Wood-based textile fibre market as part of the global forest-based bioeconomy

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Outline

- Background
- Wood-based textile fibre consumption in the context of global textile fibre market
- Environmental benefits of wood-based textiles
- Market prospects
- Summary

The presentation is partly based on the article with the same title in *Forest Policy and Economics* (2021).

What are we talking about when we talk about wood-based textile fibres?

- Manmade cellulosic fibres (MMCF) made out of wood
  - can be used like other materials for textiles (cotton, polyester,…)

- Currently, the main raw material is dissolving wood pulp (DWP)
  - bleached chemical pulp with low hemicellulose content that is further processed to viscose fibers (viscose stable, Tencel®…)

- Technologies consuming less wood and/or chemicals than DWP method under way:
  - Ioncell®, Spinnova®, to name some.
  - E.g., Spinnova method allows spinning fibre directly from pulp without chemicals.

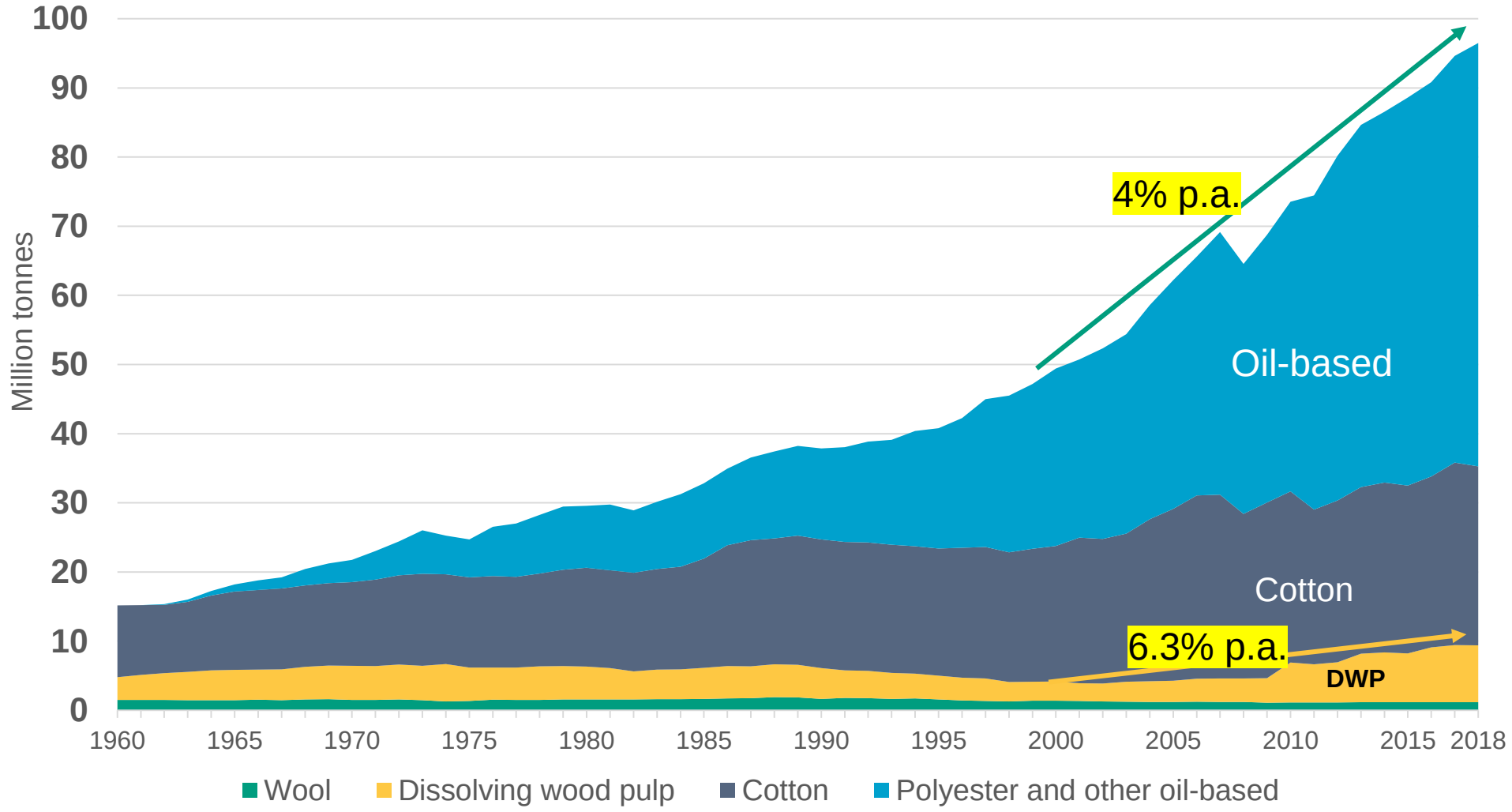
Why are the wood-based textile fibres interesting in bioeconomy context?

Both due to environmental and economic reasons.

- Environmental footprint typically lower than that of cotton and oil-based fibers.

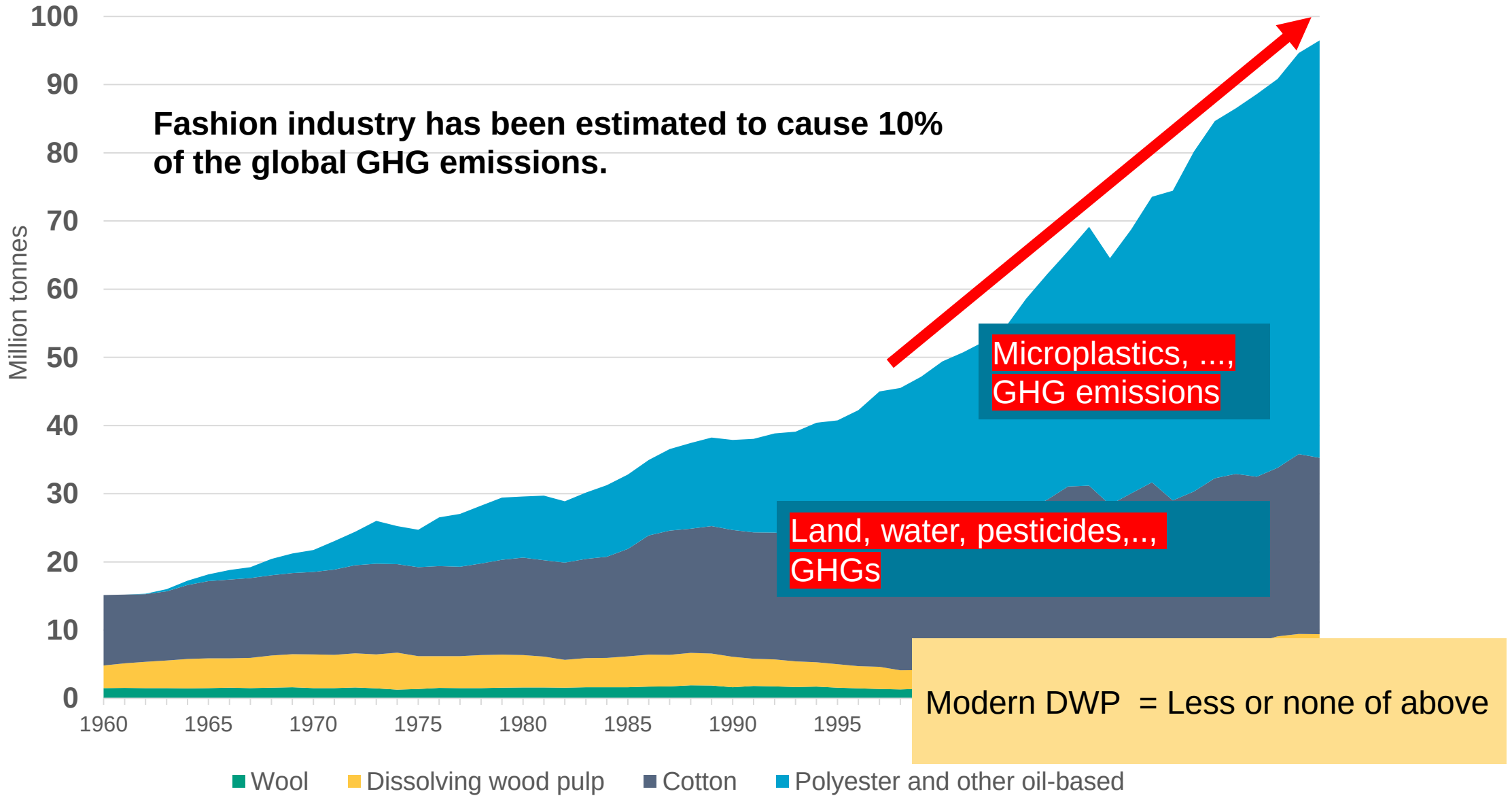
- Well-suited for production in a biorefinery with a diverse product portfolio
  - Specialty cellulose + Lignin-based products + Bioenergy/fuels
  - *Note, most of «Specialty cellulose» is dissolving pulp processed mostly to textile fibers, but in many mills it encompasses a variety of other products too.*

Wood-based textile fiber consumption has grown more rapidly than the total market, but the market share is modest



Sources:
FAOSTAT & OECD-FAO & own calculations

Increasing textiles consumption
= increasing environmental problems



Wood-based textile fibers from sustainable sources are more climate friendly than the main alternatives

- The production of 1 tonne of MMCF saves[1]
  - 0.9 - 2.2 t CO_{2eq} when replacing cotton
  - 1.7 - 4.3 t CO_{2eq} when replacing oil-based fibres.

- The incineration of 1 t of MMCF releases less GHG emissions than alternatives[2]
  - MMCF releases ca. 1.2 t CO_{2eq}
  - Cotton releases 1.4 t CO_{2eq}
  - Oil-based fibres releases 2.0 - 2.5 t CO_{2eq}.

1) Calculated from the results of Shen, Worrell & Patel. 2010. Environmental impact assessment of man-made cellulose fibres. Resources, Conservation and Recycling, 55(2)
2) Shen & Patel. 2010. Life Cycle Assessment of man-made cellulose fibres. Lenzinger Berichte, 88.

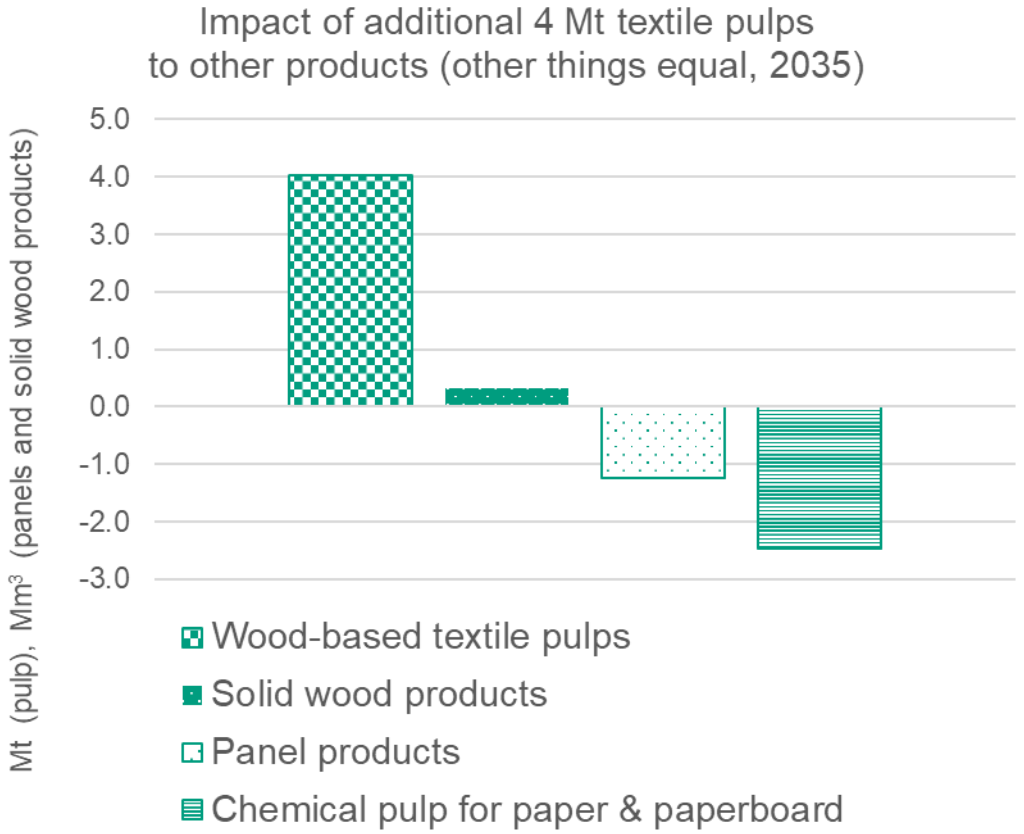
Textile pulp production is in synergy with the production of long-lived harvested wood products

Textile pulps are produced from

- small-sized wood
- sawmill chips coming as by-products from sawnwood and plywood mills

➢synergy with production of long-lived construction materials

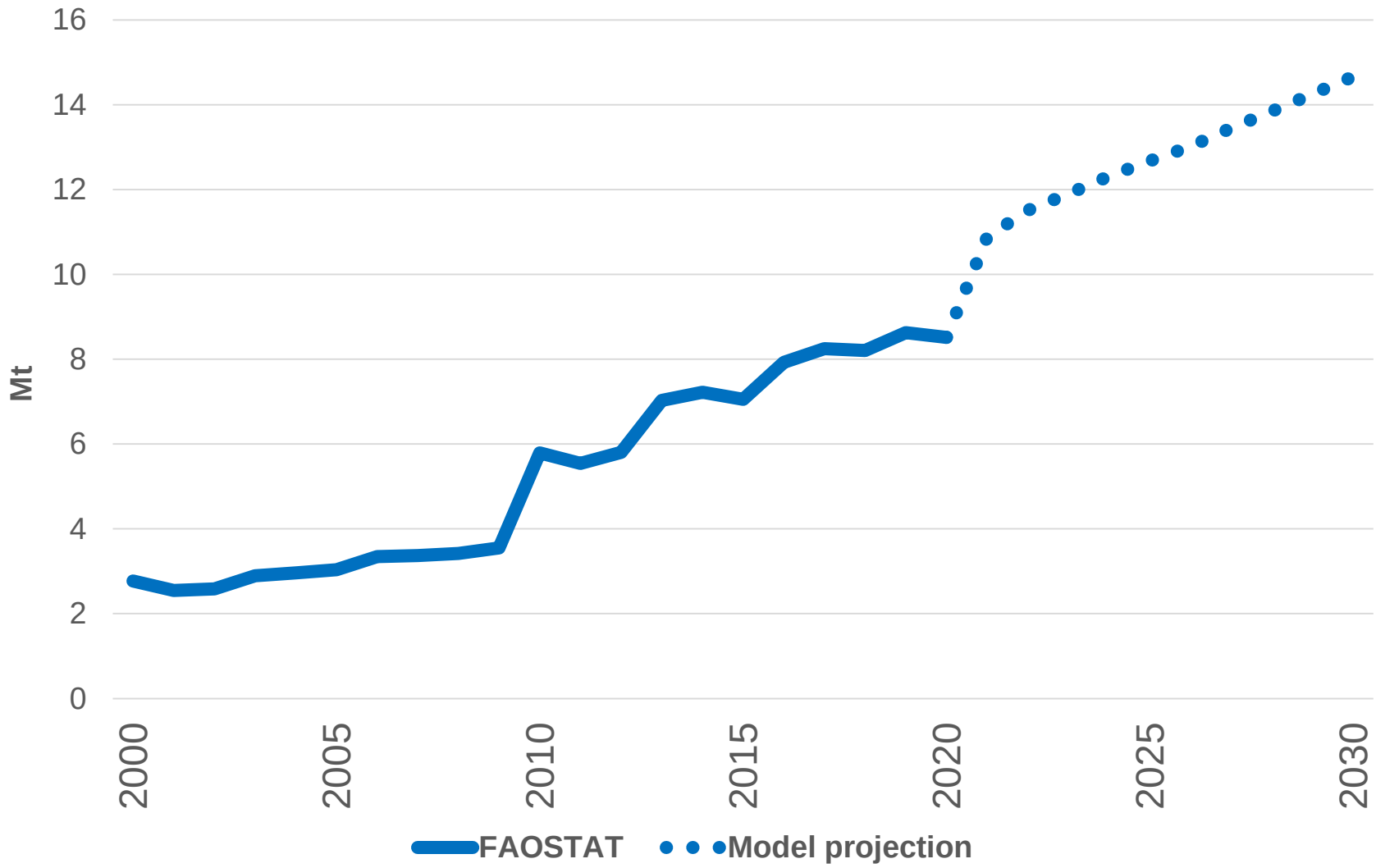
➢competion over wood with paper, paperboard & panel products



Source for figure: Simulation with FORMEQ model, scenario S2 as reported in Kallio 2021 For Pol Econ.

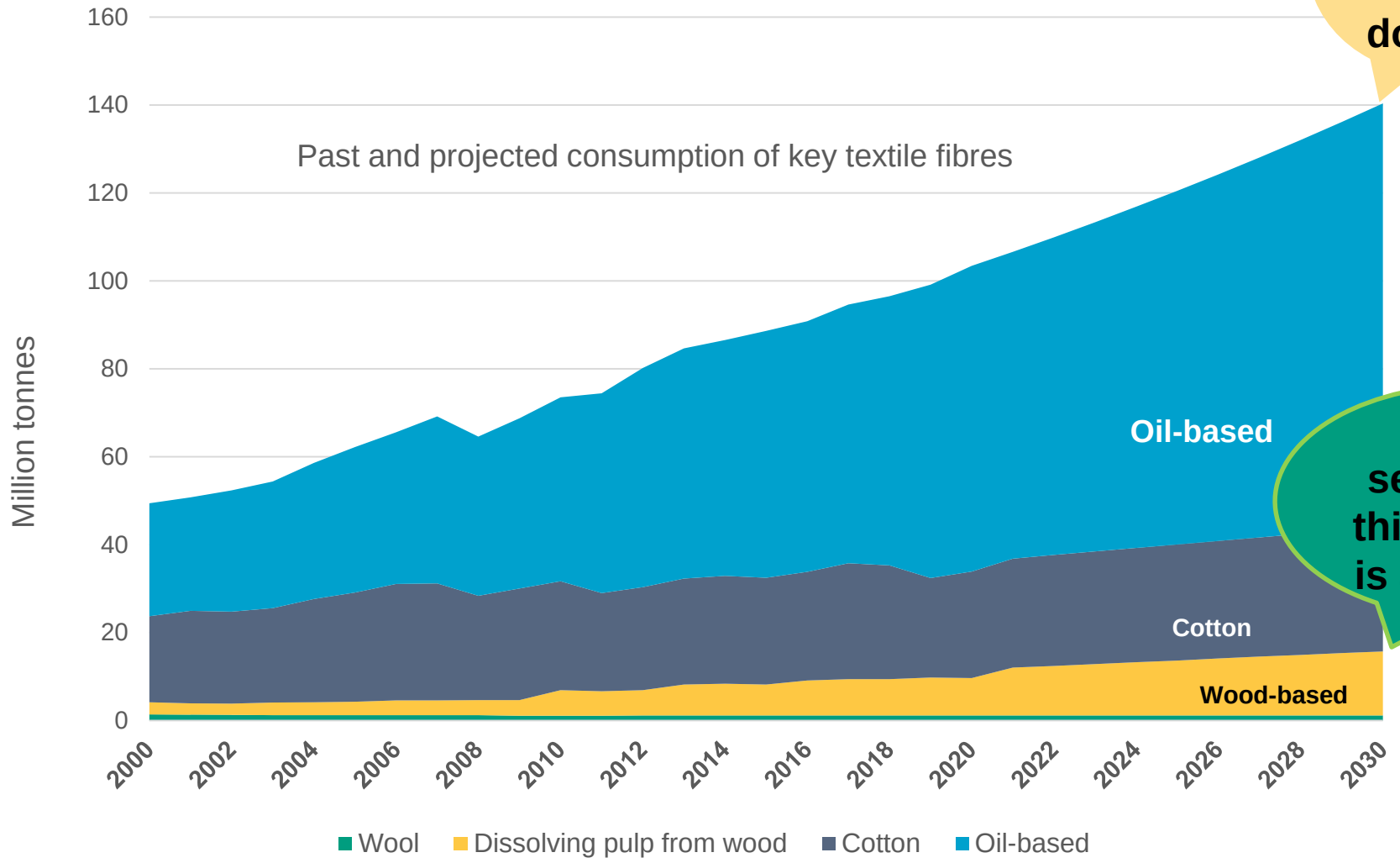
Medium-term market projections

A projection for the consumption of wood-based textile pulps up to 2030



A global forest sector model FORMEQ model was used (documented in Kallio, 2021, in Forest Policy and Economics.)
GDP growths assumptions formed based on IMF forecast 4/2021 and GDP elasticity of wood-based textile fibres demand 1.

Assuming the total fibre demand to grow ca. 3%/yr and the use of cotton to develop as projected by OECD-FAO, the market share of wood-based fibres would soon be close to 10%



How to get this total down?

Challenges for bioeconomy

How to secure that this, at least, is achieved?

Much of the capacity growth in the last decade has come from converting paper pulp mills to DWP,

but also huge greenfield investments are going on in Brazil (Bracell, Suzano)

- Some examples of paper pulp mills converted to DWP
  - Lenzing, Paskov, CZ (spruce); Stora Enso, Enocell, FIN (birch);
  - Sappi, Cloquet, USA (aspen, maple); Fortress, Thurso, CAN (maple, aspen,..), ….

- Often, the mills can «swing» = choose between paper pulp **or** textile pulp, which
  - ➢ Reduces the producers' price risk
  - ➢ Complicates market forecasting and analysis
    - Wood-based textile pulps affected by cotton, polyester & paper pulp prices and demand.

Converting pulp mills from paper pulps to textile pulps likely to continue

- Consumption of printing and writing papers produced partly or fully from chemical pulps still in decline.

- Alternatives for shutting down a mill primarily supplying pulp those products, e.g.,
  - Convert to unbleached kraft pulp for packaging applications?
  - *Convert to DWP or to «future» textile pulps + other products?*

Summary

- Textile market is growing in unsustainable manner - the market share of wood-based fibers is and continues to be modest in the short run.

- Use of wood-based textile fibres produced from sustainably sourced wood with best available (or even better) technologies removes or alleviates several of the environmental problems of cotton and oil-based materials.

- MMCF production provides synergies with the production of long-lived harvested wood products: the latter uses larger wood dimensions, the former uses pulpwood and residues.

- Conversions from paper pulp likely to continue and will satisfy some of the demand growth. Greenfield mills are needed to maintain/increase the market share of MMCF.

Thank you for your attention!

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