Sustainability assessment of advanced biofuels and synthetic fuels for transport applications

Introduction

EU climate goals
2030: 55% reduction *(EU Fit-for-55 package)*
2050: Net-zero *(EU Green deal)*

Transport sector accounts for **30% of GHG emissions** in the EU

Hard-to-abate transport applications Aviation, Shipping, Road-freight transport need **renewable drop-in substitutes** for mitigation

Advanced biofuels and synthetic fuels can offer up to **94% GHG reduction** compared to fossil

Primary objective

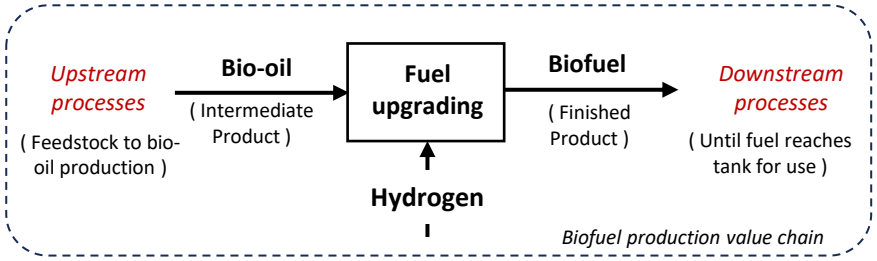
Assess climate mitigation potentials of emerging technological pathways for advanced biofuels and synthetic fuels in transport sector

Secondary objectives

- Identify **key feedstocks**; **Carbon** and **Hydrogen** sources (scenario analysis)
- **Prospective impacts** (future projections until 2050)
- Calculating **'Cost-of-abatement'** ($/ton CO_2 removed)

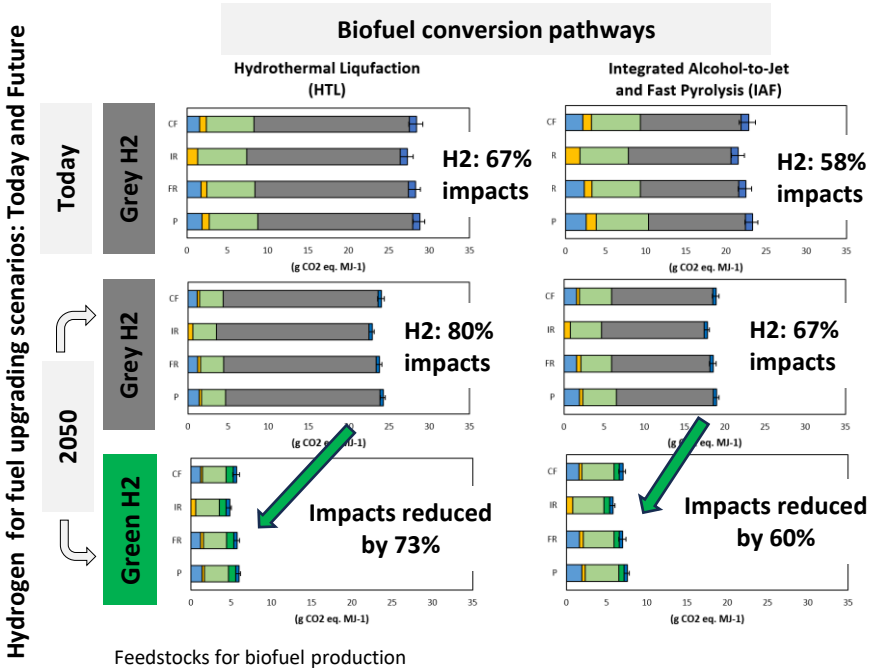
Hydrogen for biofuel upgrading:

Main driver for GWP100 life cycle climate impacts



Biofuel production value chain

Contribution Analysis: Climate impacts of advanced biofuels



Feedstocks for biofuel production
P- Pulpwood, FR- Forestry residues, IR- Industry residues, CF- Combined feedstocks

Impact category:
GWP100

Lifecycle stage:
- Forestry operations
- Feedstock transport
- Technological conversion
- Grey H2 for upgrading
- Green H2 for upgrading
- Distribution

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Related projects: FME Bio4Fuels, ICARUS

I am assessing emerging technological pathways for producing **advanced biofuels** and **synthetic fuels** for hard-to-abate **transport sectors**, including aviation, shipping, and road-freight in Norway and Europe. My work involves conducting **techno-economic** and **life cycle assessments** to evaluate their sustainability performance.

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Co-supervisor: Marcos Djun Barbosa Watanabe

Estimated progress of the PhD project:

Just started ... | < 50 % | > 50 % | Almost done ☺

Publications

Norwegian Research School on Hydrogen and Hydrogen-Based Fuels