

Are synthetic fuels a promising option for ships and trucks? An investigation of actors and acceptance of renewable methane in Germany



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Global CO₂ emissions from transport

Our World
in Data

This is based on global transport emissions in 2018, which totalled 8 billion tonnes CO₂.
Transport accounts for 24% of CO₂ emissions from energy.

74.5% of transport emissions
come from road vehicles

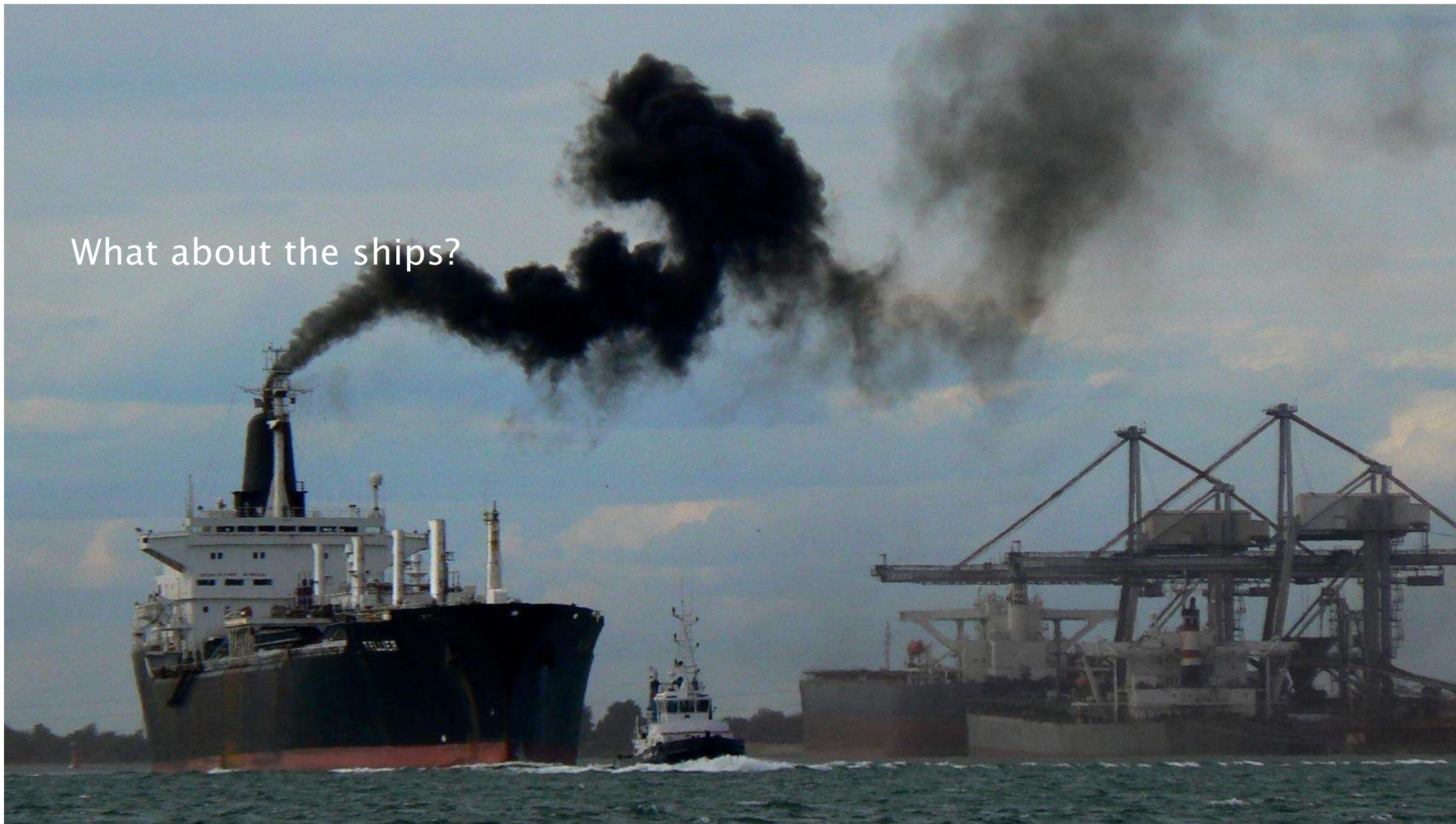


OurWorldinData.org – Research and data to make progress against the world's largest problems.

Data Source: Our World in Data based on International Energy Agency (IEA) and the International Council on Clean Transportation (ICCT).

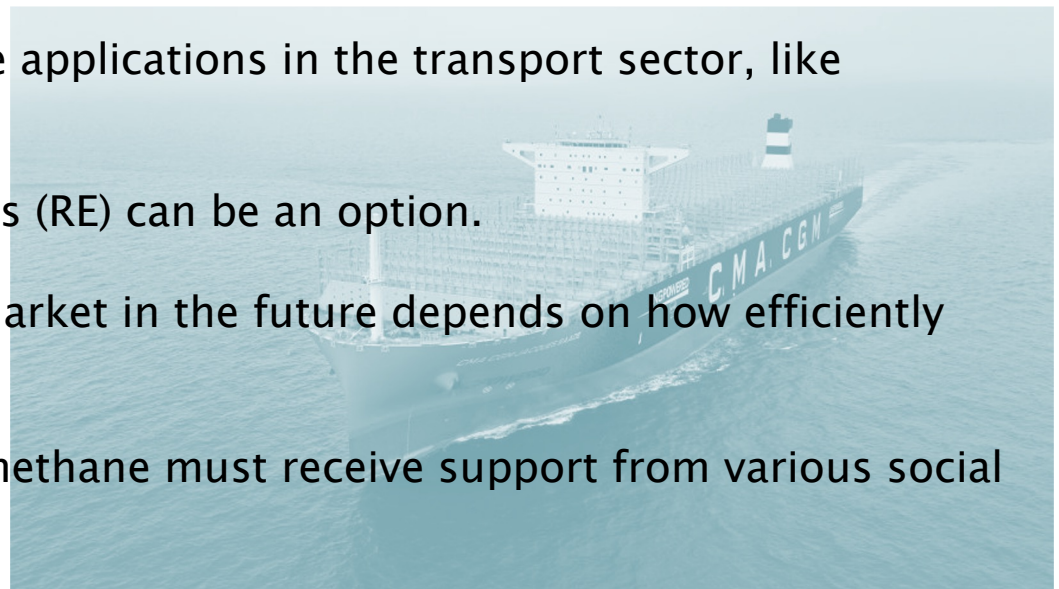
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What about the ships?



To reduce greenhouse gas emissions from ships and trucks, synthetic methane from renewable energies can be one solution

- Challenge: Decarbonising energy-intensive applications in the transport sector, like shipping and road freight transport.
- Synthetic methane from renewable energies (RE) can be an option.
- Whether RE methane will succeed on the market in the future depends on how efficiently and cost-effectively it can be produced.
- In addition, a new technology such as RE methane must receive support from various social actors in order to become established.



The research questions deal with stakeholders and acceptance of renewable methane in the transport sector

1. Which types of actors are currently active in the innovation system around renewable methane (and specifically in the truck and ship applications) in Germany?
2. How do the actors perceive the potential of renewable methane in general and in both applications?



To answer the research questions qualitative methods of data collection were applied

Methods of data collection:

1. **1st research question:** Actor identification via media and publication analysis.
 - Data base: 279 German newspaper articles and publications
2. **2nd research question:** Actors with a market focus around both applications were interviewed about their assessment and acceptance.
 - 5 guideline interviews in the German shipping sector (shipping companies, associations, engine manufacturers, networks)
 - 7 guideline interviews in the German truck sector (OEMs, industry associations, politics)

By means of the interviews, drivers and barriers for the market development of RE-methane as marine fuel were identified



LNG is first the bridge technology and then you make RE-methane with the engines that you have. Makes the MOST sense to me, because you say, ok, we have these engines, many engines can be retrofitted, many ships already have dual fuel engines ... (Representative of industry association)

Drivers

- *Same performance like fossil LNG*
- *Technical maturity of gas engines for ships*
- *Currently favorable framework conditions for LNG as a transitional technology: LNG is available and fully approved*
- *Low-emission combustion; e.g., cruise ships*
- *Greenhouse gas (GHG) mitigation potential*
- *Existing infrastructure (grid & major ports)*
- *Range*
- *Flexibility through dual fuel engines*

By means of the interviews, drivers and barriers for the market development of RE-methane as marine fuel were identified



- *Low energy efficiency*
- *High cost of RE methane*
- *Methane slip*
- *Lack of generation facilities*
- *Origin of CO₂ unclear*
- *Infrastructure so far only available in major ports worldwide*
- High space requirements on the ship for the tank
- Port regulatory: no uniform guidelines for the bunkering of ships between the federal states in Germany

Drivers

Barriers

depending on
shipping
segments!

By means of the interviews, drivers and barriers for the market development of RE-methane as truck fuel were identified



Drivers

- *Same performance like fossil LNG, miscibility with fossil natural gas and biomethane (can be introduced proportionally in infrastructure & use)*
- *Gas vehicles as mature technology*
- *Currently favorable framework conditions for LNG as a transitional technology: toll exemption, tax concession, purchase subsidies.*
- *GHG mitigation potential*
- *Existing infrastructure (gas network & filling stations)*
- *Regulatory potential: RED II, GHG reduction quota*
- *Vehicle procurement hardly more expensive*

By means of the interviews, drivers and barriers for the market development of RE-methane as truck fuel were identified



- Low energy efficiency
- High cost of RE methane
- Methane slip
- Lack of generation facilities
- Origin of CO₂ unclear
- Lack of refueling stations
- Parallel pursuit of all possible technologies
- Lack of investment
- Lack of recognition of "well-to-wheel" in regulation
- Fleet of natural gas vehicles too small

Drivers

Barriers

"Then our clear realization was: gas is not a solution for us, because we will not reach climate neutrality with gas and not at the same speed, and in this respect we have to start today with the solutions that will also be the technological answers that we need for climate neutrality in the long term and permanently." (OEM)

Summary of key findings

Interviewees are more positive on the topic of RE methane for *ships* than for *trucks*.

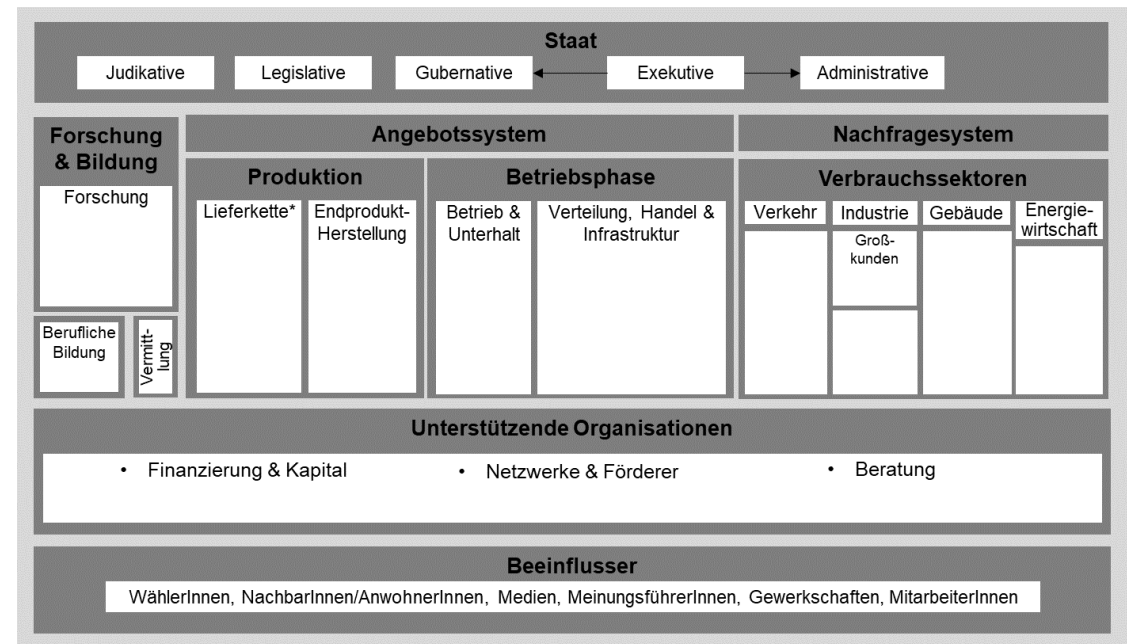
- However, the expressed level of acceptance depends on the shipping segments.

For the market development of RE methane, the most important factors are:

- Policy measures / regulation:
 - Tax fossil fuels, introduce CO₂ price
 - Expand / create framework conditions and targets for GHG reduction at EU level for trucks and ships (e.g. CO₂ fleet averages)
 - Maintain positive regulation for gas
- Infrastructure and gas supply:
 - Expansion of filling station/bunker infrastructure for LNG to ensure global supply of LNG / RE methane.
 - Faster development of RE methane production and infrastructure
- Research and development: minimize methane slip

Conclusion & outlook: Are synthetic fuels a promising option for ships and trucks?

Renewable methane will only play a role primarily in the area of *ships* and there only in certain shipping segments.



own illustration based on Hekkert et al. 2011

Conclusion & outlook: **Are synthetic fuels a promising option for ships and trucks?**

- Central challenges
 - Low energy efficiency
 - Availability of green hydrogen as an important bottleneck
 - Methane slip as a threat for GHG emission reduction
- For trucks and ships: juxtaposition of alternative fuels and propulsion systems.
- Challenge: Decarbonize maritime sector even more difficult than road freight
- Discussion on alternative fuels and drives in Germany partly ideological; not considering potential to reduce CO₂ emissions.

Thank you

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www.methquest.de

Quellen:

International Maritime Organization: Fourth IMO GHG Study 2020.
<https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-GasStudy-2020.aspx> (2020). Accessed 05.07.21

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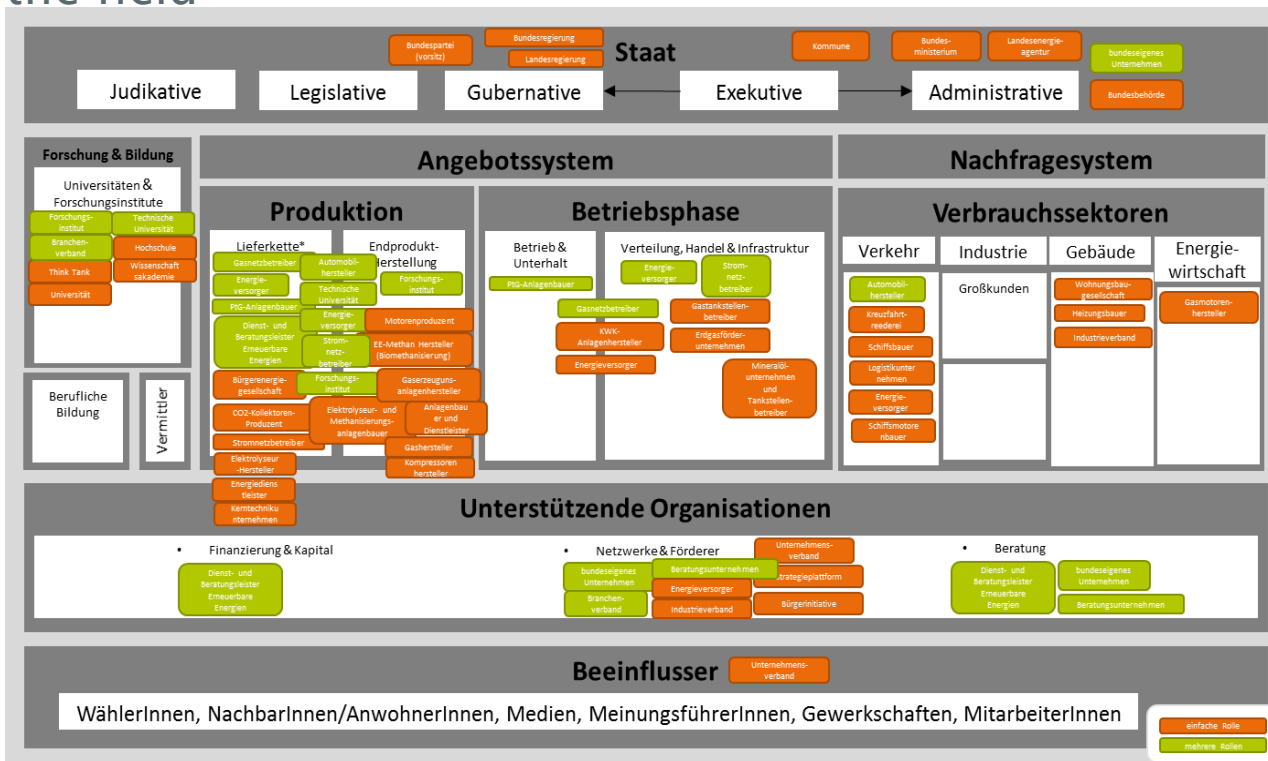


Bundesministerium
für Wirtschaft
und Energie

aufgrund eines Beschlusses
des Deutschen Bundestages

Backup

Wide range of actors, especially from research and industry, are already active in the field



Renewable methane has so far been discussed almost exclusively in specialist circles.

Many players in research and production, few in financing and application

- Early stage of technology development
- Applied research projects with test facilities

Only few actors were identified around the usage of synthetic methane in ships and trucks