The Role of Economics in the Natural Resource Damage Assessment and Restoration (NRDAR) Process

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Summary

- Current focus of natural resource and environmental economists
- Relationship between ecosystem services, human uses and economic values
- Overview of economic tools
- Overview of habitat equivalency analysis
- Questions
Economists’ View of the World

Economics is about how to manage scarce resources, including time, money, services, and natural resources.

Traditional Stereotypes
- As a social science, economics is anthropocentric.
- Economics is only about money (or profit, or things).
- Economics is unethical.

Positive Economics
- As a social science, economics concerns itself with interconnectedness between humans and the natural environment.
- Helps think about tradeoffs among scarce resources.
- Values for natural resources increase with information.
- Can coordinate well with normative positions from science, law & policy.

Factoid: Plain-speaking President Harry Truman said he longed for one-armed economists because when asked for advice, their response usually was along the line of "on the one hand, Mr. President, but on the other hand..."
Relationship Between Ecosystem Services, Uses and Values

While there may not be a universally accepted definition of ecosystem services across disciplines, ecologists’ general classification aligns with the economic concepts of use and non-use values:

- **Provisioning services**, e.g., goods produced like food, timber, fuel, water (i.e., commodities)
- **Regulating services**, e.g., flood and disease control
- **Cultural services**, e.g., spiritual, recreational, cultural benefits
- **Supporting services**, e.g., nutrient cycling, soil formation
- **Direct use** involves human physical involvement with natural resources (e.g., logging, fishing, cultural, and tourism)
- **Indirect use** values resources that support humans or what humans directly use, e.g., climate regulation, flood control, animal/fish, pollination, waste assimilation
- **Non-use** does not involve physical interaction (i.e., bequest and option values)
Why does economics fit into the damage assessment process?

- Pollution events
  - Changes in good and services provided
  - Changes in human well-being*
  - Changes in economic value

- Natural resource injuries
  - Assessment
  - Claim for damages

*Interconnectedness between humans and environment
Where does economics fit into the damage assessment process?

- NRDAR claim elements include:
  - Costs of emergency restoration
  - Trustees’ assessment costs
  - Damages

- Trustees have two options for damages claim development:
  1. Measure the costs of restoration, rehabilitation, replacement, and/or acquisition of equivalent resources (intended to re-establish baseline conditions); and/or
  2. Measure the compensable value, i.e., the amount of money or in-kind projects required to compensate the public and/or Tribes for the interim loss in services over time.
What kind of economic tools are used in the damage assessment process?

Market Methods

- **Market Price Method** (e.g., cost of dredging contaminated sediments)
- **Productivity Method** (e.g., relationship between clean water and agriculture)

Revealed Preference

- **Hedonic Pricing Method** (e.g., local housing values reflect environmental quality conditions)
- **Travel Cost Method** (e.g., value of fishing area reflected in spending to get there). Random utility model (RUM) has become the preferred way to value quality at recreation sites. People trade off travel costs and quality when making trip decisions.
Economic Tools (cont’d)

Stated Preference

- **Contingent Valuation** (e.g., survey in Montrose)

- **Conjoint Analysis or Contingent Choice** (e.g., TVE in Fox River)

Benefits Transfer (don’t be fooled, reliable transfers can be complex)
Economists extended theory from valuation studies to develop restoration-based tools, including:

- **Habitat Equivalency Analysis (HEA)**—balances service gains from restoration actions against service losses on habitat, e.g., 10 acres of salt marsh are burned after a diesel spill.
- **Resource Equivalency Analysis (REA)**—like HEA, but for a particular resource rather than a habitat e.g., 60 migratory birds die after landing in mine waste ponds.

Commonly used in NRDAR cases, hydro licensing, pipeline permitting, endangered species, non-commercial timber losses, etc.

- Method supported in US court decisions
- Been gaining wide acceptance by industry
How are economic tools selected in the damage assessment process?

The criteria for selection of economic methods include:

- Feasible and reliable for the incident and type of natural resource injury, e.g.,
  - Addresses the nature, degree, spatial and temporal extent of injury
  - Peer-reviewed
  - General acceptance by experts in the field
  - Subject to standards governing application
  - Inputs and assumptions supported by a clear rationale

- Reasonable cost (less than expected damages)
- Avoid double counting
- Cost-effective (minimum cost for a given restoration goal)
HEA Inputs from Scientists

1. Identify baseline “but for” the release. % services are related to a physical unit of habitat like acres/sq km, stream/river-miles, kg of biomass (including trophic transfer).

2. Identify % in services relative to baseline (debit), e.g., FQI, woody cover index, % loss related to contaminant levels.
3. Select appropriate restoration projects and identify % in services.
4. “Scale” selected projects so the replacement is in physical units (credit owed). Goal is to have:

Debit = Credit
Discounting

- Discount rate is applied to services lost and restored.

- CERCLA/OPA are compensatory laws, and discounting puts compensatory restoration in present value.

- Measures how much we prefer current use or condition of resources vs. the future; our “impatience”
  
  - 3% discounting means: Prefer 1 acre of habitat today vs. 18 acres in 25 years
  - 5% discounting means: Prefer 1 acre of habitat today vs. approximately 15 acres in 25 years

- 3% discount rate is commonly used for valuing lost natural resource services (Freeman, 1993; Lind, 1982; NOAA, 1999; and court decisions on NRDAR cases)
When to Use HEA

- **Types** of lost & replacement services are similar.

- **Quality** of lost & replacement functions/services are similar.

- Know enough about quality, quantity, timing of lost & replacement services to quantify.
Advantages of Using HEA

- When applied correctly, HEA/REA can quickly and reliably use the metric of ecosystem services to measure **indirect use** (not human use) values and identify appropriate quantity of restoration.

- Resource-to-resource approach avoids costly valuation studies; lost and replacement services are measured with the same metric.

- Restoration can be scaled without estimating $$ values, but could finish the analysis by calculating:
  1. **Restoration cost** (e.g., cost to restore habitat)
  2. **Substitute cost** (e.g., cost of acquiring new habitat)
  3. **Replacement cost** (e.g., cost of purchasing tree seedlings)

- Greater potential for cost-effective settlement of claims.
Disadvantages of Using HEA

- Can be difficult to identify which services lost and to be replaced.

- HEA is sensitive to the input decisions, particularly:
  - Service loss level (baseline and injury)
  - Years to recovery (recovery curve)
  - Level of recovery (residual injury)

- May incorrectly assume that the public has similar values for what was lost and restored.

- Does not help to decide whether a resource should be restored compared to the cost of restoration actions.
Questions?

Broad overview of ecosystem valuation:
http://www.ecosystemvaluation.org