Environmental Valuation for Economic Development

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Why Value Environmental Changes?

• Environmental change often a result of private productive actions that result in spatial and temporal ‘externalities’

• Difficulty in accounting for extent of damage because of the public good nature of environmental goods

• No markets or prices to signal scarcity

• Can we put a price on environmental losses and gains?
Should we value the Environment?

- Economists take an anthropocentric approach – how do environmental changes matter to us humans?
- Limited by lack of knowledge, uncertainty, aggregation and ethical considerations…
- Choices inevitably based on economic values -- useful to obtain monetary estimates for public decision-making to clarify trade-offs
What are different components of value?

Total Economic Value

Use Values
- Direct Use
- Indirect Use

Non-Use Values
- Bequest
- Option/Existence
How do we value environmental changes?

**Revealed Preferences**
- What do people’s actions suggest about value?
- Travel cost and hedonic approaches

**Stated Preferences**
- How can we get people to reveal their willingness to pay or accept by asking them?
- Contingent valuation, choice modeling.....
Where is the Policy-Valuation Interface?

- Greening National Accounts
- Allocating budgets
- Making Investment decisions
- Understanding the scale and distribution of externalities
- Evaluating Instruments or Policies
- Enabling trades
- Financing public goods
### Accounting for Forest Wealth in India (Gundimeda et al. 2005, 2006)

<table>
<thead>
<tr>
<th>Price of timber and fuelwood</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting price of NTFPs (Rs/Ha)</td>
<td>7,631</td>
</tr>
<tr>
<td>Accounting price of carbon ($/ton)</td>
<td>20</td>
</tr>
<tr>
<td>Accounting price of recreation (Rs/Ha)</td>
<td>65,193</td>
</tr>
<tr>
<td>Accounting price of genetic material (Rs/ha)</td>
<td>22,646</td>
</tr>
<tr>
<td>Total loss in forest wealth (million Rs)</td>
<td>-325,342</td>
</tr>
<tr>
<td>(USD 7 Bill)</td>
<td></td>
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</tbody>
</table>

#### Graph:
- **Y-axis**: Value range from 0 to 6,000,000
- **X-axis**:
  - Open Forest
  - Total Forest area
  - Forest Volume
  - Carbon stock
- **Legend**:
  - All India 2001
  - All India 2003
Investment Decisions

• Cost Benefit Analyses of Investment Projects
  – Understanding Impacts of dams and roads, eg. on biodiversity
  – **Should we invest in natural barriers such as mangroves?**
Are Mangroves a good investment in cyclonic areas? (Das 2007, 2011)

• As we encounter climate change should we invest in natural barriers?
• 10,000 killed in Orissa (1999)
• Could more mangroves have provided protection against storm surge?
Study Area – Kendrapapada district of Orissa (Das 2007)
Historical Mangrove Losses
(Das 2007, 2011)
Annual Storm Protection Value (Kendrapada, Orissa)

- **Death Reduction**
  - 54% with current mangroves
  - 92% with 1950 mangroves

- **Annual Storm Protection Values**
  - USD 694 / Ha/ Year
  - Death reduction + Property Loss + Livestock Losses

- **Annual Rental Value of Coastal Land**
  - USD 350 - 450 /Ha/ Year
The Value of Statistical Life

• What are we willing to pay to reduce the risk of death by a small amount?
• VSL is WTP to save 1 statistical life or to reduce the entire populations risk of death by a small amount

Economists do not try to measure the value of life, they measure people’s interest in reducing risks to life
<table>
<thead>
<tr>
<th>Study</th>
<th>VSL (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madeshwaran (2004), India</td>
<td>305,000 - 318,000</td>
</tr>
<tr>
<td>Rafiq (2011), Pakistan</td>
<td>321,813 - 775,193</td>
</tr>
<tr>
<td>World Bank (2006), Benefit Transfer, Pakistan</td>
<td>Approx 45,000</td>
</tr>
</tbody>
</table>
Understanding the costs of Externalities
Understanding Agrarian Externalities

- Shrimp farming a major industry in multiple South Asian Countries
- In South India
  - shrimp cultivation allowed beyond 500 mts of High Tide Line in *uncultivable* lands.
  - shrimp culture practiced in paddy lands along the tertiary canals.
- Agro-ecosystems affected by land salinity
Soil salinity and Paddy Productivity (Umamaheshwari 2011)

• Do shrimp farms impose costs on agricultural land?
• What is the marginal impact on paddy yields from salinization?
  – Two villages in varying distance to shrimp farmers
  – Historical and current soil salinity
  – Crop data from 257 plots
Estimating the value of Shrimp externalities (Umamaheshwari et al 2011)

<table>
<thead>
<tr>
<th>SOILS</th>
<th>YIELDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both paddy villages had normal soils in pre-shrimp period, 1994-95.</td>
<td>Average net returns distant village Rs 5038/ha and nearby village was negative</td>
</tr>
<tr>
<td>Distant village had normal soils during 2006.</td>
<td>10% increase in salinity associated with a 0.6% decrease in paddy yields.</td>
</tr>
<tr>
<td>Nearby village had high mean salinity in certain areas. Cultivated lands had lower EC</td>
<td>Returns of INR 1000 to INR 50000 per ha by reducing salinity to safe levels in affected areas.</td>
</tr>
</tbody>
</table>
Evaluation of Programs and Instruments
Financing Public Goods
## Economic Indicators

<table>
<thead>
<tr>
<th>Economic Indicators</th>
<th>Units</th>
<th>Amt</th>
<th>Tax Burden (USD/visit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourist population in 2007</td>
<td># visitors</td>
<td>675,889</td>
<td></td>
</tr>
<tr>
<td>Annual tourism benefits to all tourists</td>
<td>Million USD</td>
<td>695</td>
<td></td>
</tr>
<tr>
<td>Annual revenue generated by taxing benefits at 2 percent</td>
<td>Million USD</td>
<td>14</td>
<td>20.57</td>
</tr>
<tr>
<td>Government expenditure on the environment</td>
<td>Million USD</td>
<td>11.06</td>
<td></td>
</tr>
<tr>
<td>Env expenditure as percent of total</td>
<td>Percent</td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>Overseas environmental aid</td>
<td>Million USD</td>
<td>16.30</td>
<td></td>
</tr>
<tr>
<td>Total environmental expenditure</td>
<td>Million USD</td>
<td>27.36</td>
<td></td>
</tr>
<tr>
<td>Environmental expenditure as percent of annual Tourism Benefits</td>
<td>Percent</td>
<td>3.98</td>
<td></td>
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Issues and Priorities

• Costs
  – Data collection (cost per household): USD 10-15
  – Overall study - Basic: USD 15-20,000
  – Overall study – International peer review: +50%

• Skills and Data
  – Physical and Economic data
  – Multi-disciplinary analyses – is the science clear?
  – Multi-disciplinary teams?

• The Policy-Valuation interface
  – Evaluating a policy or an instrument
  – Financing a public good
  – National Accounts – building blocks
  – Understanding externalities – understanding connections, advocacy
  – Enabling trades -- experimental
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