Sustainability and multi-functionality in Europe's forests

Beyond Wood -conference
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Jaana Bäck & EASAC team, Beyond Wood
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Sustainability and multi-functionality in Europe's forests

- Inherently a multidisciplinary problem
- Large regional and national differences exist in forest history, condition, suitable/recommended management choices, policies and strategies
- Fulfilling international treaties (Kyoto protocol, Paris UNFCCC Agreement, Convention on Biological Diversity etc.) requires a comprehensive approach, many tradeoffs can be recognized

*European Academies of Science Advisory Council (EASAC)* decided to compile a science-based report

- Hosting: Finnish Academy of Science and Letters, participating high level experts from 15 countries
  - Multidisciplinary approach, including energy, economics, forestry, conservation, ecology and climate change experts
  - Independent scientific evidence

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What is in scientific discussion?

1) CLIMATE CHANGE
2) BIODIVERSITY

Bellassen & Luyssaert Nature 2014

Fares et al., Nature 2015
1. Climate change: Sources and sinks for carbon

1.1 Pg C y\(^{-1}\)

\[ 7.8 \text{ Pg C y}^{-1} \]

\[ 4.0 \text{ Pg C y}^{-1} \]

\[ \text{Atmosphere} \quad 44\% \]

\[ 2.6 \text{ Pg C y}^{-1} \]

\[ \text{Terrestrial ecosystems} \quad 30\% \]

\[ 2.3 \text{ Pg C y}^{-1} \]

\[ \text{Oceans} \quad 26\% \]

\[ \text{Pg} = 10^{15} \text{ g} = 10^9 \text{ tn} \]

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Sources: CDIAC NOAA-ESRL; Houghton et al, 2012; Giglio et al 2013; Le Quéré et al 2015; Global Carbon Budget 2015
Message 1. Climate change

Forest carbon sink and storage are dynamic and depend on management

A. Forest carbon sink has been increasing in EU28 during recent decades due to increases in nitrogen deposition and temperature, afforestation and improved management (increases in stand density)

B. However, climate change already affects negatively the forests: their resilience should be ensured to maintain the carbon sink
   A. Drought, storms, pests, diseases
   B. Adaptive, active management tools (continuous cover forestry, multiple species stands, rotation times, genetic diversity)

C. Not only CO₂ feedbacks are important → Full climate impact of forests should be evaluated

D. Is utilization of forests and forest bioenergy carbon neutral?

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Forest disturbance damages in Europe 1971–2030

Storms, windthrows

Bark beetles

Forest fires

Seidl et al. 2014
Is bioenergy from forests carbon neutral?

The carbon neutrality argument:
Burning of forest biomass causes CO₂ emissions but they are eliminated by the growth of new trees implying that in the long run sustainable forestry is carbon neutral and excellent source of renewable energy compared to fossil fuels

Problems in carbon neutrality argument:
1. It may take 20-300 years before the released CO₂ is stored in new trees
2. CO₂ emissions per produced energy unit from forest biomass are 1.2-2 times higher compared to natural gas and coal
3. In the long run comparisons with fossil fuels may be misleading because of new low carbon energy technology may become available
4. The possibilities to actively increase carbon storage in forests are neglected
The current EU accounting principle:
Decreases in forest carbon stocks are accounted as emissions but emissions from burning of forest biomass are not

EU policy: decreases in forest carbon stocks do not have any serious implications (if forest land area is maintained)
Thus, forest bioenergy is taken as if it is carbon neutral

Problems is EU policy
• No incentives to increase carbon storage in forests
• No incentives to store carbon in wooden product as long as possible

The EASAC team is developing an alternative accounting principle and policy implementation that aims to solve these problems
Message 2. BIODIVERSITY

Sustainable forest management criteria do not guarantee the conservation of biodiversity in forests

A. Areas of conflict and tradeoffs between renewable energy and biodiversity policies in EU
B. Global and EU –level biodiversity conservation is compromised by exclusive Member State level land use planning
C. Agreement on “natural state baseline” or pre-degradation state is needed for monitoring biodiversity
D. Meeting biodiversity conservation targets is more important than ever in the face of accelerated (environmental/climate) change but could be compromised by rapid implementation of forest intensification schemes

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Biodiversity tradeoffs

• EU's renewable energy directive sets a binding target of 20% final energy consumption from renewable sources by 2020, and recently it agreed to raise the target to 27% by 2030.

• Global Aichi targets 11 and 15 developed by the Convention on Biological Diversity state that by 2020 we will increase the protected area networks to 17% and restore 15% of the degraded lands respectively.

• Intensification of forest use e.g. for the production of biomass should be concentrated in areas that are already established as forest plantations and avoid further degradation of semi-natural forests.
Synergies and trade-offs between renewable energy and biodiversity

- BLACK: Protected Areas (PA)
- DARK GREY: top ranked areas for 17% PA expansion
- LIGHT GREY: 17–30% highest ranked areas
- WHITE: remaining 70% of the landscape

GCB Bioenergy
26 OCT 2015 DOI: 10.1111/gcbb.12299

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Summary

Knowledge gaps

– Economically and ecologically viable alternative management options are not sufficiently understood or implied in forest policy
– Carbon and climate neutrality of forestry should be re-assessed
– Tradeoffs between bioenergy & other wood uses, and other ecosystem services (climate, biodiversity, recreation)
Summary

Risks and opportunities

– Any forest harvesting immediately decreases carbon stored in trees and soil → Albeit substitution effects, there will be a period (20-350 years) with higher emissions (to reach the Paris agreement 1.5 C warming necessitates rapid emission decreases)

– Substitution of fossil fuels with forest bioenergy requires that bioenergy policy is systematically integrated with country or EU level emission reduction policy

– Adaptive management tools, optimising both climate impact and biodiversity (continuous cover forestry, multiple species stands, rotation times, genetic diversity)
THANK YOU!