
What is the environmental impact of electric cars?

Factsheet

Background

In order to limit global warming to 1.5°C if possible, the European Union must become climate neutral by 2039. To achieve this, the European Climate Law must be massively improved.¹ But the transport sector is already far from complying with the existing plan "Fit for 55".² To achieve this, annual carbon dioxide (CO₂) emissions must fall from the current level of around 682 million tonnes of CO₂ equivalents (CO₂e) of total road transportation to 68 million tonnes of CO₂ e by 2050.^{3,4} In Germany, transport accounts for around one-fifth of total emissions. Added to this are lung damage and respiratory problems caused by excessive particulate pollution. Assuming that there is no threshold below which air pollution has no effect on health, premature deaths - just in Germany - can be estimated at 63,000 due to particulate matter and 27,700 due to nitrogen dioxide (NO₂).⁵

Therefore, a transition to a climate-friendly transport sector is urgently needed. For this, a comprehensive expansion of pedestrian traffic and cycling as well as local public transport is essential. The number of cars on the roads and the kilometres driven by them must be significantly reduced.^{6,7,8} The remaining unavoidable cars must become smaller, lighter, more efficient and climate-neutral. This can only be achieved through a consistent shift to all-electric vehicles. Hybrid vehicles, hydrogen drive, agrofuels and e-fuels are not environmentally friendly alternatives.^{9,10,11,12}

When considering all environmental impacts, electric cars are the most environmentally compatible compared to other passenger car drive types. Despite this, replacing the approximately 246 million cars in Europe¹³ with internal combustion engines with electric cars would be completely misguided. This is because their production also involves a considerable consumption of resources and energy, and their use is accompanied by an enormous demand for land and infrastructure. In a direct comparison with other types of car drive, however, the battery drive is the most efficient and environmentally friendly option. For example, newly registered electric cars in Europe currently emit an average of 75 grams (g) CO₂e/km over their entire life cycle, which is around 69 % less greenhouse gases than comparable petrol-driven vehicles.¹⁴ If green electricity is used in production and operation, CO₂ emissions are reduced even further. The resource consumption of the two drives can be classified as high in each case. The battery drive requires a large proportion of abiotic resources (minerals and metals) in its production phase. The combustion engine consumes a great amount of biotic resources, such as gasoline and diesel, during the use phase, which cannot be recycled after a single use.

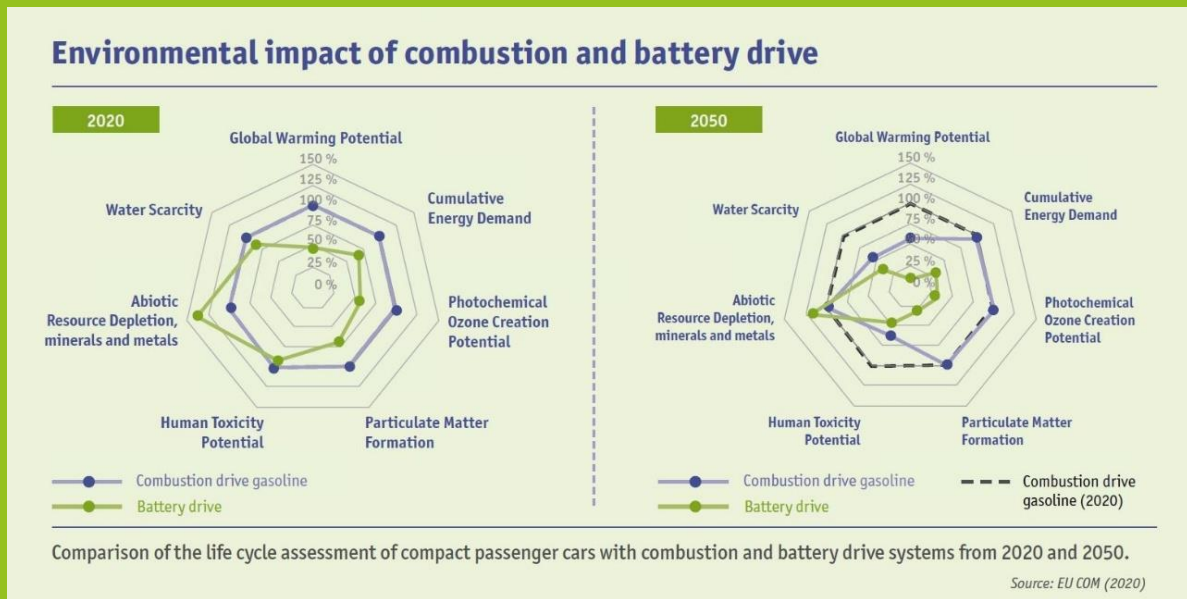
In order to fully reduce the environmental footprint of electromobility, renewable energies must be expanded at an accelerated pace, efficiency standards for passenger cars must be introduced and environmentally compatible extraction and recycling of resources must be ensured.

This factsheet is based on an information paper which can be found here: <https://www.duh.de/projekte/batterien/>

Further information and political recommendations for action on the mobility transition can be found here: <https://www.duh.de/themen/verkehr/>

Facts about Electromobility

- > Only a comprehensive mobility turnaround with significantly fewer cars and a switch to walking, cycling and public transport will enable climate-friendly and environmentally sound mobility. These things should be prioritised by politicians and not the 1:1 replacement of conventional cars with electric cars.
- > Passenger cars with combustion and battery drive are both environmentally intensive forms of drive and should be avoided if possible. In a direct comparison, the battery drive is less harmful to the environment than the internal combustion engine.



- > In life cycle assessments, the battery drive performs worse in the consumption of minerals and metals and the combustion drive in energy consumption, global warming and ozone precursors. By 2050, it is assumed that battery drive will have a significantly lower environmental impact than combustion drive in almost all areas.
- > With 75 - 150 g CO₂e/km^{15,16,17,18} (electricity mix), the battery drive has significantly lower CO₂ emissions over the entire life cycle than the combustion drive with 200 - 250 g CO₂e/km^{15,17,19,20}. For example, an average medium-sized diesel car of the "Golf class" causes about three times as much CO₂e/km as a comparable electric car. If renewable energy is used, the CO₂ emissions of the battery drive can be largely avoided.¹⁵

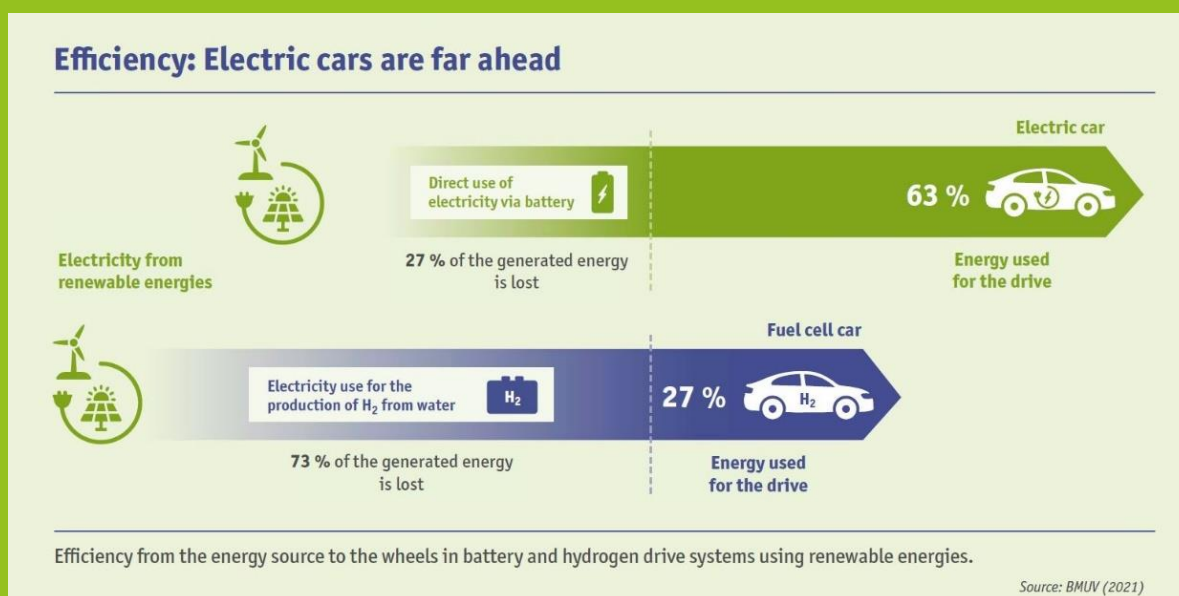
Greenhouse gas emissions of combustion and battery drive



Greenhouse gas emissions of a mid-size car with internal combustion (diesel) and battery drive (53 kWh battery capacity) over the entire life cycle.

Source: ICTT (2021)¹⁴

- > Over the life cycle, the combustion drive consumes more water than the battery drive.²¹ Due to a higher share of green electricity and oil sources that are more difficult to tap, this difference will increase significantly in the future. Particularly problematic is the pollution of water with pollutants through crude oil extraction as well as damage to and consumption of water reservoirs in dry areas during lithium extraction. The latter can be reduced through water recovery and separation processes as well as lithium-free batteries.
- > Compared to other types of drive, the battery drive is the most efficient with an efficiency from energy source to wheels of 45 % with the current electricity mix and 64 - 77 % when using green electricity. In comparison, the combustion engine has an efficiency of only 20 - 24 %.^{16,22,23,24,25}
- > To reduce the environmental impact of electric vehicles in the future, the use of green electricity, minimizing vehicle weight, new battery types without critical raw materials, due diligence in the supply chain and efficiency requirements can be important leverages.
- > In addition, reuse and recycling can significantly improve the environmental impact of a battery. In particular, the repair as well as the reuse of traction batteries as stationary energy storage devices should be promoted more strongly politically.
- > Hydrogen drive is not an environmentally friendly option for passenger cars, partly because it is significantly less efficient than battery drive, even when renewable energies are used to produce hydrogen.



- > Agrofuels and e-fuels are not a solution from an environmental perspective, as they do not make an effective contribution to climate protection and their use is very inefficient. Even when using green electricity for their production, e-fuels only achieve an efficiency of 15 %. When using the electricity mix, e-fuels are significantly more harmful to the climate than fossil fuels. Agrofuels also cause higher emissions than fossil fuels when land use changes are taken into account.^{16,22,23,,26,27}

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