EUROPEAN FOREST INSTITUTE

Transition towards circular bioeconomy – the role of forests

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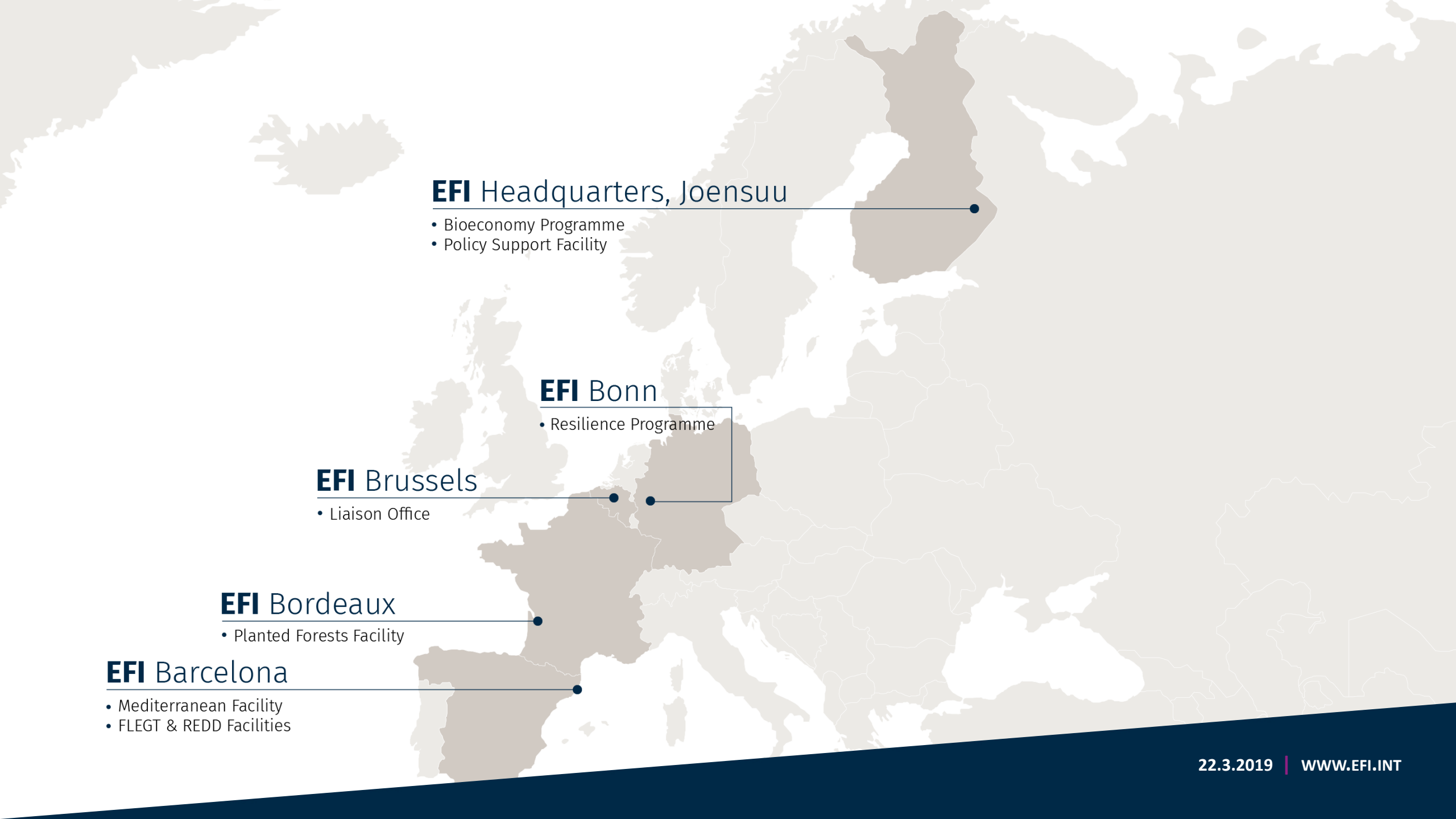
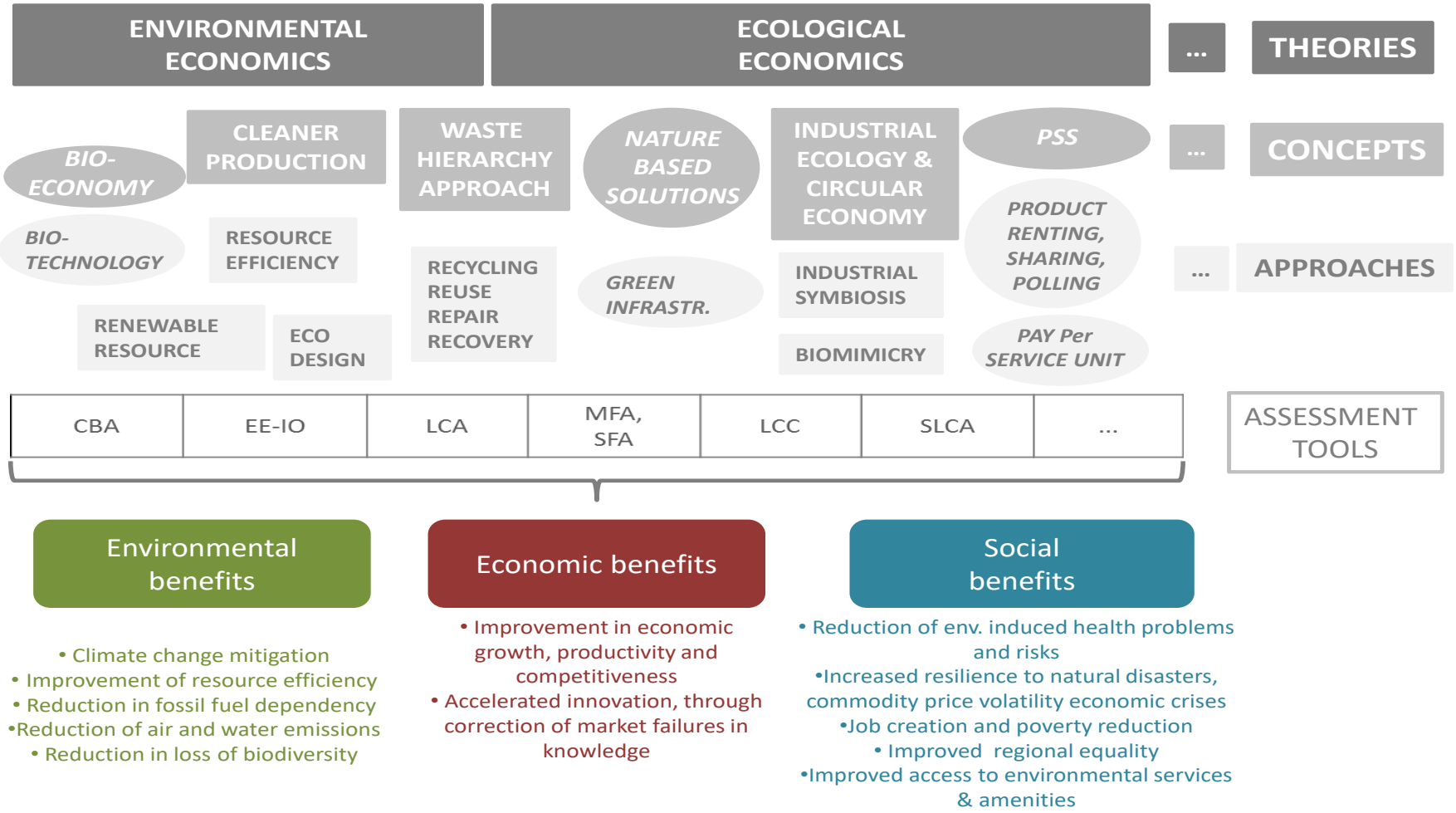
Presentation outline

1. Concepts
2. Global problems and solutions
3. Climate change mitigation and wood-based products
4. Role of circularity in bioeconomy

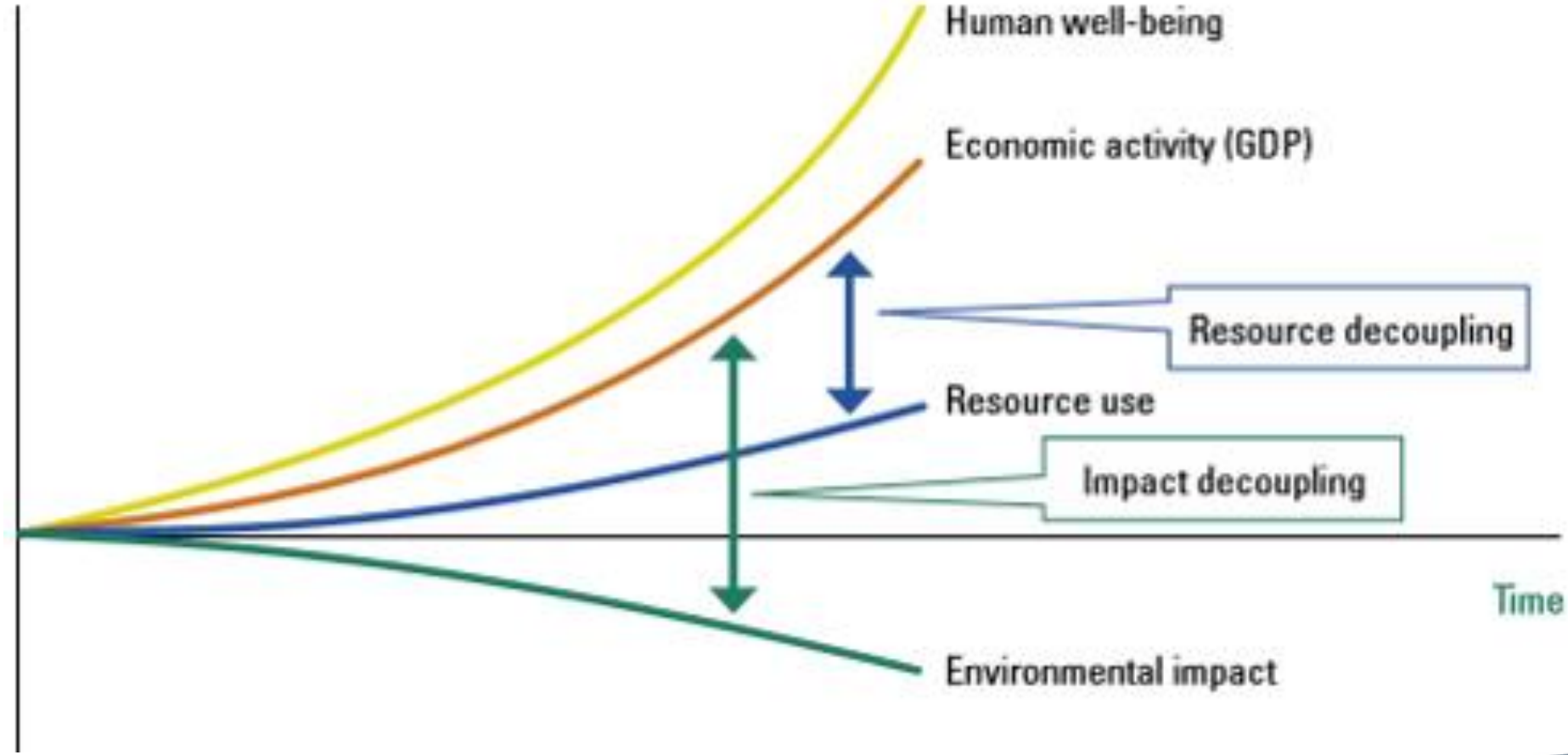

EFI Headquarters, Joensuu
• Bioeconomy Programme
• Policy Support Facility
EFI Bonn
• Resilience Programme
EFI Brussels
• Liaison Office
EFI Bordeaux
• Planted Forests Facility
EFI Barcelona
• Mediterranean Facility
• FLEGT & REDD Facilities

Green, Bio, or Circular?

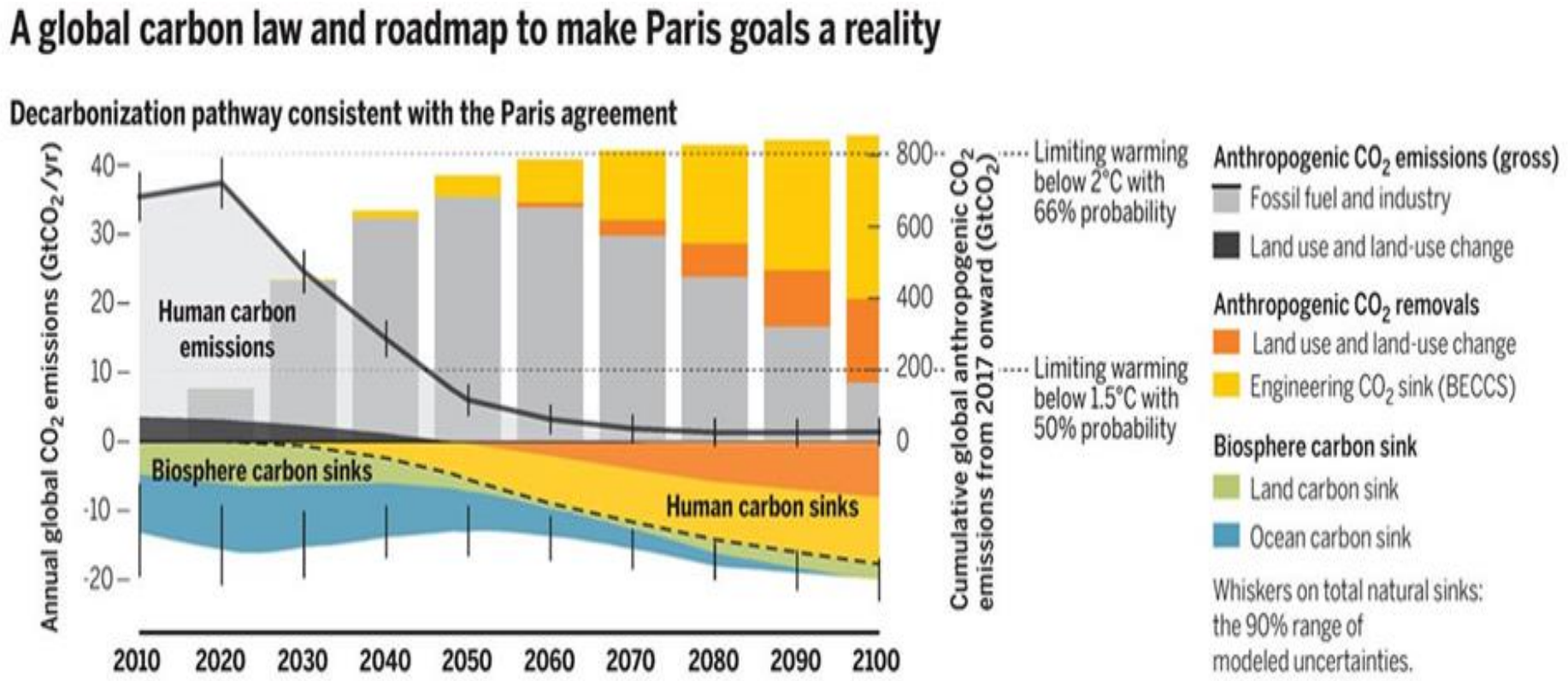


"Generic framework showing the different layers of the **green economy** concept" (E. Loiseau et al. Journal of Cleaner Production 139 (2016) 361-371).

Decoupling (UNEP's International Resource Panel)

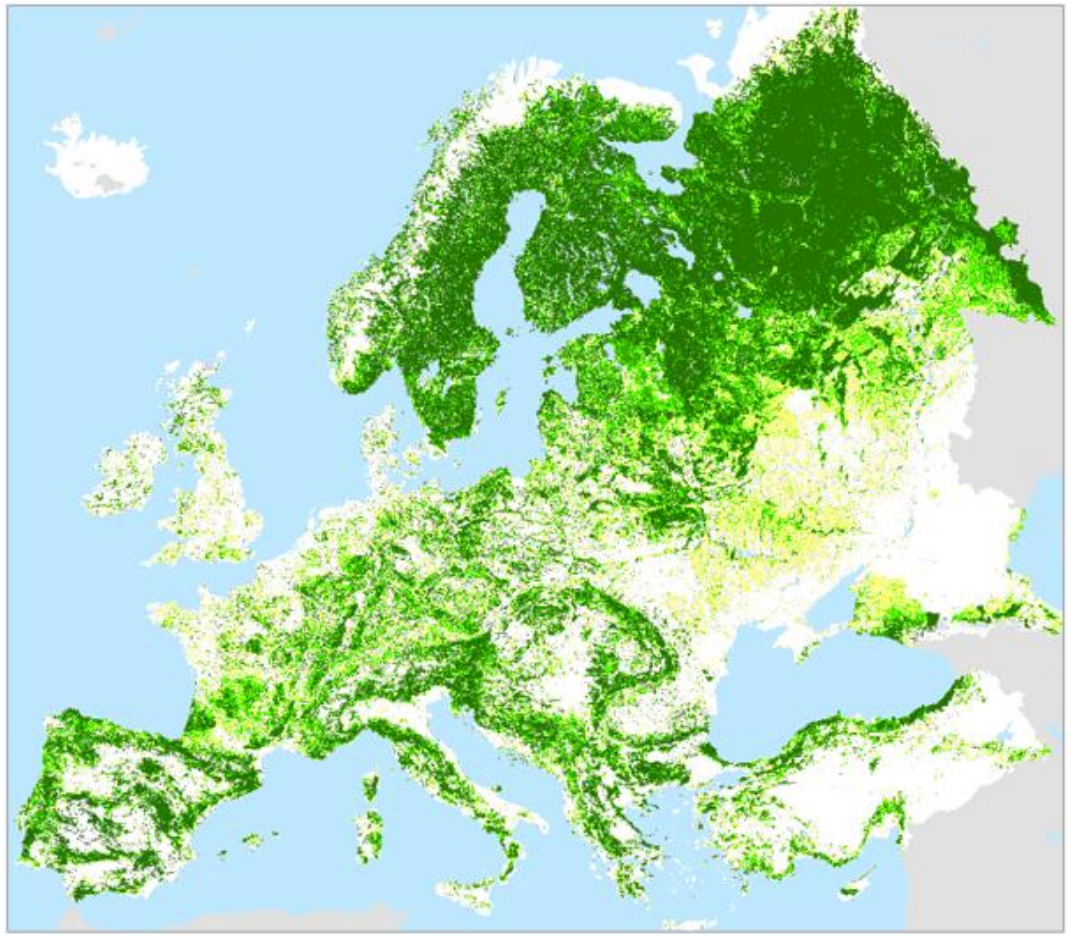


Emission pathway consistent with limiting global warming to 1.5 degrees by 2100 (Rockström et al. 2017):



Forests, our most important biological infrastructure

- Covering **43% of EU** land
- Key for **biodiversity, water and soil**
- Climate change mitigation effect equivalent to **13% of CO_2 emissions**
- **Main source** of non-food, non-feed **renewable biological resources**



Climate Smart Forestry (CSF)

- Use triple S impacts – sink, substitution and storage.
- Country differences: tailoring policies and incentives at the regional level – one size does not fit all.
- Finding synergies between climate and other benefits (e.g., bioeconomy, biodiversity, recreation).

What CSF could contribute

- Current annual mitigation effect from EU forests via contributions to the forest sink, **material substitution and energy substitution** is estimated to be 569 Mt CO2/yr (i.e. 13% of total EU emissions).

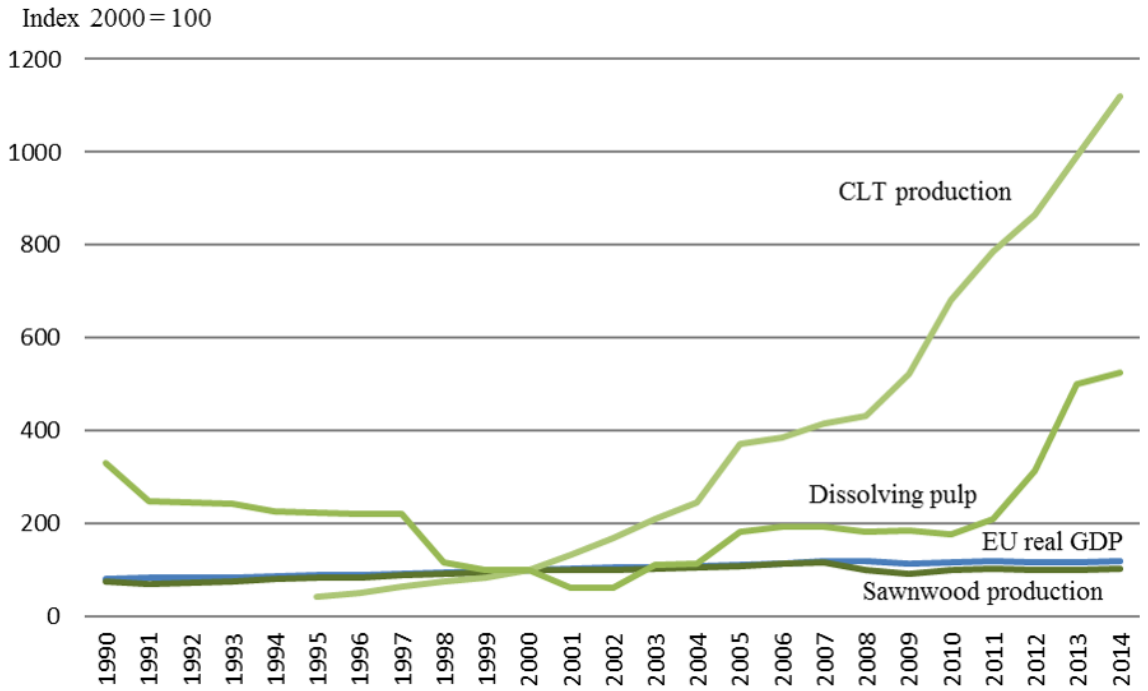
- According to Nabuurs et al., it would be possible to achieve an additional mitigation impact through CSF of 442 Mt CO2/yr by 2050.

Wood-based products

Wood construction

- For each ton of wood products used instead concrete, there could be an **emission reduction** of about 2 tons of CO2.
- If assuming 100% market share of all buildings in Europe with 50% share of wood of building mass, this could imply relatively significant reduction of total EU CO2 emissions.

Diversification of the forest sector



Cross Laminated Timber (CLT)

- > 15 % average annual growth rate since 2007, despite the economic downturn!

Dissolving pulp

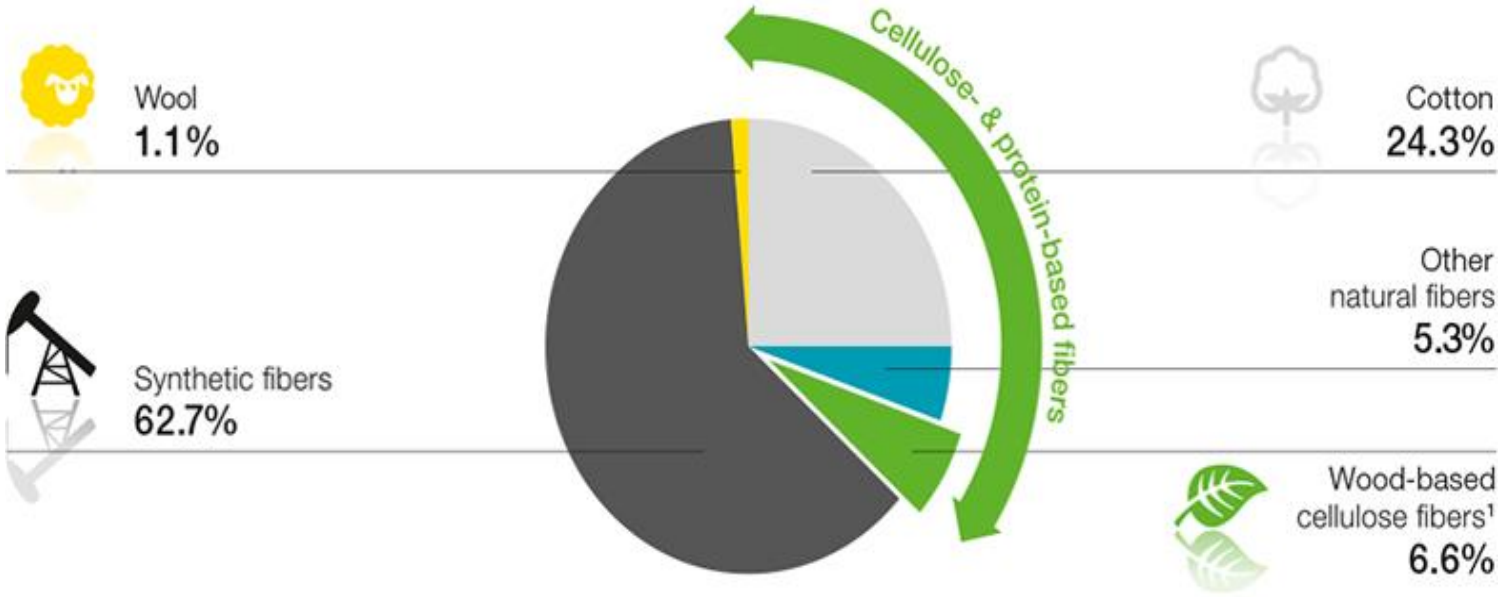
- > Pöyry (2015) expects the global demand to double by 2030

(Hetemäki & Hurmekoski 2016)

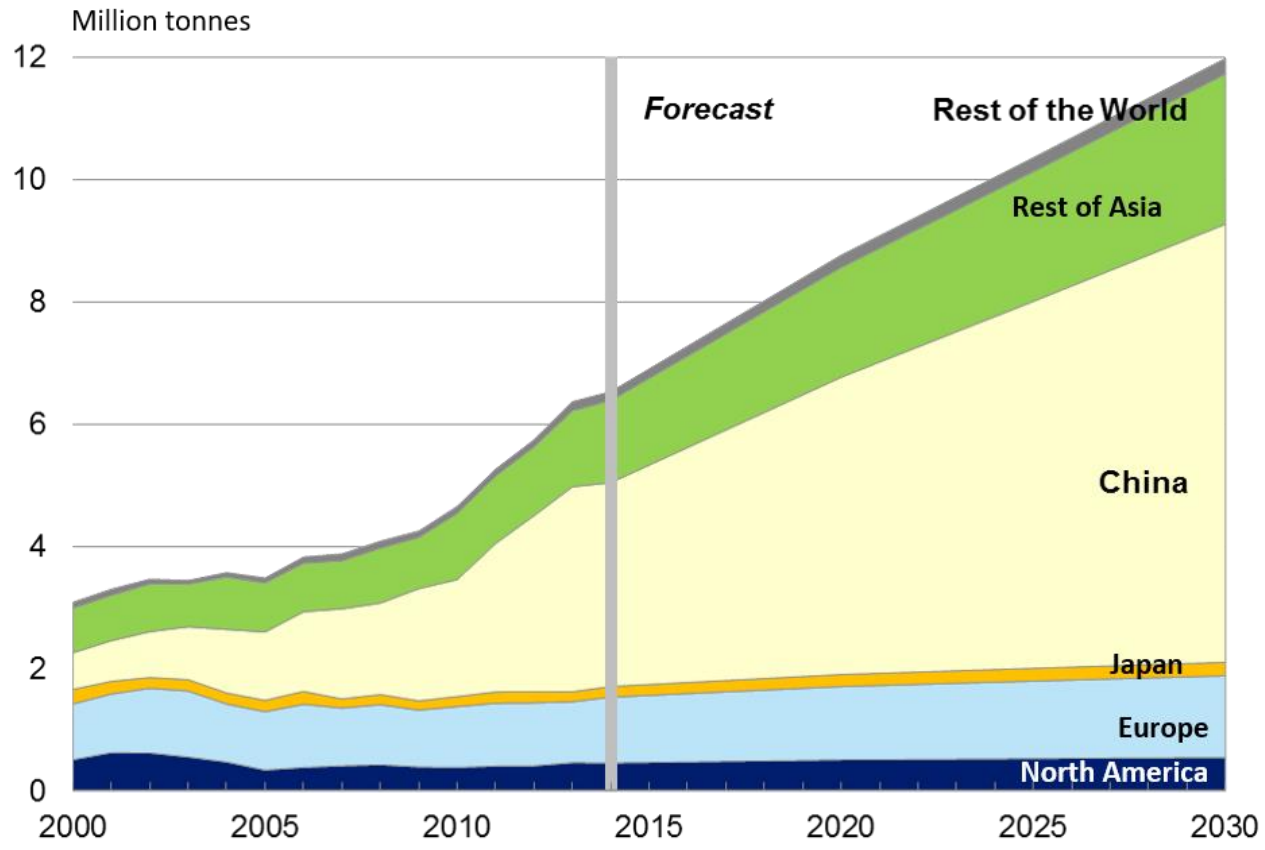
Wood-based fibres for a sustainable textile industry

- Global production of textile fibres:
  - 93 Mt (2016)
  - 250 Mt (2050)

- Carbon footprint from wood-based textile fibres can be significantly lower than synthetic ones



Dissolving pulp consumption outlook to 2030



- World demand to grow by 3.9%/yr, driven mainly by China

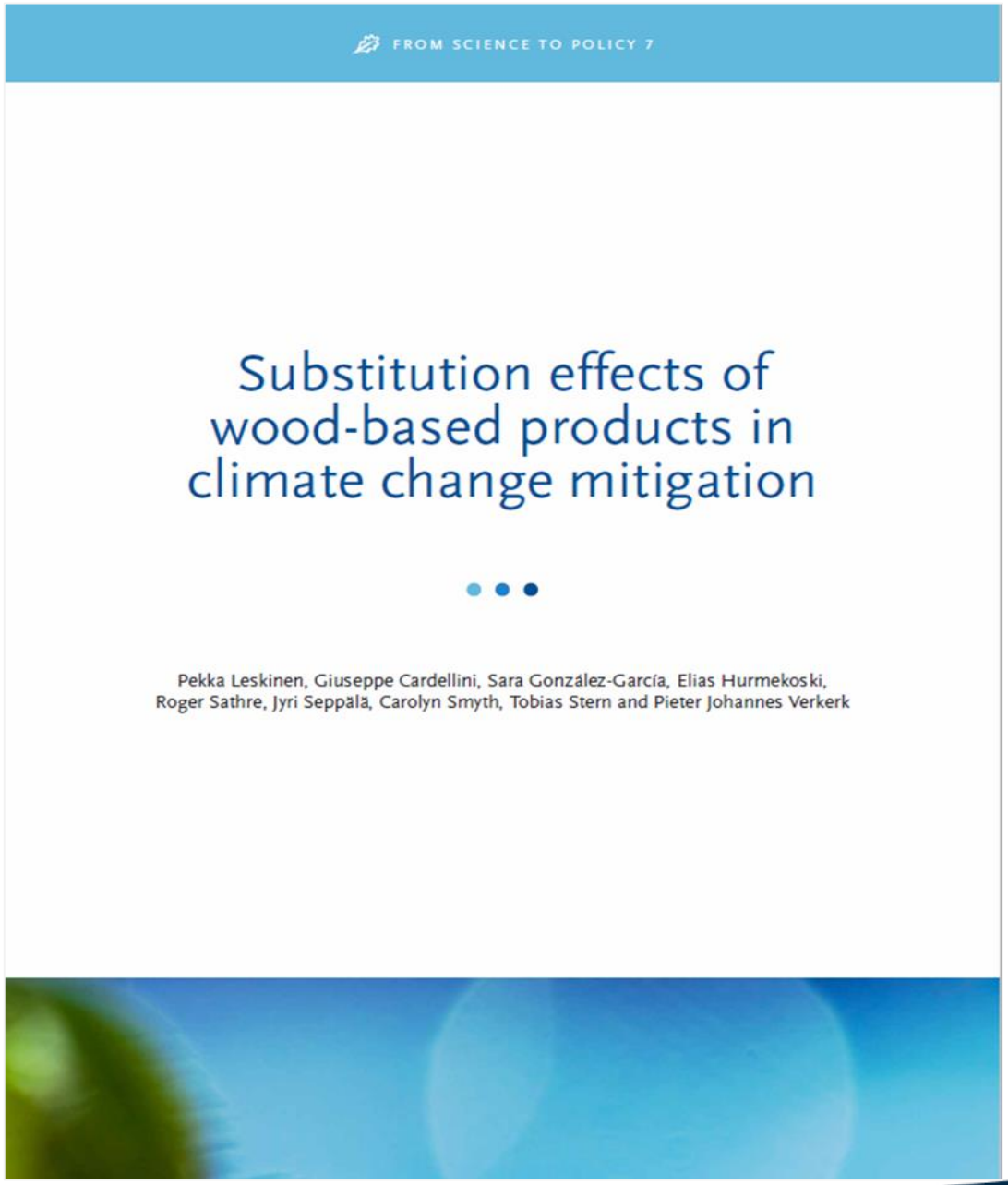
The plastics economy: an inconvenient truth?

- Global production of plastics: **311 Mt**
  - Resulting in **390 Mt CO2** and **8 Mt** of plastics **to the ocean** every year

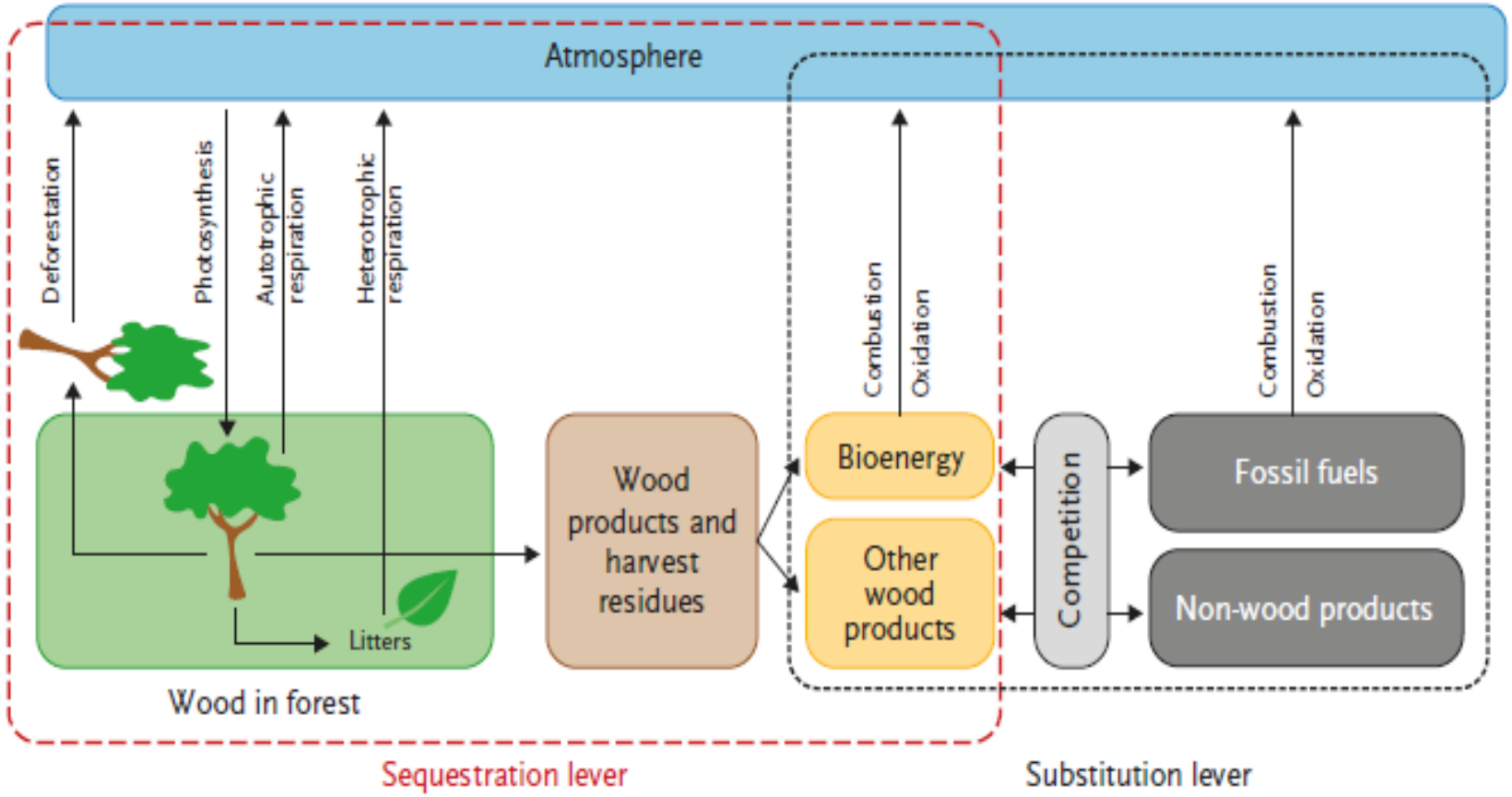
- By **2050**, demand for plastics **400% higher**:
  - **20%** of oil consumption
  - **15%** of CO2 emissions
  - **More plastic than fish in oceans**

The case for bioplastics

- Only 0.6% of total production are bio-based plastics
- Bio-based plastics result in lower carbon footprint
- Main challenge: **not cost-competitive**
  - 30-100% more costly
  - Operations not yet at large scale and not optimised


FROM SCIENCE TO POLICY 7
Substitution effects of wood-based products in climate change mitigation
Pekka Leskinen, Giuseppe Cardellini, Sara González-García, Elias Hurmekoski, Roger Sathre, Jyri Seppälä, Carolyn Smyth, Tobias Stern and Pieter Johannes Verkerk

Carbon stocks and flows (Nabuurs et al.)



Substitution is about technosystem emisssion of wood-based products compared to non-wood products.

Aims

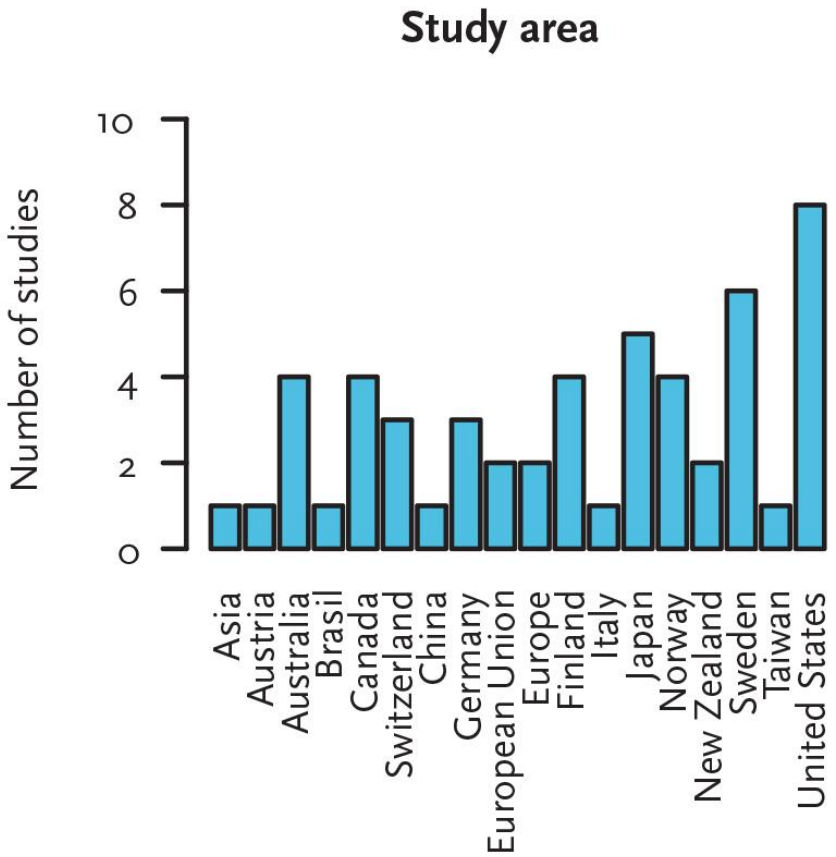
Review current scientific knowledge of GHG substitution effects of wood-based products.

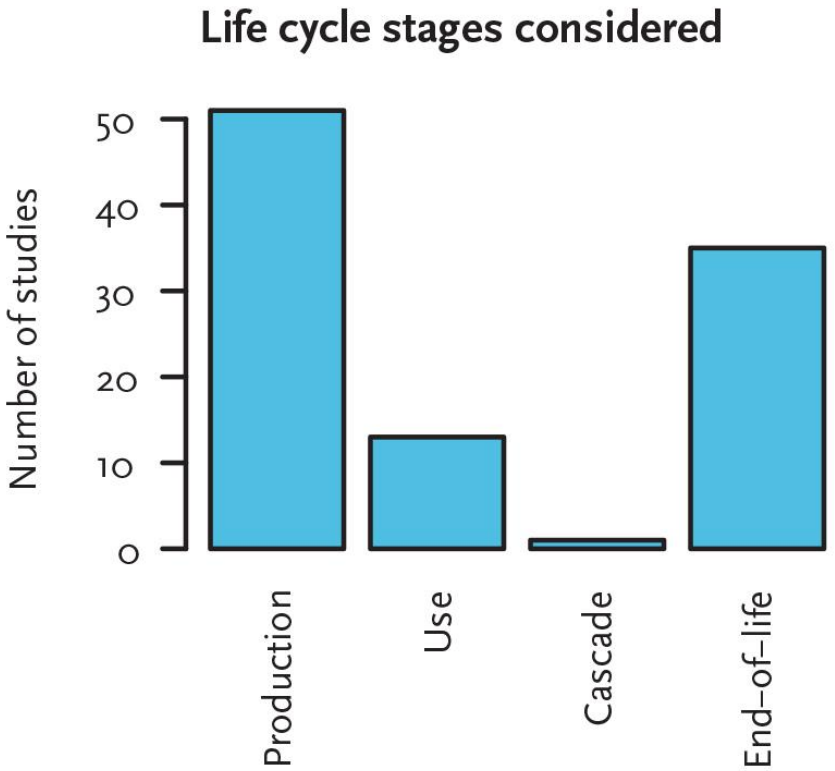
- **Defining and assessing** GHG substitution factors of wood products
- **Magnitudes** of GHG substitution effects of wood-based products
- **Upscaling** substitution factors from product level to market level
- **Scale of overall substitution benefits** at market level
- Applying substitution factors **in decision making and policy planning**

PublicDomainPictures; Pixabay

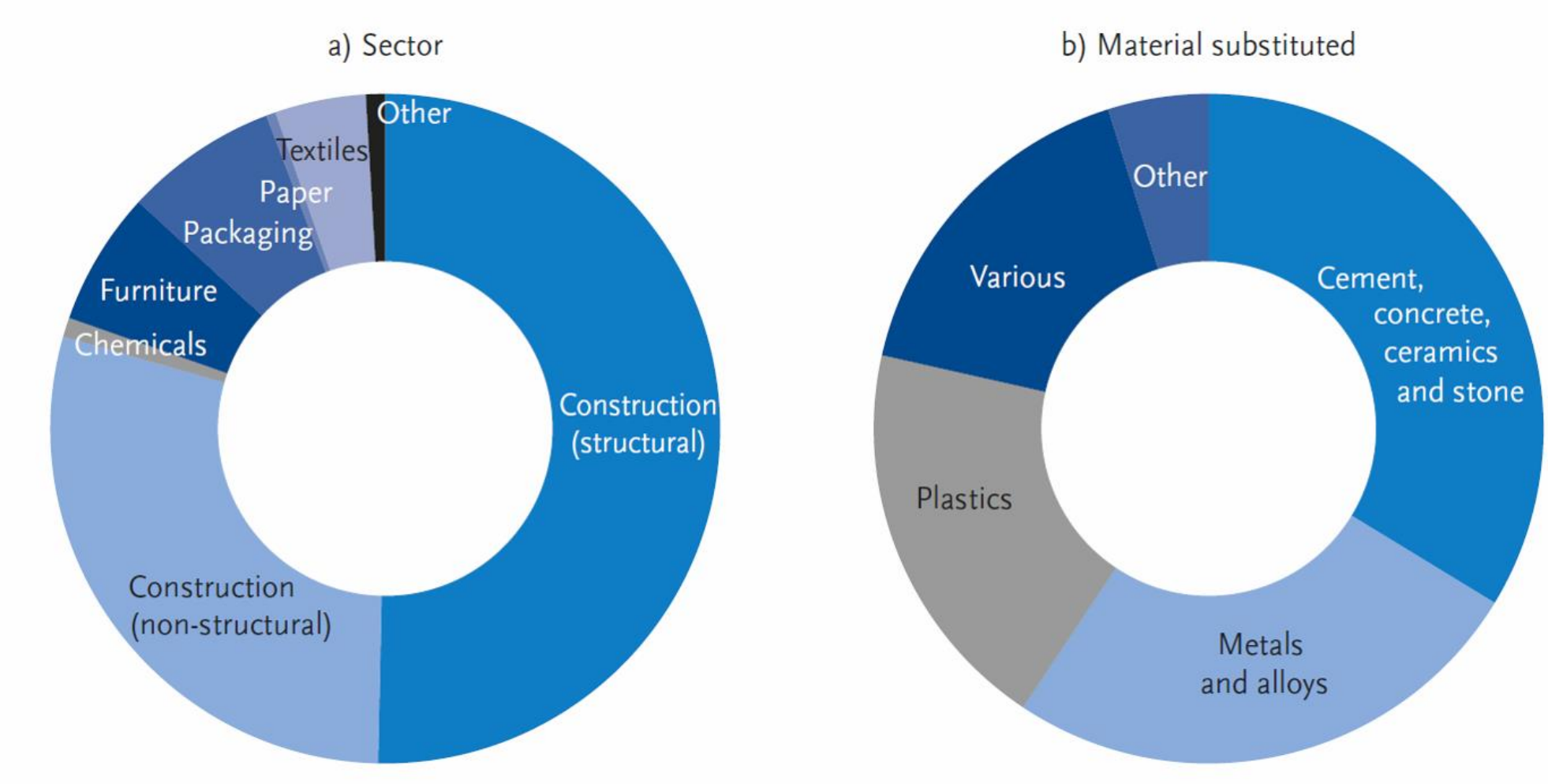
Results

51 studies: 433 separate substitution factors





Sectors and materials

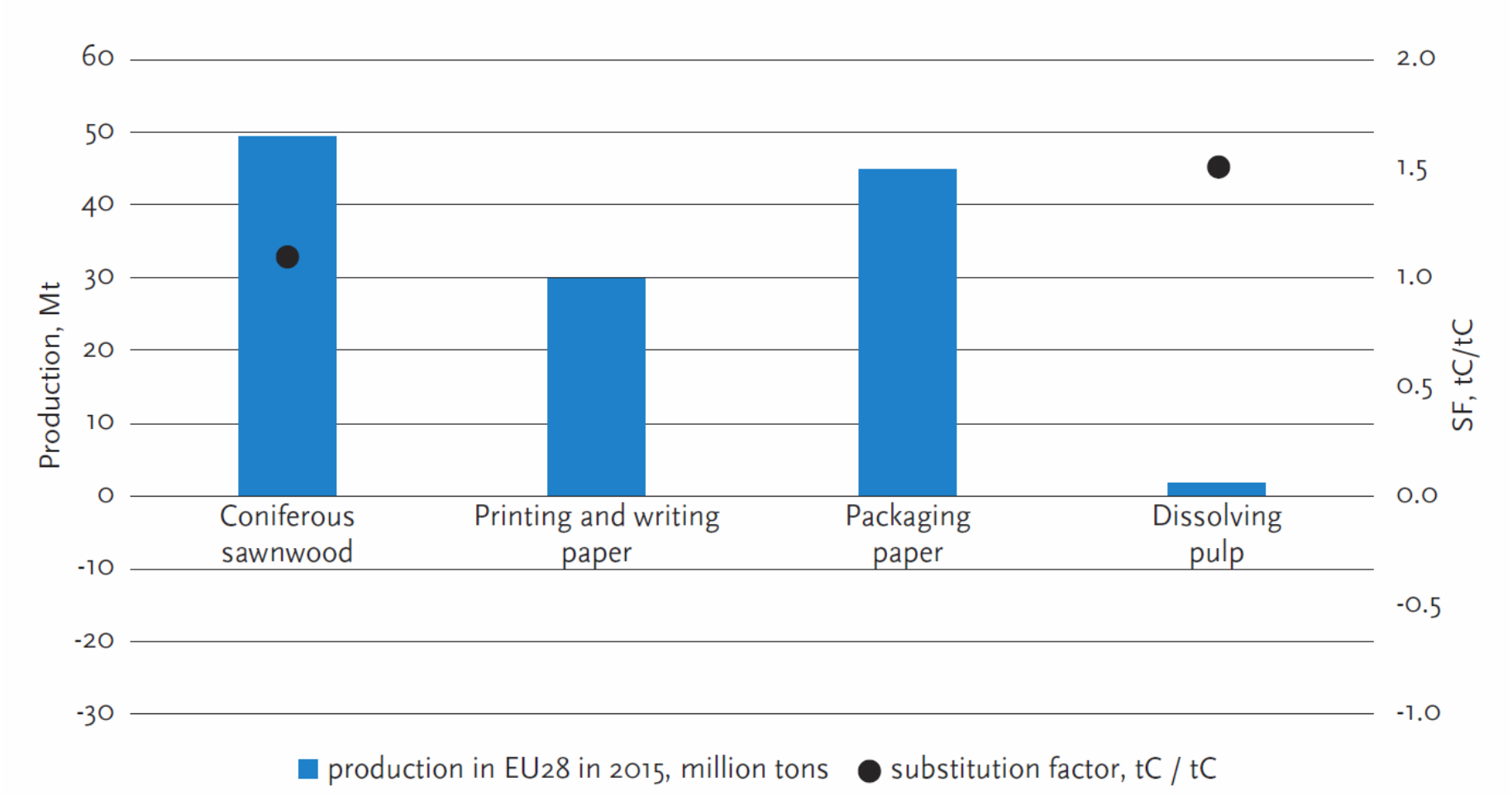


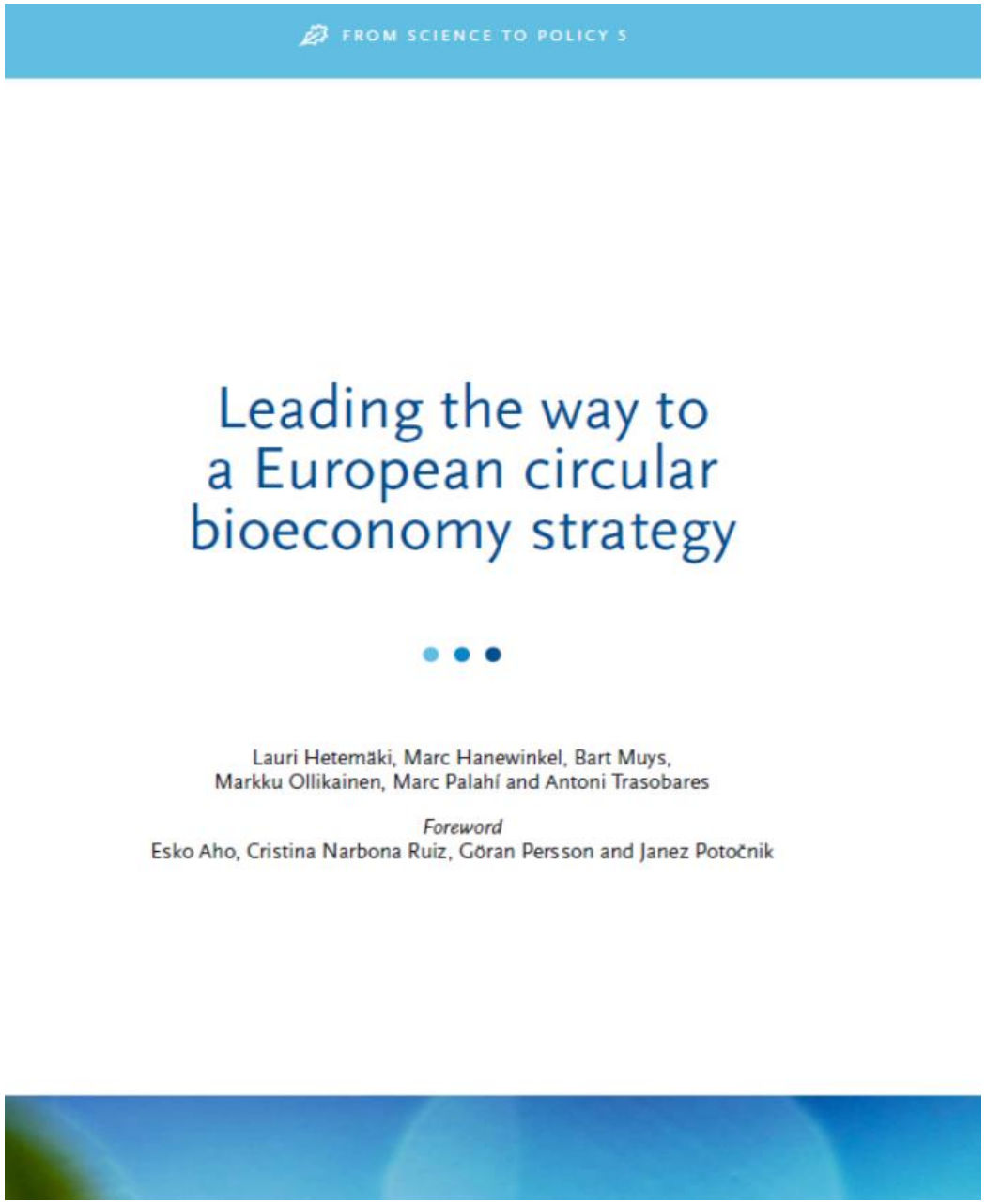
Average substitution effects

Product categories	Average substitution effect kg C / kg C wood product	Average substitution effect kg CO2 eq. / kg wood product
Structural construction	1.3	2.4
Non-structural construction	1.6	2.9
Textiles	2.8	5.1
Other product categories	1 – 1.5	1.8 – 2.7
Average across all product categories	1.2	**2.2***

*** 95% of the substitution factors between [-1.3, 9.3]**

From products to market level





This report was much utilized when European Comission updated the EU Bioeconomy Strategy 2018

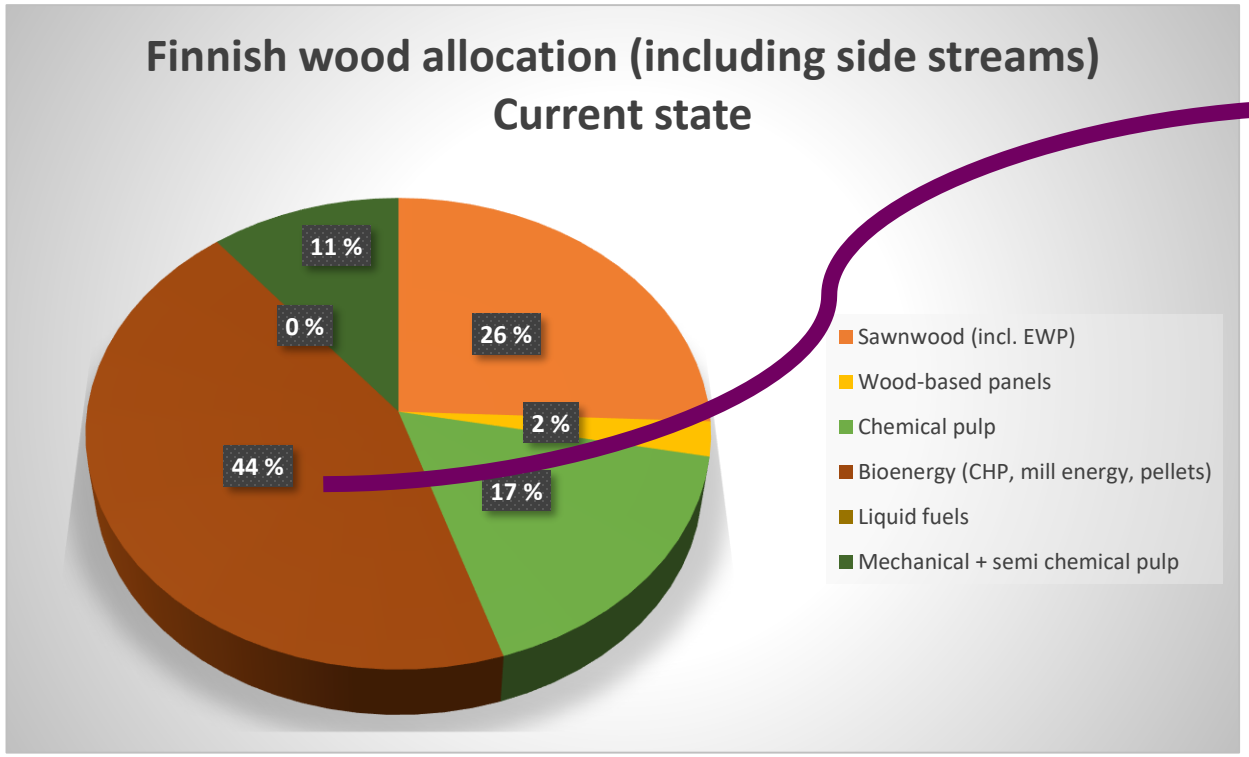
Role of circularity in bioeconomy: Case textiles (Lauri Hetemäki)

- Bioeconomy alone is not enough, but the recycling and circularity has to be built already at the design states of new products and businesses

- **Textile industry** is a big sector, in which recycling is in a bad shape, or it does not even exist

- Circular bioeconomy requires that those businesses, like forest industry, which are entering the sector, have to start to establish recycling institution, together with customers and policy makers *(c.f. paper recycling)*

Climate change mitigation through product substitution: Participative backcasting on the uses of wood in Finland (Janni Kunttu)

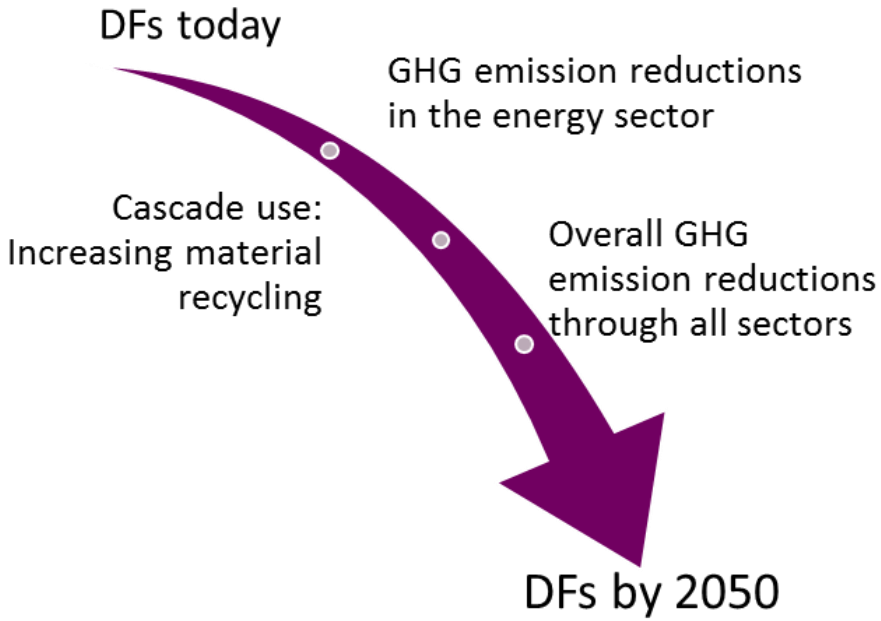


- Sidestreams are mostly used for energy *to date*
- **How to allocate wood flows for high DF material uses in the future?**

- Technical development (energy efficiency, alternative energy sources) is one driver in this transition

Climate change mitigation through product substitution: Participative backcasting on the uses of wood in Finland (Janni Kunttu)

- Future GHG **emission reductions** and increasing use of **recycled** materials
- **Technical constrains** for 'DF maximising wood utilisation patterns'
- **Market viability** and strategy development



Key messages

1. Use of wood and wood-based products is associated with **lower fossil and process-based emissions** when compared to non-wood products

2. Substitution factor is **not sufficient** to guide policy making – needs a holistic approach

3. **Resource-efficiency and minimizing material waste** should be simultaneous policy target with climate mitigation

4. **Lack of knowledge on climate impacts of emerging forest products** – textiles, packaging, chemicals

5. **Existing product portfolios can be improved to have better mitigation impacts!**

shock - Fotolia

Circular bioeconomy is not an *end* itself, but a necessary *tool* to achieve the global targets

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Thank you!

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