Economic Assessment of Ecosystem Contributions

Valuation of Ecosystem Benefits

Brussels, June 21st 2007

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What are ecosystems worth?

- Without them virtually no anthropogenic activity is possible – in that sense they are worth an almost infinite amount. But that is not very interesting.
- More interesting values of ecosystems relate to the benefits associated with improving them or with preventing their degradation. This is much more difficult.
- The literature has a number of useful valuations but they do need some qualifications.

What are ecosystems worth?

- Qualifications are offered in the Millennium Ecosystem Assessment:
  - "The temporal and spatial patterns make it extremely difficult to fully assess the costs and benefits of ecosystem changes" (Pg. 11)
- But the MEA and others working on valuation do not always recognize these limitations in the conclusions they draw from existing studies.

Definition of the total economic value of an environmental resource

TEV = Use values + Non-Use values

- **The measurement of the TEV refers to the systematic attempt to assess the combined values of an environmental asset or resource system**

Definition of the total economic value of an environmental asset

TOTAL ECONOMIC VALUE	USE VALUES	direct use value	recreation benefits e.g. sight-seeing, fishing, swimming
		indirect use value	ecosystem functional benefits e.g. watershed protection, timber production
		option value	safeguard of use benefits e.g. pharmaceuticals, future visits
	NONUSE VALUES	bequest value	legacy benefits e.g. habitat conservation for future generations
		existence value	existence/intrinsic benefits e.g. knowledge of continued protection of wildlife diversity

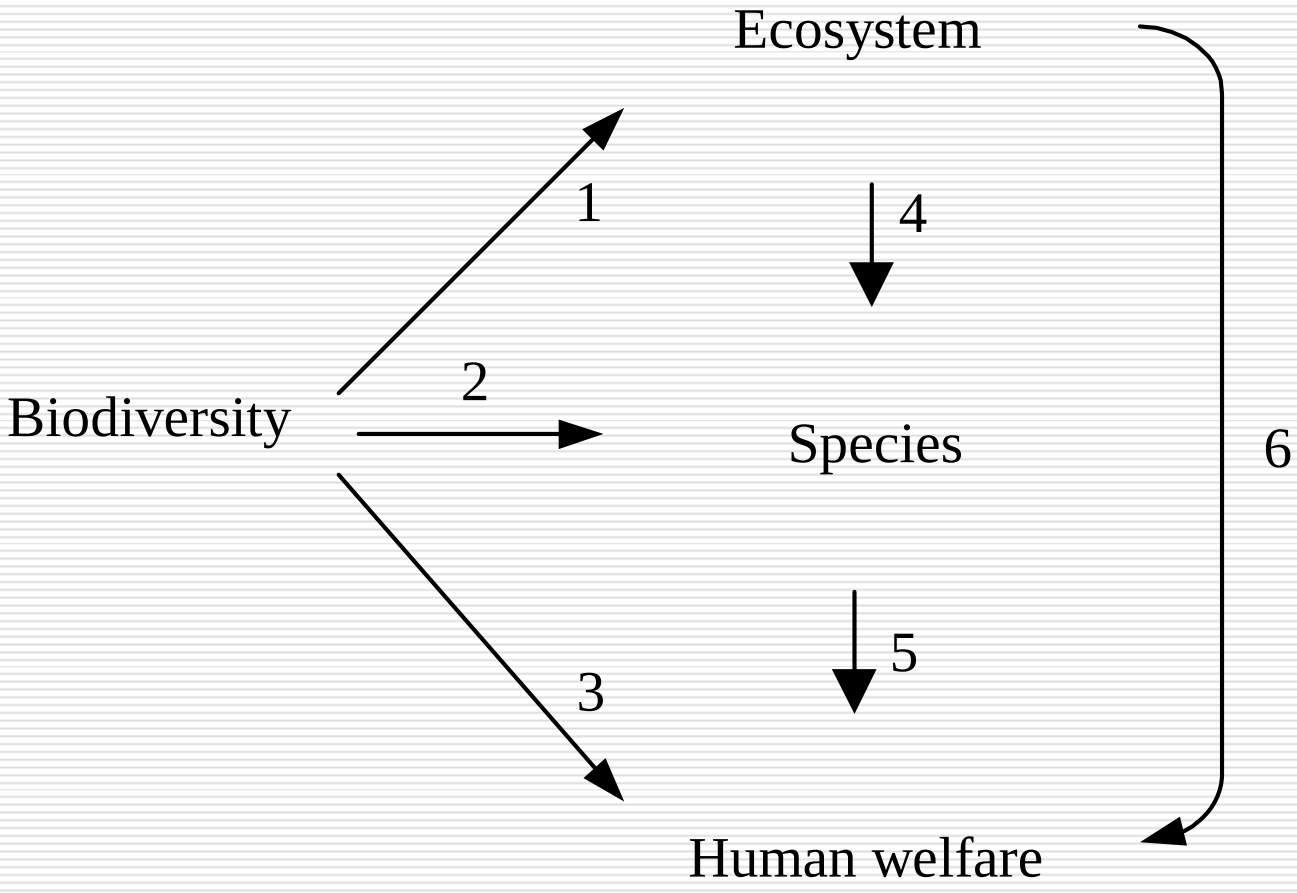
adapted from Pearce and Moran (1993)

Defining Non-use (or Passive use) values

- No discernible behavioral trail
- Arise without the need for any *in situ* use, experience or consumption (e.g. visit to a natural park)
- Attached to some desirable state of affairs

Therefore the possible loss of an environmental asset would result in a **welfare loss to the general public**, including individuals that never visited the natural park and may never do so.

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.

Non-market monetary valuation approaches

- 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)
  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:

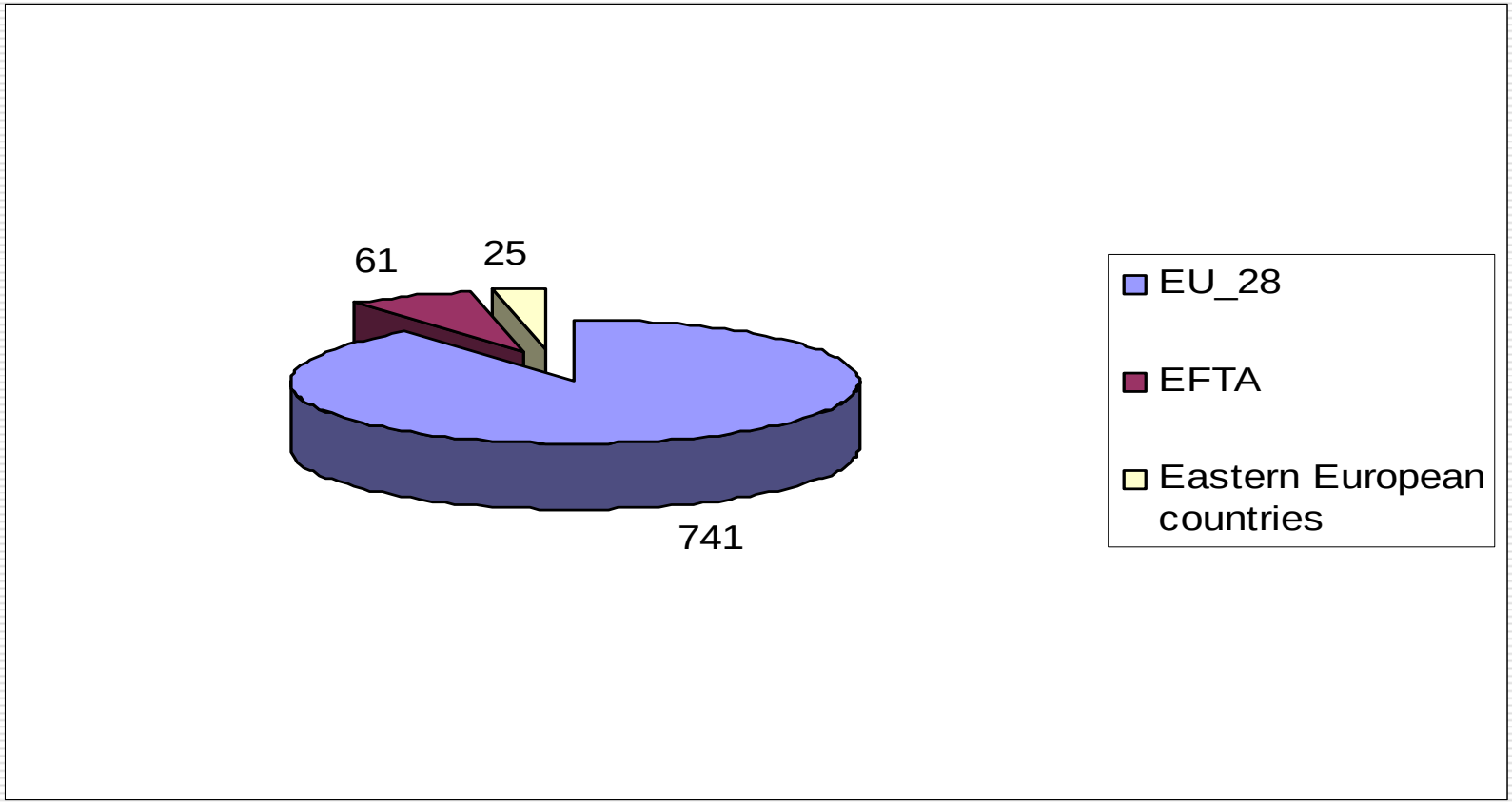
Life diversity level	Biodiversity value type	Value ranges	Method(s) selected
Ecosystems and natural habitat diversity (1=>4=>5) (3)	Terrestrial habitat	From: $27 To: $101	Contingent valuation
	Coastal habitat	From: $9 To: $51	Contingent valuation
	Wetland habitat	From: $8 To: $96	Contingent valuation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

(Annual WTP per household, per case study) (non-use)

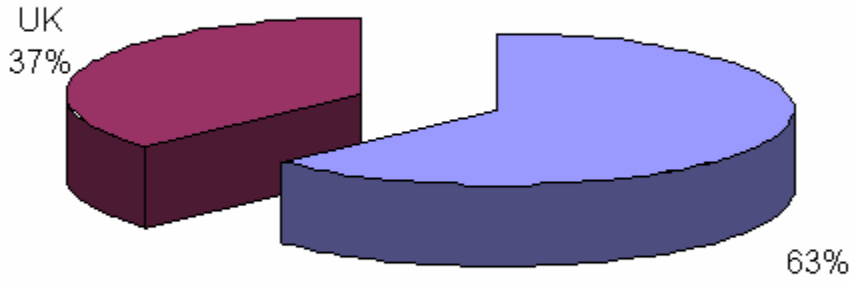
EVRI: Environmental Valuation Reference Inventory

- **Database of valuation studies accessible through internet www.evri.ca (today)**
- **Information w.r.t. European valuation:**
  - **827 value estimates (about 500 case studies)**
  - **Country (EU28, EFTA, Eastern European)**
  - **Authors, year, reference, method and asset**

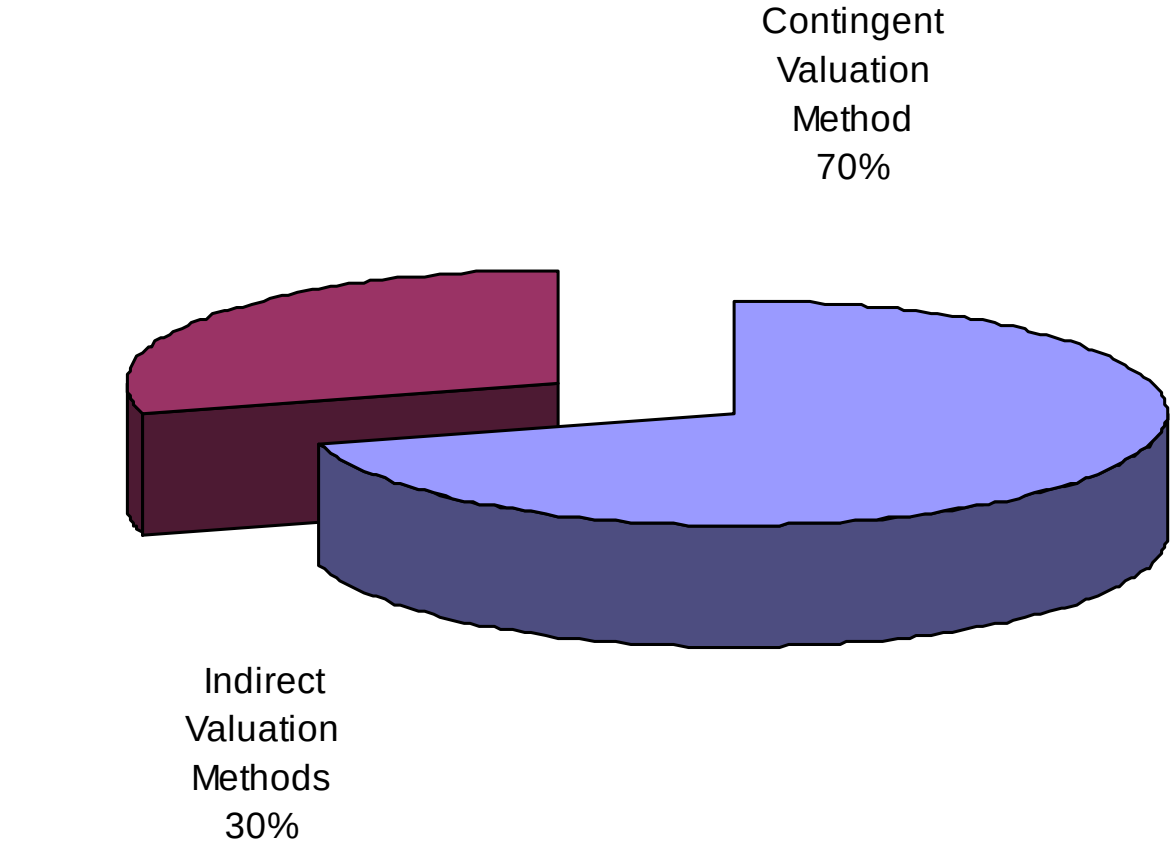
EVRI: Number of registered valuation studies



Distribution of the valuation studies



Methods used in valuation studies



Object of valuation

- **Water quality and forest recreation**
- **Wilderness areas and natural parks**
- **Forest characteristics and woodlands**
- **Wildlife and environmentally sensitive areas**
- **Moorland and watercourses**
- **Agricultural landscape and endangered species**
- **Marine recreation and marine invasive species**

Valuing Impacts of Air Pollution

- **Link is through the impact pathway approach:**
  - **Emissions->concentrations->impacts on ecosystems->valuation of those impacts**
- **Studies on valuation from the wider ecosystem literature can be used but:**
  - **The valuation of impacts is often not for marginal changes. So an assumption has to be made about how much the air pollution impact makes up of the total impact.**

Critical analysis of valuation

- 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.

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

Wetlands	3
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

Other Comments

- Economists are perhaps too optimistic about the contribution that economic valuation of 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.

Conclusions

- The present work on valuation is along the right road and, with time and effort, the economic assessment of ecosystem services will provide a more and more persuasive case for the protection of such systems and for their sustainable use.