

# Linking Ecosystem Services, Biodiversity and Society: **economic aspects**

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**ALTER-Net Conference on  
Ecosystem Services and Biodiversity: what is the link?  
Vienna, Austria, 3-4 November 2010**





# The Economics of Ecosystems and Biodiversity (TEEB) 2008 - 2010



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety



HELMHOLTZ  
CENTRE FOR  
ENVIRONMENTAL  
RESEARCH – UFZ

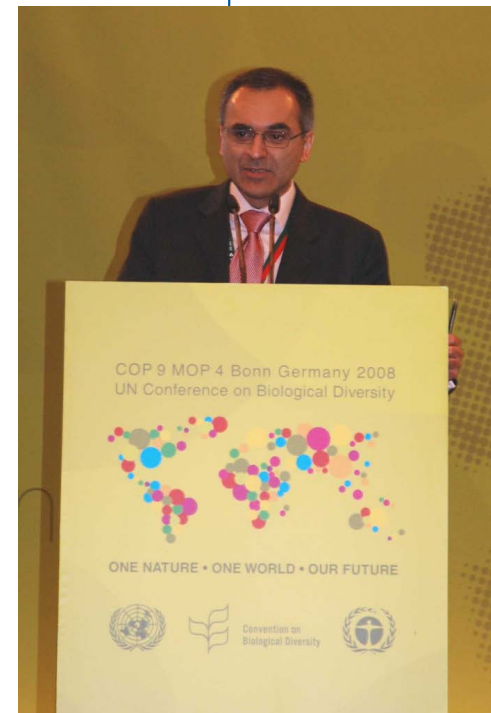
“Society must urgently **replace its defective economic compass** so that it does not jeopardize human well-being and planetary health through the under-valuation and consequent loss of ecosystems and biodiversity.”



Pavan Sukhdev, TEEB Study Leader

29.5.2008, CBD COP9

[www.teebweb.org](http://www.teebweb.org)

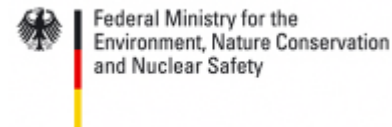


Managing Dir. & Head Global  
Market, Deutsche Bank, India  
(WCMC, Cambridge)



## The starting point:

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



Potsdam 2007-Meeting of the Environmental Ministers of the G8+5

### “Potsdam Initiative – Biological Diversity 2010”

*The economic significance of the global loss of biological diversity*

- 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.**

Stern (2006):

“Invest 2% of GDP/year to avoid damage of 20%”

**Sponsors:** UNEP & EU  
Germany + several other EU  
Countries (& Japan)



COP 10 MOP 5  
Nagoya, Japan 2010

Life in Harmony, into the future  
いのちの共生を、未来へ



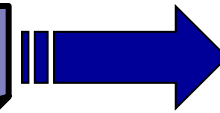
# The Economics of Ecosystems & Biodiversity



[www.teebweb.org](http://www.teebweb.org)



D0



Science & Economics  
Foundations, Policy  
Costs & Costs of Inaction

D1



Policy Evaluation  
for Policy-Makers

D2



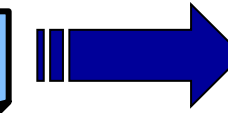
Decision Support  
for Administrators

D3



Business Risks  
& Opportunities

D4



Consumer  
Ownership



## D0 - Chapter 1

### Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation

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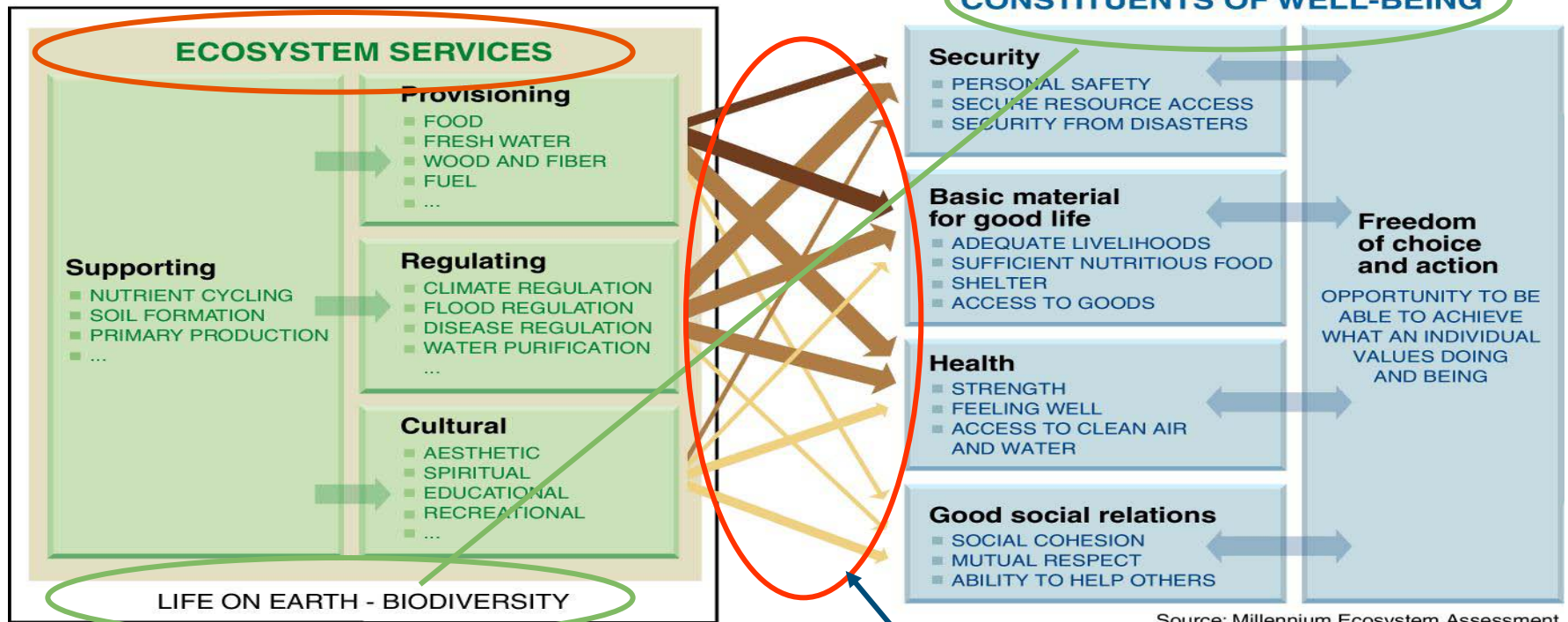
Gopal K. Kadekodi



# Linking Biodiversity and Human Wellbeing

## Millennium Ecosystem Assessment ([www.maweb.org](http://www.maweb.org))

2001-2005



Source: Millennium Ecosystem Assessment

**ARROW'S COLOR**  
Potential for mediation by socioeconomic factors

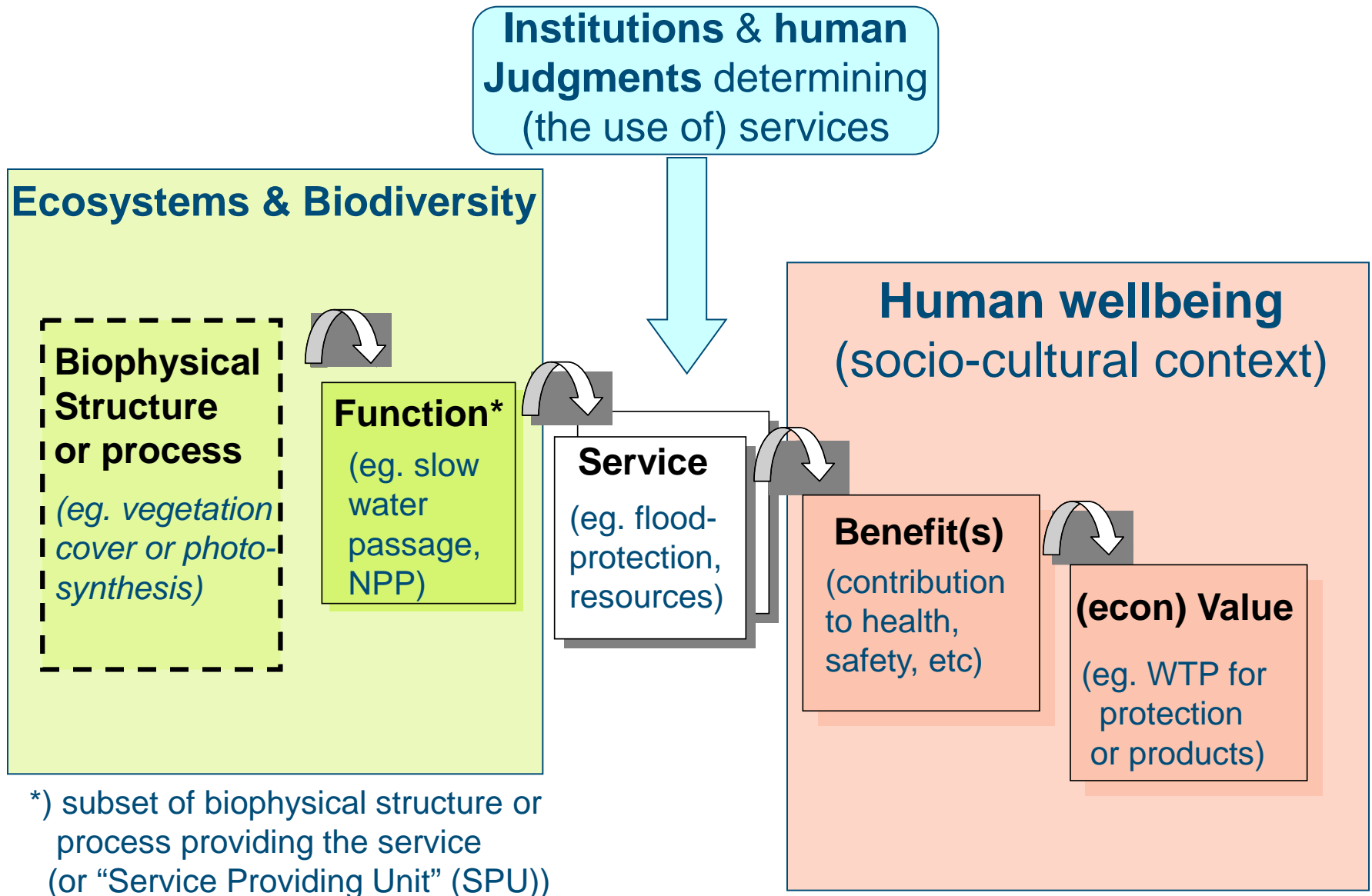
Low  
Medium  
High

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

Weak  
Medium  
Strong

60% in decline (but still many gaps, quantitative relationships unclear, no/little economic data)  
=> need for more detail in TEEB

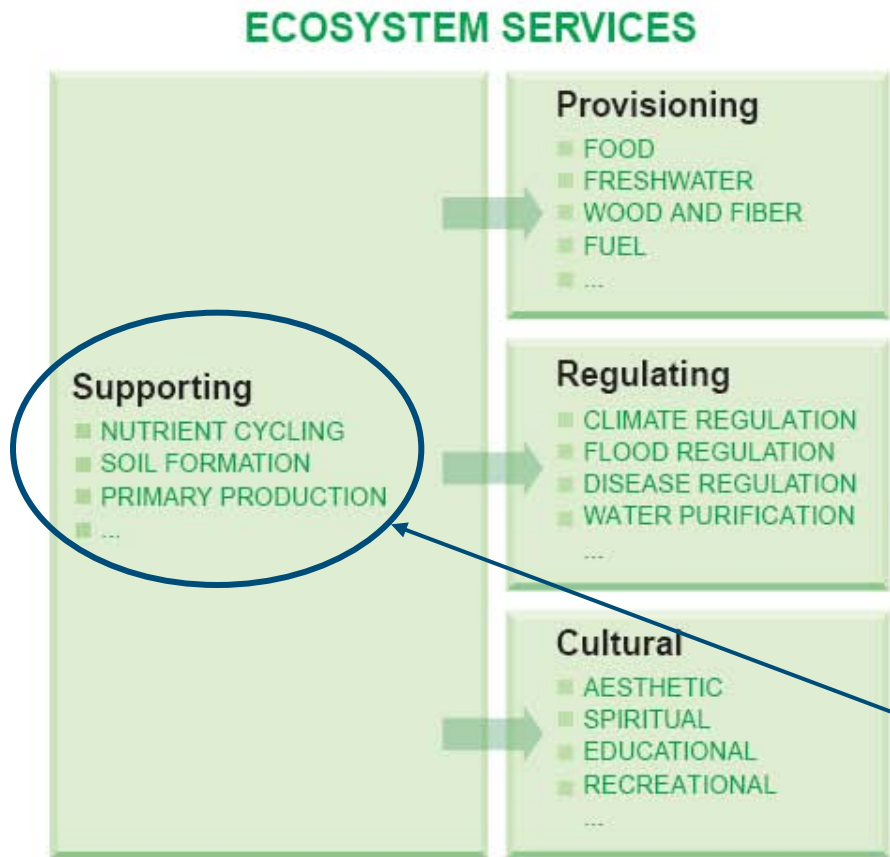
# Linking Biodiversity and Human Wellbeing



# Typology of ecosystem services

## Millennium Ecosystem Assessment (MA)

## The Economics of Ecosystems and Biodiversity (TEEB)



### Provisioning

*-Food*

### Regulating

*-Flood prevention*

### Cultural & Amenity

*-Recreation*

### Habitat

*-Nursery service*

*-Genepool prot.*

**No Supporting Services  
(= Functions)**

[www.maweb.org](http://www.maweb.org)

[www.teebweb.org](http://www.teebweb.org)

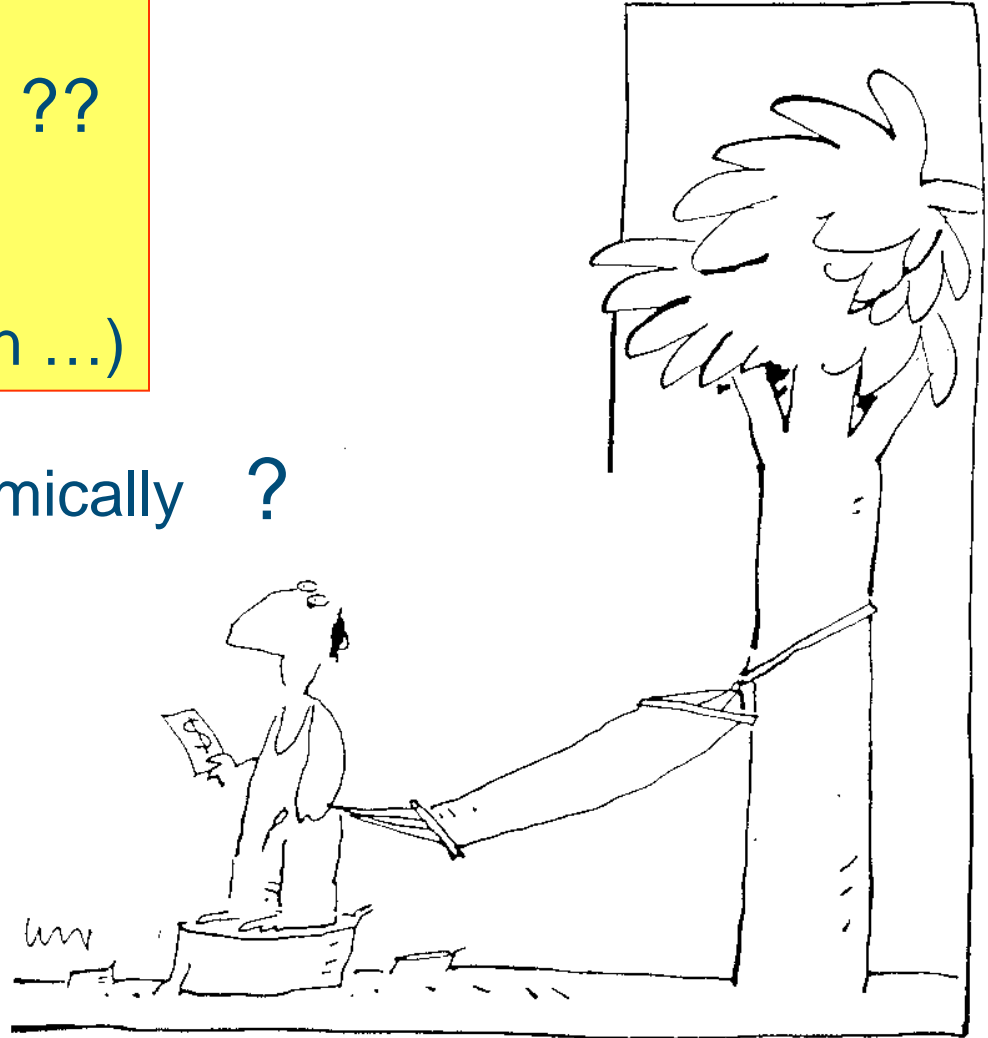


# How measure (value) the importance?

How stop loss  
of 130 species/day ??  
*[CBD, Nagoya]*

(1 species every 11 min ...)

**Should** we value economically ?



# How measure economic (monetary) value ?

## 1. Market Price



## 2. Shadow price



**Mitigation Cost:**  
2\$/minute ??



Oxygen Bar Tokyo city

## 3. Questionnaire based



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

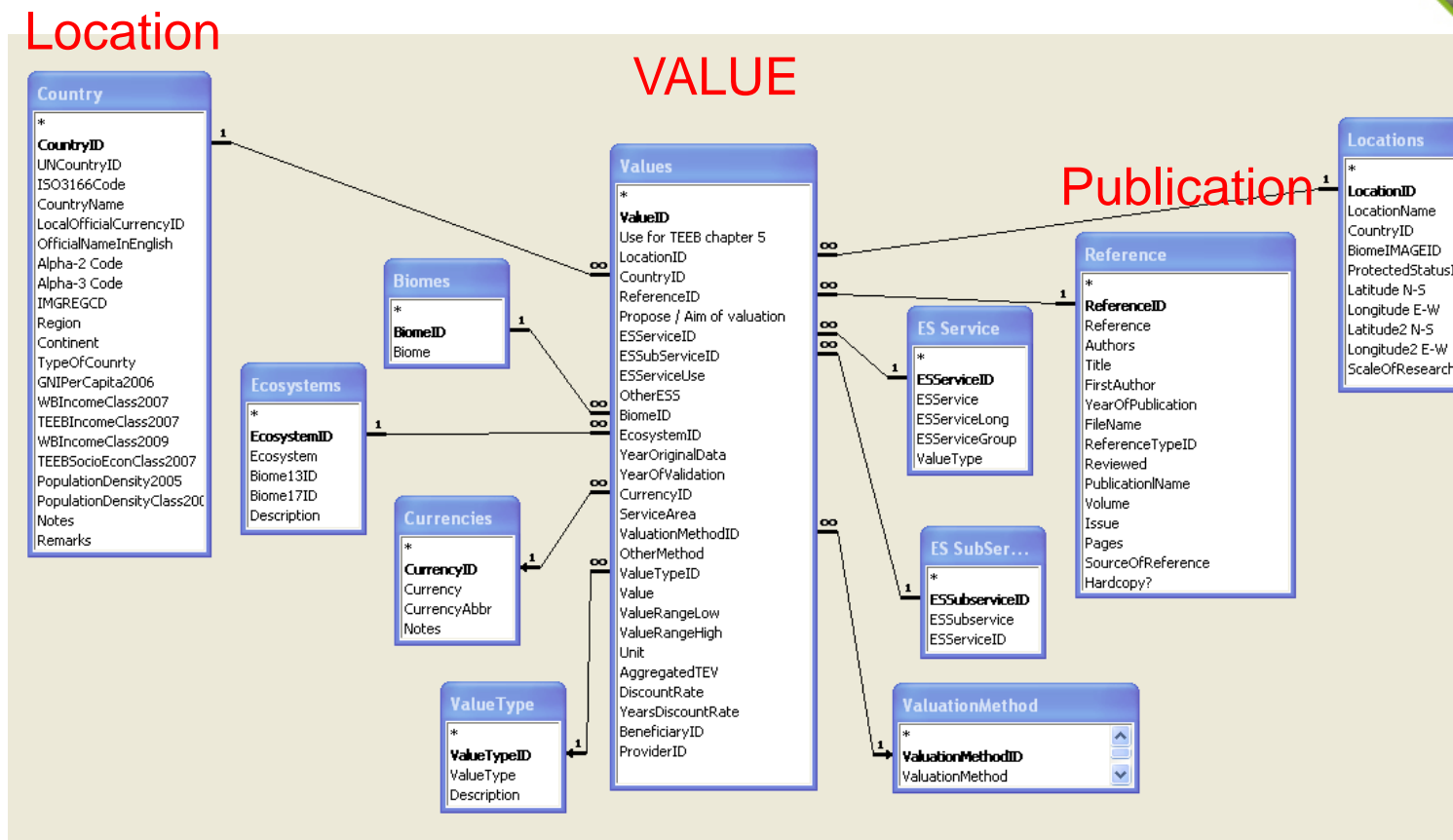


**Avoided damage Cost:** 36 million \$ (Maledives-2004).

**Replacement cost**  
10 million \$/km



## TEEB Data base structure



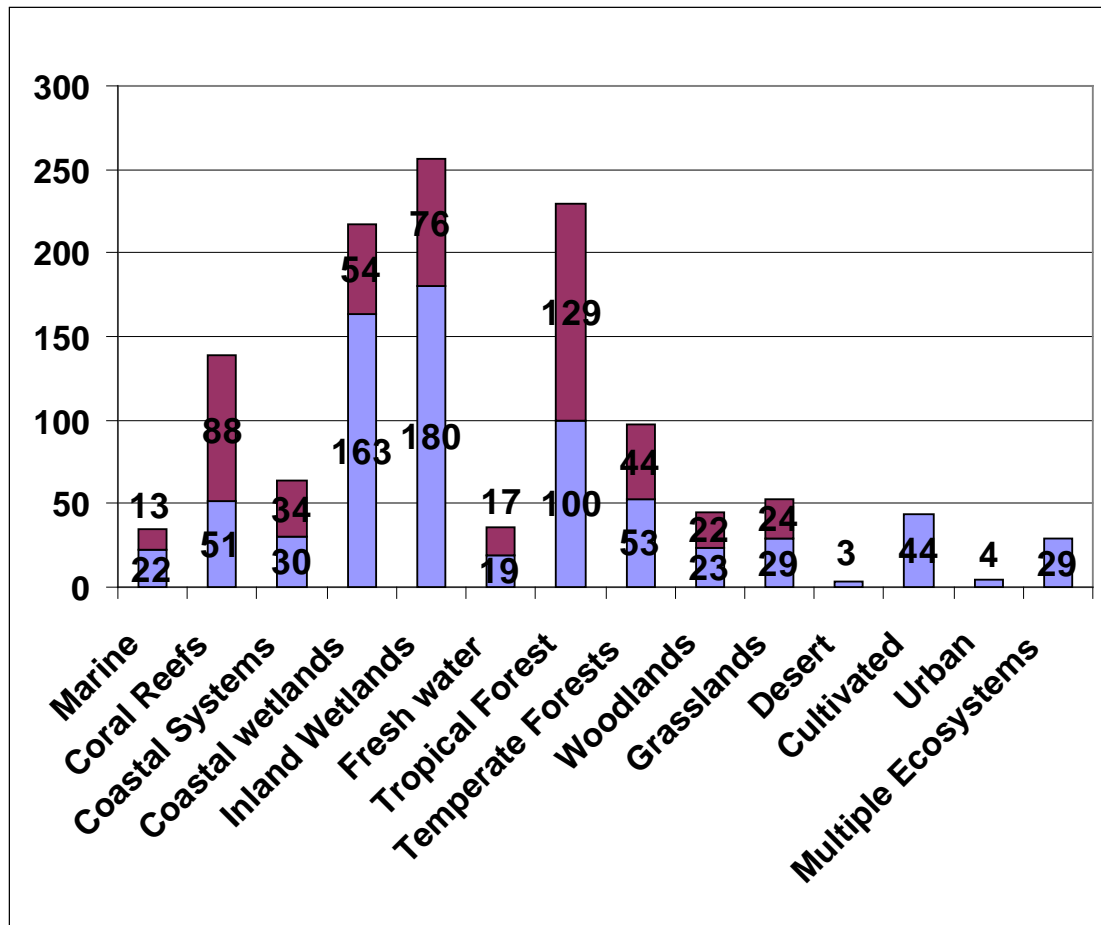
### 3 Main tables:

- The **Value** table: estimate details (service, biome, valuation-method etc)
- The **Publication** table: reference details (incl. check -> original values)
- The **Location** table(s): incl socio-econ. context, coordinates (-> eg for mapping)

# The Economics of Ecosystems & Biodiversity



Distribution of approx 1251 data points over 14 Biomes



*Most data:*

- Wetlands (inland and coastal)
- Tropical Forest
- Coral reefs

*Least data:*

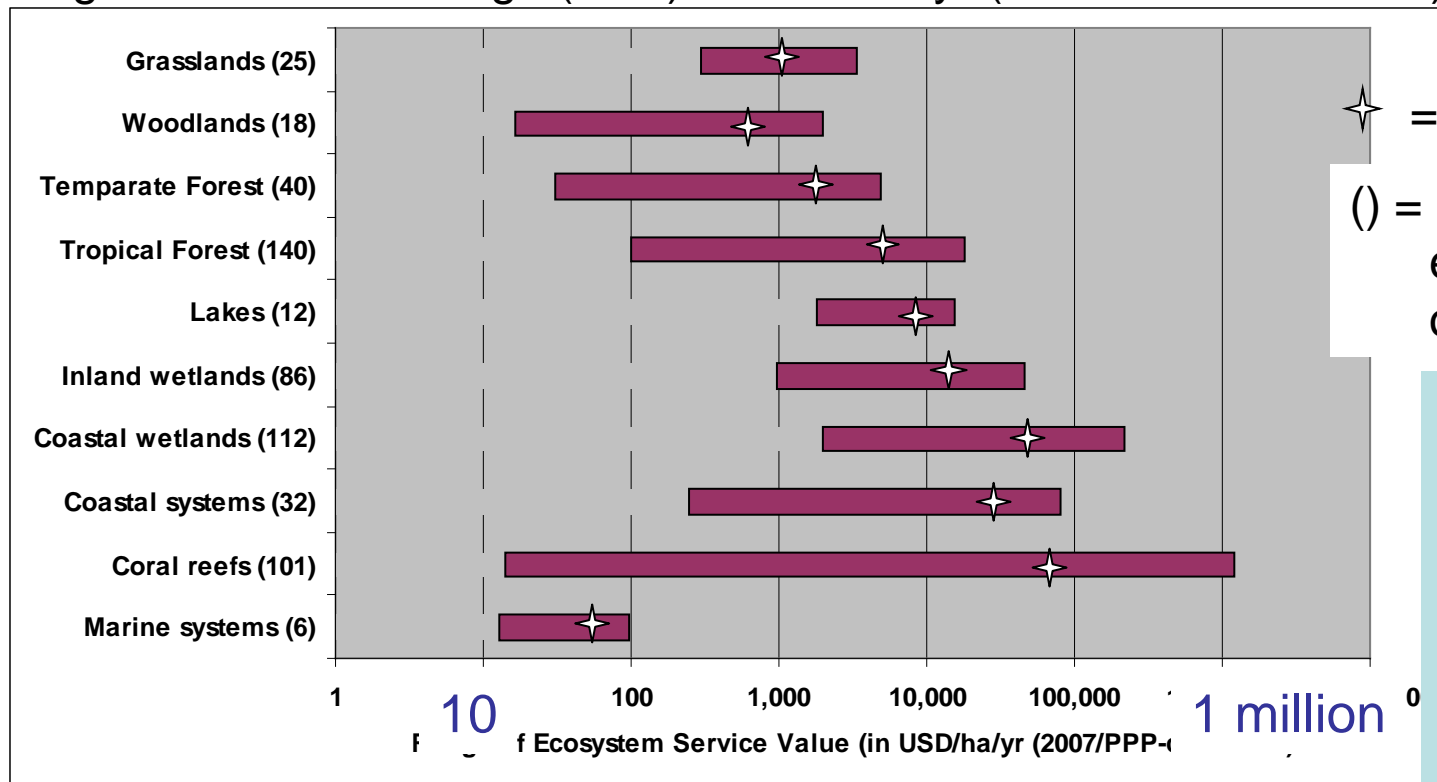
- Marine
- Urban
- Desert

- = 522 Used for Total Value Matrix and Chapter 5
- = NOT used for Total Value Matrix, but in database

# The Economics of Ecosystems & Biodiversity



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



✧ = Average value

() = number of used estimates (522 out of > 1250)

**Time & context dependent !**  
(eg TEV of Coral Reefs varies between 14 US\$ and 1.1 million US\$/ha/year)

Oceans

**49** US\$/ha/yr [climate regulation & fishery]

Mangroves

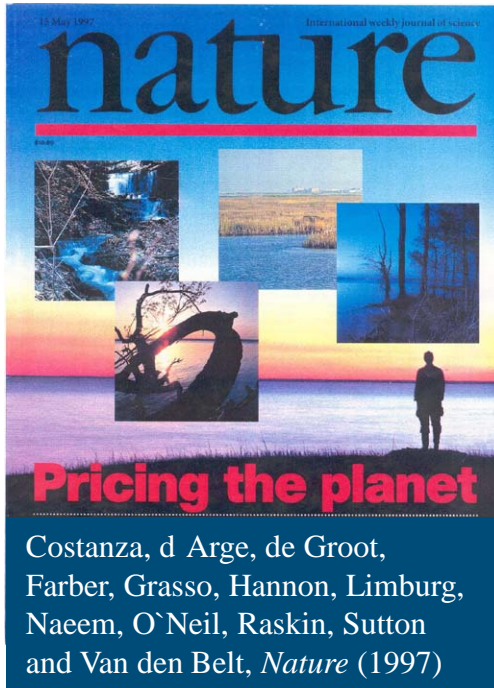
**46.239** US\$/ha/yr [waste treatment & nursery]

Coral Reefs

**92.775** US\$/ha/yr [tourism & storm protection]



# Total (Economic) Value of Ecosystems



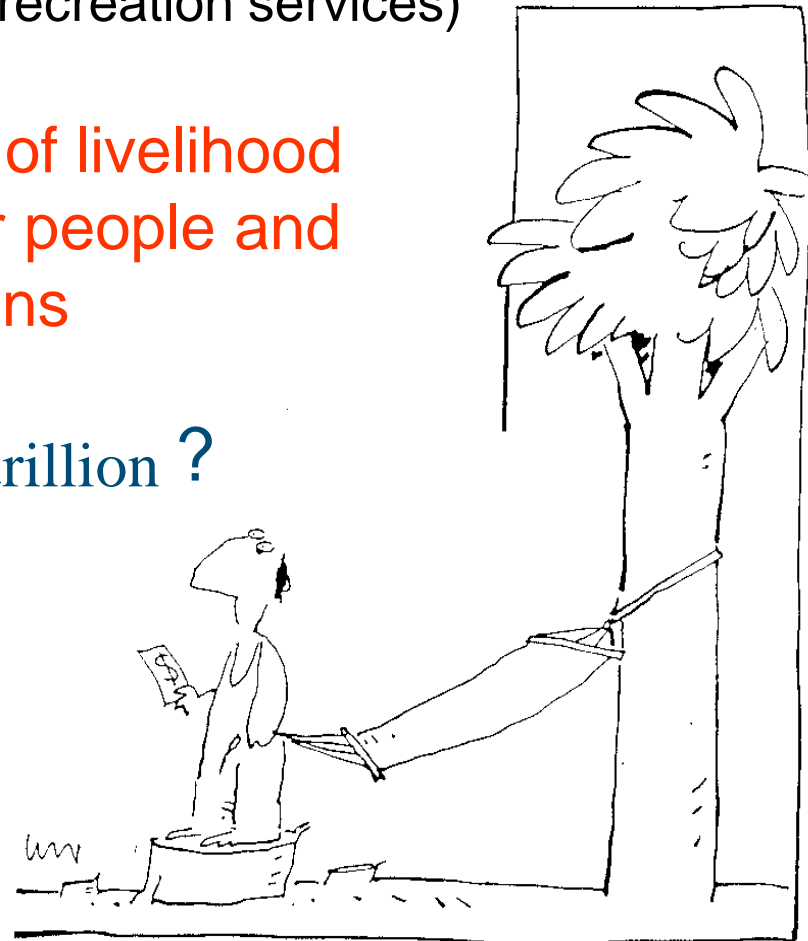
Only about 20% “in the market”  
(some provisioning & recreation services)

-> live at expense of livelihood  
& health of poor people and  
future generations

Total: 33 trillion ?

(Coast.)Wetlands	10.000 - 30.000 \$/ha/y
Forests (tropical)	1.000 – 4.000 \$/ha/y
Drylands	200 – 300 \$/ha/y

(Costanza et al, 1997, WWF, 2002, etc)



“Total Value of the World’s Ecosystem Services and Natural Capital”



Nature is priceless...

Biol.  
control

Recreation

**Cultural  
values**

**Economic  
values**

**Ecological  
values**

Air quality

Pollination

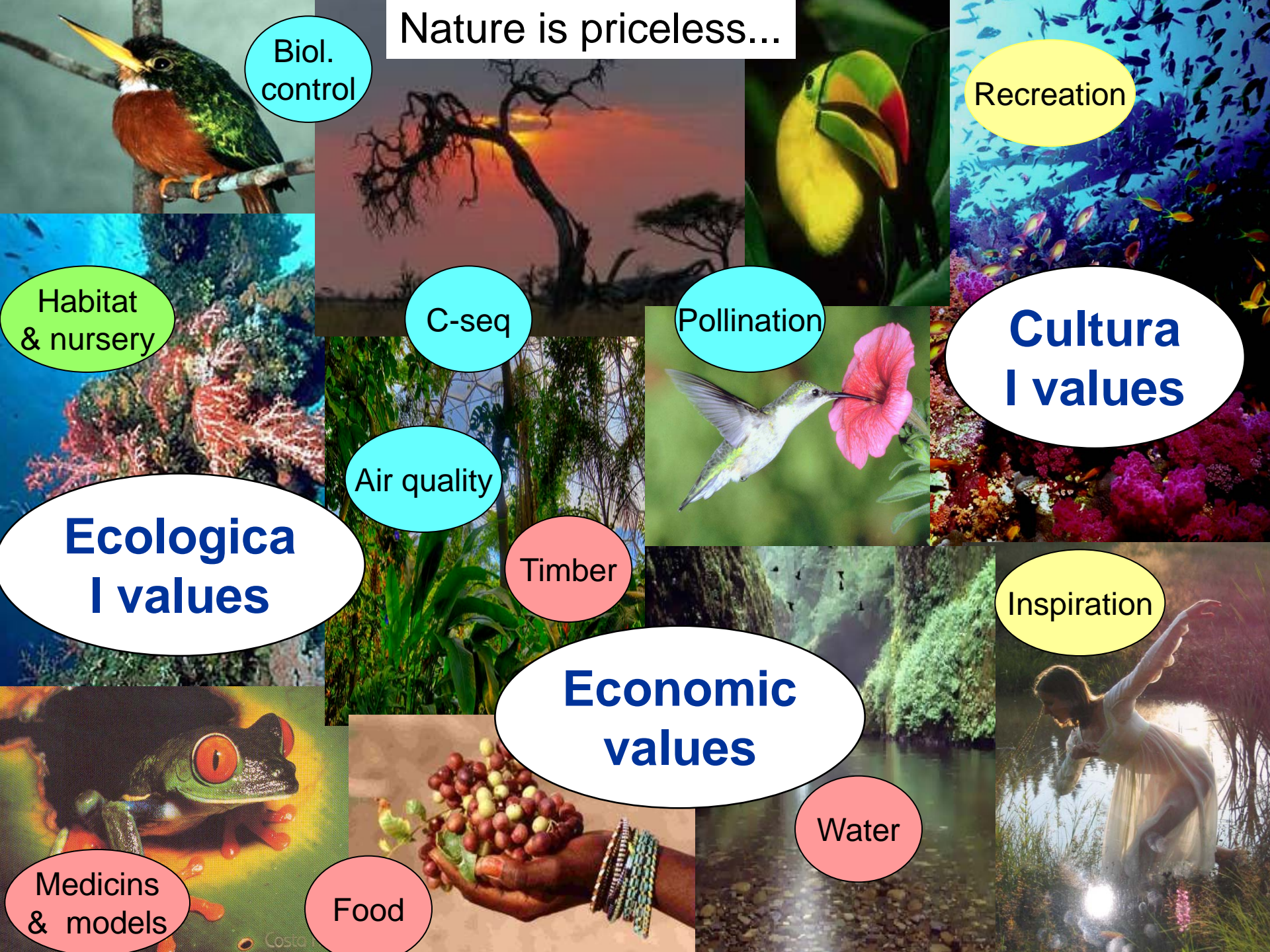
Timber

Inspiration

Water

Food

Medicines  
& models

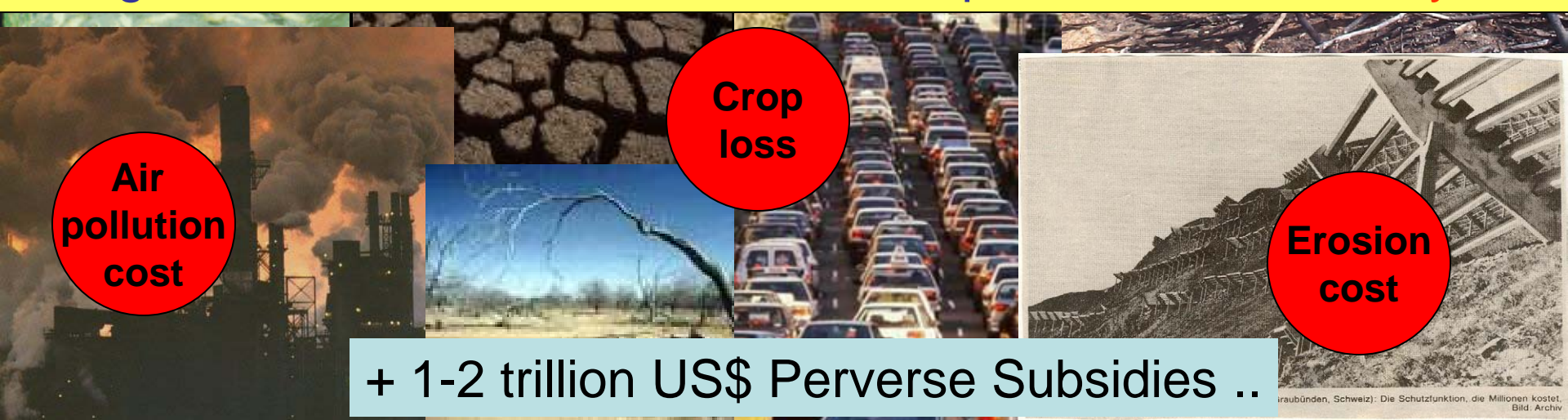




# But valuable ...?



Cost of ecosystem loss >> **250 billion** US\$ per year (*Science*, 2002)  
(damage-costs, replacement & restoration costs, etc.) **2-5% GDP**  
+ Negative env. externalities of 3000 companies: **> 2 trillion \$/year**



+ 1-2 trillion US\$ Perverse Subsidies ..



# Economic Size & Welfare Impact of Losses

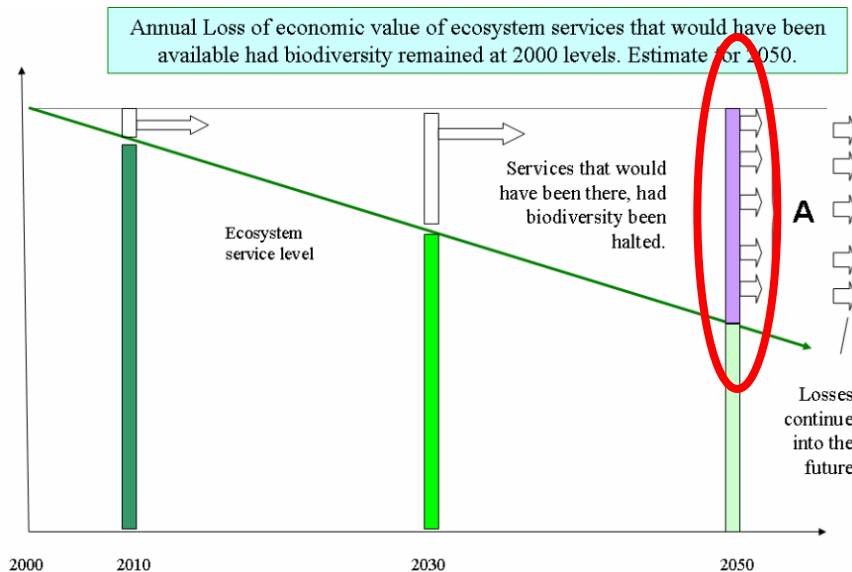


Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety

**[COPI Cost of Policy Inaction, 2008]**

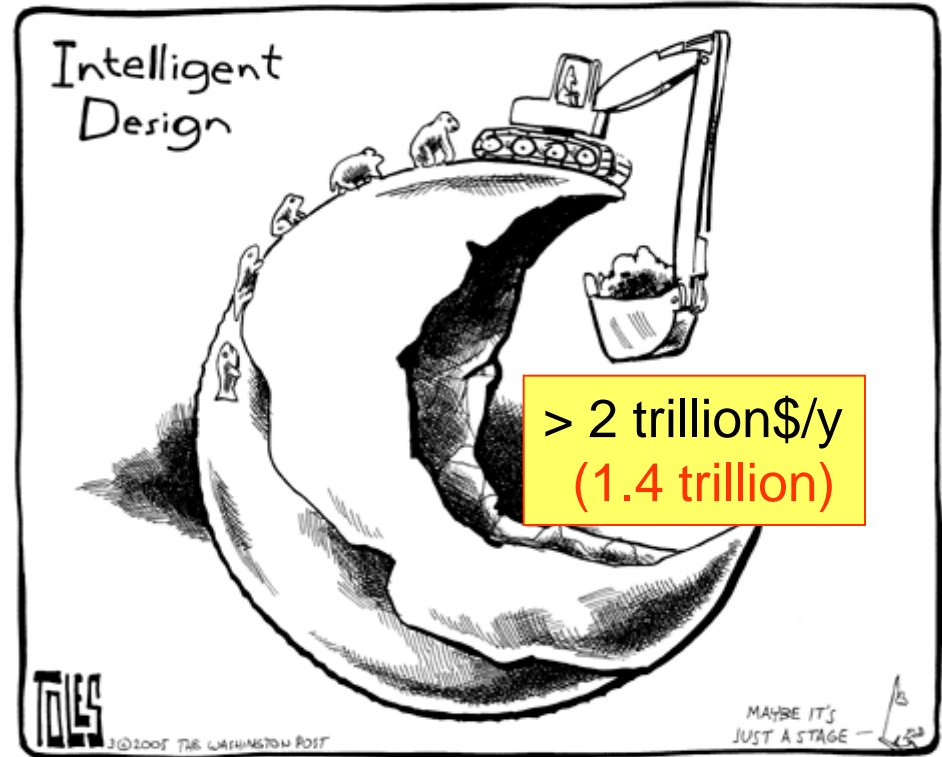
**Losses in 'Present Value' terms...**

## A : 50-year impact of inaction or 'business as usual'



**Welfare losses equivalent  
to 7 % of GDP, horizon 2050**

## B : Natural Capital Loss every year

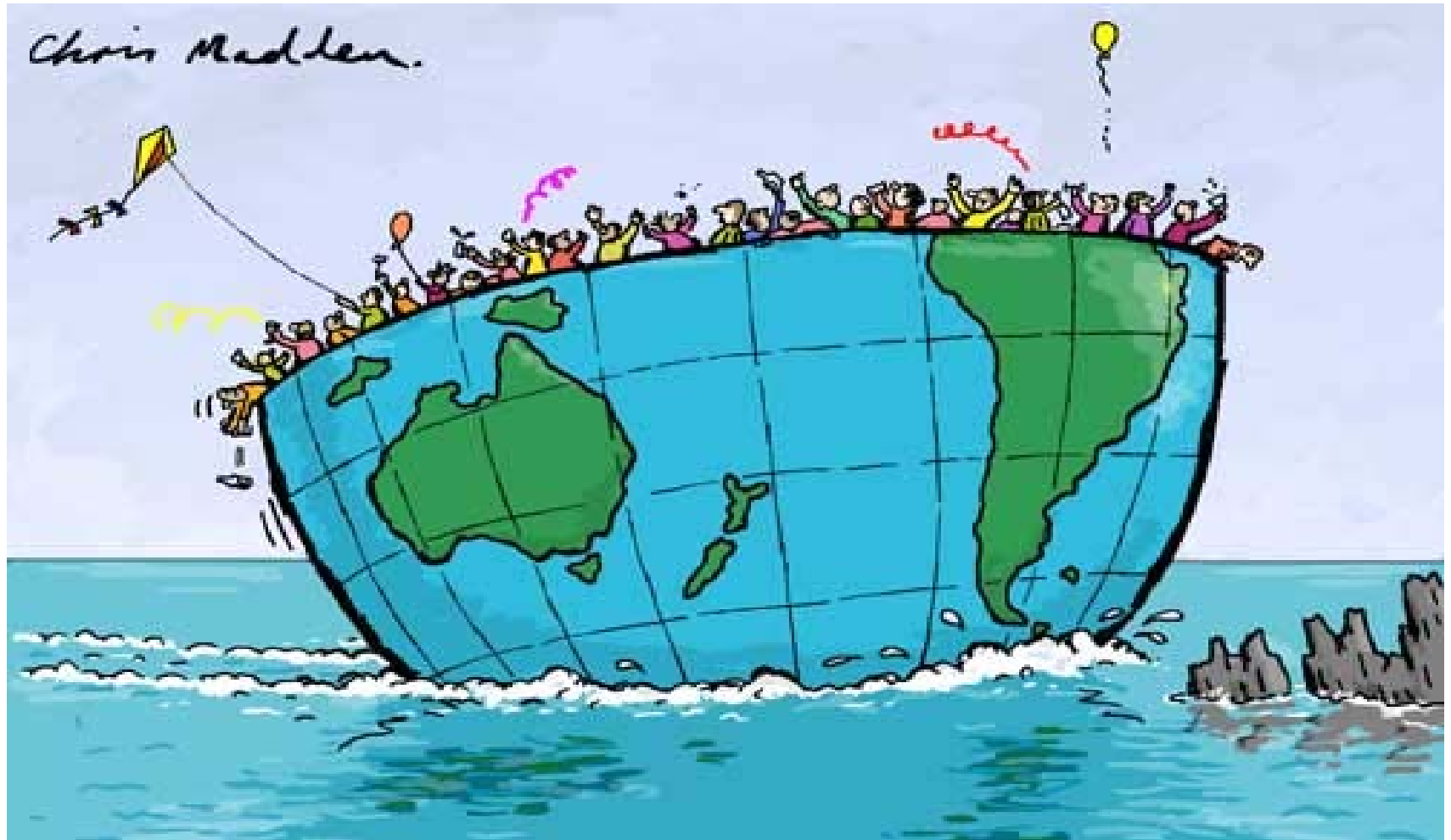


**EUR 1.35 - 3.10 trillion / year  
@ resp. 4 and 1% discount rate\***

**\* High discount rate places less value on future costs (and benefits)**

# Why continues ...?

**Why didn't we meet the CBD targets set in 2002 ?**



“The ship of fools and the ‘rocks’ of short-term economic planning”



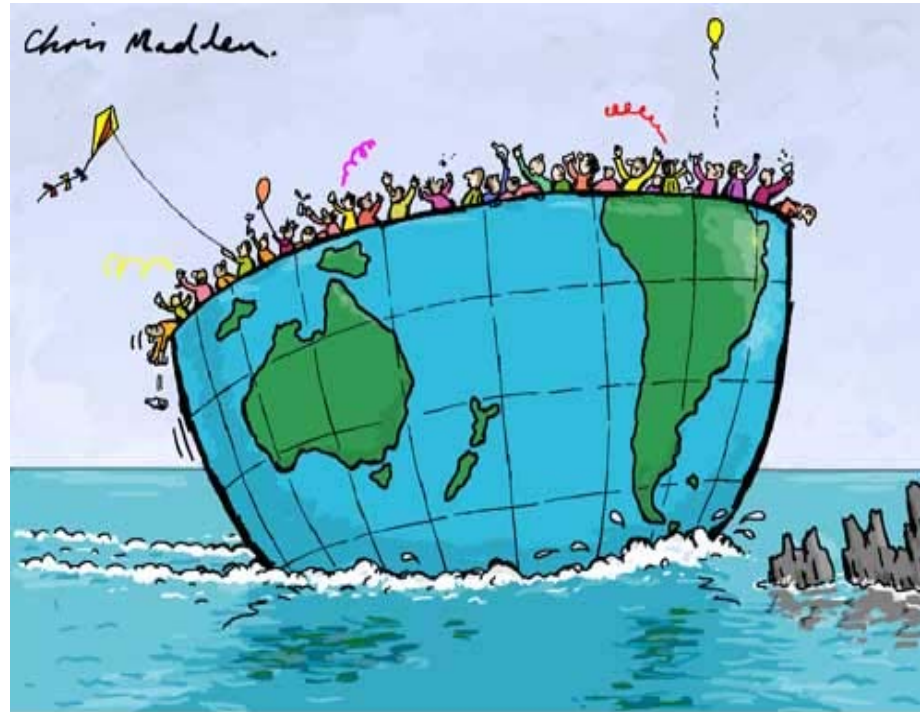
# Shortcomings of economic theory and practice

\* Value of most benefits of Ecosystem services is **under-estimated** because

they are **not** captured in conventional market economics ("free" services)

\* **Lack of data** -> trade-off decisions are based on

**incomplete information**



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

\* **Wrong (per-verse) taxes & subsidies**

**stimulate ecosystem loss**

\* **Market failures:** externalities are not accounted for (eg. costs of pollution, deforestation) (eg. fishery, shrimp farms, etc )

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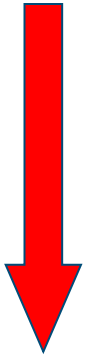
“..how .. manage ecosystems in a way that promotes ecological sustainability ?

=> Need proper incentives ....

# NEED MORE COMPLETE (HONEST) COST-BENEFIT ANALYSIS

“Pristine”  
Multi-funct.

Extensive use



Intensive use

Mono-funct.

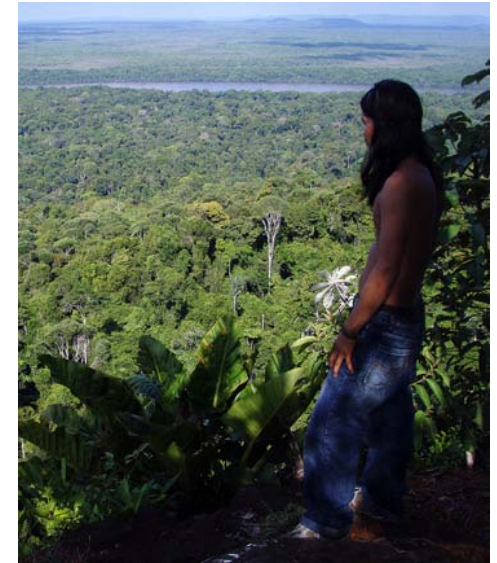
Degraded

## FOREST



## GRASSLAND

100%  
Mean abundance of original species  
0%



Trade offs ?



Oil Palm Plantations  
(& other “energy crops”)



# Trade-offs among ecosystem services

mangroves:

46.239 US\$/ha/yr [waste treatment & nursery]



## Mangrove Services:

- nursery and adult fishery habitat
- fuelwood & timber
- carbon sequestration
- traps sediment
- detoxifies pollutants
- protection from erosion & disaster

shrimp

*NPV Mangrove Mexico 600.000 US\$/ha  
sold for recreational development  
for 1.000 US\$/ha (Nature, 2008)*



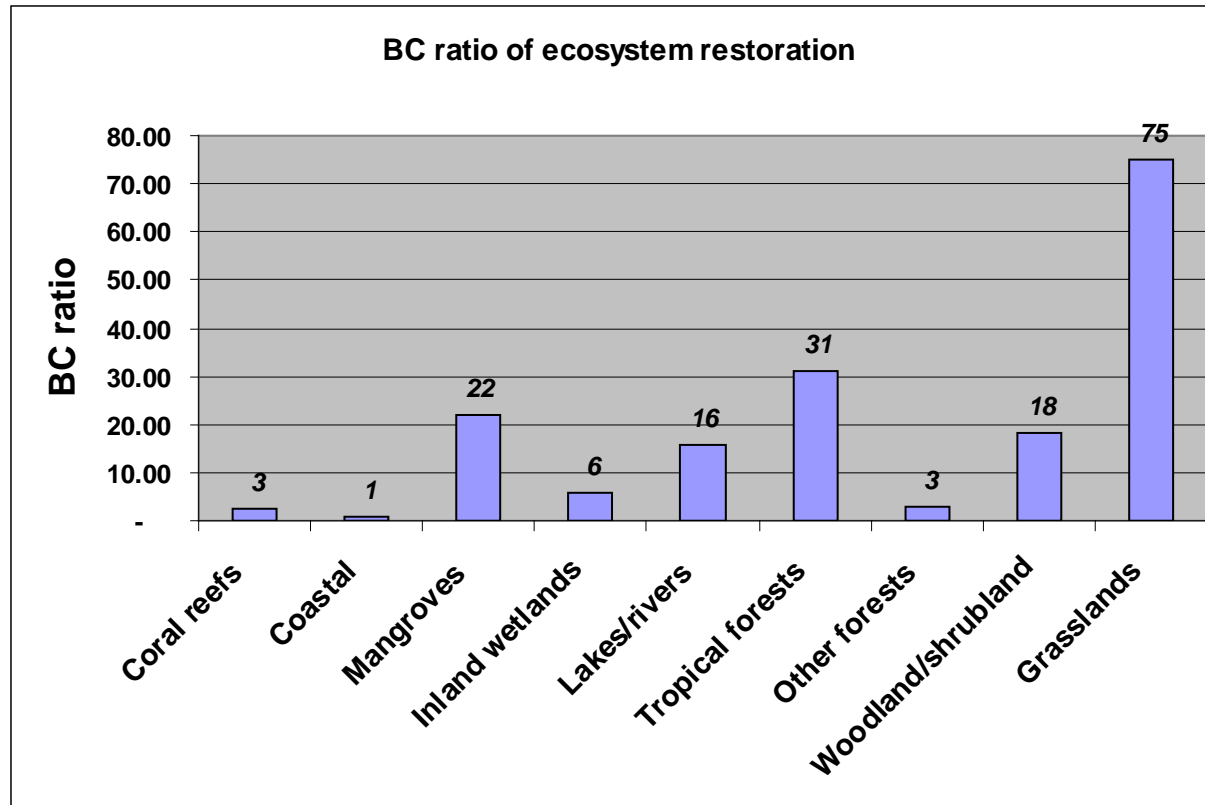
crops

# Conservation & Restoration not a cost/luxury but investment

with high return...

Blignaut et al. (unpubl.) screened 20.000; 95 selected for further analysis

## Benefit – Cost Ratio of Ecosystem Restoration



Grasslands: 75 x



Coral reefs: 3 x

**Benefits from ES in PA: >> 1,5 - 4,5 trillion\* (return 1: 30 - 100)**



# Investing in biodiversity pays !



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

The Economist  
(23 April 2005)







## But How ??



- 1) **New Economics** (TEEB D3)
  - **Internalize “externalities”**  
positive (‘free services’)  
& negative (biodiv. loss)
  - **Stop discounting** interests of future generations

- 2) **Policy Measures** (TEEB D1 & D2)

- Adjust **taxing and subsidy-system** (reward sustainability/punish unsustainab.)
- **Adjust SEEA, Greening GDP** (or better replace by other welfare-measures)
- From CDM to **Green Development Mechanism** (reward prot. of biod.) **REDD**

- 3) **Awareness raising** / TEEB for consumers (D4)

- **Fair prices**, eg. eco-labeling (e.g Fair Trade, FSC, MSC)
- > Fair society (private and corporate social responsibility)



# Information & communication is key ...

CBD  
COP 10  
(october)



# ESP

## The Ecosystem Services Partnership

Worldwide Network to enhance the science and practical  
[www.es-partnership.org](http://www.es-partnership.org) application of ecosystem services assessment