Baltic Sea ecosystem services and benefits

Management of environmental problems in aquatic ecosystems (ESCG-501)

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Topics in this lecture

• How does the Baltic Sea affect human well-being?

• How are ecosystem services linked to benefits and values?

• What is economic value?

• How to value environmental changes?

• What are current topics in regional economic and social analyses in the Baltic Sea area?
Where we are in the DPSIR framework
Ecosystem services

• “...are ecosystem characteristics that are actively or passively used to produce human well-being” (Fisher et al. 2009)

• Relationship between human well-being and ecosystems

• Benefits accrue to humans

• Several definitions/classifications
  – E.g. MEA, TEEB, CICES
  – Usable in different contexts
Cascade model of ecosystem services (adapted from Haines-Young & Potschin 2010)
Classification of ecosystem services

Intermediate services
- Supporting (primary production, nutrient cycling)
- Regulating (natural hazard regulation)

Final services
- Provisioning (fish and shellfish, water, energy)
- Cultural (landscape)
- Regulating (climate regulation, pollination)

Goods
- Objects of value
- Market and non-market
- E.g. food, recreation, healthy climate

Benefits/values
- Monetary values
- Non-monetary values
- Health values

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- Non-monetary values
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Example: recreation and tourism (cultural service)

Value of recreation and tourism

Recreation and tourism

Fish and shellfish
Algae
Clean water
Places and seascapes

Primary production
Larval and gamete production
Nutrient cycling
Water cycling
Habitat formation
Landscape formation
Waste breakdown and detoxification
What is value?

• Intrinsic value
  – Independent of humans

• Economic value
  – Anthropocentric
  – Environmental state/ecosystem services as a source of human well-being
  – Trade-offs: how much money would a person be willing to give up to obtain a better environment
Why is valuation needed?

• No market prices for environmental goods and ecosystem services – what is their value?
• Comparability
• Integrating environmental values into decision-making
  – Cost-benefit analysis
  – Setting targets
  – Prioritizing, allocation of resources
• Transparency and visibility
• Public participation
Value categories

Total economic value

Use value
- Actual use
- Option value

Non-use value
- Existence
- For others
  - Altruism
  - Bequest

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Valuation of the environment/ecosystem services

• Benefits (or damages) from changes in the environment

• Different approaches
  – Qualitative
  – Quantitative
  – Monetary (economic)

• In principle, valuation of environmental goods = valuation of ecosystem services
  – Differences in the object of valuation/phrasing of the research question
Important considerations in valuation

- Value of changes instead of total values
- Spatiality
- Double-counting
- Ecological thresholds/nonlinearities
- Account for only ecosystem services part of the total economic value
  - Part of the value may result from human actions
Valuation methods

Revealed preference methods
- Travel costs, property prices
  Use values (recreation, tourism, landscape)

Stated preference methods
- Contingent valuation, choice experiment
- Use and non-use values (recreation, existence)

Benefit transfer, meta-analysis
- Applying existing data to new contexts

Market prices
- Food, energy, medicine

Cost-based methods
- Avoided costs, replacement costs
- Climate regulation, flood control, waste breakdown
Critique on ecosystem services and valuation

- Ecosystem services as an anthropocentric concept
- "Pricing" nature
- Commodifying nature and seeing it as a service provider
- Total value of nature

Valuation methods
- Stated preferences vs. "true" preferences
- Hypothetical values
- Results do not comply with economic theory
Value of Baltic Sea recreation (Ahtiainen et al. 2013, Czajkowski et al. 2015)

- Travel cost method
- Identical surveys in 9 countries
- Value of recreation 15 billion € per year
- Improvement in environmental quality would lead to 7-18% increase in value, about 2 M€ per year

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual number of visits per person</th>
<th>Annual value of Baltic Sea recreation (M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>1.8</td>
<td>150</td>
</tr>
<tr>
<td>Finland</td>
<td>4</td>
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<td>Denmark</td>
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<td>Germany</td>
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<td>Latvia</td>
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<tr>
<td>Lithuania</td>
<td>1.7</td>
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<tr>
<td>Poland</td>
<td>1.1</td>
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</tr>
<tr>
<td>Sweden</td>
<td>6.4</td>
<td>4430</td>
</tr>
<tr>
<td>Russia</td>
<td>0.5</td>
<td>940</td>
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</table>
Benefits from reduced eutrophication (Ahtiainen et al. 2014)

- Contingent valuation method
- Identical survey in 9 countries
- Willingness to pay for reducing eutrophication
- Benefits of reduced eutrophication in total 3800-4400 M€ per year

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual willingness to pay per person (€)</th>
<th>Annual benefits of reduced eutrophication (M€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>29 – 37</td>
<td>125 – 158</td>
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<tr>
<td>Estonia</td>
<td>21 – 30</td>
<td>21 – 31</td>
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<td>Finland</td>
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<td>Germany</td>
<td>25 – 28</td>
<td>1572 – 1781</td>
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<td>Latvia</td>
<td>5 – 6</td>
<td>8 – 9</td>
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<td>9 – 10</td>
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<td>Poland</td>
<td>12 – 13</td>
<td>368 – 383</td>
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<td>Russia</td>
<td>11 – 12</td>
<td>1028 – 1129</td>
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<tr>
<td>Sweden</td>
<td>60 – 92</td>
<td>440 – 674</td>
</tr>
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</table>
Economic and social analyses at HELCOM (Baltic Marine Environment Protection Commission)
Regional economic and social analyses at HELCOM

• Important development area
• Coherent framework and information across countries
  – Regional results for the Baltic Sea
  – Support for national implementation of EU directives
• HELCOM expert network on economic and social analyses
• EU co-funded projects 2016-2019 (TAPAS, SPICE, PanBaltic SCOPE)
• Regional workshops
• Holistic assessment of ecosystem health (HOLAS II)
• Marine spatial planning
Role of economic and social analysis in the HELCOM holistic assessment

• Second Holistic Assessment of Ecosystem Health of the Baltic Sea (2014-2018) and ’State of the Baltic Sea’ report
• First version published in July 2017 (final version summer 2018)
Annual contribution from the use of marine waters to economy in the Baltic Sea region

- Selected sectors
- Monetary, employment and quantitative indicators

**FISH & SHELLFISH HARVESTING**
Value of landings: 220 million €
Employment: 9500 people

**FINFISH AQUACULTURE**
Gross value added: 14 million €

**MARINE & COASTAL RECREATION**
(Travel cost method)
Value to citizens: 15 billion €

**TRANSPORT INFRASTRUCTURE**
No. of ports: 200
Total port traffic: 840 million tonnes
No. of passengers, all ports: 100 million
Annual welfare losses for citizens if good environmental status is not reached

- Cost of degradation
- Selected degradation themes and ecosystem services

Losses from eutrophication: 3800 – 4000 million €

Losses of recreation values: 1000 – 2200 million €

Losses from degradation of perennial vegetation and fish stocks: 1800 – 2700 million €
Economic and social analyses in marine spatial planning (MSP)

• PanBaltic SCOPE project in the Baltic Sea region, 2018 →

• HELCOM coordinates the economic and social analyses
  – Review of how economic, social and cultural impacts and existing models are included in national MSP
  – Recommendations on how to develop a framework for ESA in MSP
  – Regional platform for exchanging experiences and knowledge
References and literature (1)


References and literature (2)

- HELCOM 'State of the Baltic Sea’ summary report (HOLAS II):
- HELCOM Supplementary report on economic and social analyses (HOLAS II):