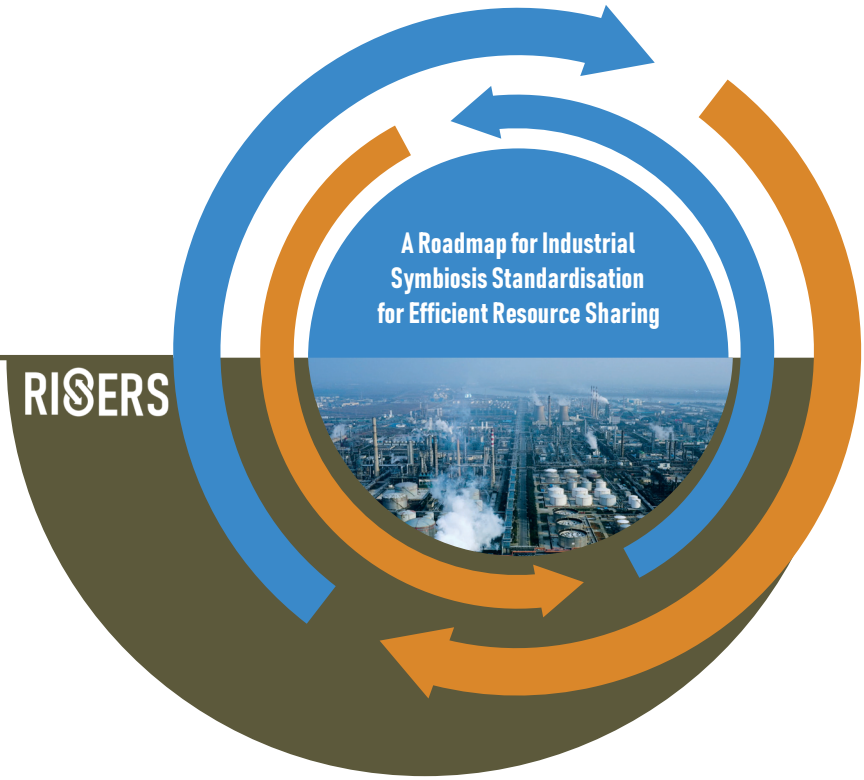
Synergy Fact Sheet

BIOMASS

Production of alternate fuels or the use of biomass as a feedstock for the production of bio-based materials



Introduction

Using the Fischer-Tropsch (FT) process, a variety of feedstocks, including biomass, can be converted into customised fuel products and other valuable outputs. The process is a technology that converts synthesis gas — a mixture of carbon monoxide and hydrogen — into liquid fuels makes it an excellent option for integrating renewable resources into the energy system, helping to reduce dependence on fossil fuels and decrease greenhouse gas emissions. In addition to producing liquid fuels, the FT process offers alternative valorisation opportunities, such as the production of waxes, lubricants, and chemicals that are widely used in industrial applications, as well as potential applications in the food industry. The European Union has recognised the importance of FT-derived biofuels for the sustainability and security of energy supply, especially with regard to the transition to a low-carbon future (Hu et al., 2012; European Academies Science Advisory Council, 2012; Singh et al., 2024, AIDRES, 2023). Sustainable fuels, biodegradable materials and feed- or food products can also be derived from biological processes, using microorganisms, including bacteria, fungi and yeast to convert biomass into materials, chemicals, pharmaceutics and/or energy streams (biogas, hydrogen, heat, electricity). This biobased economy gains an increasing importance in the development of a sustainable and circular bioeconomy. The utilisation of biomass preferentially happens by clustering parallel exploitation of side-flows, reducing and/or recovering waste and residues, thereby boosting resource efficiency as well as recycling and circularity in so-called 'bio-refineries'.

Supplying sector(s)

Urban — Urban entity, Food industry

Various — Wood processing, Agriculture

Receiving sector(s)

Refining — Various — Refineries, Various

TECHNICAL FEASIBILITY

Industrial scale - The FT process in combination with gasification of biomass is well suited for industrial scale applications. Existing plants have shown that they are capable of processing large quantities of raw materials, making the technology suitable for wide application.

Low technical requirements - Utilising the infrastructure from fossil FT production greatly simplifies the implementation of biomass-based processes. Gasification and synthesis technologies are continuously being improved, which reduces the technical hurdles.

Fischer-Tropsch from gasification + catalytic synthesis:

- **Solid industrial waste:** Residues from agriculture and forestry can be efficiently converted into synthesis gas, which is the main input for FT synthesis.
- **Agricultural residues (straw-like):** Straw and similar by-products are a widely available and sustainable feedstock for biofuel production.
- **Agricultural woody and forestry residues:** Woody materials that are rich in carbon are ideal for the FT process and are in line with circular economy principles.

PPP IMPACT – EU wide potential

Profit

Wins in industry
FT biofuels could deliver 130–200 Mtoe by 2050, strengthening Europe's energy security and diversifying its energy mix (Concawe, 2022). As part of the €725 billion EU bioeconomy (BIC, 2021), they support the shift toward a more sustainable energy system.

Planet

Environmental gains
Each Mtoe of FT biofuel can reduce greenhouse gas emissions by around 2.8 kilotonnes (kt) of CO_2 equivalent. Scaling up production to its potential by 2050 could result in millions of tonnes of avoided emissions and play a crucial role in mitigating climate change (Concawe,2022; ETIP Bioenergy 2022)

- **Lignocellulosic (woody) crops:** Specialised energy crops such as short rotation coppice provide a stable and renewable biomass source for advanced biofuels.

People

Wins for society

The FT process reduces air pollution, improving public health, and supports economic growth through skilled jobs (EUROFER, 2023). As part of the EU bioeconomy, which employed 3.3 million people in 2021 (BIC, 2021), it strengthens rural development and local economic resilience.

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About this factsheet

This fact sheet is based on the findings of the RISERS project. Led by Ghent University with the support of project partners, the study involved a systematic assessment of 600+ industrial symbiosis (IS) cases across urban-industrial and cross-sectoral clusters in Europe. These cases formed the basis for the mapping of over 300 MES (Materials, Energies, Services) streams, categorised by output (source) and input (sink) sectors.

The fact sheet provides a detailed overview of a high-potential and high-impact IS synergy, evaluating its implementation feasibility and sustainability impact. Supported by data from public databases (MAESTRI, SCALER, EPOS, AIDRES, etc.) and literature, it offers a generalised insight into the economic, environmental, and social benefits per synergy.

Factsheets authors:

Lieven Demolder, Greet van Eetvelde (Ghent University)
Izabela Ratman-Kłosińska, Grzegorz Gałko, Mateusz Korcz (IETU)

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About the RISERS project

RISERS is a Horizon Europe project aimed at developing an Industrial Symbiosis Standardisation Roadmap supporting the uptake of high impact synergies and resources considering:

- identification of the needs, gaps and opportunities,
- revision of current standards and standardisation efforts relevant for CE and the priority synergies and resources,
- initiating the process of new standards development (especially for newer technologies and pilot-scale synergies).

The RISERS project was launched in January 2024 with a duration of 3 years.

For more information visit: https://risers-project.eu

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