# Assessment of impacts from accelerating the uptake of sustainable alternative fuels in maritime transport

Executive Summary

CE Delft and Ecorys
March – 2021

**EUROPEAN COMMISSION**

Directorate-General form Mobility and Transport
Directorate D — Waterborne Transport
Unit D.1 — Maritime Transport & Logistics

*Contact:* MOVE D1 Secretariat

*E-mail: MOVE-D1-SECRETARIAT@ec.europa.eu*

*European Commission*
*B-1049 Brussels*

# Assessment of impacts from accelerating the uptake of sustainable alternative fuels in maritime transport

Executive Summary

***Europe Direct is a service to help you find answers to your questions about the European Union.***

**Freephone number** (*)**:**

**00 800 6 7 8 9 10 11**

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).



Luxembourg: Publications Office of the European Union, 2021

ISBN 978-92-76-41048-5
doi: 10.2832/101055

# Executive summary

The European Green Deal and the 2030 Climate Target Plan aim to reduce GHG emissions by at least 55% in 2030, relative to 1990, and achieve climate neutrality in 2050. All sectors should contribute to this target, including maritime transport. Ships in the scope of the EU MRV emitted about 140 Mt $CO_2$ in 2018 and 2019. One of the reasons for these emissions is the reliance of maritime transport on fossil fuels. Over 99% of marine fuels used globally were either petroleum-based or natural gas-based in 2018, and the situation in the EU is similar.

The low uptake of renewable and low-carbon fuels by ships calling at EU ports complicates reaching the ambition of the European Green Deal and, more in general, makes it more difficult to achieve the temperature goal of the Paris Agreement. In addition, ships at berth in EU ports emit significant quantities of air pollutants because of the use of fossil fuels at berth.

These problems have five drivers:

1. the regulatory framework determines the fuel choice of new ships. Uncertainty about the changes to the regulatory framework may result in more dual-fuel engines being installed, and while this would improve the versatility of the fleet, it would probably also mean that the most cost-effective renewable and low-carbon fuels will seldomly be used on these ships;
2. Most renewable and low-carbon fuels which are suitable for use onboard ships have a low technical maturity. In most cases, the bunkering infrastructure and in some cases the energy conversion on board are immature. This constitutes a high risk for first movers;
3. The production costs of renewable and low-carbon fuels are two to fifteen times more expensive than conventional fuels, depending on the type of fuel and the production pathway. In addition, some fuels require dedicated bunkering infrastructure and modifications to ships, which increase the costs of using these fuels. The cost difference per tonne of $CO_2$ reduced (equal to the carbon price required to make the fuels cost-competitive) currently ranges from around EUR 150 to several thousand euros;
4. Some renewable and low-carbon fuels are so-called drop-in fuels, meaning that they can be used in existing ships without modifications to the fuel sytem or engine. These fuels can be used occasionally by existing ships. Other fuels, however, require significant changes to ships and dedicated bunkering infrastructure. These fuels include methanol, ammonia and hydrogen, which are amongst the most cost-effective e-fuels. For these fuels, there is an interdependency between supply and demand: the costs of the bunkering infrastructure are only surmountable when there is sufficient demand for these fuels, and conversely, demand will only increase when there is a reliable supply of fuels;
5. Ships have a significant degree of freedom in choosing the place of bunkering. In many cases, they can bunker anywhere along the route they are sailing.

A problem tree is shown in Figure ES1.

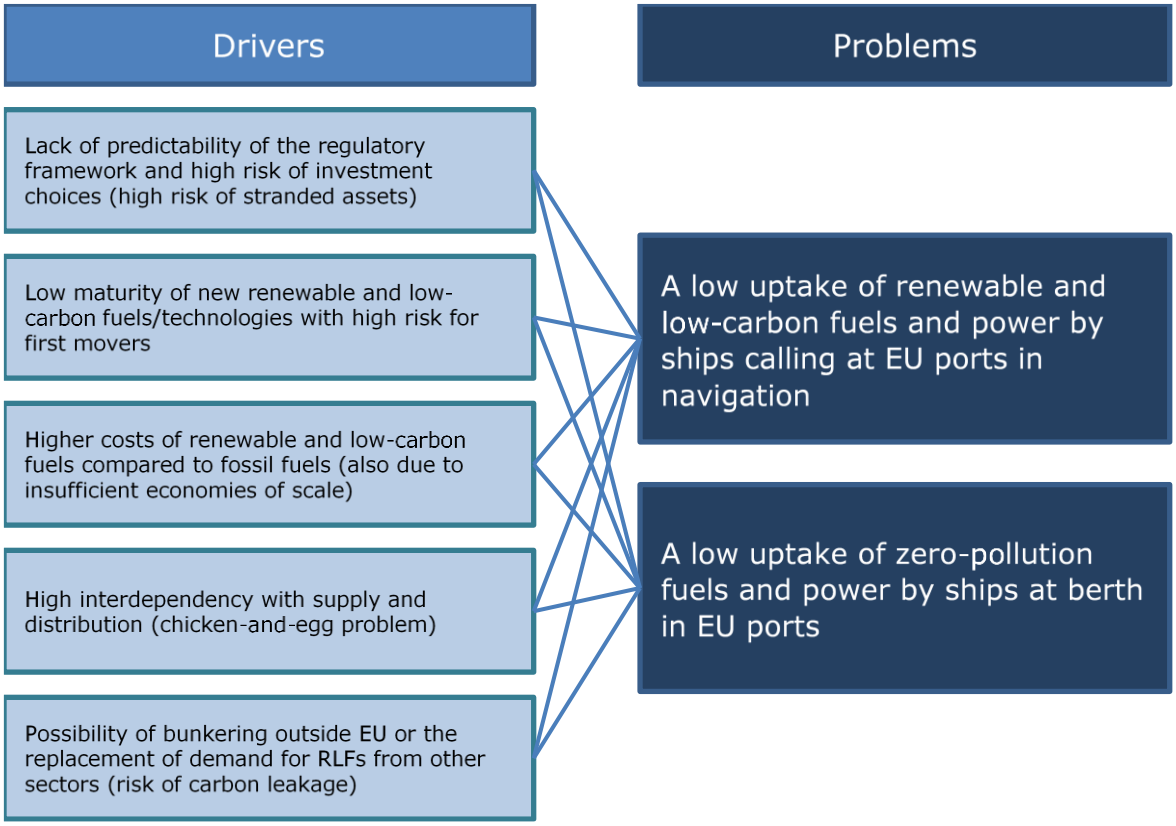


*Figure ES1 Problem tree*

In the absence of policy action, the problems are unlikely to diminish. Although there are voluntary initiatives to gain experience with renewable and low-carbon fuels, they are unlikely to result in a significant uptake of these fuels because shipping companies using these fuels on a large scale would jeopardize their competitiveness. Existing or future EU policies may provide an incentive for reducing $CO_2$ emissions from shipping, but that incentive is unlikely to become sufficiently large to overcome the price gap between fossil and renewable fuels and compensate for the risk of using alternative fuels. Member State policies are mainly targeted at R&D and pilot projects. While the Initial IMO Strategy on Reduction of GHG Emissions from Ships explicitly recognises that the global introduction of alternative fuels and/or energy sources is necessary, the consideration of global policies is in the initial stage.

Hence, in order to address the problems, European policy action is required. Because of the possibility of bunkering outside the EU, the policy should target fuels used on voyages to and/or from EU ports, rather than fuels sold in the EU. Also, because the lack of demand for renewable and low-carbon fuels is the main problem, the policy should aim demand for fuels rather than supply. Based on these considerations, this study has identified the following policies:

**Table ES1 Policy options**

| Option | In navigation and at berth | In addition at berth |
|---|---|---|
| 1 - Prescriptive approach on the choice of technology | Minimum shares of specific fuel types (established ex-ante) would be established and would increase over time. | The use of on-shore power supply will be mandated for the most polluting ships in ports, unless they can prove the use of equally performant alternative. |

| Option | In navigation and at berth | In addition at berth |
|---|---|---|
| 2 - Goal-based approach on technology | A maximum limit on the GHG content of energy used by ships in navigation (e.g. CO2eq/MJ or kWh) would be established and will be made more stringent over time. | As above |
| 3 - Goal-based approach on technology and reward mechanisms for overachievers | The maximum limit on the GHG content of the energy used by ships in navigation would be combined with the possibility to pool compliance with other ships / operators, either on a voluntary basis or through transferrable credits. Also, when establishing the ship's performance in achieving the yearly target, higher weight will be attributed to zero-emission technologies. | As above |

There are differences between the options in fuel choice and in administrative tasks, as summarised in Table ES2.

**Table ES2 Impact of policy options on fuel choice**

| Option | Likely fuel choice in navigation |
|---|---|
| 1 - Prescriptive approach on the choice of technology | Ships are incentivised to use the cheapest compliant drop-in fuel. These are bio-diesel (HVO or FAME) for ships sailing on liquid fuels and liquefied biogas for ships sailing on LNG. |
| 2 - Goal-based approach on technology | Ships are incentivised to use the most cost-effective drop-in fuel. These are bio-diesel (HVO or FAME) for ships sailing on liquid fuels and liquefied biogas for ships sailing on LNG. |
| 3 - Goal-based approach on technology and reward mechanisms for overachievers | Pools of ships are incentivised to use the most-cost-effective fuels. These are liquefied biogas, biodiesel, bio-methanol, and bio-ethanol. E-fuels are currently less cost-effective. However, if bonuses are given for e-fuels e-ammonia and e-hydrogen could become attractive. |

In order to address the reliance of shipping on fossil fuels, the European Commission launched the FuelEU Maritime initiative with the aim to create clear pathway for the demand of renewable and low-carbon fuels and power in maritime trans

## GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

– by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

– at the following standard number: +32 22999696, or

– by email via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications from: https://publications.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en ).

EU law and related documents

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU

The EU Open Data Portal ( http://data.europa.eu/euodp/en ) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

MI-01-21-157-EN-N


ISBN : 978-92-76-41048-5

doi: 10.2832/101055