



Pools and fluxes of carbon in Finnish forests and their socio-economic implications

presents

Forest Ecosystem Carbon and Its Economic Implications

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www.metla.fi



Why

What

Some results

Conclusion

Pools and fluxes of carbon in Finnish forests and their socio-economic implications 2001-2005

Needs

- Science for decision making about Kyoto Protocol, for UNFCCC matters
- GHG inventory for UNFCCC in Forest Land and some other LULUCF categories is accomplished by Metla (NFI), Kyoto reporting in the future
- Science

Pools and fluxes of carbon in Finnish forests and their socio-economic implications 2001-2005

Extent

- about 10 scientist man years / year
- Financing: Metla 70%, outside 30% (Ministries, Academy of Finland, ...)
- until now 35 ref. publications, 151 other types of publications

Cooperation within programmes

- SUNARE programme (Academy of Finland)
- Greenhouse impacts of the use of peat and peatlands in Finland (Ministries)
- Environmental Cluster Programme (Ministry of the Environment)

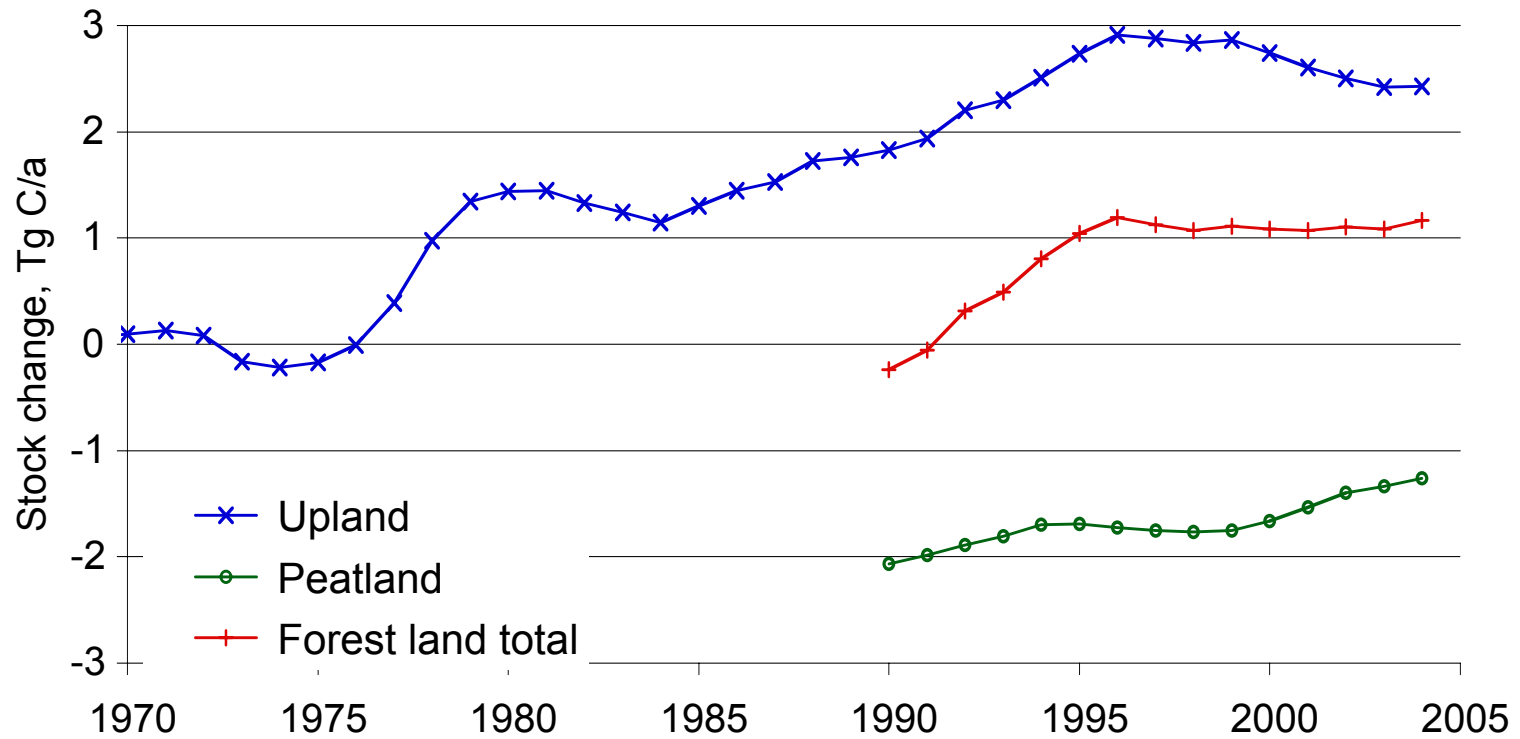
Results / Activities

1. Stock changes of dead wood, litter, and soil organic matter in Forest land for national GHG reporting in 2005
2. Stock changes of carbon in forests, past and future
3. Uncertainty of estimates of stock changes
4. Measurements of carbon stocks and fluxes in upland, peatland forests and afforested agricultural fields
5. Economic analyses of carbon sequestration at stand and forest level
6. Policy options



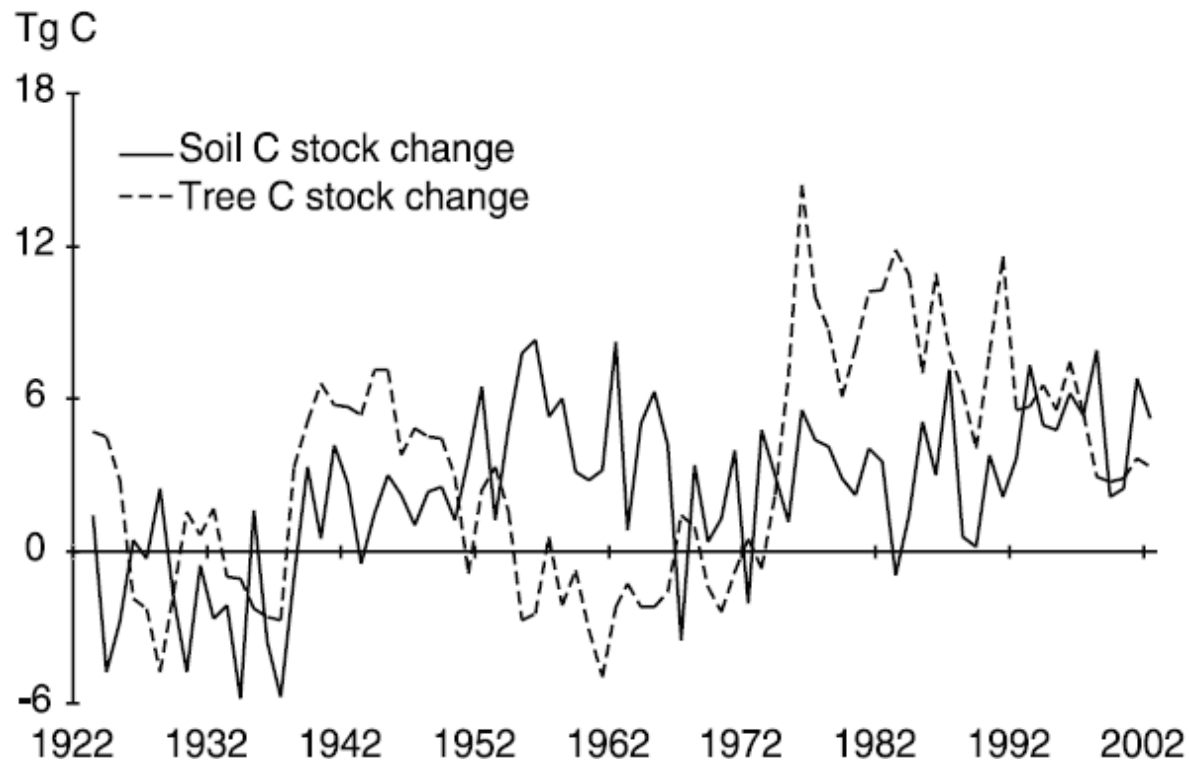
Stock change of dead organic matter, litter, and soil c matter in Forest land

Trees: ~ 7 Tg C/a



National Inventory Report to the European Union, 15 January 2006

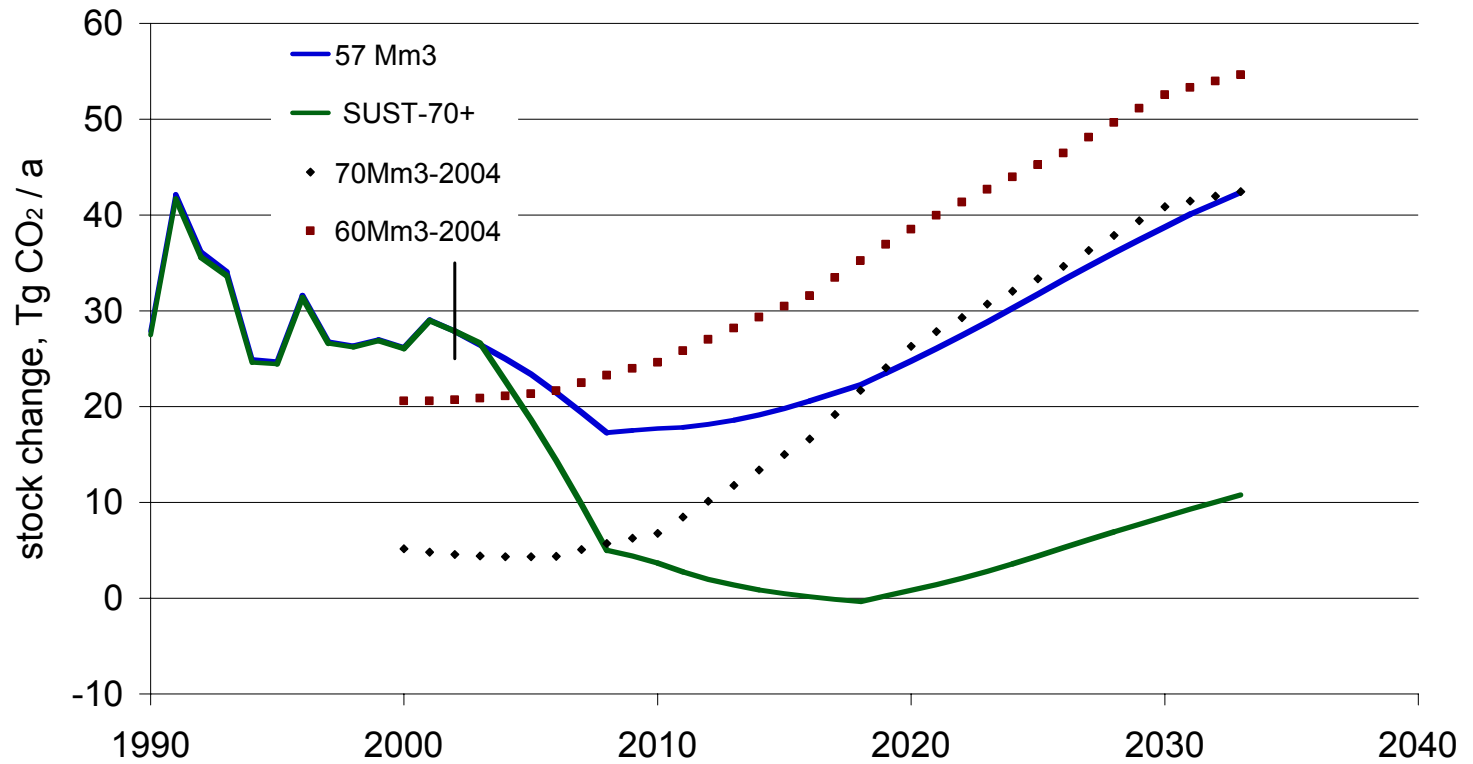
Change of tree biomass and soil C stocks in upland forests



Liski, J., Lehtonen, A., Palosuo, T., Peltoniemi, M., Eggers, T., Muukkonen, P. & Mäkipää, R. Carbon sink of the Finnish forests 1922-2002 estimated by combining forest inventory data with modelling of biomass, litter and soil
Annals of Forest Science (in revision)



Change in tree biomass and soil C stocks on Forest land



MELA system - Nuutinen et al. 2005 www.metla.fi/julkaisut/workingpapers/2005/mwp013.htm
www.mmm.fi/luonnonvarat_vesivarat_maanmittaus/luonnonvarapolitiikka/ilmastopolitiikka/MMM-nieluselvyys.pdf 2004

Uncertainty of estimates of carbon stock changes

M. Peltoniemi (Parallel session I):

- Uncertainties of forest carbon sinks are large in comparison to other sectors
- Uncertainty of soil carbon dominates in forest

Morning sessions:

- Uncertainties in estimating carbon inputs to soil high (not yet quantified)
- Especially in turnover rates of moss biomass and fine root biomass of trees and shrubs, and the decomposition rates

Pools and fluxes of carbon on mineral soils

Understanding carbon dynamics

Quantification of carbon stores and fluxes

- ▶ Stand level measurements
- ▼
- ▶ Relationships to site/stand/climate
- ▼
- ▶ National Forest Inventory data
- ▼
- ▶ Regional/national estimates



Pools and fluxes of carbon on peatlands

A. Impacts of different management regimes on GHG fluxes on organic soils

- Effect of forest management on GHG fluxes on forestry drained peatlands
- Effect of afforestation on GHG dynamics of boreal organic agricultural soils and cutaway peat production areas
- Regional variation of methane emissions from undrained and drained peatlands
- N₂O emissions from fertile swamp forests

B. Organic matter dynamics in peatland forests

- Chemical quality and decomposability of different types of litter
- Rates of decomposition of different types of litter in peatland forests
- Biomass production and its allocation in peatland forests

Economic analyses of carbon sequestration at stand and forest level

J. Pohjola (Parallel session II):

- Thinnings are important in increasing carbon sequestration.
- Scots pine; postponing and lightening thinnings
- Norway spruce; mainly the rotation length

Policy options

J. Uusivuori, J. Laturi (Parallel session II):

- Policies aimed at increased carbon sequestration in private forests may offer an effective instrument for carbon policies
- More research is needed to evaluate the short and long run impacts of policy instruments

Conclusions

We have:

- Methods to assess C stocks, fluxes of GHG's, and their changes at stand and regional level
- They have been used in GHG reporting and scenario analyses
- Empirical results have been produced and utilized in calculations
- Information on average values
- Information on economics of carbon sequestration and policy options

We need:

- Information on variability, what is behind it: processes, and their parameters = $f(\text{site conditions, temp, moisture, ...})$ --> improved models, more accurate estimates, capability to consider CC effects
- Important processes: litter production and decomposition
- Integrated analysis of forest sector considering carbon in forests and in products and their substitution effects, policy analysis