



Fondazione
Eni
Enrico Mattei

Economic Valuation of Biodiversity Benefits: a critical analysis

Paulo A.L.D. Nunes

Department of Economics, University of Venice
Fondazione Eni Enrico Mattei
School for Advanced Studies in Venice Foundation



- Why performing an economic valuation of biodiversity.
- Economic valuation perspective.
- Classification of biodiversity value categories.
- Monetary valuation approaches and respective applicability regarding the estimation of biodiversity benefits.
- Review of valuation studies on the area of biodiversity.
- Reflection, conclusions and valuation challenges.

A selection of related literature

- NUNES, P.A.L.D., J.C.J.M. van den BERGH and P. NIJKAMP (2003) *The Ecological Economics of Biodiversity: Methods, Values and Policy Applications*, Edward Elgar Publishing (UK).
- P. NIJKAMP, NUNES, P.A.L.D. and J.C.J.M. van den BERGH (2001) “Biodiversity as a social science issue”, in *Kaleidoscopic View on Social Scientific Global Change Research in the Netherlands*, pags. 12-14, Royal Netherlands Academy of Arts and Sciences, Amsterdam, The Netherlands.
- NUNES, P.A.L.D., J.C.J.M. van den BERGH and P. NIJKAMP (2001) “Integration of Economic and Ecological Indicators of Biodiversity”, in *Valuation of Biodiversity Studies: Selected Studies*, pags. 153-182, OECD, Environment Directorate, Paris, France.
- NUNES, P.A.L.D. and J.C.J.M. van den BERGH (2001) “Economic Valuation of Biodiversity: Sense or Nonsense”, *Ecological Economics*, vol. 39, pags. 203-222.
- van den BERGH, J.C.J.M., NUNES, P.A.L.D., DOTINGA, H.M., KOOISTRA, W.H.C.F., VRIELING, E.G. and L. PEPPERZAK (2002) “Exotic harmful algae in marine ecosystems: an integrated biological-economic-legal analysis of impacts and policies”, *Marine Policy*, vol. 26/1, pags. 59-74.

Economic reasons for valuing biodiversity

- Cost-benefit analysis and policy formulation.
- Biodiversity damage assessment and legal claims.
- Environmental accounting.
- Proper pricing.

Economic valuation perspective of biodiversity

- Characterize!

Alternative perspectives on valuing biodiversity

- (1) Instrumental vs. intrinsic valuation.
- (2) Monetary vs. physical indicators.
- (3) Direct vs. indirect values.
- (4) Biodiversity vs. biological resources.

Alternative perspectives on valuing biodiversity

- (5) Value of levels vs. changes of biodiversity.
- (6) Local vs. global diversity.
- (7) Genetic vs. other life organization levels.
- (8) Holistic vs. reductionist approaches.
- (9) Expert vs. general public assessments.

It is clear that many different valuation perspectives can be distinguished based on the above nine considerations. This means that different opinions on biodiversity value may in fact be based on different perspectives.

This does not mean that one is right and the other is wrong.

Evidently, it is crucial to know the perspective being adopted.

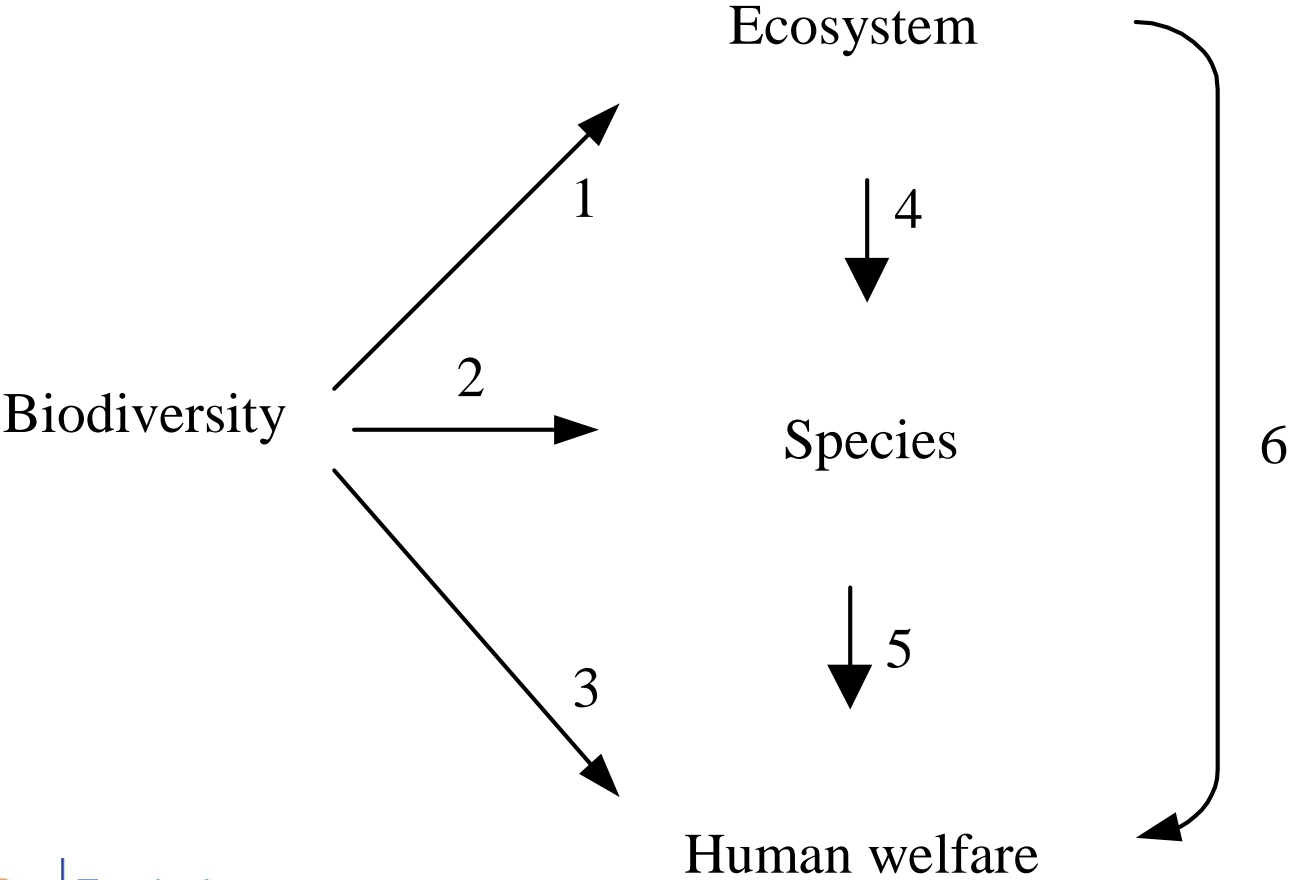
Economic valuation perspective

- 1) Instrumental valuation.
- 2) Monetary indicator.
- 3) Direct and indirect values.
- 4) Value of explicit biodiversity changes.

Economic valuation perspective

- 1) Instrumental valuation.
- 2) Monetary indicators.
- 3) Direct and indirect values.
- 4) Value of explicit biodiversity changes.
- 5) Local to global diversity.
- 6) Genetic and other life organization levels.
- 7) Reductionist approach.
- 8) General public assessments.

Classification of biodiversity economic values



Monetary valuation approaches

- **Market price valuation mechanisms.**
These include the value of contracts, as recently signed by the pharmaceutical industry and governmental agencies, and
the value of the financial revenues related to the tourism activities focused on the visits to natural areas of high outdoor recreational demand.

Monetary valuation approaches

- **Non-market valuation methods.**

These refer to special tools used by the economist so as to retrieve consumer's preferences for biodiversity benefits, including

Travel Cost (TC)

Hedonic Price (HP)

Averting behavior (AB)

Production Function (PF)

and

Contingent Valuation (CV)

Applicability

Biodiversity value category	Economic value interpretation	Biodiversity benefits	Degree of applicability of the economic valuation methods
2 => 5	Genetic and species diversity	Inputs to production processes (e.g. pharmaceutical and agriculture industries)	CV: + TC: - HP: + AB: + PF: + Contracts: +
1 => 4 => 5	Natural areas and landscape diversity	Provision of natural habitat (e.g. protection of wilderness areas and recreational areas)	CV: + TC: + HP: - AB: - PF: + Tourism revenues: +
1 => 6	Ecosystem functions and ecological services flows	Ecological values (e.g. flood control, nutrient removal, toxic retention and biodiversity maintenance)	CV: - TC: - HP: + AB: + PF: +
3	Nonuse of biodiversity	Existence or moral value (e.g. guarantee that a particular species is kept free from extinction)	CV: + TC: - HP: - AB: - PF: -

Review of valuation studies:

Life diversity level	Biodiversity value type	Value ranges	Method(s) selected
Genetic and species diversity (2=>5)	Bioprospecting (pharmaceutical industry, e.g. Glaxo)	From: \$ 175,000 To: \$ 3.2 million	Market contracts
	Single species (annual wtp per household)	From: \$5 To: \$126	Contingent valuation
	Multiple species (annual wtp per household)	From: \$18 To: \$194	Contingent valuation

Review of valuation studies:

Life diversity level	Biodiversity value type	Value ranges	Method(s) selected	
Ecosystems and natural habitat diversity (1=>4=>5) (3)	Terrestrial habitat	From: \$27 To: \$101	Contingent valuation	} (non-use) (Annual WTP per household, per case study)
	Coastal habitat	From: \$9 To: \$51	Contingent valuation	
	Wetland habitat	From: \$8 To: \$96	Contingent valuation	
	Natural areas habitat (recreation)	From: \$23/trip To: \$255 million/year	Travel cost Tourism revenue from ecotourism in Ecuador	

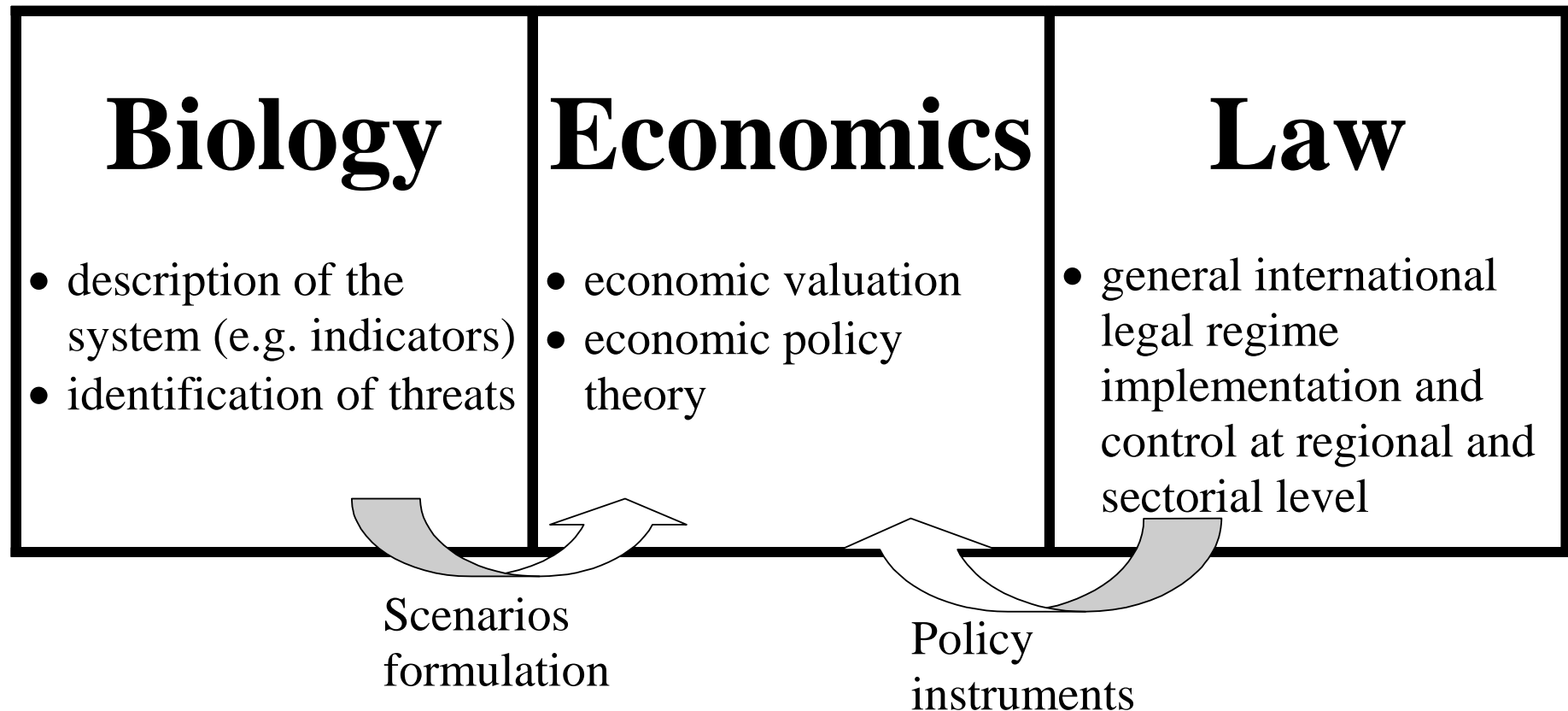
- Unequivocal support for the belief that biodiversity has a significant, positive social value.
- **Lack of an uniform**, clear perspective on biodiversity as a distinct concept from biological resources.
- Available results should be regarded as providing, at best, lower bounds to the unknown value of biodiversity changes.

- Ecologists abstract from the human economy and study only natural interdependences, while economists abstract from nature and consider only interdependences among commodities and man.”

H. E. Daly, *Journal of Political Economy* 1968

Challenge:
build an interface Economics and Natural sciences for biodiversity valuation -- targeted at biodiversity management

- Multidisciplinary: blend economics and ecology perspectives in a solid, joint, and transparent framework.



Critical analysis of ecosystem valuation? A personal scale on 1-5.

Wetlands	2
Fisheries	3-4
Agricultural Land	4
Cultural Values	2
Climate Change Impacts	1
Loss of Species	1-2
Introduction of Species	2-3
Non-timber Forest Products	3-4
Watershed Protection	2-3

Modeling the role of biodiversity in the ecosystem capacity of providing goods and services (EGS)

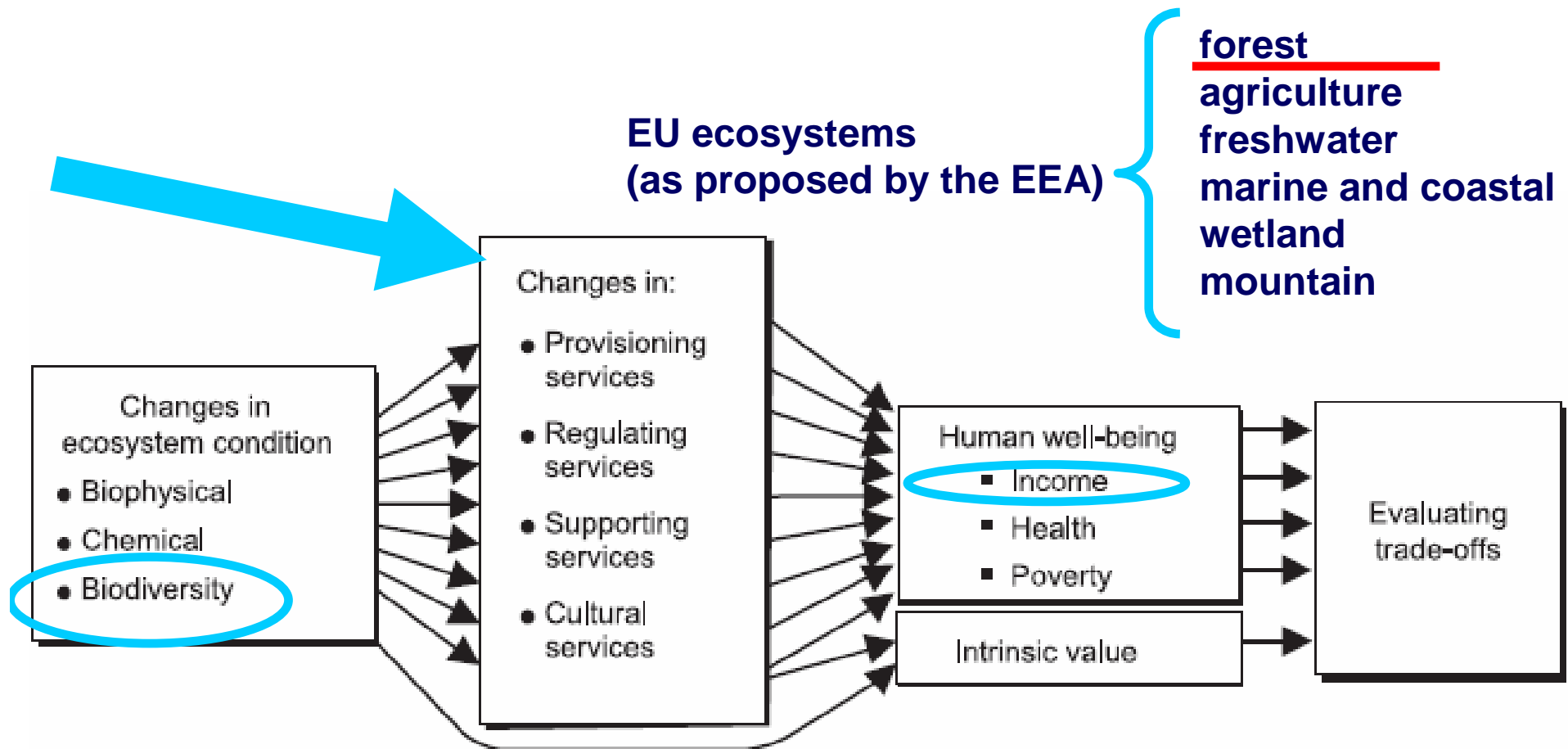
Provisioning	Food, fiber and fuel Genetic resources
	Biochemicals Fresh water
Cultural	Spiritual and religious values Knowledge system
	Education and inspiration Recreation and aesthetic values Sense of place

Source: MEA (2005), adapted.

Modeling the role of biodiversity in the ecosystem capacity of providing goods and services (EGS)

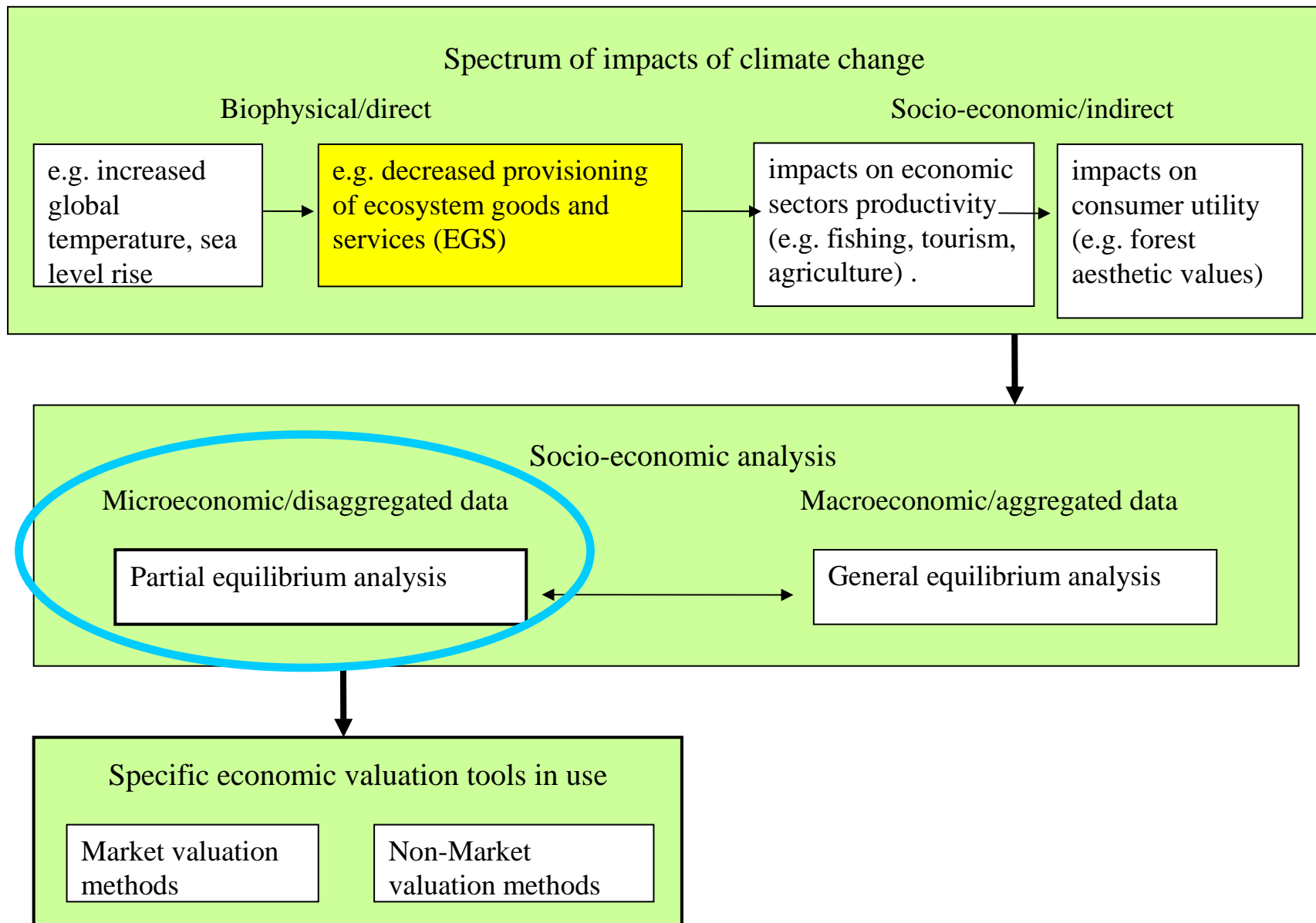
<p>Supporting</p>	<p>Primary production</p> <p>Provision of habitat</p> <p>Nutrient cycling</p> <p>Soil formation and retention</p> <p>Production of atmospheric oxygen</p> <p>Water cycling</p>
<p>Regulating</p>	<p>Invasion resistance</p> <p>Pollination</p> <p>Seed dispersal</p> <p>Climate regulation</p> <p>Pest regulation</p> <p>Disease regulation</p> <p>Natural hazard protection</p> <p>Erosion regulation</p> <p>Water purification</p>

Modeling the impact EGS on human wellbeing



Source: MEA (2005), adapted.

Link the physical world to the socio-economy



Statements Based on the Valuation of Biodiversity and Ecosystem Services that need qualifying

- The MEA is perhaps too optimistic about the contribution that economic valuation of biodiversity and ecosystem services can make to policy-making.
 - In several areas, the case still has to be made on the basis of physical judgments and a general precautionary approach.
 - The case for conservation is often faced with conflicts or trade-offs between poor users of the resource and conservationists.

- The MEA takes us along many of the right roads and, with time and effort, the economic assessment of biodiversity and ecosystem services will provide a more and more persuasive case for the protection of such systems and for their sustainable use.

Work in progress:

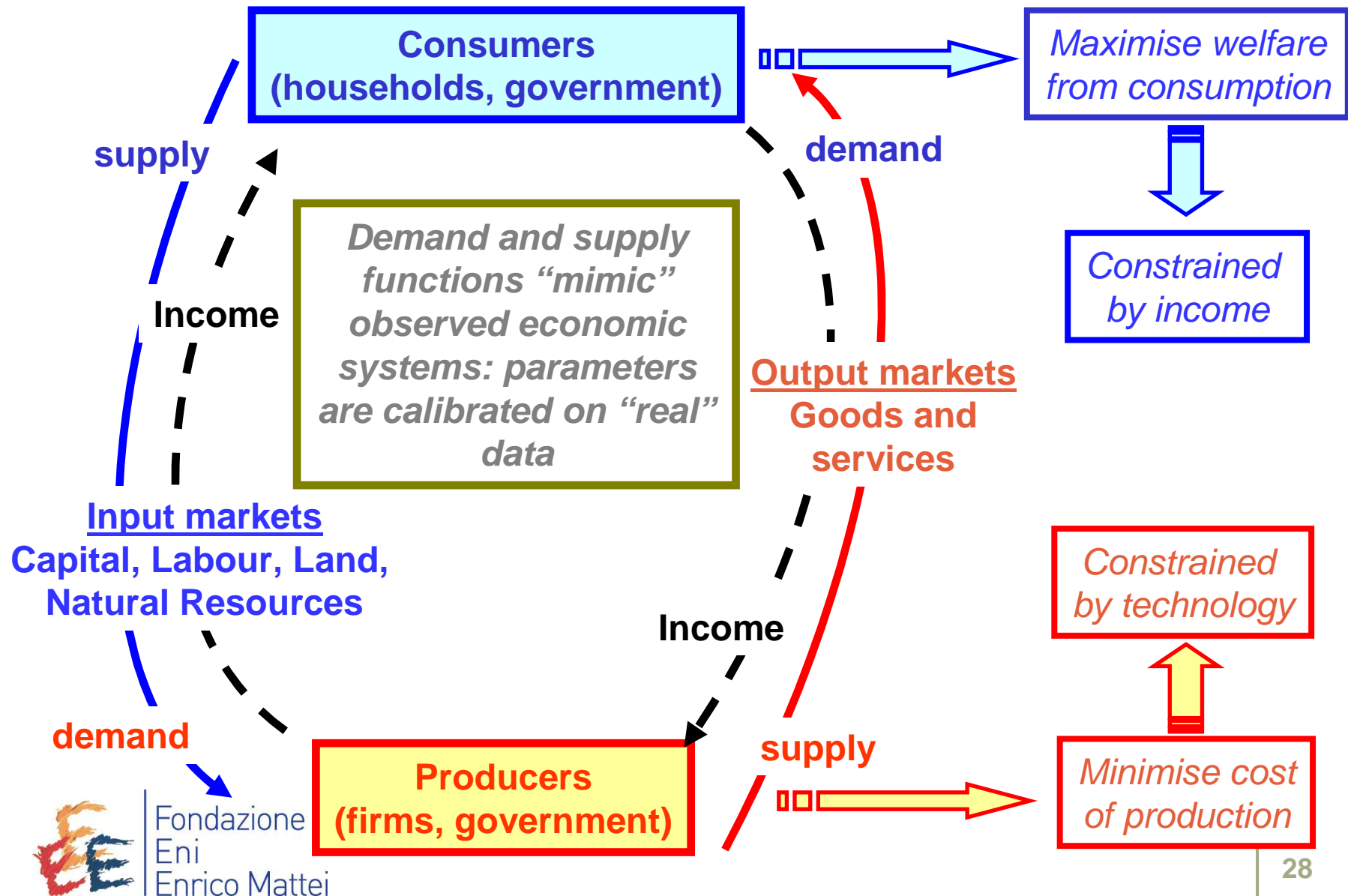
The use of a CGE models allows to:

→ **assess** and value the “environmental facts” impacts in terms of **GDP** changes, since the CGE analysis is anchored at a **macro economic perspective**, for the economies under consideration.

→ **consider** both direct **and indirect** (cost) effects – since economic systems “adapt” in response to any “shock” under consideration (substitution mechanisms)

→ **highlight** transmission channels within and between domestic and international “markets”, across all the economic sectors under consideration, since all the markets are “**linked**”.

The dynamics of CGE



pnunes@unive.it



**Campo S. Maria Formosa
30122 Venezia - Italy**

**tel +39 | 041 | 27 11 400
fax +39 | 041 | 27 11 461
web <http://www.feem.it>**