

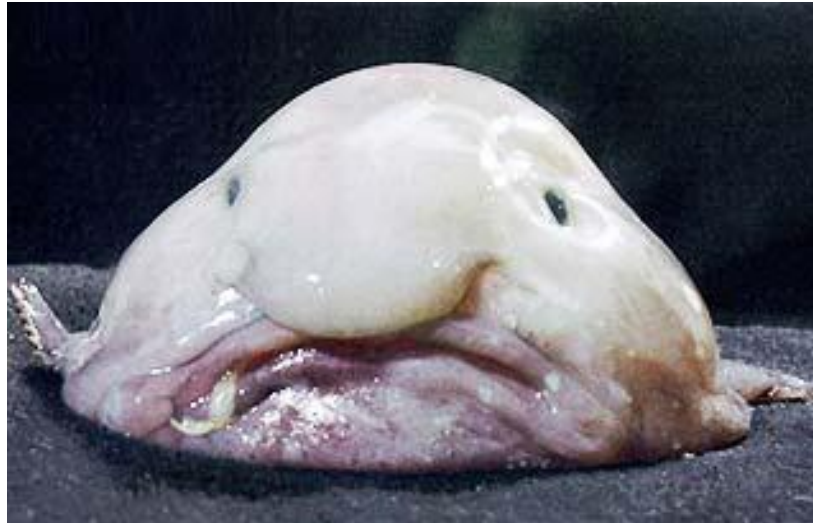
Socio-economic evaluation of ecosystem services for MSP and management of MPA

Workshop: “**Enhancing Research for Marine Spatial Planning in the Baltic Sea**”

28-29 May 2013, Klaipeda, Lithuania

*(Ru)Dolf de Groot, Env. Systems Analysis Group
Wageningen University, The Netherlands*





WAGENINGENUR

For quality of life

Benefits of Nature

Biol.
control

Recreation

Habitat
& nursery

C-seq

Pollination

**Cultural
values**

**Ecological
values**

Air quality

Timber

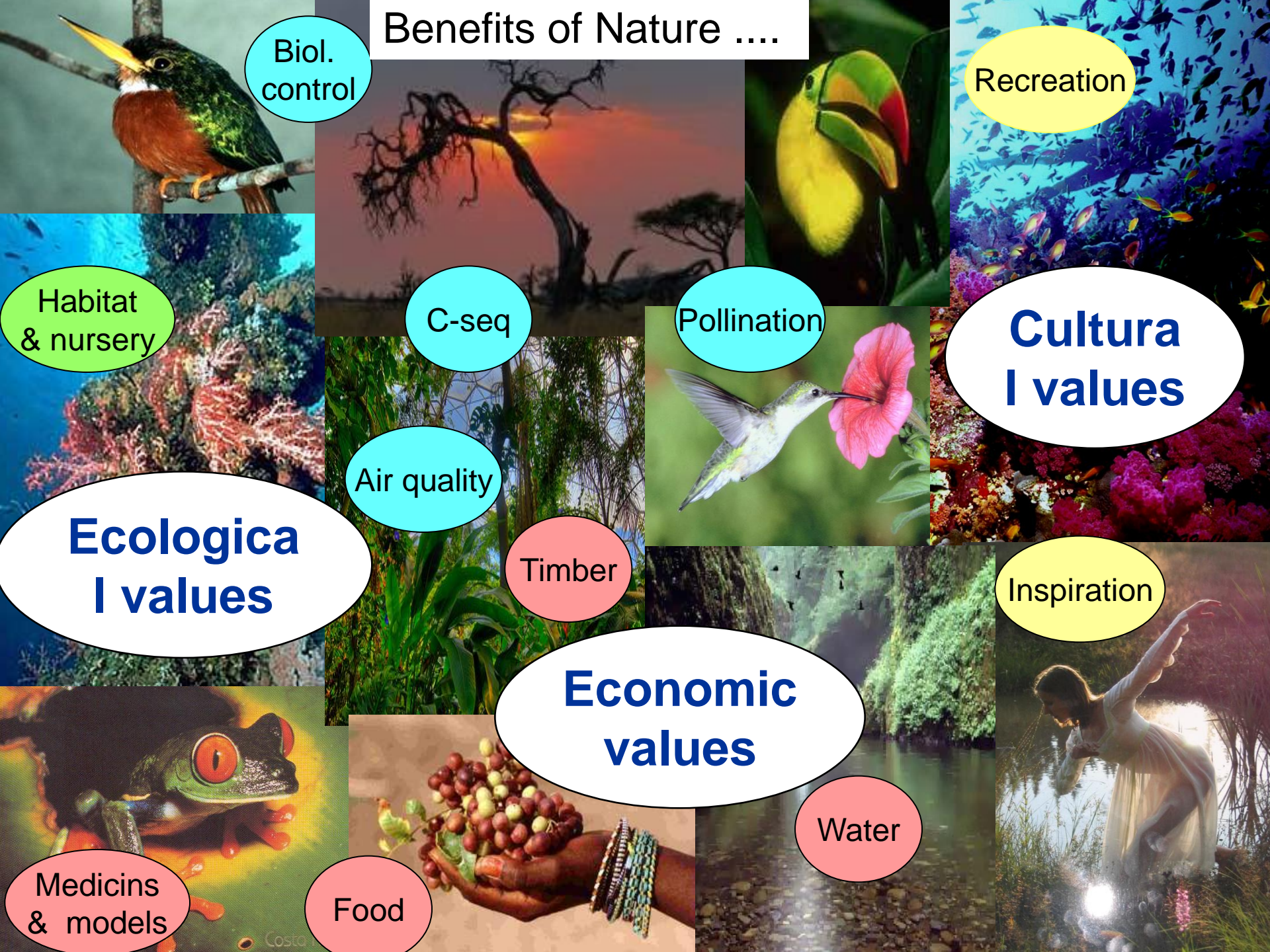
**Economic
values**

Inspiration

Medicines
& models

Food

Water

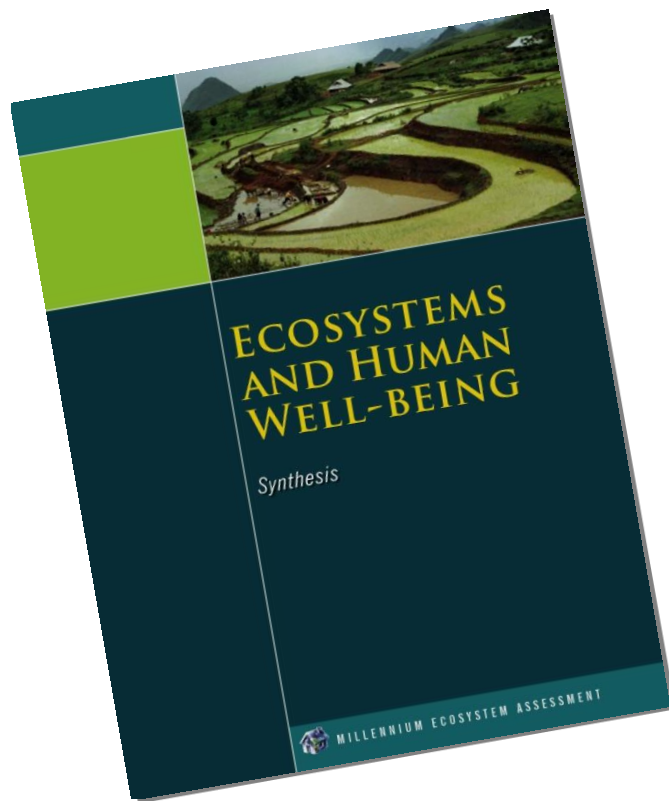


Global Assessments

Millennium Ecosystem Assessment

2001 – 2005

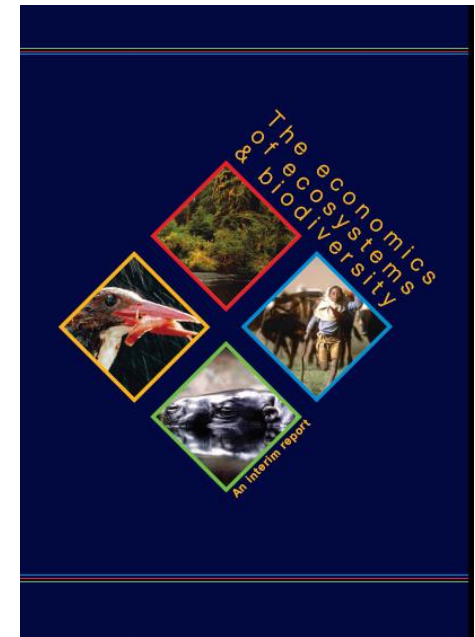
www.maweb.org



TEEB study

2008-2010+..

(www.teebweb.org)

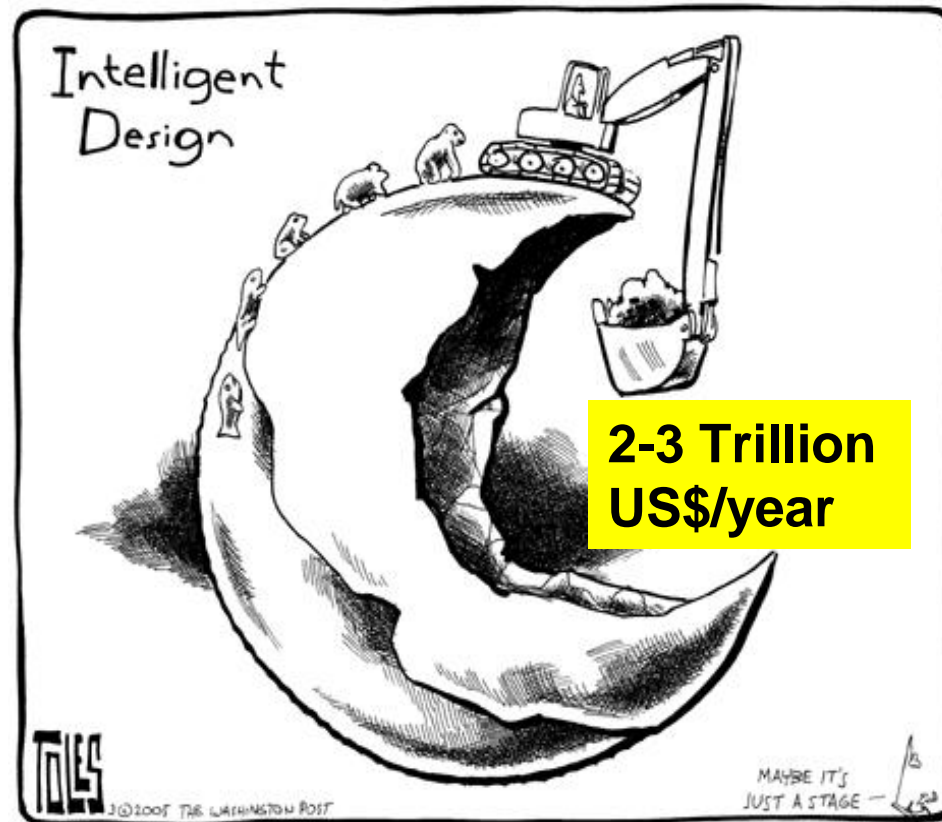


The Economics of Ecosystems & Biodiversity



Millennium Ecosystem Assessment:

- 60% of ecosystem services are in decline



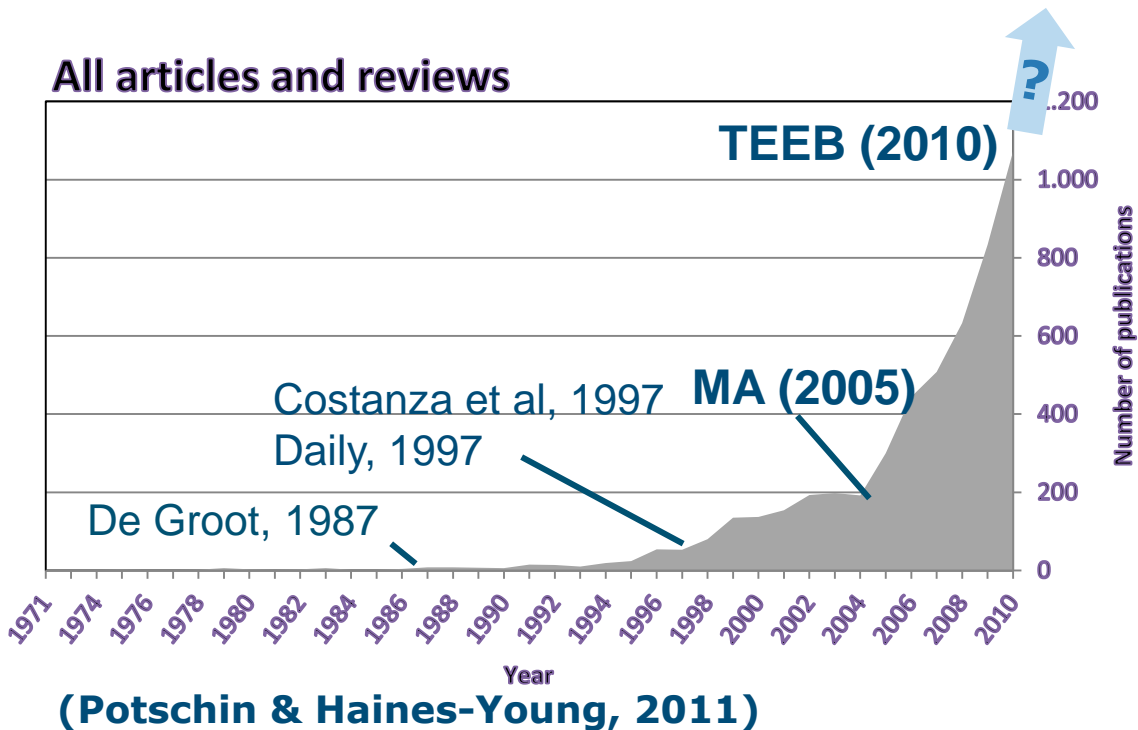
Nature loss 'dwarfs bank crisis'

By Richard Black

Environment correspondent, BBC News website,
Barcelona

9 Oct
2010

Rapid increase of ES in science and policy making



www.IPBES.net



REPORT TO THE PRESIDENT [USA]

SUSTAINING ENVIRONMENTAL CAPITAL:
PROTECTING SOCIETY AND THE ECONOMY

Executive Office
of the President
JULY 2011



EU Biodiversity Strategy
2020 (May 2011)
**“our life insurance,
our natural capital”**
All member states should
have National TEEB study
done by 2014

MSPF -> GES by 2020

TEEB in Europe

STEPS:

1. Identify & Assess

- Indicators
- Mapping
- Quantification

< 2014: map & quantify

2. Estimate Values

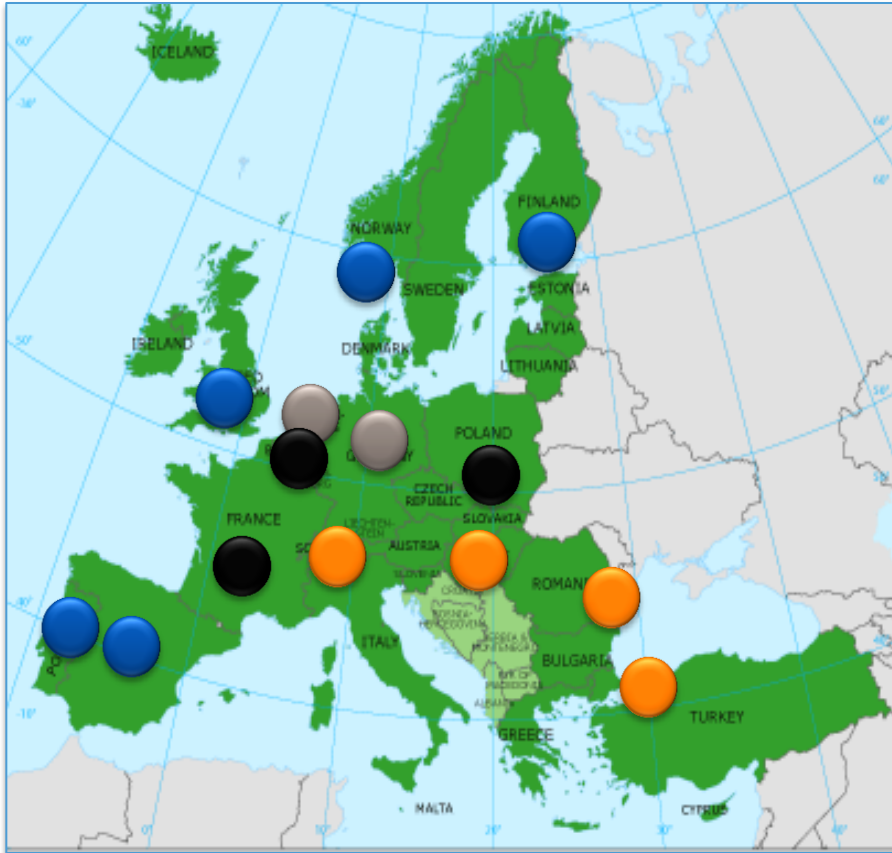
- In physical units
- Monetary

< 2020: Valuation ready

3. Capture Values

- subsidies/taxes
- Payments for ES
- Policy change
- Institutional change

< ?? : Instit. change ?





22 Service types:

Provisioning [resources]

- 1 - Food
- 2 - Water
- 3 - Raw Materials
- 4 - Genetic resources
- 5 - Medicinal resources
- 6 - Ornamental resources

Regulating [processes]

- 7 - Air quality regulation
- 8 - Climate regulation (incl. C-sequestration)
- 9 - Moderation of extreme events
- 10 - Regulation of water flows
- 11 - Waste treatment

- 12 - Erosion prevention
- 13 - Maintenance of soil fertility
- 14 - Pollination
- 15 - Biological control

Habitat/Supporting [space]

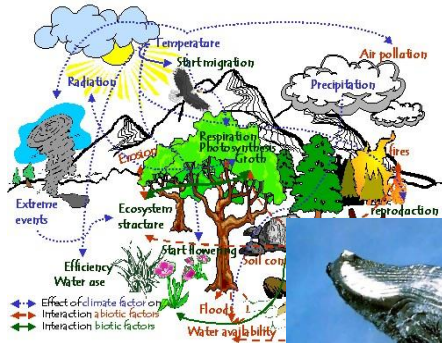
- 16 – Nursery service
- 17 – Genepool protection

Cultural [information]

- 18 - Aesthetic enjoyment
- 19 - Recreation & tourism
- 20 - Inspiration for culture, art & design
- 21 - Spiritual experience
- 22 - Cognitive development

How to measure 'value' (importance)

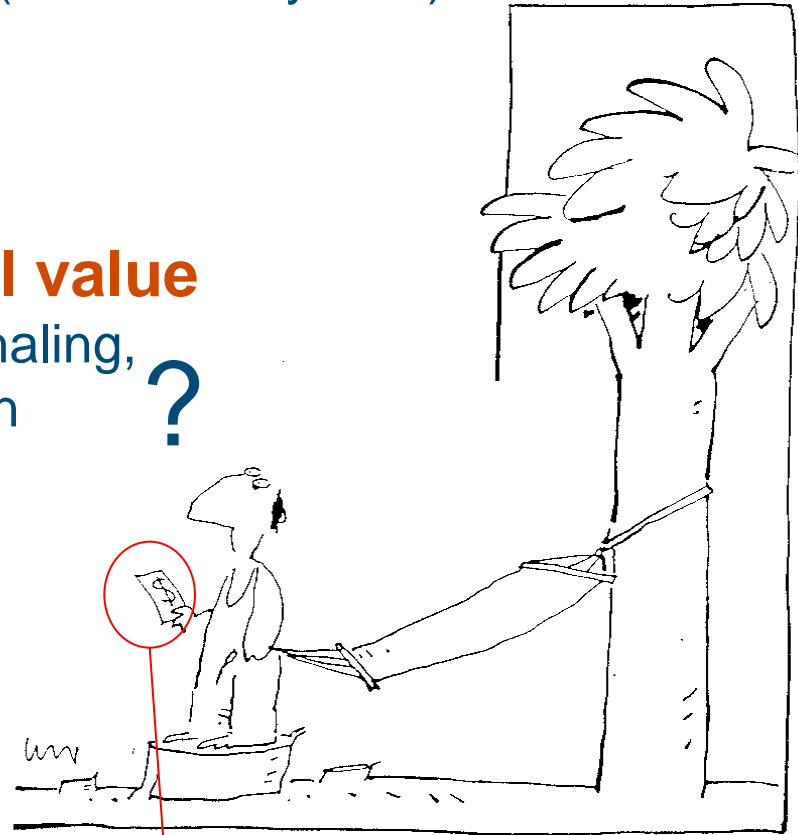
Ecological value /importance (role in ecosystem)



*Intrinsic
/existence
value*



Cultural value
(tradit. whaling,
inspiration
etc.)



Economic value

Effect on welfare and 'the' economy usually/conveniently expressed in monetary units.

Whale: meat, tourism (DUV), biol. control (IUV), donations (NUV)

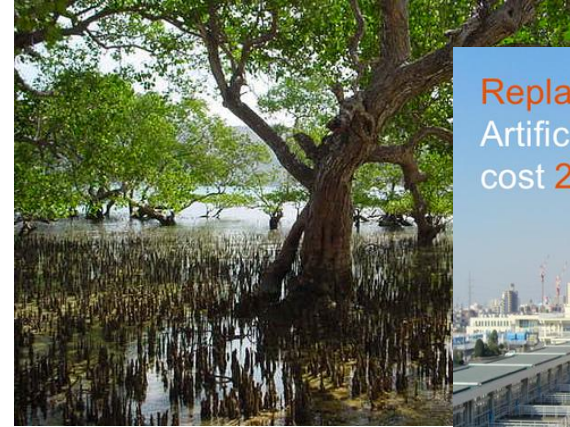
Additional value (information)
in decision making process
[but very important/trade-offs]

Monetary Valuation Methods

1. Market Price



2. Shadow Price



Replacement Cost:
Artificial treatment would
cost 2.000 \$/ha/year



3. Questionnaire based



WTP for
protecting
Humpback
Whales:
57 \$/pp/year
(1993)



Coastal Protection

**Avoided damage
Cost:** 36 million \$
(Maledives-2004).

Replacement cost
10 million \$/km

The Economics of Ecosystems & Biodiversity



Total value of ecosystem services (22) by biome (12)

Ecosystem Service	Biome	Marine	Coral Reefs	Coastal	Mangroves	Other Wetlands	Fresh water	Tropical Forest	Other Forests	Woodlands
1) Food provision		24 (6) 0 - 44	470 (22) 0 - 3.818	3.248 (12) 1 - 13.043	693 (8) 0 - 2.744	442 (16) 0 - 981	69 (3) 13 - 68	75 (19) 0 - 552	126 (8) 0 - 552	2.824 (5) 0 - 8.369
2) Water provision				1.413 (1)	1.990 (1)	2.739 (4) 15 - 5.210	1.864 (2) 1.110 - 2.619	143 (3) 6 - 411	148 (3) 0 - 442	
3) Raw material provision			400 (5) 0 - 1.990	8 (4) 0 - 36	511 (5) 3 - 326	698 (12) 1 - 2.436	1 (1)	431 (26) 1 - 1.418	24 (6) 1 - 45	541 (9) 3 - 645
4) Provision of genetic resources			20.434 (1)			12 (1)		483 (4) 7 - 1.756	2 (1)	
5) Provision of medicinal resources						92 (1)		181 (4) 11 - 562	11 (3) 0 - 11	
6) Provision of ornamental resources			264 (3) 151 - 347			10 (1)				12 (1)
7) Air quality regulation					231 (1)		0 (1)	230 (2) 10 - 449		497 (2) 90 - 903
8) Climate regulation		56 (2) 2 - 54	648 (3) 2 - 646		5.926 (4) 2 - 10.407	468 (7) 3 - 1.285	59 (1)	1.965 (10) 10 - 3.218	257 (9) 2 - 1.447	219 (2) 3 - 434
9) Moderation of extreme events			25.200 (9) 3 - 34.408	37.339 (2) 700 - 73.979	515 (2) 37 - 993	3.544 (10) 238 - 10.264		14 (2) 6 - 8	52 (2) 0 - 104	
10) Regulation of water flows						535 (2) 5 - 530		2.675 (6) 1 - 5.235	1 (2) 0 - 1	
11) Waste treatment (esp. water purification)			42 (2) 3 - 81		11.576 (2) 2.334 - 9.242	3.586 (10) 42 - 9.368	1.221 (2) 105 - 2.337	177 (6) 0 - 506	15 (4) 0 - 68	262 (4) 0 - 786
12) Erosion prevention			189.470 (1)		448 (2) 141 - 756	89 (1)		694 (9) 7 - 1.084	2 (2) 0 - 3	55 (1)
13) Maintenance of soil fertility		84 (2) 3 - 165	3 (1)	19.368 (3) 2.002 - 29.520	220 (1)	634 (3) 31 - 344	1 (1)	508 (3) 1 - 501		
14) Pollination						17 (1)		10 (2) 5 - 14	439 (1)	
15) Biological control		4 (2) 0 - 7	4 (2) 0 - 7	55 (1)		16 (1)		9 (1)	16 (1)	
16) Habitat for migratory species, incl. nursery				108 (2) 33 - 183	106 (3) 3 - 266			13 (1)		499 (1)
17) Maintenance of genetic diversity		6 (2) 1 - 11	13.541 (7) 0 - 57.133	83 (1)	174 (2) 27 - 321	648 (9) 0 - 2.247	320 (1)	373 (12) 3 - 5.151	225 (7) 0 - 2.504	1 (1)
18) Aesthetic information		0 (1)	7.425 (4) 0 - 27.484							3.733 (1)
19) Opportunities for recreation and tourism		76 (6) 0 - 511	79.099 (29) 0 - 1.063.946	13.780 (5) 70 - 40.268	1.128 (3) 493 - 713	950 (11) 1 - 3.715	649 (5) 322 - 1.166	381 (20) 1 - 1.171	758 (5) 1 - 2.934	
20) Inspiration for culture and art			0 (2) 0 - 0			595 (1)			0 (1)	
21) Spiritual experience										
22) Information for cognitive development			2.154 (4) 0 - 6.461	41 (1)						
TOTAL		250 (20)	129.245 (92)	73.852 (28)	21.077 (31)	14.245 (84)	3.803 (12)	8.338 (128)	1.618 (51)	4.343 (22)

>270 studies

>1.300
data-points

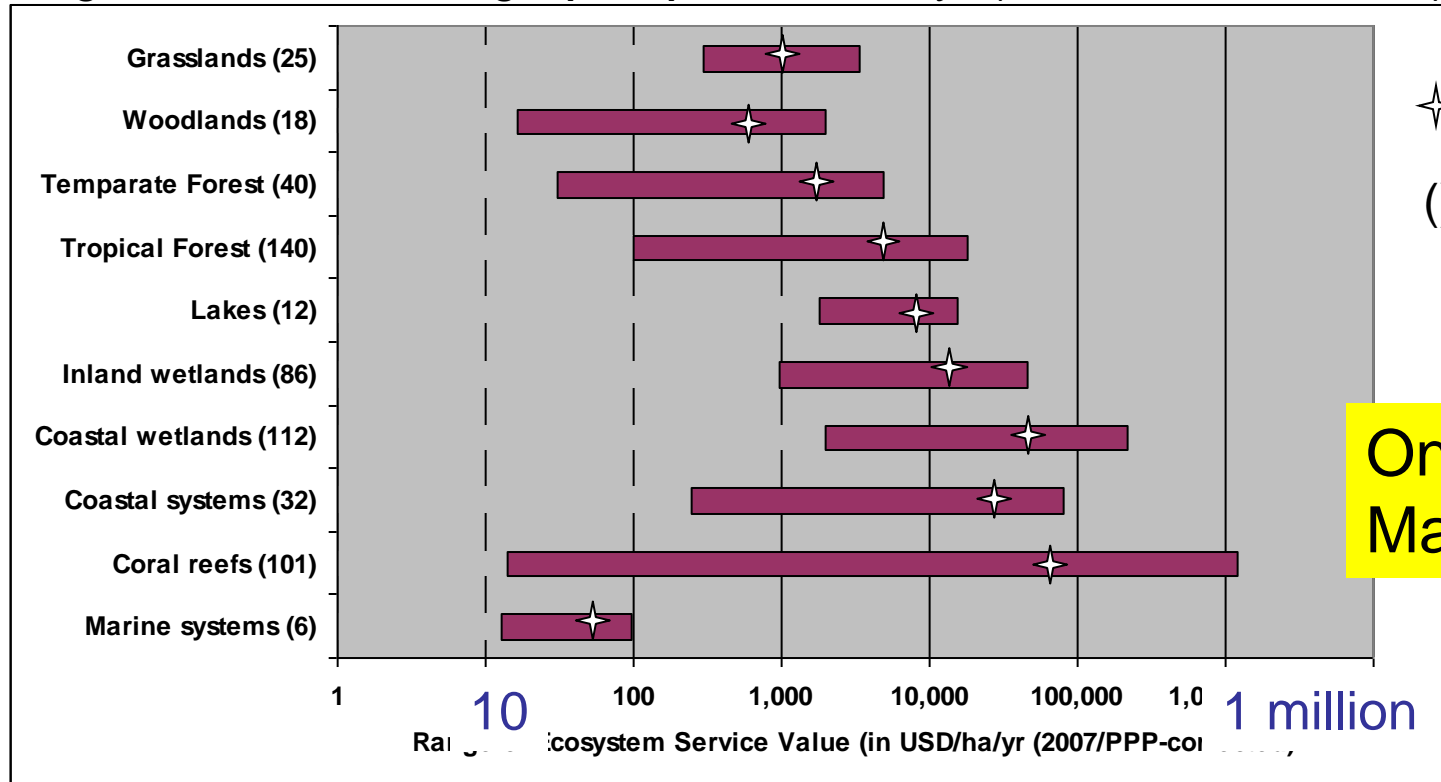
Ongoing
process ...*

* See: www.es-partnership.org

The Economics of Ecosystems & Biodiversity



Log-scale of value range (**TEV**) in US\$/ha/yr (2007 PPP corrected)



Woodlands **776** US\$/ha/yr [raw materials & water regulation]

Mangroves **46,239** US\$/ha/yr [water purification & nursery]

Coral Reefs **92,775** US\$/ha/yr [tourism & storm protection]

USE of ES in Planning, Management & Decision Making

1. Impact Analysis and project evaluation (EIA)

eg. effect of environmental damage on ecosystem functions and values

(deforestation, dams, oil-spills, etc) *[make user/polluter pay]*

2. Evaluation of alternative development & management

options Analysis of (potential) conflicts and synergies;
eg. combination or separation of functions ?

3. More integrated (Social) Cost – Benefit Analysis

(including all services and values)

4. Financing conservation, restoration and sustainable use (how turn value into real money ...)

5. Increase awareness and „ecologise economics“

(internalise externalities -> better decisions)

Prestige Oil Spill, November 2002



- **64,000 tonnes** of oil was spilled by the prestige
- **13,000 tonnes** remains in the wreck
- **5,000 to 10,000 tonnes** is drifting offshore



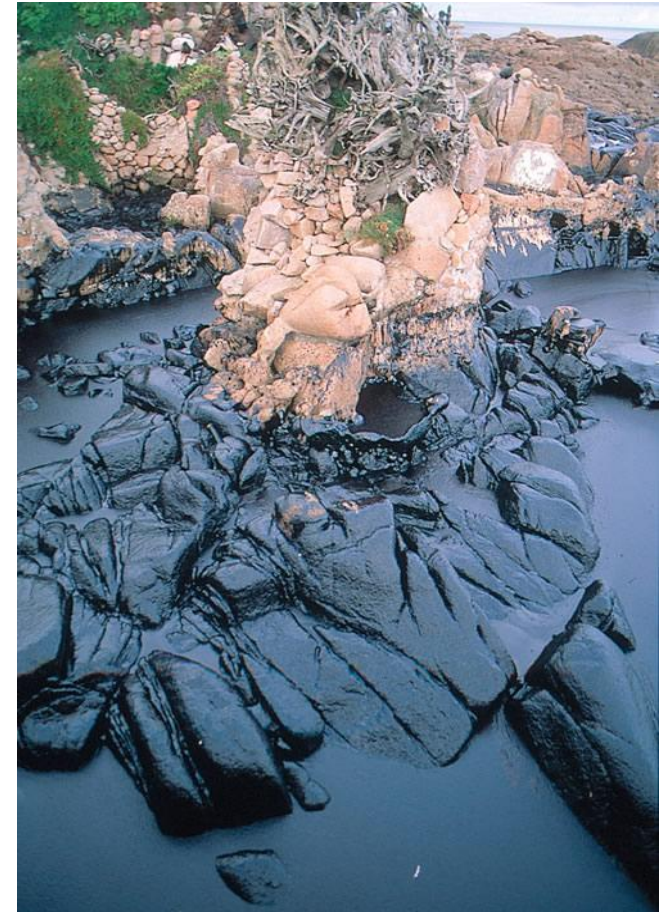
Clean up costs: ca 2,5 billion €

An attempt at containment...



Soldiers cleaning the beaches

The oil reaches the coast...



However, not only clean-up costs

“Locals used to harvest clams from this beach”

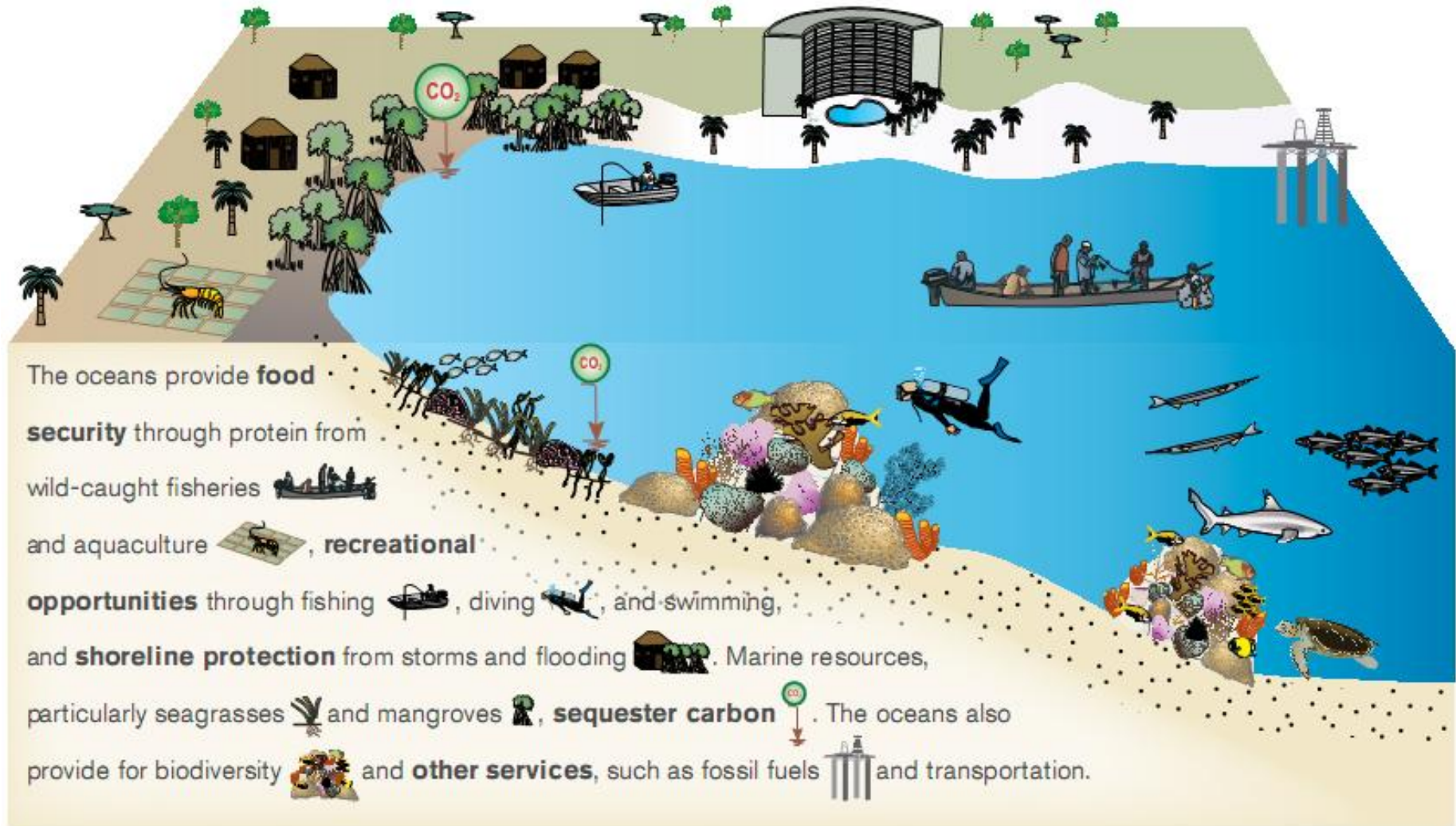


- Around 30,000 people in the fishery and shellfish sectors have been directly affected
- 80 percent drop of normal catch
- Contaminants on the sea bed can enter the food chain

According to WWF, damage to fishing and related economic sectors, tourism and the natural heritage along 3,000 km of coastline polluted by the spill may last for over a decade and cost approximately **€ 5 billion**, with society at large paying 97,5 % of it *

***) Insurance pays max. 175 Million € ...**

Evaluation of Development Options





Options for Delivering Ecosystem-based Marine Management (2011-2014)

Anne Boehnke-Henrichs

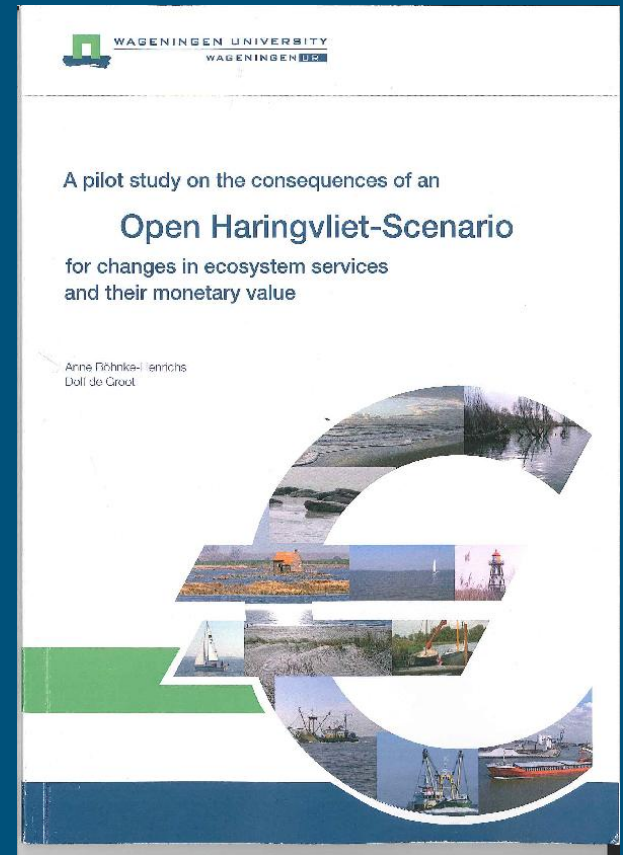
Many conflicting uses and interests:

- Increasing marine activities result in increasing spatial needs
- MSP to coordinate marine spatial uses
- Solve conflicts between different uses
- Aim for sustainable sea use
- Based on ecosystem approach



Applying the TEEB approach to estimate the economic benefits of re-naturalising the Haringvliet delta

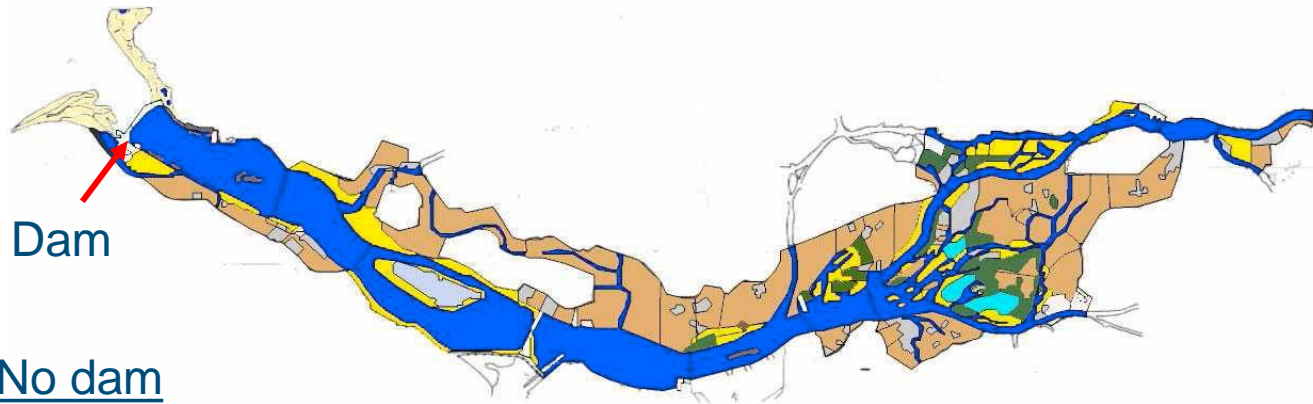
Anne Böhnke-Henrichs
& Dolf de Groot



Restoration Project Open Haringvliet



Open Haringvliet: Change in Ecosystem Services and values



Mono/few
services

No dam



+ 500 million€/year

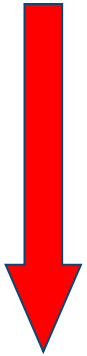
Many
services

Landgebruik		Zoet		Zout		Klimaatdijken	
Akkerland		Water met getij		Water met getij		Hoog stedelijk	
Weiland		Kreken		Kreken		Dorps smal	
Spaarbekkens		Water stilstaand		Zand & slik		Dorps breed	
Bos		Zand- & slik		Lage kwelder(schor)		Landelijk smal	
		Riet & biezten		Hoge kwelder(schor)		Landelijk breed	
		Wilgenvloedbos		Duingebied & strand		Gewone dijk	
		Grasland					

3: NEED MORE COMPLETE (HONEST) COST-BENEFIT ANALYSIS

“Pristine”
Multi-funct.

Extensive use



Intensive use

Mono-funct.

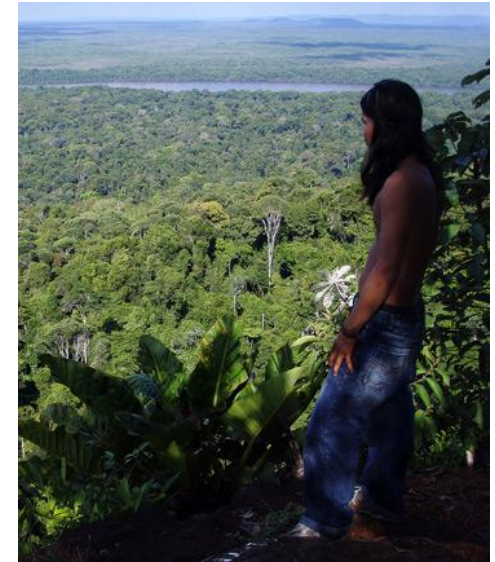
Degraded

FOREST



GRASSLAND

100%
Mean abundance of original species
0%



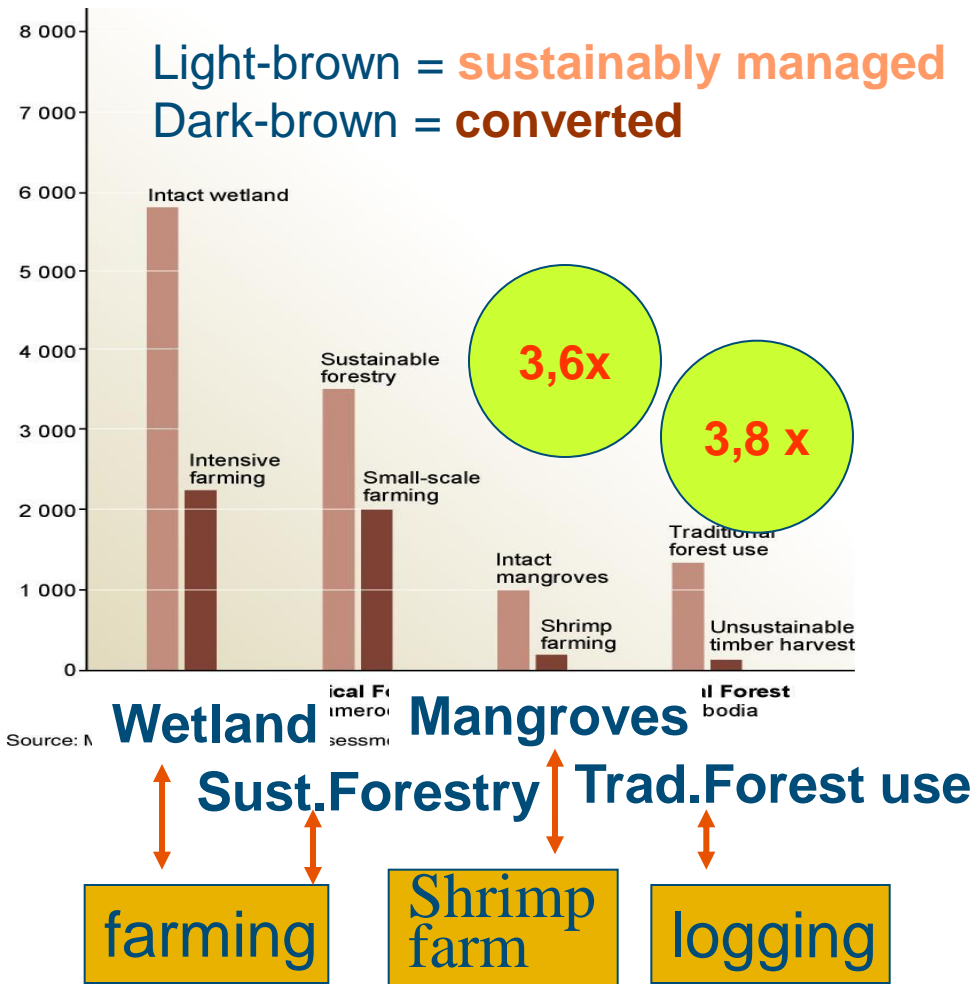
Trade offs ?



Oil Palm Plantations
(& other “energy crops”)

Conversion <-> sustainable management: “honest” CBA

Net Present Value/ha



“The **total economic value** of managing ecosystems more sustainably is often higher than the value associated with conversion”

Balmford et al (2002, Science Vol 297)
„Economic reasons for conserving wild nature“

NATURA 2000 Cost estimates

Building on the results of the Member States questionnaire, the annual costs of implementing the Natura 2000 network were estimated as **€5.8 billion** per year for the EU-27.
(Gantioler, 2010)

Average: 63€/ha/y (range: 10 – 800€/ha/y)
incl. acquisition & infrastructure (30%) + management

Marine sites:
< 3 €/ha/y.



Question: is money spent on, eg employment a “cost”?

Natura 2000 BENEFITS

“A number of examples have demonstrated that the benefits can be larger than the associated costs”



According to a study in Ireland, the aggregate benefits provided by the Burren park's limestone pavements and the orchid rich grasslands were estimated to amount to €4,420 / ha / year . The total benefit from the Park is estimated to be **€65 million** per year or about **3 times as much as the cost** of Government support (**Gantioler, 2010**)

The protection of all 300 Natura 2000 sites throughout Scotland was estimated to have an overall **benefit cost ratio of around 7** over a 25-year period (Jacobs, 2004). Total benefits were estimated at **£210 million per year**, however, 99% is non-use value (**Gantioler, 2010**)

In 2008 a study was carried out in France to determine costs and benefits of the Natura 2000 site 'Plaine de la Crau'. The calculated overall net benefits amounted to €142ha/year, which was **around seven times higher than the costs associated with the site**. (Hernandez & Sainteny, 2008).

Conservation still seen as a cost ...

“Current” expenditures on all Protected Areas (incl. bilateral agreements, GEF, etc): < 10 billion US\$/y ⁽¹⁾

Needed : 45-50 billion \$ ⁽²⁾ < 0.001%

Global GDP: ca 50 Trillion US\$ (2009) ⁽¹⁾



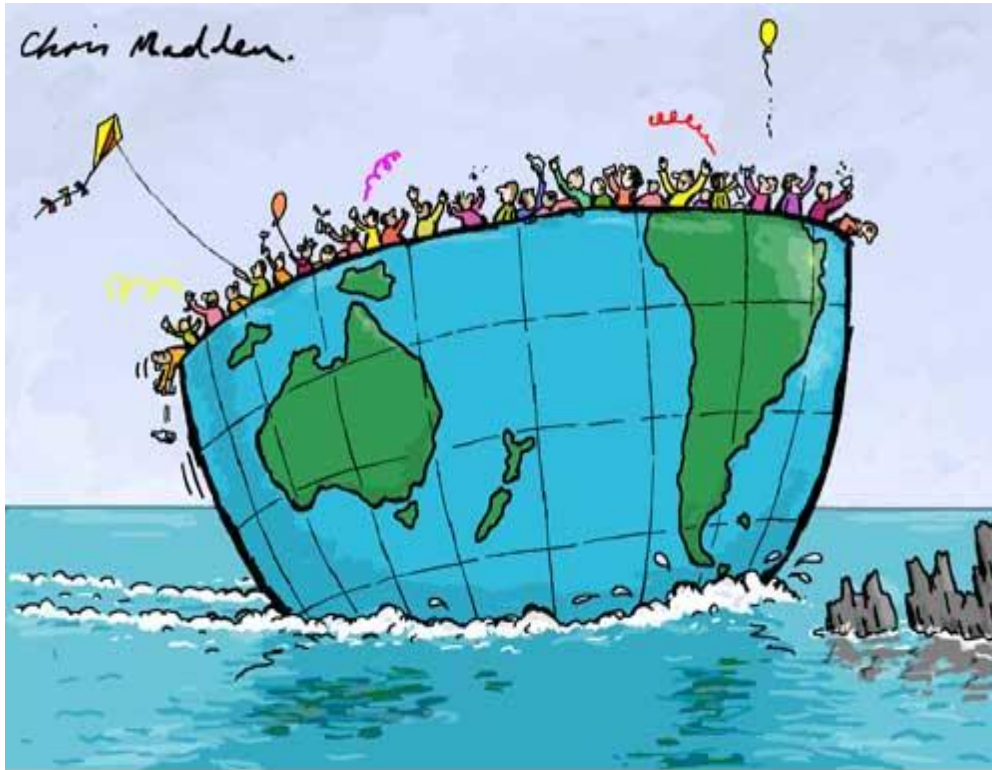
Valentines day in USA
2005: 13 billion US\$

Globally on cigarettes:
2009: 50 billion US\$

Benefits: >> 1,5 - 4,5 trillion ⁽³⁾
(return 1: 30-100)

Why continues ??

„Society must urgently replace its defective economic compass“
(Pavan Sukhdev, TEEB study leader, 2007)



THE SHIP OF FOOLS AND THE ROCKS OF
SHORT-TERM ECONOMIC PLANNING

Some shortcomings
of conventional economic
theory (& practice):

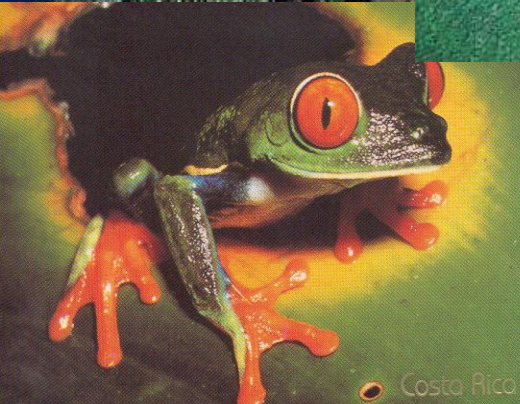
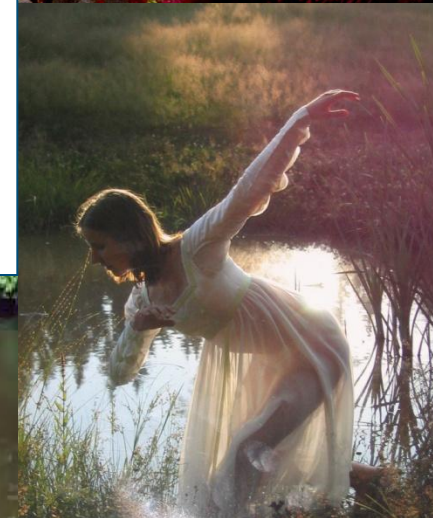
- “Free” services” (>75%)
- Neglect of externalities
- Perverse subsidies
- Wrong assumptions
(& paradigms) about
people & markets

Investing in nature (restoration) pays!



**„Every dollar
invested
saves any-
where
between 7,5
and 200 US\$
in damage &
repair costs“**

The Economist
(23 April 2005)



www.es-partnership.org


Ecosystem Services Partnership

[Login](#) [Forgot password?](#) [Create user account](#)

ESP

The Ecosystem Services Partnership

Worldwide Network to enhance the Science and practical Application of ecosystem services assessment



Science Policy Practice

- Home
- About the Partnership
- Become a member
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- ESP Working groups
- ESP Conferences 2012
- Journals
- News
- Agenda
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[> Homepage](#)

Welcome to the new ESP website

Several pages and functionalities are still under construction or are being updated. If you have any suggestions please contact [ESP Support Team](#).


ESP Services

- Networking & Outreach
- Case studies & Showcases
- Data & Knowledge sharing
- Training and Education
- Guidelines & Toolkits
- Calls for cooperation

- Contact
- Support & FAQ
- Members & Partners
- Become a Member

ESP Activities and Networks

- Thematic Working Groups
- Biome Expert Groups
- National ESP Networks



ESVD / EVT

MESP

Ecosystem Services Partnership

ESP

www.es-partnership.org