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Turning Emission to Feedstock: Mapping Europe's CO_2 Market for Fuels and Chemicals

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The defossilisation of the European industry requires alternative, sustainable carbon sources to ensure a resilient supply for fuels and chemicals. In this context, CO_2 is increasingly discussed as a valuable carbon carrier that can be transformed into chemicals and fuels, contributing to a circular carbon economy. While CCU technologies are advancing, a systemic understanding of how CO_2 can be integrated into reliable and scalable value chains – such as CCU or PtX – is lacking.

Turning CO_2 into a marketable raw material requires addressing several issues simultaneously: the geographic distribution of CO_2 sources and potential users, the need for purification and suitable transport infrastructure, cost structures along the entire value chain, and regulatory framework across Europe.

This project tackles these questions by developing a data-driven framework to analyse potential CO_2 flows across Europe. The approach combines:

• spatially resolved data on industrial CO_2 point sources and activity data from industry and mobility (aviation and shipping) as possible consumers of CO_2-based chemicals and fuels,
• assessment of transport options, infrastructure needs, and location choice for potential carbon hubs,
• evaluation of policy instruments such as ETS, CBAM, quotas, funding programmes, and of cost pathways for CO_2-based products.

A key focus lies on identifying regions where CO_2 supply, demand, and infrastructure coincide, potentially enabling integrated value chains.

By integrating the above elements, the project seeks to clarify the conditions under which CO_2-based fuels and chemicals can become part of a European carbon economy. Based on this framework, the project will provide a science-based foundation for policy decisions on the development of a European CO_2 market. The results are intended to support policy makers in designing infrastructure strategies and regulatory frameworks for CO_2-based value chains. In support, the project will deliver an interactive online map displaying European CO_2 flows and highlighting emerging carbon hubs. This tool will support infrastructure planning and provide evidence-based policy insights for decision makers.

Therefore, the work directly connects to the key themes of this conference:
How can CO_2 contribute to a resilient supply of carbon for fuels and chemicals? What infrastructure and market structures are required? What conditions are required to enable large-scale deployment?