Estimating the value of six ecosystem services in Europe

KIP INCA

Alessandra La Notte
OUTLINE

• What did we do
• Which services did we value
  • Fast-track approach
  • Modelling approach
  • Mixed approach
• Results
• Management: pros and cons
• Uses of the accounts
Objective: to develop a system of natural capital accounting for Europe, consistent with System of integrated Environmental and Economic Accounts – Experimental Ecosystem Accounts (SEEA EEA by UNSD)

**Eurostat:** Coordination of INCA, data provider, SEEA EEA alignment/testing

**DG Environment:** Provides policy context, manages MAES, principal user of INCA outputs

**INCA partners**

**European Environment Agency:** Developing shared data platform and ecosystem extent and condition accounts, data provider

**DG Research and Innovation:** Coordination between INCA and EU research activities

**EC Joint Research Centre:** Expertise in modelling ecosystem services, developing ecosystem services accounts
Ecosystem Services Accounts (JRC)

JRC TECHNICAL REPORTS

Implementing an EU system of accounting for ecosystems and their services

Initial proposals for the implementation of ecosystem services accounts

Report under phase 2 of the knowledge innovation project on an integrated system of natural capital and ecosystem services accounting in the EU

Alessandra La Notte, Sara Vallecillo, Chiara Polce, Grazia Zulian, Joachim Maes

2017

Ecosystem services accounting

Part I  Outdoor recreation and crop pollination

KIP INCA Report - contribution to the Knowledge and Innovation Project on an Integrated System of Natural Capital and Ecosystem Services Accounting in the EU

Sara Vallecillo, Alessandra La Notte, Chiara Polce, Grazia Zulian, Silia Allexandri, Silvia Formis and Joachim Maes

2018

Ecosystem services accounting

Part II  Pilot accounts for crop and timber provision, global climate regulation and flood control

KIP INCA Report - contribution to the Knowledge and Innovation Project on an Integrated System of Natural Capital and Ecosystem Services Accounting in the EU

Vallecillo, S., La Notte, A., Katsoulari, G., Kiebner, J., Robert, N., Deltor, F., Raymo, I., Rega, C., Maes, J.

2019

Relevant references provided at the end of the presentation.
JRC approach on ecosystem services

- Ecosystems
  - Service potential

- Socio-economic systems
  - Service demand

- Ecosystem service use (actual flow)

- Benefit
  - Economic products
  - Well-being

Accounting tables
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### Ecosystem services assessed in KIP-INCA

<table>
<thead>
<tr>
<th>Biophysical and monetary accounts</th>
<th>INCA work plan</th>
<th>Valuation technique</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROVISIONING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop provision</td>
<td>2018-19</td>
<td>Mkt price</td>
</tr>
<tr>
<td>Timber provision</td>
<td>2018-19</td>
<td>Mkt price</td>
</tr>
<tr>
<td><strong>REGULATING AND MAINTENANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop pollination</td>
<td>2017-18</td>
<td>Mkt price</td>
</tr>
<tr>
<td>Soil erosion control</td>
<td>2019-20</td>
<td>Replacement cost</td>
</tr>
<tr>
<td>Water purification (upd.)</td>
<td>2019-20</td>
<td>Replacement cost</td>
</tr>
<tr>
<td>Global climate regulation</td>
<td>2018-19</td>
<td>Carbon rates</td>
</tr>
<tr>
<td>Habitat maintenance</td>
<td>2019-20</td>
<td>Choice experiment</td>
</tr>
<tr>
<td>Flood control</td>
<td>2018-19</td>
<td>Avoided cost</td>
</tr>
<tr>
<td><strong>CULTURAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature-based recreation</td>
<td>2017-18</td>
<td>Travel cost method</td>
</tr>
</tbody>
</table>
Fast-track approach: crop provision

Natural inputs
- Sun, nutrients, rainfall

Human inputs
- Planting, chemical products, irrigation

management

The plant

Yield

the SNA product

Units of energy: MJ/ha

\[ \text{EcoCon}_{\text{crop}} = \frac{\text{Natural Inputs}}{\text{Yield}} \]

Based on CAPRI data: Pérez-Soba et al. 2020. JRC Technical report
Fast-track approach: crop provision

**CROP TYPES**
1. Soft wheat
2. Durum wheat
3. Barley
4. Oats
5. Maize
6. Other cereals
7. Rape
8. Sunflower
9. Fodder maize
10. Other fodder
11. Pulses
12. Potatoes
13. Sugar beet
Fast-track approach: crop provision

Crop production (SNA product)

Ecosystem Contribution (crop provision)
Fast-track approach: timber provision and GHG regulation

- Ecosystem contribution to timber growth
  - Cubic meters in 2012
  - 0 - 250
  - 251 - 500
  - 501 - 1,000
  - 1,001 - 2,512

- Agriculture, forestry and fishery statistics
  - 2013 edition

- CO2 Uptake (tonnes) 2012
  - 0 - 250
  - 251 - 500
  - 501 - 1,000
  - 1,001 - 1,990

- Effective Carbon Rates
  - Pricing CO2 through taxes and emissions trading systems

- OECD

- European Commission
Modelling approach: nature-based recreation (biophysical modelling)

Land cover
- Suitability of land to support recreation

Natural settings
- Protected areas

Water
- Presence and geomorphology of coast
- Lakes
- Bathing water quality

Features to reach
- Distance to the road network
- Distance to residential areas
Modelling approach: nature-based recreation
[monetary modelling]

Potential users (within 4 km)

Potential visits (actual flow)

Mobility model/trip generation function

Potential users: How often do they use recreational areas?

Potential visits: (actual flow)

Mobility model/trip generation function

\[ V_z = f(TC) \]
Modelling approach: flood control

[biophysical modelling]

- CORINE Land Cover
- Soil Type
- Imperviousness (COPERNICUS)
- Slope
- Riparian zones (COPERNICUS)

Runoff Curve Number (USDA methodology)

Semi-natural LC riparian zones

Indicator of flood regulation potential

\[ \sum \text{Flow ratio} \times \text{pixel size} \]

1.2 ha of use
Modelling approach: flood control

[monetary modelling]

Expected Annual Avoided Cost

$$\text{EAAD} \approx \sum ((f_i-f_{i-1})^* (A_i+A_{i-1})/2)$$

NC: flood control derived from natural capital
NC+: flood control derived from natural capital in support to defence measures
Mixed approach: crop pollination
[biophysical modelling]

Expert-based model
- Land Cover & roads
  (Food resources and nesting sites)
- Irradiance & Temperature
  (Insect activity)
- Distance to semi-natural areas

Species-distribution model
- Species occurrences
- Land Cover (%)
- Climate
- Topography
- Distance to semi-natural areas
Mixed approach: crop pollination
[fast-track monetary valuation]
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ES supply and use tables

Ecosystem types yearly provide ES flows...

...that enter the SNA as intermediate consumption for Economic Sectors (NACE) and as final consumption for Households and Global Society

<table>
<thead>
<tr>
<th>Year 2012, million EUR</th>
<th>Ecosystem type</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Cropland</td>
</tr>
<tr>
<td>Crop provision</td>
<td>20,560</td>
<td>20,560</td>
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<tr>
<td>Timber provision</td>
<td>14,540</td>
<td></td>
</tr>
<tr>
<td>Global climate regulation</td>
<td>20</td>
<td>14,390</td>
</tr>
<tr>
<td>Flood control</td>
<td>90</td>
<td>1,020</td>
</tr>
<tr>
<td>Crop pollination</td>
<td>9,720</td>
<td></td>
</tr>
<tr>
<td>Nature-based recreation</td>
<td>80</td>
<td>4,070</td>
</tr>
<tr>
<td>Total</td>
<td>28,740</td>
<td></td>
</tr>
</tbody>
</table>

Value in EUR/km²

<table>
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<th>Year 2012, million EUR</th>
<th>Economic units</th>
</tr>
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Values rounded to the nearest tens
Trend of crop and timber provision

Crop provision

Timber provision
Trend of crop pollination and nature-based recreations

Changes in the contribution of pollination to crop production (2000-2012)

- Pollination potential: -2.6%
- Pollination demand: 17.5%
  +15%

Changes in the use of nature-based recreation (2000-2012)

- Recreation potential: 11.0%
- Recreation demand: 9.4%
  +20.4%

Crop pollination

Nature-based recreation
Trend of GHG regulation and flood control

**GHG regulation**

Demand: economic assets

Value increased by (2%): higher avoided damage

Floodplain -2006

Floodplain -2012
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Ecological modelers: inhouse
Valuation models: inhouse + external contracts

First the experimental applications – now we need to build tools (GIS plug-in) to allow replications

Test and correct:
• Refinement of biophysical models in terms of input data and in terms of procedure
• Alternative valuation techniques to facilitate interpretation of relative values by practitioners
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Multi-regional input-output analysis -> Water purification embedded in agricultural products traded in EU
What was mostly appreciated of the accounts by policy DGs

Appropriate inclusion of the ecological component within a cause-effect chain from ecosystems to economy and society

Assessment of ES unmet demand

Need to test and develop uses concerning the monetary accounts


Thank you

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