Linking ecosystem services and human well-being in practice: The Coastal Futures Approach
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leisure time
income
security
climate regulation
personal well-being
renewable energy
education
aesthetics
food, fisheries, employment

9 June, 2010
Research question:

• How to conceptualise the link between ecosystem services and human well-being?

• What constitutes human well-being?

• Which ecosystem services relate to which components of human well-being?
Content:

• State of offshore wind farms development
• Scenario
• Impacted ecosystem services
• Human well-being and quality of life
• Linking ecosystem services and human well-being
• Examples for linkages of ES and HWB
• Discussion / Conclusions
State of OWF development:

- high mitigation potential ascribed to offshore wind energy in relation to the climate change debate
- large scale development activities are planned
- realisation currently starting

<table>
<thead>
<tr>
<th>Operational OWFs in Europe (end 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>country</td>
</tr>
<tr>
<td>Belgium</td>
</tr>
<tr>
<td>Denmark</td>
</tr>
<tr>
<td>Finland</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Ireland</td>
</tr>
<tr>
<td>Netherlands</td>
</tr>
<tr>
<td>Norway</td>
</tr>
<tr>
<td>Sweden</td>
</tr>
<tr>
<td>UK</td>
</tr>
<tr>
<td>total</td>
</tr>
</tbody>
</table>

Source: EWEA

<table>
<thead>
<tr>
<th>OWF expansion in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
</tr>
<tr>
<td>2009</td>
</tr>
<tr>
<td>2010</td>
</tr>
</tbody>
</table>
Scenario:

- strong enforcement of offshore wind farm development according to the plans of the German federal government

- North Sea primarily used as energy park (~25,000 MW till 2030)
**Ecological integrity**

- Energy cycling
- Nutrient cycling
- Storage capacity
- Minimization of nutrient loss
- Abiotic heterogeneity
- Biotic diversity
- Organization

**Regulating ecosystem services**
- Climate regulation
- Sea bed control
- Water purification and waste treatment
- Storm protection

**Provisioning ecosystem services**
- Food (fishery / co-use mariculture)
- Wind energy
- Biochemicals

**Cultural ecosystem services**
- Aesthetics
- Beauty of landscape
- Sense of place
- Cultural heritage
- Habitat and species value
- Regional image
- Inspiration
- Informal education
- Knowledge systems
- Recreation

**Determinants of Human well-being**

- Income
- Employment
- Housing
- Infrastructure
- Safety
- Personal well-being
- Nutrition
- Demography
- Health
- Education
- Leisure time
- Social relations

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GKSS Forschungszentrum
Ecology Centre – Kiel University
Human well-being = Quality of life

Objective living conditions
- society level
- economic situation, state of public sector
- statistical data & infrastructure as proxy measure

Subjective well-being
- individual level
- personal perception and experiences
- immaterial values
- empirical data

Determinants of Human well-being

Economic well-being
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- Safety

Social well-being
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- Education
- Leisure time
- Social relations

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Linking ecosystem services and human well-being:

**Step 1:** Identify ES impacted by OWF development

**Step 2:** construct direct connections between ES and objective or subjective aspects of human well-being and define indicators

**Step 3:** Discuss and rate those connections
Interrelations identified:

**Ecosystem Services**
- Global climate regulation
- Provision of food
- Provision of energy
- Aesthetics/beauty of Landscape
- Image of the region/recreation
- Species and habitat value

**Components of Human well-being**
- Income
- Employment
- Housing
- Infrastructure
- Safety
- Personal well-being
- Nutrition
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- Health
- Education
- Leisure time
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**Components of Human well-being**

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Example: ES Energy - Employment

Ecosystem Services
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Economic well-being
- Social well-being

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Example: ES wind energy - employment

Cumulated employment effects of offshore wind energy in the 'West Coast' region of SH until 2030 assuming a maximum regional share of the wind energy value chain.

Scenarios
- Scenario 'Little Implementation'
- Scenario 'Modest Implementation'
- Scenario 'High Implementation'

- Investment wind energy
- O&M wind energy
- Income multiplier wind
- Conventional electricity replaced
- Income multiplier conv. electricity
- Consumption change
- Income multiplier consumption
- Net effect

Person Years (2000)
Example: ES
Aesthetics – Personal well-being

Ecosystem Services
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- Provision of energy
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Determinants of Human well-being
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Economic well-being
Social well-being

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Example: ES Aesthetics – Personal well-being

<table>
<thead>
<tr>
<th>“How important is… for your life at the west coast of Schleswig-Holstein?“</th>
<th>very important</th>
<th>not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>clean water, air, beach and tidal flat</td>
<td>87 %</td>
<td>0 %</td>
</tr>
<tr>
<td>healthy, diverse animal and plant community</td>
<td>72 %</td>
<td>0 %</td>
</tr>
<tr>
<td>attractive landscape</td>
<td>58 %</td>
<td>2,5 %</td>
</tr>
<tr>
<td>wide, open horizon</td>
<td>56 %</td>
<td>4 %</td>
</tr>
<tr>
<td>untouched nature</td>
<td>40 %</td>
<td>3 %</td>
</tr>
<tr>
<td>spend leisure time at the coast or sea</td>
<td>38 %</td>
<td>3 %</td>
</tr>
<tr>
<td>challenging employment</td>
<td>32 %</td>
<td>6 %</td>
</tr>
<tr>
<td>economic growth</td>
<td>23 %</td>
<td>7,5 %</td>
</tr>
<tr>
<td>new industries and technology</td>
<td>16,5 %</td>
<td>26 %</td>
</tr>
<tr>
<td>attraction of profitable companies and industry</td>
<td>13 %</td>
<td>33 %</td>
</tr>
</tbody>
</table>
Discussion:

• It proofed to be possible to construct strong/direct causal chains and a large amount of indirect ones

• Other development have a much stronger impacts on the chosen determinants (demographic change, global economy)

• A degree of subjectivity may well be an inherent feature of human well-being assessments

• Results influenced by the scale chosen for assessment and the scenario used as a baseline
Conclusion:

- Ecosystem service approach a valuable tool to analyse and estimate expected impacts of OWFs.
- Interrelation between environmental change (via OWFs) and aspects of human well-being could be shown on a conceptual basis.
- Impacts of offshore wind farming can affect human well-being through a multitude of routes. Both, at the level of objective conditions and subjective sense of well-being.
- Changes in the marine environment result in impacts at considerable distance and clearly indicate land-ocean interactions.
Thank you for your attention!
References:


