Valuation of Ecosystem Services : Key to PES

Evidences from TEEB

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Meaning and Notion of PES

- Many terms but same notion
- 'Market for Ecosystem Services', 'Compensation for Conservation', 'Payment for Ecosystem Services', 'Benefits transfer for conservation', 'Benefit sharing for conservation' etc
- Context of PES
  - Payment for Biodiversity (upfront and contingent payment to locals by the pharmaceutical firms for supply of genetic materials-Merck + INBio)
  - Payment for Hydrological function (Catskill)
  - Payment for Carbon Credit (under CDM)

Critical Precondition of PES

Conditions for Successful PES

- Assessment of physical ecosystem services (bio-physical relationship) with definite space and time dimension
- Economic Estimate of ecosystems services
- Availability of Buyer(s) and Seller(s)
- Definite (enforceable) Property Rights
- Enabling Institutional conditions
- Skilled manpower (adept in conducting credible economic estimates)
- Social Trust

Background: TEEB's Genesis

Potsdam 2007: meeting of the environment ministers of the G8 countries and the five major newly industrialising countries

G8 2007
Environment Ministers Meeting
Potsdam, 15-17 March 2007

"Potsdam Initiative – Biological Diversity 2010"

1) The economic significance of the global loss of biological diversity

In a global study we will initiate the process of analysing

the global economic ***benefit of biological diversity****,*

the ***costs of the loss of biodiversity*** *and*

the failure to take protective measures versus the costs of effective conservation*.*

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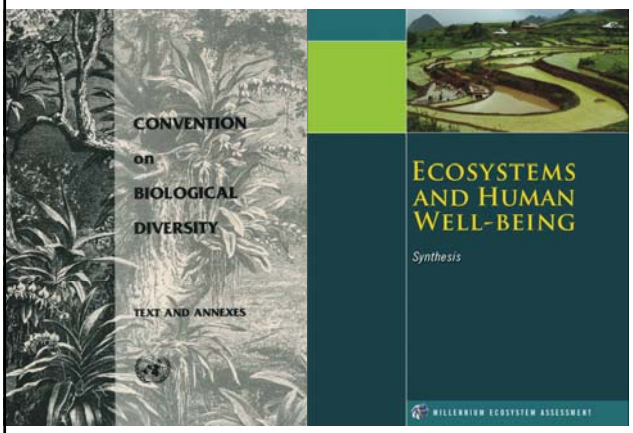
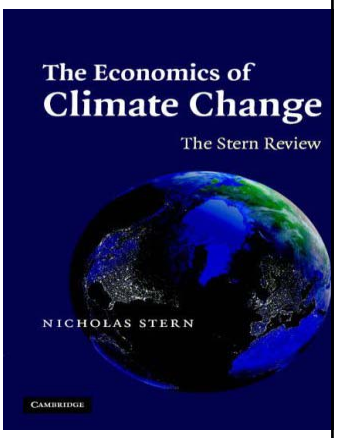
Contextual Background





Parallel Influential Initiatives....

ipBes

DIVERSITAS
an international
programme
of biodiversity
science

Natural
Capital
Initiative
Linking Environment & Policy

http://www.naturalcapitalproject.org/

MISTRA
THE FOUNDATION FOR STRATEGIC ENVIRONMENTAL RESEARCH

Stockholm Resilience Centre
Research for Governance of Social-Ecological Systems

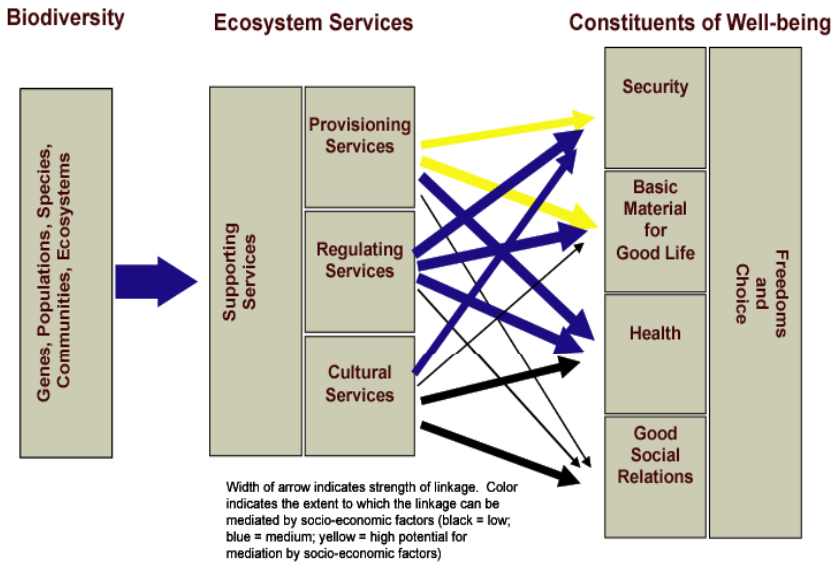
Stockholm University

Sub Global Assessments (SGAs): MA Follow Ups

A network of sub-global assessments was created under the overall MA Follow-up Programme to favouring crossfertilization and sharing experiences among SGA practitioners, as well as to enhancing links between sub-global activities and international processes

SGAs LOCATIONS (as at September 2009)

Millennium Ecosystem Assessment



Stern Report 2006

1. No action costs 5% of the global GDP, could go up to 20% of the GDP if comprehensive risks and impacts accounted
2. Actions (reducing GHGs) costs approximately 1% of the global GDP
3. Global investment and production pattern would further accelerate the problem of global warming
4. If no action taken, by 2035, the temperature to rise by 2 degree C
5. Responsibility is common but differentiated
6. The costs of taking action are not evenly distributed

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Overarching Objectives of TEEB

✓TEEB aims to strengthen economics as an instrument in biodiversity policy through improved understanding of the benefits from biodiversity, ecosystem services and the costs of their loss.

✓TEEB synthesizes state-of-the-art scientific and applied knowledge for the main types of ecosystems worldwide. It will propose a selection of cost-effective policy options for protecting biodiversity and ecosystem services.

✓TEEB aims to help policy makers, local authorities, companies and individuals in making decisions with respect to their responsibilities in safeguarding biodiversity.

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TEEB – Final Report
Sep 2009, June 2010

- Science & Economics Foundations, Policy Costs, & Costs of Inaction
- Policy Evaluation for Policy-Makers
- Decision Support for Administrators
- Business Risks & Opportunities
- Consumer Ownership

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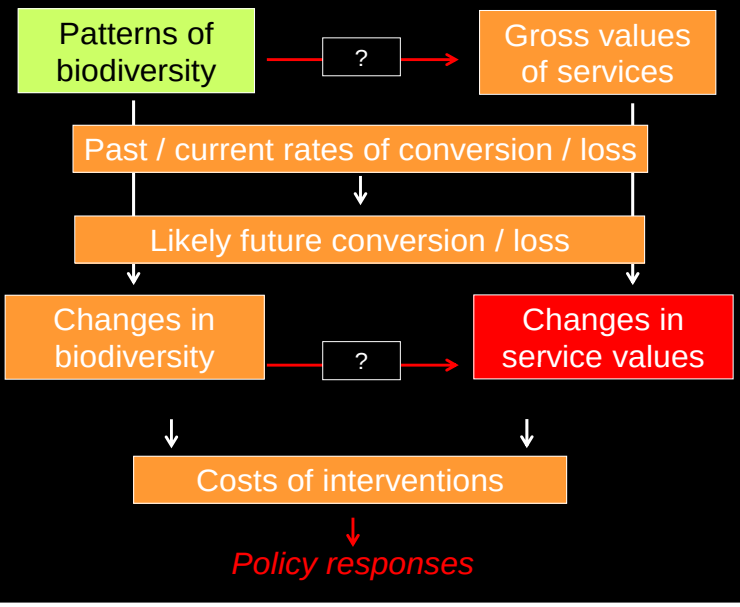
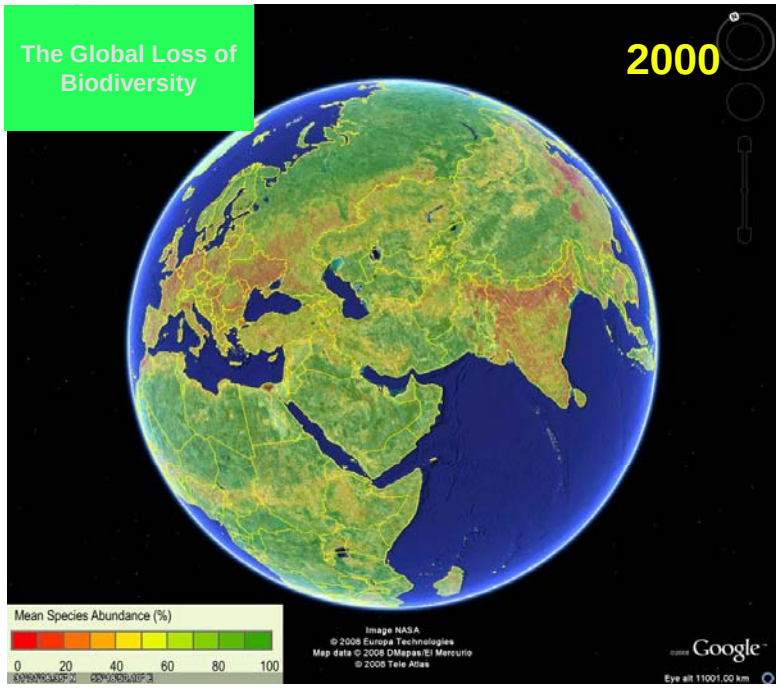
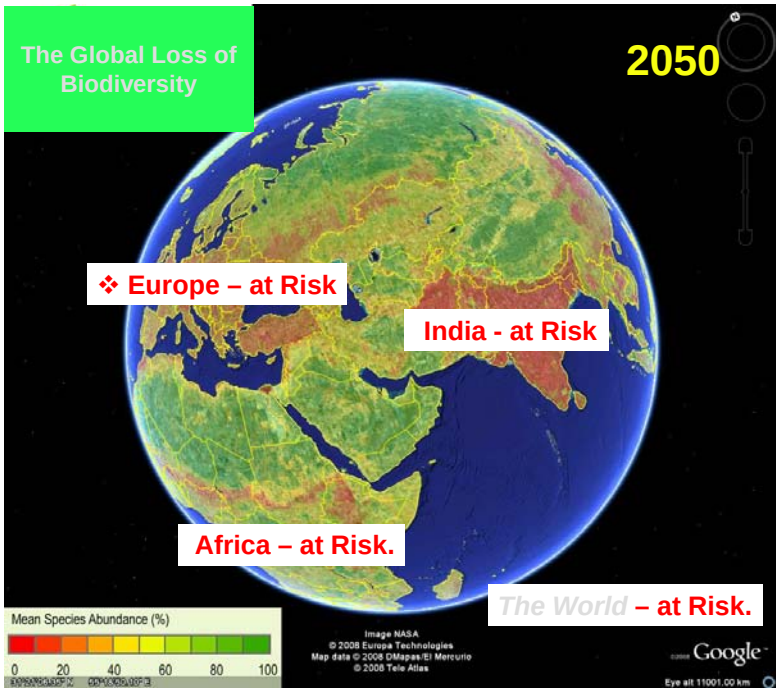
What we know so far



Ecosystem Service and Biodiversity

Component of biodiversity	Example of ecosystem service	Sources
Genetic variability	Medicinal products	Chai et al. (1989)
Population sizes and biomass	Food from crops and animals	Kontoleon et al. (2008)
Species assemblages, communities and structures	Habitat provision and recreation	Rosenberg et al. (2000)
Interactions between organisms and their abiotic environment	Water purification	Hefting et al. (2003)
Interactions between and among individuals and species	Pollination and biological control	Messelink et al. (2008)





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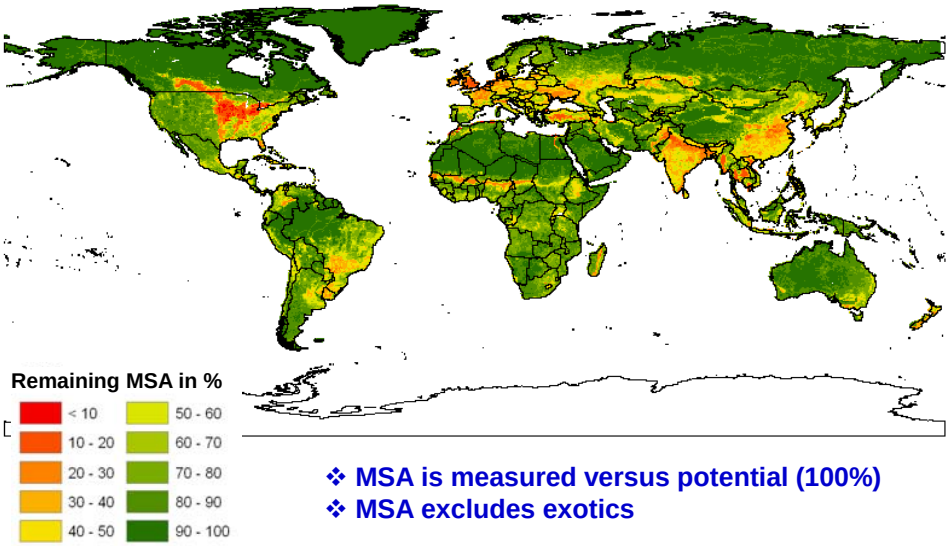
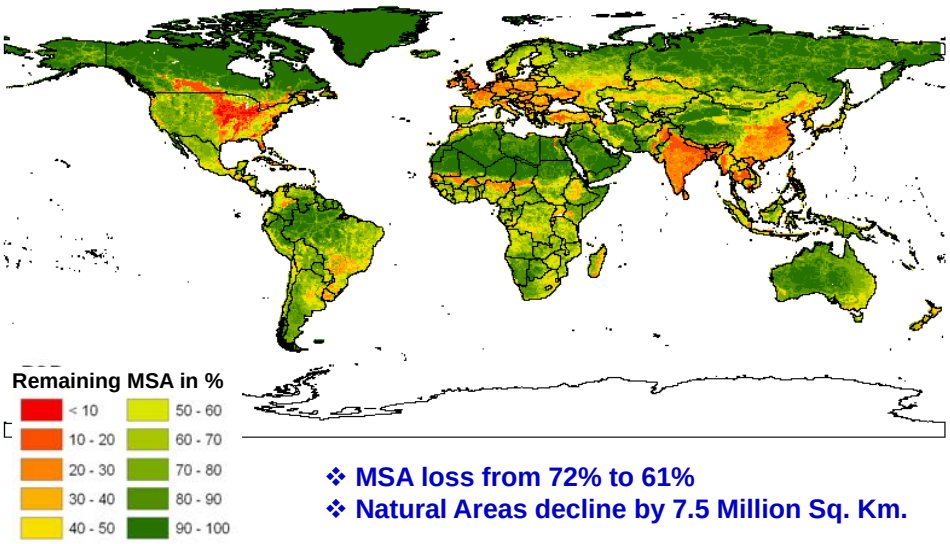
Biodiversity in the World in 2000
The Mean Species Abundance (MSA) indicator



- ❖ MSA is measured versus potential (100%)
- ❖ MSA excludes exotics

Source: Ben ten Brink (MNP) presentation at the Workshop: *The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium.*

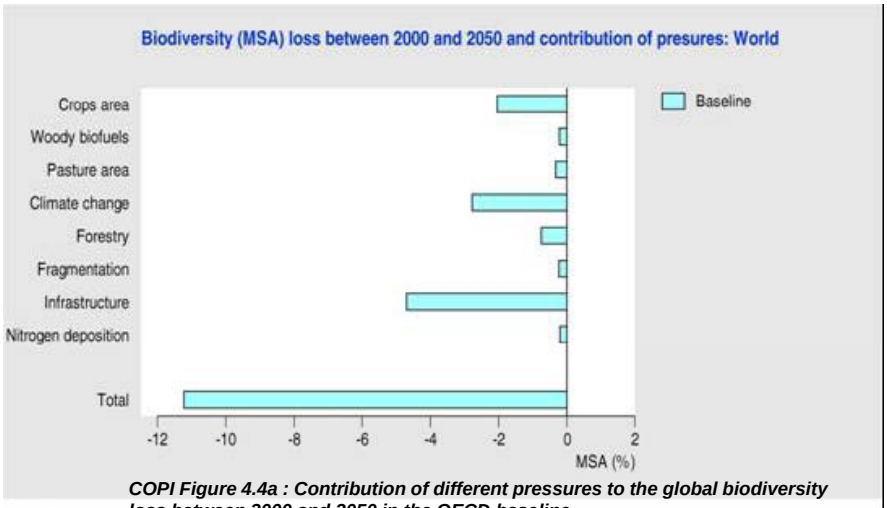
Biodiversity in the World in 2050
Future scenario : using OECD/ Globio-3



- MSA loss from 72% to 61%
- Natural Areas decline by 7.5 Million Sq. Km.

Source: Ben ten Brink (MNP), presentation at the Workshop: *The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium.*

Drivers of Biodiversity Loss
2000 - 2050 (Globio-3)



COPI Figure 4.4a : Contribution of different pressures to the global biodiversity loss between 2000 and 2050 in the OECD baseline

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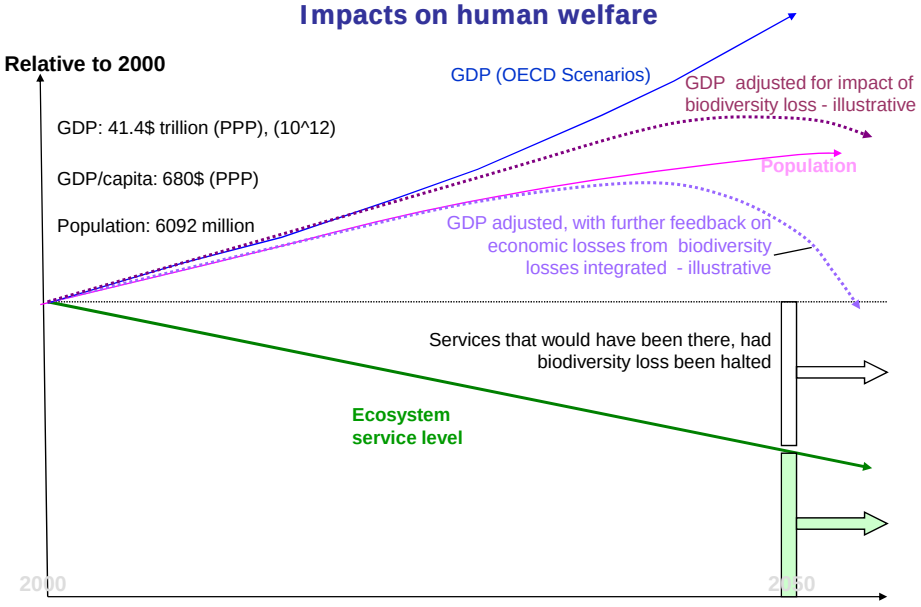
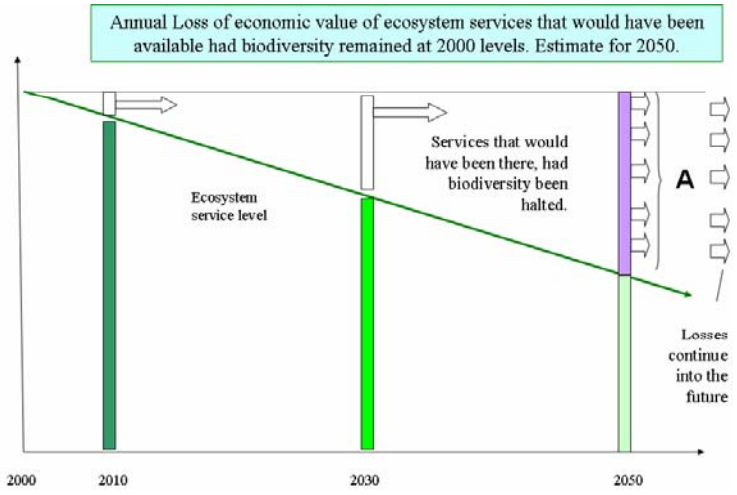
(1) Ecosystem service losses: Impacts on human welfare



Source: Patrick ten Brink (IEEP), Leon Braat (Alterra), Mark van Oorschot (MNP), Matt Rayment (GHK)

(1-cont'd) Large Welfare Losses Forecast

(just from business-as-usual *Forest losses*, & valuing only 8 of 18 forest services)



Welfare loss equivalent to 6 % of global GDP per annum, horizon 2050

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Change of Landuse (area coverage)
across all biomes – Global Total

Actual	2000	2050	Difference
Area	million km2	million km2	2000 to 2050
Natural areas	65.5	58.0	-11%
Bare natural	3.3	3.0	-9%
Forest managed	4.2	7.0	70%
Extensive agriculture	5.0	3.0	-39%
Intensive agriculture	11.0	15.8	44%
Woody biofuels	0.1	0.5	626%
Cultivated grazing	19.1	20.8	9%
Artificial surfaces	0.2	0.2	0%
World Total *	108.4	108.4	0%

- **Natural areas loss** is **7.5m km2** - broadly equivalent to the area of the **Australia.**
- Losses: **natural, bare natural areas & extensive agriculture** broadly equals the **USA**

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Loss of Quality / Degradation
Global total

Loss of quality - due to pollution, fragmentation, infrastructure and climate impacts (Global average all biomes)
Mean Species Abundance indicator

Mean species abundance change for different land use categories	MSA loss 2000 to 2050
Natural areas	11%
Bare natural	8%
Forest managed	20%
Extensive agriculture	8%
Intensive agriculture	-2%
Woody biofuels	0%
Cultivated grazing	14%
World Total	18%

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Global
Loss of Ecosystem services
from land based ecosystems

Area	Relative to 2000 Billion EUR	Relative to 2000 Equivalent to % of GDP in 2050
Natural areas	-15678	-7.97%
Forest managed	1852	0.95%
Extensive Agriculture	-1109	-0.57%
Intensive Agriculture	1303	0.67%
Woody biofuels	381	0.19%
Cultivated grazing	-786	-0.40%
World Total	-13938	-7.1%

The loss grows with each year of biodiversity and ecosystem loss!

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Global
Loss of Ecosystem services
Forestry biomes

Forest biomes	Partial Estimation	Fuller Estimation
Boreal forest	-163	-1999
Tropical forest	-536	-3362
Warm mixed forest	-249	-2332
Temperate mixed forest	-190	-1372
Cool coniferous forest	-47	-701
Temperate deciduous forest	-133	-1025
Forest Total	-1317	-10791
Natural areas	-1552	-12310
World GDP in 2050 (trillion (10^12) EUR)*	195.5	
Losses of ESS from forests as share of % GDP	-0.7%	-5.5%
Losses of ESS from natural areas in forest biomes as share of % GDP	-0.8%	-6.3%

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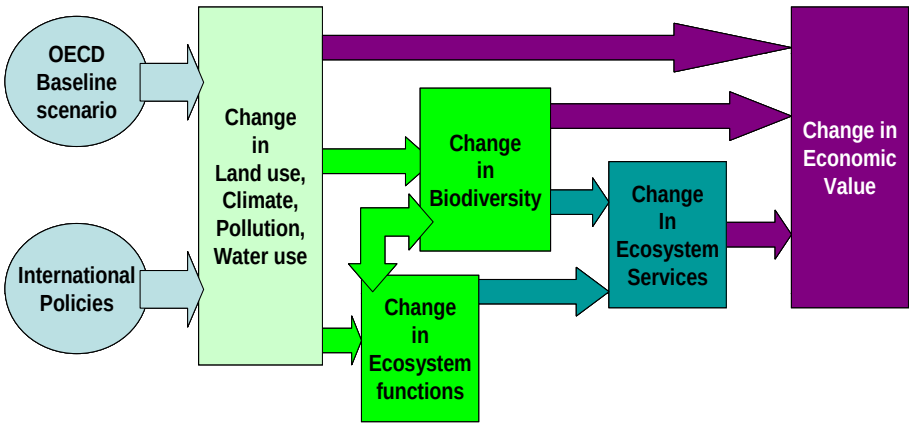
Biodiversity, Ecosystems, and their Services



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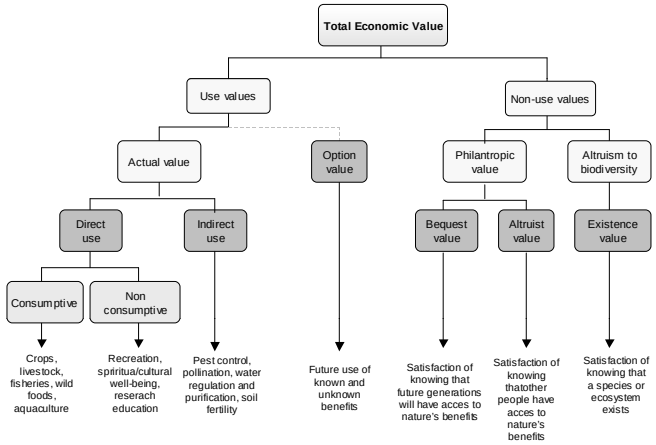
Overview of Values



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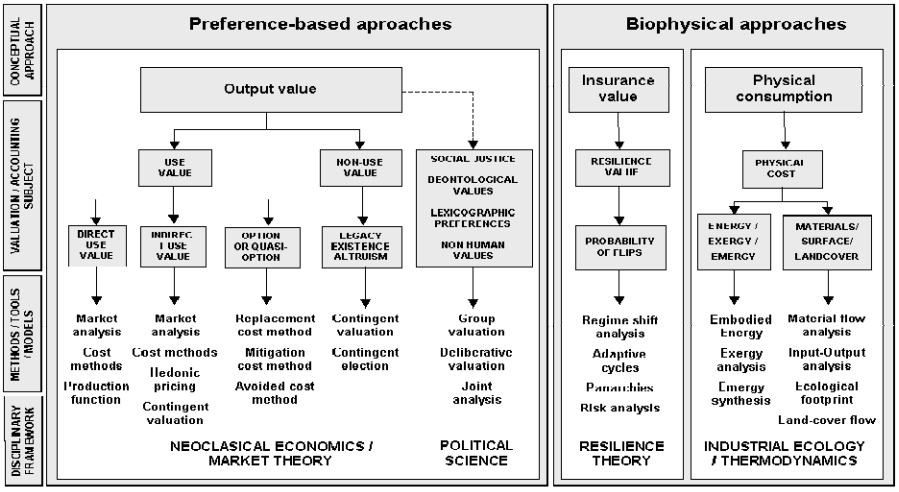
Context and Theory of 'Value'



Source: drafted from Gómez-Baggethun and de Groot, in press

Taxonomy of Valuation Methods

Approach		Method	Value
Market valuation	Price-based	Market prices	Direct and indirect use
	Cost-based	Avoided cost	Direct and indirect use
		Replacement cost	Direct and indirect use
		Mitigation / Restoration cost	Direct and indirect use
	Production-based	Production function approach	Indirect use
		Factor Income	Indirect use
Revealed preference		Travel cost method	Direct (indirect) use
		Hedonic pricing	Direct and indirect use
Stated preference		Contingent Valuation	Use and non-use
		Choice modelling/ Conjoint Analysis	Use and non-use
		Contingent ranking	Use and non-use
		Deliberative group valuation	Use and non-use

Valuation Changes the Decision Making Criteria

Table 1: Benefits from ecosystem services in coral reef ecosystems

CORAL REEFS	Value of ecosystem services (in US$ / ha / year – 2007 values)		
Ecosystem Service	**Average**	**Maximum**	**Number of Studies**
Provisioning services			
Food	470	3,818	22
Raw materials	400	1,990	5
Ornamental resources	264	347	3
Regulating services			
Climate regulation	648	648	3
Moderation of extreme events	25,200	34,408	9
Waste treatment / water purification	42	81	2
Biological control	4	7	2
Cultural Services			
Aesthetic information / Amenity	7,425	27,484	4
Opportunities for recreation and tourism	79,099	1,063,946	29
Information for cognitive development	2,154	6,461	4
Total	**115,704**	**1,139,190**	**83**
Supporting Services			
Maintenance of genetic diversity	13,541	57,133	7

Note: these estimates are based on ongoing analyses for TEEB (TEEB Ecological and Economic Foundations, Chapter 7). As the TEEB data base and value-analysis are still under development, this table is for illustrative purposes only.

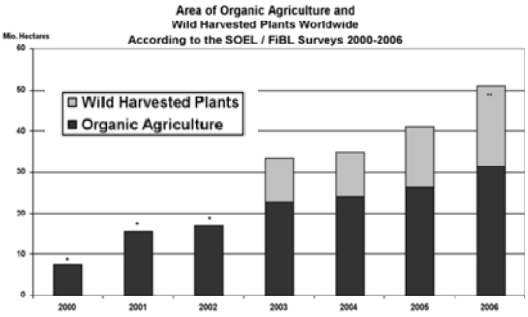
Sensitivity Analysis…. 5 key parameters

Ecosystem	Typical cost	Avg. benefit	NPV	IRR	BCR
Coral	542,497	129,245	1,165,988	7%	2.8
Coastal	232,674	73,852	935,379	11%	4.4
Mangroves	2,876	4,346	88,297	40%	26.8
Inland wetlands	33,007	14,245	171,296	12%	5.4
Lakes / rivers	4,032	3,803	69,687	27%	15.5
Tropical forest	3,448	7,022	148,675	50%	37.3
Temperate forests	2,387	1,618	26,273	20%	10.3
Woodland / shrubland	987	4,343	97,696	85%	84.3
Grasslands / rangelands	257	1,012	22,624	79%	75.1

	Ecosystem	Typical cost	Avg. benefit	NPV	IRR	BCR
	Tropical forest	**3,448**	**7,022**	**148,675**	**50%**	**37.3**
1	**Benefits peak @ 70%, instead of 80% of Generic**				**42%**	**31.5**
2	**Costs @ 100%, instead of 120% of Typical**				**57%**	**45.4**
3	**Maintenance Cost (10%) stops after 5 years**				**51%**	**40.0**
4	**Benefits flows accounted for 50 yrs, instead of 40**				**50%**	**45.4**
5	**Discount rate 4%, instead of 1%**				**50%**	**21.7**

Examples: Making markets with information- Certification and eco-labelling

Organic agriculture: 30 million hectares and US$38 billion in 2006



Source: Willer et al. (2008)

Certified forestry: 7% of productive forest area and US$20 billion sales in 2007

Source: FAO (2007); FSC (2008)

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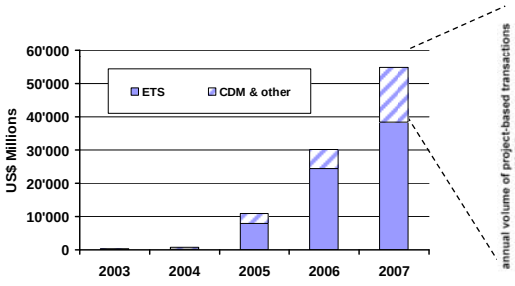
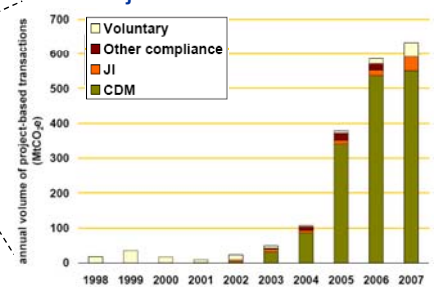
The carbon trade and bio-carbon offsets

Global Carbon Trade



Project-Based Carbon Offsets



"Investors all over the world have pumped around $66 billion into more than 200 newly launched mutual funds and exchange traded funds investing in companies that help to mitigate or adapt to climate change" (Deutsche Asset Management, 2008)

Sources: World Bank (2007); Point Carbon (2008); Financial Times (24.03.2008)

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Other Selective Examples of the PES and relevant Organisations Currently involved

- Alternatives to Slash-and-Burn
- UNDP/UNEP Poverty and Environment Initiative
- Equator Initiative
- GEF small grants program
- Country poverty reduction strategies
- TNC Great Rivers Partnership
- USAID and Development Alternatives – Indonesia case study
- CIFOR - payments for ecosystem services - Rewarding the Upland Poor
- Environmental accounting initiatives
- Brazil Value Added Tax and links to payments for ES