Ecosystem services in practice: potentials and limitations in environmental management

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International Conference
Solutions for Sustaining Natural Capital and Ecosystem Services:
Designing Socio-Ecological Institutions
Kiel, Salzau June 7th 2010
Structure

1. Purposes, applications, and methodology of environmental planning – the example of landscape planning in Germany

2. Environmental planning approaches in the framework of other ecosystem service concepts. Potentials and limitations.

3. Conclusions
Political decision levels = Planning levels of landscape planning in D
Regional Landscape Plans in Germany

- LP completed: 44%
- LP in preparation: 22%
- No LP: 29%
- LRP abgeschlossen: 5%
Inventory, assessment of the state of the landscape: Value, resilience, potentials, impacts

Which ecosystem services are covered?

Landscape functions*:
- Natural yields function (esp. natural soil fertility potential)
- Water provision function
- Water retention function (the importance of the landscape for flood protection)
- (Climate protection function)
- Bioclimatic function
- Geodiversity function
- Biodiversity function
- Landscape aesthetic function
- (Renewable energy provision function)

* In planning normative connotation, different from ecology (Jax 2002, de Groot)
What is Landscape?

territorial, includes human influence

Alexander von Humboldt ~ 1799:

„Landscape is the total character of a region of the earth“

ELC, Chapter I
Article 1: “an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”

A region of the earth and aesthetic, cultural, ecological and economic system which reflects the human perception and realisation (ILN 1998)
Reduction of the complexity of reality: What are landscape functions?

Natural territorial potentials (Bobbeck, Schmidthüsen 1949, Troll 1950, Neef 1966, Haase 1978:116, Bastian) have to be mobilised (released) by land use

→ Term too abstract for practical planning → landscape functions (Bastian, Gruehn, Haaren..)
Water provision function, retention function (flood protection)

Ground water resources: importance and vulnerability

- High sensitivity against nitrate pollution of ground water
- High retention, flood protection function
- Land cover, regulating run off, river discharge
- Pressure, impairment high: Flood plains without permanent vegetation cover

High ground water replenishment rate
Natural yields function: Natural fertility (value), erosion, compression, contamination sensitivity, actual impairment

Soil erosion vulnerability

Off site damage

Source: Mitasowa

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Landscape aesthetics, landscape experience functions

Inventory and valuation of natural scenery and cultural heritage assets

- Attractive landscape elements
- Features with cultural and historic value
- Damaging elements
- Scenic views
Climate protection function as sink or storage

v. Haaren, Saathoff: submitted

Dealing with multifunctionality: Spatial identification of synergies and conflicts (climate protection, biodiversity)

On 3900 ha synergy with protection of birds, on 700 ha with insects, on 8 ha with protection of flora, on 24 ha conflicts with flora

v.Haaren & Saathoff, submitted
Example for map of objectives which integrates different landscape functions, alternatives

- Spatial target zones, e.g. conservation, development, redevelopment
- Objectives and requirements for sustainable use patterns
- Implementation priorities

Most important targets:
- Development of field margins, hedgerows, buffer stripes along creeks
- Conservation of grassland,
- Reduce nitrogen leaking on arable land,
- Enhance portion of deciduous trees in forests
How does landscape planning cope with misfits of spatial interconnections and decision scale, NiMBY

„The tyranny of the small decisions (Eugene Odum)“
Adoption of higher level objectives

Global

Landscape planning

EU

federal

state

region

local

Decision (legal) competence/implementation competence?

Implementation problems

Areas of international
national
state
regional
local
value/importance

Ecological connections beyond political boundaries: Impact on higher tier than pressure; or functional areas cross border (habitat, ground water replenishment); or value high because on higher scale endangered/scarc
Considering spatial connections on different scales

Adoption and implementation (?) + regional network

Impairment: dissection

Regional landscape plan

Local landscape plan

Farm

Adoption + local network

+ network for plant protection
Fields of practical application
<table>
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<th>Landscape planning supports:</th>
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<td><strong>Regulation</strong></td>
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<td>- Protected areas</td>
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<td>- Impact regulation and compensation</td>
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<td>Rehabilitation and improvement of landscape functions</td>
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<td><strong>Participation and education</strong></td>
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<td>- Comments of NGOs citizens, land users on planned projects</td>
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<td>- Environmental awareness, regional identity</td>
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<td><strong>Information basis for valorisation of Nature</strong></td>
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<td>- Targeting the spending of public funds for environmental services</td>
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<td>- Sale of eco friendly products, eco-tourism</td>
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Landscape Planning as interface between general goals of the law and implementation

General Goals and Principles of Nature Conservation

Landscape Planning: area specific objectives and measures

- Compensation regulation
- Nature reserves
- Good practice of agriculture, forestry, fishery
- Species protection
- Right to sue of NGOs

Monitoring of the environment
Integration of environmental aspects into spatial planning

Regional landscape plan 1:50 000

Taken from county Hameln-Pyrmont

environmental goals and information in LP suitable for integration into Regional spatial plan

The competent authorities have to include all available and necessary information in the decision making process

„Translation map“
Procedure of the Intervention Regulation
According to the Federal Nature Conservation Act

Intervention

Avoidance of impairments

Functional compensation

Material substitution

Legal, political weighing

Monetary substitution

Basic principle of compensation:

Restore function (area 1:1)

Obligation of developer to pay for reestablishment of functions (compensation)
Approaches to accounting the substitution area

- Reestablishment cost approach for calculating substitution amount
- Standard approach in case of loosing widespread functions which are not in short supply (lower value): product of area and value of lost function (substitute)
  + arguing for best solution (development potential, landscape planning)

→ money can be spent on small site establishing high value function or vice versa

→ developers as well as municipalities look for the least vulnerable areas for development (in landscape plan) as ecosystems with long development times and high management requirements for rehabilitation are more expensive to compensate

Compensation pool for Container Terminal 4 in Bremerhaven
Monetary substitution and difficulties in practice

- Prices are mostly politically defined
- No material compensation
- Rehabilitation cost approach suitable for functions with short re-establishment times (< 30 years = 1 generation?), what about functions which cannot be re-established in political planning timeframes? Calculate compound interests?

In monetary value it is an equal compensation for the tarn.
Landscape planning supports:

**Regulation**
- Protected areas
- Impact regulation and compensation
- Rehabilitation and improvement of landscape functions

**Participation**
- Comments of NGOs, citizens, land users on planned projects
  - Environmental awareness, regional identity

**Information basis for valorisation of Nature**
- Targeting the spending of public funds on environmental services
- Sale of eco friendly products, eco-tourism
Experiences in political decision making and participation

Modules of the interactive landscape plan

- Clearly defined scope for decisions necessary (tier-specific competencies)
- Spatial specification fosters discussion and implementation
- Decision makers sometimes shy away from transparency (new media, monetization?)
- Monetizing losses of land owners reduces emotions in debate
- Communication requires adequate wording, practical actions, examples, visualization
- Farmers often do not like to supply „services“
Landscape planning is useful for three main tasks in the context of sustainable landscape development:

**Landscape planning supports:**

- **Regulation**
  - Protected areas
  - Impact regulation and compensation
  - Rehabilitation and improvement of landscape functions

- **Participation and education**
  - Comments of NGOs, citizens, land users on planned projects
  - Environmental awareness, regional identity

- **Information basis for valorisation of Nature**
  - Targeting the spending of public funds for environmental services
  - Sale of eco friendly products, eco-tourism
Accounting on farms for better marketing opportunities: Quality, quantity, connectivity of biotopes

Assessment by open source GIS software
MANUELA (Haaren et al. 2008)

Percentage (farm area) of hedgerows of different value
„Theoretical Production Potential“

Area to produce nature conservation products
possible adjustments to market demands (on basis of Landscape plan)

- Arable land: 34%
- Grassland: 41%
- Water bodies: 3%
- Forests: 12%
- Formerly soil extraction: 10%
- 5000 lambs
- 10,000 cattle

Heath, moor, extraction: 10%

Legende

- Acker
- Bodenabbau
- Gewässer
- Grünland
- Heide
- Laubwald
- Mischwald
- Moor
- Nadelwald
- Siedlung
- Landkreisgrenze

Heath, moor, formerly soil: areas with borders: areas of the highest priority (indisposable)
without borders: areas with flexible targets and measures

Albert et al. 2009
### Willingness to pay for nature conservation in D

**Umfrage 1)**

<table>
<thead>
<tr>
<th>Programmeebene</th>
<th>Arten- und Naturschutz in Deutschland (HAMPICKE et al. 1991)</th>
<th>10,23</th>
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<tr>
<td></td>
<td>Verhinderung des Artensterbens in Deutschland (HOM-MÜLLER 1991)</td>
<td>8,24</td>
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<td>Arten- und Biotopschutzprogramm für Berlin/West(SCHWPPE-KRAFT et al. 1994)</td>
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<td>15% der Landesfläche SH für Naturschutz (ALVENSLEBEN &amp; SCHLEYERBACH 1994)</td>
<td>7,20</td>
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<td>Erhaltung der Artenvielfalt im Lahn-Dill-Bergland (MÜLLER et al. 2001)</td>
<td>5,68</td>
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<td>Erhaltung des Biospärenreservats Schorfheide Chorin (ROMMEL 1998)</td>
<td>2,16</td>
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<td>Landschaftspflege in der Lüneburger Heide (CORDES 1994)</td>
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<td>Artenschutz im Allgäu und Kraichgau (JUNG 1996)</td>
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<td>Landschaftspflege im Emsland und Werra-Meißner-Kreis (ZIMMER 1994)</td>
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<td>Grünlandextensivierung und Gewässerrandstreifen (umfangreiches Programm) (DEGENHARDT et al. 1998)</td>
<td>13,19</td>
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<td></td>
<td>Grünlandextensivierung und Gewässerrandstreifen (kleines Programm) (s.o.)</td>
<td>4,26</td>
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<td>Grünlandextensivierung und Landespflegemaßnahmen (s.o.)</td>
<td>7,16</td>
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1) Die Befragten wenden sich an die Wohnbevölkerung des jeweiligen Gebietes
2) Eigene Umrechnung auf Zahlungsbereitschaft für Haushalt
3) Die Befragung bezog sich auf die Zahlungsbereitschaft der befragten Person.
   Ob dies auch die Zahlungsbereitschaft des Haushalts ist wurde nicht thematisiert.

**Zahlungsbereitschaft für den Naturschutz**

Quelle: Bundesamt für Naturschutz (BfN), 2002
v.Haaren /2003; Vorl II und III; Folie 21; bei Jonczyk
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## Placing the landscape planning approach

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<tr>
<th>Landscape planning</th>
<th>Ecosystem Service concepts</th>
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<tbody>
<tr>
<td>1. Goal: Maintenance, rehabilitation, development. Accounting with regard to certain instruments (compensation)</td>
<td>Valuation, accounting</td>
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<td>2. Definition, classification, characteristics public goods emphasis</td>
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<td>3. Concentration in spatial implementation on regional, local planning tier, Germany national tier not implemented</td>
<td>Higher decision levels</td>
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<td>4. always spatially explicit → concrete implementation</td>
<td>Participation?</td>
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<td>5. consequences of political interface/participation for preparation of planning contents: Terms, priorities, consider danger of abuse in case of monetization</td>
<td>Monetization</td>
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Definitions

Landscape functions are “the capacity of landscapes and their subspaces to sustainably fulfil basic and or democratically legitimised material or immaterial human demands”. Landscape functions are characterised by their value (for satisfying the demands), their specific sensitivity against different pressures, the state of impairment and – optionally – by development potentials.” (modified on the basis of Haaren, Holitz 1991, Haase 1978, Bastian)

“Final” ecosystem services: “components of nature, directly enjoyed, consumed, or used to yield human well-being” (Boyed, Banzhaf 2007 p:619).

Ecosystem services are the aspects of ecosystems utilized (actively or passively) to produce human well-being.
1) services must be ecological phenomena and
2) they do not have to be directly utilized. Fisher et al. 2009:645

- Explicitly include results of human influence on territory
- Focussing on non-commercial market goods, selection criteria: basic, long time, legitimised human needs

Fisher et al. 2009 non excludable
Non rival
- Inclusion of potential, resilience, impairment
Pros and cons of including actual goods, commercial benefits in landscape planning valuation?

- Task of government is to preserve preconditions for different use options (societal, long term perspective)
- Actual use is short term, volatile, changeable → considered as a variable for management
- Actual benefit is perceived individually and differently and can be valued only on local/sub-local level
- Commercial benefits are brought forward in the spatial planning process anyway by stakeholders, other administrations
  + Acceptability by stakeholders and political support would rise.
  + Synergies between land use + conservation
  + Monetization facilitates communication with political decision makers
Options for accounting, monetization on the basis of landscape planning

Options for monetization:
- Potential market, rehabilitation value of functions & development potential
- Actual and potential rehabilitation costs
- Actual contribution to GDP, non market goods, contingent valuation

Applications:
- Support precaution, preservation; cost benefit analysis in decision procedures, compensation costs.
- Green GDP, calculate taxes, levies in case of external costs

Communication with political decision makers
Structure

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3. Conclusion: Potentials of a better integration of the approaches

1. Supplement environmental management with an additional (separate) ecosystem service accounting and monetization (national, state level)
   - parallel “bookkeeping” especially in SEA, EIA
   - Inclusion of time effects: compound interests, discounting?

2. Better framework for accounting needed: Homogeneous standards for assessment, valuation, geodata for all planning tiers (integrated environmental information systems → INSPIRE)

3. Use of methodologies and data from environmental management in accounting (inventory, assessment)

4. Open questions:
   - How to tackle risks of setting off nature values against each other and against commercial market values (weak sustainability)?
   - Communication with citizens: In connection to biodiversity and landscape beauty → danger of disenchantment of nature
Thank you very much for your attention