



**The Cost of Policy Inaction (COPI)**  
**The case of not meeting the 2010 biodiversity target**

**A summary of the Economics, Methods and Lessons**

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17 June 2008  
Enveco

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# COPI Full Team



**Based on the Report to the European Commission, May 29, 2008**

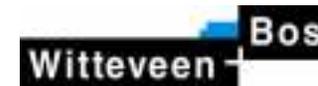
## **The Cost of Policy Inaction**

**L. Braat & P. ten Brink (eds.)**

with

**J. Bakkes, K. Bolt, I. Braeuer, B. ten Brink, A. Chiabai, H. Ding, H. Gerdes, M. Jeuken, M. Kettunen, U. Kirchholtes, C. Klok, A. Markandya, P. Nunes, M. van Oorschot, N. Peralta-Bezerra, M. Rayment, C. Travisi, M. Walpole.**

**Wageningen / Brussels, May 2008**



# Broader Objectives: Context for COPI



## "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.*

# Aims and Objectives of COPI



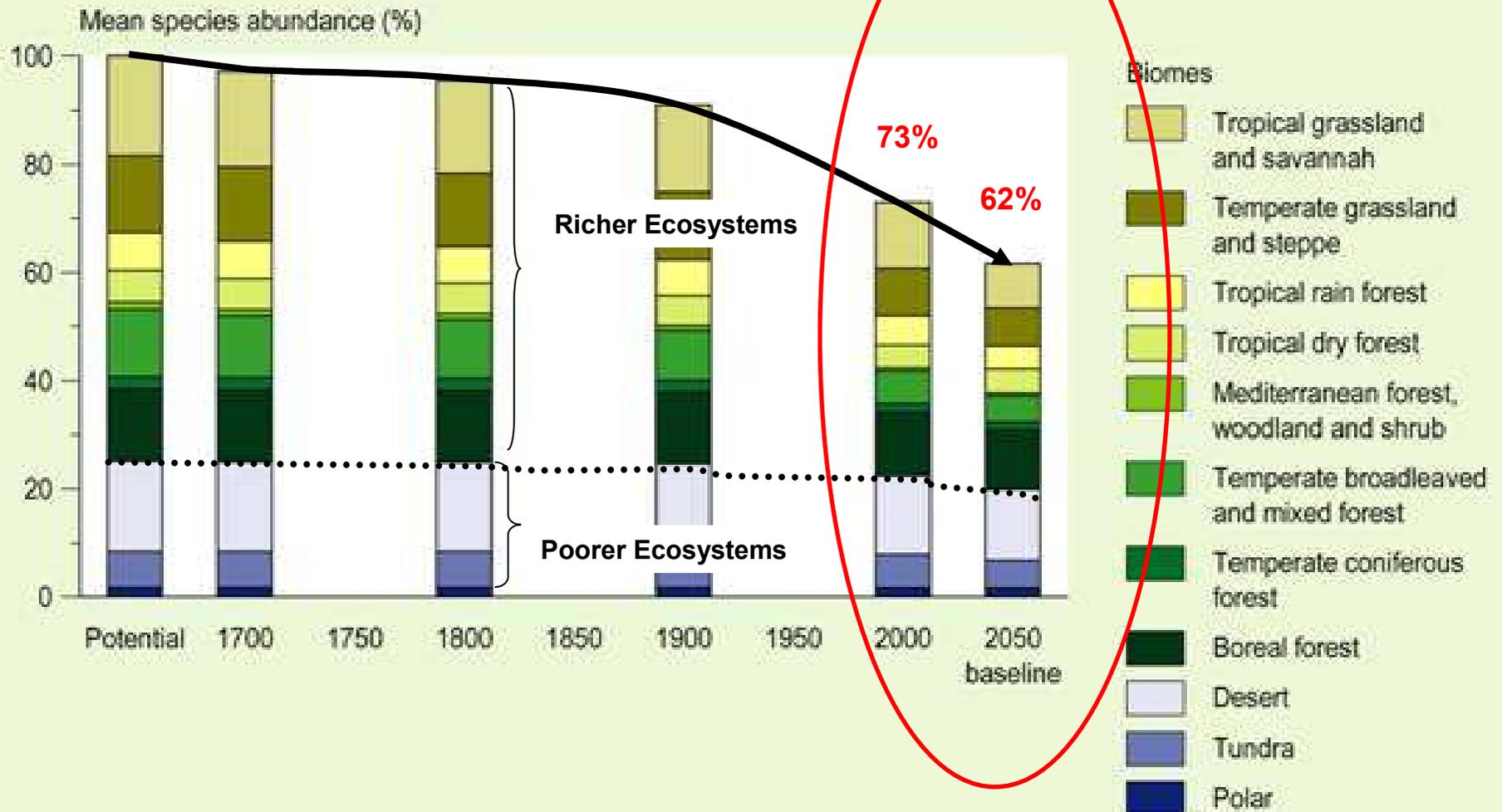
- **Estimate the Cost of Policy Inaction (COPI) - the case of not meeting the 2010 biodiversity target. How much will the loss of ecosystems and biodiversity cost society/the economy?**
- This is a **first analysis**– sufficiently robust to be useful, but with potential for improvement.
- It is also an **exploration of methodological approaches and needs**
- The COPI focus has primarily been on **land-based biomes and associated ecosystem services** *given model availability*
- Some **scoping for other areas and testing of methodological solutions.**

Part of response to the **Biodiversity Communication Action Plan** (COM(2006)216; EC, 2006) – to “***Strengthen understanding and communication of values of natural capital and of ecosystem services...***”.

# Biodiversity loss from 1700 to 2050 accelerates



## Historic and future development of global biodiversity



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

# Ecosystem Services - COPI builds on the Millennium Ecosystem Assessment (MA) Framework



## CONSTITUENTS OF WELL-BEING



Source: Millennium Ecosystem Assessment

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

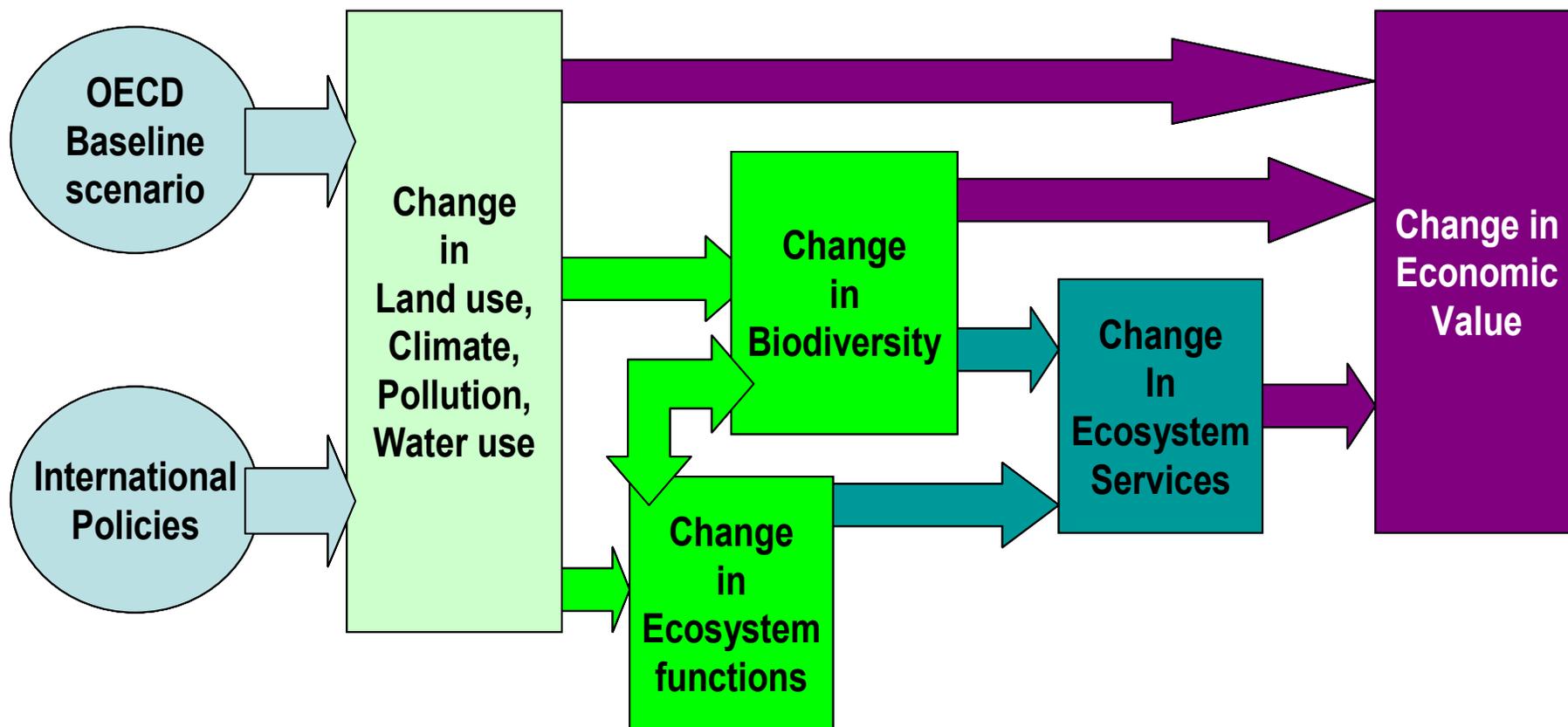
- Low
- Medium
- High

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

- Weak
- Medium
- Strong

Source: MEA

# Mapping changes : from Biodiversity & Ecosystems to Economic Values



# Approach and Methodological issues



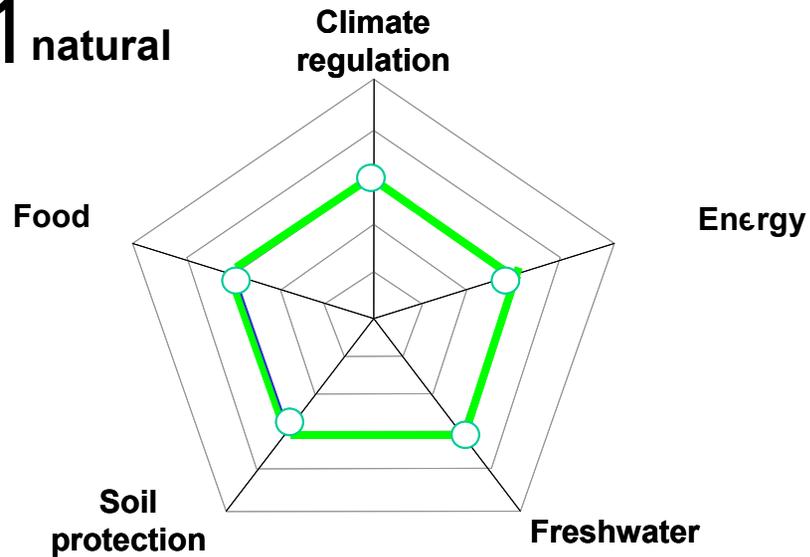
- **Model availability important** – OECD/Globio model suitable for land-based biomes showing changes in landuse and quality to 2050.
- **Input Data is key** – eg data needed on ecosystem service values in per hectare terms for land-use, biome, geographic region and time (as projection to 2050)  
Data existence varies / gaps exist; some can be addressed using assumptions and techniques (benefits transfer et al) .  
Two scenarios used - *Partial estimation* scenario and *Fuller estimation* scenario
- **Pragmatic assumptions necessary:** the approach assumed a **linear relation of value to loss of biodiversity**. Yet not some changes are non-linear, there are (critical) thresholds too.
- **Analysis is an analysis of marginal change** – loss at the margins and not an estimate of total value of natural capital.
- **Other areas** of costs from biodiversity loss – **marine, coral reefs, wetlands, IAS** – **scoped**, but not in the main numbers. **Final numbers conservative.**
- **Analysis focuses on both land-use changes** (eg conversion from one land use to another) and **quality changes** (eg loss in biodiversity)

# Land-uses and trade offs for ecosystem services

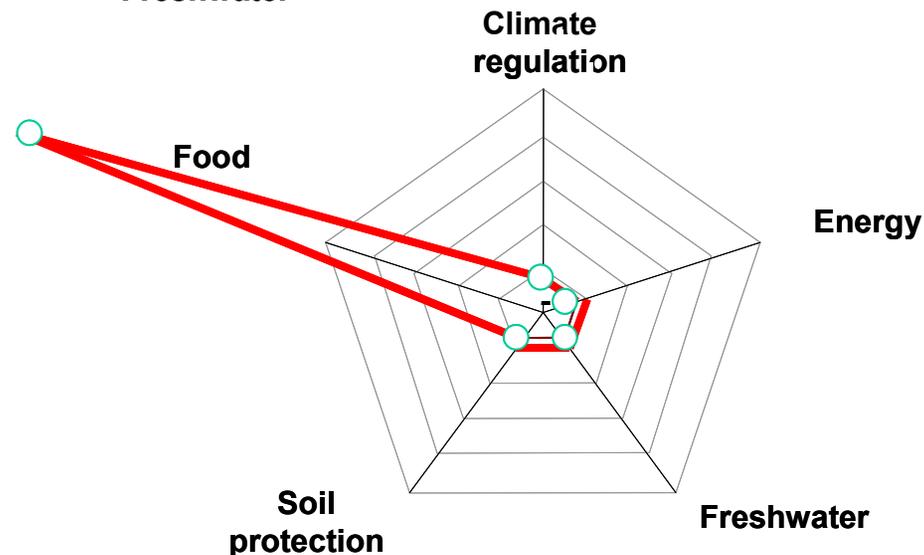
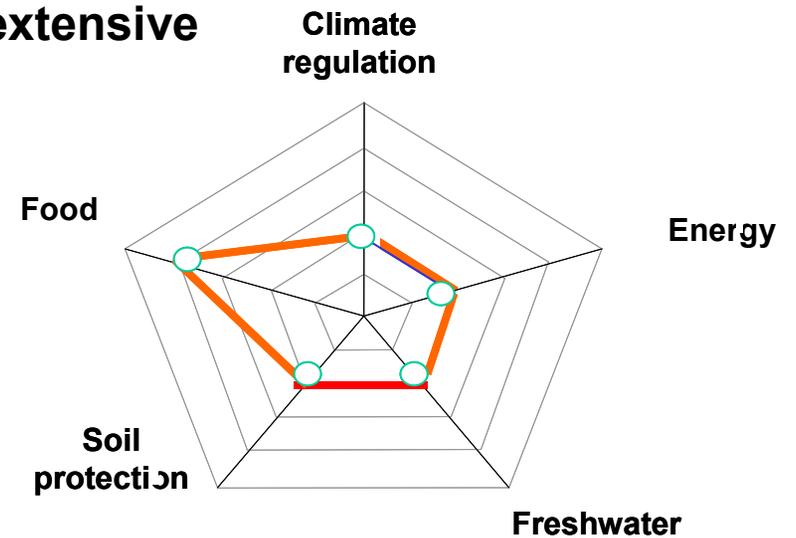
## Example of conversion: natural area to agriculture



**1 natural**



**2 extensive**



**3 intensive**



## Key Results

# The Global Loss of Biodiversity

2000

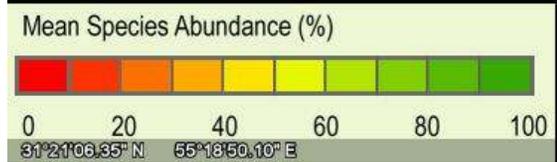


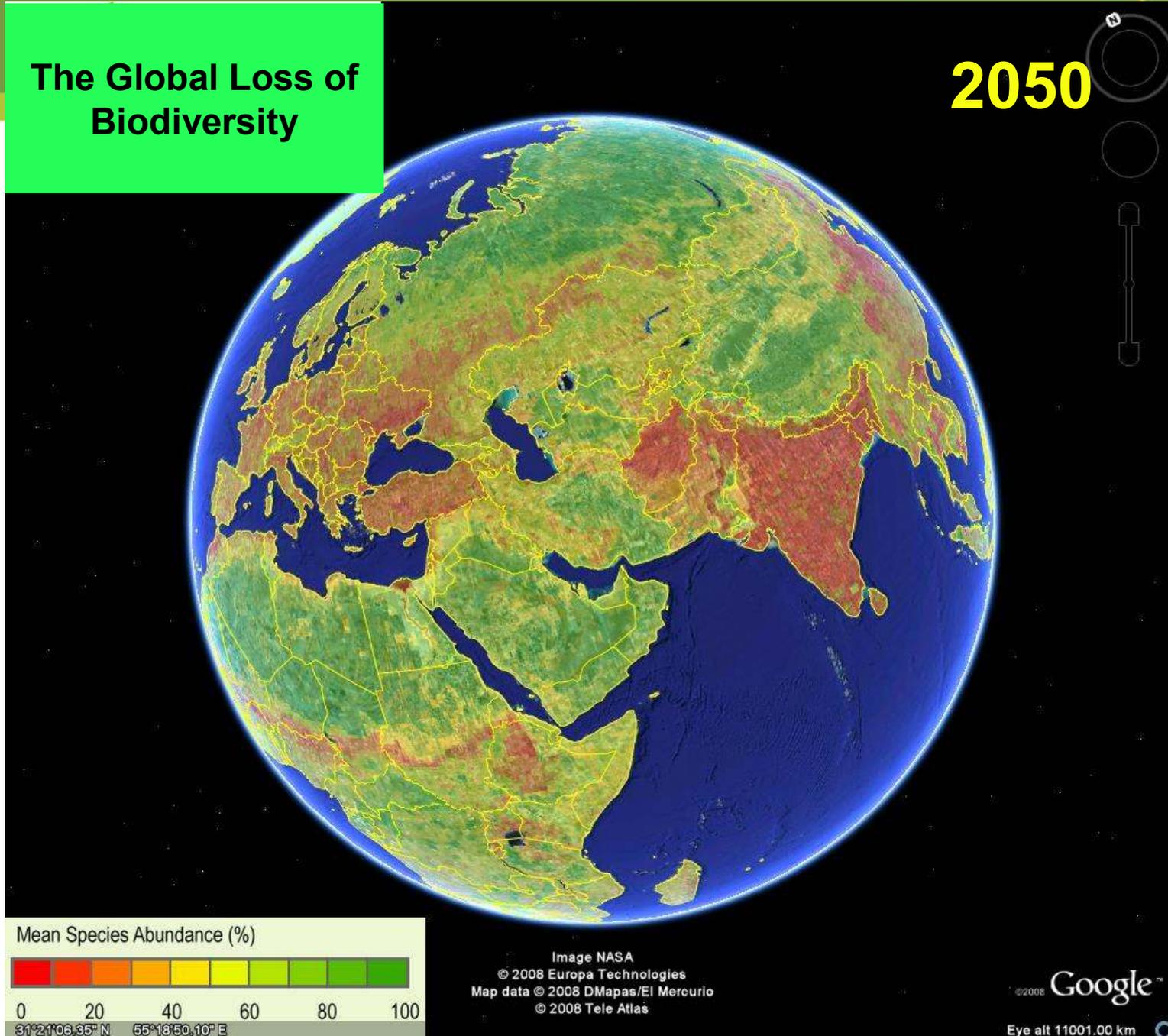
Image NASA  
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Eye alt 11001.00 km

Source: L Braat presentation COP9 Bonn May 2008

# The Global Loss of Biodiversity

2050



Source: L Braat presentation COP9 Bonn May 2008

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



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

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

# Loss of Quality

## Global total



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

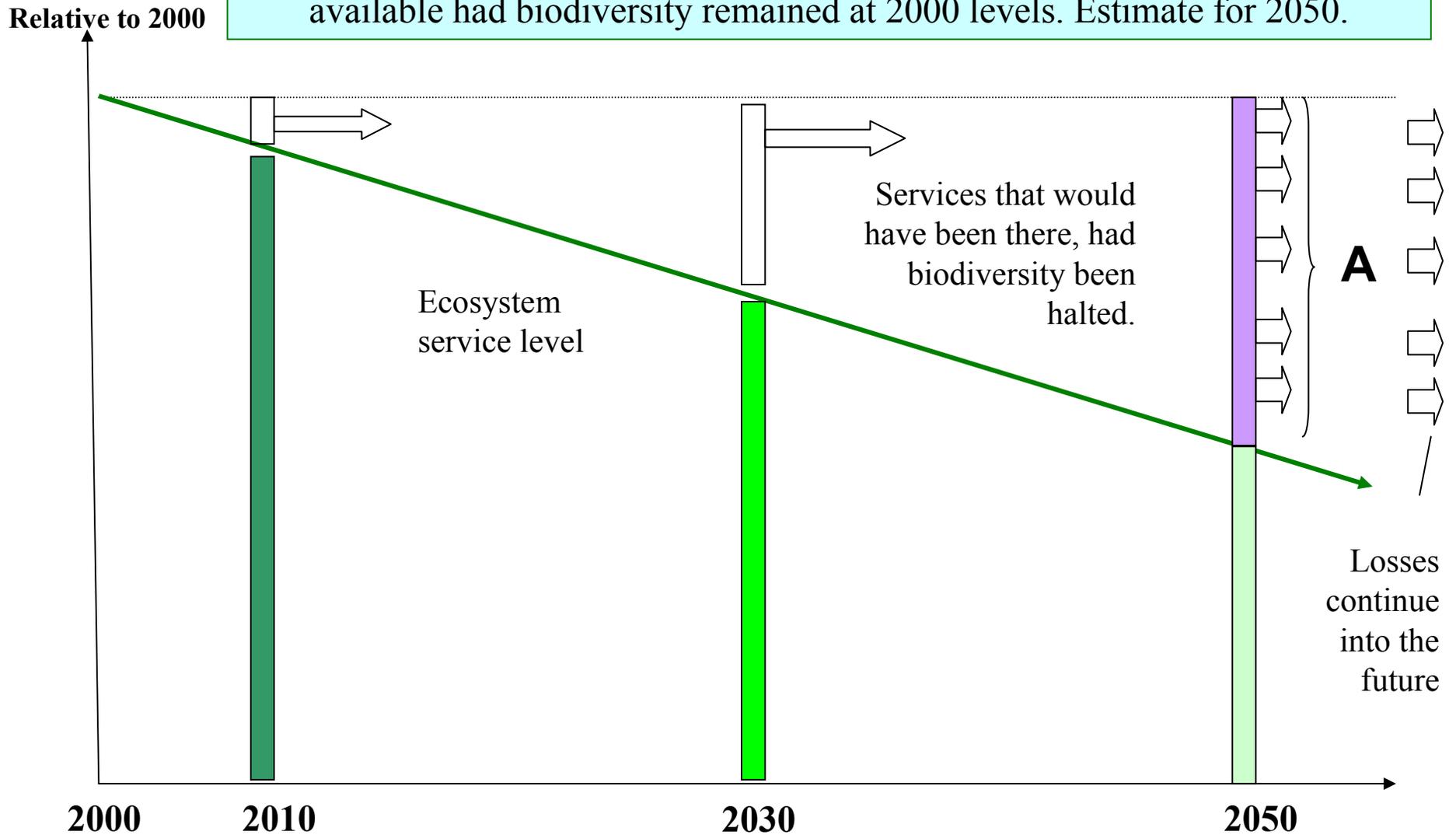
<b>Mean species abundance change for different land use categories</b>	<b>MSA loss 2000 to 2050</b>
<b>Natural areas</b>	<b>11%</b>
<b>Bare natural</b>	<b>8%</b>
<b>Forest managed</b>	<b>20%</b>
<b>Extensive agriculture</b>	<b>8%</b>
<b>Intensive agriculture</b>	<b>-2%</b>
<b>Woody biofuels</b>	<b>0%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

# Valuation and Ecosystem service losses

## COPI calculation: A



Annual Loss of economic value of ecosystem services that would have been available had biodiversity remained at 2000 levels. Estimate for 2050.



# COPI - Some key results



- The welfare loss grows with each year of biodiversity and ecosystem loss.
- Over the period 2000 to 2010 this amounts to around **50 billion Euros extra loss per year, every year.**
- By 2010 the welfare losses from the loss of ecosystem services amount to **545 billion EUR in 2010** or just under **1% of world GDP.**
- **The value of the amount lost every year rises,** until it is around 275bn EUR/yr in 2050.
- The loss of welfare in 2050 from the **cumulative loss** of ecosystem services between now and then amounts to **\$14 trillion (10<sup>12</sup>) Euros** under the *fuller estimation* scenario
- This is equivalent in scale to **7% of projected global GDP for 2050** – across land-based biomes. This is nearer **5.5% for forestry biomes**

# Global COPI - Loss of Ecosystem services from land based ecosystems – all biomes



**Loss of economic value of ecosystem services that would have been available had biodiversity remained at 2000 levels. Estimate for 2050.**

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

**Land based ecosystems only**

Source: L. Braat & P. ten Brink (eds.)

# Global COPI - 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
<b>Forest Total</b>	<b>-1317</b>	<b>-10791</b>
<i>Natural areas</i>	<i>-1552</i>	<i>-12310</i>
World GDP in 2050 (trillion (10 <sup>12</sup> ) EUR)	195.5	195.5
<b>Losses of ESS from forests as share of % GDP</b>	<b>-0.7%</b>	<b>-5.5%</b>
<i>Losses of ESS from natural areas in forest biomes as share of % GDP</i>	<i>-0.8%</i>	<i>-6.3%</i>

# What ESS could already be included (forests)?



## Included - (8 services)

### *Provisioning services*

- Food, fiber, fuel

### *Regulating services*

- Air quality maintenance
- Soil quality maintenance
- Climate regulation (i.e. carbon storage)
- Water regulation (i.e. flood prevention,, aquifer recharge etc.)
- Water purification and waste management

### *Cultural services*

- Cultural diversity, spiritual and religious values, educational values, aesthetic and cultural
- Recreation and ecotourism

## Not included - (10 services)

### *Provisioning services*

- Biochemicals, natural medicines, pharmaceuticals
- Ornamental resources
- Fresh water

### *Regulating services*

- Temperature regulation, precipitation
- Erosion control
- Technology development from nature
- Regulation of human diseases
- Biological control and pollination
- Natural hazards control / mitigation

### *Cultural services*

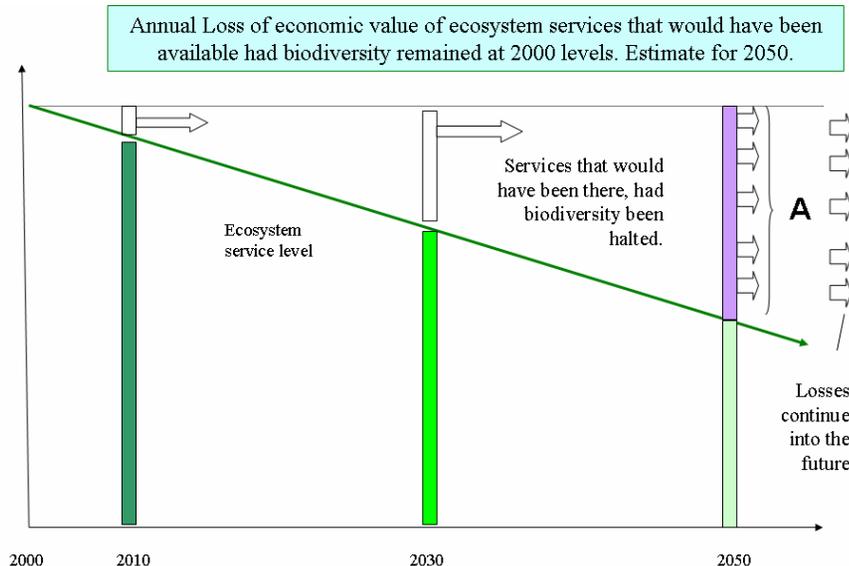
- Living comfort due to environmental amenities

# COPI – Forestry Biome

## Different ways of calculating the loss



### A : 50-year impact of inaction

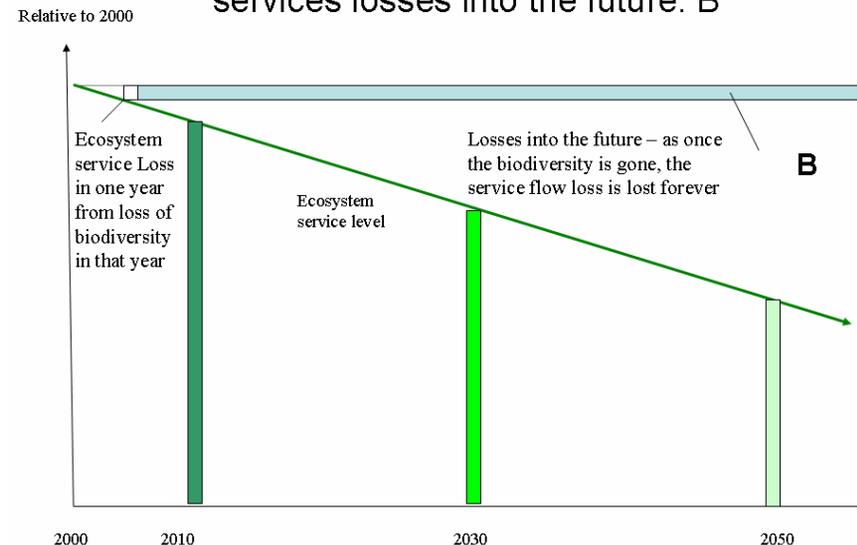


**Lost Welfare equivalent to 5.5 % of GDP (from forest biomes overall) ... or...**

Source: L. Braat & P. ten Brink (eds.)

### B : Natural Capital Loss every year

Valuation and Ecosystem service losses  
A year's biodiversity loss leads to ecosystem services losses into the future: B



**Natural Capital Lost from USD  $1.35 \times 10^{12}$  to  $3.10 \times 10^{12}$  (@ 4% Discount Rate) (@ 1% Discount Rate)**

# Methodological insights for future work



- **Data Gaps** – need additional work to fill in gaps, test and improve gap filling approaches
- **Address potential inherent biases in the (application of) economic valuation?**
  - eg greater focus & ease of analysis for commodity prices related valuations
  - Work on other services – eg regulating services
- **Non-linearity** – integrate non-linear issues (eg critical thresholds) into analysis.
- **Important to look at how to address substitutability (or lack of)**
- **Risks and Scientific Uncertainty** – also apply risk assessment
- **Spatial perspective** – provision of service and benefit from service not always in the same location. Careful treatment is needed.
- **Some costs only have an effect in future generations – discounting important (indeed critical).**
- **Ethical issues** – anthropocentric approach; equity, fairness – need to be core.

# Next Steps



Broaden/update to help in wider TEEB

- Build on lessons & ensure lessons fully integrated in TEEB phase II
- Refine a COPI for land-based biomes in light of efforts to improve data and assumptions.
- Broaden COPI to do similar exercise for other biomes
- Make efforts to ensure wider set of ecosystem services are covered (equally)
- Make links to sectors of the economy (which benefit, which burden et al)
- Make greater links to social aspects (well-being, distributional impacts).
- Assess role of drivers and policy implications
- Use values of benefits (and costs) of ecosystems and biodiversity (loss) to improve the evidence base for decision making.

# Questions ?



**Thank You !**

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*If citing, please reference as: Presentation by Patrick ten Brink of IEEP on **The Cost of Policy Inaction (COPI)**  
**The case of not meeting the 2010 biodiversity target** at the Enveco Meeting, Brussels, 17 June 2008*

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