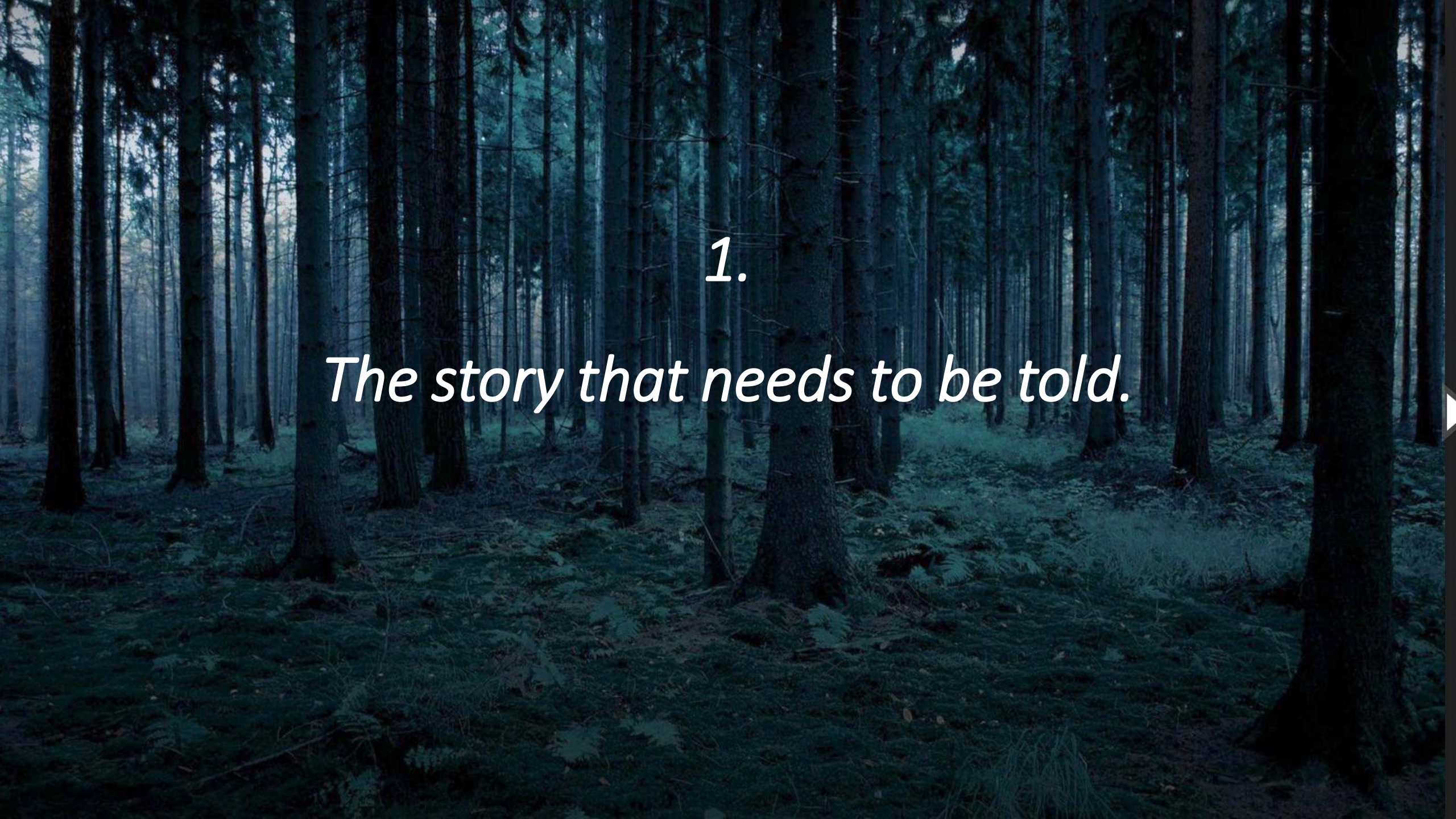
Climate effect of the forestry sector in Europe

Preliminary findings
Report outline

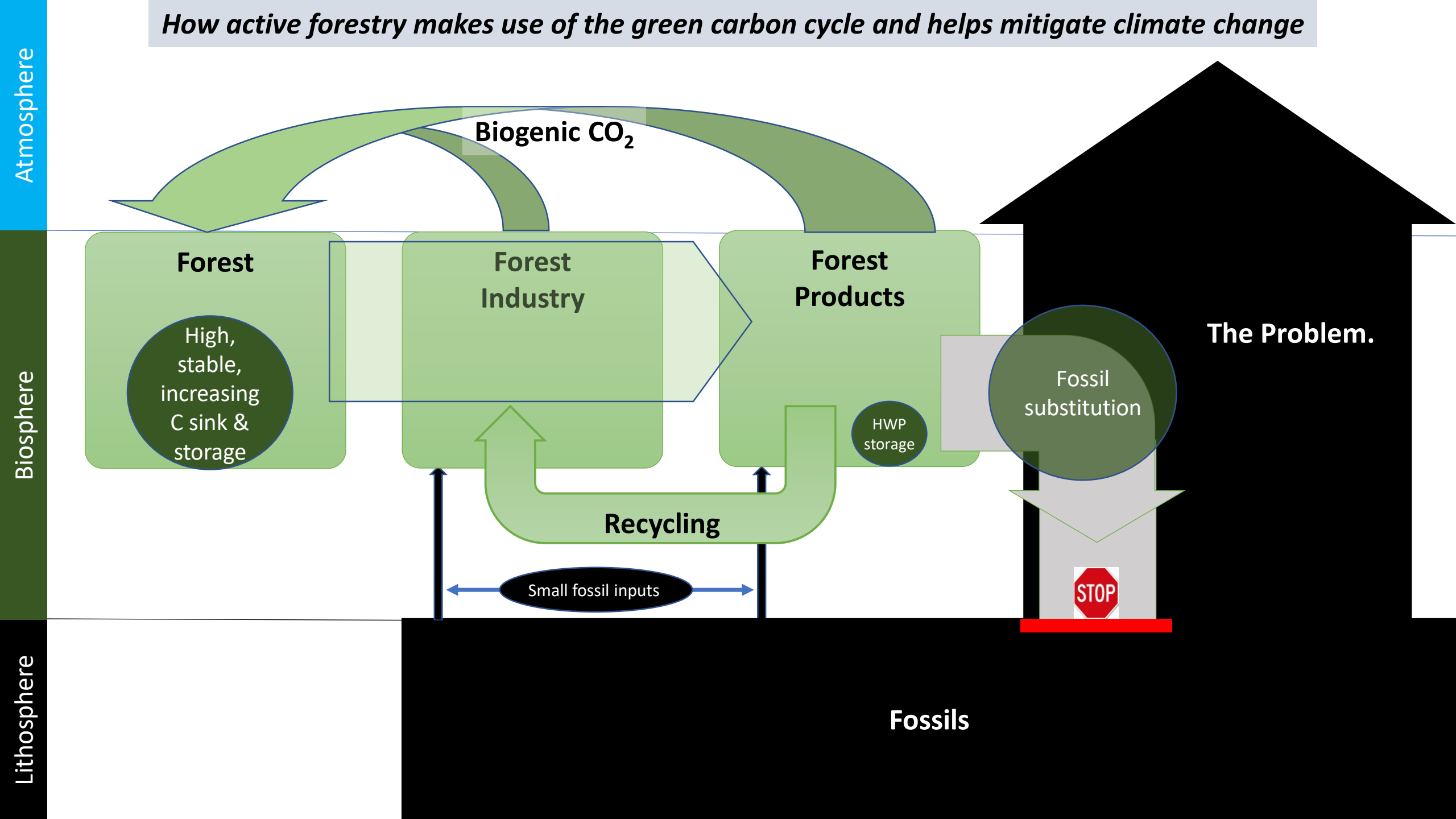
Peter Holmgren 29 January 2020

Outline

1. The story that needs to be told
2. How (much) are European forests used?
3. Understanding the ”substitution effect”
4. Climate effects - results
5. Key points


1.
The story that needs to be told.

How active forestry makes use of the green carbon cycle and helps mitigate climate change



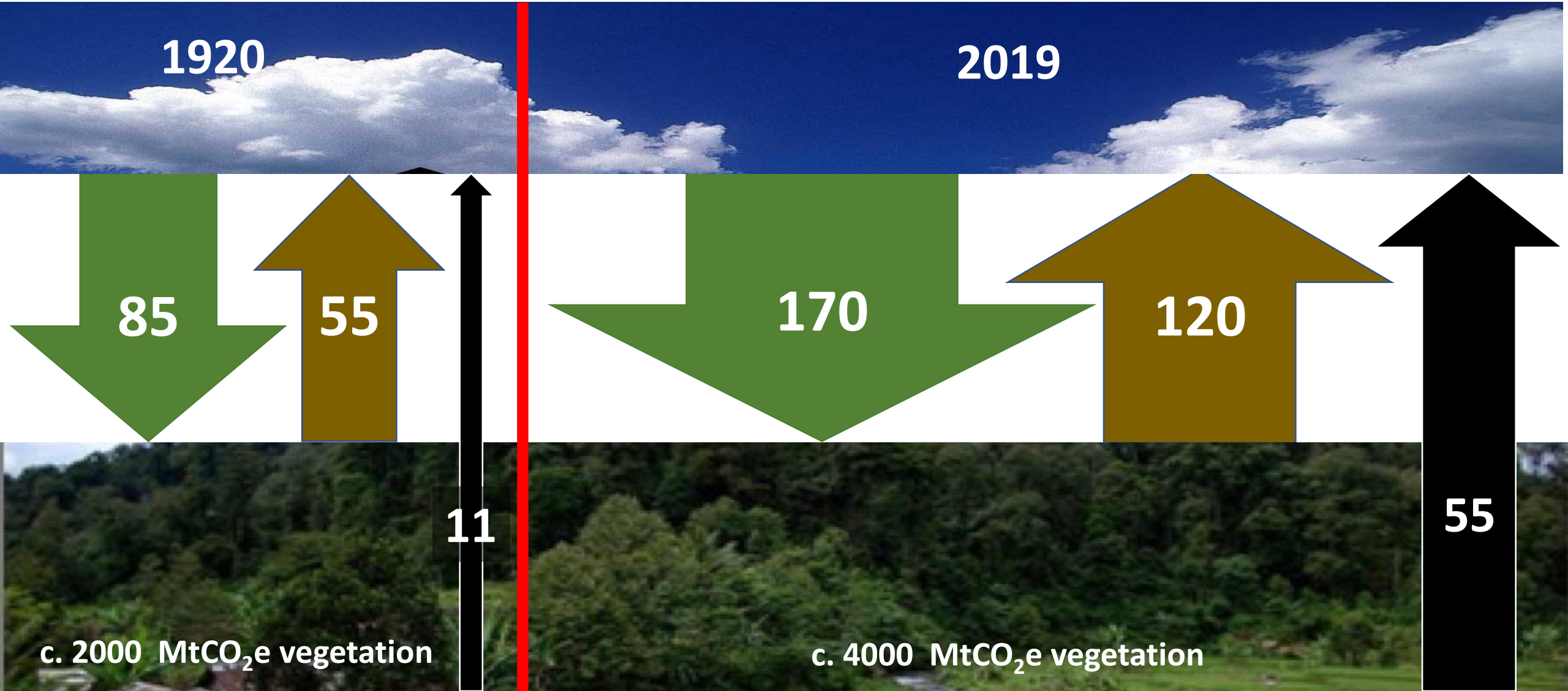
Large carbon sink in Swedish forests.

Forest growth - sink

Harvest & losses

Swedish fossil emissions

$MtCO_2e/yr$



Forestry & Forest products

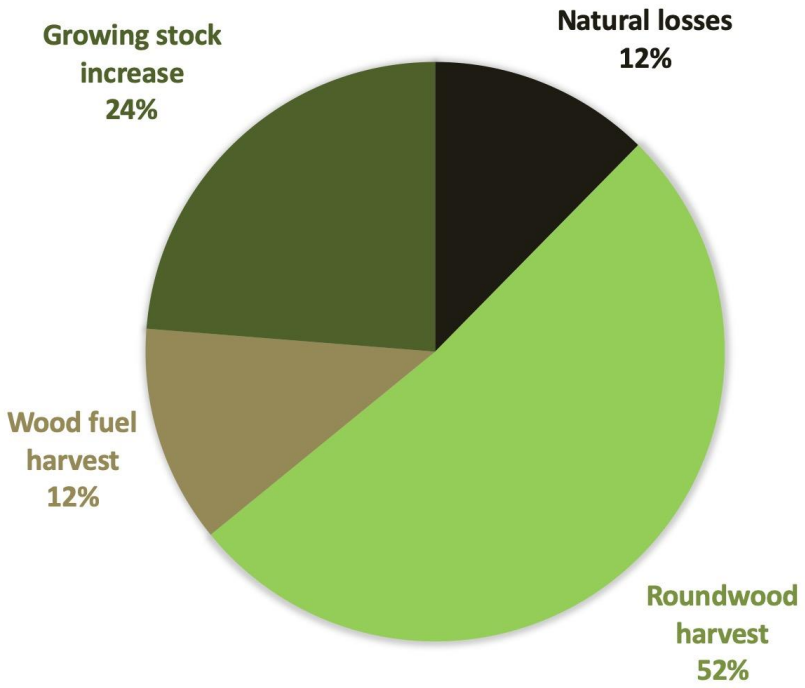
- Great for climate action!
  - at scale
  - already
- Must be considered as an integrated system
- Current sector structure in UNFCCC-related policies
  - isolates the forest
  - does not encourage integrated forestry action
- Important to illustrate & quantify overall climate effects
  - including potential for enhancing effects

2.

How (much) are European forests used?

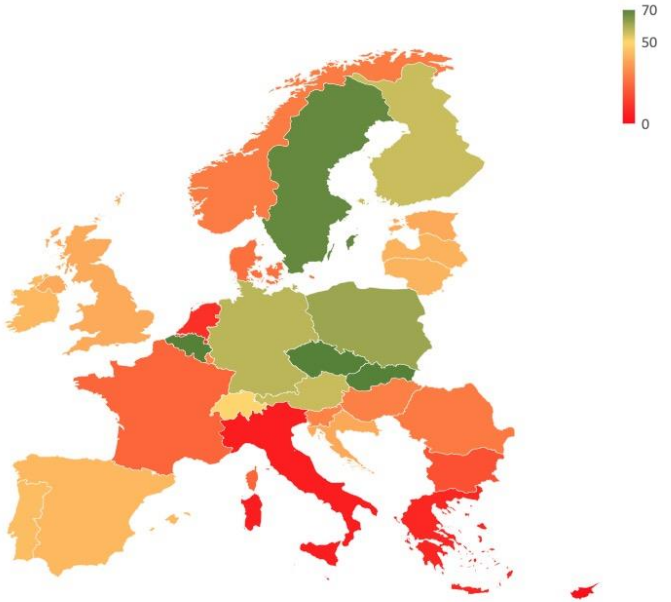
Intensity of forestry in EU28+2, all forests

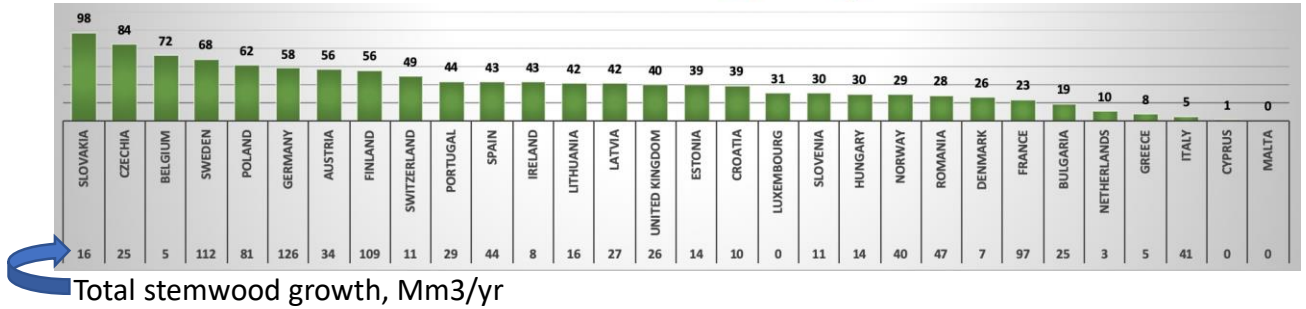
Destination of forest stemwood growth



Gross growth = c. 1bn m^3/yr

Appr. % of stemwood growth used industrially

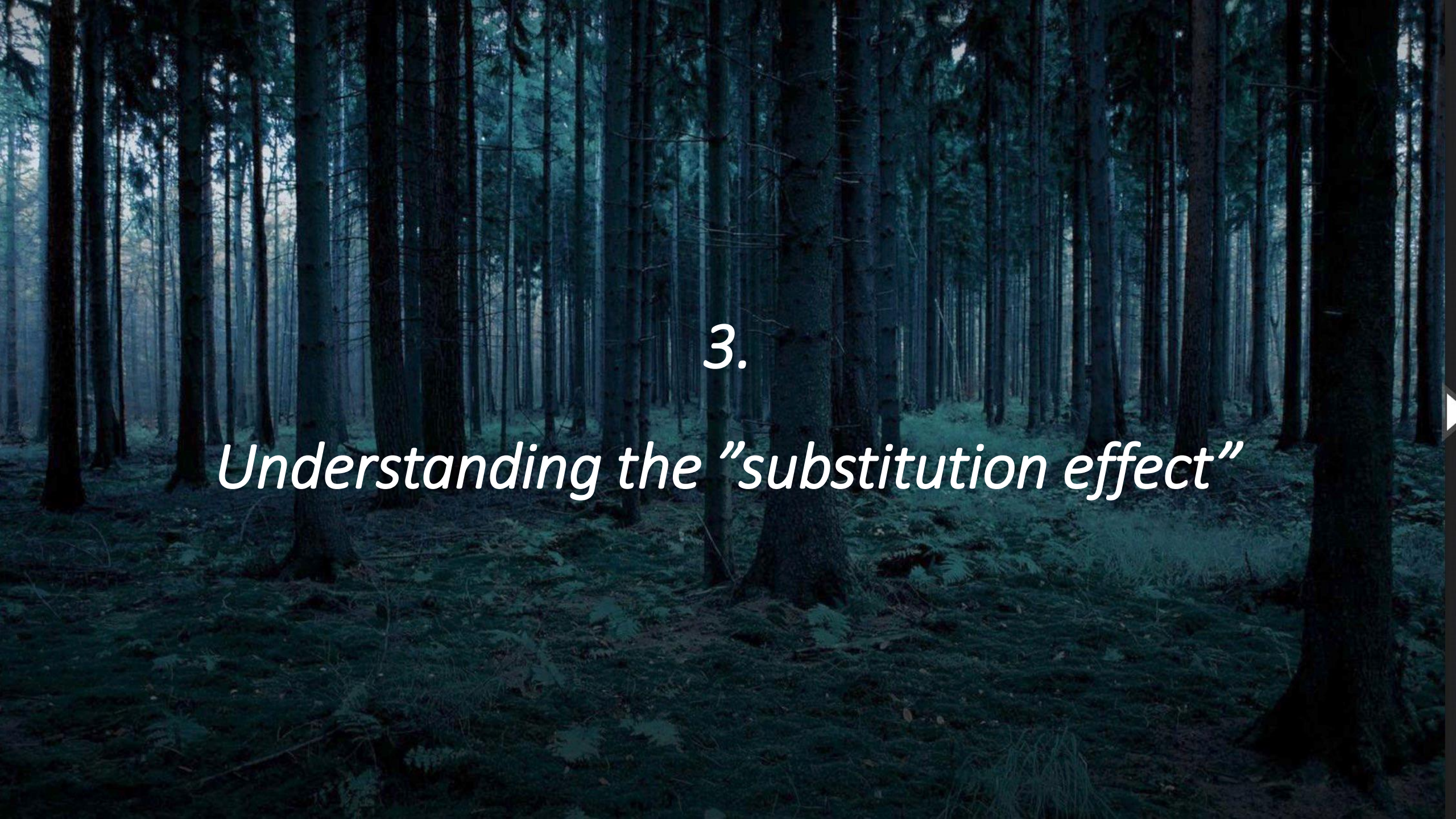




Total stemwood growth, Mm3/yr

Context of European forest management

- Considerable dynamics in recent decades
  - Timber crisis in post-war reconstruction
  - Urbanization and economic growth
  - Increasing forest areas and stocking
- Current situation
  - About half of growth used by industry
    - Varying level of investment in value chains
  - LULUCF logic: Forest to compensate European emissions
    - Risks with parking carbon long-term in forest (fire, storm, bugs)
  - Biodiversity strategy
    - Proposals to ”protect” much larger areas
- Will the forest potential for climate action be realized?
  - #EUGreenDeal



3.

Understanding the ”substitution effect”

Understanding the ”substitution effect”

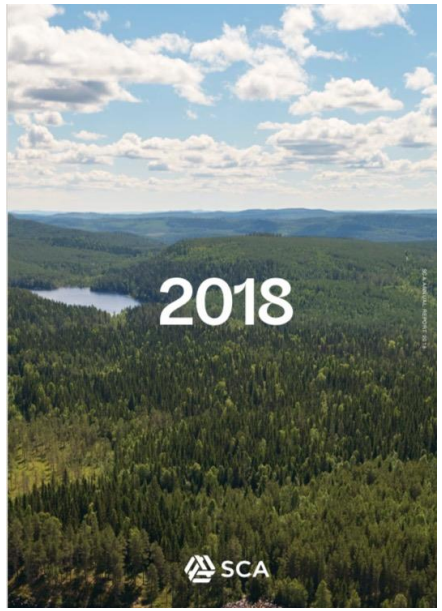
- Increase wood production and forest productivity by silvicultural measures and genetically improved trees, thus helping to increase the forest carbon sink, to meet increasing demand for wood as well as to support replacement of fossil fuels and other materials by wood and to avoid inappropriate land use conversion.

IPCC 1st Assessment Report 1990. Primary recommendation on forests.

Substitution = Reduction of fossil emissions

- Obvious factor for transformation to a fossil-free society
  - But not part of official climate reporting
  - And not explicit in emissions trading systems
- Evidence on substitution factors therefore relatively limited
- Available studies, conservative estimates, full lifecycle:
  - Sawn/solid products: 1.5 tC/tC
  - Bioenergy 0.7 tC/tC
  - Fiber products 0.7 tC/tC (if assumed equal to end-use for energy)
    (could be assumed higher wrt recycling in Europe

Study for SCA Annual Report 2018



are included into integrated estimates

BIOENERGY

Reference	Geography	Substitution effect ratio	Other climate impact factors included		Note
		tC/tC	Change in forest carbon stock (ΔFCS)	Value chain emissions (VCE)	
Knauf et al., 2015	North Rhine Westphalia	0.67	no	no	
Taverna et al., 2007	Switzerland	0.65	no	no	converted from 0.60 tCO_2e/m^3
Rüter et al., 2016	EU	0.70-0.83	no	no	converted from 68-81 gCO_2e/MJ
Soimakallio et al., 2016	Finland	0.80	no	no	
Smyth et al., 2017	Canada	0.47-0.89	no	yes	
Lundmark et al., 2014	Sweden	0.52	yes	yes	average across categories, converted from 0.466 tCO_2e/m^3
Braun et al., 2016	Austria	0.71	yes	yes	average across categories, converted from 0.64 tCO_2e/m^3

PULP AND PAPER PRODUCTS

Reference	Geography	Substitution effect ratio	Other climate impact factors included		Note
		tC/tC	Change in forest carbon stock (ΔFCS)	Value chain emissions (VCE)	
Knauf et al., 2015	North Rhine Westphalia	0.57	no	no	only residual bioenergy included
Soimakallio, S. et al., 2016	Finland	0.8-1.4	no	no	
Lundmark et al., 2014	Sweden	0.52	yes	yes	average across categories, converted from 0.466 tCO_2e/m^3
Braun et al., 2016	Austria	0.71	yes	yes	average across categories, converted from 0.64 tCO_2e/m^3

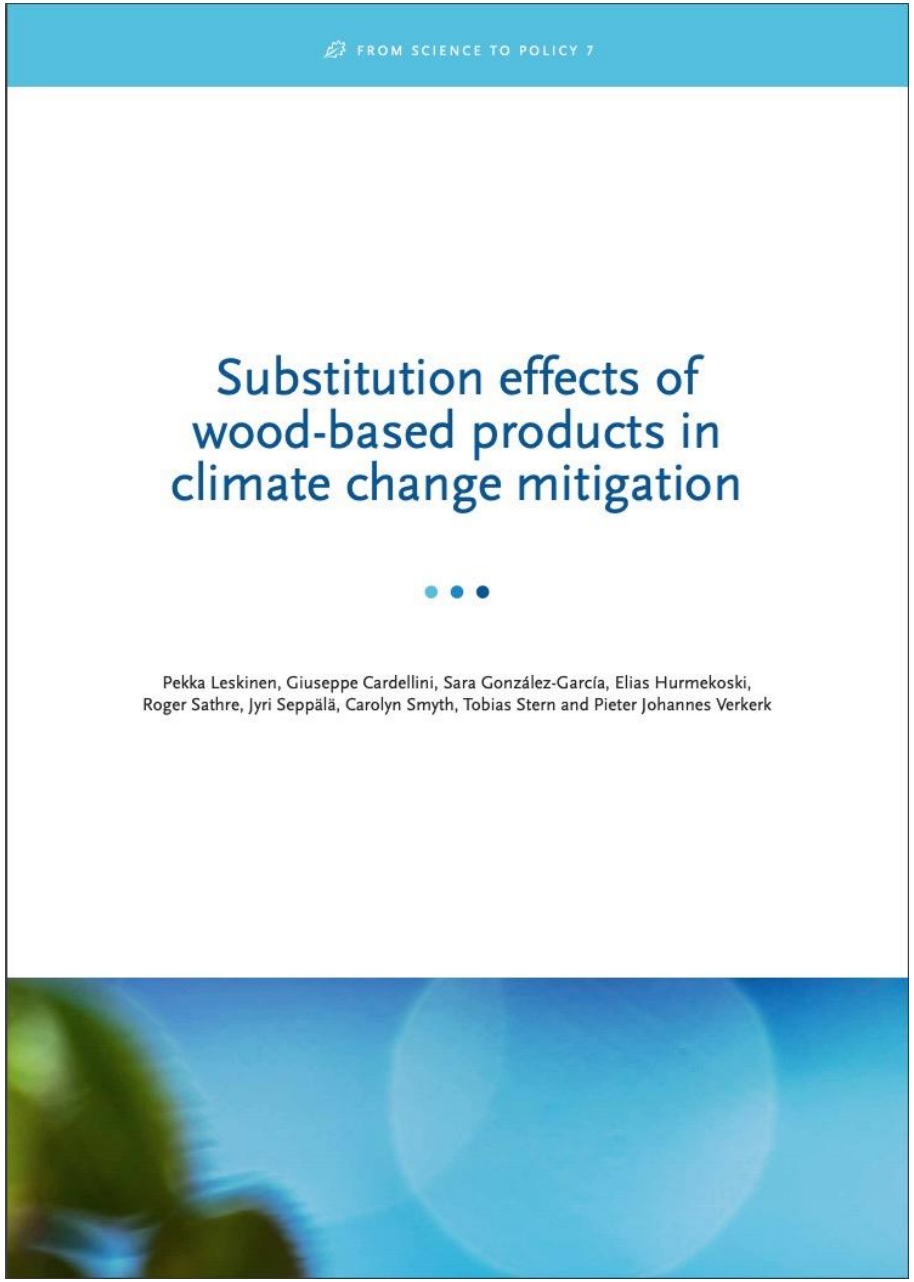
SOLID WOOD PRODUCTS

Reference	Geography	Substitution effect ratio	Other climate impact factors included		n products considered	Note
		tC/tC	Change in forest carbon stock (ΔFCS)	Value chain emissions (VCE)		
Knauf et al., 2015	North Rhine Westphalia	1.10-2.4 (1.5 used)	no	no	16	
Chen et al., 2018	Canada	2.43	no	no	15	converted from 8.91 tCO_2e/tC
Rüter et al., 2016	EU	ca 1.7	no	no	20	
Soimakallio, S. et al., 2016	Finland	1.30	no	no	1	
Taverna et al., 2007	Switzerland	0.78	no	yes	15	converted from 0.70 tCO_2e/m^3
Smyth et al., 2017	Canada	0.45-0.54	no	yes	6	does not include cascading substitution
Lundmark et al., 2014	Sweden	0.52	yes	yes		average across categories, converted from 0.466 tCO_2e/m^3
Braun et al., 2016	Austria	0.71	yes	yes		average across categories, converted from 0.64 tCO_2e/m^3
Sathre and O'Connor, 2010	meta	2.10	yes	yes	40	forest dynamics included in most cases

c. 0.7 tC/tC

c. 0.7 tC/tC

c. 1.5 tC/tC

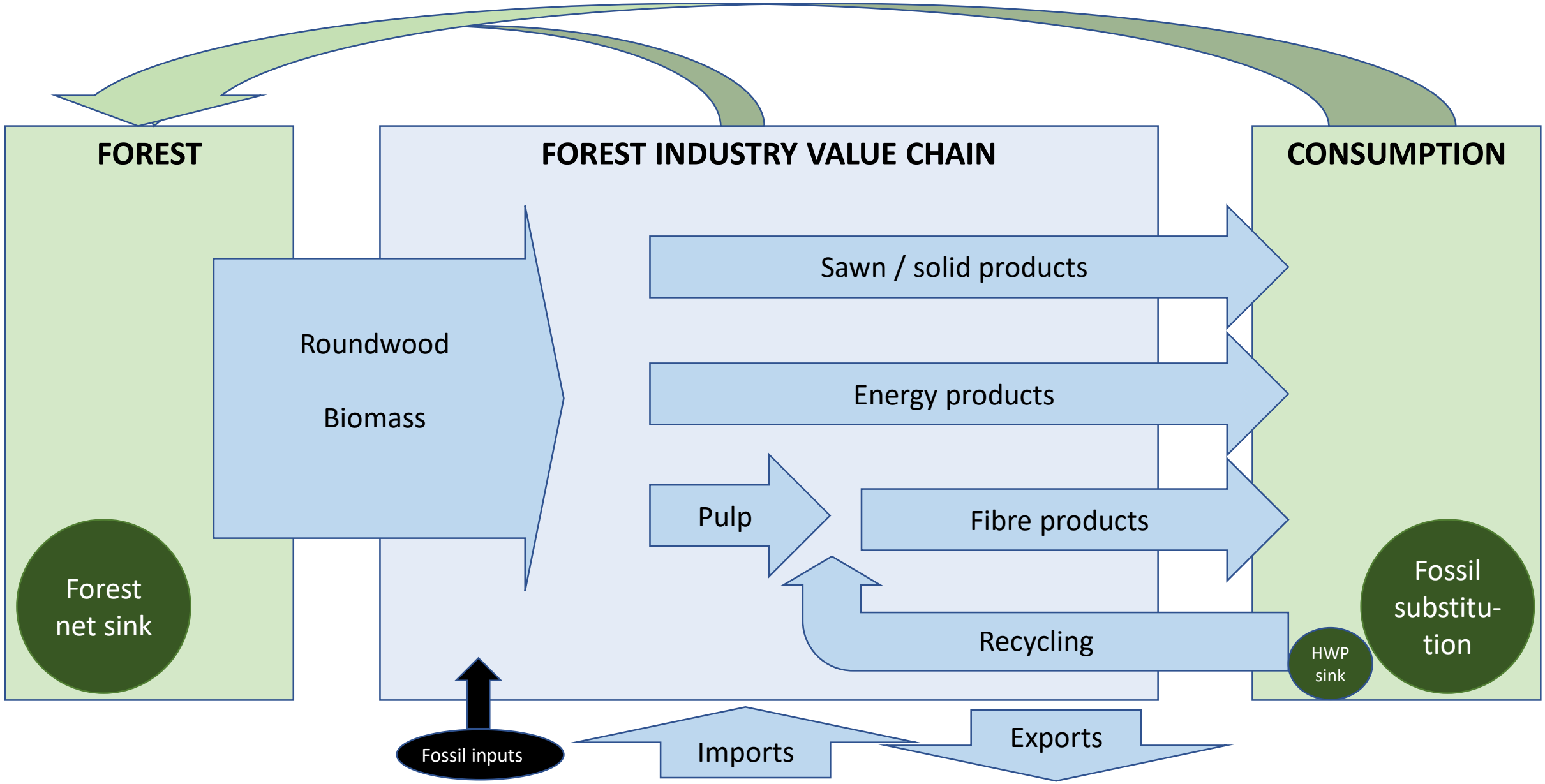


Product categories	Average substitution effects kg C / kg C wood product
Structural construction *(eg building, internal or external wall, wood frame, beam)*	1.3
Non-structural construction *(eg window, door, ceiling and floor cover, cladding, civil engineering)*	1.6
Textiles	2.8
Other product categories *(e.g. chemicals, furniture, packaging)*	1 – 1.5
Average across all product categories	**1.2**

4.

Climate effects of forests, forest industry & forest products

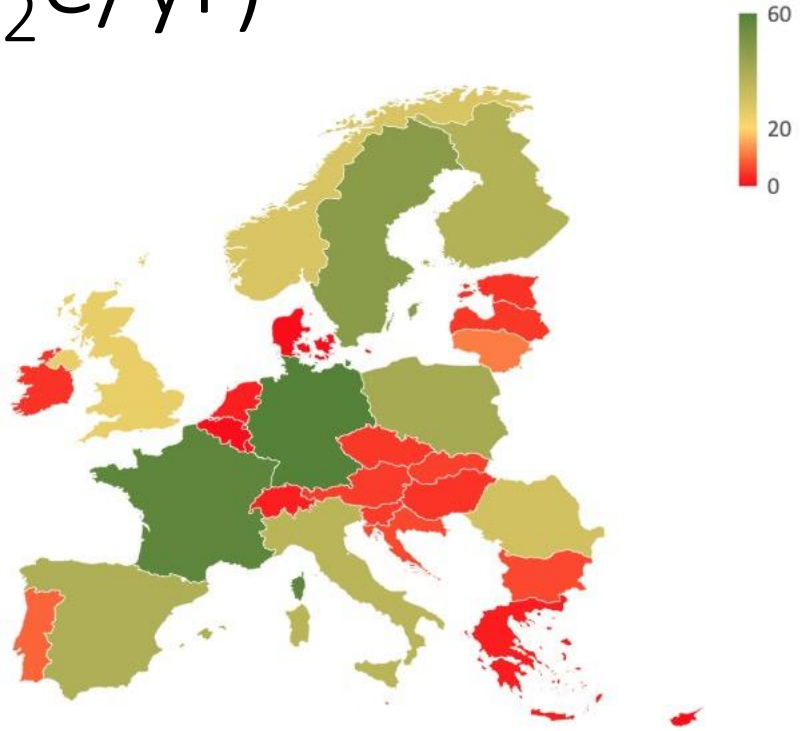
Model for estimating climate effect of forestry sector



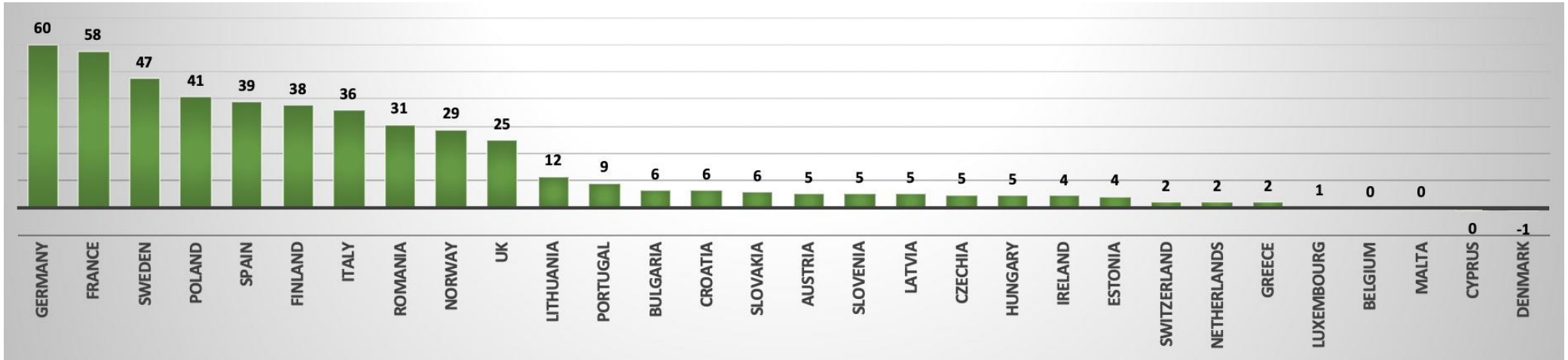
1. Forest & HWP sink (Mt CO_2e/yr)

European forest & HWP sink 2016

- **Forest 446 Mt**
- **HWP 35 Mt**
- **Total 482 Mt**
- **0.9 t CO_2e for each citizen**
- **compensates 11% of European emissions**



Source: 2018 National Inventory Reports to UNFCCC



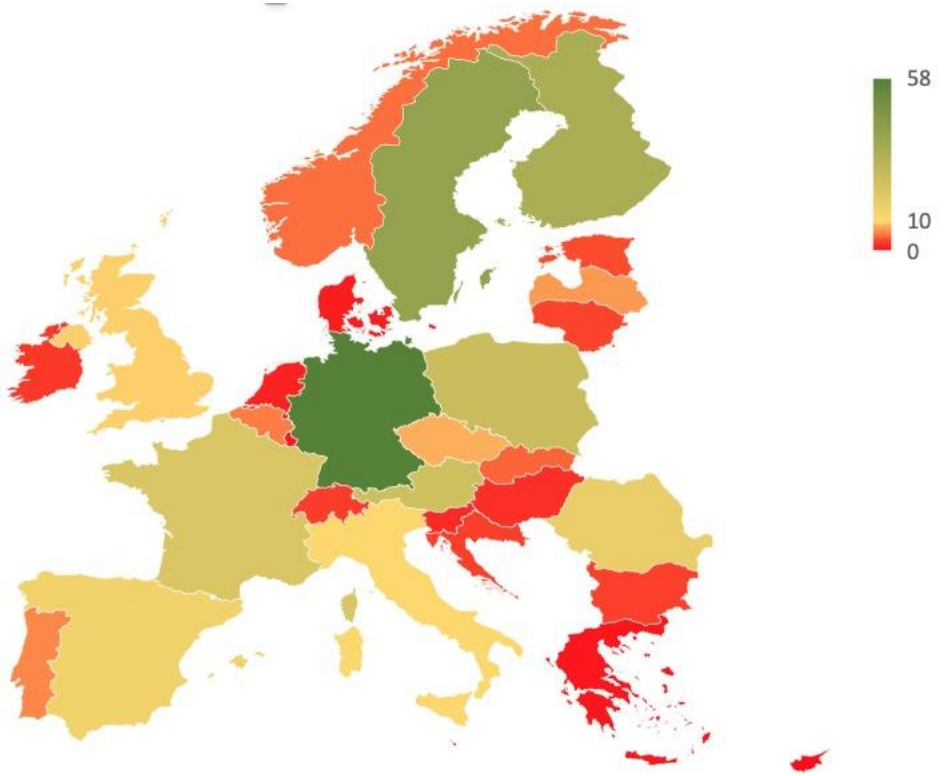
2. Value chain emissions

- For now only aggregated numbers:
- 33 $MtCO_2e$ fossil emissions from pulp&paper industry
  - 70% of energy needs from biomass
- 5 (estimate!) $MtCO_2e$ fossil emissions from solid products industry
- 13 (estimate!) $MtCO_2e$ fossil emissions from transport
- Fossil emissions from input goods (scope 3) not included

- Total 50 $MtCO_2e$ fossil emissions in value chain

- (c 100 $MtCO_2e$ biogenic emissions in value chain)

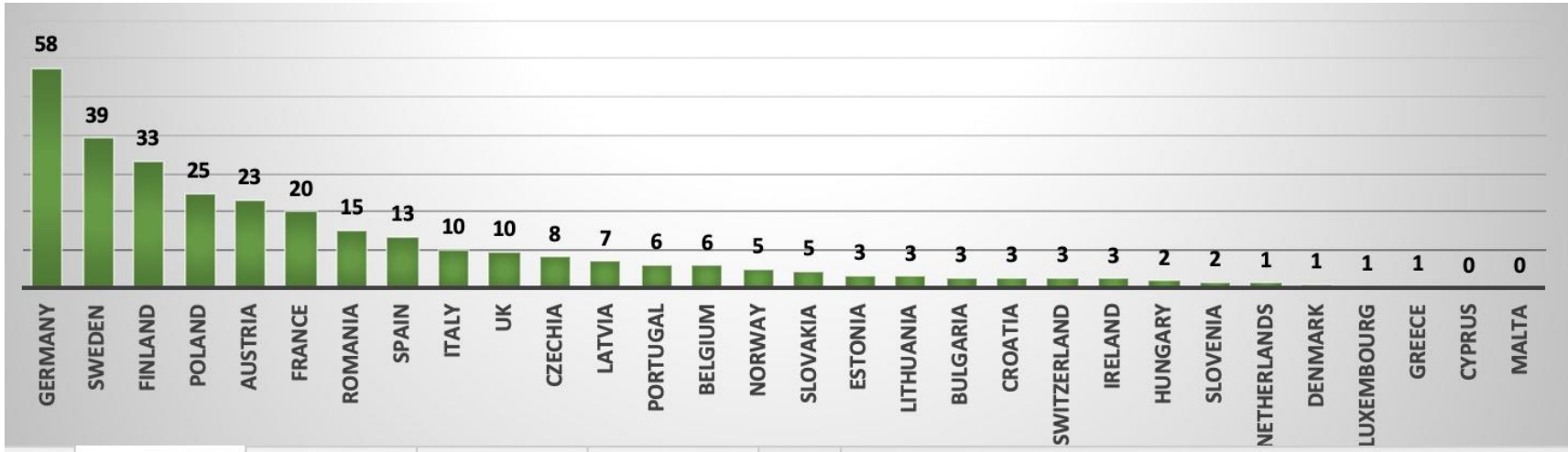
3. Substitution (Mt CO_2e/yr)



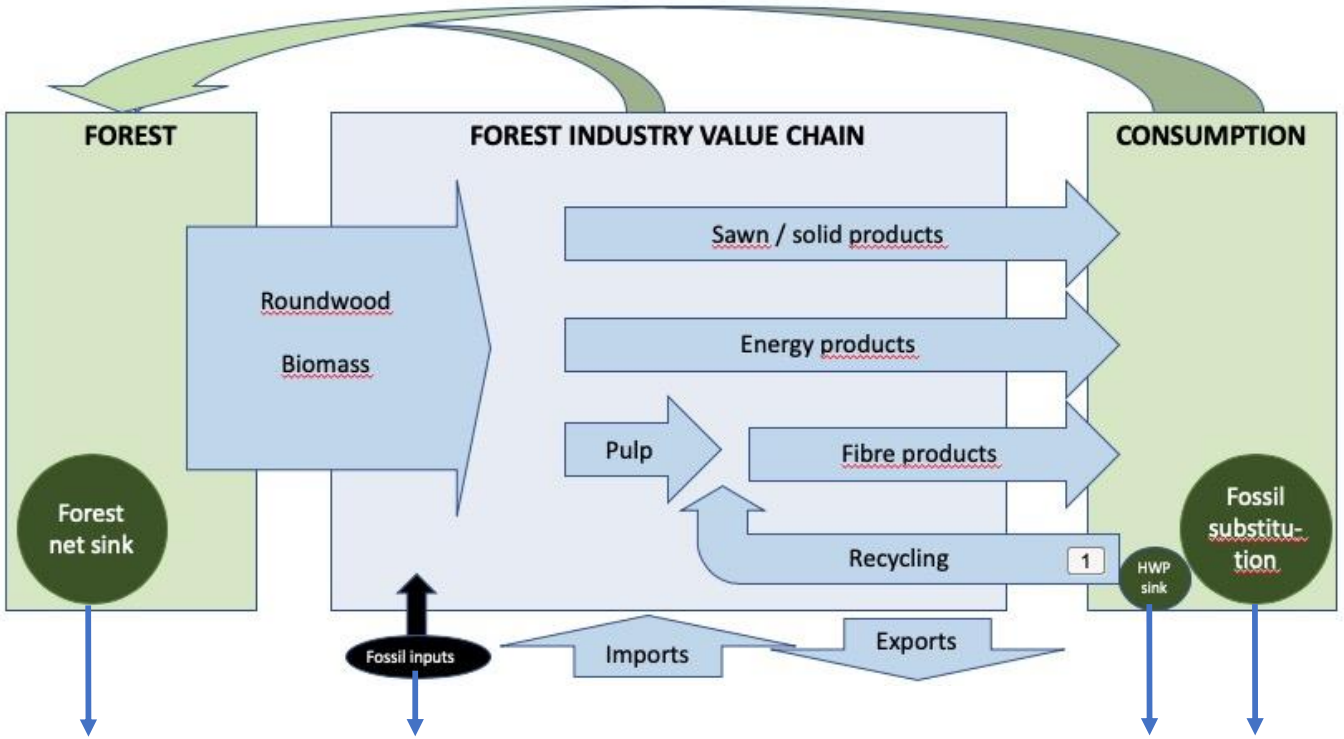
Total 308 Mt CO_2e/yr

Note:

- **Mainly primary fibre products included – recycling not fully represented**
- **Bioenergy production outside forest industries not included**
- **2018 product stats**



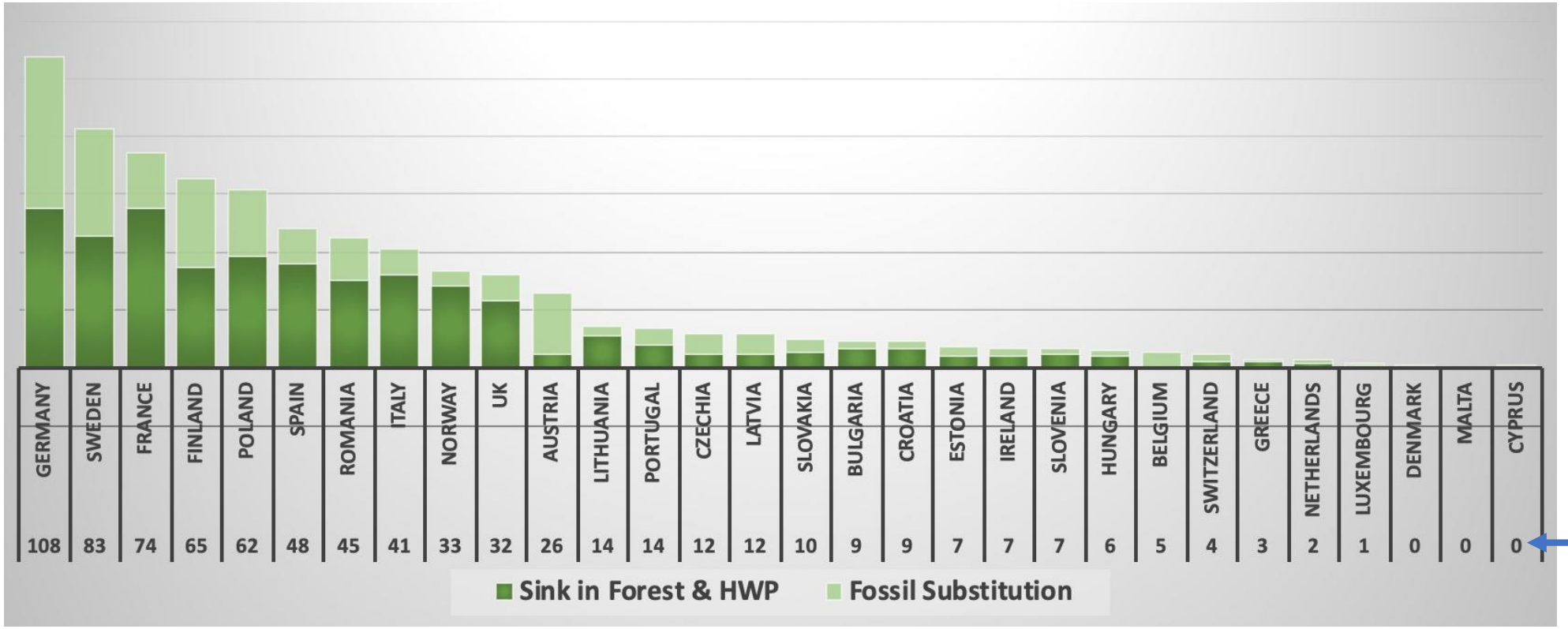
Overall preliminary results



Preliminary estimates of climate effects by European (EU28+2) forestry sector, Mt CO_2e/yr (based on 2016-2018 data)

Preliminary results by country

- Climate effect of forestry sector, MtCO2e/yr
  - Value chain emissions deducted
  - Recycled products not fully represented



Preliminary findings - Key points

1. Overall climate effect of European forestry sector = +740 $MtCO_2e$/year
   - Corresponds to 16-17% of EU fossil emissions
2. An active forestry sector reinforces over time
   - Sinks -> through investments in forest management
   - Storage -> stable forest carbon stock
   - Substitution -> more reduced fossil use
3. There appears to be a potential for expansion
   - Using more of forest growth
   - Investing in integrated value chains
4. Existing climate policy instruments may include counter-productive elements

Report draft outline

1. Report objectives, policy relevance
2. Forestry sector system – a circular bioeconomy
3. Model design for estimating climate effect
4. Results
    a. Carbon sink & storage (forest + HWP = LULUCF) (including current forest management intensity)
    b. Fossil replacement through substitution
    c. Fossil emissions in sector
    d. Total climate effect
    e. Some developments over past decades
5. Discussion
    a. Model construction including knowledge/data gaps
    b. Substitution effect - principle and application
    c. Results in relation to policy structures (LULUCF, ES, ETS, (Green Deal))
    d. Potential developments (sort of scenarios)
        - Potential effects of intensification of forest management (or not, cf protected areas discussion),
        - investments in forest product value chains,
        - Reduction of fossil emisisons in the sector (and in other sectors)
6. Conclusions

References

Some Questions / Issues

- Access to solid wood products industry data
- Representation of recycled products in results
- How handle export/import of raw materials/products?
- How treat woodfuel? (currently outside but significant part of wood harvest)
- Include scope 3? (if so based on assumptions)
- How (far) relate to current and developing policies?
- Right level of detail?
- Right system boundary?