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Ecosystem Services and Forest Management in Europe
Perspectives from the EU Project ALTERFOR

Peter Biber, Eva-Maria Nordström, Maarten Nieuwenhuis

69. Tagung des Deutschen Forstvereins
Dresden, 9. Mai 2019
ALTERFOR - Question

How can Forest Management influence Ecosystem Service Provision in European Forest Landscapes?

- 10 Case study landscapes in 9 countries
- Selected for typical forest and socio-economic issues
- About 100,000 ha each
- Appropriate forest growth simulation tools / DSS available for each case study
The ALTERFOR Approach

National Frame Scenarios – Climate – Demand for Wood
(provided by IIASA, Vienna)

Country - Case Study Area

Forest Growth Simulations

Forest Management Scenarios

Scenarios of Ecosystem Service Provision

Meaning for Forest Policy

Synopsis
Frame Scenarios (by IIASA)

- **Reference scenario** – assumes that the future is based on historical development, an increase in timber demand. The global temperature will be about 3.7°C higher by 2100 than the pre-industrial level.

- **EU Bioenergy scenario** – assumes an increase in biomass demand over time. The global temperature will be ca 2.5°C higher by 2100 than the pre-industrial level.

- **Global Bioenergy scenario** – assumes stringent climate change policies worldwide, leading to an increase in biomass demand over time. Global temperature increase of 1.5 to 2.0°C by 2100, compared to pre-industrial level.
Forest Management Scenarios

Called „Alternative Forest Management Models“ - aFMMs

- Based on stakeholder surveys
- Individually defined on case study level
- Aimed at improved provision of desired (by important stakeholders) ecosystem services; extremes were not avoided
- 1-5 per case study and frame scenario
- General concepts on landscape level; translate into high differentiation on stand level

Example Germany: Landscape level scenarios were

1) Multifunctional forest,
2) Production forest,
3) Nature protection forest
Ecosystem Services

- Timber provision
- Biodiversity
- Regulatory services (resistance against main damages)
- Carbon sequestration (forest, products, emission savings)
- Cultural services (recreation)
- Water related services
Ecosystem Services

Ecosystem service (ES) provision was evaluated with case study specific approaches,

Guided by the ALTERFOR ES expert team

A common evaluation tool for Carbon balancing was developed
Ecosystem Service (ES) evaluation was based on a set of ~30 compulsory simulation output variables (from top height to deadwood).

We show a few examples on the following slides ...
Standing Volume [m³/ha]

2020

2060

2100

- General tendency of increase, low frame scenario differentiation
- Considerable divergence in Germany (production forest vs. setasides), setasides accumulate extreme volumes (high C-storage, but also high risk)
• General tendency of increase or stability (except Ireland and Italy)
• High interim differentiation in Germany
• Clear frame scenario differentiation in the Netherlands
• Initially mostly smaller than volume increment (=> increasing volumes)
• Extreme divergence in Germany AWF between harvesting waves in the production forest scenario and zero harvest in the setaside scenarios
• Frame scenario differentiation in Sweden, Slovakia, Ireland, and the Netherlands
General tendency of slight increase
But considerable divergence in some countries with several forest management scenarios (Sweden, Germany, Italy, Portugal)
• General tendency of shrinking balances (reasons are case study specific)
• Balances stabilize at values $\geq 0$
• Changes in forest bound C-stocks make great a difference, but emission savings are most important on the long run
Synthesis

All the simulation output variables (examples shown before) were used for evaluating perspectives for forest ecosystem service provision.

A collection of methods has been developed and applied to achieve this.

We summarize the main insights on the following slides ...
Synthesis

• The results obtained for the aFMMs reflect the heterogeneity of landscapes, forests, forestry and the forest management goals across Europe

• The global frame scenarios had in general no pronounced effects
  • This may be partly due to methodological reasons
  • But also due to the fact that forests are slow-developing systems with negative feedback loops creating a remarkable degree of inertia and resilience

• Sustainable timber supply seems possible at high levels in all three global frame scenarios
  • This may, however, not be enough to satisfy the timber demand under the Global Bioenergy Scenario

• The problem of how to fight climate change best with forest management comes down to a strategical decision somewhere between two extremes:
  • Maximize sustainable wood production in order to have maximum ‘eternal’ C-emission savings, or
  • Try to achieve maximum C sequestration rates in forest-bound stocks with very low harvest amounts

• To find optima between these two extremes is an important task for the future
• Lower harvest rates, as implied by the low-impact management strategies, will consistently increase a forest landscape’s recreational value.

• In many cases, lower harvest intensities also coincided with higher biodiversity. However, initial local conditions seem to have a considerable impact on how an FMM affects biodiversity.

• Deciding between low and high impact forest management must also be considered from a risk perspective as stands with high stand densities and large standing volume/biomass usually are more risk-prone than (thinned) stands with lower densities.

• In some cases, high intensity forest management conflicted with water-related services by creating unsuitable stand structures and species compositions.

• Conflicts with water-related services, were found in situations where fire risk mitigation measures, or the provision of recreation-friendly landscapes, increased the erosion potential.
Conclusions

• ALTERFOR provides a state-of-the-art European perspective on forest management and the provision of ES throughout Europe

• Considerable effort has been invested in improving the applied DSS models’ capabilities to provide ES projections for large forested landscapes while maintaining down-to-the-stand-level silvicultural diversity

• The degree of detail in the silvicultural scenarios and associated ES provision modelling, while embedded in large-scale market and climate change scenarios and stakeholder preference research, is unprecedented for such a large collection of forest DSS/models and variety of forested landscapes

• From the experiences gained so far, we learned that a most important field for DSS, model and scenario development is the integration of extreme climate-related events

• While this compilation of results for aFMMs clearly indicates the potential to increase the provision of all considered ES individually, the obtainable synergies and tradeoffs often vary from region to region