FOSSIILITON LIIKENNE

Marko Janhunen, UPM

Mitigating climate change & driving long-term value creation

BUSINESS AMBITION FOR 1.5°C

OUR ONLY FUTURE

We act through FORESTS

Climate positive forestry

We act through EMISSIONS

65% less CO_2 emissions

We act through PRODUCTS

New innovations

| © UPM

UPM Lappeenranta Biorefinery

The Biofore Company UPM

The world's first biorefinery
producing wood-based
renewable diesel and naphtha

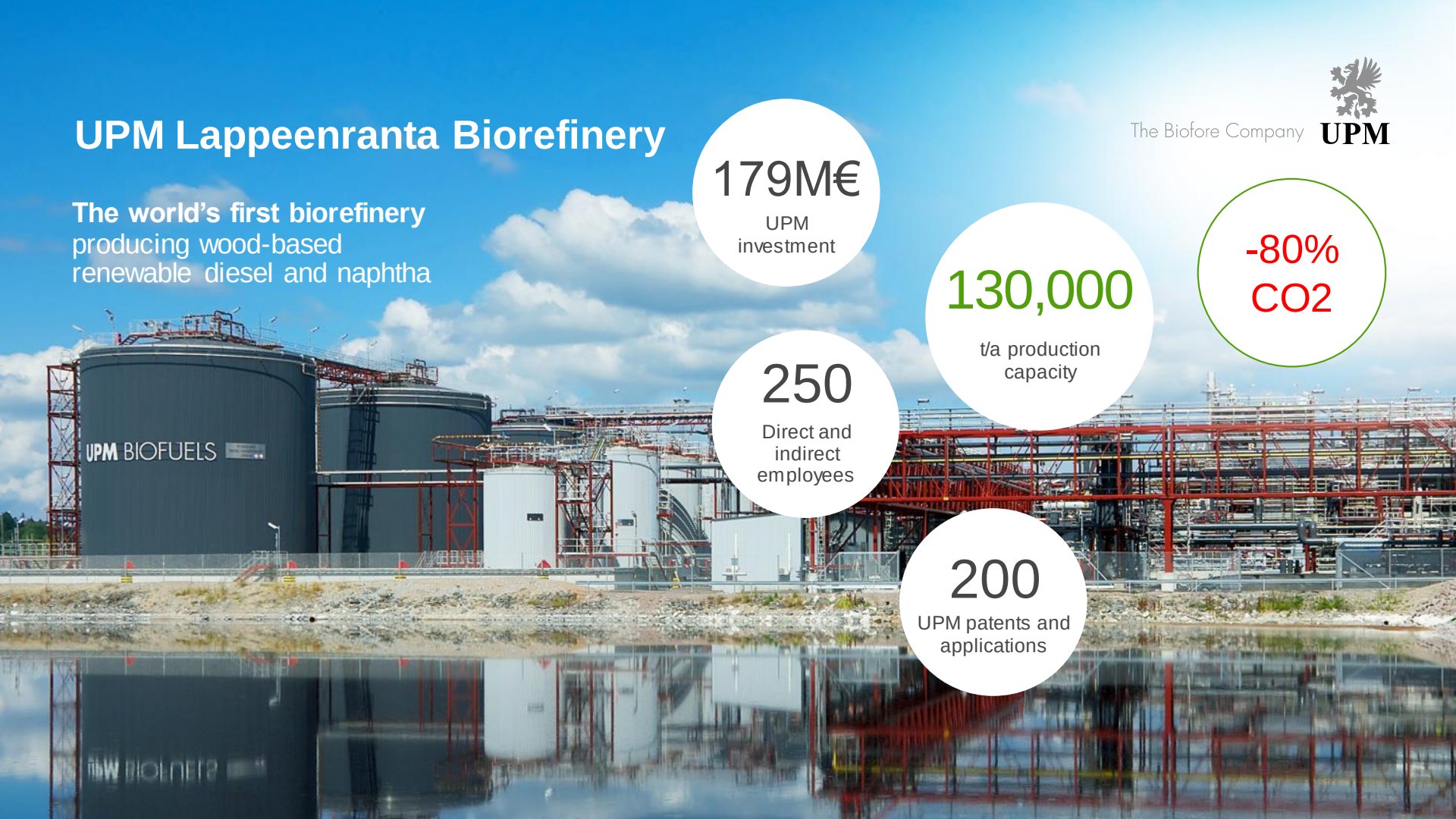
179M€
UPM investment

130,000
t/a production capacity

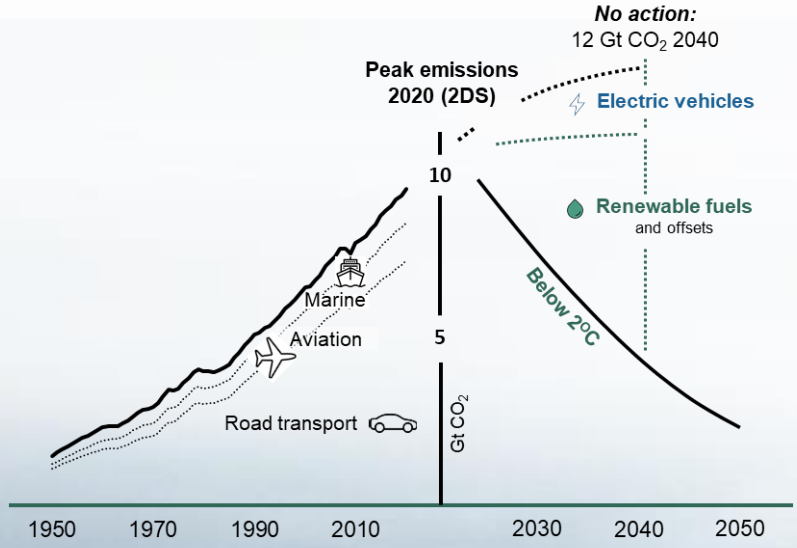
-80% CO2

250
Direct and indirect employees

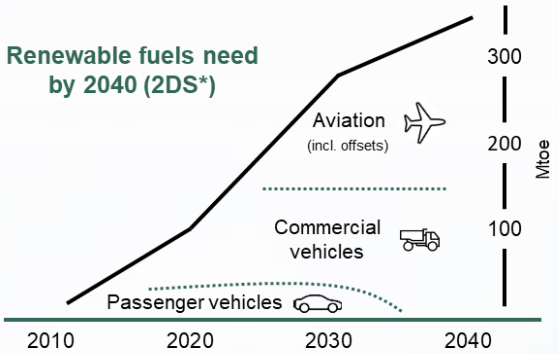
200
UPM patents and applications



Carbon mitigation in transport is dependent on renewable fuels – Aviation to become biggest renewable fuel consuming sector



Global transport:
Carbon emissions growth and mitigation (2DS)



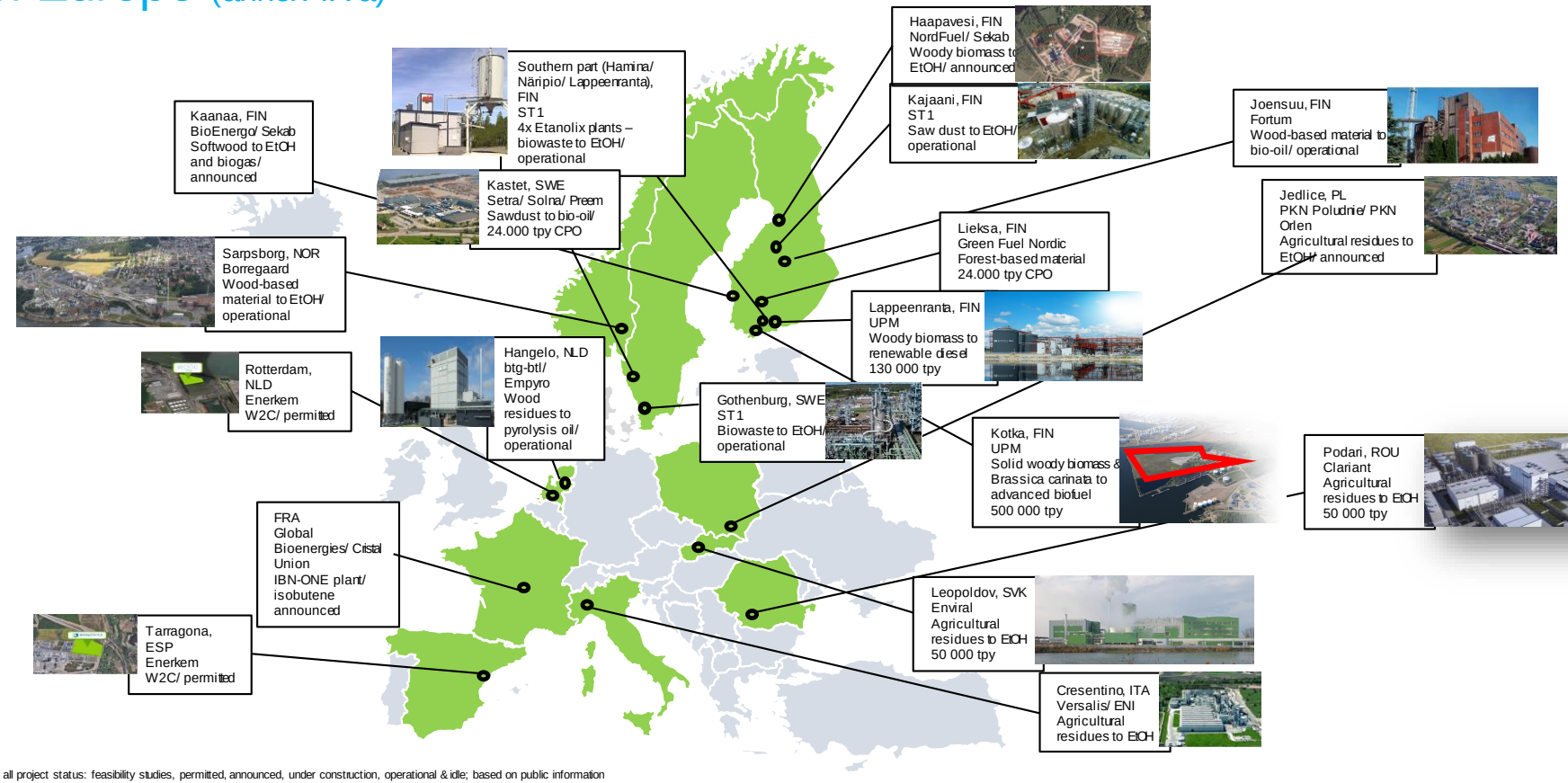
Road transport: Europe and North America
Aviation: Global

Source: UPM based on WoodMackenzie, Bloomberg, ICAO, EIA, IEA

*The two degree scenario (2DS) is calculated vs. 2005 reference per sector (-30% 2030, -40% 2040, -50% 2050)

Commercial scale projects[1] add significant production capacity in Europe (annex IX a)

ADVANCED BIOFUELS COALITION LSB



[1]Includes all project status: feasibility studies, permitted, announced, under construction, operational & idle; based on public information

European renewable fuel demand grows ahead of RED deadline, West Coast sets the pace in North America

2030 targets for renewable fuels use in selected countries

CALIFORNIA

-20% Carbon intensity

CANADA

-30Mt CO_2*

EUROPEAN UNION

14% Renewables in transport

-30% GHG savings in non-ETS sectors

ITALY

22% Renewables in transport*

NORWAY

40% Renewables in transport*

30% Biofuels in aviation

SWEDEN

-70% CO_2*

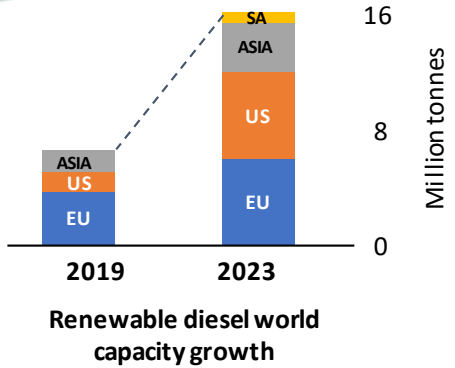
FINLAND

30% Renewables in road transport

* Preliminary values

RED: EU Renewable Energy Directive I GHG: Greenhouse gas I ETS: Emission Trading System

Several companies entering renewable diesel market – announced projects would triple global production




UPM INVESTIGATES NEW OPPORTUNITIES IN ADVANCED BIOFUELS

UPM studies the feasibility of possible Kotka Biorefinery

UPM is studying biofuels development opportunities for a possible biorefinery in Mussalo, Kotka, in south-eastern Finland

| © UPM

<u>The proposed **second UPM biorefinery** would</u>

- produce approximately 500,000 tonnes of advanced biofuels for transportation

- **use several new sustainable feedstocks**, e.g. solid wood biomass and Brassica carinata

- use **conversion of solid biomass and hydrotreatment technology**

- be located in Kotka, Mussalo – the area of dismantled coal-fired power plant

| © UPM

UPM BIOFUELS Kotka: Innovation and Environmental benefits

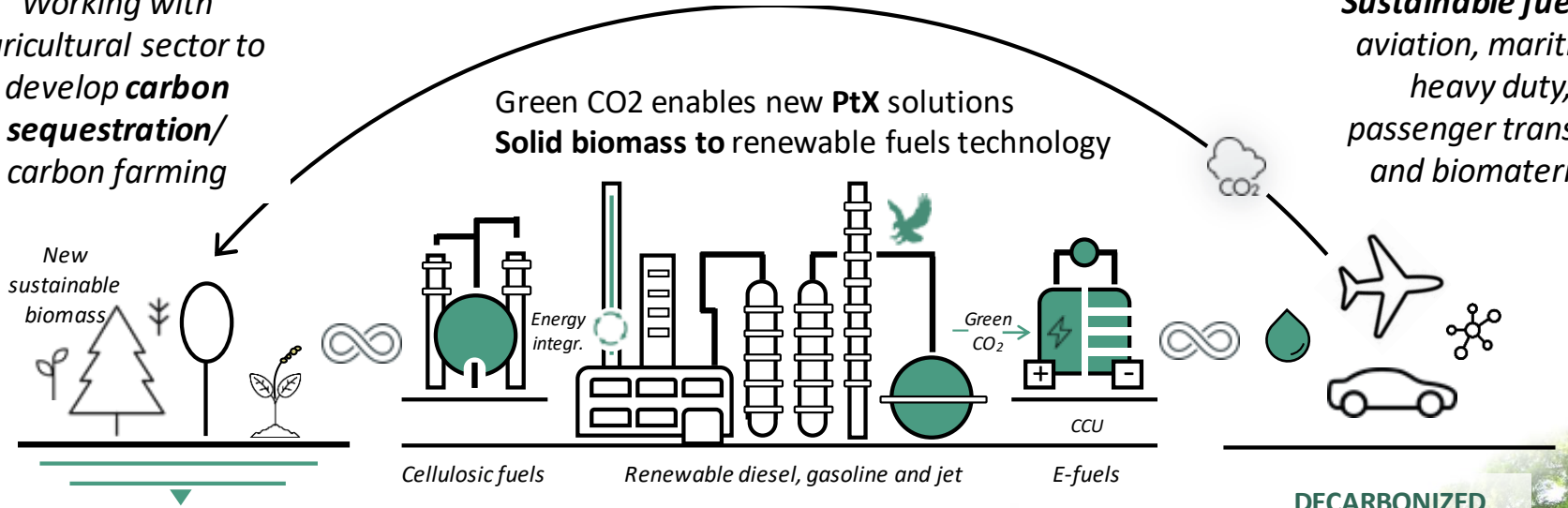
The Biofore Company UPM

*Expanding feedstock base to **solid biomass**. Working with agricultural sector to develop **carbon sequestration**/ carbon farming*

C02 reduction: 1.9 MtC02eqv annually

Green CO2 enables new **PtX** solutions
Solid biomass to renewable fuels technology

***Sustainable fuels** for aviation, maritime, heavy duty, passenger transport and biomaterials*



CARBON STORED TO SOIL
in each cycle

CLIMATE-POSITIVE FUELS

DECARBONIZED TRANSPORT and PETROCHEMICALS

UPM KOTKA POTENTIAL BIOREFINERY
Impact

- 500 000 tons of production
- Estimated CO2 reduction 1,9Mt/a
- Corresponds to emissions from 445 000 diesel cars in Finland
- Supports circular economy

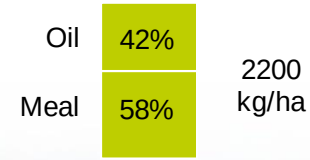
- **In order to deliver the same CO2 reduction impact:**
  - 495 000 electric vehicles with FI grid electricity
  - 445 000 zero emission electric vehicles

THE NEED FOR SUSTAINABLE FEEDSTOCK

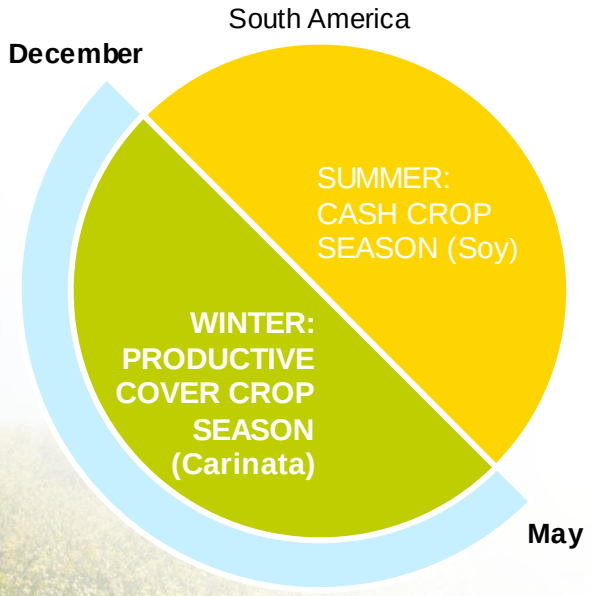
The Biofore Company UPM

CASE SUSTAINABLE AGRICULTURE AND CARBON SEQUESTRATION

Sustainable land use enables new alternatives for biofuels feedstock – Case Brassica Carinata



Additional biomass generated through productive cover cropping (Carinata)



Additional biomass

Non-edible oil for biofuels production
High protein animal feed

Soil cover around year
Crop residues left on soil

Erosion control
More biomass to soil and enhanced soil carbon balance

Deep rooting system
Diversification of crop rotation

Better grow th conditions
Soil quality improves
Efficient nutrient uptake
Better pest and w eed control for main crop

UPM BIOFORE
BEYOND FOSSILS

UPM

Inspired by the limitless opportunities of bioeconomy

Delivering renewable and responsible solutions

Innovating for a future beyond fossils


UPMBIOFORE