

# EU fleet consumption regulation undermines climate protection

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## Keywords

fleet consumption regulation, hybrid and electric cars

## Abstract

The decision of EU-Commission, EU-Parliament and Member States on the 17<sup>th</sup> December 2018 to further cut the fleet average CO<sub>2</sub> emissions from new cars by 37.5 percent beyond 2021 level is presented as a big success for the climate. But due to the generous credit and super-credit system for electric and plug-in hybrid electric cars and the spurious measurement method, this system allows car manufacturers to produce heavy plug-in hybrid electric cars with high fuel consumption under normal use to be counted as zero-emission cars in the fleet calculations. This fault in the EU fleet consumption control mechanism has far-reaching consequences for the climate and the German taxpayers. Without further regulations in the energy and transport sector, the real emissions will only decrease very slowly.

In this paper, we show that the fleet consumption regulation is far from reaching the necessary emission reduction in the transport sector. Instead of the 54 % expected reduction in the average specific CO<sub>2</sub> emission of the new German car fleet by 2030 as compared to the existing level, the real emissions will only decrease by about 10 %. Furthermore, the regulation will allow car manufacturers to continue selling heavy cars that are deteriorating to the environment. Additionally, it will lead to high financial costs for the German taxpayers, because the government will have to compensate the deficit in the Non-ETS sector through the purchase of CO<sub>2</sub> allowances from other EU countries. Depending on the price development of the CO<sub>2</sub> certificates, we estimated an expenditure of 4.1 to 8.2 billion Euro for the expected 3.84 million Plug-in Hybrid cars, which

we projected to be sold in the German market in order to reach the EU target of 59 gCO<sub>2</sub>/km in the year 2030.

In the end of the paper, we recommend revising the fleet consumption regulation and briefly describe some additional measures/instruments, which combined with a revised fleet consumption regulation could achieve the climate protection goals in the transport sector.

## EU fleet consumption control – how it works

The “EU legislation sets mandatory **emission reduction targets** for new cars. This legislation is the cornerstone of the EU’s strategy to improve the fuel economy of cars sold on the European market.”<sup>1</sup> The EU legislation started in 2010 with a 2015 target of 130 gCO<sub>2</sub>/km. In 2014, the CO<sub>2</sub> target for the year 2020/21 was set to 95 gCO<sub>2</sub>/km.<sup>2</sup> However, there is a one-year phase-in period, requiring only 95 % of new car sales to comply with the target in 2020 and 100 % from 2021 onwards. In November 2017, the Commission presented a legislative proposal setting new CO<sub>2</sub> emission standards for cars and vans for the period after 2020 and on 17<sup>th</sup> December 2018 the EU set the target for 2030: a 37.5 % reduction compared to the 2021 value was fixed for passenger cars and a reduction of 31 % for light commercial vehicles<sup>3</sup>. An interim target for 2025, a 15 % reduction for passenger cars compared to 2021 was agreed upon.

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1. [https://ec.europa.eu/clima/policies/transport/vehicles/cars\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/cars_en)

2. REGULATION (EU) No 333/2014.

3. The decision paper has to be formally accepted by the parliament and from the Council and will come into force as soon as it is published in the official register of the EU.

It has to be noted that the CO<sub>2</sub> emission limits are set **according to the mass of the vehicle**, using a limit value curve. The curve is set in such a way that the target values are achieved for the average of all car fleets in the EU. Heavier cars are allowed to have higher emissions than lighter cars. For every 100 kg additional vehicle weight of the manufacturer's car fleet, the additional emission of 3.33 gCO<sub>2</sub>/km is allowed.<sup>4</sup> Only the fleet average of every car manufacturer is regulated, so manufacturers are still able to produce vehicles with emissions above the limit value curve, as long as vehicles below the curve balance these.

#### ZERO-EMISSION CARS AND SUPER CREDITS

To give the car manufacturers additional incentives to produce vehicles with extremely low emissions, battery-electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell vehicles (FCVs) with emissions **below 50 gCO<sub>2</sub>/km**<sup>5</sup> are counted as zero emission cars. Additionally, these cars get **super credits** within the regulation. In the years between 2020 and 2023, the zero-emission cars will be counted with an additional weighting factor. This factor is as follows:

- 2 vehicles in 2020
- 1.67 in 2021
- 1.33 in 2022
- 1 from 2023 onwards.

The allowance of the super credits is however capped at 7.5 gCO<sub>2</sub>/km per manufacturer.<sup>6</sup>

### Why Plug-in Hybrids and Battery Electric vehicles are no “zero emission vehicles”?

#### PLUG-IN HYBRID ELECTRIC VEHICLE (PHEV)

Firstly, we will give an example of a brand new PHEV (Figure 17).

As mentioned above, PHEVs that pass the test procedure with CO<sub>2</sub> emissions below 50 g/km<sup>8</sup> are counted as zero in the calculation of the car fleet emission. But how does the measurement and calculation procedure work?

**Step 1:** The car drives the test procedure with full battery until the battery is depleted. In the case of the example above, the range is 54 km. The CO<sub>2</sub> emission from the electricity used is not accounted for.

**Step 2:** The car drives the test procedure with its diesel or gasoline engine over a distance of 25 km. In the example above the measured consumption is 1.3 litre of diesel.

**Step 3:** The total fossil fuel consumption of the car is calculated for a distance of 100 km. The consumption is 1.3 litre/ (54 km + 25 km) \* 100 km = 1.6 litre/100 km.

**Step 4:** Based on the diesel consumption the CO<sub>2</sub> emissions are calculated: 1.6 litre of diesel/100 km \* 2.64 kgCO<sub>2</sub>/litre diesel = 4.2 kgCO<sub>2</sub>/100 km = 42 gCO<sub>2</sub>/km.

**Result:** The car receives the status of a zero-emission car, as the emissions are lower than the threshold of 50 gCO<sub>2</sub>/km.

In reality the heavy PHEVs are mainly used as business cars and are typically driven long distances with diesel or gasoline. In this case, the PHEV will not use less fuel as compared to a conventional car and the additional weight of the car (in this case 200 kg from the battery and additional electric motor) will counteract any gains from regenerative braking.<sup>10</sup>

The actual diesel consumption of the same car type (Mercedes E 300 d) without electric motor is about 7.9 litre/100 km in real everyday use<sup>11</sup>. This is equivalent to 209 gCO<sub>2</sub>/km that far exceeds any fleet emission targets. Moreover, even if the car is used only in electric mode, it can cause high CO<sub>2</sub> emissions. In electric mode, the car with the battery capacity of 13.5 kWh can reach a distance of 54 km. As a result, the consumption will be 25 kWh/100 km. When considering the CO<sub>2</sub> emissions caused by the electricity demand with the merit-order method, the emission will be between 200 and 221 gCO<sub>2</sub>/km (the basis of calculation is presented in the next section).

In summary, the real emission of the PHEV is much higher than the target values in 2021<sup>12</sup> or 2030. However, in the calculation of the EU fleet consumption, it is counted as “zero” and within a certain period, it can even receive the super credit.

#### PHEVS AND BEVS CAN HELP CAR MANUFACTURERS TO AVOID PENALTIES

To understand how the automobile industry will respond to the ambitious new car fleet consumption targets, it is helpful to look at the expected fines from the perspective of an automobile company, which is likely to miss the target values.

The EU's CO<sub>2</sub> reduction targets for fleet consumption (95 gCO<sub>2</sub>/km by 2021) and a further 37.5 % reduction for 2030 compared to 2021<sup>13</sup> can only be met by the car manufacturers through a strong increase in BEVs and PHEVs.<sup>14</sup> If the average CO<sub>2</sub> emissions of a manufacturer's fleet exceed its limit value, the manufacturer has to pay an excess emission premium for each car registered. This penalty amounts to €95 per gram which exceeds the target value.

4. International Council on Clean Transportation, January 2014: EU CO<sub>2</sub> Emission Standards for Passenger Cars and Light-Commercial Vehicles.

5. “Zero- and low-emission vehicle” is defined as a passenger car or a light commercial vehicle with tailpipe emissions from zero up to 50 gCO<sub>2</sub>/km. Zero emission vehicles are battery electric vehicles (BEV), Fuel Cell Electric Vehicles and Plug-in hybrids (PHEVs) with emissions lower than 50 gCO<sub>2</sub>/km.

6. There is a third incentive, called eco-innovations, to foster “innovative technologies” of which the benefits are not adequately captured by the test cycle.

7. <https://www.mercedes-benz.de/passengercars/content-pool/tool-pages/car-configurator.html?motorization?rccVehicleModelId=2130421>

8. Before 1.9.2018 the CO<sub>2</sub> emission was measured according to the New European Driving Cycle (NEDC). Since then, the new Worldwide Harmonised Light Vehicles Test Procedure (WLTP) is used.

9. Amtsblatt der Europäischen Union vom 26.5.2012.

10. “In practice, the actual consumption of a plug-in hybrid car will vary widely from user to user. On long-distance journeys, the electric driving mode will be of little importance and therefore consumption will be at the level of a conventional combustion engine.” (Translation by author) (Source VDA, <https://www.vda.de/themen/umwelt-und-klima/WLTP-realitaetsnaehere-Ergebnisse-beim-Kraftstoffverbrauch/WLTP-Wie-werden-Plug-in-Hybride-und-Elektroautos-gemessen.html>).

11. Average of 16 users; Source: [www.spritmonitor.de](http://www.spritmonitor.de), Feb, 2019, diesel, car with 150 to 250 kW power, built between 2016 and 2019.

12. The target fleet emissions for 2021 are 102.8 gCO<sub>2</sub>/km for Daimler and 97.7 gCO<sub>2</sub>/km for Volkswagen (Source PAConsulting 2018).

13. Based on the average of all cars sold in Europe.

14. Authors view, but also view of car manufacturer (for example VW. Source: Handelsblatt, 20.12.2018).

**Mercedes E 300 de**

power (diesel)	143 kW
power electric	90 kW
diesel consumption	1,6 litre/100 km
electricity consumption	17,9 kWh/100 km
CO <sub>2</sub> -emission	41 g/km
velocity	250 km/h
capacity of accu	13,5 kWh
range	54 km



Figure 1. Example of a brand new PHEV. Source: Mercedes Benz Konfigurator.

This regulation can cause heavy additional expenditures for the car manufacturer. Let us calculate the marginal fines for the sale of one additional Audi Q7 with 162 gCO<sub>2</sub>/km under the likely assumption that Volkswagen would not reach the fleet emission target.<sup>15</sup> This car would cause the manufacturer a penalty of €6,109<sup>16</sup>. In contrast, if the car manufacturer can sell this car as a PHEV with emissions less than 50 gCO<sub>2</sub>/km in the year 2021, it will be counted as a zero-emission vehicle and further qualifies for the 1.67 super credit. Not only is the fine averted but also the PHEV helps to compensate the emissions and therefore fines from other cars. This bonus amounts to fleet consumption target multiplied by the super credit factor and the excess emission premium i.e. 97.7 gCO<sub>2</sub> \* 1.67 \* €95/gCO<sub>2</sub> and this is equivalent to €15,472<sup>17</sup>. Compared with the penalty the car manufacturer would have to pay for the conventional car of the same type, the PHEV saves the company about €21,580 in averted fines.

### CO<sub>2</sub> emissions from electricity consumed by EVs

As discussed above, some electric cars are counted as zero emission cars and qualify for super credits. But how does this regulation affect climate emissions? The additional electricity demand for the use of an electric car in Germany will be produced by the next power plant in line in the merit-order. For the foreseeable future, this will be a coal- or gas-fired power plant.

In theory, new renewable electricity generation capacity could be installed to cover the future demand for electrifying the transport sector. However, in Germany there is no legal regulation, directive nor political statement that requires, that the additional electricity demand from the transport sector should be covered by renewable energies.

It is hard to determine exactly which type of fossil fuel power plant will cover the additional demand of the electric car because the demand will be covered by the interaction of all fossil

fuel power plants over time, depending on the time of day when the electric cars are charged, the total demand and the production of the renewable power plants. As shown in Figure 2, the additional electricity demand is covered by the power plant with the next lowest variable power production costs, which is on the right of demand “x”.<sup>18</sup>

To estimate the marginal emission factor of the additional electricity production, we calculated two scenarios: Scenario A assumes that the additional electricity production comes from 40 % lignite, 40 % coal and 20 % gas-fired power plants. In scenario B we calculate with a 1/3 mix of the fossil fuel power plants. As a result, we estimate that the additional CO<sub>2</sub> emissions ranging between 884 and 802 gCO<sub>2</sub>/kWh (Table 1<sup>19</sup>).

The average electricity consumption over 100 km of a full electric car as provided by the manufacturers<sup>20</sup> is between 14 kWh for a small car<sup>21</sup> and 20 kWh for a mid-sized car. This will lead to emissions between 112 gCO<sub>2</sub>/km and 177 gCO<sub>2</sub>/km respectively. In reality, the electricity consumption might be even higher than the listed values.

### Average fleet consumption of new cars in Germany is rising

After a period of declining fleet consumption from 152 g in 2010 to 128 g in 2017 the average fleet consumption for new cars increased again in 2018. This was due to the diesel scandal that led to a subsequent decline in the share of diesel cars and the high demand for SUVs, off-road vehicles and sports cars. In October 2018, the average was 3.3 g higher than in the same month of the year before and reached 131 g on average.<sup>22</sup>

At the beginning of 2019, it is obvious that the German car manufacturers will not reach their fleet emission targets with only efficiency gains. Our calculations show that the gCO<sub>2</sub>/km emission target for 2021 can only be reached with a 15,8 % share of zero-emission electric cars, assuming efficiency gain

15. Based on official figures measured with New European Driving Cycle (NEDC), which are much too low compared to real consumption (see [www.spritmonitor.de](http://www.spritmonitor.de)) and Transport&Environment 2018.

16. The penalty is calculated as following: the standard emissions of this car are 162 gCO<sub>2</sub>, which is 64 gCO<sub>2</sub> higher than the 97.7 gCO<sub>2</sub> target of the Volkswagen trust. If the car comes to market in 2021, the company has to pay €95/gCO<sub>2</sub>.

17. The target fleet consumption values are fixed for each manufacturer. These values might however change in the future if the average tonnage of the vehicles of this manufacturer changes.

18. Öko-Institut (2011): p. 30.

19. UBA 2018: Entwicklung der spezifischen Kohlendioxid-Emissionen des deutschen Strommix in den Jahren 1990–2017, Berlin, May 2018.

20. Measured with NEDC. Based on WLTP the emissions will be 25 % higher.

21. VCD Umweltliste, October 2018.

22. Kraftfahrt-Bundesamt November 2018.

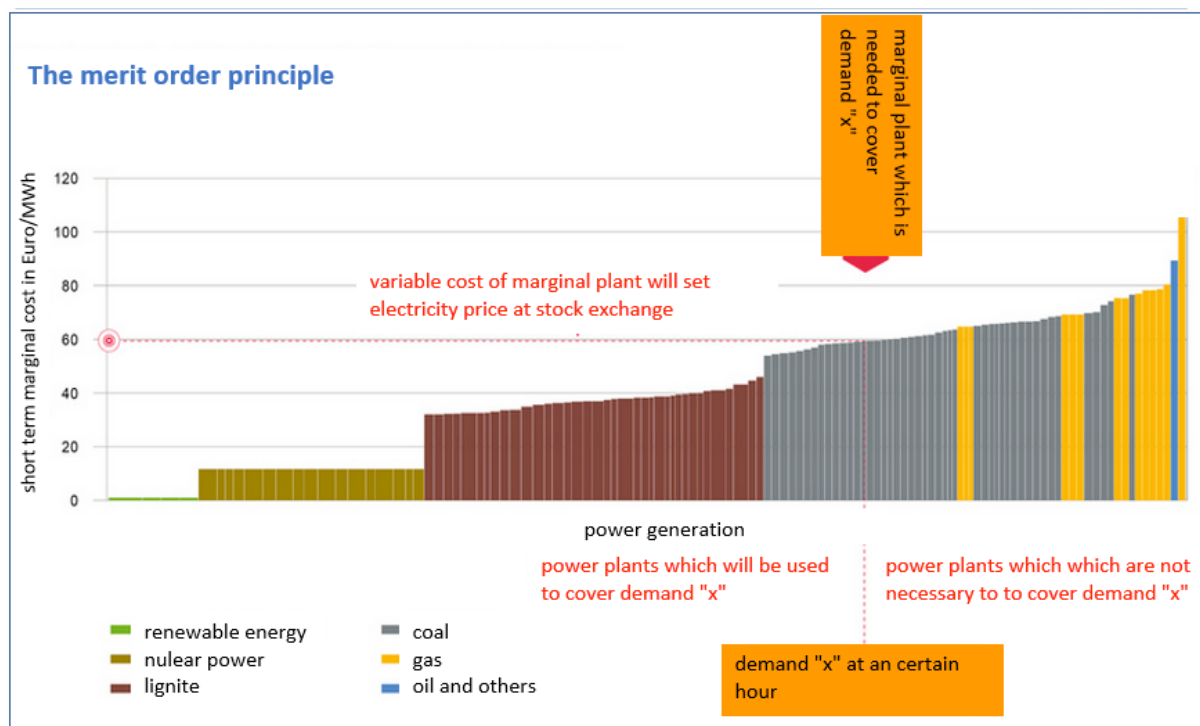


Figure 2. The merit order principle (Source: Öko-Institut 2011).

Table 1. CO<sub>2</sub> emission from electricity production (Source: UBA 2017, assumptions and calculation by Büro Ö-quadrat).

fuel	CO <sub>2</sub> -emissions related to fuel	efficiency factor related to electricity demand	CO <sub>2</sub> -emission-factor related to electricity demand	Scenario A	Scenario B	Emission-factor scenario A	Emission-factor scenario B
	g/kWh	%	g CO <sub>2</sub> /kWh			g CO <sub>2</sub> /kWh	g CO <sub>2</sub> /kWh
lignite	407	35	1151	40%	33,3%	460	384
coal	337	39	863	40%	33,3%	345	288
gas	201	51	391	20%	33,3%	78	130
						<b>884</b>	<b>802</b>

of 2 % per year for conventional cars.<sup>23</sup> As a reference, the total number of BEVs and PHEVs licenced in Germany at the end of 2018 was 98,000, thereof 44,000 PHEVs<sup>24</sup>.

### Germany will not reach CO<sub>2</sub> Emission commitment under the Paris Agreement

It might be the problem of car manufacturers that they will have to pay for not reaching their target. However, this will also affect the German government and society as a whole. In May 2018, the European Parliament and the EU council set binding annual greenhouse gas emission reduction target in the non-ETS sector for member states from 2021 to 2030.<sup>25</sup> The aim was

to meet the Union's commitments to reduce greenhouse gas emissions by at least 30 % compared to 2005 under the Paris Agreement. Each member state needs to limit its greenhouse gas emissions at least to its self-imposed target and for Germany the reduction target is 38 % compared to 2005.

Each member state has to ensure that its greenhouse gas emissions in each year between 2021 and 2030 do not exceed the limit defined by a linear trajectory, starting from the average of its greenhouse gas emissions in 2016, 2017 and 2018.<sup>26</sup> If a member state cannot fulfil its emission budget, it has to purchase emission certificates from other members of the Union. Nevertheless, some flexibility is built in to ensure an efficient process.<sup>27</sup>

23. In our scenarios we did not include Mild Hybrid cars nor cars powered by natural gas.

24. Kraftfahrt-Bundesamt, January 2019.

25. The emissions for the transportation sector are calculated based on the overall gasoline and diesel consumption in the member states. These figures are therefore independent from the emissions of test procedures.

26. The linear trajectory of a member state shall start either at five-twelfths of the distance from 2018 to 2020 or in 2020, whichever results in a lower allocation for that member state.

27. Similar to borrowing and banking of emission allocations (article 5) REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018.

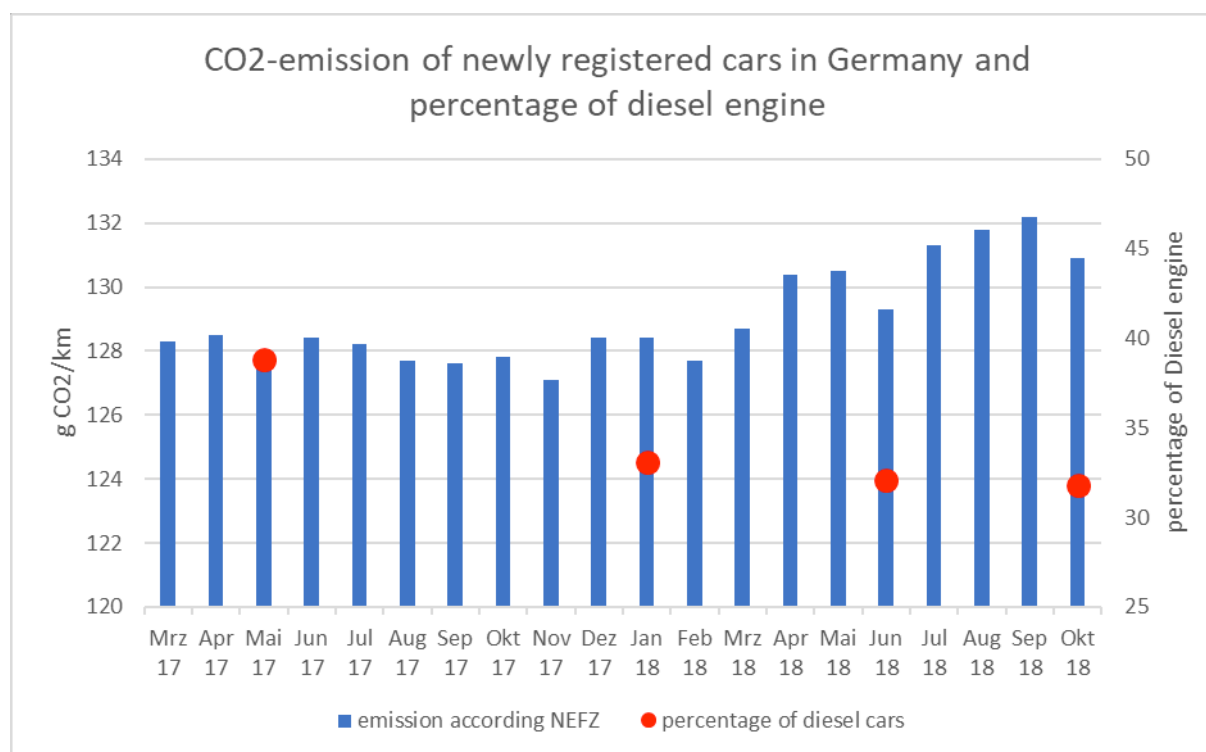


Figure 3. CO<sub>2</sub> emissions of newly registered cars in Germany (Data Source: Kraftfahrt-Bundesamt, monthly bulletin).

In the period from 2005 to 2018, there was hardly any emission reduction in the Non-ETS sector of Germany. While the building sector has reduced its emissions by 16 %, greenhouse gas emissions in the agriculture and transport sector have risen. To fulfil its obligation, the Non-ETS sector has to reduce the emissions by 14 million ton CO<sub>2eq</sub> per year, which corresponds to 3.0 % reduction every year. As the transportation sector accounts for the highest emissions within the Non-ETS sector and there is no potential to exceed the target for the building and agriculture sector, the transport sector has to cover the reduction by itself (see Figure 4<sup>28</sup>).

Driven by the EU fleet consumption regulation, the car manufacturers will bring the claimed 'zero emission vehicles' into the market. But as shown above, the large and heavy PHEVs will not reduce the emissions in the Non-ETS sector and their electricity demand will result in additional generation from fossil fuel power plants and therefore will have an impact in the ETS-sector through a higher electricity demand. Through credits and super-credits for PHEVs, the CO<sub>2</sub> emissions can be reduced on paper, but they will not actually reduce CO<sub>2</sub> emissions. On the other hand, the automobile manufacturers are enabled to further expand their product range of heavy vehicles with high CO<sub>2</sub> emissions. The consequence is costly to the taxpayers as the non-ETS sector reduction set by the EU Climate Change Guidelines and the Climate Action Regulation of 2018 will fall far short and compensation payments will be unavoidable.

### High compensation payments expected in Germany's non-ETS sector

Using the model of Büro Ö-quadrat, we analysed the number of PHEVs and BEVs that will be necessary to reach the 2025 and 2030 fleet emission targets. To determine the fraction of electric cars and their impact on the CO<sub>2</sub> emission of the transportation sector, we made several assumptions:

- The efficiency of new diesel and gasoline cars will rise by 2 % per year from 2018 until 2025 and by 1 % from 2026 to 2030. The same assumption was made for the fossil fraction of PHEVs. The consumer preferences towards heavier and high power cars e.g. SUVs are omitted.
- The efficiency of electric cars will rise by 1 %<sup>29</sup> per year from 2018 until 2025 and by 0,5 % from 2026 to 2030. The same assumption was made for the electricity consumption of PHEVs.
- With the technical advancement of BEVs, the ratio between PHEV and BEV will change. Until 2021, the share of PHEV among electric vehicles (PHEV+BEV) will increase from the current 40 % to 50 %. From 2021 to 2025, the share of PHEV among electric cars will decrease again linearly to 40 %. Until 2030, this share will drop further to 30 %.
- The share of diesel cars among conventional cars will drop from 33,8 % in 2018 to 30 % in 2021, where it will remain until 2030.

28. Agora Energiewende, Agora Verkehrswende (2018), p. 17.

29. In respect to the already high efficiency of electric motors.



While these simplification and uncertainties do not allow precise predictions; the results provide a basis for an initial discussion. It is noted that the focus is not on the absolute values but rather the magnitude as compared to the current situation. Under the above assumptions, 15.6 % of all newly registered cars in the year 2021 have to be zero-emission cars to fulfil the fleet consumption targets. The share of zero-emission cars was less than 2 % in 2018, which means a substantial increase in the sale of zero-emission cars is needed by 2021. This is unlikely to happen and therefore, it is very likely that Germany will have to pay for the non-conformance with the non-ETS sectoral emission targets. In this calculation, the super credits

for the zero emission vehicles are already included. Without the super credits, the number of zero emission cars would have to be even higher in 2021. In 2030, 46 % of all newly registered cars have to be zero emission cars to fulfil the EU fleet emission target for new cars.

Based on the development trend and other assumptions presented above, the car market will reach a CO<sub>2</sub> reduction of 54 % in 2030 relative to 2018. Figure 6 shows the CO<sub>2</sub> emissions calculated with the EU car fleet regulation (grey solid line). Without the super credits, the average fleet emission would be higher during the period 2020 to 2022 (grey dash line). However, this reduction is merely theoretical. In reality, we have to

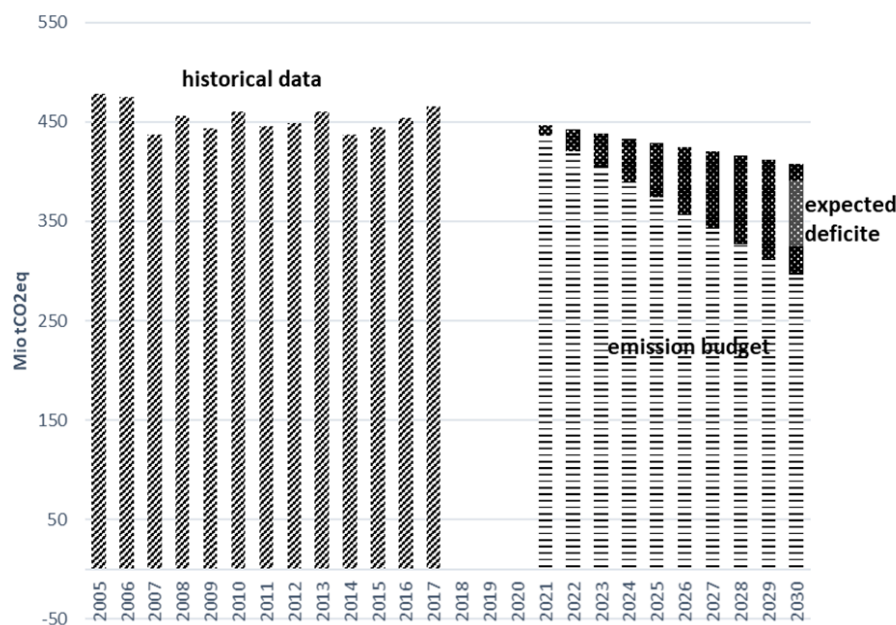


Figure 4. Historical data and expected deficit in the German Non-ETS sector. Source: Agora 2018.

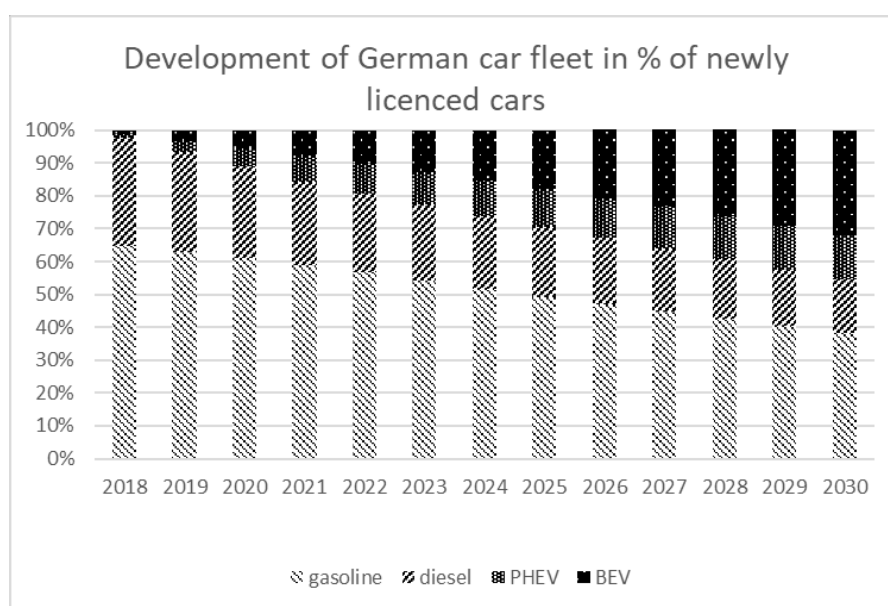


Figure 5. Development of the share of newly registered cars in Germany (Source Büro Ö-quadrat).

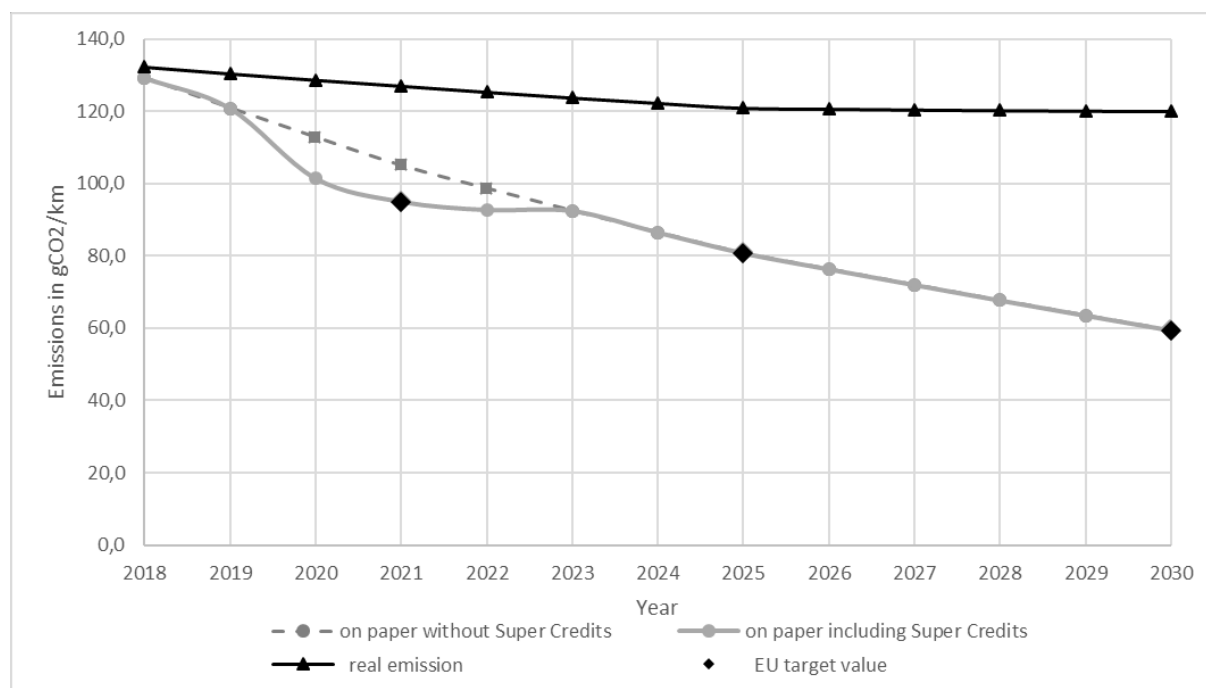


Figure 6. Average CO<sub>2</sub> emission of newly registered cars in Germany according to the car fleet regulations (theoretical) versus real emissions (Source: own calculation Büro Ö-quadrat).

include the emissions of electricity generation from fossil power plants in 2030 (12.2 Mio. t CO<sub>2</sub> related to 14.5 TWh) for the electric cars<sup>30</sup> and the emissions from fossil fuel use in PHEVs. If we assume that PHEVs are driven 70 % in combustion mode and 30 % in electric mode<sup>31</sup>, the emissions of PHEVs will sum up to 7 Mio t CO<sub>2</sub> in 2030. Overall, the average emission of the new car fleet will only reduce by less than 10 % until 2030.

Finally, we calculated the cost of the faulty EU regulation on PHEVs for the taxpayers. Based on our study, 3.8 million PHEVs will be sold and registered until 2030. These cars will emit about 1.8 tons of CO<sub>2</sub> per year<sup>32</sup> through driving with the combustion engine. Over an average lifetime of 12 years with a CO<sub>2</sub> certificate price of €100/ton CO<sub>2</sub>,<sup>33</sup> this will sum up to €2,140/car and €8.1 billion for the total number of PHEVs that will be brought into market until 2030. Although the future price of CO<sub>2</sub> certificates in the non-ETS sector is uncertain up to now but even at only €50/tonCO<sub>2</sub>, the cost for the tax payers will amount to €4.1 billion. These figures only include the additional costs caused by PHEVs, it does not account for the total cost that results from the non-conformance of the whole transport sector with the EU non-ETS sectoral emission targets. Furthermore, the emissions related to the electricity use of the PHEVs are not included here. These emissions will be counted in the ETS sector, where they will not influence the

quantity of the certificate allowances but will lead to higher prices for the CO<sub>2</sub>-certificates.

There are, however, aspects in the transportation sector, which we have not accounted for in our study. For the major part, these aspects would lead to higher emissions, which makes our result a rather optimistic scenario.

1. This result only describes the development of the emissions of the new car fleet. The emissions of the existing car fleet are expected to decrease much slower.
2. This model does not include the growth of the transport sector. The car fleet in Germany is still growing; in the period 2010 to 2017, the average growth rate was 1.4 % per year. The total distance driven by all cars increased with the same growth rate.<sup>34</sup> Self-driving cars are also expected to increase the comfort of driving and therefore the average distance driven.
3. This study does not account for the current trend towards larger, heavier and more powerful vehicles. If this trend continues, the real emissions of the new car fleet will drop even slower or not at all.
4. After the “Dieselgate” scandal, the sales of diesel engines plummeted (see Figure 3) and the demand shifted to gasoline cars, which will emit more CO<sub>2</sub> compared to an equivalent diesel car. The official German statistic shows that between 2010 and 2016, the average consumption of all gasoline cars decreased from 7.9 to 7.7 litre/100 km; whilst the average consumption of diesel cars remained unchanged at 6.8 litre/100 km<sup>35</sup>. If the share of diesel car

30. Based on electricity consumption measured under NECD, and an emission factor of 843 gCO<sub>2</sub>/kWh (average of scenario A and B).

31. Manufacturers will mainly offer PHEV with an electric range of around 50 km, meeting the requirements of count as zero-emission vehicles while minimizing costs. All longer journeys will therefore be driven predominantly by combustion engine. In Öko-Institut et al. the authors calculate with a share of 75 % combustion mode, but no references are documented (p. 57).

32. Assumptions: Average distance with fossil mode is 9,800 km per year (70 % of 14,000 km). Real CO<sub>2</sub> emissions of 182 g/km, average lifetime of cars 12 years.

33. Agora Energiewende, Agora Verkehrswende (2018): p. 28.

34. DIW: Verkehr in Zahlen 2017/2018, table 309.xlsx.

35. DIW: Verkehr in Zahlen 2017/2018, table 309.xlsx.

drops further, the average fleet emissions can be expected to increase further.

5. In the past the car manufacturers have achieved a very large part of the efficiency gains by exploiting the loophole in the testing procedure. This has widened the gap between test results and real-world performance from 9 % in 2010 to 42 % in 2017, equivalent to 21 gCO<sub>2</sub>/km of fake savings.<sup>36</sup> One reason of the discrepancy stemmed from the fact that PHEVs are counted as zero emission cars as illustrated previously.
6. “In addition, the industry consistently fits technology to cars that will deflate emissions far more in the lab than on the road, such as short range plug-in hybrids, stop-start and cylinder deactivation.”<sup>37</sup>

### Recommendation on supplementary measures

There is no silver bullet for a successful transformation of the transport sector and to shift the market to low emission cars. As we have presented above, the EU fleet consumption regulation alone will only achieve a very small reduction in real CO<sub>2</sub> emissions and must therefore be amended or supplemented by further measures. Our recommendation on the most influential measures is outlined as follows.

#### AMENDMENT OF THE EU FLEET CONSUMPTION REGULATION

- PHEVs should not be counted as zero emission vehicles and instead, they should be included into the average fleet consumption calculation with their real emissions.
- Super credits should be avoided as they distort the emission calculations.
- The introduction of BEVs has to be accompanied by accelerating the installation of new renewable energy capacities.

#### CARBON TAX ON GASOLINE, DIESEL AND AVIATION FUEL

Without a rising CO<sub>2</sub>-oriented tax, the efficiency progress will be counteracted by additional demand and additional emissions. A growing number of Member States are using this instrument to cut emissions from the transport sector; for example, Sweden has successfully reduced the emissions in the transport sector by 20 % since 2005 with a CO<sub>2</sub> tax<sup>38</sup>. France has plans to increase the CO<sub>2</sub> tax from €45/ton CO<sub>2</sub>eq to €86/ton CO<sub>2</sub>eq in 2022. However, considering the current social unrest, we believe that such tax has to be introduced with care and convincing arguments.<sup>39</sup>

#### TAXATION ON PRIVATE AND COMMERCIAL CARS

Only 35 % of all new passenger cars and light commercial vehicles sold in Germany are private cars. The rest was bought by companies with tax reduction. This leads to a high demand for high power and expensive cars. Additionally, a new tax regula-

tion in force in 2019 will make it more attractive to buy PHEVs and BEVs<sup>40</sup>. This regulation will especially foster heavy PHEVs, which will lead to the adverse effects revealed by our study.

A good example on how to bring more efficient cars on the road is the French feebate<sup>41</sup> system. The registration tax for new vehicles in France is based on the CO<sub>2</sub> emissions of the car (Figure 7). From 2018 onwards, vehicles that emit more than 119 gCO<sub>2</sub>/km pay a penalty starting at €50 and increases exponentially up to a maximum of €10,500 for vehicles emitting more than 184 gCO<sub>2</sub>/km. Low-carbon vehicle owners with less than 21 gCO<sub>2</sub>/km benefit from licensing bonus payments i.e. individuals and companies receive a bonus amounting to 27 % of the vehicle purchase price with a maximum bonus of €6,000. Vehicles with CO<sub>2</sub> emissions between 21 and 119 g/km pay no registration tax.<sup>42</sup>

#### MODIFICATION OF THE COMMUTER ALLOWANCE

The current calculations of the commuter allowance for employees and self-employed people promote commuting over long distances and thus contribute to increase traffic-related noise, air pollution and greenhouse gas emissions. In Germany, 68 % of commuters use cars for work travel. As a result, the federal government is losing considerable tax revenues, for instance, the commuter allowance summed up to €5.1 billion in 2012. Against this background, consideration should be made to reform the commuter allowance according to ecological criteria. Nevertheless, socio-political aspects of such changes must be carefully considered.

#### SLOW DOWN

Germany remains the only major industrial country without speed limit on part of its motorways and a speed limit of 100 km/h on country roads, which is usually not controlled. The introduction of a speed limit on motorways and lower speed limits on other roads (including city streets) does not only have the immediate effect of lower emission but also drive the market towards smaller and more efficient cars. The lower speed limit would also increase the electric driving range of electric vehicles. This measure would also help to make public transport more competitive as compared to individual transport and would reduce the number of accidents.

### Conclusion

The EU fleet consumption regulation is far from reaching the necessary emission reduction in the transport sector in Germany. The 54 % reduction target in the average CO<sub>2</sub> emission from new cars until 2030 might sound ambitious but due to the loopholes in the system, real CO<sub>2</sub> emissions will only decrease by about 10 %. The regulation will allow car manufacturers to continue selling heavy and environmentally unfriendly cars. Additionally, it will lead to high financial costs for the German tax payers because the government will have to compensate

36. Transport and environment, April 2018: CO<sub>2</sub> EMISSIONS FROM CARS: the facts.

37. Transport and environment, April 2018, page 3.

38. Agora Energiewende, Agora Verkehrswende (2018): p. 44, figure 11.

39. Agora Verkehrswende (2018): p. 44.

40. Employees who use a company battery-electric car or a plug-in hybrid vehicle for private purposes only have to pay tax on the pecuniary advantage at a monthly rate of 0.5 percent of the gross list price instead of 1 percent as before.

41. Combination of “fee” and “rebate”. Term is used for instruments, which combine the two forces.

42. Agora Verkehrswende 2018, p. 26.



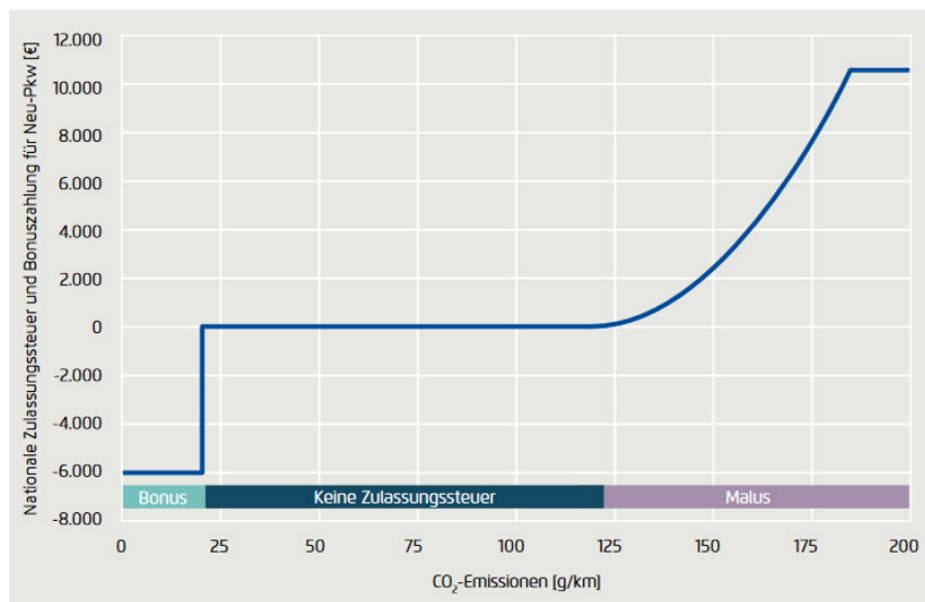


Figure 7. Vehicle registration tax in France in 2018 (Source: Agora Verkehrswende, 2018).

the deficit in the non-ETS sector through the purchase of CO<sub>2</sub> allowances from other EU countries.

We presented the necessary change in the EU fleet regulation scheme for passenger cars and light commercial vehicles. However, these changes have to be accompanied by a climate friendly transport policy that aims to reduce vehicle-kilometres travelled and motivate people to change to a transport mode with lower emissions. This can be achieved through more investment into public transport, investment into safer and better bicycle lanes, attractive pedestrian walkways, fewer and more expensive car parks in the city and a city toll.<sup>43</sup> And last but not least, we need better educational campaigns that start in kindergarten and schools.

## References

- Agora Verkehrswende (2018): CO<sub>2</sub>-Minderung bei Pkw – die Rolle der Steuerpolitik. Ein europäischer Vergleich.
- Agora Verkehrswende (2018a): Klimaschutz im Verkehr: Maßnahmen zur Erreichung des Sektorziels 2030.
- Agora Energiewende, Agora Verkehrswende (2018): Die Kosten von unterlassenem Klimaschutz für den Bundeshaushalt. Die Klimaschutz-Verpflichtungen Deutschlands bei Verkehr, Gebäuden und Landwirtschaft nach der EU-Effort-Sharing-Entscheidung und der EU-Climate-Action-Verordnung.
- Amtsblatt der Europäischen Union vom 26.5.2012: Regelung Nr. 101 der Wirtschaftskommission der Vereinten Nationen für Europa (UN/ECE).
- DIW: Verkehr in Zahlen 2017/2018.
- International Council on Clean Transportation, January 2014 EU CO<sub>2</sub> Emission Standards for Passenger Cars and Light-Commercial Vehicles.
- Kraftfahrt-Bundesamt November 2018.
- Öko-Institut (2011): Autos unter Strom, Berlin, September 2011.
- Öko-Institut, Institut für Verkehrsforschung im DLR, Institut für Energie- und Umweltforschung Heidelberg, Infrast AG: Endbericht Renewability III, Optionen einer Dekarbonisierung des Verkehrssektors. November 2016.
- PAConsulting (2018) Driving into a Low Emissions Future – Looking Beyond 2021.
- REGULATION (EU) No 333/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 March 2014.
- REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018.
- Transport&Environment, (2018): CO<sub>2</sub>-Emissions from cars: the facts. April 2018.
- UBA 2018: Entwicklung der spezifischen Kohlendioxid-Emissionen des deutschen Strommix in den Jahren 1990–2017, Berlin, Mai 2018.
- VCD Umweltliste, Oktober 2018.

43. A briefly overview is given in Agora Verkehrswende 2018a

