Introducing ecosystem services of sediments into maritime spatial planning with the focus on Polish experience

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POLAND
Structure of the presentation

- Problem description
- Definition of Maritime Spatial Planning
- Concept of ecosystem goods & services
- Goods & services provided by sediments
- Polish case study – Gulf of Gdansk
- Sediments in Maritime Spatial Planning in Poland
- Conclusions – lessons learned
Human wellbeing and its relation to capital

NEW POLICY FRAME

✓ Natural Capital as important factor of human well-being.

✓ Growing pressure on natural capital of the sea (new uses e.g. wind mills, shale gas, aquaculture).

✓ Better understanding of benefits and goods provided by the natural capital of the oceans.

But sediments somehow outside this new policy frame

NEW POLICY CONCEPTS:

- Integrated maritime policy
- MARITIME SPATIAL PLANNING
- ECOSYSTEM GOODS AND SERVICES

Source: ESA (2011)
Definition of Maritime Spatial Planning

MSP is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process.

Source: EHLER C., DOUVERE F. (2009)

Source: European Commission (2010)
## Concept of ecosystem goods & services

### Goods and services

*“the direct and indirect benefits people obtain from ecosystems”*

Source: Beaumont et al. (2007)

### Classification of ecosystem goods & services

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production services</td>
<td>products obtained from the ecosystem</td>
</tr>
<tr>
<td>Regulating services</td>
<td>the benefits obtained from the regulation of ecosystem processes</td>
</tr>
<tr>
<td>Cultural services</td>
<td>the nonmaterial benefits people obtain from ecosystems</td>
</tr>
<tr>
<td>Supporting services</td>
<td>necessary for the production of all other ecosystem services, but do not yield direct benefits to humans</td>
</tr>
</tbody>
</table>

Source: Millenium Ecosystem Assessment (2003) and Hein et al. (2006)
Concept of ecosystem goods & services

Example of relationships between intermediate services, final services and benefits

ECOSYSTEM CLASS
Marine sediment

INTERMEDIATE SERVICE
Removal of nitrogen - denitrification

FINAL SERVICE
Regulation of water quality - mitigation of eutrophication

BENEFITS
ecosystem stability, amenity/recreation provision, good state of fish stock et cetera ...

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>GOOD OR SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production services</td>
<td>Food provision (plants and animals)</td>
</tr>
<tr>
<td></td>
<td>Fuels, energy</td>
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<tr>
<td></td>
<td>Fiber</td>
</tr>
<tr>
<td>Regulating services</td>
<td>Bioremediation of waste, mitigation eutrophication</td>
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<td></td>
<td>Remineralization</td>
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<td>Biological control</td>
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<td>Gas and climat regulation</td>
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<tr>
<td></td>
<td>Disturbance prevention (Erosion and sedimentation control)</td>
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<tr>
<td>Cultural services</td>
<td>Leisure and recreation (tourism)</td>
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<td></td>
<td>Cognitive benefits (education)</td>
</tr>
<tr>
<td>Supporting services</td>
<td>Resilience and resistance (life support)</td>
</tr>
<tr>
<td></td>
<td>Biologically mediated habitat</td>
</tr>
<tr>
<td>Option-use value</td>
<td>Future unknown and speculative benefits</td>
</tr>
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</table>

Economic valuation methodologies

METHODS

Indirect methods
- Revealed preferences
  - Replacement cost
  - Travel cost method
  - Hedonic pricing

Direct methods
- Stated preferences
  - Contingent valuation method
  - Choice modelling
Why? For what?

✓ to **make better decisions** about the environment (solving the specific spatial conflicts - different uses of the sea)

✓ to **make rational choices**, which consequences are changes in the environment.

✓ to **ensure safe and sustainable use** of the sea

✓ to **better protect** the environment

✓ to **better manage** natural resources
Case study area – Gulf of Gdansk brackish estuary (the Southern Baltic Sea)

**AIM of the study**

the economic valuation of mitigation eutrophication (regulating ecosystem service)
Economic valuation of...

Regulating ecosystem services

Mitigation eutrophication
the removal of excess NITROGEN and PHOSPHOROUS
from the sea through the following processes:

1) Accumulation in living tissue
2) Denitrification.
3) Anaerobic nitrification/anaerobic ammonium oxidation.
4) Accumulation in sediments.

- it reduces eutrophication
- it permanently removes excess nitrogen from the ecosystem
- it is the only natural mechanism by which nitrogen is truly removed from the ecosystem

Economic valuation, HOW?

combination of two non-market goods valuation methods

I. The artificial substitute for ecosystem services - similar in terms of processes;
II. The substitute for the ecosystem services - as cheap as possible;
III. The society has to demonstrate their willingness to pay (WTP) for the services provided artificially, if the ecosystem will not be able to provide the service.

Source: Shabman & Batie (1978)
Sediments – bentic marine landscape

Identification based on sediment, salinity and light (not processes).

Which type of marine landscape is rare?

Which places are more vulnerable/valuable on an ecosystem level?

Economic value of functions provided by sediments – NEW LAYER OF DATA

Sediments in Polish MSP considered as a gravel, ...
Conclusions – lessons learned

So far we could only use those services which have **market value (gravel)**.

„Intangible services„ or intermediate services of sediments related to regulating and supporting ecosystem services have been almost **neglected**.

Allocating the space we **could not compare** value of sediments in terms of a building lot for a new sea construction to a mitigating eutrophication function.

As the results the **sediments were out of planning agenda** due to lack of knowledge and information (with exception of gravel extraction).

But a huge effort was done to **examine the role of sediments in habitat creation** (the concept of marine landscapes) and to **estimate economic value of services**.

**Replacement cost method** is supposed to be rather easy to understand and therefore might be suitable to enhance social perception of indirect use values.

**Argument** for allocation of founds into mitigation of eutrophication.
Support of the maritime policy objectives by their **economic justification**.
Thank you for your attention

Acknowledgements

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