



The Biofore Company **UPM**

WOOD-BASED BIOREFINERIES PAVE THE WAY TO SUCCESSFUL BIOECONOMY

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UPM

ETIP Bioenergy

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Megatrends drive demand for sustainable and safe solutions

Biofore fits well into the changing world



Population growth, urbanisation



Resource scarcity, role of renewables




Digitalisation



Climate change



Responsibility and compliance



Efficient use of renewable materials and energy
Renewable and recyclable products
Innovations and new businesses
Responsibility integrated in all operations

UPM today



UPM BIOREFINING

Pulp
Plantations
Biofuels
Sawmills
Wood Sourcing
and Forestry



UPM ENERGY

Hydro-, nuclear-
and condensing power
(incl. shares in energy
companies)
Electricity production
and trading
Optimisation services



UPM RAFLATAC

Label materials
for product and
information
labelling



UPM SPECIALTY PAPERS

Fine and specialty
papers in China
and APAC
Labelling material
globally
Packaging papers
mainly in Europe



UPM PAPER ENA

Extensive product
range of graphic
papers for advertising
and publishing
as well as home
and office uses



UPM PLYWOOD

Wisa® Plywood
and veneer
products
UPM Grada®
wood material



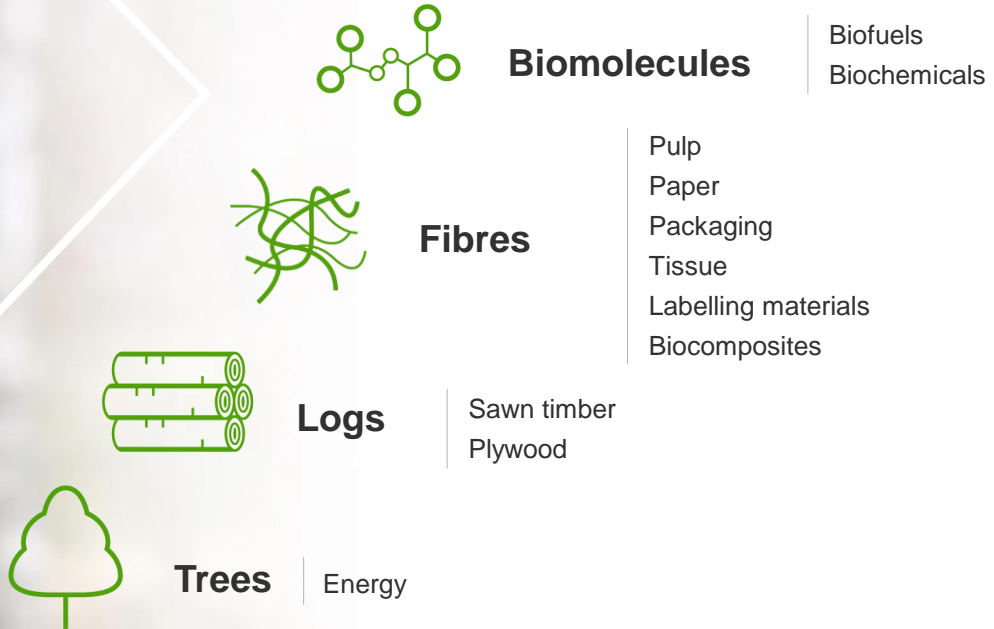
UPM BIOCOMPOSITES

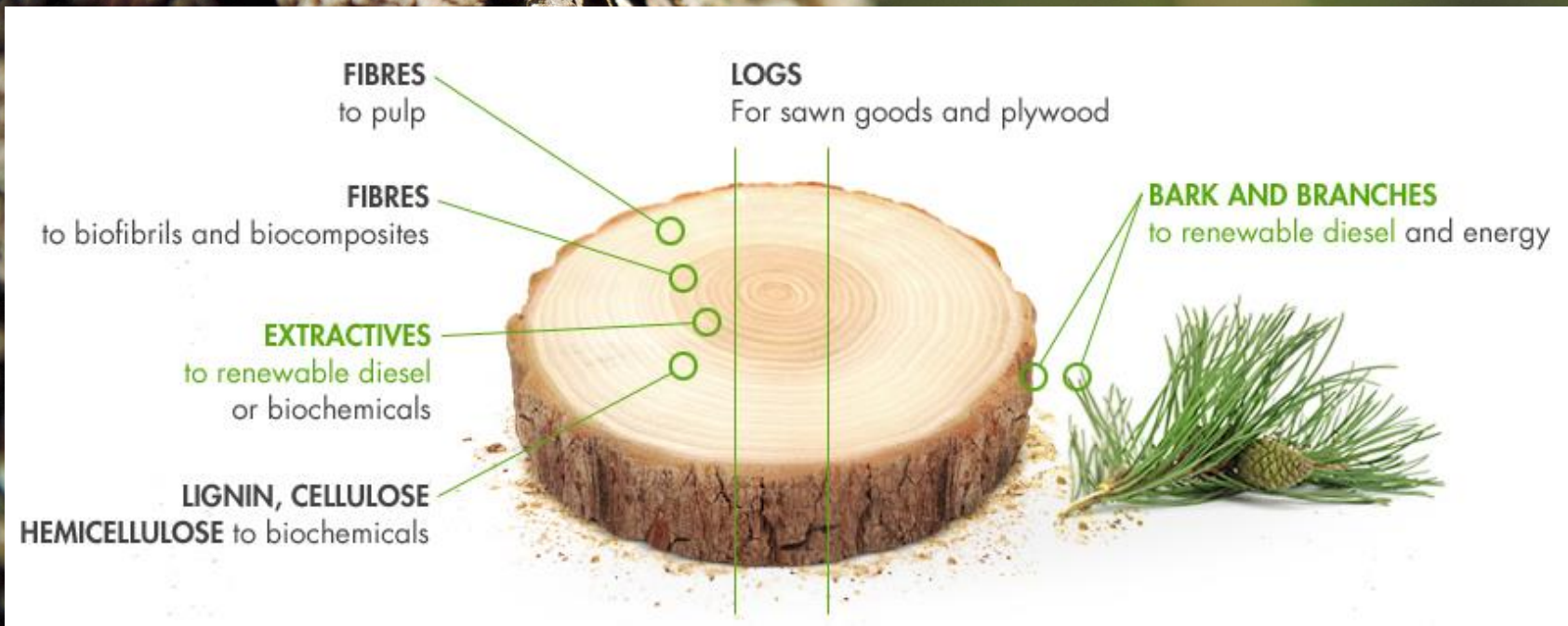
UPM ProFi
UPM Formi

UPM BIOCHEMICALS

Biochemicals
Biomedical products
Lignin products

Evolution of wood usage







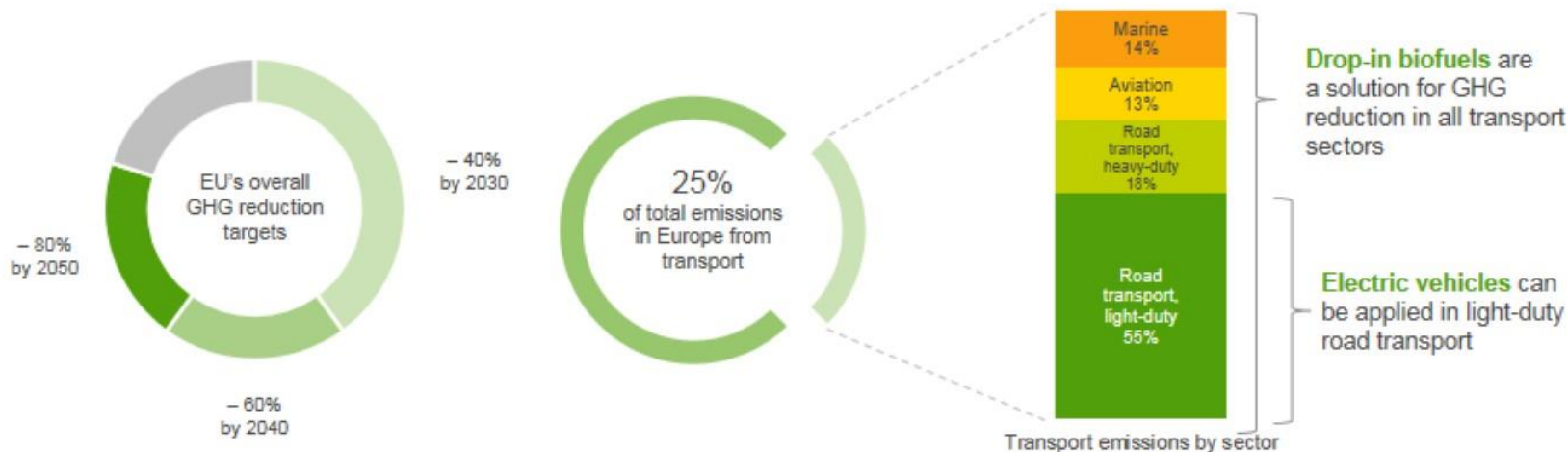
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THE CLIMATE CHALLENGE

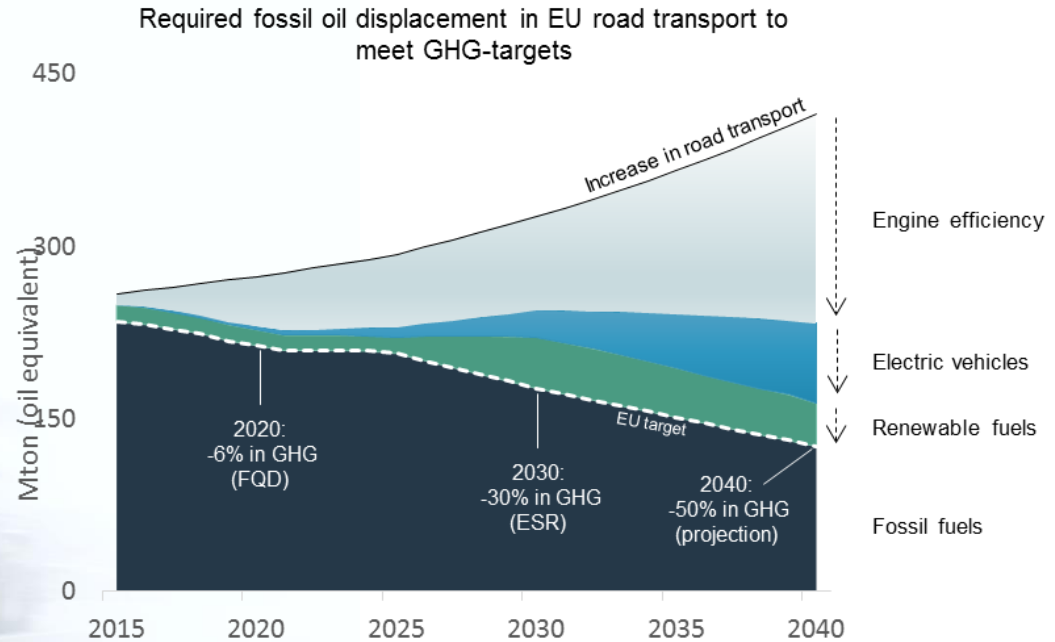


Significant emission cuts needed in transportation sector

EU's greenhouse gas reduction targets cannot be met without significant emission cuts in transport – actions needed in all sectors



What is the role of sustainable biofuels in transport decarbonisation?





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UPM WOOD-BASED BIOFUELS



UPM Kaukas, Lappeenranta, Finland

Industrial evolution of the world's most versatile forest industry integrate



UPM KAUKAS

1. Main gate
2. Mutteri office
3. Research Center (NERC)
4. Biorefinery
5. Bio-power plant
6. Pulp mill
7. Sawmill
8. Paper mill
9. Effluent treatment plant



UPM Lappeenranta Biorefinery

Key facts

- Product: Renewable diesel
- UPM investment: 179 M€
- Capacity: 100,000 tonnes/a
- UPM patents and applications: 200
- Employs 250 persons (incl. indirect)

UPM BioVerno – Renewable diesel

OXYGEN FREE
HYDROCARBON

100%

RENEWABLE
FEEDSTOCK

100%

CO₂ EMISSIONS
(VS. FOSSIL FUEL)

-80%

IN FOOD CHAIN

0%



UPM Biofuels in existing and future end-use



Fuel retail



Dedicated green fleets



Marine/Aviation



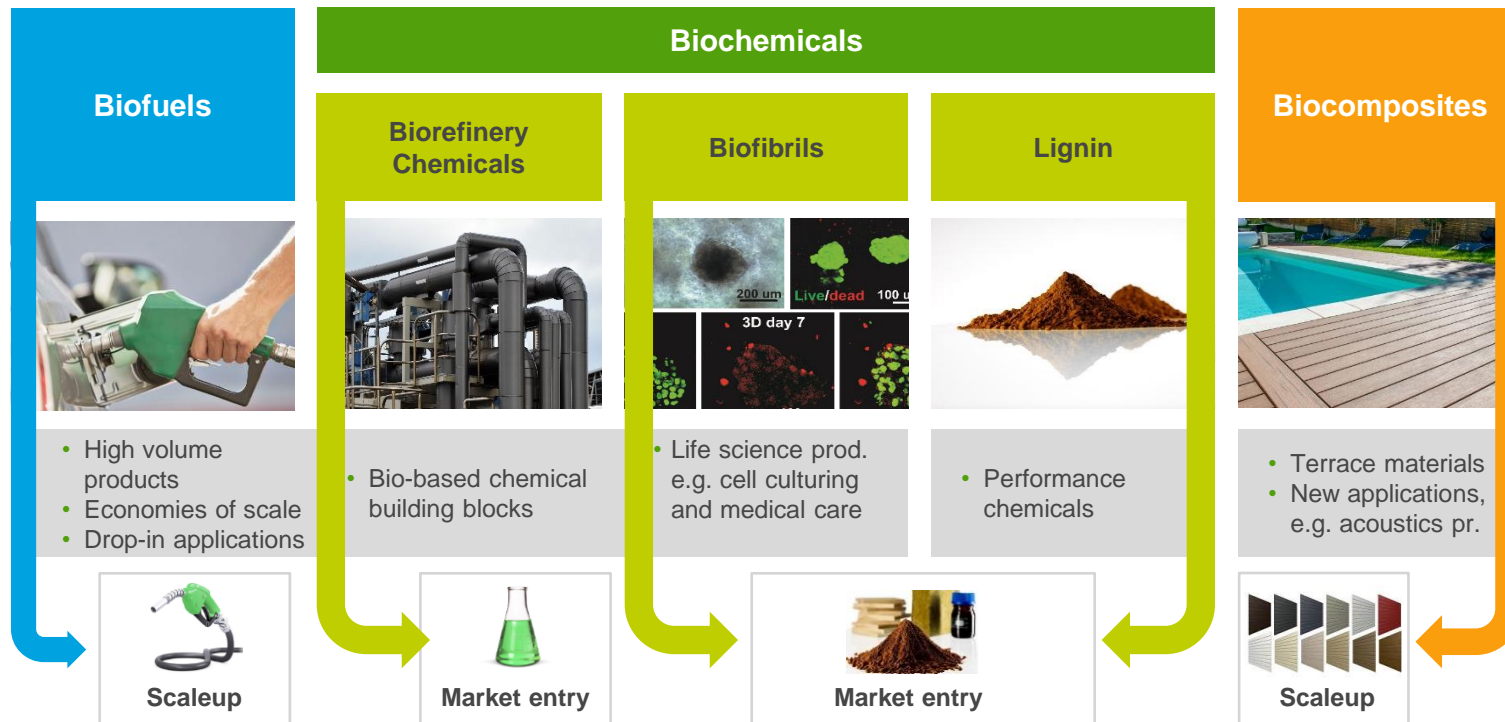


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UPM IS INVESTIGATING OPPORTUNITIES IN WOOD-BASED CHEMICALS



New business opportunities for UPM



Biochemicals biorefinery targeting to produce bio-MEG, bio-MPG and lignin from hardwood

BIOREFINERY PROCESS

STEP 1: SUGAR PULPING

Disintegrating wood into sugars, lignin and green energy

STEP 2: CHEMICAL CONVERSION

Conversion of sugars into targeted biochemicals



40%
Cellulose

30%
Hemi-cellulose

25%
Lignin

Biochemicals products are sustainable and competitive drop-in alternatives for brand owners



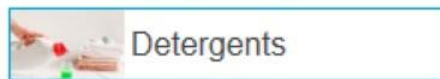
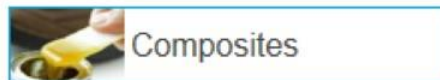
Mono Ethylene Glycol

- Existing fossil-based market
- Market demand > 26 mio tons
- CAGR >3%
- Application examples:



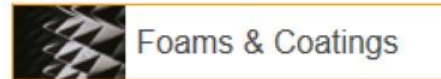
Mono Propylene Glycol

- Existing fossil-based market
- Market demand >2 mio tons
- CAGR >5%
- Application examples:



Lignin

- Performance chemical
- Application driven
- Strong IP position
- Application examples:



UPM has been actively pursuing lignin application development for over 10 years



Successful commercialization: WISA BioBond solution replaces fossil-based phenol with bio-based lignin in the adhesive used in the production of plywood.



UPM STUDYING OPPORTUNITIES FOR GROWTH IN BIOFUELS

UPM studies the feasibility of possible new Biorefinery in Kotka, Finland

Environmental impact assessment (EIA) for a possible biorefinery in Mussalo, Kotka, Finland has been started and takes approximately 1 year

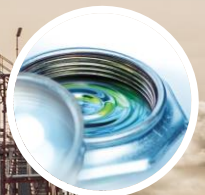
The proposed second UPM biorefinery would

- produce approximately 500,000 tonnes of advanced biofuels
- use several new sustainable feedstocks different from UPM Lappeenranta Biorefinery
 - e.g. solid wood biomass and *Brassica carinata*
- have partly different technology:
conversion of solid biomass and hydrotreatment
- Biofuels regulation decisions to be made by Finland and EU will impact the future investment consideration



Kotka, Mussalo, Finland – the area of dismantled power plant formerly run by Pohjolan Voima

Driving cleaner traffic





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