Complexities in valuation of multiple ecosystem services: Learning from ICIMOD-SANDEE landscape program

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Ecosystem vs. Ecosystem Services

• Ecosystem and ecosystem services are not the same - former is the stock concept while the later is the flow

  • **Ecosystem** mainly refers to biophysical or natural world, while
  • **Ecosystem services** refers to contributions of the natural world which generate goods & services that people value
Value of Ecosystem Services

- **Existence value**
  - Consumptive value & non-consumptive
  - Non-use value
  - Option value

- **Ecological**
  - Health of ecosystem

- **Socio-cultural**
  - Cultural identity and ES services

- **Total value**
  - non use value but can be used in future

Existence value
Valuation Methods

Adjusted Market
- Adjusted for tax, subsidy, underground economy, etc.

Production function
- ES is used as input to production and value is measured through its effect on production

Revealed preference
- Examines actual expenditure on market goods related to ES

Stated preference
- Uses surveys to elicit preferences: CVM or CM (total economics value: use + non-use values)
KSL Research sites
- Patal Bhuwaneshwor: Cultural Services
  - Survey of travellers (200+) to understand the value that they put to the cave temple

- Hatkalika: Cultural Services + ES from forest (water)
  - Survey of 300 HHs for traveling to local cultural sites - 5 years references, plus water provisioning services of forest

- Chadak: Cultural Services + ES from forest
  - Survey of 300 HHs for traveling experience to local cultural sites - 5 years experience, plus the ES from forest

- Gwallek: Cultural Services + ES from forest
  - Survey of travellers (350+) to understand the value that they put to the Gwallek Kedar and ES from forest

- Dasharath Chand: PES for water provisioning services from Gwallek
  - Survey of 250 HHs for illicitating their preferences for drinking water supply from Gwallek
Methods used

• **Revealed preference (travel cost)** method for cultural services –
  • people travel cultural sites and we can observe and gather information, how much do they spend in terms of money, time (opportunity cost of time),

• **Production function** method for assessing the drinking water services that watershed provide to the households

• **Stated preference (choice experiment)** method for assessing the value of the clean drinking water services that municipality residents get from Gwallek watershed.
Survey instruments

• Four different sets of survey instruments for assessing the value of ES from these sites
  • Travelers surveys at Patal Bhuwaneshwor (day visitors & overnight)
  • Household survey at the watersheds
    • two separate modules: visiting on cultural sites and drinking water and related information;
  • Household survey of municipal residents to find out preferences on the drinking water quantity/quality and price that they are willing to pay for the better services
## Value of Cultural Services

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Rs (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Patal Bhuwaneshwar</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Full sample</td>
<td></td>
<td>21,947 ($211)</td>
</tr>
<tr>
<td>i. Day visitors</td>
<td></td>
<td>6.723 ($65)</td>
</tr>
<tr>
<td><strong>2. Hat-Kalika visitors (from Hat-Kalika and Chandak)</strong></td>
<td></td>
<td>1,784 ($17)</td>
</tr>
<tr>
<td><strong>3. Gwallek Kedar visitors</strong></td>
<td></td>
<td>3,413 ($33)</td>
</tr>
<tr>
<td><strong>4. Pooled sample (local residents of sites 2 and 3)</strong></td>
<td></td>
<td>1,980 ($19)</td>
</tr>
<tr>
<td><strong>5. KSL area</strong></td>
<td></td>
<td>300 million ($2.9 million)</td>
</tr>
<tr>
<td>i. Per year (use) value of cultural services for three sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii. Per year (use) value of cultural services derived from KSL area (for local residents only)</td>
<td></td>
<td>2.35 billion ($22.6 million)</td>
</tr>
</tbody>
</table>
### Annual value of water provisioning services of forests (compared to Chir Pine in USD)

<table>
<thead>
<tr>
<th>Forest types/direction</th>
<th>Nepal</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Broadleaf in North east</td>
<td>70.0</td>
<td>52.5</td>
</tr>
<tr>
<td>Native Broadleaf in West</td>
<td>176.2</td>
<td>132.1</td>
</tr>
<tr>
<td>Native Broadleaf in South east</td>
<td>99.2</td>
<td>74.4</td>
</tr>
<tr>
<td>Native Broadleaf in South west</td>
<td>162.8</td>
<td>122.0</td>
</tr>
<tr>
<td>Mix in North east</td>
<td>55.2</td>
<td>41.4</td>
</tr>
<tr>
<td>Mix in West</td>
<td>68.8</td>
<td>51.6</td>
</tr>
<tr>
<td>Mix in South east</td>
<td>97.9</td>
<td>73.4</td>
</tr>
<tr>
<td>Mix in South west</td>
<td>97.6</td>
<td>73.2</td>
</tr>
<tr>
<td>Conifer mix in North east</td>
<td>98.6</td>
<td>73.9</td>
</tr>
<tr>
<td>Conifer mix in West</td>
<td>142.3</td>
<td>106.7</td>
</tr>
<tr>
<td>Conifer mix in South east</td>
<td>138.7</td>
<td>104.0</td>
</tr>
<tr>
<td>Conifer mix in South west</td>
<td>57.4</td>
<td>43.1</td>
</tr>
</tbody>
</table>
Implicit price of attributes of water provisioning services

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Implicit price (confident interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quantity</td>
<td>1.90 (1.22-3.57)</td>
</tr>
<tr>
<td>Water quality</td>
<td>40.88 (26.27-76.86)</td>
</tr>
</tbody>
</table>

- Water users would like to pay an additional NPR 1.90/month for an increase in the supply of one liter of water per person per day. This means that they are willing to pay NPR 1.90 for 188 liters of water for a month.
- Households would like to pay a water source management fee of NPR 40.88 per month if the available tap water is drinkable.
Issues & complexity in valuing ES

• Ever sophistication in methodology
• More scrutiny about validity and reliability of estimated values
• Concerns about empirical relationship between assets stocks, service flows and how these services are valued at different stock levels
• Apparent uncertainty of scientific and economic data, if they are available at all
Issues and complexity

- **Asymmetric information** - ES depends on human actions and there are hidden actions of the service providers, and hidden information – that results into moral hazard problem

- **PES should be output based** BUT **outputs may not be known a priori**

- Payment schemes are designed based on inputs, which in principle is not an optimal system. Why?

- **Ecosystem services are partly dependent on providers activities but mostly depend on the external elements**, such as climatic factors, ecological and biophysical characteristics of the landscape
Learning from our experience

• Understanding biophysical as well as socioeconomic characteristics is essential of the study area and residents

• Repeated interactions to the communities are needed to identify the services that are the most valuable to the community requires repeated interactions with the stakeholders

• Designing survey instrument is a difficult and challenging task as the values are mostly elicited using survey instruments – need to get help form experienced researchers – there is no short-cut – if you try yourself without much experience, you will surely make mistakes
Learning from our experience

- **Training enumerators well is necessary for collecting quality data** – training not only involves understanding questionnaire well, but also going to the field and pre-testing with the enumerators.
- **Field supervision is essential** for consistency and resolving issues on the ground.
- **Collecting quality data is challenging** - bad data is no data.
Learning from our experience

• **Huge spatial variation** in stock of ecosystem assets and service flow

• **Difficulties in applying results from a study in one place to another places** (value transfer) due to heterogeneity
  
  • Example – the value of cultural services per person per trip was USD 17 for Hat-kalika and Chandak, while it was USD 33 for Gwallek (almost double).
Thank you