Written on 07 November 2023 3 minutes of reading

News

Innovation and Industry

Life cycle analysis (LCA) Biofuels and e-fuels

What approach to establishing a green river transport sector in France? Meeting European objectives requires a radical transformation of the sector. Based on IFPEN's expertise (via its IFPEN Transports Energie Carnot Institute) in the field of Life Cycle Analysis (LCA) and prospective modeling, the FLUENT (FLUvial ENergie Transition, or river energy transition) study evaluated the global and multidimensional consequences of establishing a green river fleet with a view to guiding the drawing up of the French national roadmap.

Developing river transport: an ecological necessity

Given that its environmental footprint is considerably smaller than that of road transport, river transport represents **a more eco-friendly alternative for moving goods**. The European Union intends to further develop this mode of transport and has set objectives for shifting from road to rail or river of:

- 30% by 2030;
- 50% by 2050;

Nevertheless, in the context of the energy transition, the deployment of this mode of transport needs to be supported by a greener river fleet. The European Commission, the French government via its green growth commitments (ECVs) and the CCNR (Central Commission for Navigation of the Rhine) are thus preparing for a two-stage reduction in pollutant and greenhouse gas emissions:

- 2035: the Mannheim agreements target a reduction in emissions of 35% compared to 2015, and aim to end greenhouse gas and other pollutant emissions as far as possible by 2050.
- 2050: the European Commission has set an objective of carbon neutrality within the framework of the “European Green Deal”. Moreover, one of the objectives of the Mannheim agreements is to largely eliminate greenhouse gas and other pollutant emissions by 2050.

What roadmap to achieve these objectives?

Establishing a green river transport sector is **a multidimensional operation**: in particular, it is necessary to take into account boat types, propulsion modes and the types of fuels used, as well as their evolution over time. A decision of this magnitude and complexity needed to **be informed by a global vision of its potential impact**s.

It was to this end that, between 2020 and 2022, IFPEN and VNF (the French Waterways Network), in partnership with the French Ministry for the Ecological Transition (DGITM), ADEME, Europe, the CNR and E2F, conducted the FLUENT technical and economic study on the Rhône Saône river basin, t**o guide the drawing up of a roadmap necessary to achieve these objectives**.

A complete environmental analysis

The methodology combined energy modeling of the different boat propulsion solutions (IC, hybrid and electric) and energy vectors used (off-road diesel, biofuels, synfuels) with an environmental analysis of powertrain components, using Life Cycle Analysis (LCA) from well to exhaust and cradle to grave.

The life cycle analysis evaluated three impact categories:

- on climate via greenhouse gas emissions,
- on human health via the formation of fine particles,
- on aquatic ecosystems via substance ecotoxicity.

In order to assess the cost of such a change, the study also aggregated all the costs borne by the operator of a boat, from initial investment to energy expenditure, over its entire lifespan.

FLUENT established an **energy transition roadmap** for the river transport sector for the period from 2030 to 2050, identifying the relevant technological solutions and drawing up prospective scenarios for creating a green river fleet, which can be adapted to all French basins as a function of their specific characteristics, needs and usages.

>>Read the study

Establishing a green river transport fleet: LCA and prospective modeling at the heart of the FLUENT study
07 November 2023

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