

The Economics of Global Loss of Biological Diversity

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# The Transfer and Aggregation Challenges in Biodiversity Valuation

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- Existing databases for valuation studies
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# Benefit transfer (BT)

- Transfer economic value of public good from *study* site (primary valuation study) to *policy* site; *both* benefits and costs transfer (i.e. rather call it “value transfer”)
- Increased use of cost-benefit analysis, and lack time and money to do new primary study on policy site  
→ Use BT, but increased errors – acceptable?
- Three basic requirements for valid BT:
  - 1) Complete, searchable and accessible **database** of domestic and foreign valuation studies
  - 2) **Best practise criteria** for assessing quality of *primary valuation study*
  - 3) **Best practise criteria** for *benefit transfer*  
(*In order to minimize transfer error*)

## The Economics of Non-Market Goods and Resources

Ståle Navrud  
Richard Ready  
Editors

**Environmental Value Transfer: Issues and Methods**  
The Economics of Non-Market Goods and Resources, volume 9

The transfer of environmental values in time and space has increased rapidly with the widespread use of cost benefit analysis in project evaluation and regulatory assessments over the last three decades. The purpose of this volume is to take a snapshot of the research that is ongoing in the area of value transfer (benefit transfer). It includes papers by some of the most influential authors in the area, and covers the latest developments in the field. It will be useful for academics conducting research in this area and for practitioners in government agencies and ministries, as well as consulting firms.

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economic decision making. Only by addressing the complexity of the underlying issues raised by such a task can society hope to redirect global economies onto paths of sustainable development. To this end the series combines and contrasts perspectives from environmental, ecological and resource economics and contains a variety of volumes which will appeal to students, researchers and decision makers at a range of expertise levels. The series will initially address two themes, the first examining the ways in which economists assess the value of non-market goods, the second looking at approaches to the sustainable use and management of such goods. These will be supplemented with further texts examining the fundamental theoretical and applied problems raised by public good decision making.

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## The Economics of Non-Market Goods and Resources

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# Environmental Value Transfer: Issues and Methods



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# Existing databases

- **International**

- EVRI – Environmental Valuation Reference Inventory
- ENVALUE (Australia and International)
- RED - Review of Externality Data
- BeTa – Benefits Table
- NOAA’s databases on Marine and Coastal resources (Coastal recreation and Coral Reef Valuation etc.)

- **National**

- New Zealand NMDB
- ValueBase <sup>SWE</sup>
- UK Defra Environmental Valuation Source List
- USDA NRCS (Natural Resource Conservation Service)
  - US Recreational Value Database, Ecosystem Val.; Coastal Res.

# Biodiversity Valuation Studies and Data Bases

- The web-based database EVRI [www.evri.ca](http://www.evri.ca) is the most comprehensive one and continually updated and extended (Operated by Environment Canada )
- EVRI now contains a total of 2000 studies; including both primary valuation studies and meta analyses on biodiversity
- Identify more candidate studies on biodiversity to be entered into EVRI, and perform quality assessment of these candidate studies
- In Europe, only citizen of UK and France have free access to EVRI; Citizens of other countries must pay subscription fee
  - EVRI club: USA, Canada, Australia, UK, France; contribute to cover mainly operational costs of EVRI. Input of new studies depend mainly on valuation practitioners (but e.g. Nordic Council of Ministers paid us to include all Nordic valuation studies after 1992 in EVRI)
  - Is more detailed reporting av studies needed in EVRI for biodiversity valuation studies to be used in meta analysis and benefit transfer

# Quality assessment of primary valuation studies

- **Quality assessment** of candidate studies (Journal articles, Ph.D. Theses, "Grey literature (M.Sc.-theses, research reports), using

Söderquist, T and Å. Soutukorva (2006):

*An instrument for assessing the quality of environmental valuation studies.* Report, Swedish Environmental Protection Agency,

Stockholm <http://www.naturvardsverket.se/bokhandeln/pdf/620-1252-5.pdf>

# Benefit Transfer methods

- **Unit Value Transfer**
  - Simple (naïve) unit transfer
    - use value: Consumer surplus/activity day
    - non-use value: WTP/household/year
  - Unit transfer with income adjustments
  - International transfer: PPP-adjusted exchange rates
- **Function transfer**
  - Benefit function transfer (from one or a few similar studies)
  - Meta-analysis (from many studies with different scope in terms of size of the environmental change (and different baselines and availability of substitute sites), habitats vs. Single species, ecosystem functions, recreational Use vs. Non-use )

# Unit value transfer with income adjustment

Adjusted benefit estimate  $B_p'$  at the policy site:

$$B_p' = B_s (Y_p / Y_s)^\beta$$

$B_s$  primary benefit estimate (e.g. WTP) from study site,  
 $Y_s, Y_p$  income levels at the study and policy site, resp.  
 $\beta$  income elasticity of WTP for env. Good

Jacobsen & Hanley (2007) found that GDP per capita (i.e. wealth in society) was a better predictor of WTP than respondent's income (i.e. Individual wealth) in a meta analysis of 46 CV studies of WTP for nature conservation

# Benefit function (BF) and Meta analysis (MA)

**BF:**  $WTP_{ij} = b_0 + b_1 G_j + b_2 H_{ij} + e$

$WTP_{ij}$  = willingness-to-pay of household i at site j,

$G_j$  = set of characteristics of environmental good at site j,

$H_{ij}$  = set of characteristics of household i at site j

**MA:**  $WTP_s = b_0 + b_1 G_j + b_2 H_{ij} + b_2 C_s + e$

$WTP_{ij}$  = mean willingness-to-pay/household of study s

$C_s$  = set of methodological characteristics of study s

n = number of studies (but also several estimates from each study)

# Meta analyses (MA) of Biological Diversity

- **Rereational use values of ecosystems (TC and CV)**
  - Rosenberger and Loomis (2003), US studies
  - Shrestha and Loomis (2003), US studies
  - Zandersen and Tol (2005) (9 European countries)
- **Non-use values (mainly CV)**
  - Loomis & White (1996) Rare and endangered species
    - Brander et al (2006) Wetlands
  - Brander et al (2007) Coral reefs
  - Nijkamp et al (2007) Biodiversity and Habitat Services
  - Jacobsen and Hanley (2007): Biodiversity; 46 CV studies worldwide
  - Lindhjem (2006); and Lindhjem and Navrud (2007)
    - MA and BT based on MA of 30 studies in Norway, Sweden and Finland; non-use values of coniferous forests
  - Tuan and Lindhjem 2008: Biodiversity in Asia and Oceania

# **Policy use and examples of applications to biodiversity in ongoing EU-projects**

- **Cost-Benefit Analysis (CBA)**  
e.g. AQUAMONEY, NEEDS, CASES, EXIOPOL
- **Environmental Costing / Regulation**  
e.g. NEEDS, (Externe Series Project, MethodEx)
- **Green National Accounting**  
e.g. NEEDS, (Greensense)
- **Natural Resource Damage Assessment – NRDA**  
with regards to **Environmental Liability Directive**  
e.g. REMEDE

# Transfer Error (TE)

- Percent difference between the transferred ( $WTP_T$ ) and policy site primary estimate ( $WTP_P$ )

$$TE = \frac{|WTP_T - WTP_P|}{WTP_P}$$

# Acceptable Transfer errors

Need higher level of accuracy in NRDA than for CBA, since NRDA is directly used to determine the compensation to be paid by identified polluter

Acceptable transfer error level for CBA depend on decision situation →

If Costs and Benefits are close (i.e. NPV close to zero); higher accuracy needed in order to decide whether Benefits exceeds Costs

# Validity tests - transfer errors

- Average transfer error for spatial value transfers both *within and across* countries tends to be in the range of 25% - 40% (Navrud, 2004, Ready and Navrud 2006 – Special issue of *Ecological Economics* on BT)
- Individual transfers could have errors as high as 100 % or more.
- *Function transfer* does not seem to perform better than *unit value* transfer. *Meta analyses* could be potentially helpful, but should be limited in scope (i.e. number of studies included) in terms of similar type environmental goods and similar type, state-of-the-art methodology

# Criteria for BT

- i) Scientific soundness* (data collection procedures, empirical methodology, consistency with scientific or economic theory, statistical techniques);
- ii) Relevance* (change in environmental quality, baseline environmental quality, affected services and commodities, site characteristics of affected commodity, duration and timing of effects, exposure path and nature of health risks, Socioeconomics characteristics of the affected population, property rights.);
- iii) Richness in detail* (definition of variables and means, treatment of substitutes, cost of time (in Travel cost studies), participation rates (“Extent of market” i.e. number of affected people)

*Source: Desvousges et al (1998)*

# Benefit Transfer Protocol\*

1) *Identify the affected population at the policy site*  
*(i) Describe baseline, magnitude and direction of change in environmental quality*  
*(ii) Describe baseline, magnitude and direction of change in environmental quality*

(ii) Describe baseline, magnitude and direction of change in environmental quality

2) *Identify the affected population at the policy site*

3) *Conduct a literature review to identify relevant primary studies (from EVRI database)*

\* Navrud (2006): Benefit Transfer Guidelines. Report to Daish Environmental Protection Agency.

# BT protocol II

4) *Assessing the quality of study site values for transfer*

(i) Scientific soundness; the transfer estimates are only as good as the methodology and assumptions employed in the original studies

(ii) Relevance; primary studies should be similar and applicable to the “new” context

(iii) Richness in detail; primary studies should provide a detailed dataset and accompanying information

# BT protocol III

- 5) *Select and summarize the data available from the study site(s)*
- 6) *Transfer value estimate from study site(s) to policy site*
  - (i) Determine the transfer unit
  - (ii) Determine the transfer method for spatial transfer
  - (iii) Determine the transfer method for temporal transfer
- 7) *Calculating total benefits or costs*
- 8) *Assessment of uncertainty and acceptable transfer errors*

# Cumulative effects

Lindhjem (2006) found in a MA of 30 studies in Norway, Sweden and Finland of mainly non-use values of coniferous forests that WTP does not vary with size of forest area  
→ transfers and aggregation exercises using value pr. ha will be biased

# Questions for discussion

## General:

What are the difficulties/ challenges in benefit transfer of biodiversity values, from an ecological and economic point of view?

## Specific:

- requirements for benefit transfer ; especially access to EVRI database and coverage of EVRI for biodiversity studies
- level of valuation/transfer: species, habitats, ecosystem services and functions
- use vs. non-use values
- reliability of use and non-use values (Hypothetical vs. Actual Willingness-to-pay, e.g. Veisten & Navrud 2006))
- site specific values ? Different baseline conditions?
- transfer methods; unit transfer, function transfer, meta analysis
- BT protocol for biodiversity
- double counting issues (e.g. Different methods estimate partly overlapping value components)
- how to deal with uncertainty and risk
- acceptable transfer errors
- aggregation issues (aggregating over area, species, habitats, affected households etc.)
- cumulative effects
- new primary valuation studies using state-of-the art methodology → What methods?
- new primary studies should be constructed and reported with BT in mind
- Protocol for new primary valuation studies for biodiversity

# Report to plenary

- Summary of discussion

Answer the following questions for transfer and aggregation:

- What do we know now ?
- Short term (2 years) priorities in review and research ?
- Major gaps and medium term research challenge ?