



Biomaterials – Innovating for the future

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EVP, Biomaterials division

Our road to success in the bioeconomy

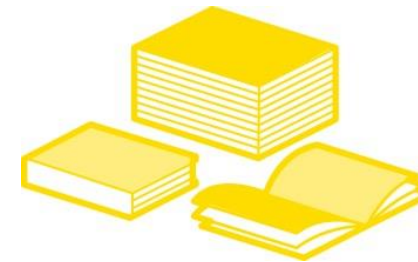
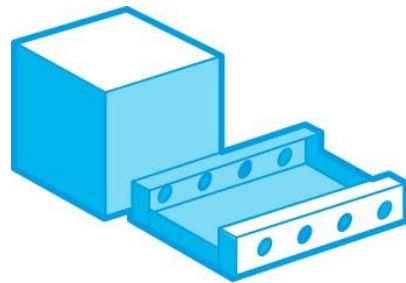


Introducing
new products
and services

Addressing
attractive
end-use
segments

Delivering
sustainable
profitable
growth

Generating
superior
ROCE



Biomaterials has the widest offering in the market



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60 countries
1 376 MEUR sales 2016
+13.5% Q3 YOY 2017

- 4** R&D centres
- 2** new products since 2014
- 6** strategic partnerships on innovation
- 7** digitalisation projects



Well managed certified renewable raw material



5 pulp mills

Finland, Sweden, Brazil, Uruguay

2.15MT market pulp

203 MEUR EBIT
Q1–Q3/17

14.8% ROOC Q3/17

Only 18% of our external market pulp sales are geared to the **graphic paper market**



1 700 employees
22% are women

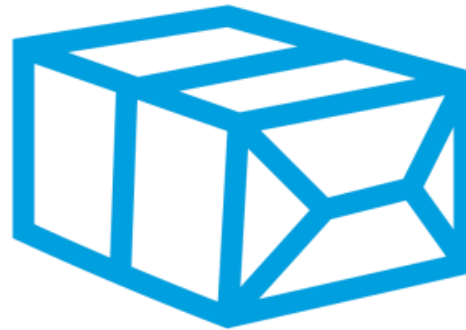


Our three focus areas



Maximize value from eucalyptus pulp

- Continue to improve production efficiency
- Improve cost competitiveness in Montes del Plata



Differentiate our Nordic pulp business

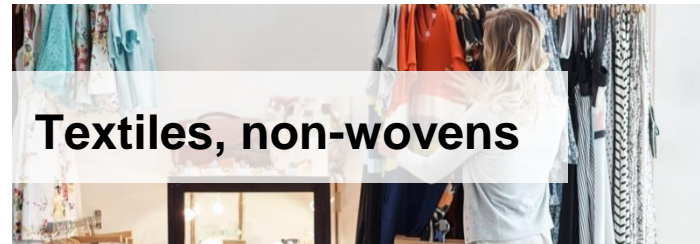
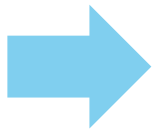
- Reduce exposure in softwood
- Grow in fluff and dissolving pulp
- Continue to improve production efficiency
- Innovate on pulp applications with current customers



Create new platforms for growth

- We build and develop strong business on:
 - Improved pulp properties
 - Regenerated cellulose and MFC
 - Lignin
 - Bio-based chemicals
 - Extraction and separation technologies

Global trends enhance pulp growth...



Textiles, non-wovens

100 Mt market, growing 3%/y
6.1 Mt market pulp (dissolving)



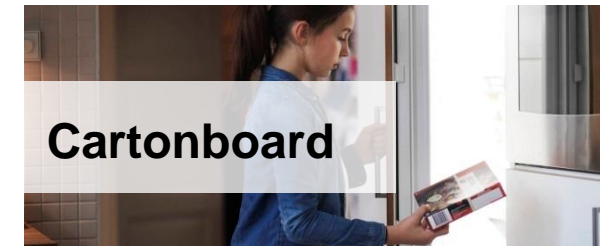
Hygiene

590 billions of converted unit, growing 3.6%/y
6 Mt market pulp (fluff)



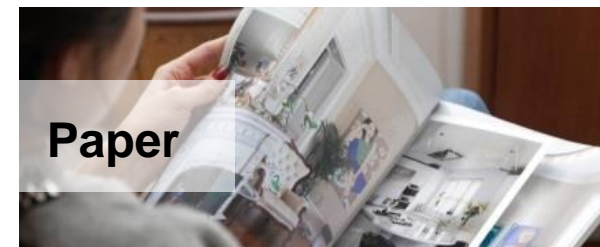
Tissue

34 Mt market, growing +3.5%/y
20 Mt market pulp



Cartonboard

44 Mt market, growing 2.5%/y
4.5 Mt market pulp



Paper

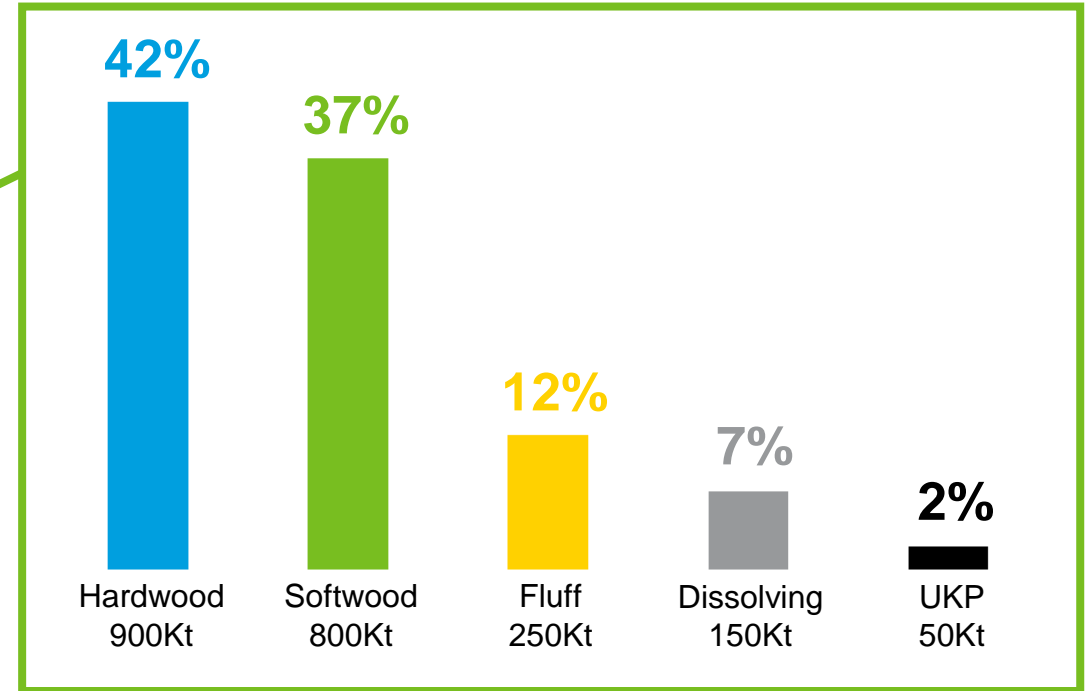
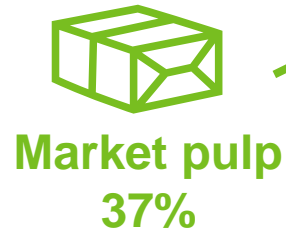
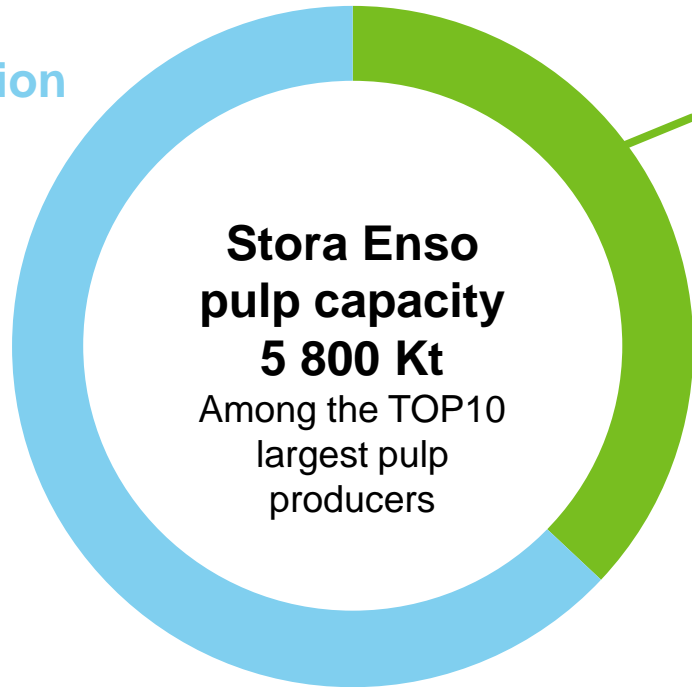
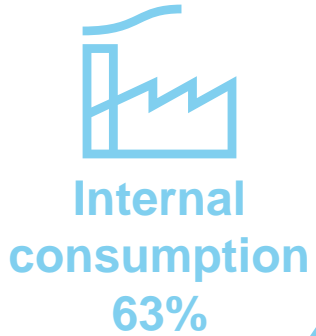
Graphic: 108 Mt market, declining -2.5%/y
17 Mt market pulp

Specialty: 28 Mt market, growing 1.8%/y
9 Mt market pulp

To 2021...

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

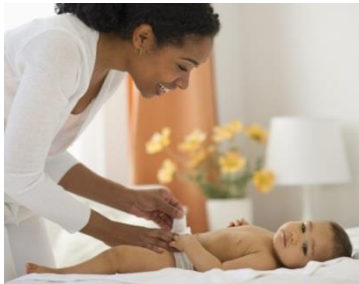
...and we have the widest pulp portfolio in the market



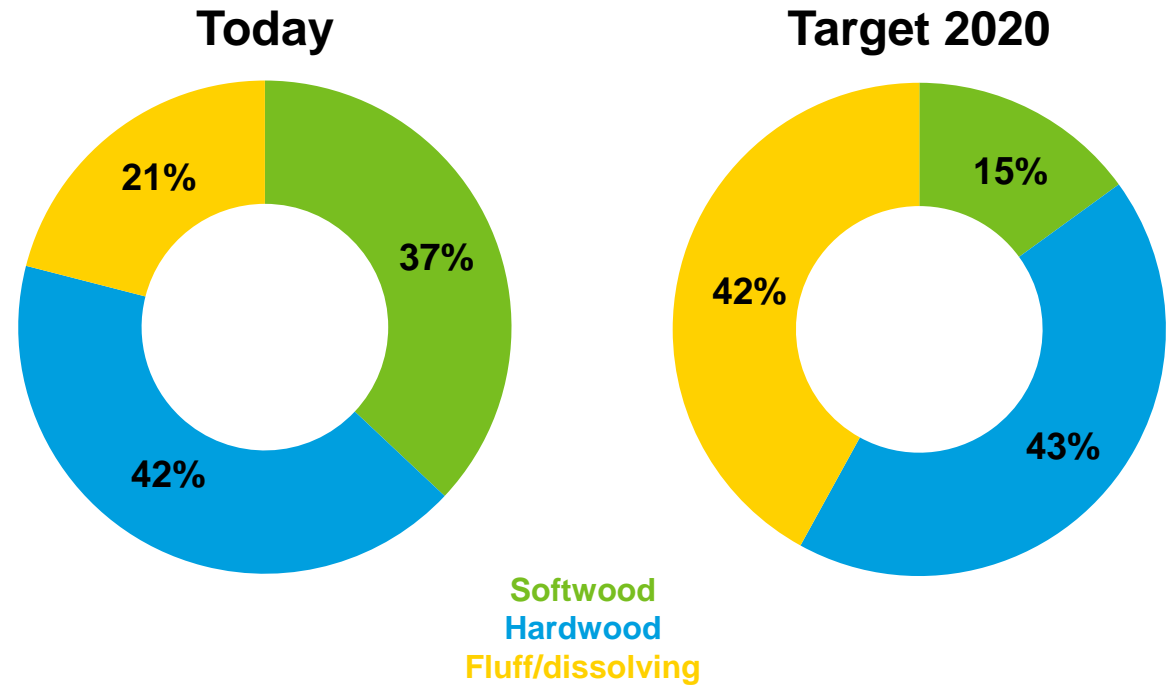
We are differentiating our pulp mix...



Maximize value from eucalyptus pulp



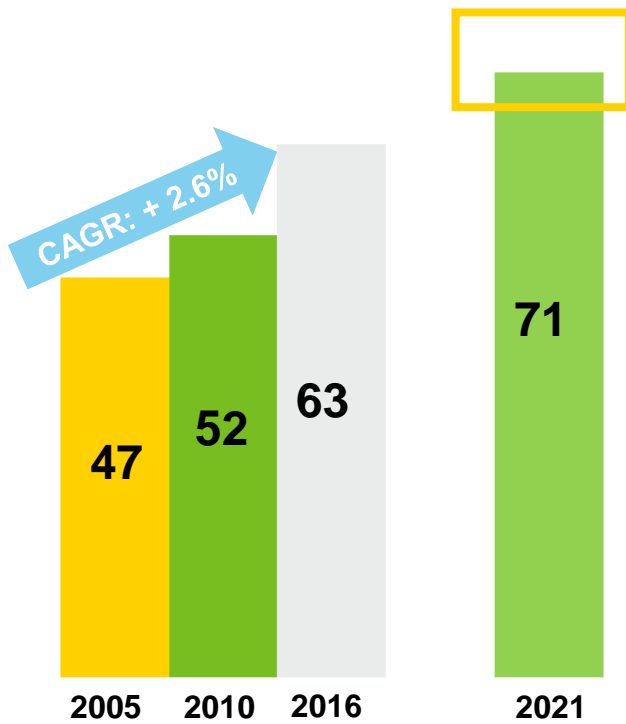
Improve competitiveness of our Nordic mills (Fluff and dissolving)



...and pulp demand is growing in our strategic segments



Pulp demand to 2021
in million tonnes (Mt)



Source: Hawkins Wright, Pöyry, Stora Enso



CAGR: +2.5% ~ +1.7 million tonnes (Mt)/year

Grade	Mt
Hardwood	4.2
Softwood	0.7
Fluff	1.1
Dissolving Pulp	2.4
TOTAL	8.4

Balanced market expected

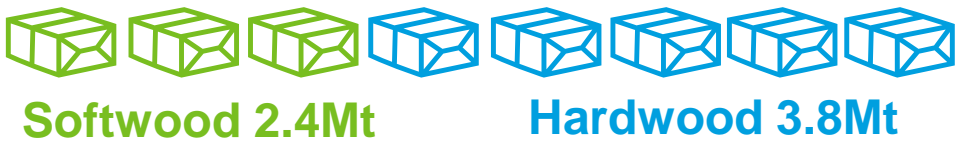


Hardwood and softwood average capacity growth (Mt/year)

2006-2016 **+ 1.4 Mt/y (90% ratios)**

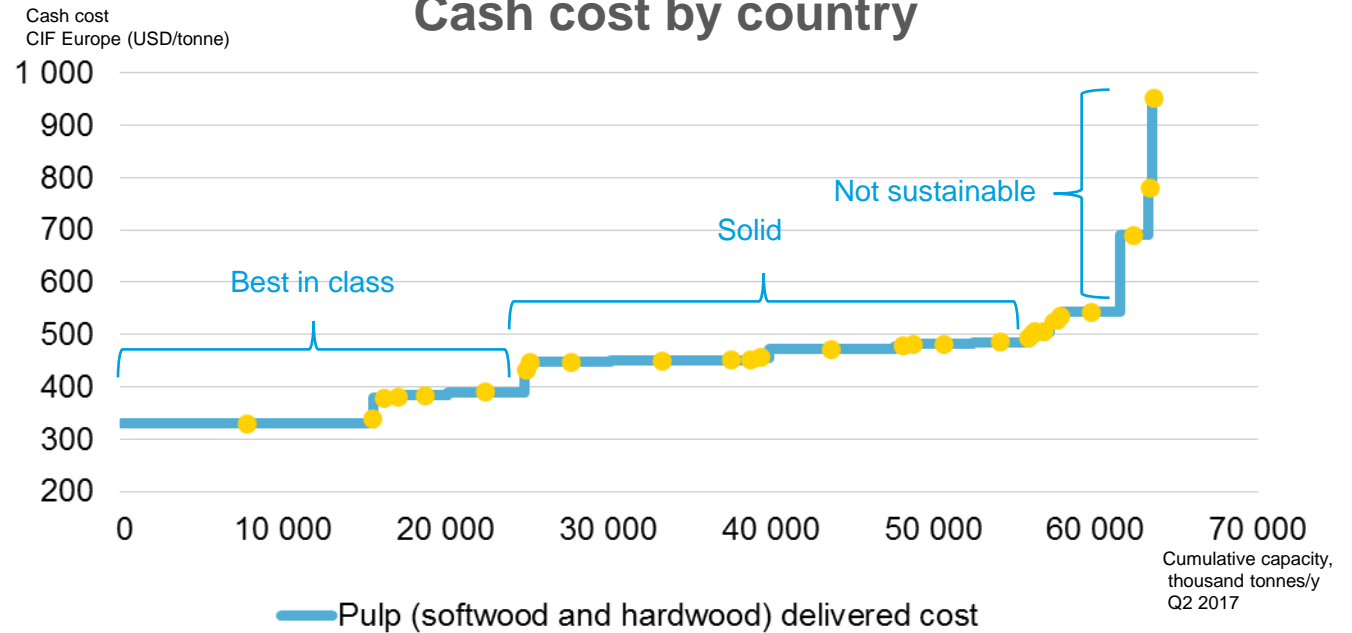
2017-2021 **+ 1.2 Mt/y**

**Announced capacity growth 2017–2021:
6.2 Mt (1.2 Mt/year)**



Source: Pöyry, Hawkins Wright

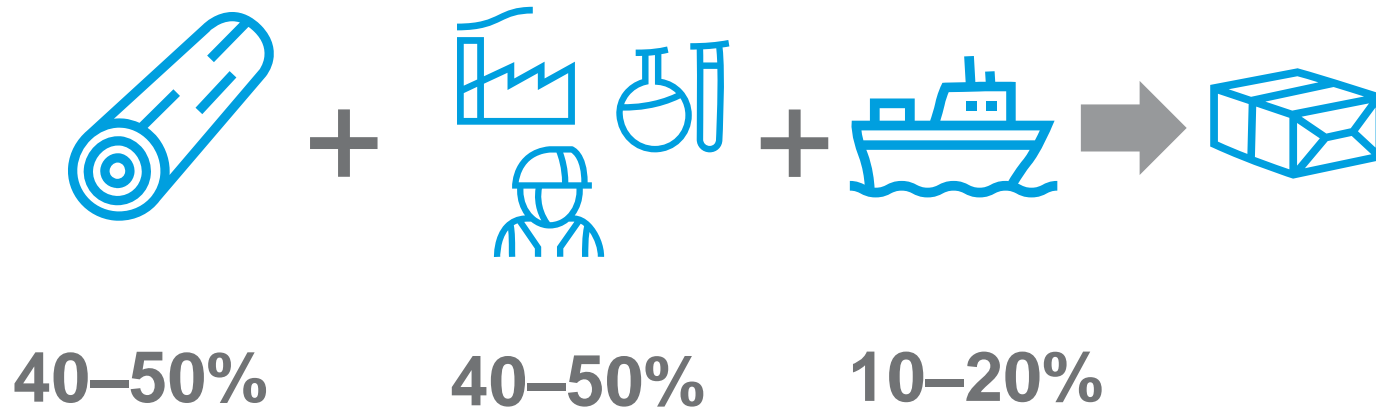
Cash cost by country



Wood price impact in pulp industry



Average industry pulp cost breakdown



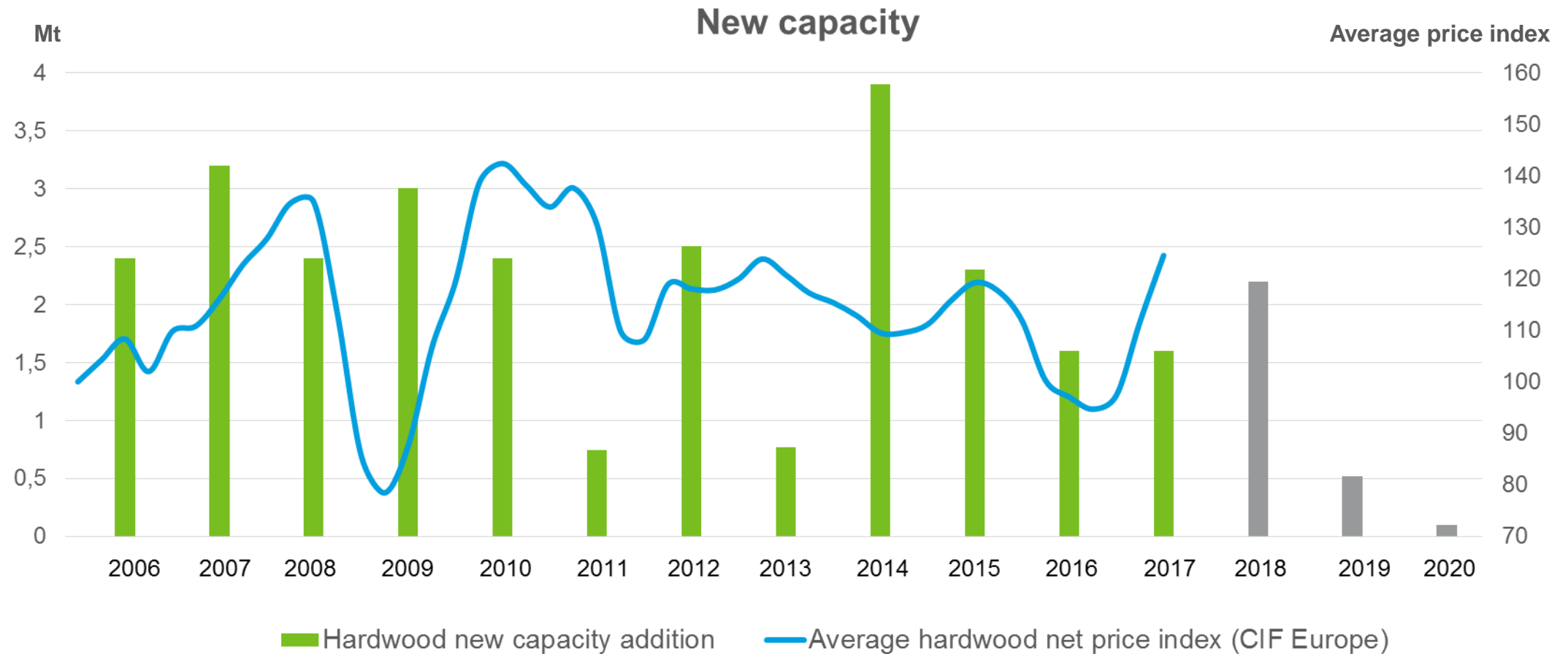
Wood cost per region

Region	Hardwood	Softwood
Brazil	33	29
USA	41	35
Chile	51	34
Canada	35	41
Nordics	46	45
Portugal	51	39
Indonesia	51	n/a
China	80	74

Q2/17 (USD/m³/sob) at mill

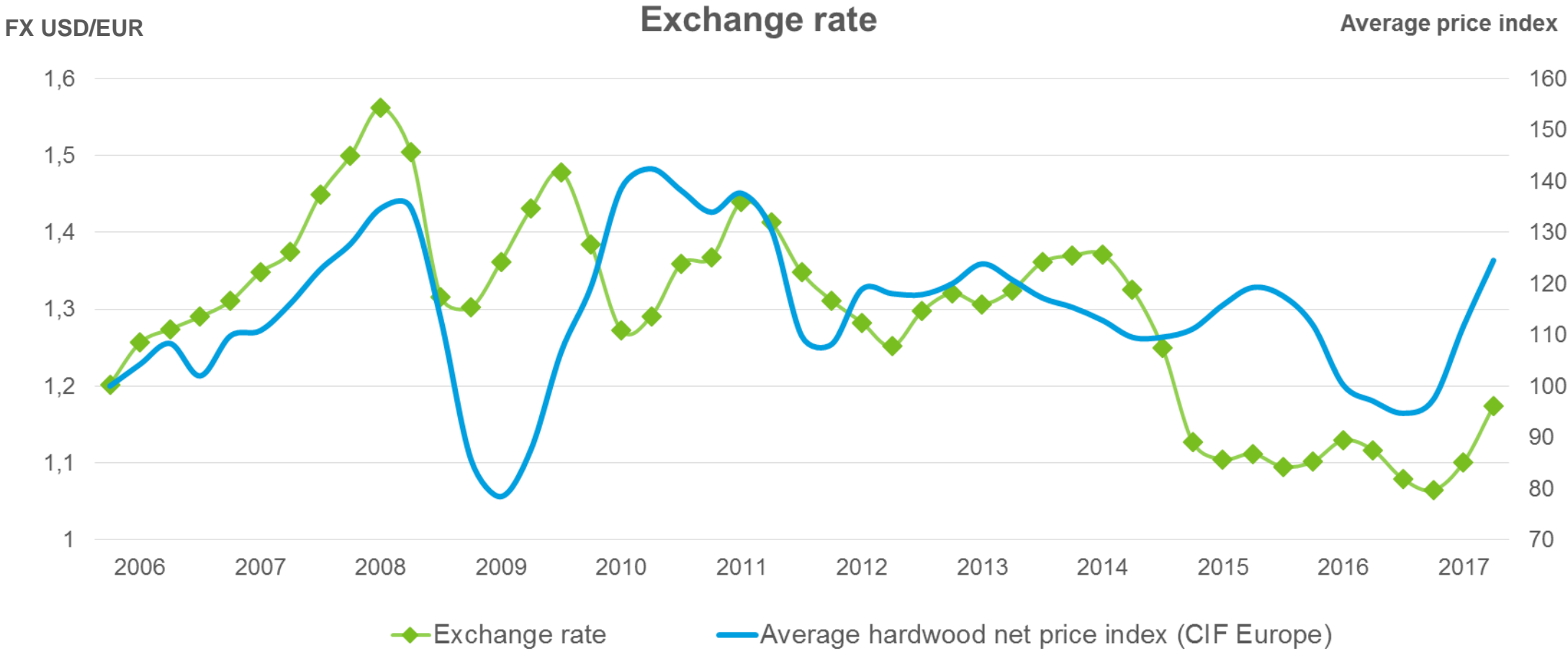
Source: Hawkins Wright, Pöyry
1 EUR = 1.123 USD

New capacity does not fully correlate with pricing



Source: Pöyry (net price included average estimated discounts)

Exchange rate has an impact on pulp pricing



Source: European Central Bank and Pöyry (net price included average estimated discounts)

GDP correlating well with pulp prices

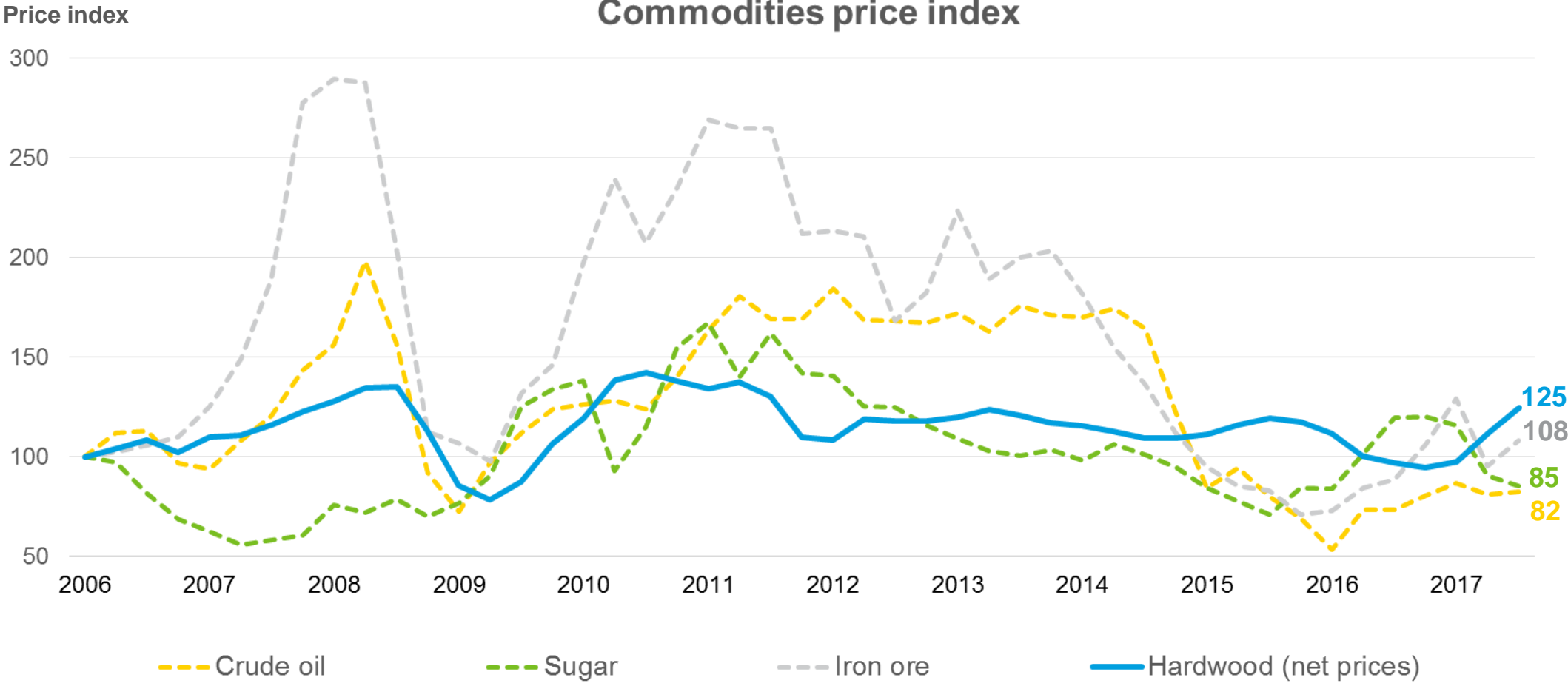


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Source: IMF and Pöyry (net price included average estimated discounts)
 * Based on G20 countries, representing more than four-fifths of gross world product

Pulp price is stable compared to other commodities

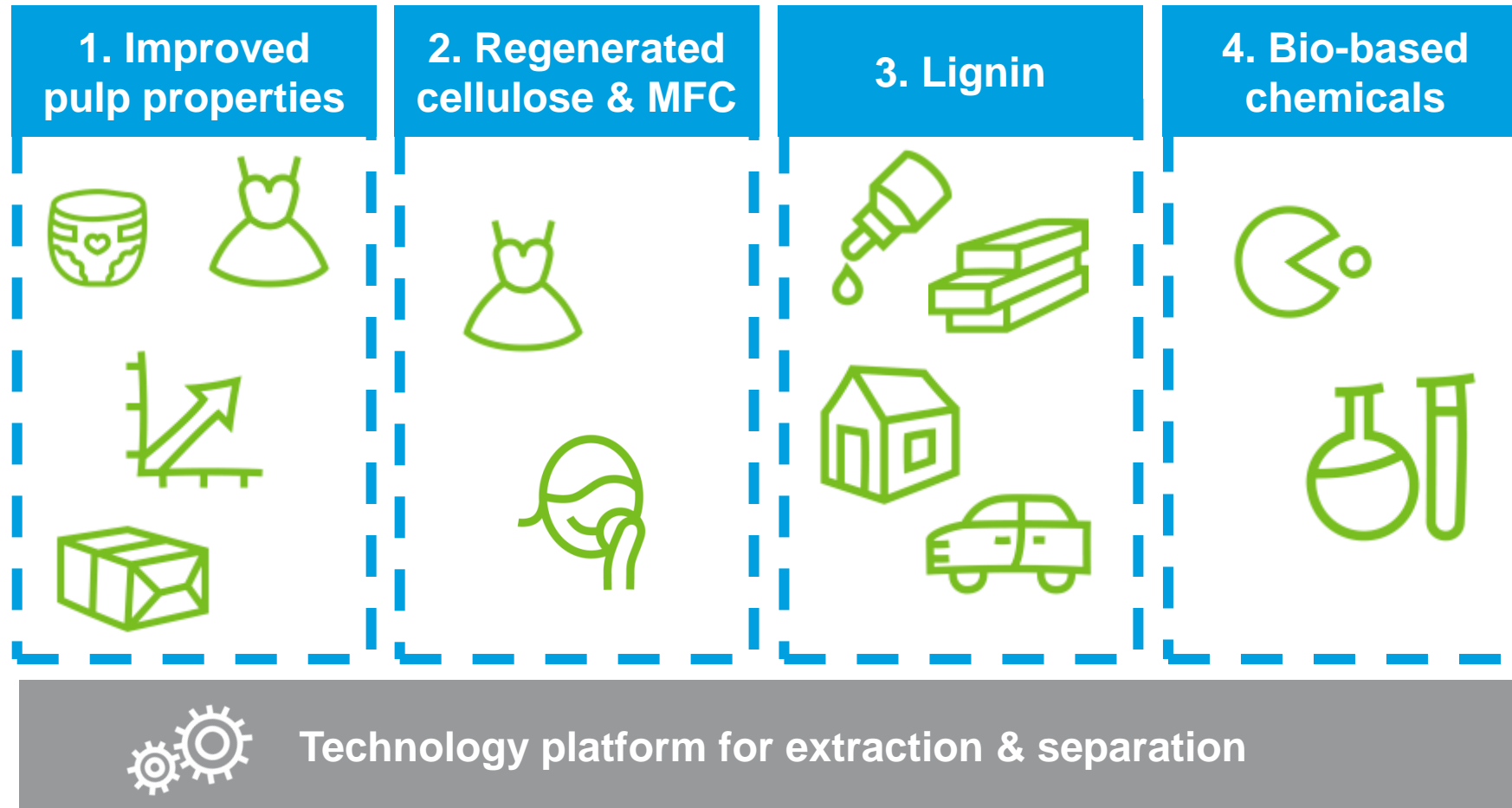


Source: World Bank, Pöyry (net price included average estimated discounts)

Innovation is key for sustainable profitable growth



Product platforms



Platform 1: improving pulp properties for existing products



Fluff pulp

- Hygiene and health, growing by 3.6% per year
- Life expectancy and increased disposable income in developing countries
- Improve fluff pulp properties to increase customer value



Dissolving pulp

- Dissolving pulp to textiles is a 6.1 Mt market, growing 6.8% per year
- The increase of cellulosic fibre in textiles is driven by global brand owners
- Improve quality to be able to differentiate in the value chain



Pulp for specialty papers

- Flexible packaging, labels, security, décor, among others
- 28 Mt market, growing 1.8% per year
- Fibre improvements, special additives, sustainable coatings & barriers, source reduction and other innovation opportunities

Source: *Smithers Pira, Hawkins Wright*

Platform 2: Developing new technologies for using wood fibre in textiles, non-woven and specialty papers



Regenerated cellulose

- Participate in the development of new technologies for using wood fibre in textile
- Growing interest from global brand owners increases demand for renewable fibres
- Opportunity to leverage on existing assets to enter this new market



MFC

- MFC has potential to be used in specialty papers and non-woven
- MFC is a versatile material with potential to work as strength enhancer, additive, binder and barrier material
- Stora Enso has a long history in the research of MFC and has a demonstration plant in Imatra, Finland

Source: Stora Enso

Platform 3: Lignin – big opportunities in many markets



Lignin



Phenol replacement

- Phenolic resins is a 2.8 Mt market, growing at 4% CAGR
- It replaces phenol in adhesives for plywood, OSB (oriented strand board), laminates, LVL and other wood construction materials
- The carbon footprint for lignin is roughly 1/10 of the carbon footprint of phenol



Carbon fibre

- Light-weight high performance composites
- 70–80 Kt market, growing at 9–12% CAGR
- Low-carbon-footprint carbon fibre is unoccupied market space



Energy storage

- Substitution of conventional hard carbon anode materials in energy storage, namely Li-Ion Batteries and Supercapacitors
- Market growing on average by 20% CAGR
- Key applications: portable consumer electronics, power tools, electrical vehicles, stationary applications and back-up systems

Source: Stora Enso, Carbon Composites, IDTechEx, LuxResearch, Markets and Research, Zion Research

Platform 4: Bio-based chemicals replacing fossil-based materials



Bioplastics and intermediates

- Growing interest in packaging/bottling markets for renewable solutions
- Reduction on carbon footprint and enhanced properties are key target areas
- Market clearly favoring second generation biomass as the raw material source
- It is a very populated market place, thus, strategic alliances will be crucial to win in this industry



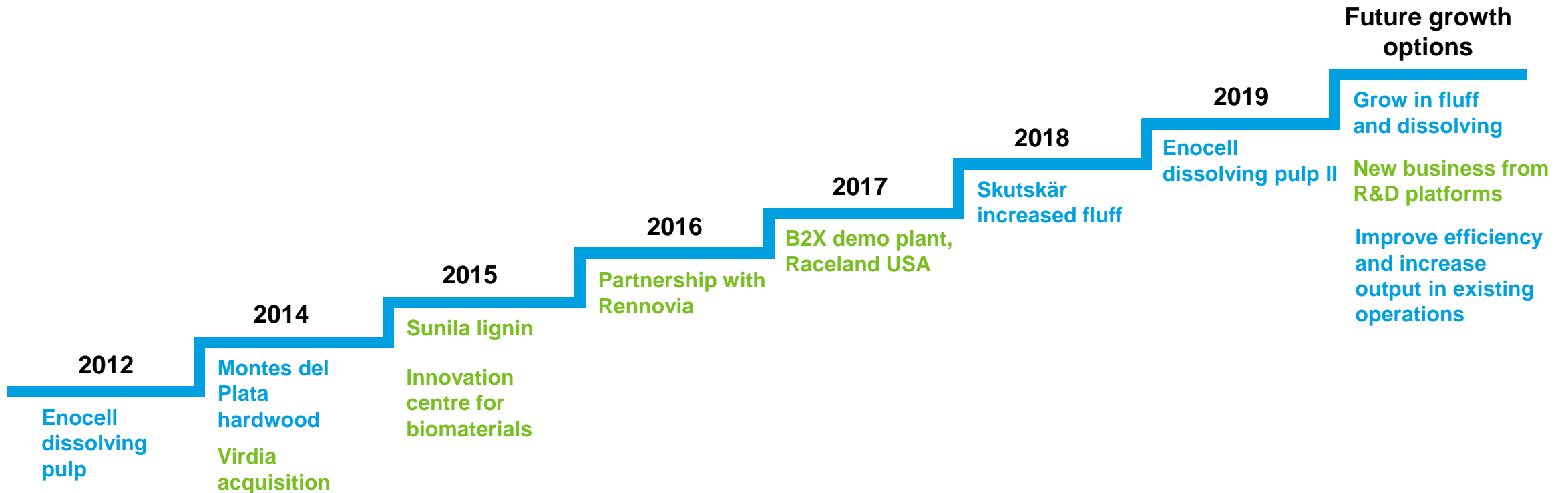
Xylose

- Key application is the xylitol (sweetener) market (approximately 120 Kt at 4–6% CAGR)
- Compared to C6 sugars it still is a rather undeveloped market, mainly due to lack of pure xylose availability. This is changing with the biorefinery concepts
- Growing interest and developments taking place in the market
- Stora Enso well positioned to be a frontrunner here

Source: PwC, Kline and Industry experts

Strategic steps for new business and differentiation

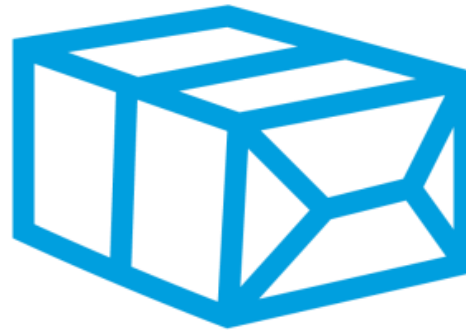
Pulp business - New platforms for growth



Our three focus areas



Maximize value from eucalyptus pulp



Differentiate our Nordic pulp business



Create new platform for growth



Delivering sustainable profitable growth



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

Disclaimer



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