New markets for biomaterials and bio based chemicals

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storaenso

THE RENEWABLE MATERIALS COMPANY

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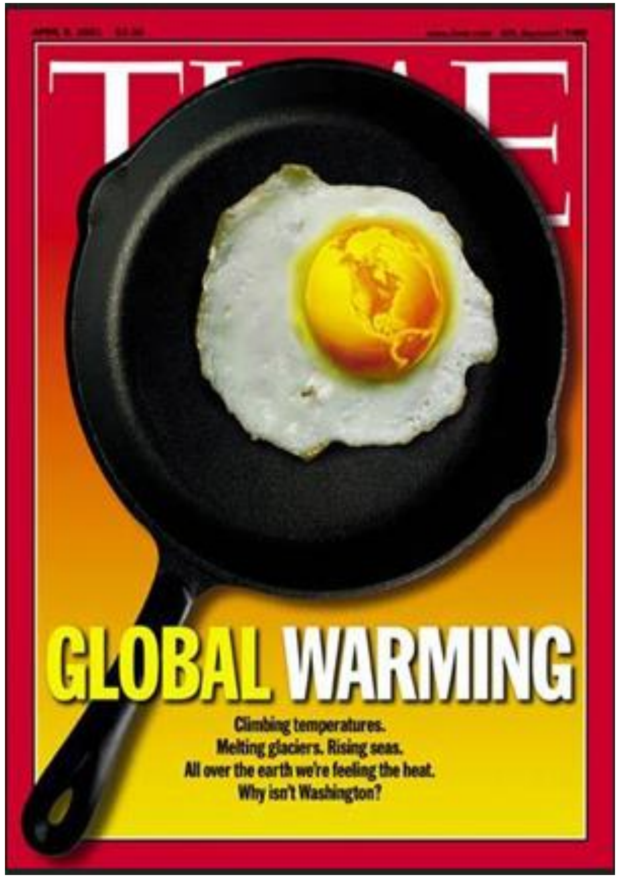
There is a need for a new approach to materials
- Different sides of the same coin



The world needs a new approach to materials


The Washington Post
Democracy Dies in Darkness
Energy and Environment
There's literally a ton of plastic garbage for every person on Earth
By Darryl Fears
July 19
Floating debris in Hawaii's Hanauma Bay in 2008. (NOAA Pacific Islands
The Washington Post The Daily 202 SIGN UP NOW POLITICAL AND POLICY INTEL FOR LEADERS


environment Ethical and green living with Lucy Siegle 2
The eco guide to microplastics
Seafood eaters consume up to 11,000 tiny pieces of plastic a year. Scary, isn't it?
Lucy Siegle
07:00 CEST söndag, 06 augusti 2017
Follow Lucy Siegle
I'm officially declaring this the Summer of Plastic. With the rising tide of plastic waste - 38.5 million plastic bottles a day in the UK alone and production set to quadruple by 2050 - the plastic pollution crisis in our oceans has become the breakout issue.

EU declares war on plastic waste

Brussels targets single-use plastics in an urgent clean-up plan that aims to make all packaging reusable or recyclable by 2030

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The renewable materials profitable growth company

We are well-positioned for profitable growth – strength of our portfolio

		Sales 2018 EUR and % of group's sales		Market growth	Position
Consumer Board	+	2.6 BEUR	25%	2016–2030 for virgin board: Europe 1.8%, North America 1.2%, Latin America 3.3%, China 4.3%, Rest of Asia 3.4%, Africa 2.5%	**#1** in LPB, FSB and CUK in Europe or the world
Packaging Solutions	+	1.3 BEUR	13%	High quality SC fluting 1-3%; Kraftliner 2–3% excl. North Am; Testliner 3–4% Eastern Europe	**#6** in containerboard in Europe
Biomaterials	+	1.6 BEUR	16%	Market pulp 2.3%; Fastest growth in tissue (3.2%)	Widest pulp grades portfolio **#1** in Europe in fluff
Wood Products	+	1.6 BEUR	15%	Global sawn softwood 2–3%, European new construction 3.5%	**#1** in Europe and **#4** in the world in supplying wooden construction material
Paper	-	3.1 BEUR	29%	Declining 3–5% annually	**#2** in Europe

The megatrends make us important in helping customers stay competitive and profitable

- Global warming
- Growing middle class
- Eco awareness
- Changing lifestyles
- Urbanisation
- Growing population
- Digitalisation

Increasing demand for material that is **renewable**, **recyclable** and **fossil free**

New demands on brands to keep their pricing power

THE RENEWABLE MATERIALS COMPANY

Wood-based materials offer a better alternative to fossil-based and other non-renewable materials

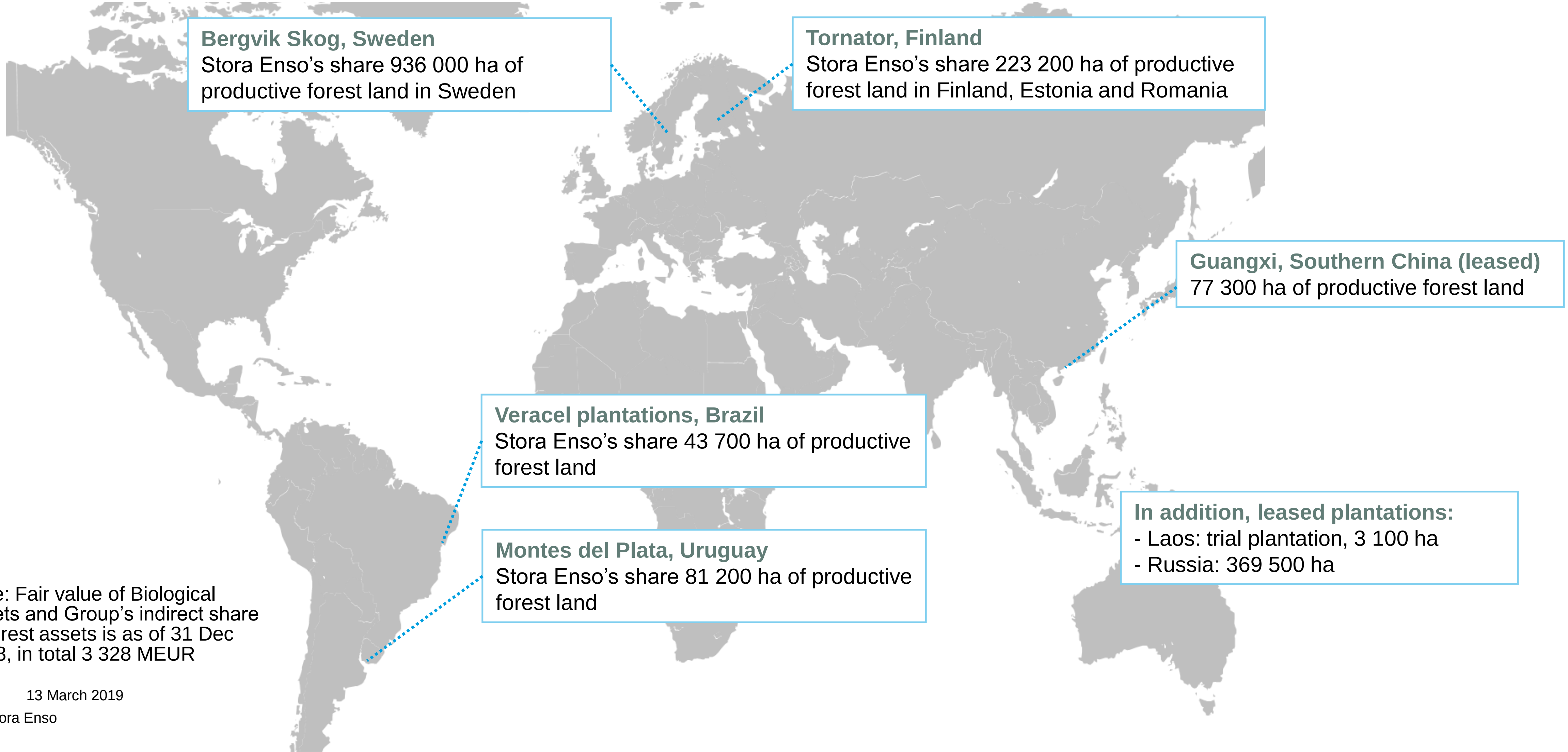
Trees, our raw material, grow back

Recycling is good – but it's not enough

Renewable materials help combat global warming

Join us on our journey to replace plastics

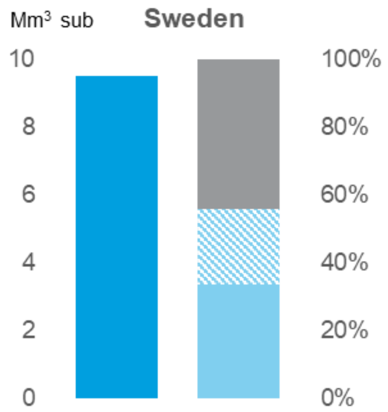
Forest assets – Northern and Southern hemisphere
Fair value of 3.3 BEUR

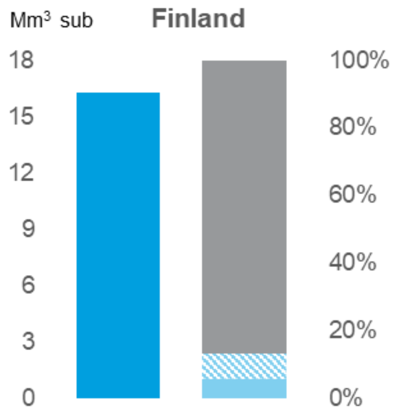


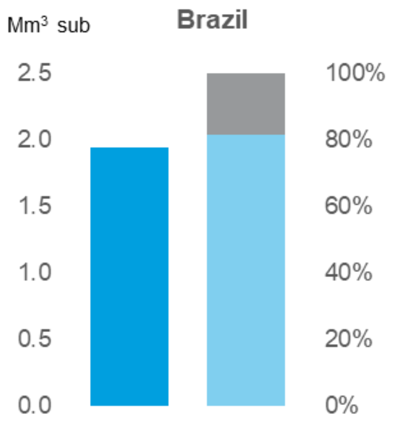
Note: Fair value of Biological assets and Group’s indirect share of forest assets is as of 31 Dec 2018, in total 3 328 MEUR

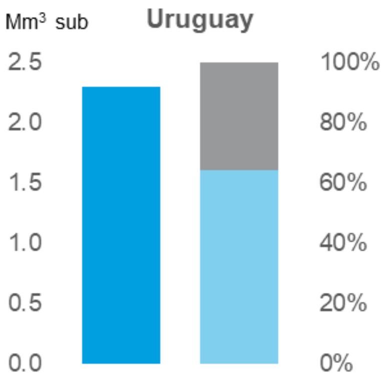
We control ~30% of our wood raw material
– a critical advantage in the bioeconomy

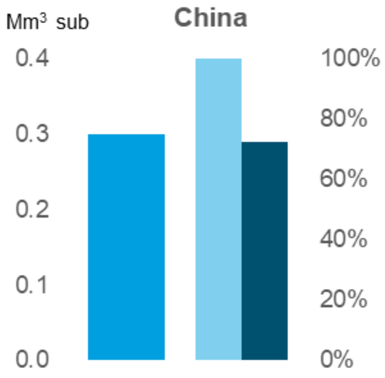
Stora Enso's forest assets*







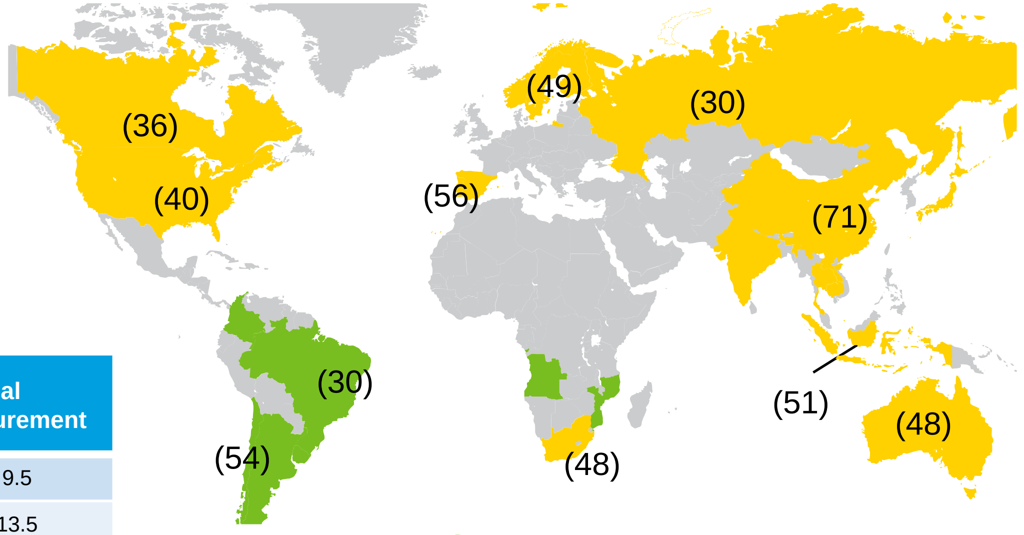




million m^3sub	Standing stock	Annual procurement
Sweden	79.3	9.5
Finland	24.6	13.5
Brazil	2.9	1.9
Uruguay	8.1	2.1
China	6.4	0.3

Consumption, million m^3 sub (solid under bark)
Long-term supply contracts, %
Sold externally of annual harvesting, %
Supply from own sources based on ownership, %
Purchased, %

Pulpwood plantation availability and wood cost



Potential for wood supply expansion
Wood supply restrictions for expansion
( ) Wood cost (USD/m3/sob) at mill - hardwood

** Sweden includes Stora Enso's share of Bergvik Skog and Finland Stora Enso's share of Tornator. Brazil and Uruguay with 50% share.*

Demand for all pulp grades is growing by 2.3%...

Textiles, nonwovens
107 Mt market, growing 3%/y
6.6 Mt market pulp (dissolving)

Carton board
47 Mt market, growing 2.0%/y
5.3 Mt market pulp

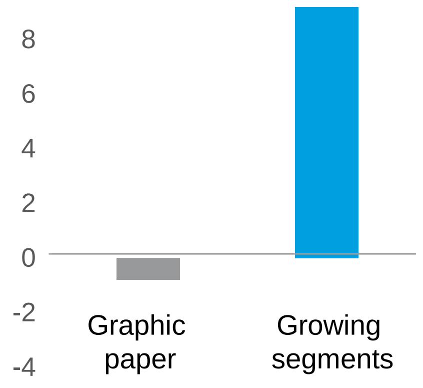
Tissue
36 Mt market, growing 3.2%/y
22 Mt market pulp

Hygiene
590 billions of converted unit, growing 3.5%/y
6.2 Mt market pulp (fluff)

Paper
Specialty: 29 Mt market, growing 2.0%/y
9 Mt market pulp

Graphic: 101 Mt market, declining -1.0%/y
17 Mt market pulp

Pulp consumption increase (Mt)

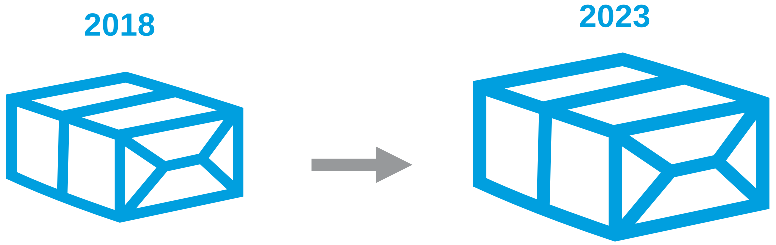


Digitalisation | Urbanisation | Growing middle class | Global warming | Eco awareness | Changing lifestyles | Growing population

Source: Pöyry Consulting Group, Hawkins Wright, Smithers Pira, RISI

…and we expect a balanced market in pulp to continue

Pulp (hardwood and softwood) demand grows 2% CAGR by 2023

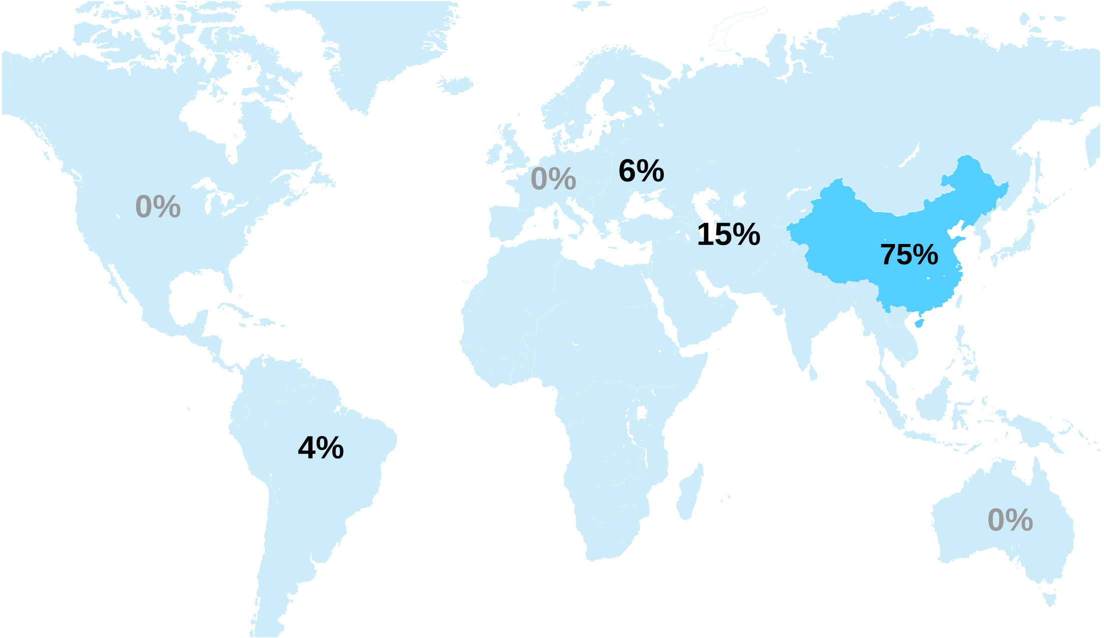


2018		2023
59	Demand, Mt/a	65
90	Market balance, %	96

Pulp average capacity growth

2007-2018	+ 1.6 Mt/y (90% ratios)
2019-2023	+ 0.3 Mt/y; +1.3 Mt/y Unconfirmed capacity additions

Share in pulp demand growth



Source: Hawkins Wright, Pöyry and Stora Enso

Megatrends support the demand for virgin pulp in China

To 2030:

Urbanisation

58% **70%**
(+200 million people)

Growing middle class

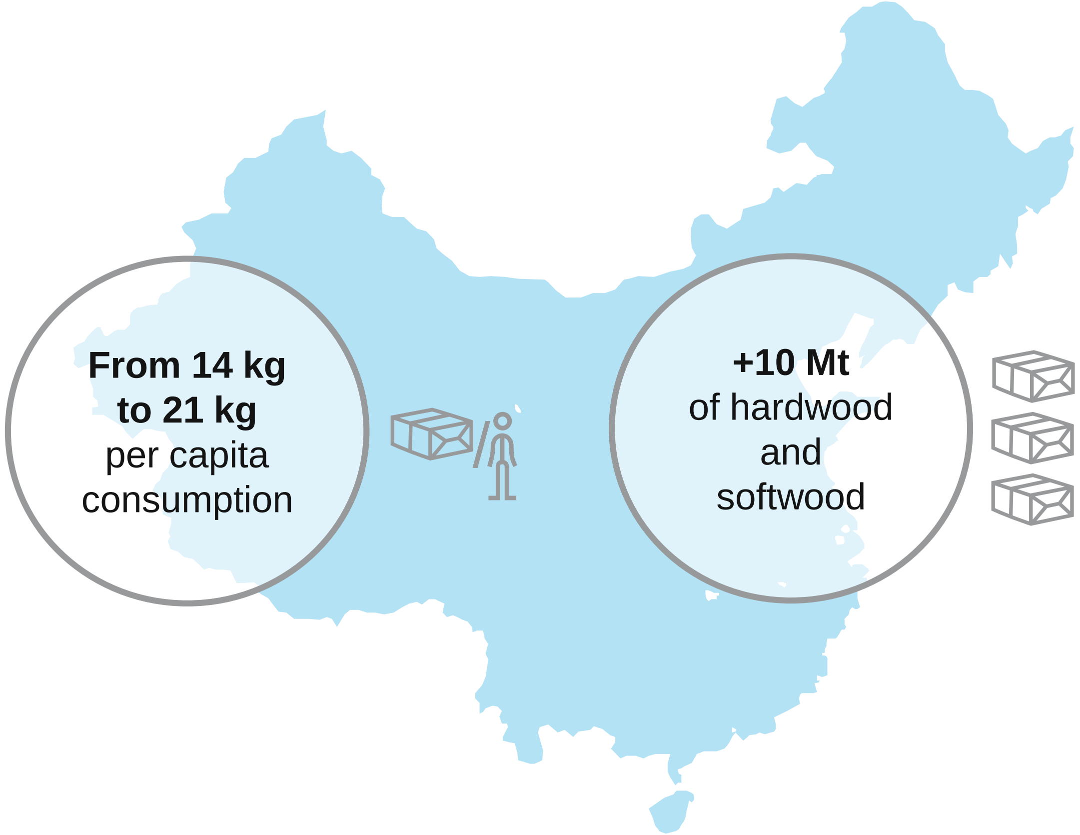
5 trillion **9.6 trillion**
(private consumption in USD)

Changing lifestyles

60% **90%**
(safe sanitation services)

Eco awareness

Ban on imported recovered fibre



Source: World Bank, UN Global Goals, Morgan Stanley Research, RISI, Stora Enso

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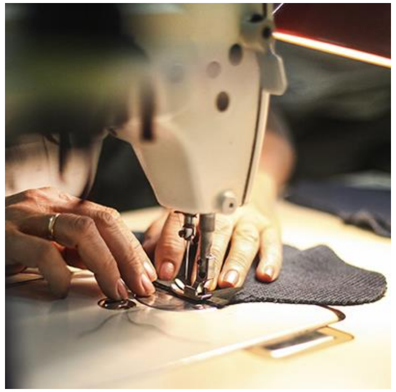
Solutions for various end-use applications

Our **Supreme**, **Perform** and **Select** grades are transformed by our customers into all kinds of paper, packaging and tissue.

Our **Care** fluff grades are mostly used for the manufacturing of hygiene products such as diapers and feminine care products.



Our **Pure** dissolving pulp is used for the production of viscose fabrics, but also in applications in the food and pharmaceutical industries.

In addition to pulp, we also produce various by-products such as **Lineo™ by Stora Enso** (kraft lignin)**, Tall Oil and Turpentine**, used as raw materials in the adhesive and cosmetic industries among others.

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Solid performance with increased focus on innovation

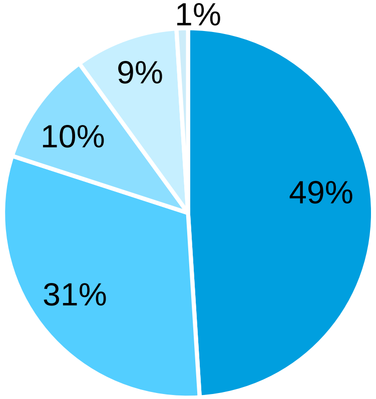
60 countries

1 635 MEUR sales 2018

+10.3% 2018 YoY

Sales by product

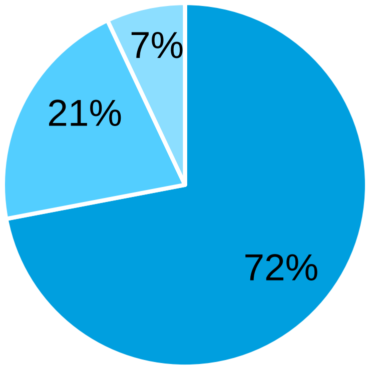
- Hardwood
- Softwood
- Fluff
- Dissolving
- Others



Nr 1 in fluff in Europe

Sales by region

- Europe
- China
- Others



Renewable material from certified forests and plantations

4 R&D Innovation centres

4 Growth platforms

16 Projects

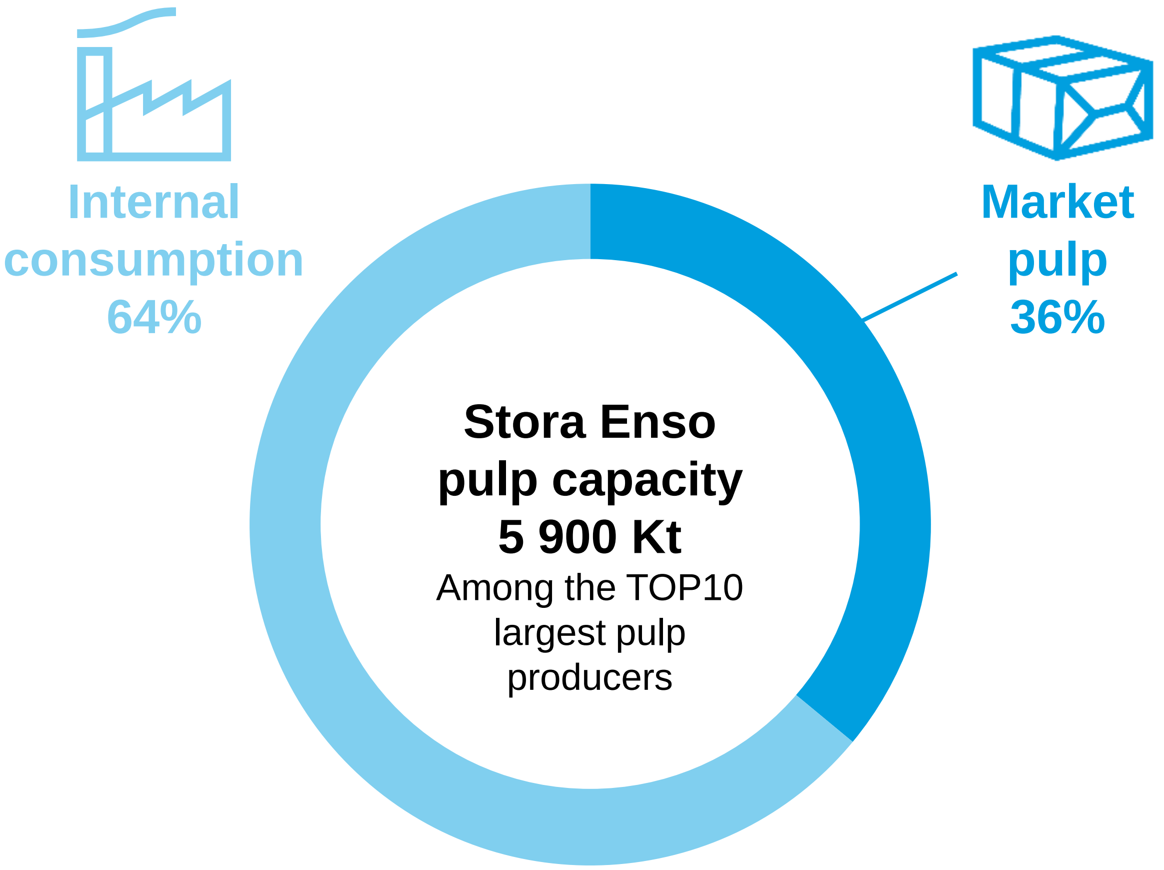
An ambition to become the leading R&D innovator within the industry sector

100% of our wood is traceable to its forest of origin

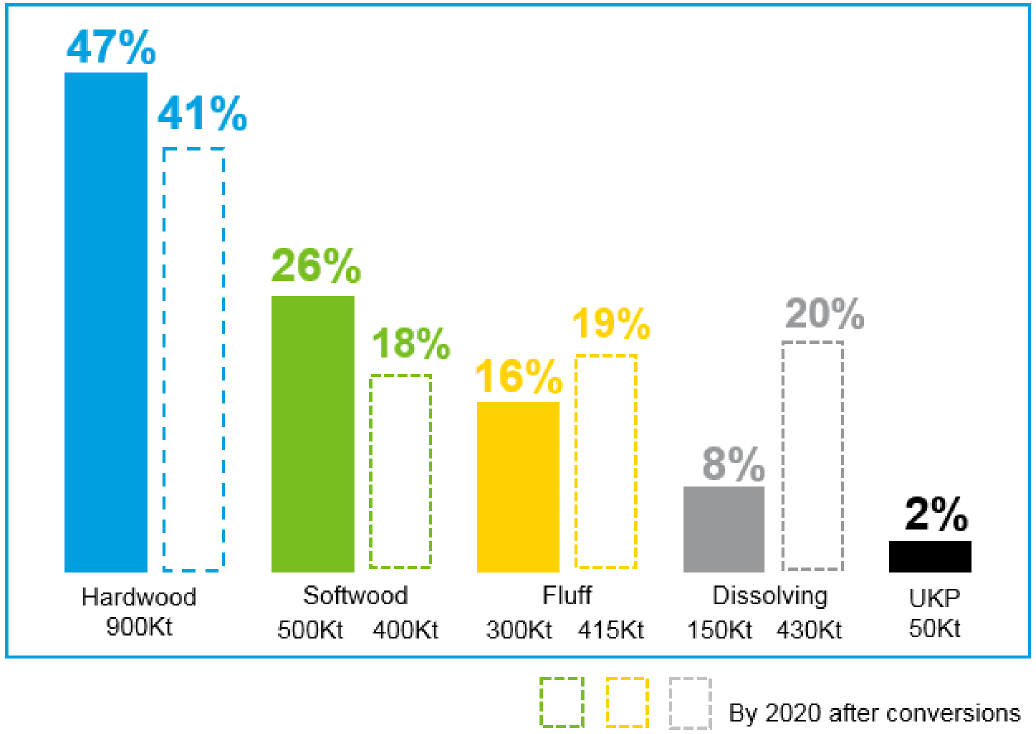
26.1% EBIT margin 2018

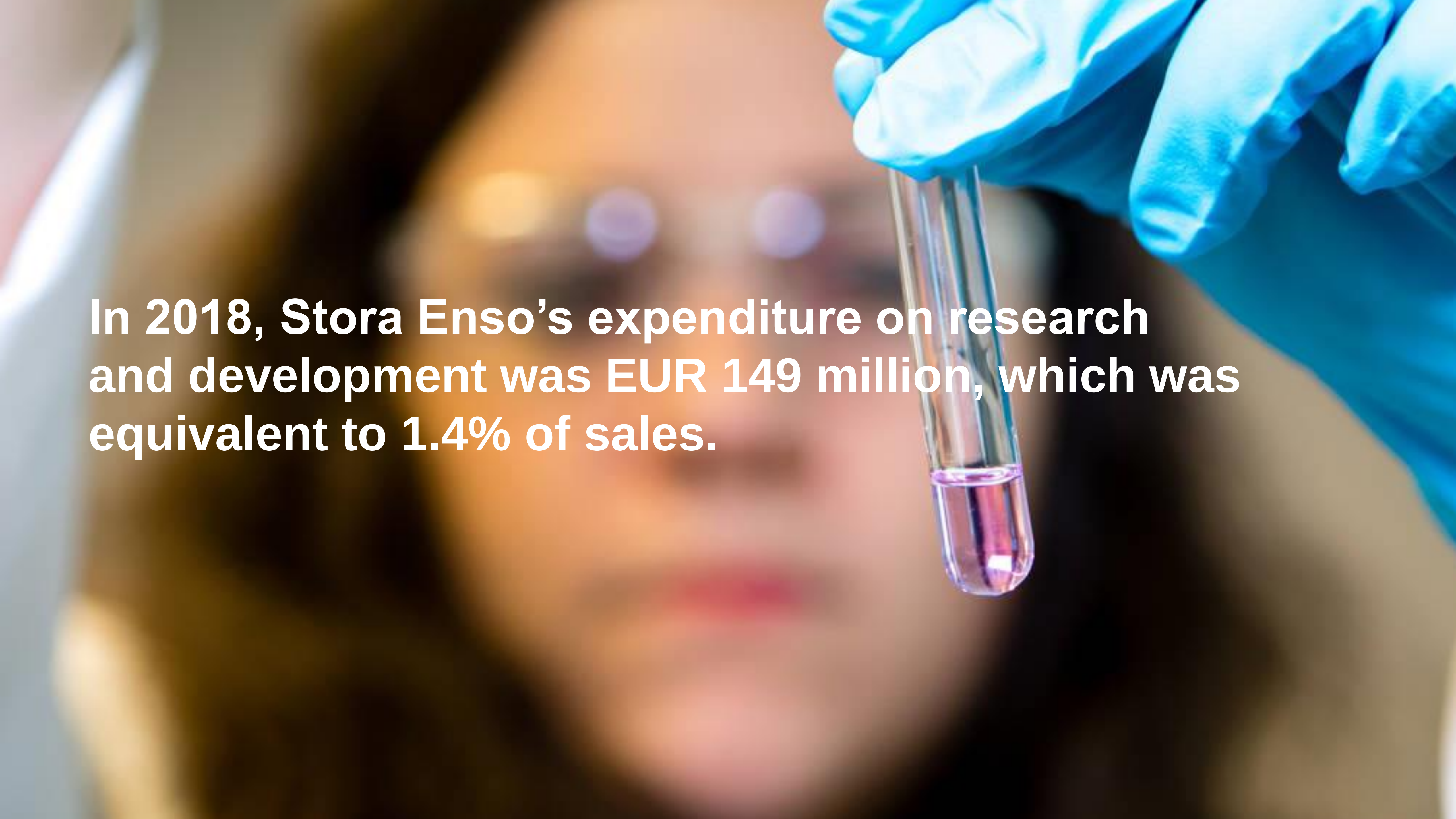
17.9% ROOC 2018

Our chemical pulp offering



Market pulp 2019





In 2018, Stora Enso’s expenditure on research and development was EUR 149 million, which was equivalent to 1.4% of sales.

Our renewable products


Biocomposites


Bio-based chemicals


Bio-based materials


Wood Products


Intelligent packaging


Lignin


Paperboard materials


Packaging solutions


Paper


Market pulp


Pellets


Speciality papers

Future potentials to replace fossil-based materials

BIO-BARRIERS AND FILMS

REPLACING PE-FILMS IN CUPS

POUCHES FOR LOW TO MEDIUM SHELF LIFE

LIDS

REPLACING ALUMINIUM FOIL

POUCHES WITH HIGH BARRIER PROPERTIES

GLOBAL MARKET SIZE

~80 BEUR

2019-2021 → 2021-2023 → 2023-2025

BIOCOMPOSITES

STRAWS

CAPS, CLOSURES & PACKAGING COMPONENTS

RIGID CONTAINERS

TRAYS

CAPS WITH HINGES

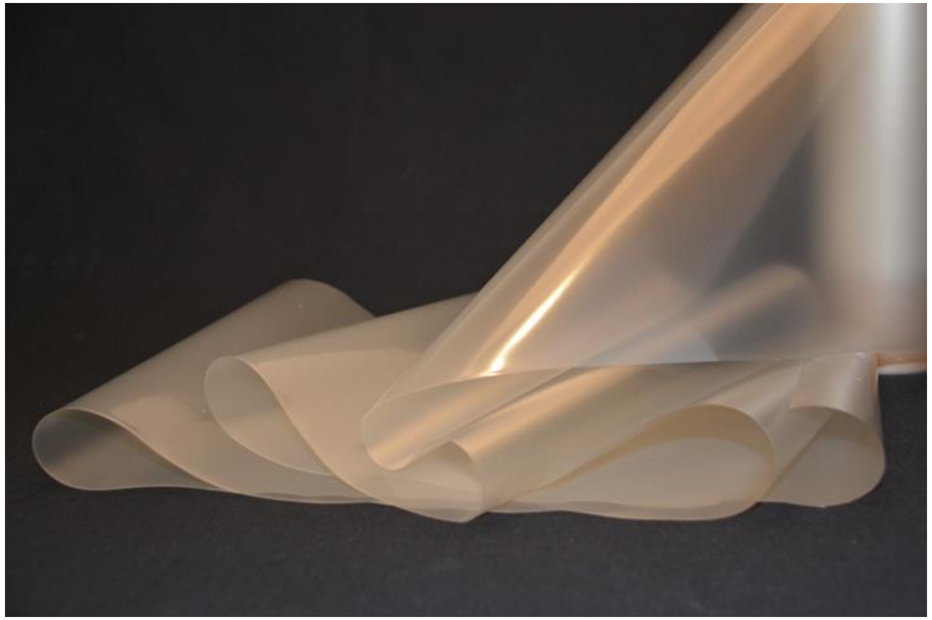
TUBES

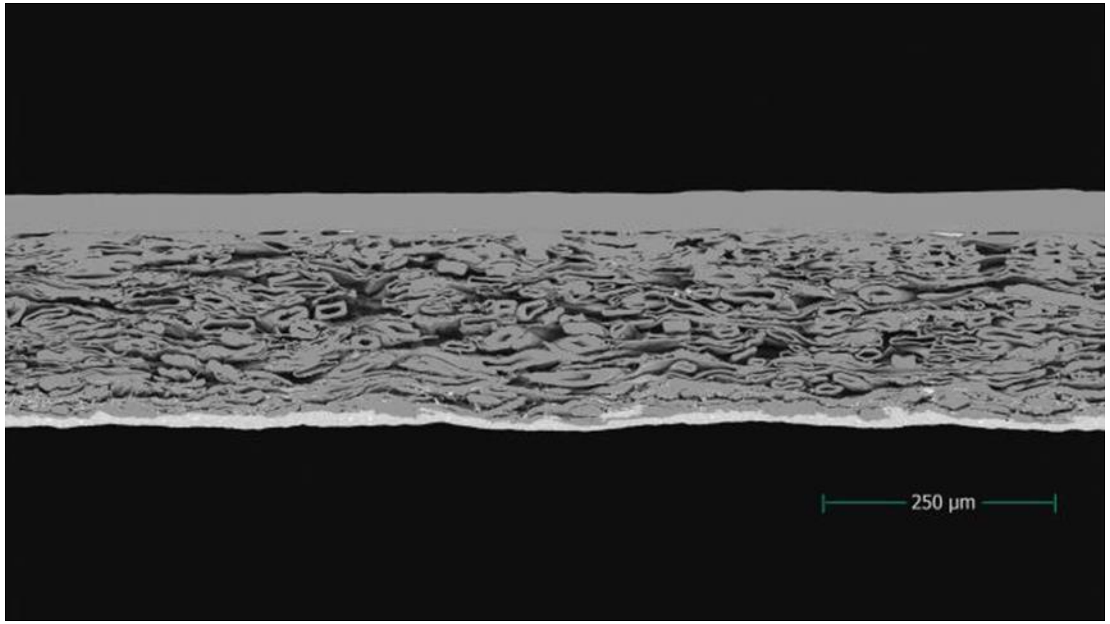
~25 BEUR

Source: SmithersPira, internal analysis

Micro Fibrillated Cellulose – potential in films, coatings and barrier materials

- MFC key areas of use are strength enhancement, ideal for specialty paper and wet-laid nonwovens.
- Rheology modifier and stabilizer
- Films and barrier solutions





Biocomposites gradually replacing plastic

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- Use in products, such as disposable cutlery, furniture, as well as storage and logistics goods
- Raw material for markets where plastics dominate
- Can reduce the consumption of fossil-based plastic by up to 60%
- Always a better alternative than fossil-based plastic, reducing the carbon footprint of a product up to 80%

DuraSense™
by Stora Enso




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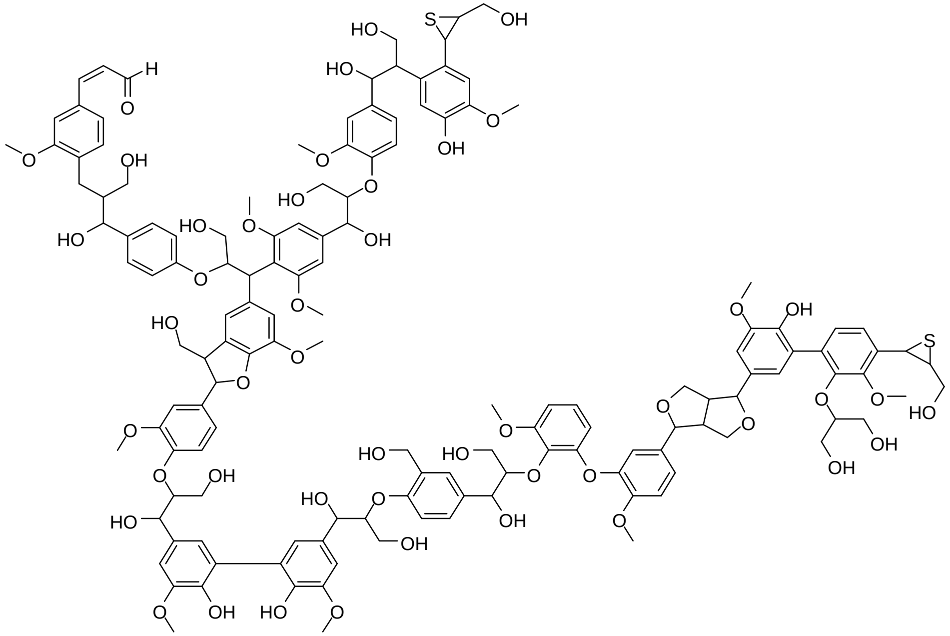
Lignin replaces fossil-based materials



Lineo™
by Stora Enso

Lignin – big opportunities in many markets

Adhesives

Carbon fibre

Energy storage

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New technologies for sustainable wood fibre in textiles

TreeToTextile – sustainable textile fibres with less energy and chemicals

- TreeToTextile a joint venture between H&M group, Inter IKEA group, Stora Enso and innovator Lars Stigsson

- TreeToTextile has developed a new way of processing dissolving pulp to yarn, similar to Viscose, Modal, Tencel, Ioncell

- The TreeToTextile production process uses less energy and chemicals, allowing for a much more sustainable and cost-efficient fibres.

- There is a strong market for a fibre with good sustainability performance

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Creating value from renewable, reusable and fossil free materials

Innovation Platforms	Value proposition	End markets	Time to market	Market Potential: Size / value
Improved pulp properties	Increased material efficiency and performance	Specialty papers, hygiene fibre-based packaging	Continuous	2.6 Mt / 1.4 BEUR
Regenerated cellulose	Novel sustainable material from cellulose	Textile, and as film material in packaging	2020–2022	20 Mt / 35 BEUR
MFC	Increased material efficiency and performance	Specialty papers, coatings, cosmetics, and as film material in packaging	2019–2021	0.7 Mt / 1.6 BEUR
Lignin	Replace fossil-based materials	Resins and adhesives Carbon fibre Carbons for energy storage	2017–2023	1 Mt / 1.7 BEUR
Bio-based chemicals	Replace fossil-based materials for plastics	Packaging	2026–2027	2 Mt / 2.5 BEUR

Sources: Hawkins Wright, The Fiber Year 2018, EMBS, Smithers Pira, Transparency market research, Price Hanna consultants, Composites Marktbericht, Plastics Insight, Stora Enso experts

Winning in sustainability

Sweden's most sustainable B2B brand of the industry in the Sustainable Brand Index™

Among the top ten sustainability reports globally according to *Reporting matters 2018* by the World Business Council for Sustainable Development (WBCSD)

Top-ranked in gender balance and gender equality by Equileap

Best Sustainability Report according to Finnish financial journalists in a competition organised by the corporate responsibility network FIBS

Rated Sweden's most sustainable company by Aktuell Hållbarhet, Lund University, and Dagens Industri

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1% shift of fossil-based and other materials
=
20 BEUR renewable business

POWER OF A

TREE

THE RENEWABLE MATERIALS COMPANY