Valuing benefits derived from wetland ecosystems

Introduction to Ramsar Guidelines

Ritesh Kumar, STRP Member

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Wetland loss and degradation – an economic perspective

- **Ecosystem services not priced and reflected in decision making** – (Market failure)
  
  Agriculture produce from converted lake does not reflect the values lost due to flood protection, fisheries, biodiversity etc.

- **Sectoral policies may provide incentives to activities causing ecosystem loss** (Perverse incentives)
  
  Grow more food campaigns leading to conversion of floodplains

- **People who degrade are not the same whose livelihoods are affected leading to continued degradation** (Unequal sharing of costs and benefits)
  
  Deforestation in upstream catchments creating flooding downstream as wetlands loose water holding capacity
We need to make choices!
Wetland loss and degradation – an economic perspective

- Quantifying and valuation of wetland ecosystem services
- Making them comparable with the returns derived from alternative uses
Economic Valuation

Process of expressing value of ecosystem services in concrete monetary terms
When does economic valuation help?

**Determining the value of ecosystem services** – What is the benefit stream that ecosystem services contribute? (Total Economic Valuation)

**Impact assessment**
What would be the overall economic impact of a developmental activity, say upstream hydrological regulation on wetland ecosystem services? (Environmental Impact Assessment)

**Understanding tradeoffs**
What do alternate uses of ecosystems entail? Shrimp culture versus maintaining intact mangroves? (Multi-functional use)
Classifying wetland values

TOTAL ECONOMIC VALUE

USE VALUE
- DIRECT USE VALUE
  Resources used directly
  - Provisioning services (e.g., water, fish)
  - Cultural and amenity services (e.g., recreation)
- INDIRECT USE VALUE
  Resources used indirectly
  - Regulating services (e.g., flood prevention, water purification)

NON-USE VALUE
- OPTION VALUE
  Our future possible use
  - ALL services (including Supporting services)
- BEQUEST VALUE
  Future generations' possible use
  - ALL services (including Supporting services)
- EXISTENCE VALUE
  Right of existence
  - Supporting services (e.g., panda, blue whales, wild eagle)
Framework for Integrated Assessment and Valuation of Wetland Services

Policy Analysis
- Defining purpose of valuation and institutional context
  - Multi Functional Use
  - Total Economic Valuation
  - Environmental Impact Assessment

Stakeholder Analysis
- Defining who should do the valuation

Function Analysis
- Identification of indicators for wetland goods and services

Valuation
- Quantification of goods and services

Trade Off Analysis

Policy Measures
Management Measures

Communication and Dissemination

- Why undertake valuation?
- Valuation for whom?
- What is to be valued?
- What is the value?
- Communicate?
Step 1: Policy Analysis

Defining the purpose of valuation

- Who requires the value?
- Which stakeholders influence the value?
- What is the objective of valuation?
- What is the valuation question?
- Ensures reflection of policy goals in valuation process
Step 2: Stakeholder analysis

Stakeholders: Person, organization or group with interest in wetlands

- Varying degree of influence on wetland management
- Likely to be impacted by wetland management

- Who would be affected by a decision?
- What are the conflicts between stakeholders?
### Step 2: Stakeholder analysis

#### Degree of influence

<table>
<thead>
<tr>
<th>Degree of importance</th>
<th>Degree of influence</th>
<th>Organized recreation industry</th>
<th>Traditional communities dependant on wetland resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>Significant loss / gains due to decisions and high power to influence</td>
<td>Significant loss / gains due to decisions but low power to influence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Need to represent interests + maintain strategic relationships Organized recreation industry</td>
<td>Need to represent interests Traditional communities dependant on wetland resources</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>High power to influence but not directly affected</td>
<td>No power to influence and not directly affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High source of risk Governmental implementing agencies</td>
<td>External world</td>
</tr>
</tbody>
</table>
Step 3: Function analysis

Wetland ecosystem services are dependent on functional properties of ecosystems, for example:
- Biotic and abiotic interactions
- Nutrient cycles
- Food-chain dynamics

- Identification of what services are important for valuation process
- Quantification of capacities of wetlands to deliver services on sustainable basis
### Step 3: Function analysis

<table>
<thead>
<tr>
<th>Ecosystem Service</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Ecosystem function</strong></td>
</tr>
<tr>
<td>Provision of freshwater</td>
<td>Precipitation, runoff, inflows, Biotic and abiotic processes influencing water quality</td>
</tr>
<tr>
<td>Natural hazard mitigation</td>
<td>Role of ecosystems in dampening extreme events</td>
</tr>
</tbody>
</table>
Step 4: Valuation

- *Revealed preference*: Observing real market behavior
- *Costs based approaches*: Focus on costs related to ecosystem services (damage/ replacement / maintenance expenditure)
- *Stated preference*: Observing hypothetical market behavior
- *Benefit transfer*: Values imputed from an existing assessment
Step 4: Valuation

Revealed Preference Approaches
- Market Prices
  - Market Prices
- Production function approaches
  - Effect on production
- Surrogate market approaches
  - Travel cost
    - Hedonic Pricing

Cost based approaches
- Replacement costs
- Mitigative / Avertive Expenditure
  - Damage cost avoided

Stated preference approaches
- Contingent valuation
- Conjoint analysis

Benefit transfer approaches
- Benefit transfer
- Choice experiments
Step 4: Valuation

- Production function approach: environment as an input to production of tangible outcome

**Eg. Hydropower generation in Loktak Lake, Manipur**

\[
\ln(Y) = 0.866 \ln(W) + 0.110 \ln(M) + 0.178 \ln(C)
\]

- \(Y\) = hydropower production (MW)
- \(W\) = water usage (Mm3)
- \(M\) = costs of manpower (Rs.)
- \(C\) = operational costs (Rs.)

Hydropower accounts for 86% of value = Rs. 227 m per annum
Expressing visitation rate as a function of trip duration, trip cost per person, distance travelled, journey purpose, income, age

<table>
<thead>
<tr>
<th></th>
<th>Av WTP</th>
<th>Arrivals</th>
<th>Total Surplus (Rs. Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>US$</td>
<td>5,806</td>
<td>378,370</td>
</tr>
<tr>
<td>Foreign</td>
<td>2,868.56</td>
<td>120,479</td>
<td>1,153</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
Step 4: Valuation

- **Hedonic approaches**: Estimating values based on ecosystems as a determinant of land values / wages

Valuing urban wetlands in Perth, Australia

\[
\ln(ADJSALE_i) = \beta_0 + \sum \beta_j S_{ji} + \sum \beta_k N_{ki} + \sum \beta_l W_{li} + \sum \beta_m SUB_{mi} + \epsilon_i
\]

- **ADJSALE** = property value
- **S** = Structural attributes
- **N** = Neighborhood attributes
- **W** = Wetland attributes
- **Sub** = Suburban attributes

Presence of wetland within 1.5 km of property increases house prices by AU$ 6976 (Tapsuwan et al, 2009)
Step 4: Valuation

- Damage costs avoided: Estimating damages avoided by ecosystems

Hurricane Protection Function, Bhitarkanika Mangroves, Orissa, India

Average opportunity cost of saving a life by retaining mangroves was 11.7 million rupees per life saved. (Das et al, PNAS, 2009)
Step 4: Valuation

- Contingent valuation: Estimating willingness to pay in hypothetical markets
  Biodiversity values, Chilika Lake, Orissa, India

Estimating probability of paying a certain amount to a reserve fund for Chilika conservation

Probability of paying decreases with increasing WTP

Total non-use benefits estimated to be Rs. 858.78 millions (21% of overall benefits)
Step 4: Valuation

- Benefit transfer: Using existing assessments to estimate values

**TEV of wetland ecosystem services (US$/ha/year)**

**TEV of wetlands:**
200 b US$ / annum

Results based on benefit transfer from > 200 valuation studies

![Graph showing TEV of wetland ecosystem services](image)
Step 5: Linking valuation to decision making

a) Cost benefit analysis
b) Cost–effectiveness analysis
c) Risk effectiveness analysis
d) Multi–criteria analysis
Cost Benefit Analysis: Mangroves versus Shrimp Culture

<table>
<thead>
<tr>
<th>Net Present Value over 5 years and 10% discount rate (at 1996 US$)</th>
<th>Commercial profit from shrimp farming</th>
<th>Commercial profit from mangrove forests</th>
<th>Economic returns from shrimp farming</th>
<th>Economic returns from mangroves including fish nursery</th>
<th>Economic returns from shrimp farming including restoration costs</th>
<th>Economic returns from mangroves including storm protection function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series1</td>
<td>9632</td>
<td>584</td>
<td>9632</td>
<td>1571</td>
<td>-8098</td>
<td>12392</td>
</tr>
</tbody>
</table>
Understanding benefit distribution to stakeholders

(Chilika Lake, Orissa, India)

Livelihood objective: profits
Substitution opportunities: several, can exploit one and go for another

Livelihood objective: sustenance
Substitution opportunities: limited

Annual household income (Rs.)
Landing (MT)
Assessing costs and benefits of restoration efforts
Questions:

a) What is the role of economic valuation in managing your wetlands?

b) How can we increase the utility of these guidance?
   1. Tools...
   2. Methods...
   3. Case studies...
   4. Collaborative projects...
Real life decision making is complex

- Real-life decision making uses several forms of valuations, not merely economic valuation
  - Social valuations
  - Institutional relationships
  - Moral and ethical valuations

- Economic valuation is just one of the decision making tools, and therefore at the best partial
Good valuations need to be based on systems understanding

- Ecosystems are complex, and so is the delivery of ecosystem services

- Relationships are not definitive, nested at multiple scales and non-linear

- Valuation should ideally be integrated with rigorous and credible assessment processes
Economic valuation is Utilitarian thinking

- Economic valuation is a largely anthropocentric way of looking at things
- Certain things are beyond utalitarian framework
  - *Culture*
  - *Religious systems*
- Extending economic valuation beyond a certain point raises ethical questions
- For certain things, valuation is **not needed**
Economic valuation is not totally definitive

- Values need to be interpreted as a range, *valuation serves to narrow the range*

- Ascribed to perceptions and preferences of people

- Often not universally valid and transferable

The range of the value of coral reefs for tourism

![Graph showing the range of coral reef values for tourism](image-url)