AT A GLANCE

Requested by the TRAN Committee

Study in Focus

European Parliament

Assessment of the potential of sustainable fuels in transport

See the full study

This note is based on the study *Assessment of the potential of sustainable fuels in transport*, which focuses mainly on the following sustainable fuels:

- **biofuels** (from oleochemical, biochemical and thermochemical pathways),
- **renewable fuels of non-biological origin** (RFNBO, including renewable hydrogen, and different e-fuels),
- **recycled carbon fuels** (RCFs),
- **fossil and nuclear-based hydrogen**, pursuant to the Taxonomy Regulation.

A key alternative to liquid or gaseous transport fuels is **direct electrification**. This is not assessed in detail in the research, but it is still included.

Main observations

The study assesses the potential of sustainable fuels to decarbonise the transport sector, and help the sector achieve the 2050 decarbonisation goals.

- **Sustainable fuels will be suitable for different transport modes and transport applications**, depending on their technical specifications, their sustainability characteristics including feedstock availability, their cost-competitiveness and their technology readiness.
- Given the global limitation of resources, **the shift to sustainable fuels should be first driven by a significant increase in energy efficiency**.
- **Liquid and gaseous sustainable fuels should be primarily dedicated to transport sub-sectors that cannot be easily electrified**, i.e. aviation, shipping, and – possibly – part of heavy-duty road transport. Direct electrification from renewable sources is considered as a key option to decarbonise road transport and short-haul shipping.
- **Biofuels are cheaper than renewable e-liquids, but they face availability limitations** exacerbated by competing demand in the bioeconomy and sustainability constraints with respect to land use.
- **Renewable e-liquids could be among the most relevant options by 2050** if the carbon they use is sustainably sourced, thanks to the fact that they do not require changes to infrastructure or powertrains. Challenges remain with the high reliance on large-scale renewable electricity production, low energy efficiency, high production costs, and low technology readiness of some of their enabling technologies (such as direct air capture).

- **Renewable hydrogen could technically be a viable fuel for heavy-duty road**, short-range aircraft and shipping. Important challenges remain with the low energy density, costs required for infrastructure development and high-risk profiles of related investments.
- **E-ammonia and e-methanol are cheaper than other e-liquids and are good candidates for maritime**. The development of infrastructure needed for their transport, storage and distribution is cheaper than for hydrogen, but still subject to investment risks. Challenges remain with e-ammonia's safety issues and sourcing of renewable carbon for e-methanol.
- **Recycled Carbon Fuels may contribute to GHG emission abatement in the near term**. However, carbon sourcing from processes that still lead to net CO2 increases will become a limiting factor for RCFs, along with competition from carbon capture.

Access this note

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PE 733.104 - April 2023

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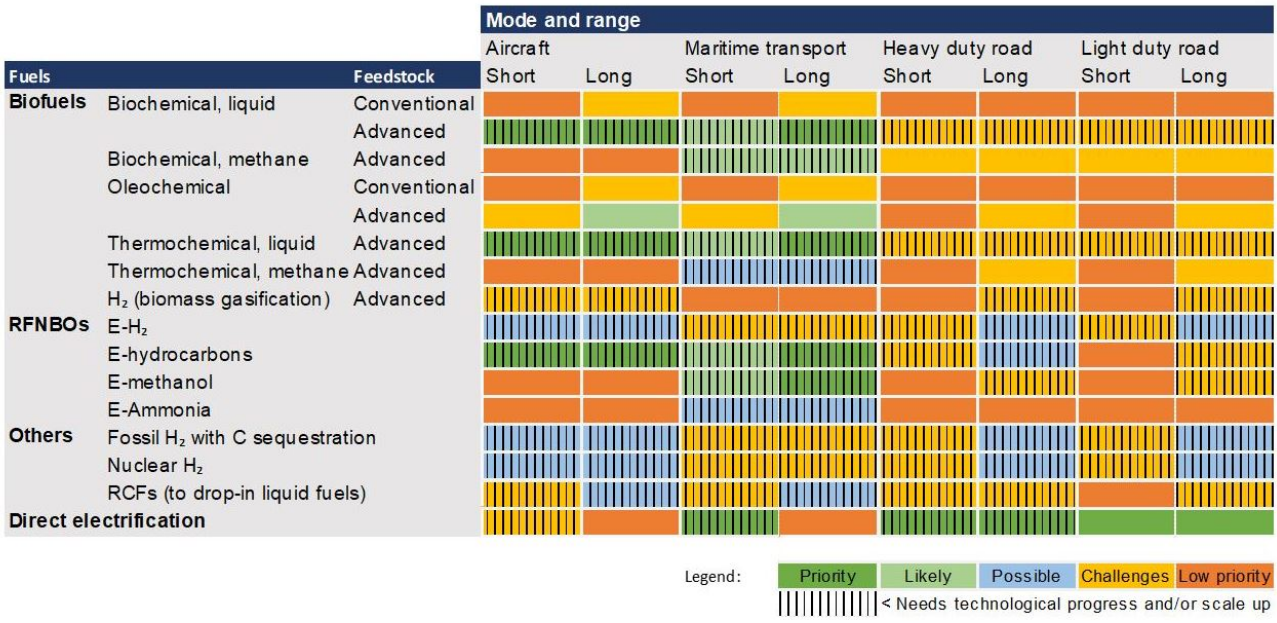
- **Supporting infrastructure needed for sustainable fuel take-up is fuel-specific**. It requires reinforcing the electricity system, developing a hydrogen network, and adapting the existing oil and liquid infrastructure to accommodate a higher share of biofuels.
- **Existing policies and the set of policy proposals in 'Fit for 55' tackle most of the barriers** to accelerate the shift to sustainable fuels, the deployment of the required infrastructure and the changes in vehicle powertrain technologies.
- The EU's policy to support sustainable fuels shall seek to **further enhance technological development, foster industrial transformation, and strengthen re-distributional measures** without compromising sustainability.

Conclusions and policy recommendations

The analysis results in several policy recommendations to address remaining gaps and weaknesses:

- **Exploring further the recommended pathways** for developing and deploying sustainable fuels and matching the different end-use applications.
- **Increasing the share of RFNBOs in 2050 for the maritime and aviation sectors**, and having large pleasure/luxury boats and private jets spearhead the efforts.
- Ensuring that hydrogen and RFNBOs or RCFs needing large amounts of electricity for their production are subject to **additionality requirements** when production is scaled up.
- **Establishing clear pricing signals** via the Emissions Trading System (ETS) and the Energy Taxation Directive (ETD) to remove biases in the fiscal treatment applied to fossil fuels subject to low tax rates, for both domestic and international aviation and maritime transport.
- **Complementing carbon pricing with mechanisms supporting innovation and re-distributional measures** (to address energy poverty).
- **Mobilising research, design and innovation** (RD&I) spending on key enabling technologies for a transition of transport to sustainable energy and fuels (e.g. batteries, water electrolysis, Direct Air Capture, electrochemical reduction of CO2).
- **Supporting pilot and demonstration projects** to speed up identification of the most suitable sustainable fuels for specific applications, (e.g. methanol, ammonia or e-hydrocarbons for long-distance shipping).
- RD&I agendas should remain open to **a possible phase-in of hydrogen use in heavy-duty road**, or even in maritime and aviation.

Match making between fuels and transport modes – Summary of all factors



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Publication: March 2023. © Image on page 1 used under the licence from Adobe Stock
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