



Scenarios for carbon-neutral transport: Which actions achieve the goal?

The transport sector's contribution to achieving the climate targets is still unsatisfactory. In contrast to other sectors such as energy and buildings, CO₂ emissions have not fallen in comparison to 1990, the baseline year – apart from the decrease caused by the COVID-19 pandemic. There are immense challenges if the greenhouse gas emissions from transport are indeed to fall by approximately 48 per cent of 1990 levels to 85 million **tonnes of CO₂ equivalent** by 2030, in line with the German government's revised Climate Change Act. By 2045, the transport sector must be carbon-neutral.

The magnitude of the task demands a strategic approach. With the aid of scenarios, it is possible to demonstrate which measures and instruments can produce real contributions to climate change mitigation and what the impact of combining different instruments will be.

Scenarios demonstrate possible trajectories

A number of Oeko-Institut research projects have developed scenarios demonstrating strategies for climate policy, each of which uses a variety of approaches (for example, electric vehicles, modal shift, new types of fuel) or combinations of these strategies to achieve the target.

Various trajectories are analysed in detail. Is enough electricity available from renewable sources to support the conversion of entire vehicle fleets to e-mobility? What are the most promising options for freight transport? Factors such as the national economy, quality of life in cities and the ease of implementing measures are also relevant here.

In a study commissioned by Agora Verkehrswende, Agora Energiewende and the Climate Neutrality Foundation (Stiftung Klimaneutralität), the Oeko-Institut, Prognos and the Wuppertal Institute have shown how Germany can reach its climate targets by as early as 2045, instead of 2050.

A milestone on the path to climate neutrality: an emissions reduction target of 65% for 2030

To that end, a reversal of the trend is both necessary and feasible in the transport sector: this would mean that by 2030, greenhouse gas emissions decrease to 89 million tonnes (Mt) from 162 million tonnes in 2018. There will be 14 million electric cars (including plug-in hybrids) on German roads; electric cars will account for approximately 80 per cent of new registrations. Carpooling will increase capacity utilisation of vehicles. There will be a clear shift to public transport (bus and rail), walking

and cycling. Passenger car mileage will decrease by around 13 per cent in total. Goods will be increasingly transported by rail, and trucks that run on batteries, overhead lines, and fuel cells will cover nearly one-third of road freight mileage.

Towards a Climate-Neutral Germany by 2045

Beginning in 2032, no new passenger cars with combustion engines will be registered. By 2045, the national vehicle fleet will consist almost exclusively of electric cars. In 2045, road freight, buses and rail will be almost entirely electrified (battery electric, overhead lines) or powered by fuel cells. The share of power fuels in air and waterway transport will increase significantly from 2035 onwards. The higher cost of synfuels, combined with other measures, will slow growth in international air transport demand at an earlier stage.

A more ambitious mix of instruments is required

In the past two years, the German Climate Action Plan and the Climate Change Act have generated considerable momentum (promotion of e-vehicles, local public transport and cycling, on the one hand; CO₂ pricing and a more pronounced spread of the motor vehicle tax according to CO₂, on the other). The Projection Report 2021 for Germany, however, indicates that with the current measures, transport sector emissions will exceed 125 million tonnes of CO₂ equivalent in 2030 and will still amount to around 78 million tonnes of CO₂ equivalent in 2040. In order to achieve lasting emission reductions in the transport sector and reach the targets set in the Climate Change Act, a higher level of ambition is required.

Reshaping mobility: fair, individual and sustainable

Higher CO₂ prices in combination with the abolition of the surcharge introduced by the German Renewable Energy Sources Act (EEG levy), appropriate taxation of company cars, a bonus/penalty system for the purchase of passenger cars, and an additional CO₂ component in the truck toll: this transformation of the current system of taxes and surcharges would do much to ensure the success of the transport turnaround (*Verkehrswende*) and achieve the transport sector's climate targets. These are some of the key findings of a study by the Oeko-Institut, the Ecological-Social Market Economy Forum and Professor Stefan Klinski on behalf of the German Environment Agency (UBA).

To that end, four policy instruments must be implemented no later than 2025: an increase in CO₂ prices in combination with the abolition of the EEG levy, appropriate (i.e. higher) taxation of company cars, a significantly higher CO₂ spread in the vehicle tax for passenger cars, and an additional CO₂ component in the truck toll. In the long term (i.e. from 2030 onwards), a mileage-based toll on all roads and for all vehicles (cars and trucks alike) is a key instrument for ensuring sustainable financing of the infrastructure and bringing about an ecological steering effect beyond CO₂ emissions.

Guardrails and pitfalls: key instruments for transforming the transport sector

On behalf of the German Environment Agency (UBA), the Oeko-Institut has identified guardrails and pitfalls affecting the development of a total of 10 policy instruments and has described them in a series of briefing papers.

The papers look first at incentives to change mobility behaviour. They encompass an increase in CO₂ prices in the transport sector (including redistribution of revenue) and a 120 km/h speed limit on

motorways. The commuting allowance should be restructured, although this seems unlikely in the short term in light of the recent decision and steps taken to increase it. The mileage-based passenger car toll and the mileage-based truck toll are primarily intended to raise revenues to fund the road infrastructure. The latter toll should be rolled out to all roads and all vehicles exceeding 3.5 tonnes from 2025 and be combined with a CO₂ component. To bring about a genuine modal shift in the transport sector, however, a good range of alternatives is a prerequisite.

It is also important to reduce the number of new vehicle registrations and promote vehicles with lower CO₂ emissions. Instead of making the use of company cars more attractive through low taxation and company fuel cards, company car taxation should in future be based on the total value of vehicle utilisation and also take account of private mileage. With regard to plug-in hybrid passenger cars, the minimum electric range must be sufficiently high, and CO₂ emissions sufficiently low, to have a beneficial climate impact, and charging must become more attractive, also in financial terms, than filling up with petrol. In addition, the motor vehicle tax should be restructured (bonus/penalty system), with increased surcharges for CO₂-intensive vehicles; the revenue should be used to fund the incentive for buying an electric car.

In order to ensure that car manufacturers develop vehicles with lower and zero CO₂ emissions and put them on the road, the fleet-wide targets for CO₂ emissions for passenger cars should be adjusted every five years; plug-in hybrids should be assessed on the basis of their actual fuel consumption. The expansion of the charging infrastructure must keep pace with this. The same applies to CO₂ emissions performance standards for heavy goods vehicles. Regulations are also required for buses, light commercial vehicles and trailers, along with a revision of the targets to 2040 to support forward planning.

Transport policy: fair and climate-friendly

With a view to ensuring that transport policy not only contributes to climate change mitigation but is also socially equitable, existing climate policy instruments should be adapted accordingly. For example, the CO₂ component of the motor vehicle tax should be increased, with the additional revenue being used to fund the incentive for buying an electric car. The commuting allowance could become a travel allowance that encourages the use of public transport. The tax on company cars should be increased and should be based on the vehicle's CO₂ emissions.

The Oeko-Institut was commissioned by the Nature and Biodiversity Conservation Union (NABU) to consider these and other instruments. The aim of the study was to analyse the social impacts of present transport policies and put forward ideas for a climate-friendly and socially fair transport system of the future.

[Impulse für mehr Klimaschutz und Sozialverträglichkeit in der Verkehrspolitik](#) [Incentives for more action on climate change and social equity in transport policy]: Study by the Oeko-Institut

Further information

[Renewbility III – Optionen einer Dekarbonisierung des Verkehrssektors \[Renewbility III – Options for decarbonisation of the transport sector\]: Final report, led by the Oeko-Institut, in collaboration with DRL Transport Research, the Institute for Energy and Environmental Research \(ifeu\), Heidelberg, and Infrac, Zurich](#)

[Klimaschutz im Verkehr: Maßnahmen zur Erreichung des Sektorziels 2030 \[Climate change mitigation in transport – action to achieve the sector’s target to 2030\]: Study by the Oeko-Institut and the International Council on Clean Transportation \(ICCT\) for Agora Verkehrswende](#)

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