The potential of participatory multi-criteria analysis in ecosystem services valuation

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Nordic workshop on
Ecosystem services in forests - how to assess and value them?
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Ecosystem services exist only in relation to people’s needs, and different groups may value the services in different ways at different times and locales.

It is important to develop methods which can improve our understanding of these valuations and convey them to decision-making.

In addition to economic valuation methods, there is a growing interest in non-monetary valuation methods such as multi-criteria analysis (MCA), which can be seen as alternative or complementary approaches to economic valuation.
Structure of the presentation

- A brief overview of MCA methods
- A case study on the use of MCA to address an old-growth forest controversy in Finnish Upper Lapland
- Implications for ecosystem services valuation
Multi-criteria analysis

- MCA is a systematic approach to tackle complex decision-making situations with multiple objectives and incommensurate criteria

- MCA methods include analytic hierarchy process (AHP), Multi-Attribute Value Tree theory (MAVT) and outranking methods such as ELECTRE and PROMETHEE

- MCA or MCDA (Multi-Criteria Decision Analysis)
Value tree

OVERALL GOAL

GOALS

ATTRIBUTES

ALTERNATIVES
Scoring and weighing

- Each alternative is assigned a performance measure with respect to each alternative (scoring) and each criterion will be assigned a weight according to its importance to the evaluator (weighing).

- An overall performance score for each alternative is attained by multiplying the criteria-wise performance scores by corresponding criteria weights and then summing them up.
Assuming that attributes are mutually preferentially independent, an additive value function can be used to get an overall value for each alternative, which describe the overall preferences of the alternatives to the stakeholder. Mathematically, the overall value $v(x)$ of alternative $x$ is

$$v(x) = \sum_{i=1}^{n} w_i v_i(x_i)$$

$n$ is the number of attributes, $w_i \in [0, 1]$ is the weight of attribute $i$, $x_i$ the consequence of alternative $x$ with respect to attribute $i$ and $v_i(x_i)$ its value on 0–1 scale.
Case Forestry vs Reindeer Herding in Finnish Upper Lapland

- Conflict between state forestry and reindeer herding:
- The economically viable logging potential in Upper Lapland is in over 140-year-old forests.
- The old-growth forests are also important winter pastures for reindeer.
## Scoring

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
<th>Alt 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local income, M€/year</td>
<td>130</td>
<td>124</td>
<td>118</td>
<td>111</td>
<td>107</td>
</tr>
<tr>
<td>Employment, pm/year</td>
<td>1374</td>
<td>1338</td>
<td>1309</td>
<td>1420</td>
<td>1190</td>
</tr>
<tr>
<td>Reindeer herding culture, -5…+5</td>
<td>-4</td>
<td>-2</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Recreational use of nature, -5…+5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biodiversity, -5 … +5</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Social cohesion, -5 ... +5</td>
<td>-4</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>-4</td>
</tr>
</tbody>
</table>
Weighing

1. Assign 100 points to the most important attribute (Rank = 1)
2. Give points (<100) to reflect the importance of the attribute relative to the most important attribute

<table>
<thead>
<tr>
<th>Rank</th>
<th>Attribute</th>
<th>Points</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local income</td>
<td>100.0</td>
<td>0.200</td>
</tr>
<tr>
<td>2</td>
<td>Employment</td>
<td>100.0</td>
<td>0.200</td>
</tr>
<tr>
<td>4</td>
<td>Sámi culture</td>
<td>80.0</td>
<td>0.160</td>
</tr>
<tr>
<td>6</td>
<td>Recreation</td>
<td>60.0</td>
<td>0.120</td>
</tr>
<tr>
<td>5</td>
<td>Biodiversity</td>
<td>60.0</td>
<td>0.120</td>
</tr>
<tr>
<td>3</td>
<td>Soc. cohesion</td>
<td>100.0</td>
<td>0.200</td>
</tr>
</tbody>
</table>
Results

Ryhmä 1 - Tyypillinen tulos

0
0.2
0.4
0.6
0.8
VE 1 VE 2 VE 3 VE 4 VE 5

Ryhmä 2 - Tyypillinen tulos

0
0.2
0.4
0.6
0.8
VE 1 VE 2 VE 3 VE 4 VE 5

Ryhmä 3 - Tyypillinen tulos

0
0.2
0.4
0.6
0.8
VE 1 VE 2 VE 3 VE 4 VE 5

Local income
Employment
Sámi reindeer herding culture
Luonnonkäyttö
Biodiversity
Social cohesion
Reference

The advantages of MCA in valuing ES

Alaotsikko tai ingressi

- Helpful in illustrating trade-offs and distributional impacts
- Captures social and ethical concerns, which might escape from monetary valuation approaches
- Suits well for assisting participatory processes (explicit treatment of alternatives, criteria and weights)
- Plural and conditional conclusions
  - Pros: does not obliterate politics
  - Cons: do not inform policy-makers about the economic estimate of the value of any particular project and its effectiveness in terms of resource use
Problem 1

- MCA methods ignore the possibility that certain criteria may be better represented as issues of principle, than as utilitarian trade-offs.
- Cannot deal with lexicographic preferences (principles and virtues)
- Chan et al 2012: ”For ES research to ignore principles and virtues at the valuation stage would be to advance a dismembered concept of value lacking much of what matters to people”.
Problem 2

- The standard MCA techniques, like economic valuation techniques, assume that people have a fixed set of preferences for non-market goods such as biodiversity or clean air.
- However, the proponents of deliberative valuation argue that people do not have well-articulated preferences for unfamiliar objects like ecosystem services.
- Therefore, value elicitation processes should make use of group techniques such as citizens' juries and other participatory designs, which can help people to form and articulate preferences through dialogue with others.
In conclusion

- MCA methods can structure an assessment of a complex problem along both cognitive and normative dimensions, both of which are essential in evaluating ecosystem services (Vatn 2009)
- MCA methods are helpful in illustrating trade-offs between different ecosystem services and the distributional impacts of the decisions to use of conserve ecosystem services
- They are also suited well for capturing social and ethical concerns that might escape from monetary valuation approaches
- Can be used in participatory processes
- However, they cannot deal with lexicographic preferences
- Group-based approaches to weight elicitation would help people to form and articulate preferences through dialogue with others
Thank you for your attention!
References