Forest company's perspective on the business opportunities regarding Bio-CCUS

Bio-CO2 Use and Removal 2024, Helsinki 2024

Laura Lundell, Business development director, UPM Fibres

Key messages of today:

Both BioCCU/P2X and BioCCS i.e carbon removals look interesting

We see both opportunities to mitigate climate change and to create future business opportunities in this area

We will most probably see large scale BioCCUS projects emerge, when markets mature and the long-term regulatory outlook stabilises

This is UPM

Wood-based raw materials

Low-emission energy

BUSINESSES:

UPM FIBRES

UPM ENERGY

UPM RAFLATAC

UPM SPECIALTY PAPERS

UPM COMMUNICATION PAPERS

UPM PLYWOOD

UPM BIOREFINING

54 production plants

16,600 employees in 43 countries

RENEWABLE AND RECYCLABLE PRODUCTS FOR:

PACKAGING

LABELLING

TRANSPORTATION

ELECTRIFICATION

CONSTRUCTION

COMMUNICATION

TISSUE AND HYGIENE PRODUCTS

MANUFACTURING

BIOPLASTICS

BIOMEDICALS

11,000 customers

180 million end-users globally

Our climate commitment through 2030

UPM

WE ACT THROUGH FORESTS

Committed to climate-positive forestry and enhancing biodiversity

WE ACT THROUGH EMISSION REDUCTIONS

-65% from own CO_2 emissions

-30% from CO_2 emissions of supply chain

WE ACT THROUGH PRODUCTS

Innovative products

Scientifically verifying the climate impact of all our products

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

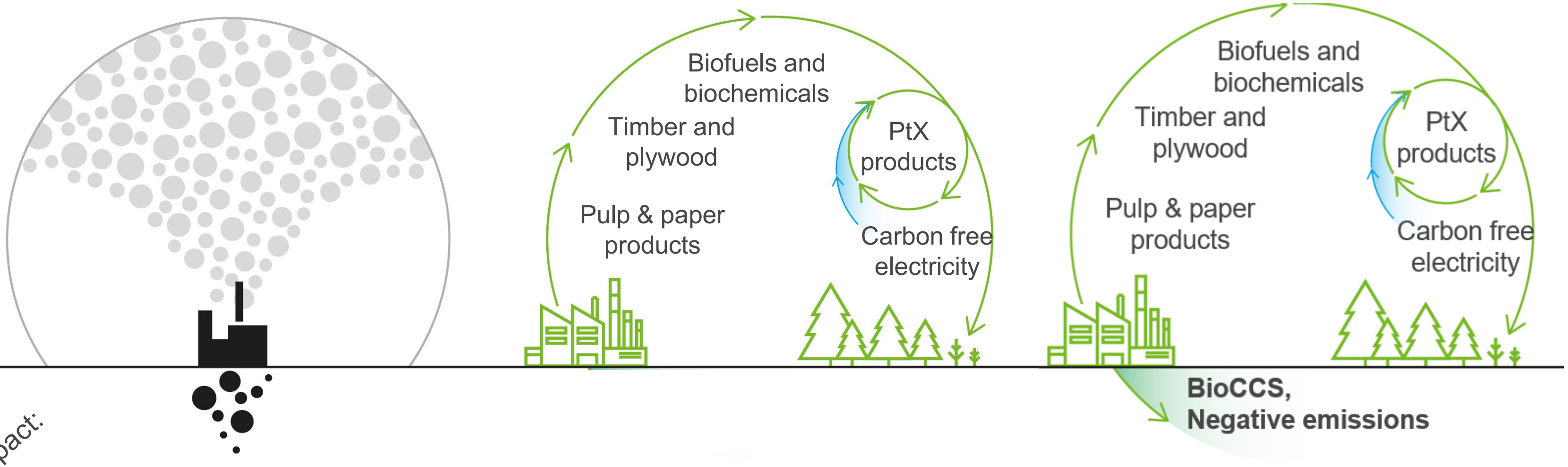
BUSINESS AMBITION FOR 1.5°C

OUR ONLY FUTURE

THE CLIMATE PLEDGE
Paris... 10 years Early

Different solutions have different climate impact, value chains and markets

Fossil economy	Carbon neutral	Carbon negative



Climate impact:

Fossil economy	Carbon neutral	Carbon negative
Increasing CO_2 concentration in atmosphere	*Temporary carbon storage and replacing fossils*	*Permanent carbon removal takes CO_2 out of atmosphere*

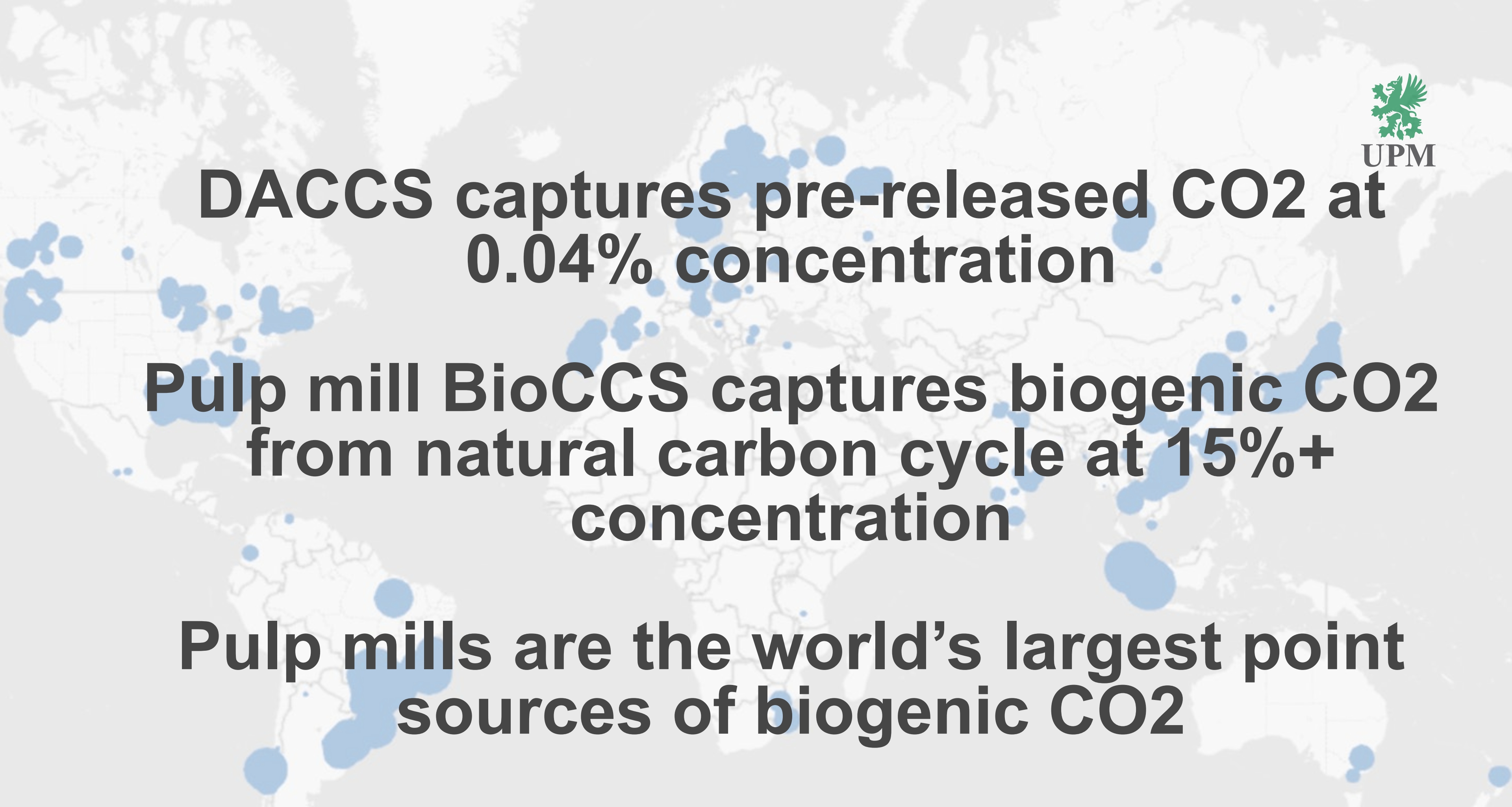
Example methods:

Fossil economy	Carbon neutral	Carbon negative
Burning of gas, coal, gasoline, diesel…	*Bio-based products, BECCU, P2X products such as e-fuels*	*Technical carbon sinks, BioCCS, BECCS, DACCS, Biochar*

DACCS captures pre-released CO_2 at 0.04% concentration

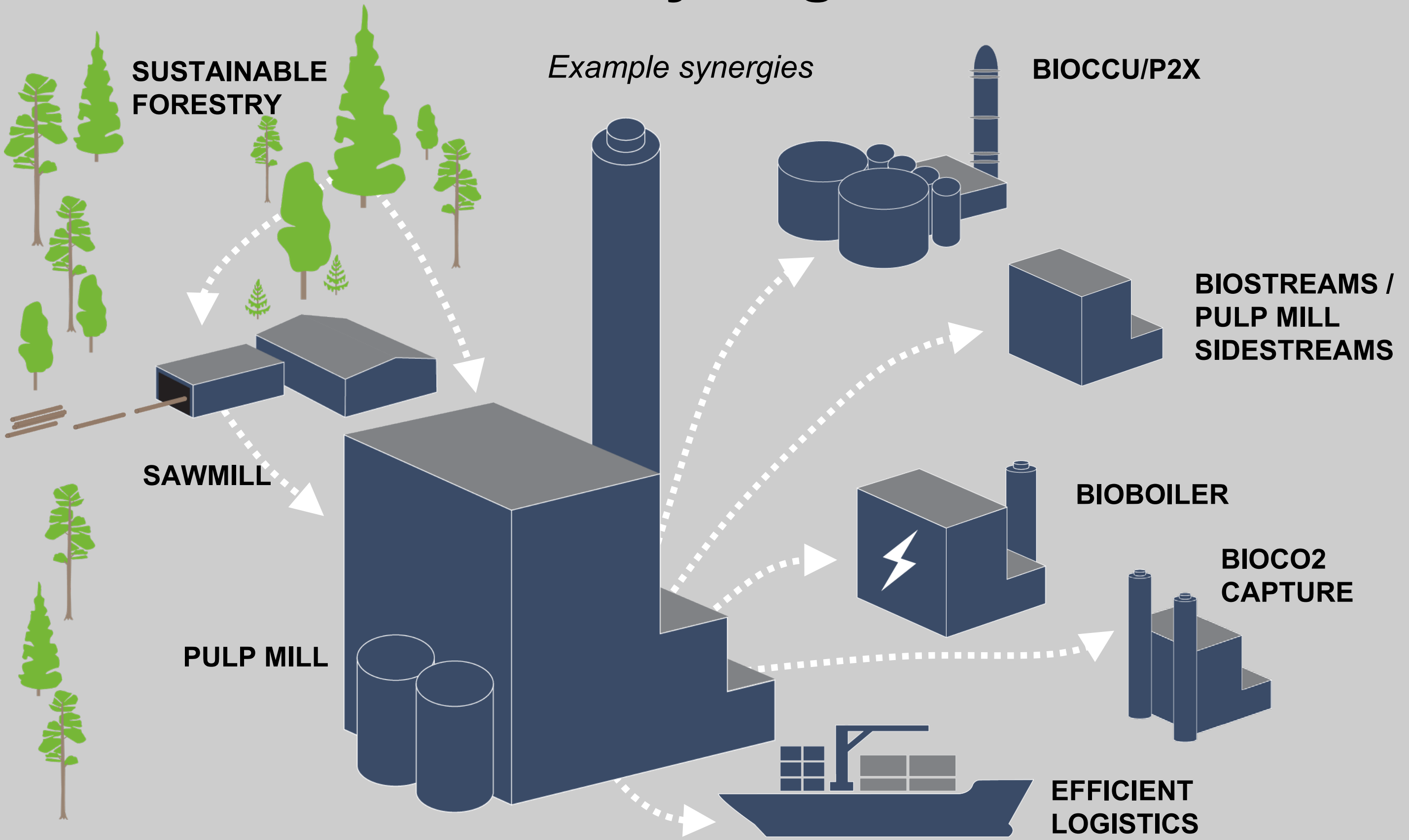
Pulp mill BioCCS captures biogenic CO_2 from natural carbon cycle at 15%+ concentration

Pulp mills are the world's largest point sources of biogenic CO_2



Map of pulp mills globally Sources: Afry

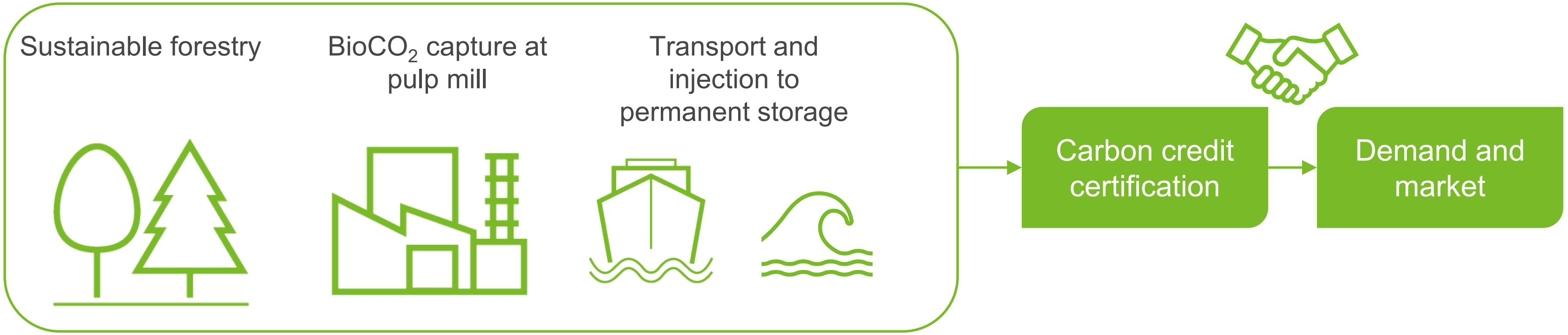
Pulp mill integrates can host BioCCUS projects and create industrial synergies in the future



Technical topics of retrofitting a carbon capture equipment:

- Energy balance of the mill
- Cooling water capacity
- Secondary heat utilization
- Always site specific

BioCCS value chain is already realizable and market is voluntary carbon market



- Pulp mill BioCCS scale can enable large climate impact (one project 1+ million tonnes/a)
- Post-combustion carbon capture is mature technology available at scale
- Permanent geological storages are commercial services and available from 2024 onwards
- Voluntary demand for technology-based removals exists and gets stronger

It all starts with sustainable Forestry: Key UPM forestry principles

100% traceable wood origin

100% legal sources

Dual certification with FSC® and PEFC™

Zero deforestation

No use of tropical rainforests

Respecting traditional and civil rights

Safeguarding high conservation values

No use of genetically modified trees

Efficient use of wood – nothing goes to waste

Fibres to **pulp and paper**

Fibres to **biofibrils and biocomposites**

Logs for **sawn goods and plywood**

Lignin, cellulose and hemicellulose to **biochemicals**

Extractives to **renewable diesel and naphtha or biochemicals**

Bark and branches to **energy**

Biogenic CO_2 is the side product of the above

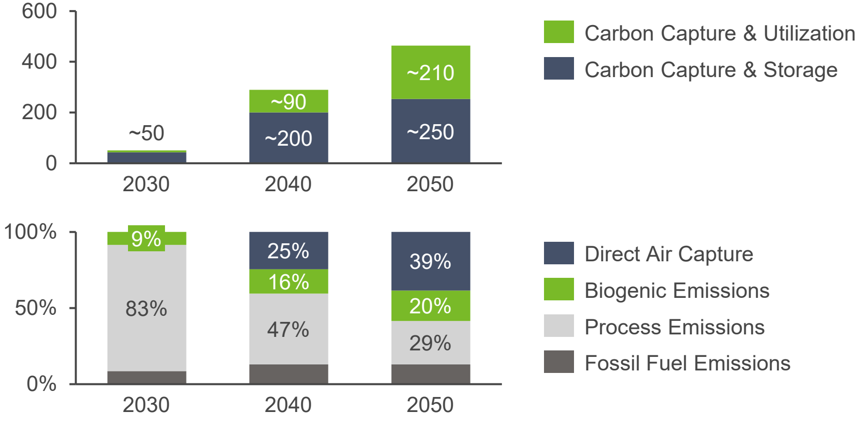
CDR Markets – early indications that CDRs are moving towards an EU compliance market; timeline still unknown

Today at voluntary carbon market:

- CDRs are today traded at Voluntary carbon market. Voluntary carbon market includes many submarkets (avoidance vs removal and nature based vs tech-based)
- Eventually price per credit is defined by the quality, permanence and impact of an individual project

EU industrial carbon management strategy

Mt CO_2 / Share of CO_2 captured by origin (%)



- EU targets for BioCCS of 5 Mt/a in 2030 and ~35 Mt/a in 2040. (BioCO2 supply in EU ~170 mt/a)
- Natural carbon sinks have different targets (LULUCF)
- Incentivization and other market mechanisms under discussion for go-live

Early signals of technology based CDRs gaining momentum at the Voluntary carbon market

Market signals:

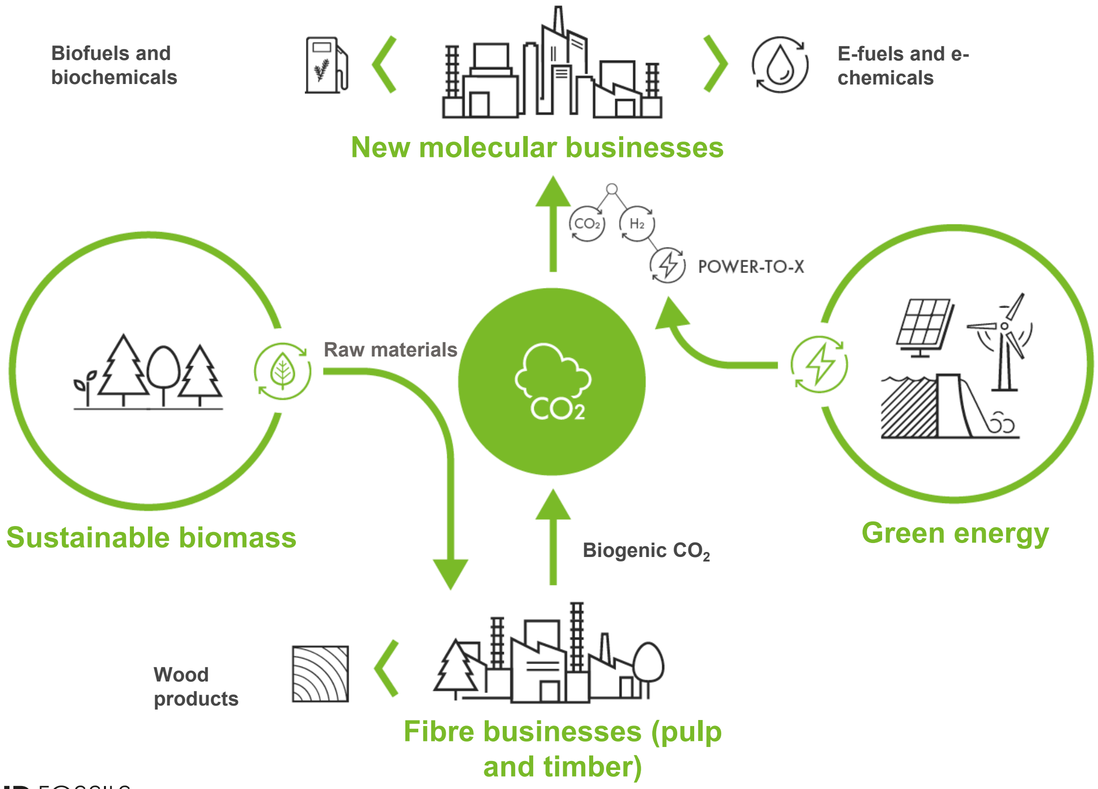
- First BECCS & DACCS projects selling their credit volumes beforehand
- Science-based Targets initiative allows the used of carbon credits for Scope3 emissions by companies
- EU 2040 targets and Carbon removals certification framework to indicate the need technology based removals

Current market deals (frontrunners securing CDRs):
Source: CRD.fyi

Top suppliers (BECCS & DACCS)	Kilotonnes sold	Top purchasers of tech. carbon removals	Kilotonnes purchased
Orsted (BECCS)	2 670	Microsoft	3 315
1PointFive (DACCS)	740	Airbus	400
Heirloom (DACCS)	342	Frontier Buyers	358
Climeworks (DACCS)	174	Amazon	250
Carbon capture inc. (DACCS)	81	NextGen	193
Red Trail energy (BECCS)	44	BCG	141

Technical carbon removals include BECCS, DACCS, Biochar, Mineralisation, Enhanced weathering and bio-oil

BioCCU value chain is based on bioCO2 capture, green hydrogen and new technology



How could we ensure that technical carbon removals are a business opportunity and ramp-up soon?

1. **Demand:** Strong voluntary demand for permanent carbon removals from companies to speed up the supply development
2. **Demand:** Clear pathway and incentives, if CDRs are part of EU Compliance market
3. **Regulatory:** Scaling up of CDRs requires private and public collaboration, including possibility for co-claiming the carbon credits
4. **Regulatory:** Stable, long-term regulatory framework to ensure investment security

More info in UPM White Paper on Carbon Dioxide Removals, available at www.upm.com

UPM BIOFORE
BEYOND FOSSILS