The Economics of Ecosystems and Biodiversity (TEEB)

Integrating biodiversity and ecosystems with national accounts

UNCEEA Meetings
24 – 26th June, New York

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IIT Bombay
on behalf of UNEP and
Pavan Sukhdev (Study leader)

TEEB Overview

1. **TEEB Background**
2. **The links**: Biodiversity, Ecosystems, Functions, Benefits and Value
3. **TEEB Phase 1**: Results and impacts
4. **TEEB Phase 2**: Challenges ahead – and how they are approached

The Starting Point

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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

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

"**<u>Potsdam Initiative – Biological Diversity 2010</u>**"

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****,*

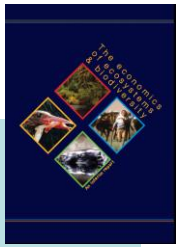
the ***costs of the loss of biodiversity*** *and*

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

TEEB's goals

- To mainstream the economics of ecosystems and biodiversity
- To review extensively the current state of the science and economics of ecosystems and biodiversity, and recommend a valuation framework and methodology
- To address the needs of the "end-users" of these economics : policy-makers, local administrators, corporations and citizens

Source: Pavan Sukhdev, Bonn 2008



Phase 1 (2007-2008):

- Preliminary scoping work,
- Some first analysis,
- Clarification as to how to address the wider goals,
- Preliminary identification of experts and organisations to contribute

Phase 2 (2008-2010):

- Valuation framework
- Broaden the scope of studies (methods; ESS and biomes addressed)
- Focus on End-user products
- Stronger Involvement from different experts & organisations

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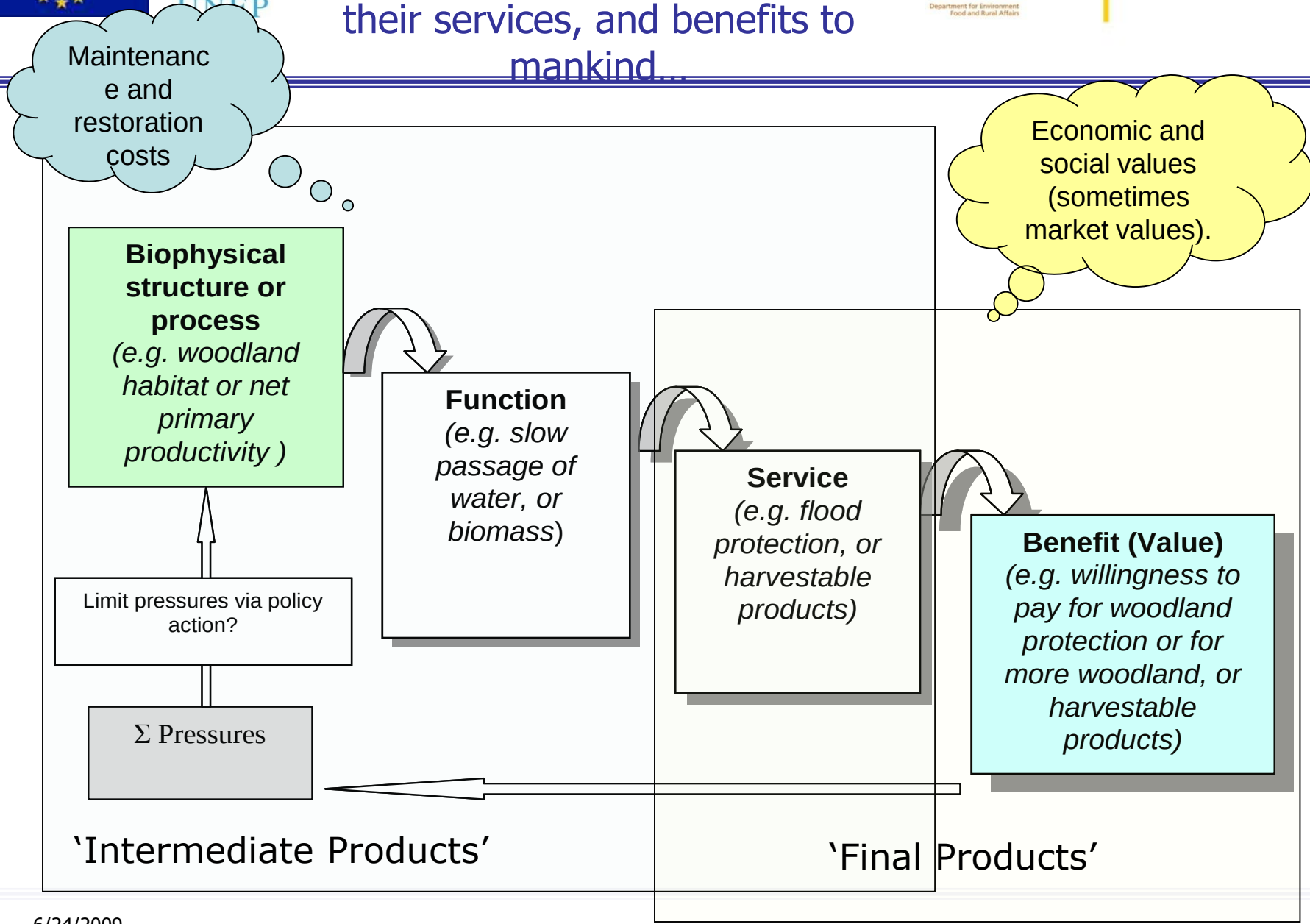
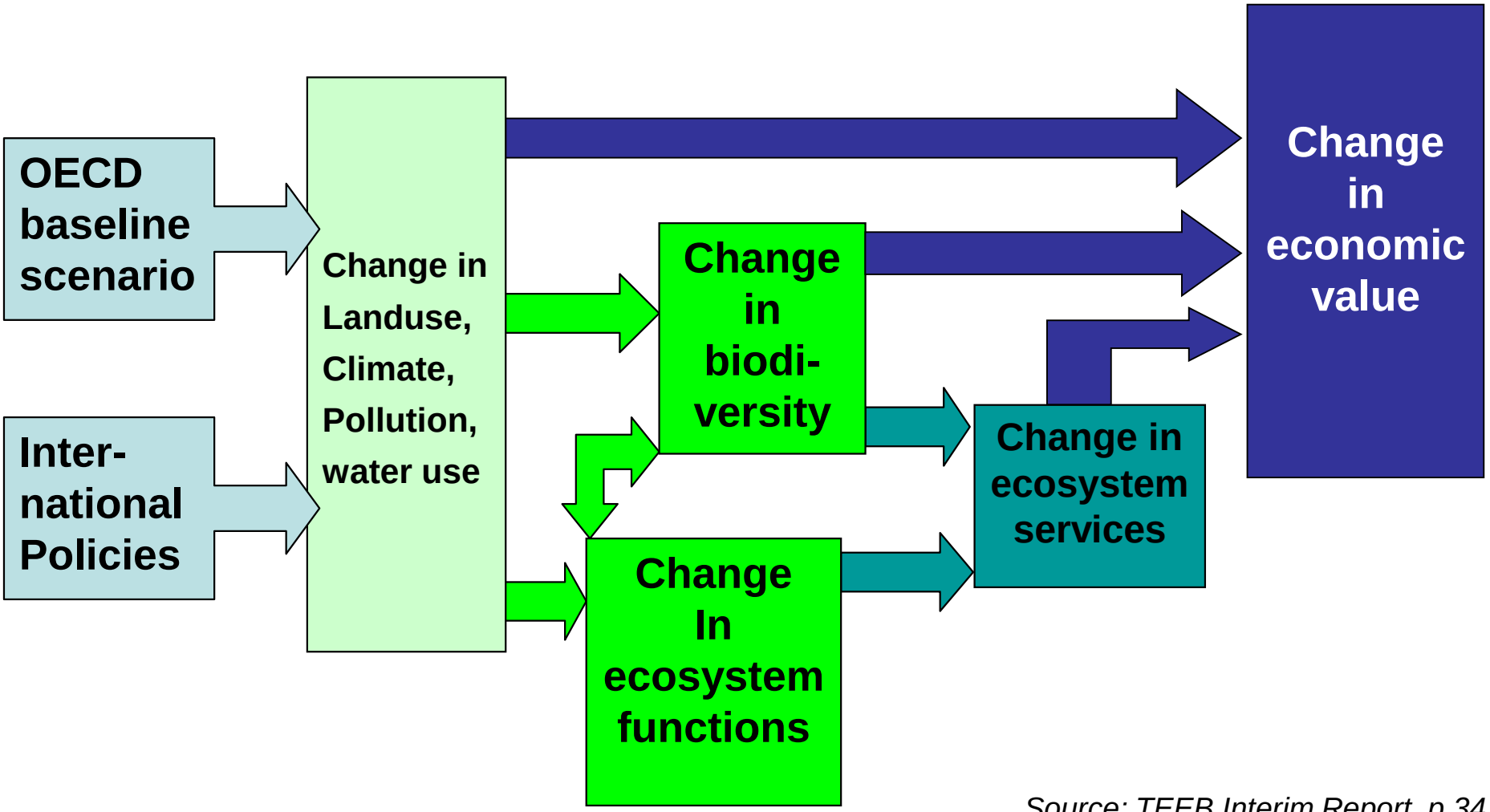
The link between biodiversity, ecosystems, their services, and benefits to mankind…



Source: Jean-Louis Weber (EEA) presentation at the Workshop: ***The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium***

Biodiversity, ecosystems and their services



Source: TEEB Interim Report, p.34

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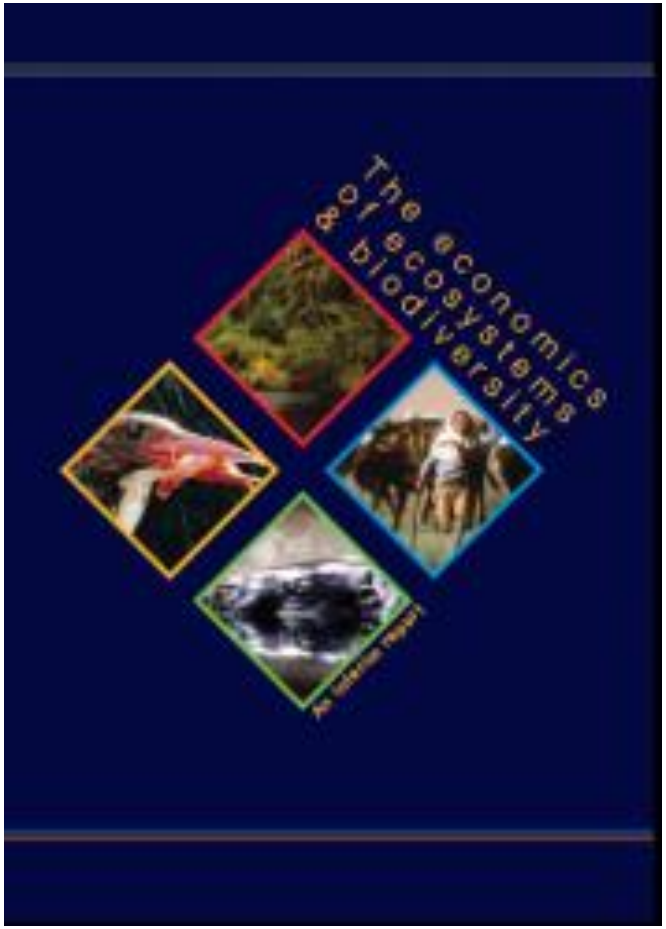
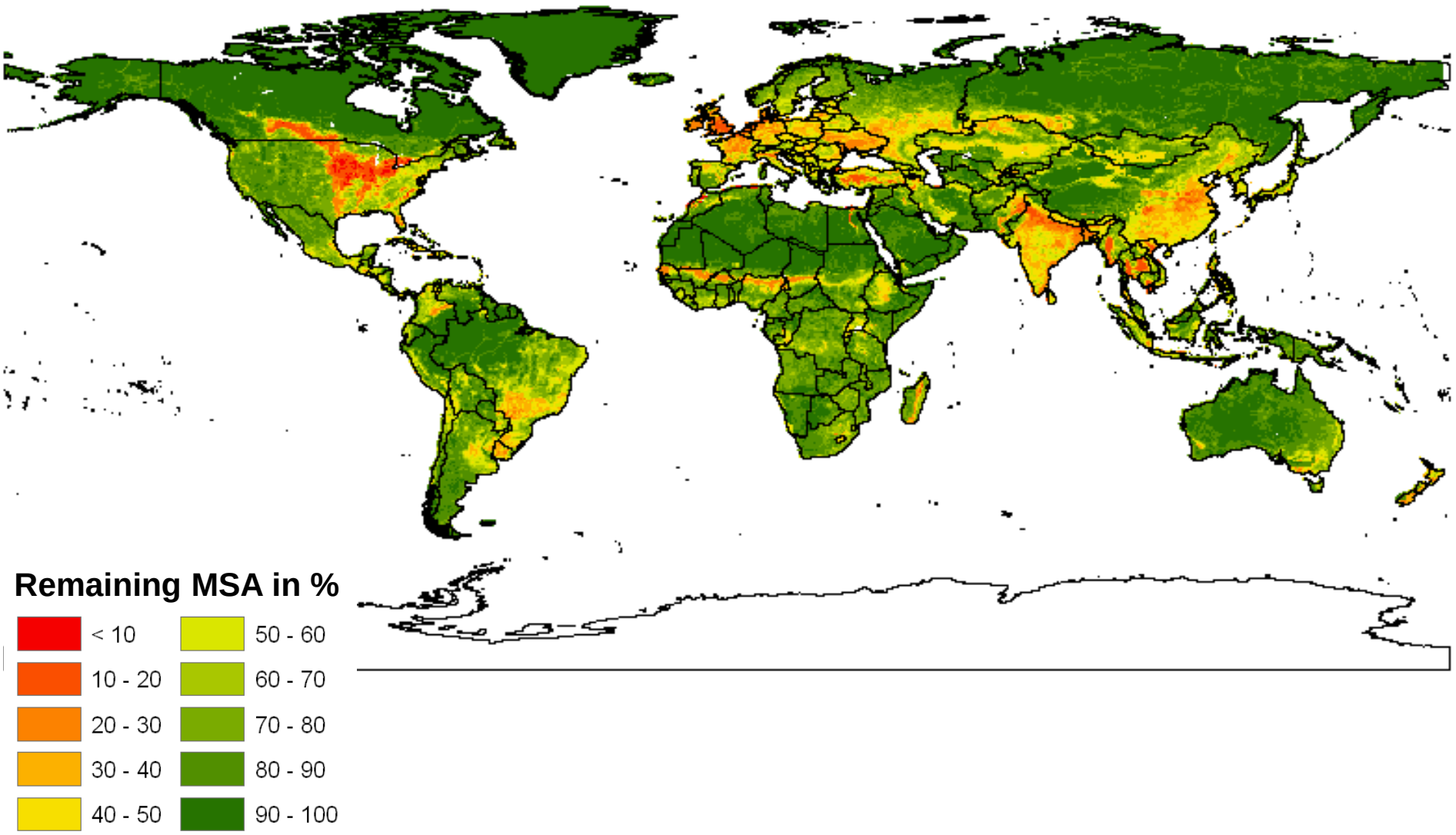
TEEB-Interim Report
COP-9, Bonn, May 2008



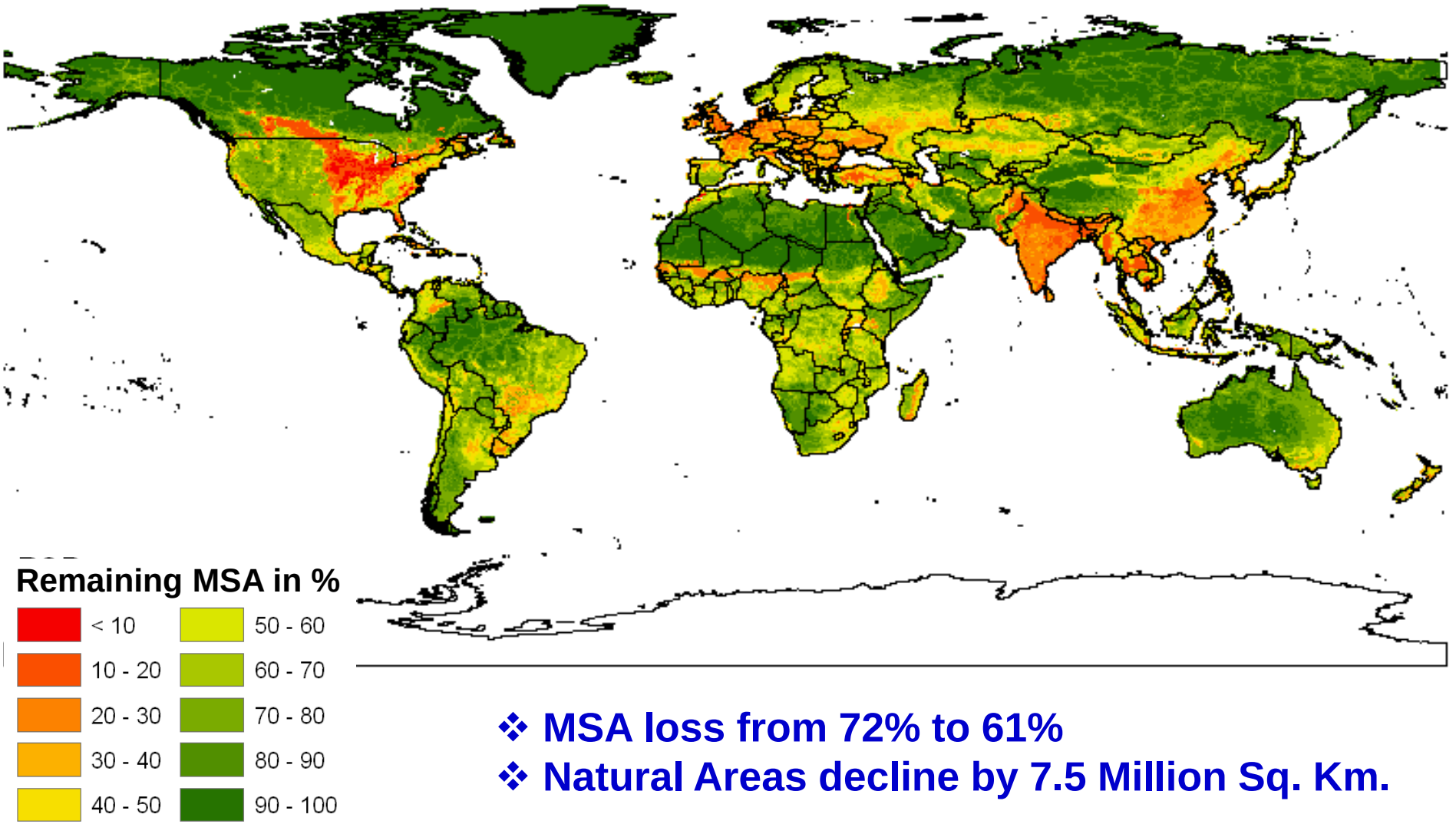
- Economic Size & Welfare Impact of Losses
- Deep Links with Poverty
- Discount rates are *ethical* choices

Level of Biodiversity in the World in 2000 (OECD baseline, Globio-3 model, "MSA" indicator)



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

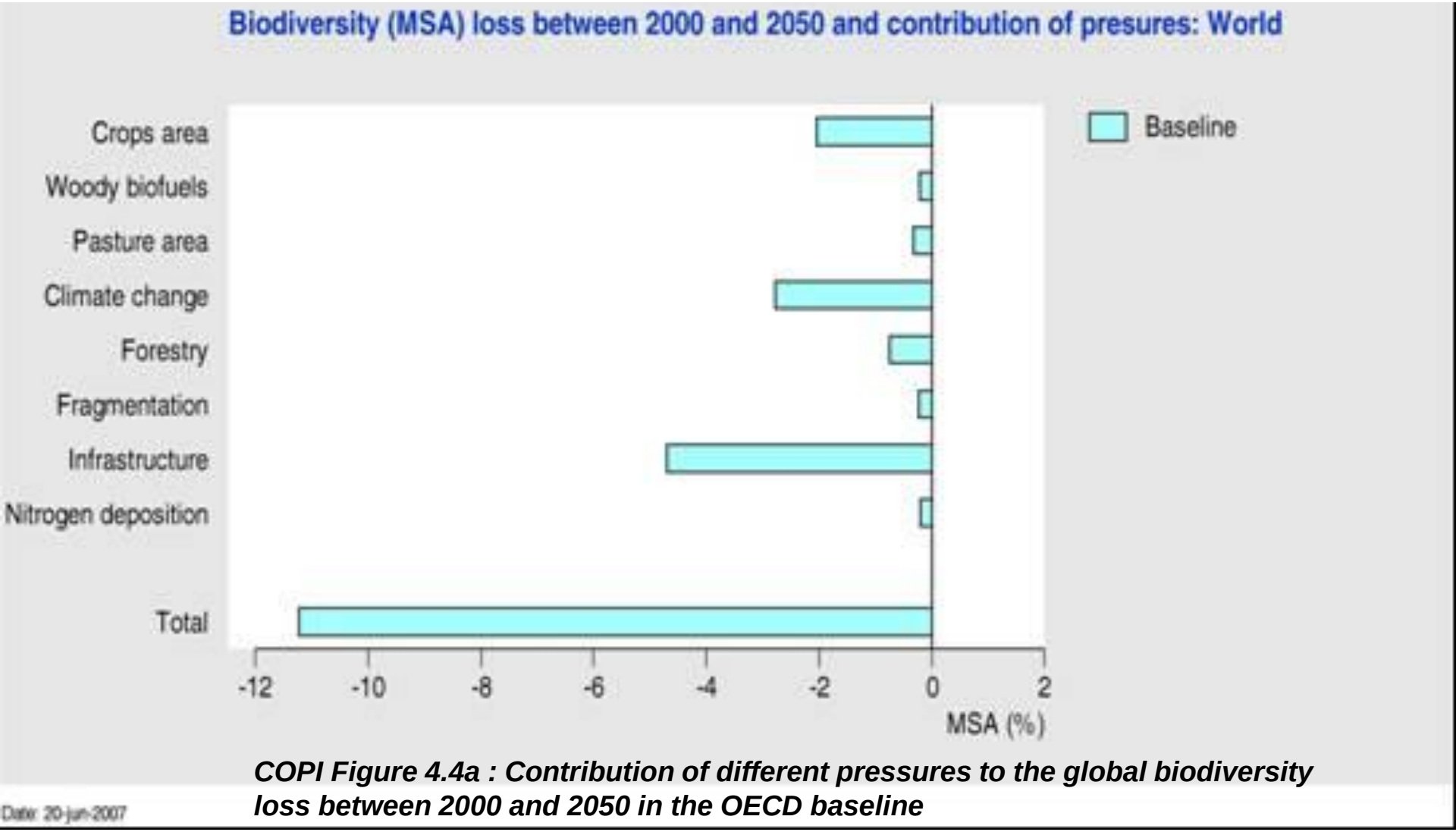
Level of Biodiversity in the World in 2050
"Business as Usual" Scenario of the future



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

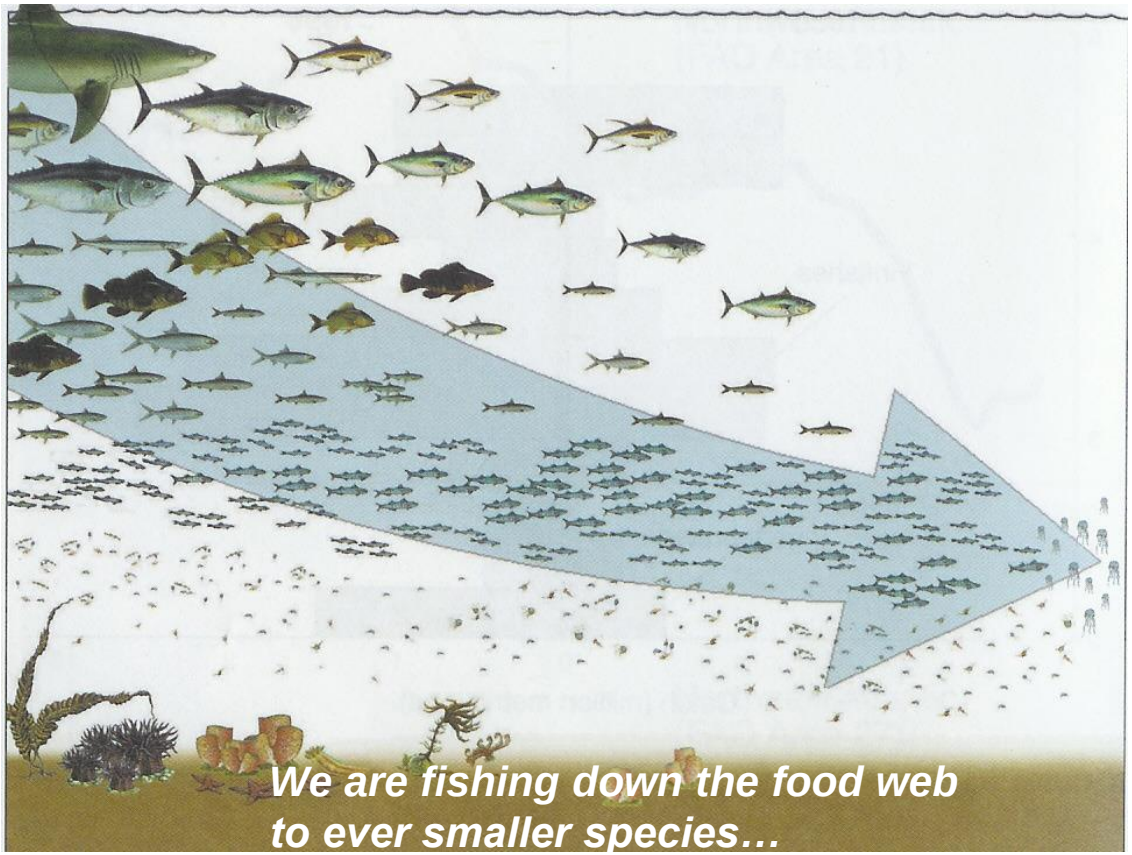
Source: Ben ten Brink (MNP) presentation at the Workshop: ***The Economics of the Global Loss of Biological Diversity 5-6 March 2008, Brussels, Belgium.***

Main 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

Global Loss of Fisheries…
…Human Welfare Impact



- ❑ **Perverse Subsidies are a key driver of the loss of fisheries**
- ❑ **Half of wild marine fisheries are fully exploited, with a further quarter already over-exploited**
- ❑ ***at risk : $ 80-100 billion income from the sector***
- ❑ ***at risk : est. 27 million jobs***
- ❑ ***but most important of all…..***

at risk : Health … over a billion rely on fish as their main or sole source of animal protein, especially in developing countries.

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

Ecosystem Losses & Links to MDG's

...

MDG 1: Eradicate extreme poverty and hunger

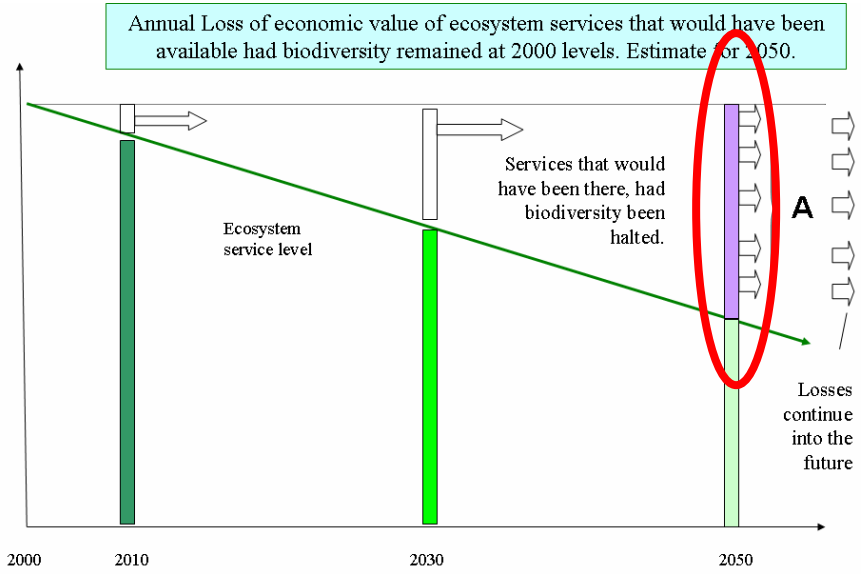
MDG 8: Develop a Global Partnership for Development

MDG 5: Improve maternal health

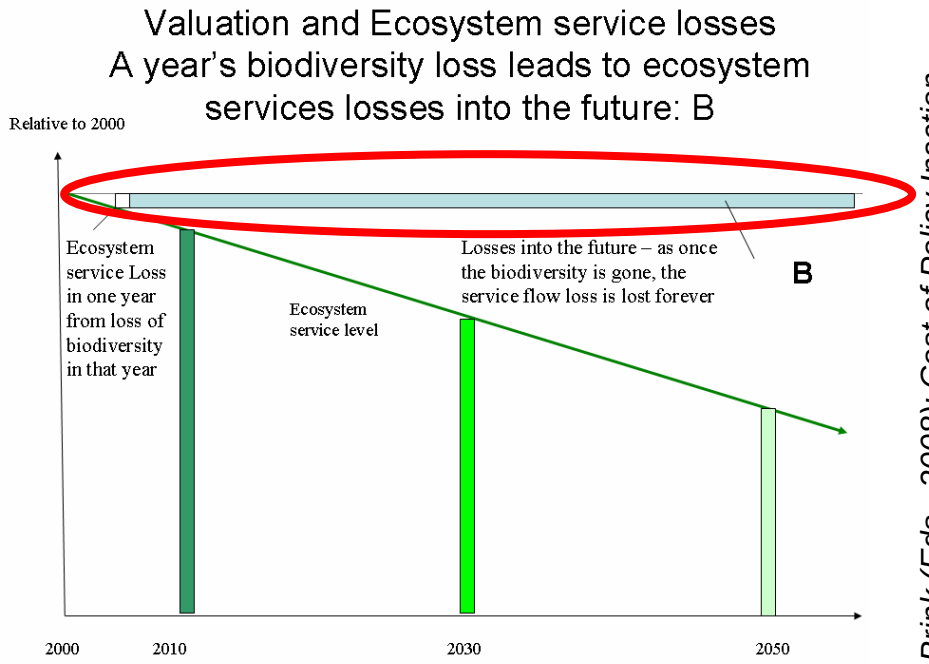
MDG 4: Reduce child mortality

(1) Economic size of losses (COPI 1 study)

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



B : Natural Capital Loss every year



Welfare losses equivalent to 7 % of GDP, horizon 2050

Natural Capital Lost : Annually EUR 1.35 x 10^{12} to 3.10 x 10^{12}

(@ 4% Discount Rate) **(@ 1% Discount Rate)**

Source: Braat & ten Brink (Eds., 2008): Cost of Policy Inaction

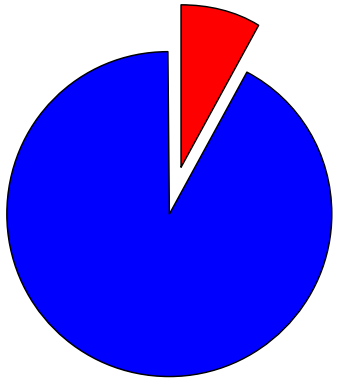
(2) Deep Links with Poverty

"GDP of the Poor" most seriously impacted by ecosystem losses…

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

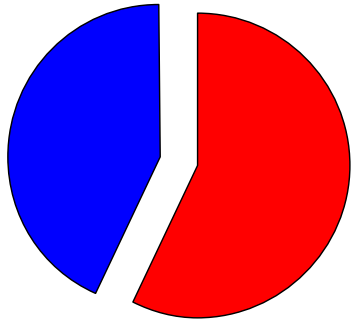
India Example: 480 Million people in small farming, animal husbandry, informal forestry, fisheries …

Ecosystem services to classical GDP



7.3 %

Ecosystem services to "GDP of the Poor"



57 %

Source: GIST's Green Accounting for Indian States Project, 2002-03 data

(3) Ethics of discounting
Three hidden stories

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Most of the 29 valuation studies in our meta-study of forest valuations use discount rates between 3%-5%

Cash flow 50 years in the future	Annual discount rate	Present value of the future cash flow
1,000,000	**4 %**	140,713
1,000,000	**2 %**	371,328
1,000,000	**1 %**	608,039
1,000,000	**0 %**	1,000,000

1. **Declining Growth Paths in the per-capita flow of nature's services …** ***imply that discount rates should be negative !***

2. **Marginal Utility of $1 to the Rich vs Poor …** ***is too different to merit the same discounting treatment***

3. **Inter-generational Equity …** ***following 'market practise' means valuing nature's utility to your grandchild at one-seventh of your own !***

TEEB in the press

REUTERS

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U.N. experts warn of economic cost of species loss

Ecosystem destruction costing hundreds of billions a year

The Guardian, 30.05.2008

SPIEGEL ONLINE
29. Mai 2008, 17:47 Uhr
KOSTENRECHNUNG

Umweltzerst

Raubbau kostet Menschheit Billionen

UN-Artenschützer: Waldverlust verschlingt jährlich sechs Prozent des Bruttosozialprodukts

Independent.co.uk

Loss of biodiversity threatens livelihoods of world's poorest

By Emily Dugan
Friday, 30 May 2008

This stock collapse is petty when compared to the nature crunch

The financial crisis at least affords us an opportunity to now rethink our catastrophic ecological trajectory

The Guardian, Tuesday October 14 2008 George Monbiot

Rodungen kosten Billionen

Das Abholzen der Wälder wird die Menschheit jährlich mit sechs Prozent der globalen Wirtschaftsleistung

Nature loss 'dwarfs bank crisis'

By Richard Black
Environment correspondent, BBC News website, Barcelona

SEE ALS
Wildlife
09 Oct

TIMESONLINE

From The Times
May 30, 2008

Destroying the world's wildlife costs economy £40bn a year

The Economic Times India, 30.05.2008

Printed from THE ECONOMIC TIMES

Nature loss could halve living standards for the world's poor
30 May, 2008, 1303 hrs IST, ANI

LONDON: An environmental review, headed by an Indian, has concluded that damage to forests, rivers, marine life and other aspects of nature could halve living standards for the world's poor.

FREITAG, 30. MAI 2008
FINANCIAL TIMES DEUTSCH

Umweltzerstörung bedroht Wol

Deutsche-Bank-Manager warnt vor dramatischen Wachstumseinbußen von weltweit sechs Prozent bis zum Jahr 2050

nomisch sinnvoller als die rück-sichtslose Ausbeutung der Natur.

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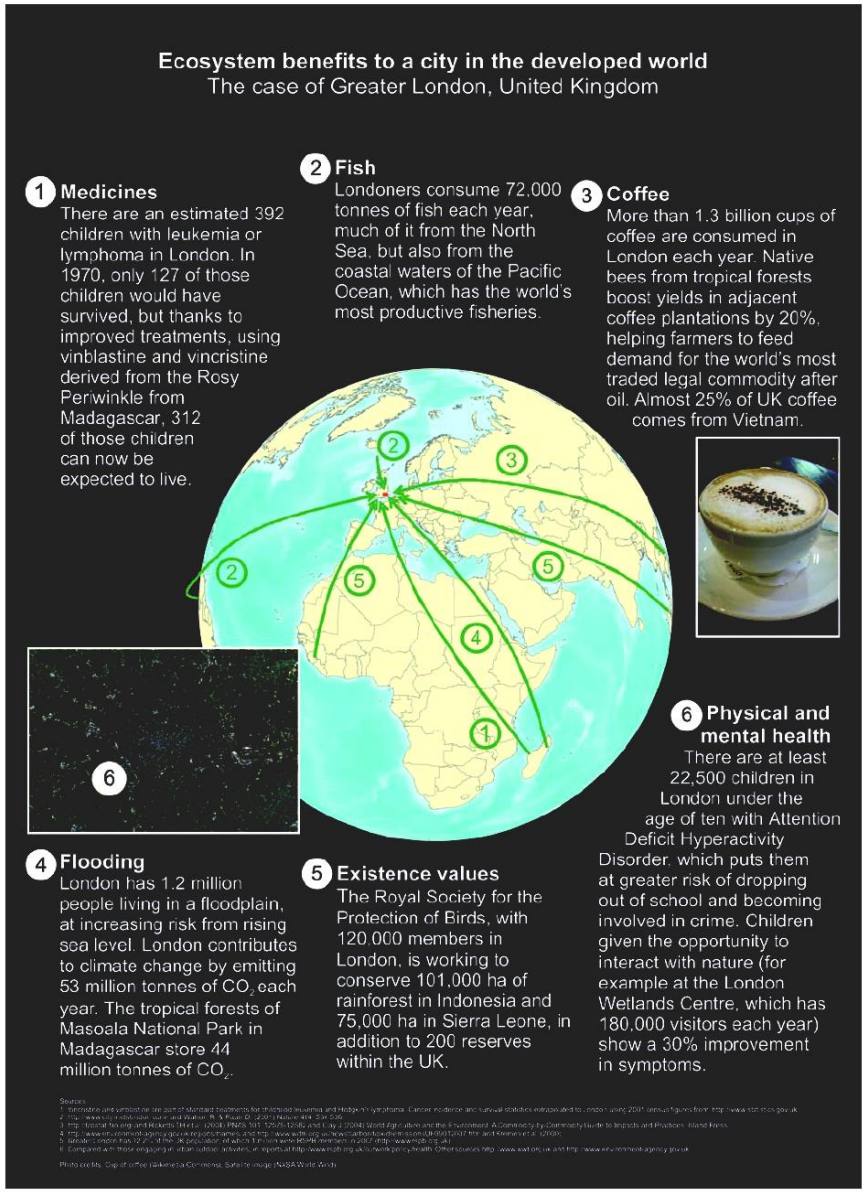
TEEB
from macro to micro



TEEB, phase 1 focused on the macro picture

TEEB, phase 2 will explicitly address the local, business and consumer level

TEEB – Final Reports
Sep 2009 - June 2010

Science & Economics Foundations, Policy Costs & Costs of Inaction — **D0**

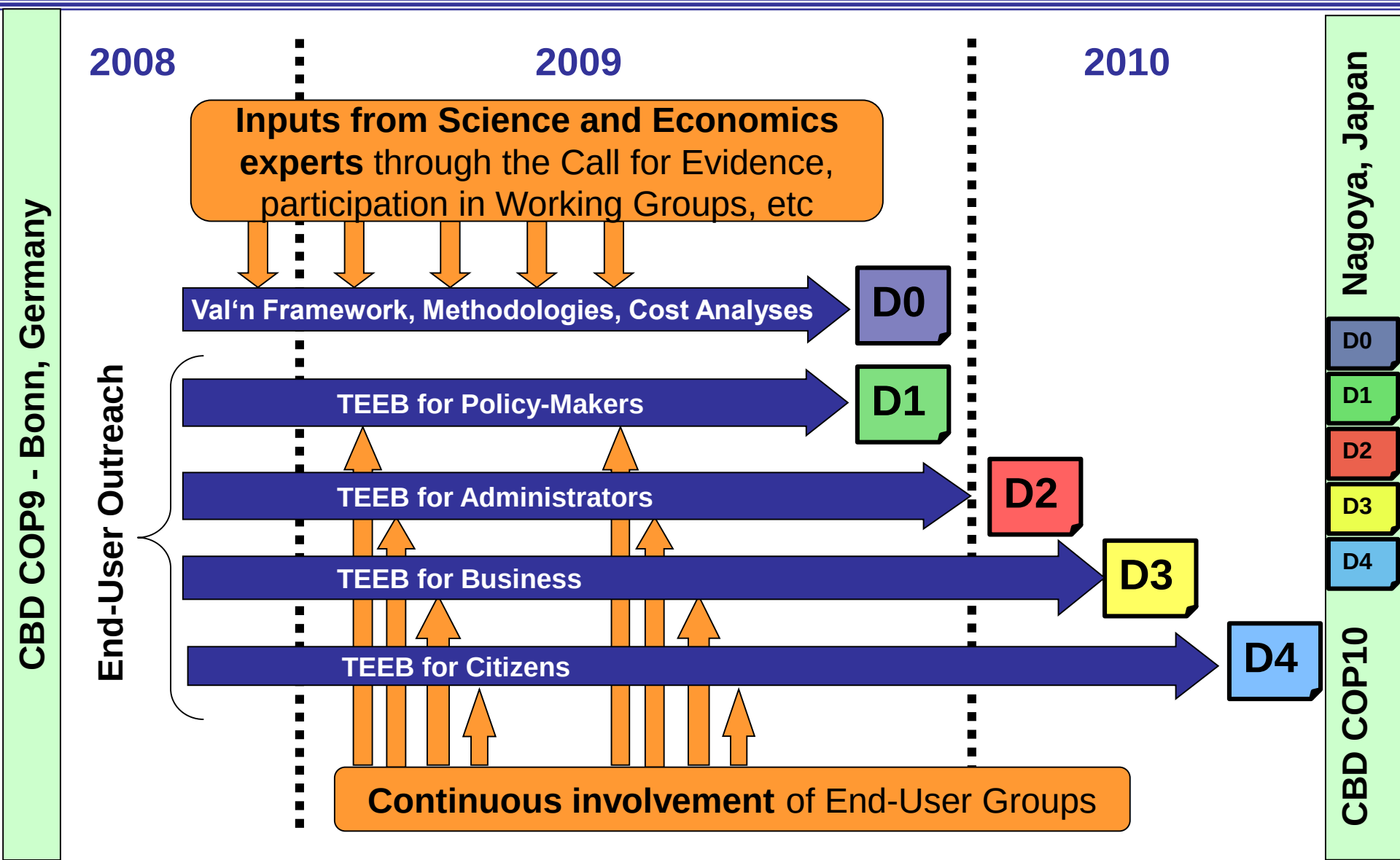
Policy Evaluation for Policy-Makers — **D1**

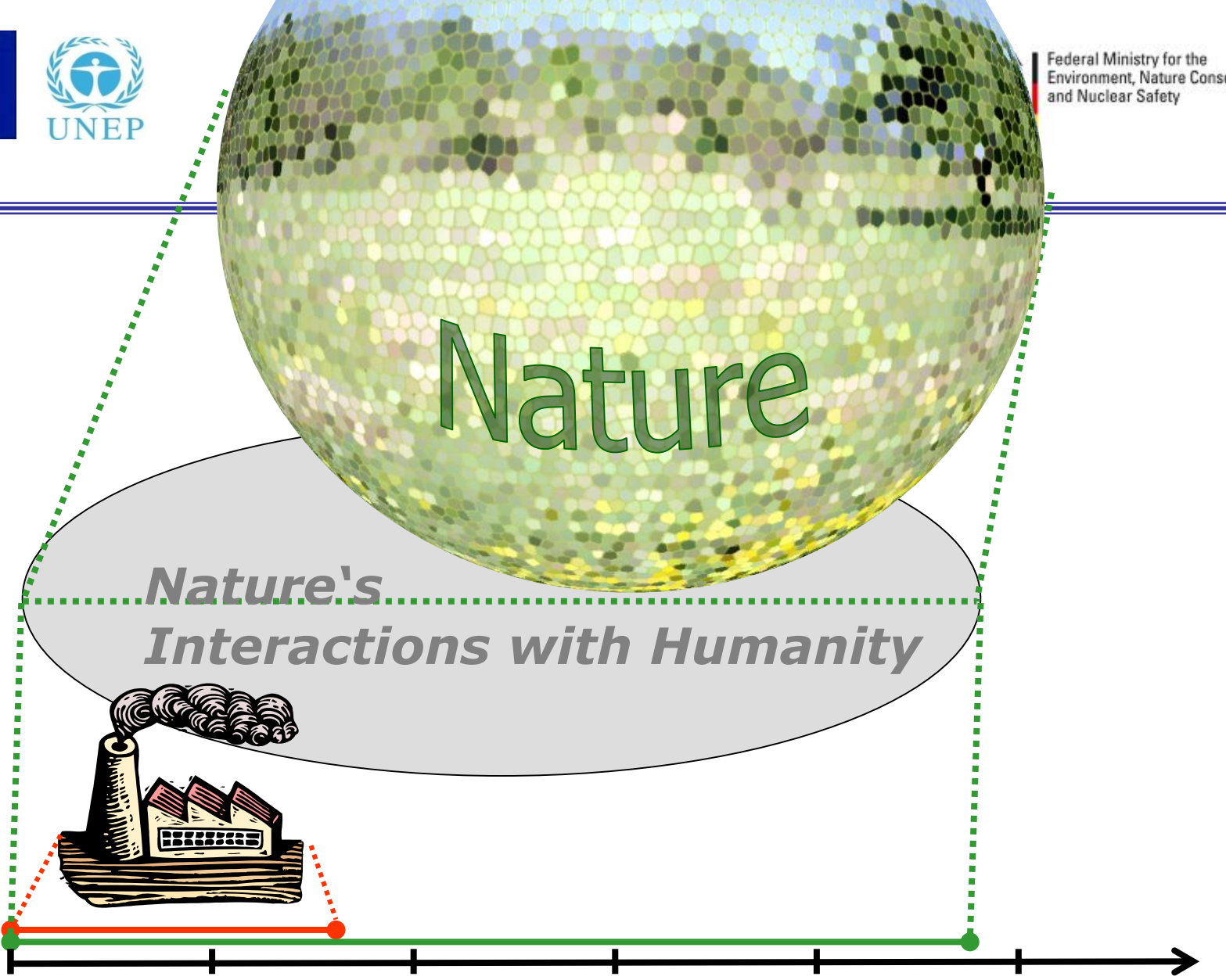
Decision Support for Administrators — **D2**

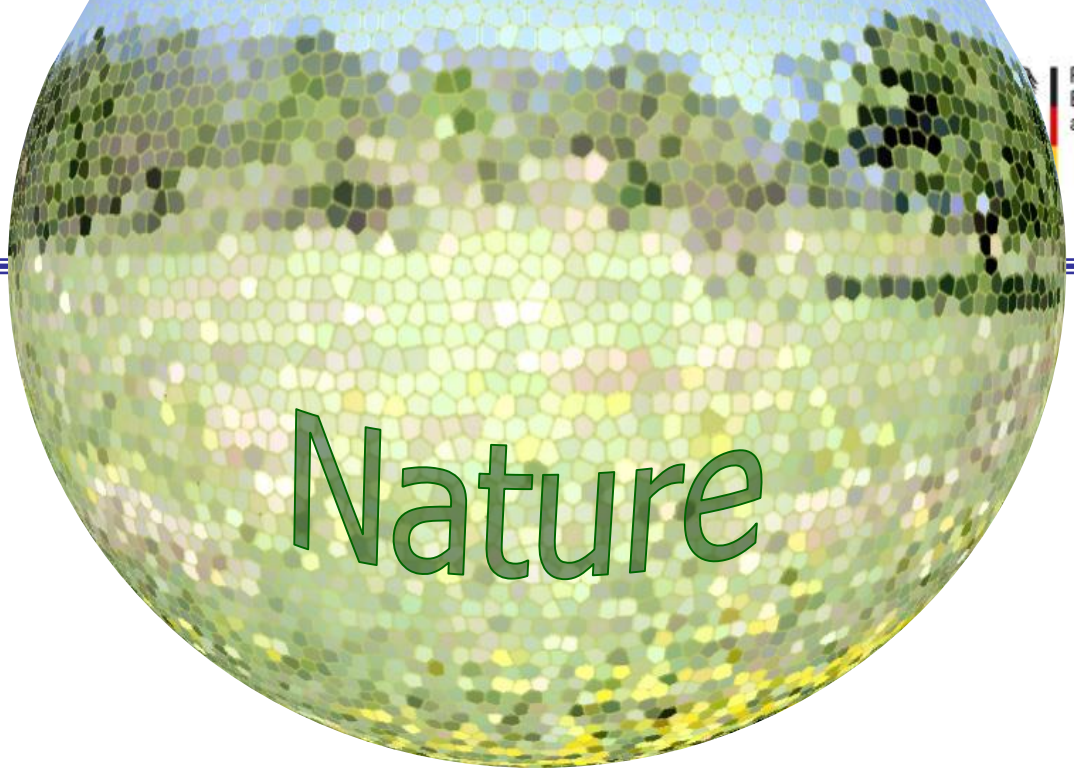
Business Risks & Opportunities — **D3**

Consumer Ownership — **D4**

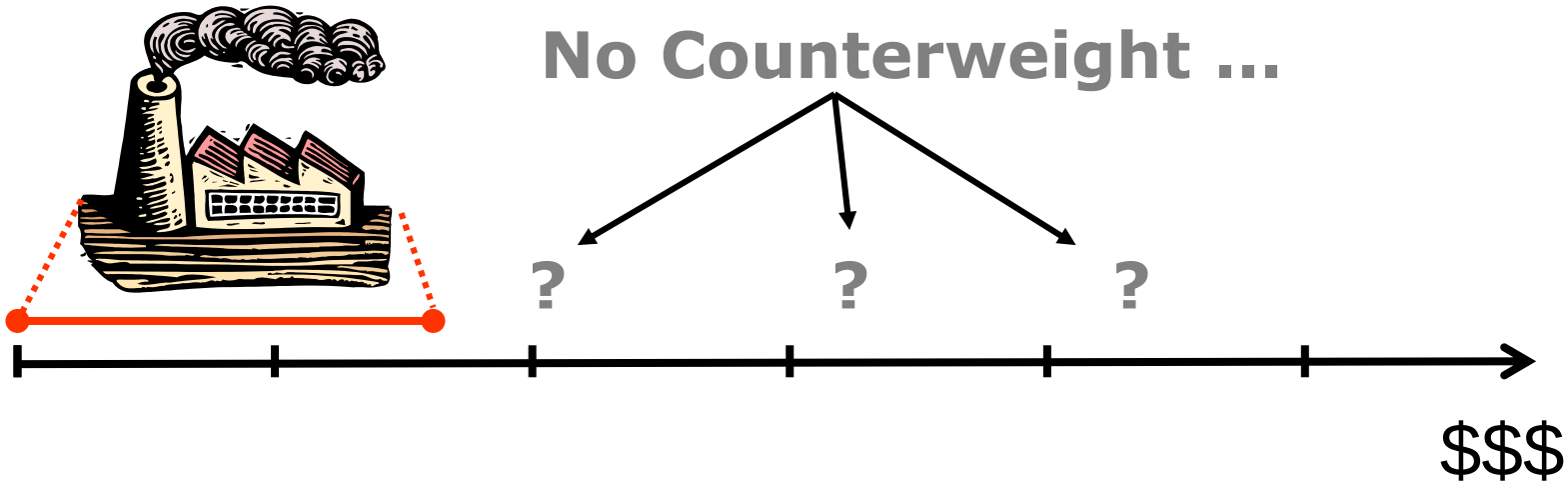
The Process for TEEB Phase 2




Nature
Nature's
Interactions with Humanity
Money : today's Yardstick
$$$



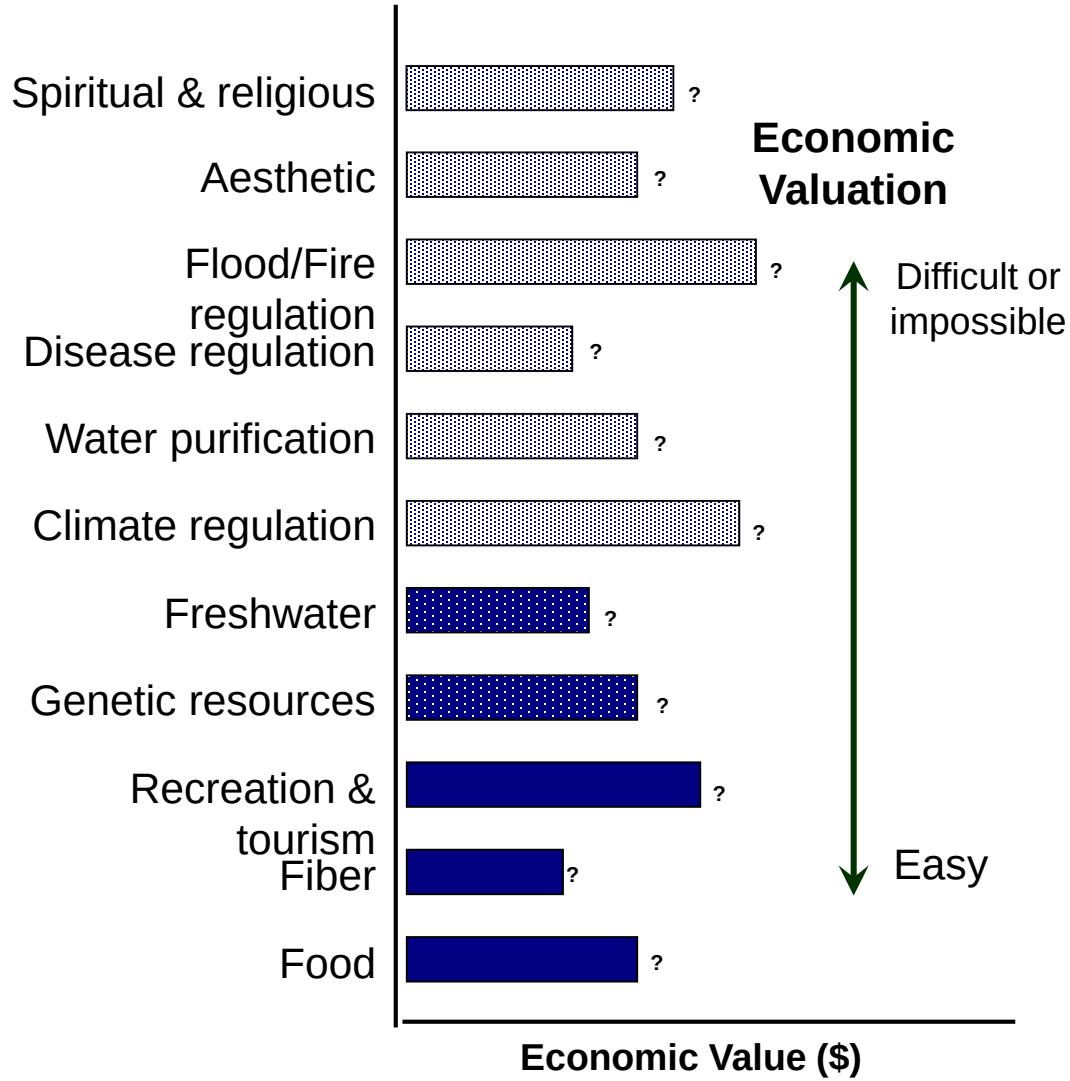
No Value =
No Counterweight …



Important - How we measure what we value?

Improving Measurement can be a long process, but of fundamental importance to being able to obtain a solution (TEEB, D1, chapter 3, work in progress)

Ecosystem services public goods & difficulty of valuation



Source: Jeffrey A. McNeely, Chief Scientist, IUCN-The World Conservation Union from presentaion: FUNDING MECHANISMS FOR BIODIVERSITY. 27 July 2006 Inter-American Development Bank Workshop on Biodiversity Loss

Measuring What we Manage:
Towards Proper Stewardship of Our Natural Capital

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

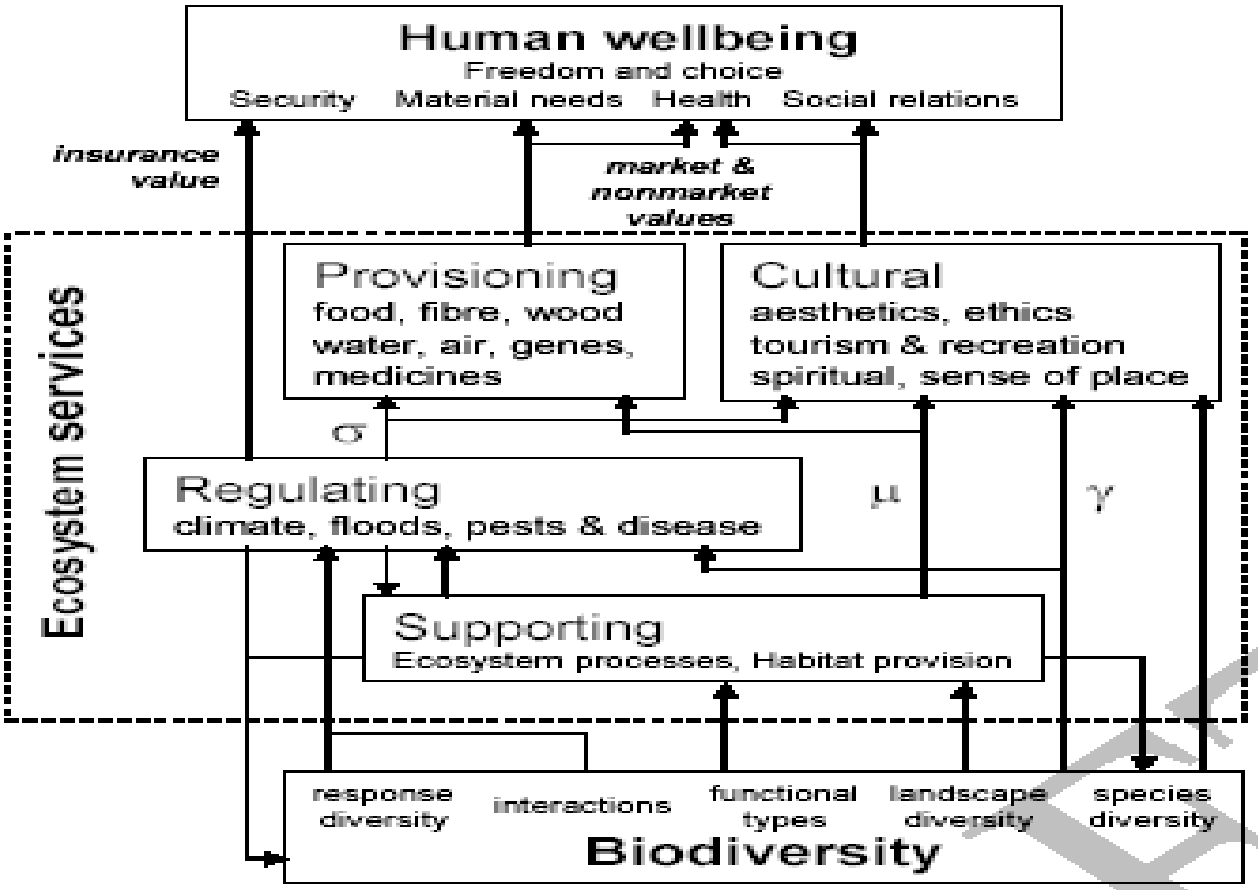
Range of opportunities to take natural capital into account

- **Biodiversity indicators: needs for measurement/monitoring, modeling and targets.**
- **Ecosystem services indicators important for instrument design (PES, REDD)**
- **Ecological footprints valuable for policy targets and communication**
- **Critical importance of ecosystem services to the poor – refocus poverty policy?**
- **National policy makers with more comprehensive national income accounts**

Five Important Dimensions of "Biodiversity"…

1. **Species Richness** (to quantify species diversity, its recreational, medicinal, etc. values, including contribution to ecosystem resilience and robustness)
2. **Species Rarity** (to quantify species close to extinction, their ethical and recreational values, global citizens significant "WTP" for these. Note that Species Rarity is closely and inversely related to another biodiversity attribute, Population Viability, hence a reflection of physical dispersion, mean range size & separation)
3. **Biomass Density** (because of its role in delivering very important services, especially Carbon storage, water provisioning and regulation, and others)
4. **Primary Productivity** (to measure the natural rate of production of biomass, & its food production potential through the human appropriation of net primary productivity - to feed 9 billion of us in 2050)
5. **Genetic diversity** (to quantify bio-prospecting values and insurance values for future foods, etc)

From indicators to ESS

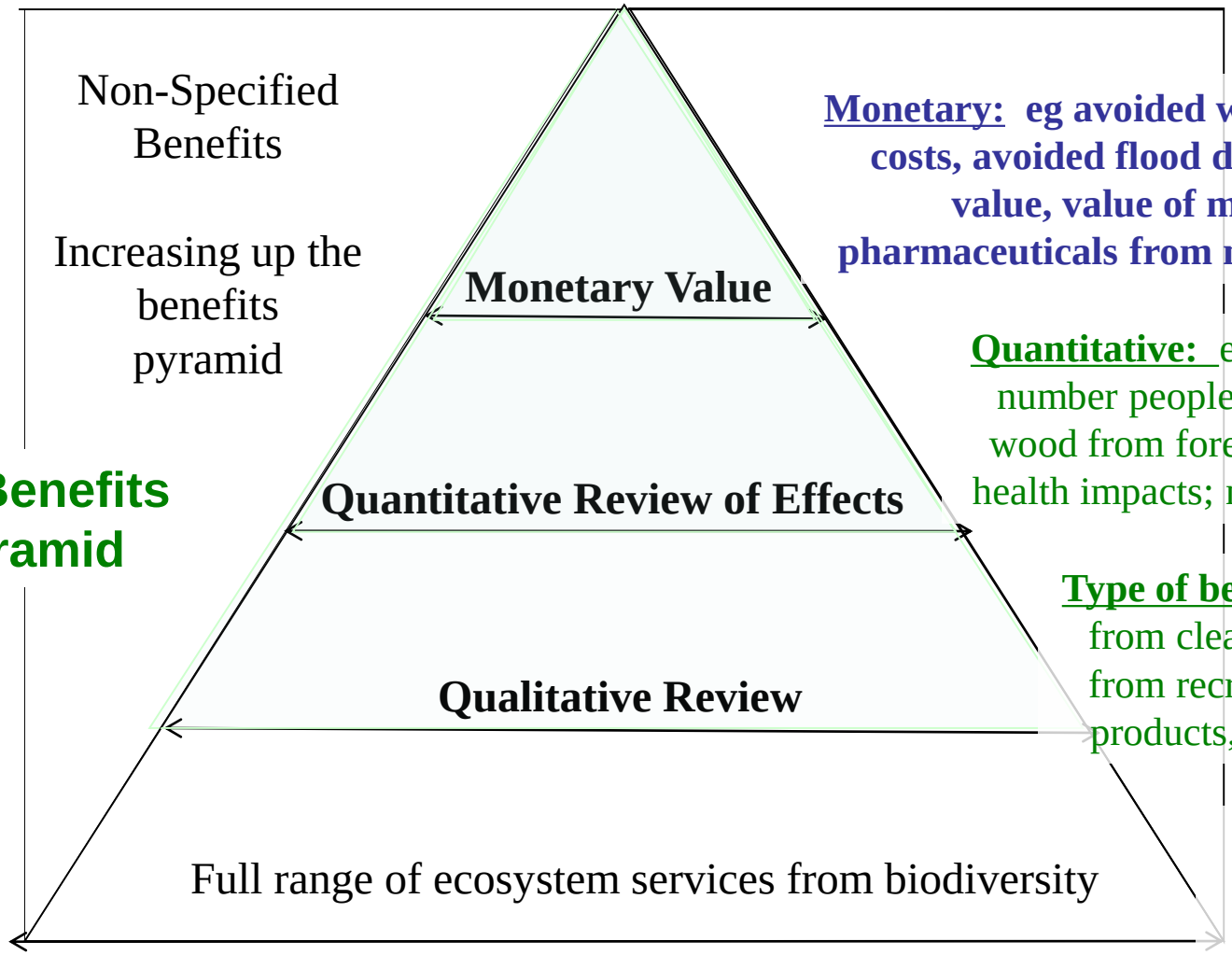


Source; Chapter 3 D0 TEEB work in progress

Ecosystem services indicators

- **Offer the unique opportunity to describe the flow of benefits provided by biodiversity and ecosystems**.
- Some examples from D1 TEEB (ten brink et al..)
- **Provisioning services**
- Food – Crop production from sustainable [organic] sources in tonnes/ha
- Number of wild species used as food
- **Regulating Services**
- **Climate / climate change regulation** (Total amount of carbon sequestered/stored)
- **Natural hazards control (**Trends in number of damaging natural disasters
- Probability of incident)
- **Water regulation** (Infiltration capacity/rate of an ecosystem, Soil water storage capacity in mm/m, Floodplain water storage capacity in mm/m)
- **Cultural and social services**
- **Ecotourism & recreation (**Number of visitors to protected sites per year,
- Amount of nature tourism)

Measuring Benefits of Ecosystem services
Answers are needed at all levels



The Benefits Pyramid

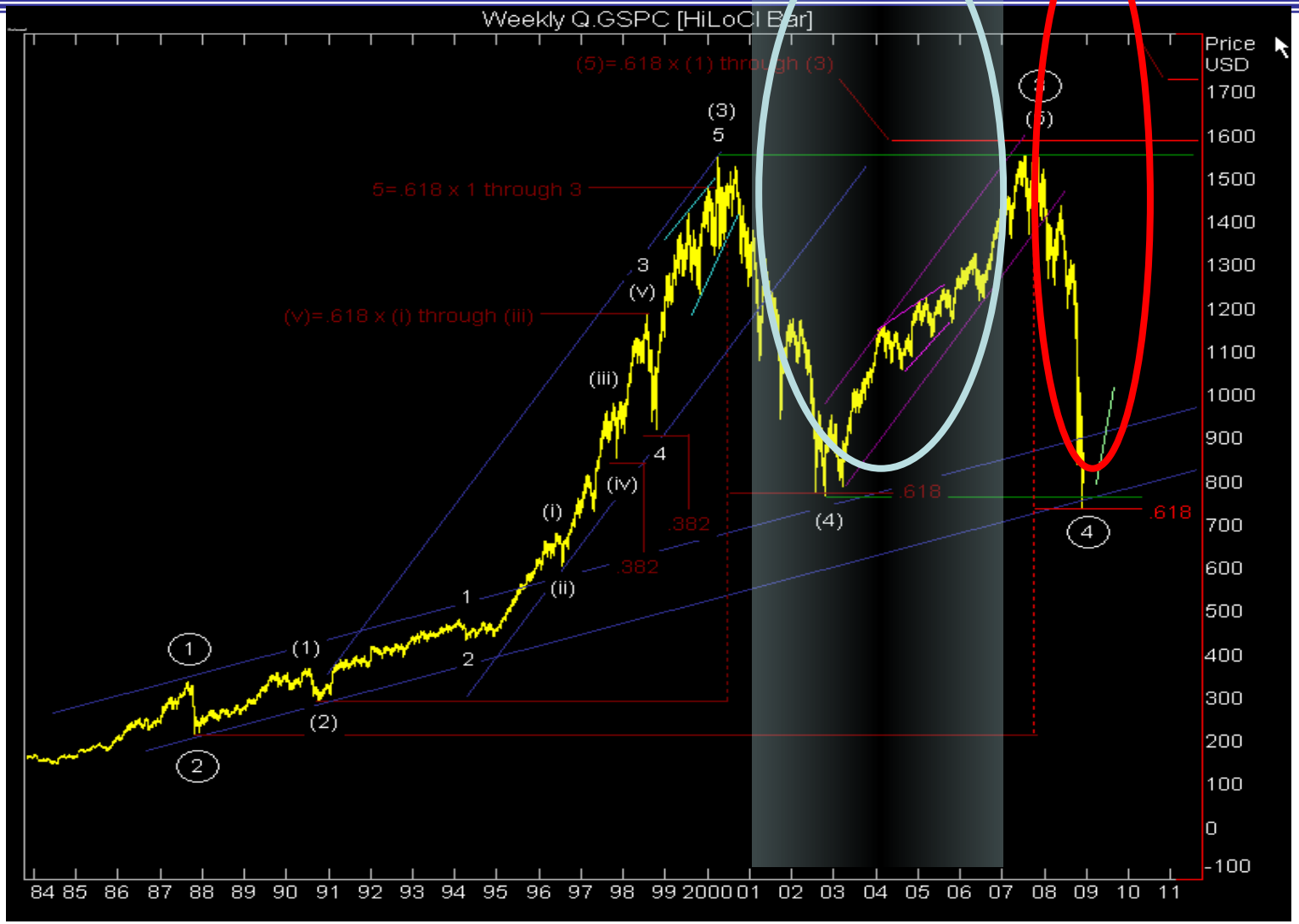
Monetary: **eg avoided water purification costs, avoided flood damage, tourist value, value of medicines / pharmaceuticals from natural products**

Quantitative: eg level of service, number people benefiting from wood from forests, # of avoided health impacts; number of visitors

Type of benefits; health benefits from clean air, social benefits from recreation, income from products, security, wellbeing.

Knowledge gaps
The "known-unknowns" and "unknown-unknowns"

Source: P. ten Brink: presentation at March 2008 workshop Review of Economics of Biodiversity Loss, Brussels


Weekly Q.GSPC [HiLoCl Bar]
Price USD
(5)=.618 x (1) through (3)
5=.618 x 1 through 3
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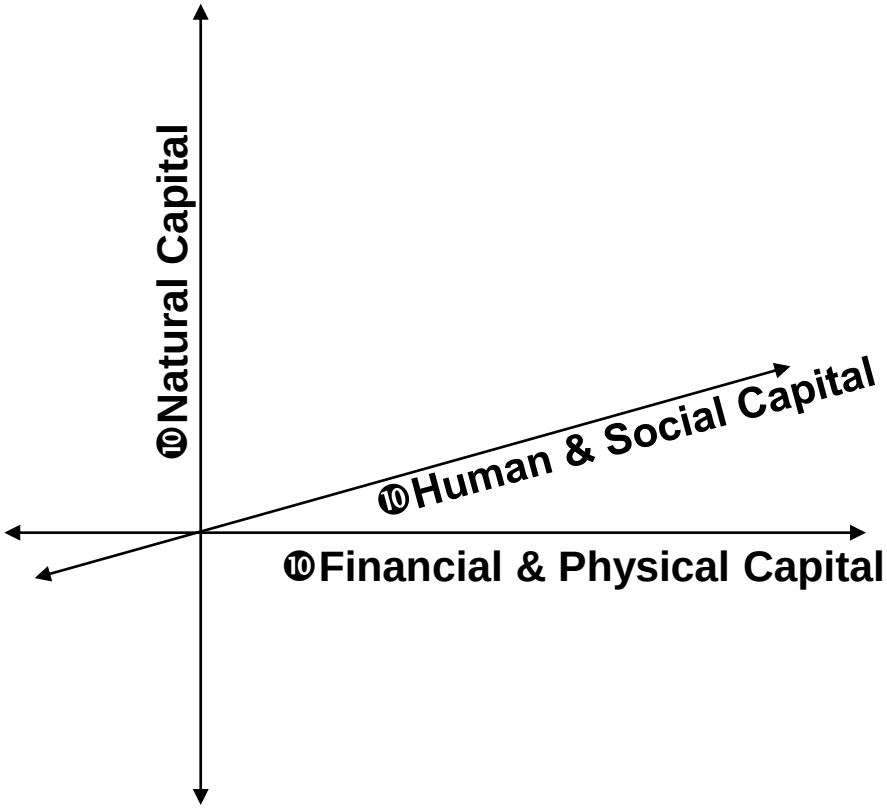
Our Economic Space… and our Economic Compass…



Sustainable measurement need of the hour

- Economic assets – Natural assets
- Infrastructure – Green infrastructure
- Gross fixed capital formation – Natural capital formation
- Trade deficits – Green deficits
- National net savings – Genuine savings
- National Accounts – Satellite Accounts for nature
- GDP – EDP
- **There is a natural counterpart to many of our economic measures, which is equally important, yet we do not take it into account. This must change to achieve true sustainable development (TEEB, D1, Chapter 3)**

Integration of ecosystems into national accounts - vital

- Compute ecosystem asset accounts
- Compute the loss in flows due to capital consumption
- Derive Adjusted net domestic product/income
- Integrate ecosystem accounts with the national accounting matrices and the monetary and physical indicators used for policy making.

Example from India GAISP project for forests

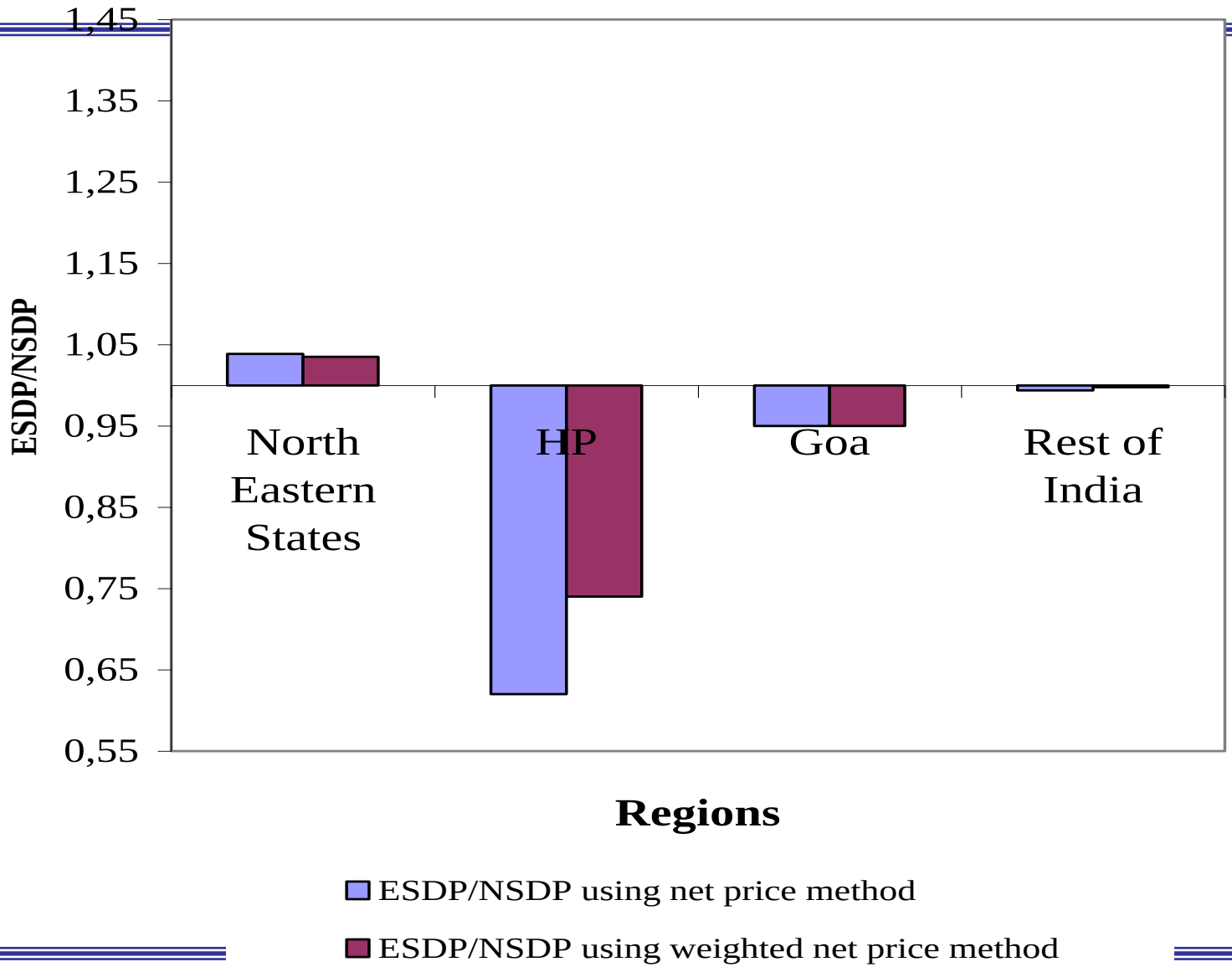
- Opening stocks
  - ➢ Changes due to economic activities
  - ➢ Other Changes
- Closing stocks

Detailed components for forestland, timber and carbon are slightly different for each

Total economic value (Timber, fuelwood, fodder, nontimber forest products, carbon, ecotourism and biodiversity)

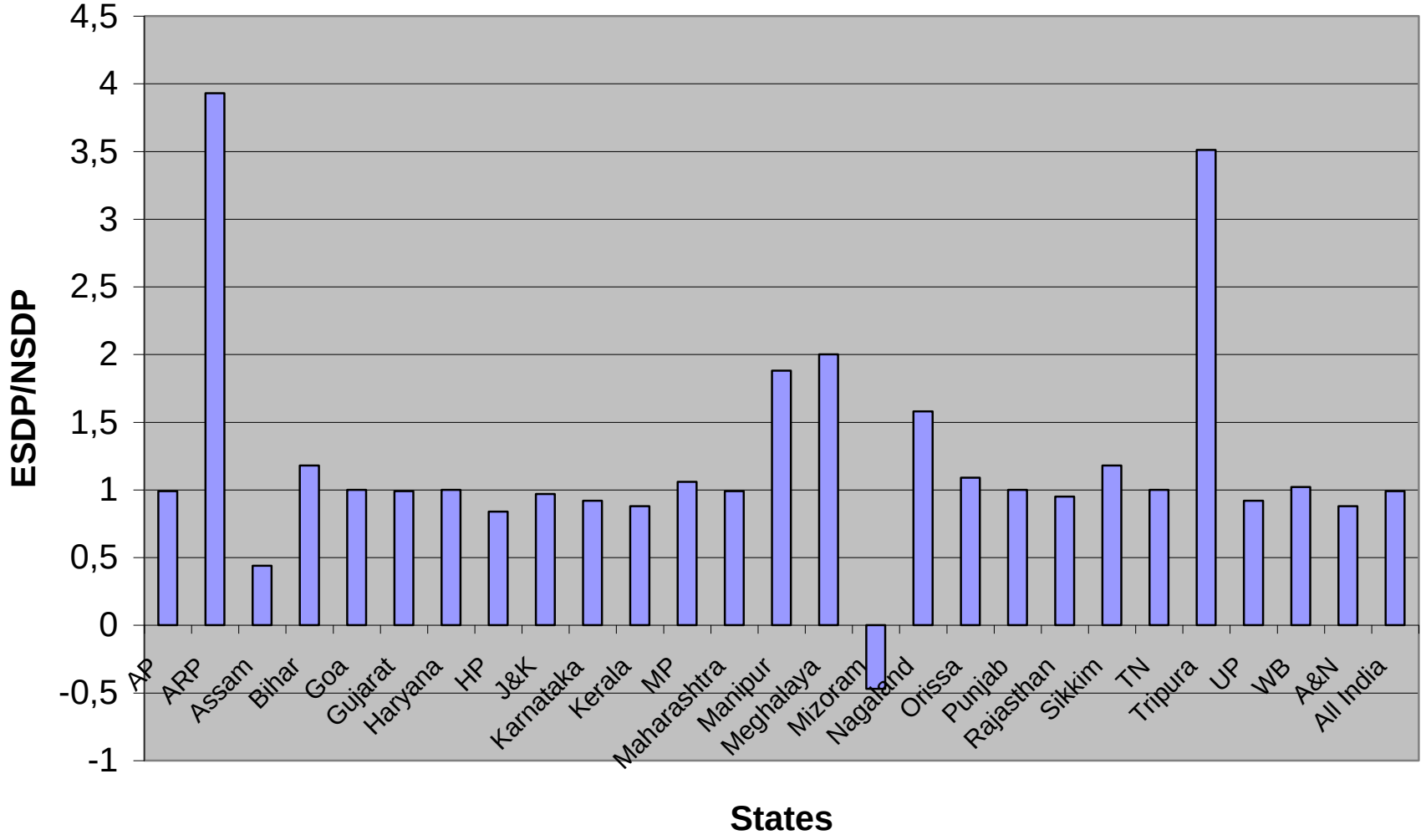
Monetary accounts

Depletion Adjusted NSDP (ESDP) to NSDP



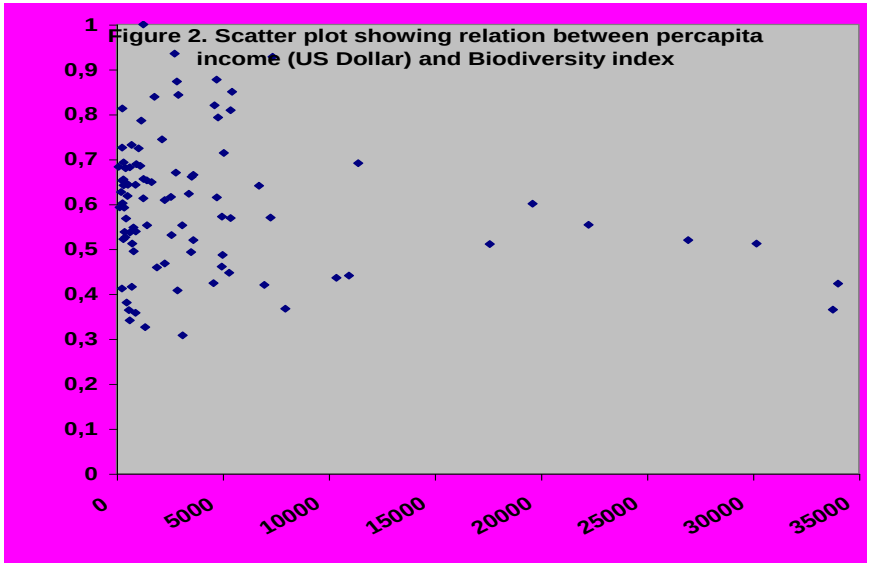
Ecotourism and biodiversity

ESDP/NSDP

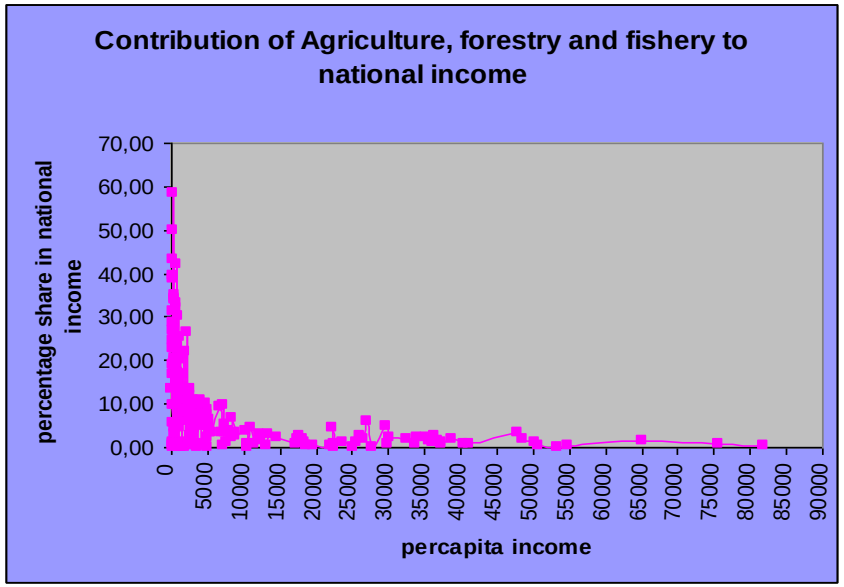


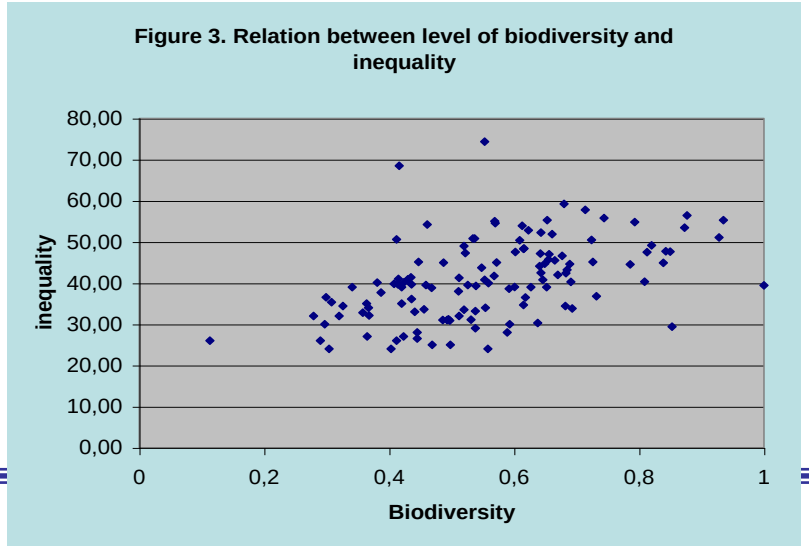
GDP of the poor

•A ‘tale of two tragedies’ for mixed economies pursuing a traditional GDP-growth-led development paradigm.



Gundimeda and Sukhdev, D1 TEEB



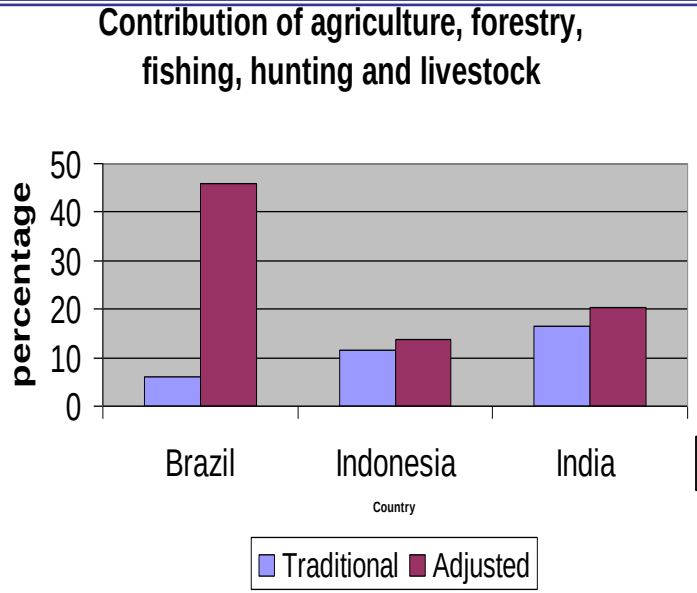


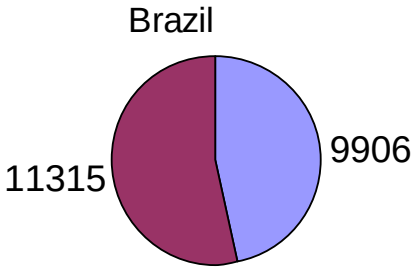
Quantification of linkages

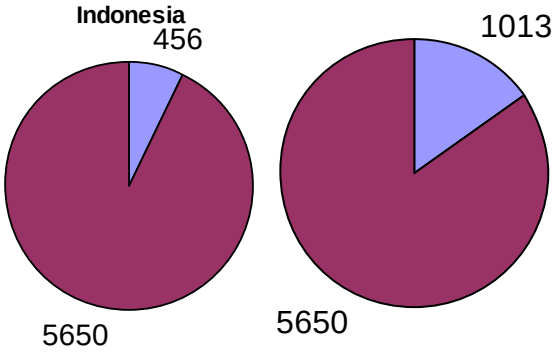
	Contribution of agricultural, forestry, fisheries and livestock to agriculture	*Per capita GDP*	*Gini coefficient*	*Total wealth*	*Natural wealth*	*Biodiversity index*
Contribution of agriculture, forestry, fisheries and livestock to GDP	1.00					
Per capita GDP	-0.48	1.00				
Gini coefficient	0.15	-0.55	1.00			
Total wealth	-0.47	0.96	-0.53	1.00		
Natural wealth	-0.32	0.49	-0-16	0.35	1.00	
Biodiversity index	**0.12**	**-0.39**	**0.47**	**-0.35**	**-0.04**	**1.00**

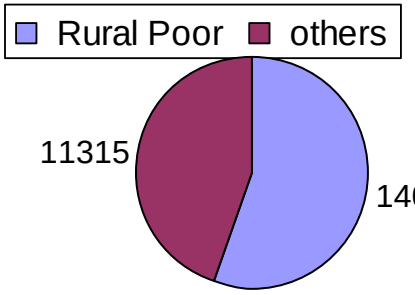
Source: Gundimeda and Sukhdev D1 TEEB

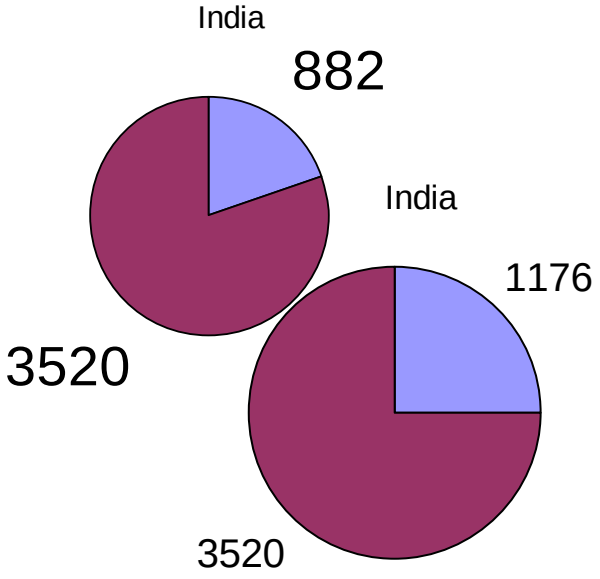
GDP of the poor

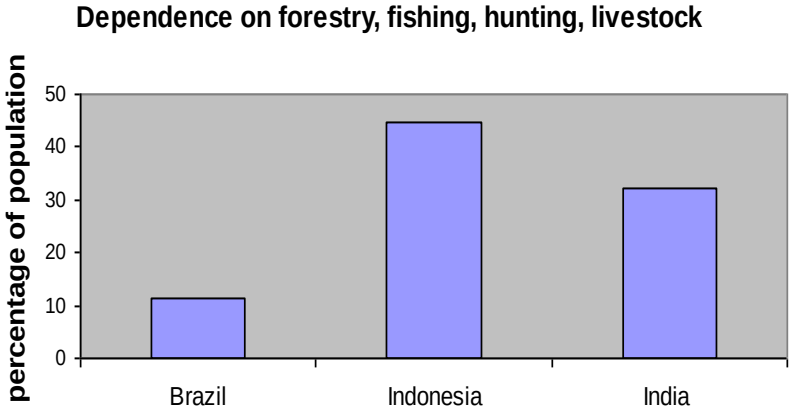




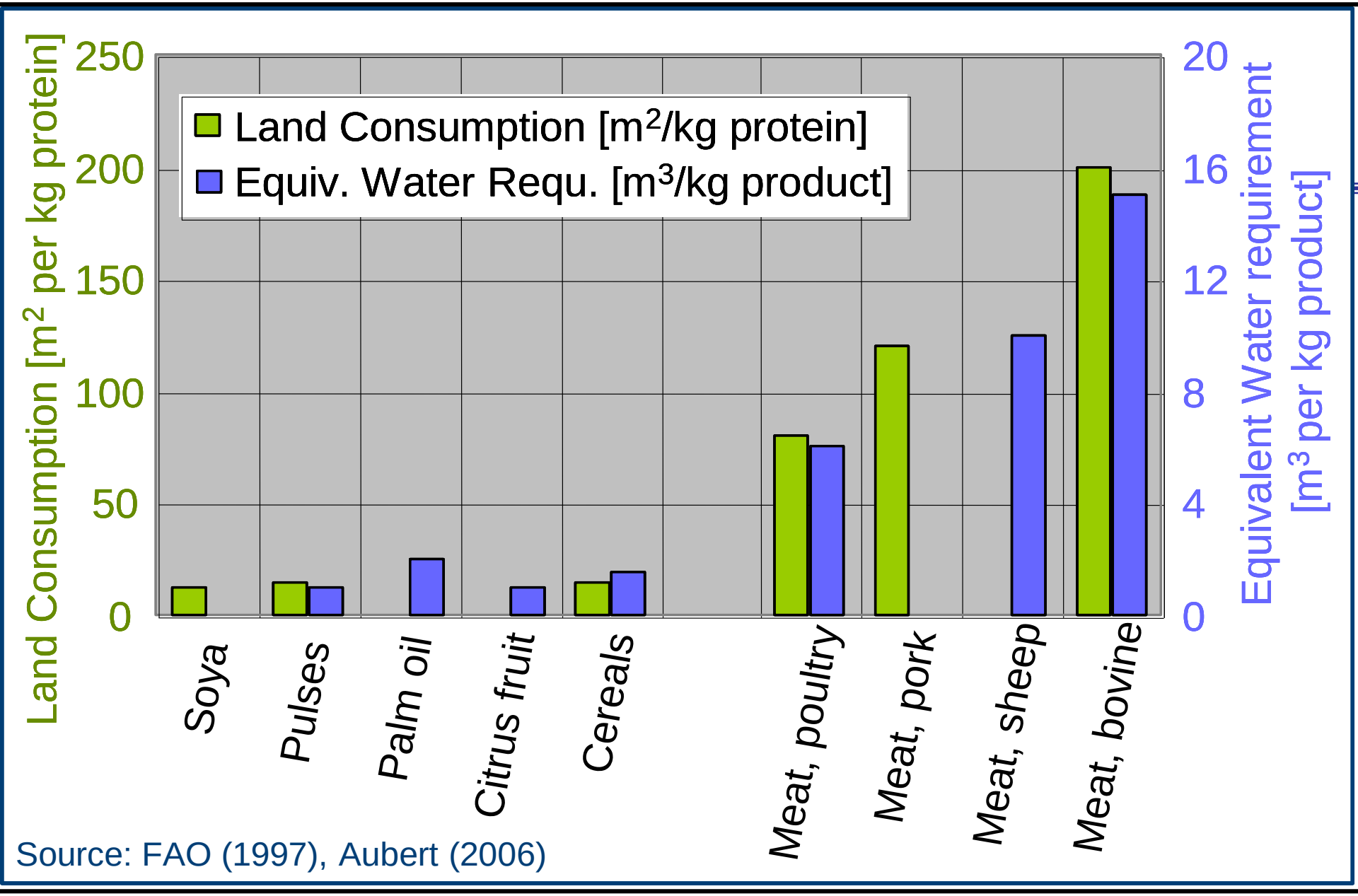








Source: Gundimeda and Sukhdev D1 TEEB



Source: FAO (1997), Aubert (2006)

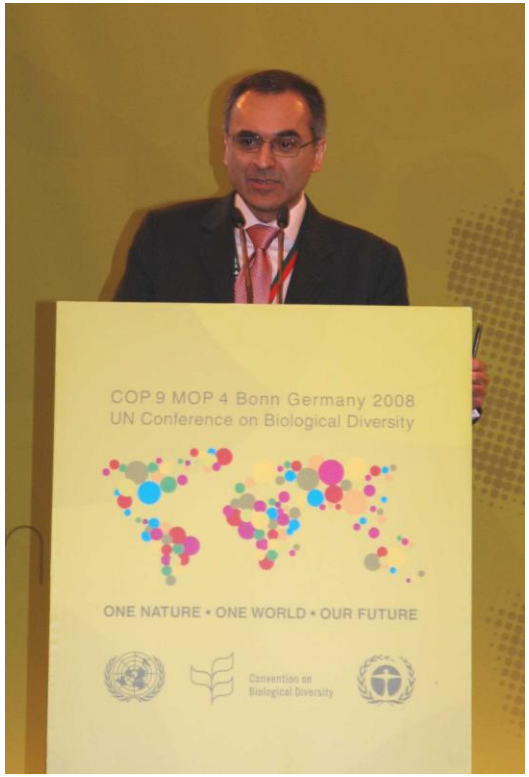
Consumer Theme : Ecological Footprints - Land and Water use by various foods

Message from TEEB

"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



Message from TEEB community

- **Qualitative indicators are an important tool in underlying quantitative and monetary information and help to close gaps where no such information exists**.
- Economic values are critical means of communicating urgency, addressing need of action or designing effective policy instruments.
- Greening the national accounts are necessary to correct defective economic compass
- Indicators like GDP of the poor are also necessary to analyse the vulnerability of poor people to environmental degradation. For transitional economies where rural and forest-dweller poverty is a significant social problem, we advocate using a measure of GDP which is sectoral and focused on their livelihoods : we call this "GDP of the poor".
- Beyond GDP indicators important for policy targets and communication
- **For TEEB each aspect is important – integration into the national accounts, monetary indicators, the quantitative and the qualitative.**

Recommendations for UNCEEA

- Three methods recommended - Green National Accounting ; Genuine Savings ; Inclusive Wealth - all require stock adjustments
- Flow adjustments also needed, and reflected against GDP for Governments, to stop using GDP as the only progress indicator
- SEEA-2003 revision to become a more comprehensive "guidebook"
- Countries who can move ahead should do so...
- The Key here is to set the direction , not try to dictate the speed at which countries migrate to 'Green Accounting'
- Therefore ....a Tier 1 should form of countries who can simultaneously do ecosystem accounting etc and prepare comprehensive Green Accounts (eg : India).
- Tier 2 should be countries who can do some, not all, the key recommendations.
- Tier 3 are those for whom WB or UN just has to make their own spreadsheet estimations of value adjustments

Thank You !