

# The CO<sub>2</sub> Storage Balance

A method for more comprehensively assessing  
GHG implications of wood use

## Managing forests in the 21st century

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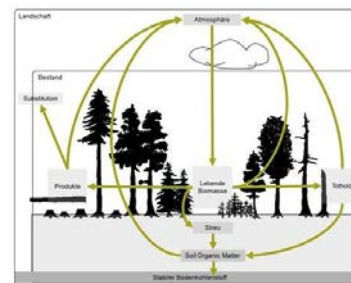
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# Background

## Assessment of mitigation options including biomass use



000005.0007 — EN — 08.04.2018 — 010.001 — 1

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► **DIRECTIVE 2008/57/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**  
of 13 October 2008  
establishing a **EU system** for **assessing** the **compatibility** of **rolling stock** with the **ETCS** system and **amending** Council Directive 2001/16/EC  
(Text with EEA relevance)  
(OJ L 275, 25.10.2008, p. 15)

Amended by:

	Official Journal				
	No	page	date		
► <b>M1</b>	Directive 2004/101/EC of the European Parliament and of the Council	1	138	18	13.11.2004
► <b>M2</b>	Directive 2008/101/EC of the European Parliament and of the Council	3	131	2009	19 November 2008
► <b>M3</b>	Regulation (EC) No 219/2009 of the European Parliament and of the Council	1	109	13.1.2009	13 March 2009
► <b>M4</b>	Directive 2008/59/EC of the European Parliament and of the Council	1	140	63	5.6.2008
► <b>M5</b>	Directive No. 1159/2011/EC of the European Parliament and of the Council	1	143	1	19.12.2011
► <b>M6</b>	Regulation (EU) No 413/2013 of the European Parliament and of the Council	1	129	1	30.4.2014
► <b>M7</b>	Regulation (EU) 2015/1007 of the European Parliament and of the Council	1	264	1	9.10.2015
► <b>M8</b>	Regulation (EU) 2017/1001 of the European Parliament and of the Council	1	350	7	29.12.2017
► <b>M9</b>	Directive (EU) 2019/1161 of the European Parliament and of the Council	1	76	3	19.3.2019

Amended by:

► <b>A1</b>	Treaty of the European Union	1	112	21	24.6.2012
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Comments:

► **C1** — Commission, OJ L 180, 14.5.2014, p. 177 (421/2014)

e.g. co-firing of wood pellets  
in coal power plant

[illegible]

e.g. advanced biofuels from wood, energy wood

19/4/2018

1/20

Official Journal of the European Union

L 134/1

I

(Legislative act)

REGULATION

REGULATION (EU) 2018/945 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 19 June 2018

on the inclusion of greenhouse gas emissions in accounts for companies and on energy efficiency in the 2030 climate and energy framework and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework (EU) 2018/945

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the Member States,

Having regard to the opinion of the European Economic and Social Committee,

Having regard to the opinion of the Committee of the Regions,

Acting in accordance with the ordinary legislative procedure,

Have decided:

Article 1 of the European Union's commitment to the 2030 climate and energy policy framework, and on energy efficiency in the 2030 climate and energy framework, and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework, and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework (EU) 2018/945

(1) The European Council and the Council of the European Union, in their 2030 climate and energy policy framework, and on energy efficiency in the 2030 climate and energy framework, and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework, and on energy efficiency in energy-intensive industry in the 2030 climate and energy framework (EU) 2018/945

(1) OJ L 2018/945, 19.6.2018, p. 101.

(2) OJ L 2018/945, 19.6.2018, p. 101.

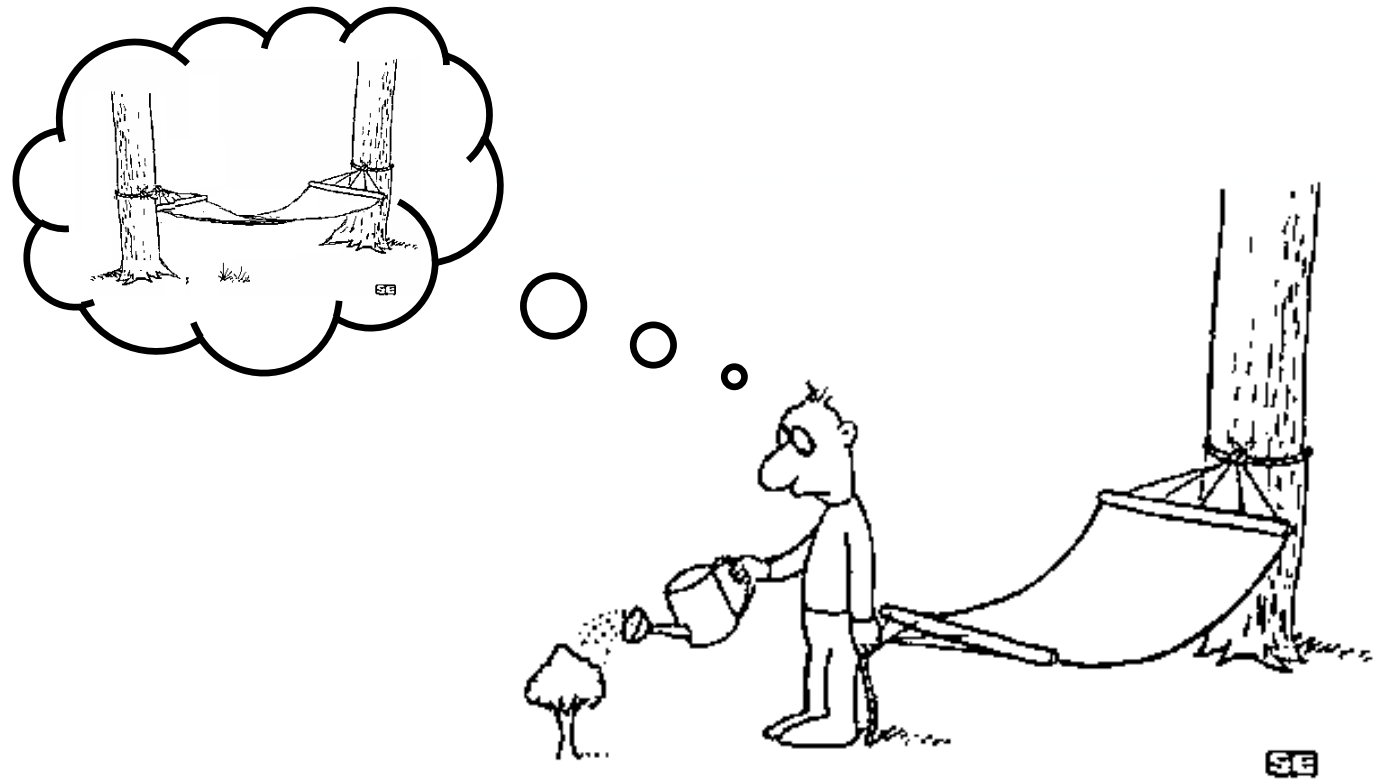
(3) Position of the European Parliament of 17 April 2018 (not yet published in the Official Journal) and decision of the Council of 14 May 2018.

(4) Directive 2018/757 of the European Parliament and of the Council of 11 October 2018 establishing a scheme for greenhouse gas emissions allowance trading within the Community and amending Council Directive 2003/87/EC, OJ L 2018/945, p. 10.

## „No-debit“ rule, forest reference levels

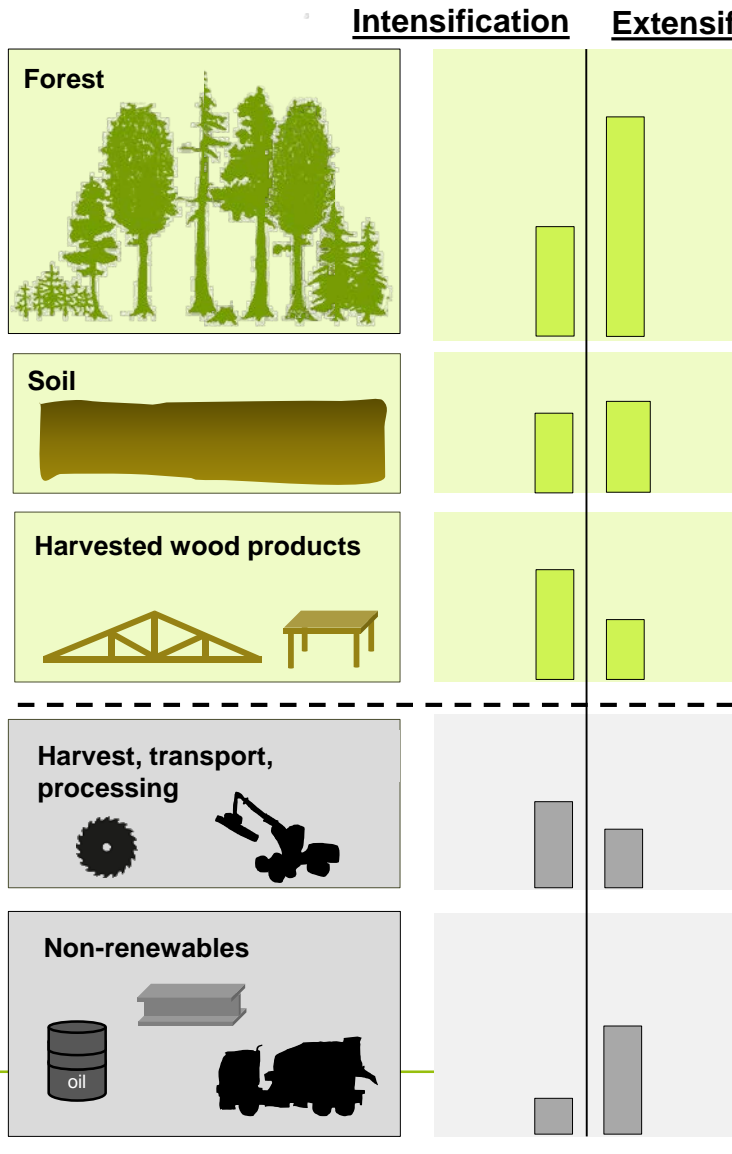
# Forest management for climate change mitigation?

High hopes



# Methodology

## Assessing GHG implications of biomass use



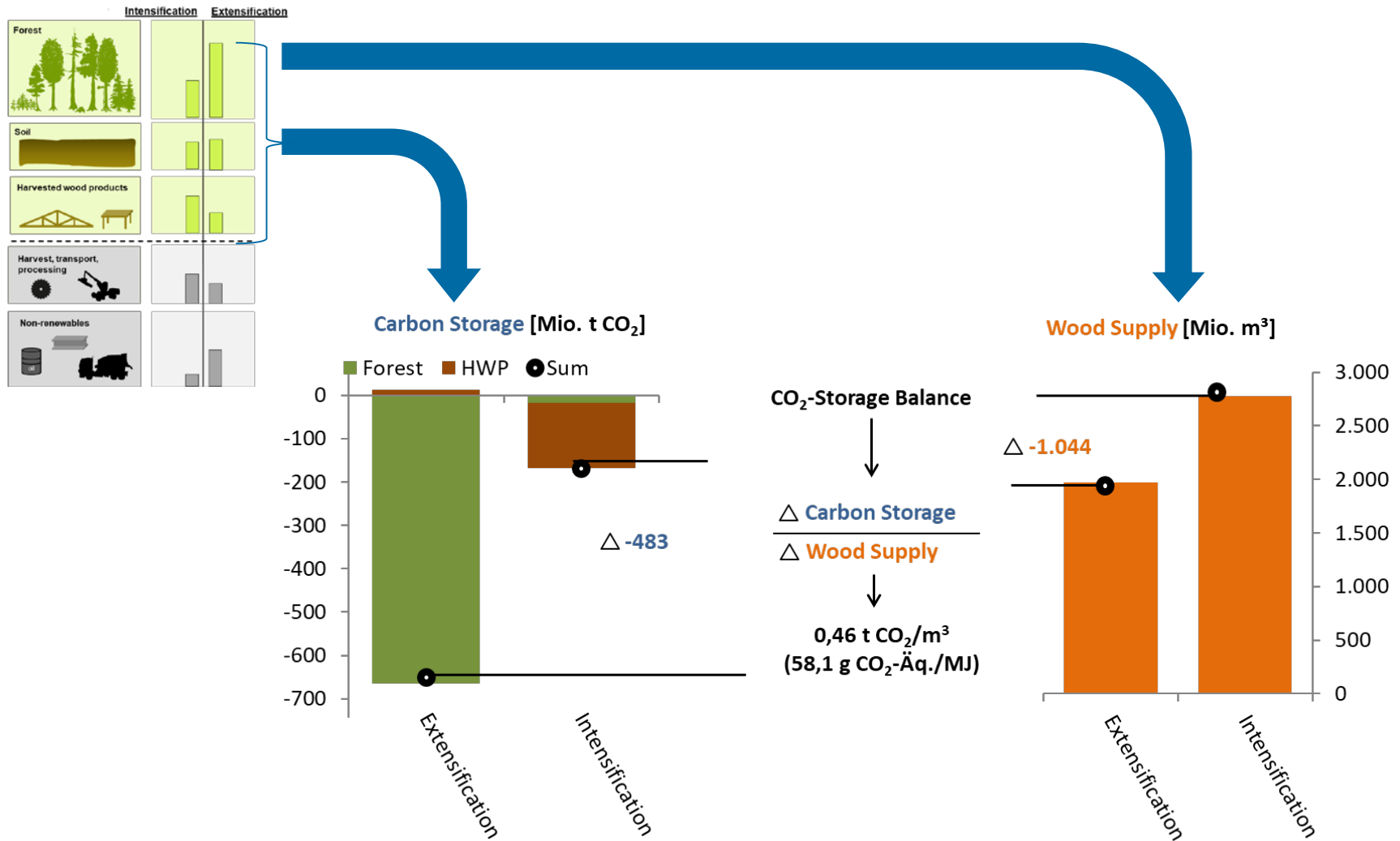
- Comparison of two alternative systems
  - Intensive biomass use
  - Extensive biomass use (no use)
- Inclusion of all carbon pools and effects
  - Forest, soil
  - Harvested wood products (HWP)
  - Fossil fuel emissions
  - Substitution

CO<sub>2</sub> storage

CO<sub>2</sub> emissions

# Methodology

## General approach of CO<sub>2</sub> Storage Balance (CSB)



# Methodology

## Review study

**Review:** >150 modelling studies comparing at least two management scenarios of different intensity, covering boreal and temperate forests

**Construct:** 175 scenario pairs within studies

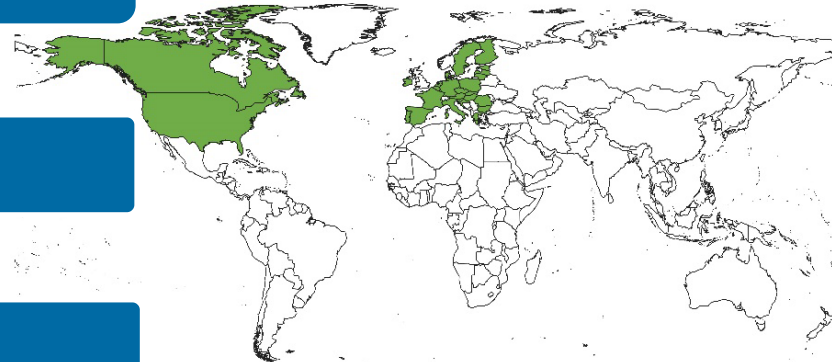
**Extract:** model output and assumptions

**Carbon storage** [t CO<sub>2</sub>/year]  
Forest (biomass, litter, soil)  
Wood products

**Wood supply** [m<sup>3</sup>/year]

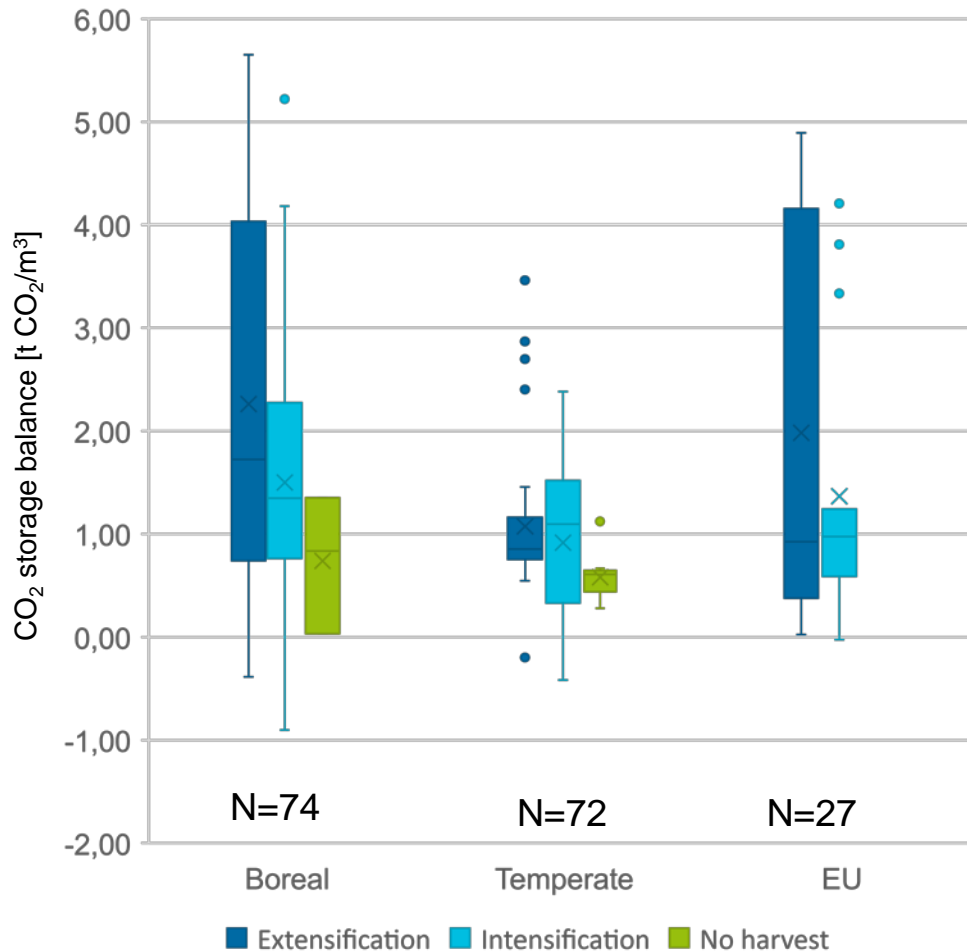
**Forest types, scenario assumptions etc.**

**Calculate:** CO<sub>2</sub> Storage Balance (CSB)



# Results

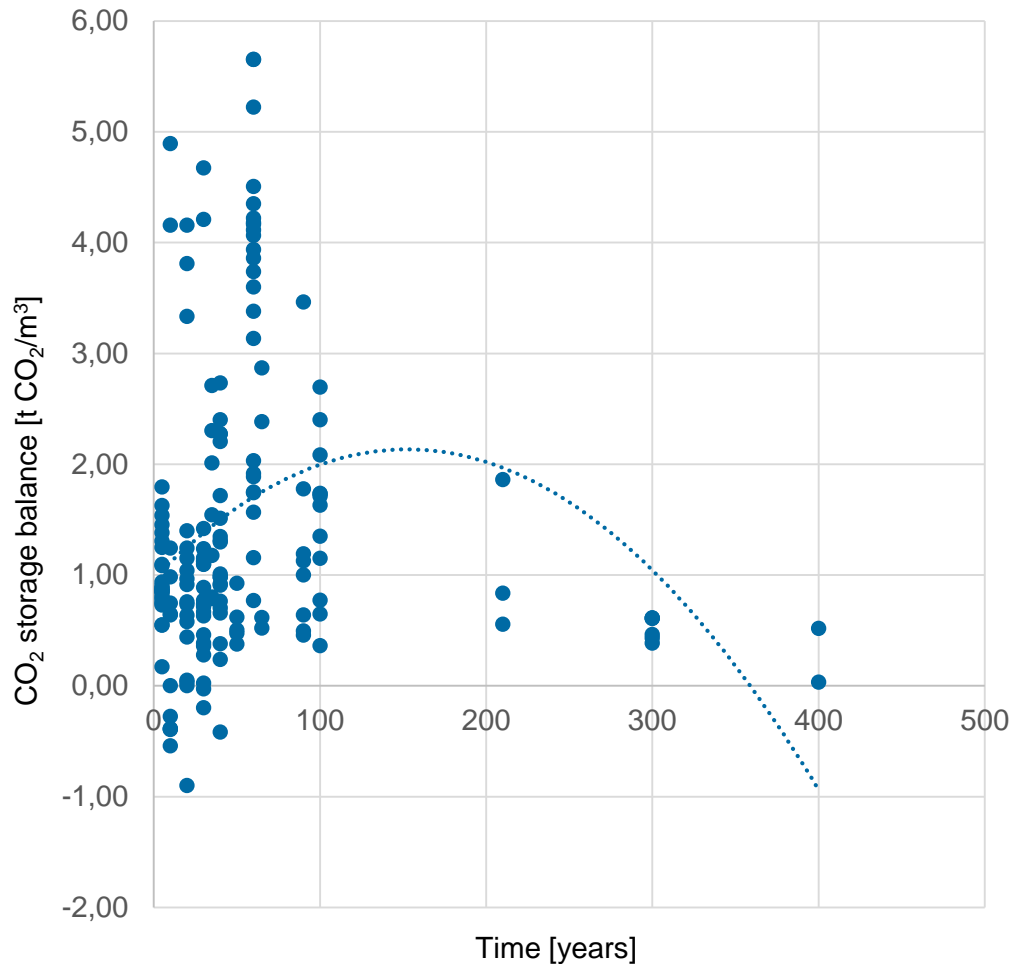
## Impact of forest types and scenario types



- CSB varies largely between studies
- CSB for temperate forests lower than for boreal
- Similar effects for intensification and extensification
- Scenarios of „no harvest“ option have lower CSB
- Lack of studies assuming „no harvest“ scenarios

# Results

## Impact of time

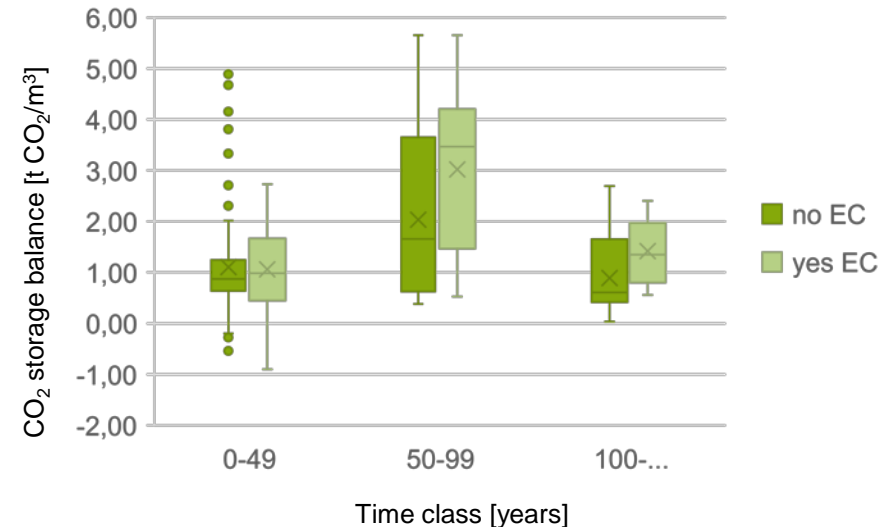
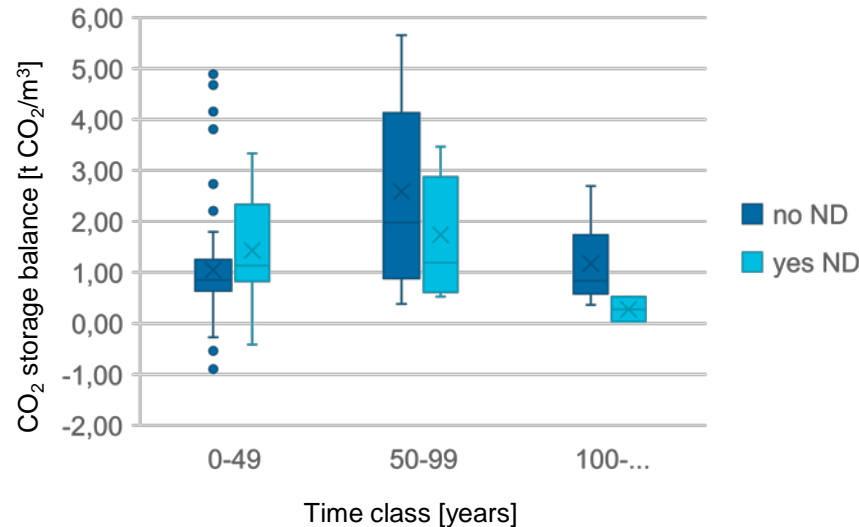


- CSB increases until 50 years simulation time, then decreases
- CSB can be negative in the short term for some scenarios
- Lack of long-term simulation studies



# Results

## Impact of Natural Disturbances (ND) and Environmental Change (EC)

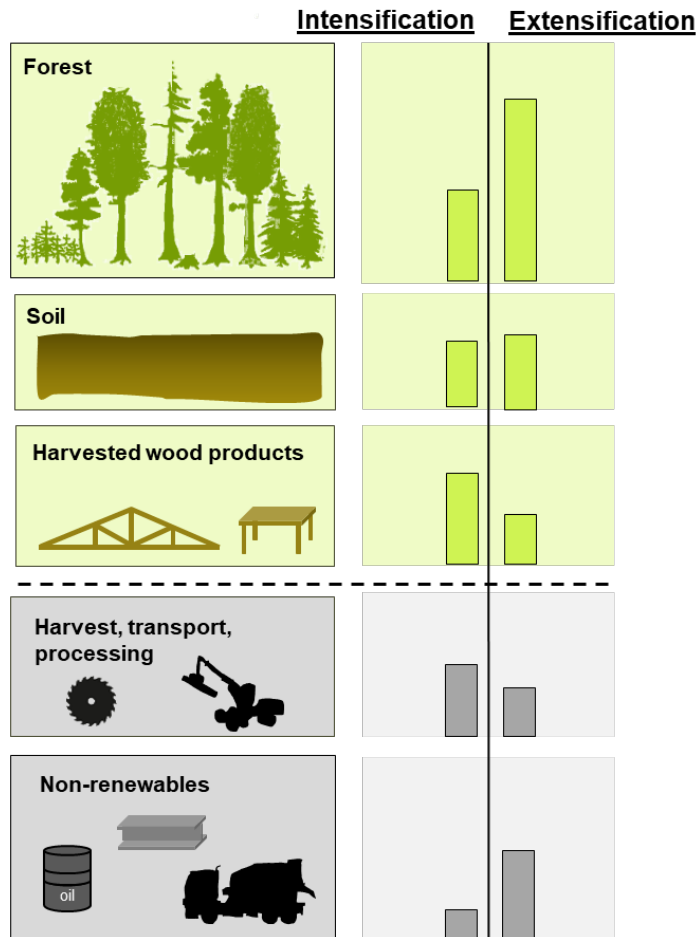


- CSB is reduced when natural disturbances (e.g. wind brake, bark beetle, fire) are considered in models, especially in the long-term
- CSB is increased when environmental change (e.g. increased CO<sub>2</sub>, Nitrogen deposition etc.) is considered in models

# Synthesis

## Integration of CO<sub>2</sub> Storage Balance into GHG Lifecycle Analyses

Taking Germany as an example...



	Low CSB model estimate	High CSB model estimate
Δ Harvest (m <sup>3</sup> /ha/a)	3,35	1,19
CSB (t CO <sub>2</sub> /m <sup>3</sup> )	0,62	1,43

	t CO <sub>2</sub> /ha/a	t CO <sub>2</sub> /ha/a
Δ Forest	2,08	1,71
Δ Soil	?	?
Δ Harvested wood products	-0,73	-0,26
Δ Harvest, transport, processing	1,20	0,43
Δ Non-renewables	-4,28	-1,52
<b>Σ</b>	<b>-1,73</b>	<b>0,36</b>

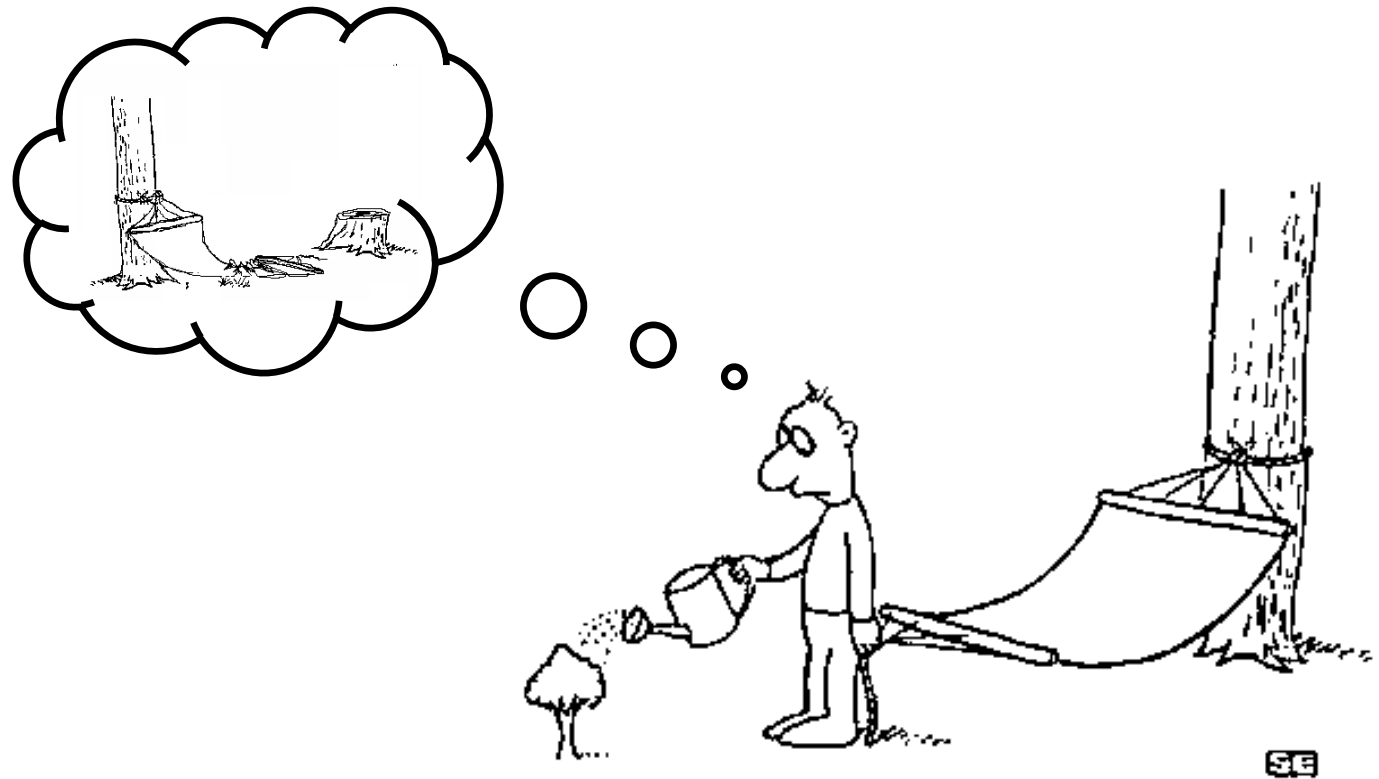
# Conclusions

## Implications for assessments of mitigation options including biomass use

- The CO<sub>2</sub> storage balance (CSB) can be determined by comparing scenario results
- It depends on level of management intensity, forest initial state, time period covered etc.
- CSB is relevant for the assessment of the overall GHG balance of wood use, especially when substitution effects are low (energy use)
- CSB is often ignored, leading to overestimation of mitigation potential of mitigation options including biomass use

# Forest management for climate change mitigation?

High hopes or disappointment?



# Thank you!



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