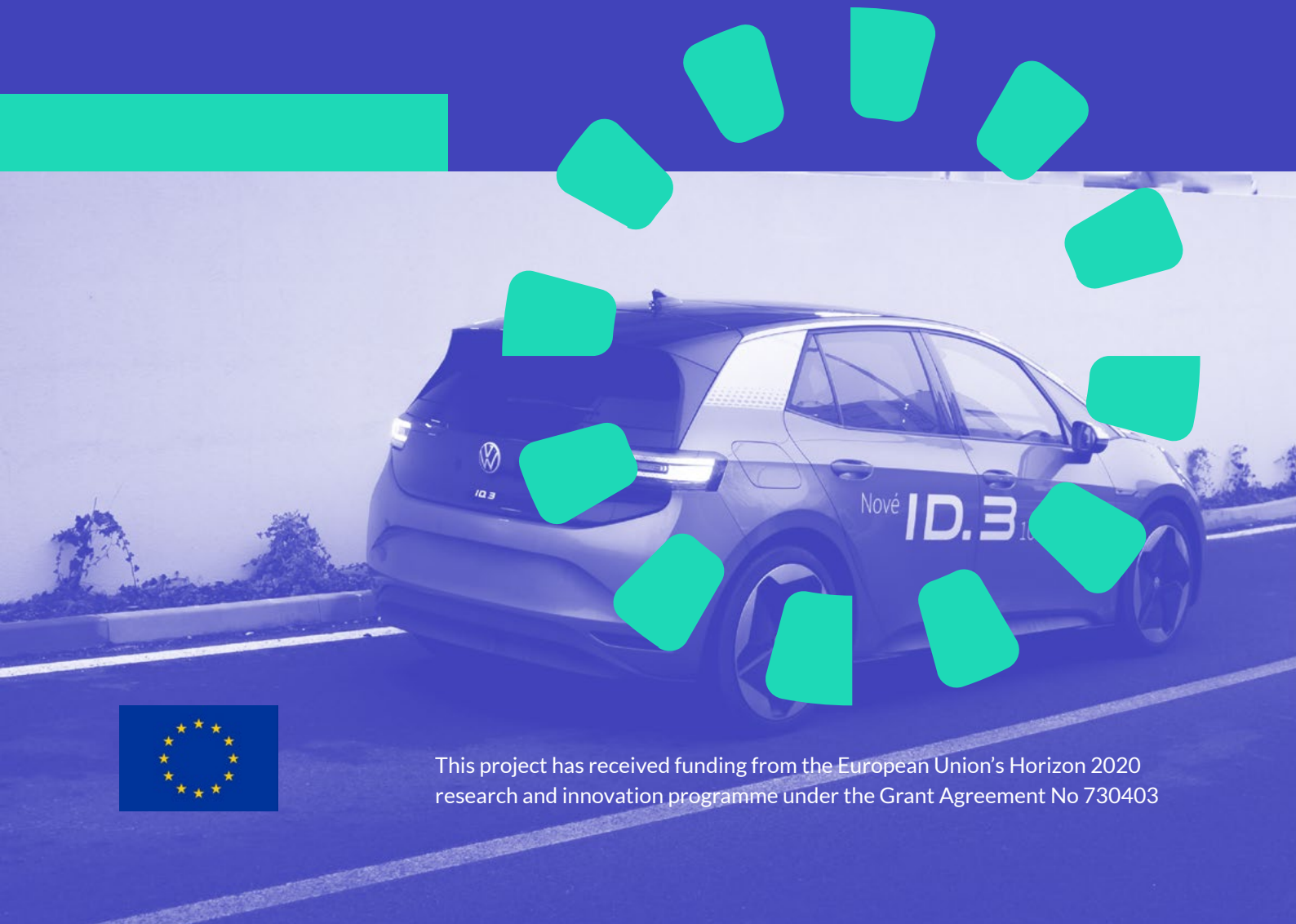
Policy Brief

INNOPATHS

Decarbonising Transport

Electric vehicles for cars and a mix of alternative technologies and fuels in other markets, can decarbonise EU transport



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Key Messages

- Strong policies are needed to push the EU transport system towards adopting zero-emission technologies tailored to the different transport markets across the EU.
- Short-term transport decarbonisation priorities include the mass adoption of electric vehicles with a low-carbon electricity generation.
- Investing in charging infrastructure is key to solve the “chicken-egg” problem for the widespread uptake of electric vehicles in urban areas.
- Hydrogen-based liquid fuels and advanced biofuels will help reduce emissions in hard-to-electrify sectors such as aviation and shipping.

Background and Context

The EU's ambition to reach climate neutrality by mid-century requires the ground-breaking transformation of the transport sector towards deep decarbonisation. The new EU Sustainable and Smart Mobility Strategy[1] replaces the 2011 White Paper Strategy and lays the foundations of a new era in transport policy, guided by a 90% cut in transport-related GHG emissions by 2050 compared to 1990. This target is consistent with Europe's commitment to deliver 55% GHG emission reduction by 2030 and reach climate neutrality in 2050 as set out in the EU Green Deal.

1 https://ec.europa.eu/transport/themes/mobilitystrategy_en

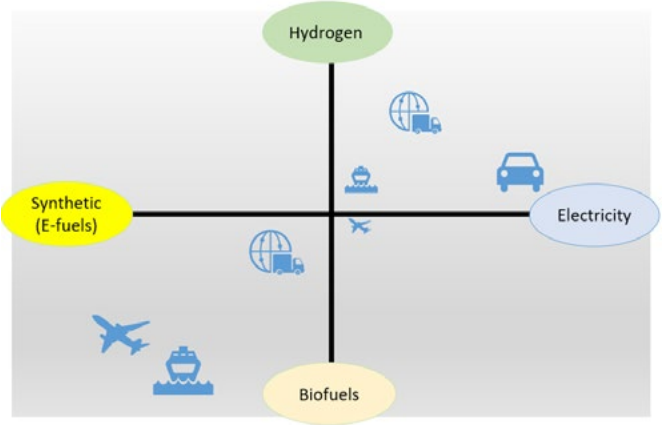
Strong policies are needed to push the EU transport system towards adopting zero-emission technologies tailored to the different transport markets across the EU.

To deliver deep emission reductions, the transport sector will have to undergo structural changes over the next 30 years. Market actors need to receive strong policy signals to become fully engaged in the transformation of the transport sector, to support the market uptake of zero-emission vehicles and vessels, the increased production and use of sustainable fuels and a substantial rollout of infrastructure for recharging batteries and re-fueling with alternative fuels.

A number of different technological pathways and fuels could lead to a 90% reduction of transport-related emissions by 2050. While projecting the technology and fuel mix that will prevail in the transport sector in the long term is tentative and subject to uncertainty, one thing is certain: delivering this ambitious target in a cost-optimal way cannot be based on a single fuel or technology, but should be the outcome of an effective mix of policies and technologies customized to the specificities of different transport markets. Different decarbonisation options need to match the characteristics of specific transport modes (Figure 1), travelling behaviors, supply chains and logistics. Transport decarbonisation also involves the uptake of sustainable mobility solutions like the promotion of public transport, soft transport modes (cycling, e-scooters), changes in mobility behaviors/ trip patterns (e.g. more teleworking) and modal shifts towards less energy-intensive modes of transport.

The timing of policy measures is also critical. Announcing more ambitious vehicle standards must be done well in advance of introducing such standards, so that vehicle manufacturers can prepare to shift production towards low- and zero-emission technologies. The ultimate policy signal would be to set zero-emission standards on car manufacturers, resulting in sales of only zero-emission (i.e. battery electric and hydrogen fuel cell) cars in the EU. CO_2 emission targets on vehicle manufacturers are among the most effective policy measures to promote zero-emission vehicles in the EU market. Other complementary measures like road pricing for cars (based on their WLTP [Worldwide harmonized Light-duty vehicles Test Procedure] CO_2 emissions) could be considered.

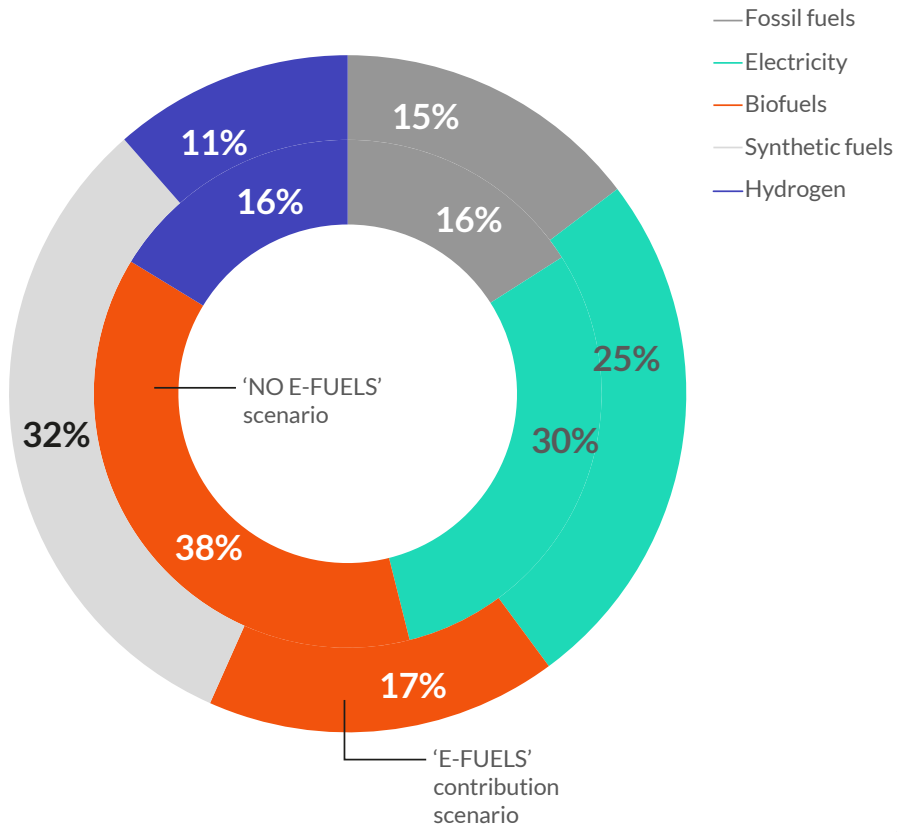
Figure 1



Ambitious standards need also to apply to truck manufacturers. Even though trucks represent only a small fraction of total road vehicles (4%), they contribute approximately 25% of total road transport emissions in the EU. Fuel cell, battery and catenary (overhead cable) electric truck powertrains can help reduce emissions. Fuel cell trucks are expected to dominate mainly long-haul road freight transport markets, while battery electric trucks would be used in different markets (e.g. for regional deliveries). Catenary trucks may be used in specific motorways equipped with electricity overhead power lines.

Mandates on the fuel supply and demand-side obligations on the use of sustainable fuels are also necessary to establish regulatory certainty and investment security to the fuel supply industry to deliver low- and zero-emission fuels in the market. This, in particular, is true for the use of synthetic clean fuels in specific non-road transport markets such as aviation and international shipping. Strong policy action needs to be pursued today such that the deployment and market uptake of sustainable fuels by 2030 becomes feasible on a large commercial scale (around 5% of the total energy consumption of the sector). Mandates on the fuel supply side, like carbon standards on the vehicle side, are also considered as an effective measure. The first passenger flight with sustainable synthetic kerosene took place in the first days of February 2021, demonstrating innovation in decarbonizing the aviation sector, which is commonly considered one of the most difficult to decarbonise. Contrasting scenario analysis (Figure 2) shows that without synthetic fuels, biofuels and hydrogen are used for long journeys and most freight transport, while around half the biofuels go to aviation (biokerosene), along with the remaining fossil fuels. With synthetic fuels, these take the largest single share in the fuel mix, and substitute to a considerable degree for both biofuels and hydrogen for these uses.

Figure 2



Short-term transport decarbonisation priorities include the mass adoption of electric vehicles with a low-carbon electricity generation.

Electric vehicles (EVs) represent the key technology for reducing the tailpipe emissions from passenger cars. While still higher than that of conventional petrol cars, the price of EVs has been falling rapidly over the last 5 years, as a result of the reduction in the cost combined with improved battery performance. Studies expect the costs of EVs to keep falling in the next 5-10 years. The price gap between EVs – in particular short-range EVs (200-250 km) – and petrol cars is expected to be bridged in the coming years. Short-range EVs cover the daily mobility needs of the average household without imposing day-to-day travelling limitations.

At the same time, the uptake of EVs should be complemented with a sharp increase in the share of renewable electricity (RE). A 55% reduction of transport GHG emissions by 2030 requires a big drop in emissions also in power generation, in order to reach carbon neutrality in 2040. EVs are the obvious choice for bringing down emissions in urban areas, which would also improve air quality.

Investing in charging infrastructure is key to solve the "chicken-egg" problem for the widespread uptake of electric vehicles in urban areas.

The most important barrier for the widespread uptake of EVs in the 2025-2030 horizon seems to be the lack of EV charging infrastructure. While battery costs are rapidly falling, the deployment of charging infrastructure is progressing more slowly in most EU countries. Equally problematic is the, currently, uneven development of recharging infrastructure across the EU countries. Private investors are reluctant to engage in the development of such infrastructure, due to high investment costs coupled with policy and regulatory uncertainty; consumers are also discouraged from purchasing an EV, due to not only their – still high – price, but also the lack of re-charging stations. This is known as the "chicken-egg" problem, which delays the market uptake of EVs.

For a mature e-mobility ecosystem to be established by 2030, the large-scale rollout of charging infrastructure should happen by 2025 with the strong support of governments. While private investments may invest in the most profitable locations, publicly-funded infrastructure is necessary for ensuring a minimum supply of EV charging points, one that will help consumers overcome their reluctance to purchase EVs. This should then create a spiral effect where the penetration of EVs attracts further private investment which in turn helps reach a critical mass of EVs in the EU.

Hydrogen-based liquid fuels and advanced biofuels will help reduce emissions in aviation and shipping.

Synthetic fuels, produced from “green” hydrogen that is derived from RE-based electricity, along with advanced biofuels, can deliver significant emission reductions in transport modes which are rather difficult to decarbonise. The use of sustainable fuels in shipping and aviation will not entail any changes to the way these transport markets operate today, with freight and passenger transportation able to continue to use current transport infrastructure.

The industrial maturity of today’s nascent technologies is key for achieving the deep decarbonisation of the transport sector by 2050. Synthetic fuels need to become commercially mature and affordable. Technologies for producing synthetic fuels are not novel, but industrially immature, which keeps their costs high. Strong policy support in the form of fuel mandates or other sectoral GHG emission reduction constraints is thus necessary to provide investment security to the industry to be able to deliver these low-emission fuels to the market at scale.

> Strong energy efficiency improvements will have to take place in aviation and maritime by 2050, to rationalize the amount of sustainable liquid fuels needed and the resources required to produce them

Further Information

For further information, please consult the following publications:

- Low carbon innovation in electric vehicle automotive manufacturing: Insights from BMW (Germany) and Fiat (Italy) 2019, Benjamin K. Sovacool, Jan-Christophe Rogge, Claudio Saleta, and Edward Masterson-Cox, *Environmental Innovation and Societal Transitions*, November, Vol.33, pp.45-60, 10.1016/j.eist.2019.02.004
- INNOPATHS Deliverable D3.9: Report on decarbonisation in the transport sector, *https://innopaths.eu/publications/#project-deliverables*
- Siskos, P., Moysoglou, Y. (2019). Assessing the impacts of setting CO_2 emission targets on truck manufacturers: A model implementation and application for the EU. *Transportation Research Part A: Policy and Practice*, 125, 123-138
- Statharas, S., Moysoglou, Y., Siskos, P., Capros, P. (2021). Simulating the Evolution of Business Models for Electricity Recharging Infrastructure Development by 2030: A Case Study for Greece. *Energies* 2021, 14, 2345

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