FACT SHEET: EUROPE

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

FOOTPRINT VERSUS MASS: HOW TO BEST ACCOUNT FOR WEIGHT REDUCTION IN THE EUROPEAN VEHICLE CO_2 REGULATION

When setting new vehicle carbon dioxide (CO_2) or fuel consumption targets, government regulators can decide for either absolute target values (each vehicle model must meet the same target) or relative target values (each vehicle model must meet a specific target, depending on the "utility" of the vehicle). Popular vehicle utility parameters applied by governments worldwide include vehicle mass and size. Using mass as the normalizing parameter allows heavier vehicles to emit more CO_2 and consume more fuel than lighter vehicles. Using size as the parameter allows larger vehicles a less stringent target than smaller vehicles.

BACKGROUND

» When the European Union (EU) introduced its first set of mandatory new vehicle CO_2 standards in 2009, for passenger cars, and 2011, for light commercial vehicles, vehicle mass was chosen as a utility parameter because data on mass were readily available. However, the regulation asked the European Commission to collect data on alternative utility parameters and to consider switching to another parameter, such as vehicle footprint (an expression of vehicle size, measured as track width times wheelbase), at a later time. For the 2020 passenger car regulation, the European Parliament suggested vehicle footprint as an alternative compliance option. However, for the final regulation, vehicle weight was kept as the utility parameter and it was decided to consider the change to footprint as the utility parameter for a future review. In the United States, vehicle footprint is used as the utility parameter for both passenger cars and light trucks.

» Looking at the current market distribution of passenger cars and light commercial vehicles in the EU, it can be seen that manufacturers with an above-average mass of their vehicle portfolio are granted a higher CO_2 emission target while manufacturers that tend to sell lighter vehicles have a lower target value (Figure 1 and Figure 2).

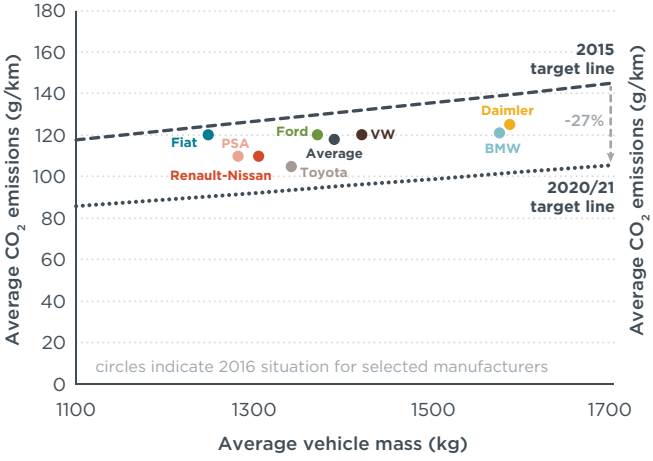

Figure 1. Performance of the top-selling EU passenger car manufacturer groups for 2016, along with the 2015 and 2020 (effectively 2021) target lines.

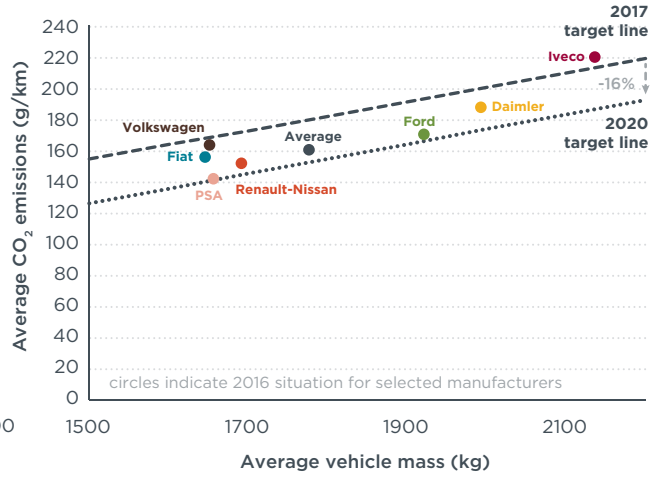

Figure 2. Performance of the top-selling EU light commercial vehicle manufacturer groups for 2016, along with the 2017 and 2020 target lines.

KEY FINDINGS

» With the direct correlation of weight and mass, the heavier a vehicle is, the greater its fuel consumption and CO_2 emissions. Therefore, reducing mass is an effective way to reduce a vehicle's emissions. However, the current EU CO_2 target system offers little incentive to reduce the mass of vehicles: the lighter a manufacturer's fleet, the lower its assigned CO_2 target. If a manufacturer reduces the mass of its vehicles, it must then also achieve a lower g/km target. This eliminates most of the manufacturer's weight-reduction advantage and puts mass reduction at a competitive disadvantage compared to other CO_2 saving technologies. The situation is very different in a target system that is based on vehicle size instead. Here the manufacturer's CO_2 target does not change if mass reduction is applied and the manufacturer benefits fully from the CO_2 reduction effect of lightweighting (Figure 3).

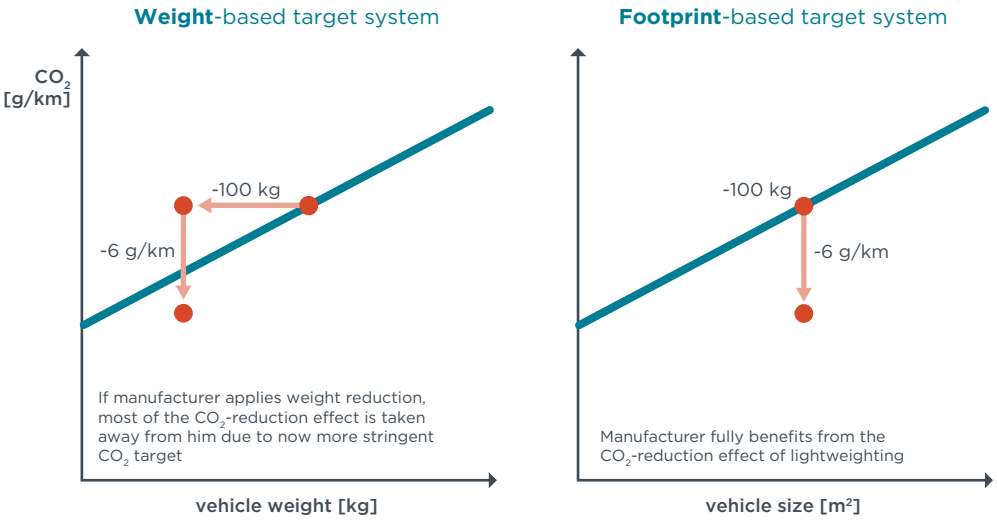

Figure 3. Weight reduction in a weight-based CO_2 target system (left) and in a size based system (right).

» Although CO_2 emission levels determined by official testing procedures of new cars and light commercial vehicles in the EU have decreased in recent years, the average new car in 2016 was about 10% heavier than 15 years ago (Figure 4). For light commercial vehicles, the average vehicle mass has increased by 10% within the last 7 years and is at an all-time high (Figure 5).

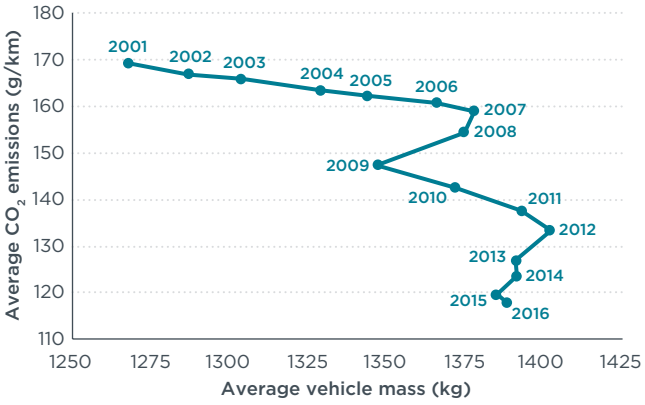

Figure 4. Average CO_2 emission level and average vehicle mass for new passenger cars in the EU.

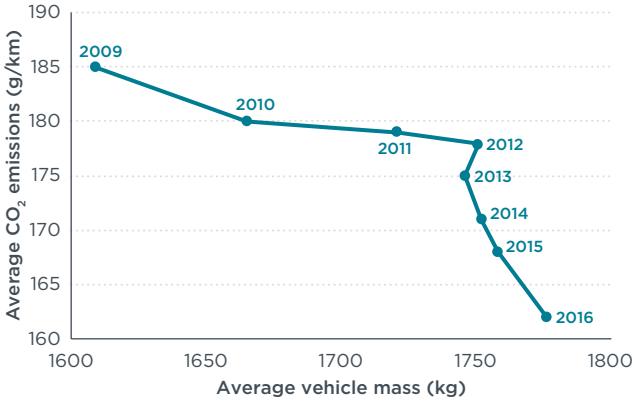

Figure 5. Average CO_2 emission level and average vehicle mass for new light commercial vehicles in the EU.

» Because a weight-based CO_2 target system discourages the use of lightweighting, it takes away flexibility from vehicle manufacturers and thereby increases the cost for regulatory compliance. A recent ICCT study finds that for cars, the cost for meeting a 2025 target value of 70 g/km[1] is between 250 and 500 euros higher than would be the case in a footprint-based CO_2 target system (Figure 6). For light commercial vehicles, the cost for meeting a 2025 target value of 110 g/km is between 400 and 1,850 euros higher than if switching to a footprint-based target system (Figure 7).

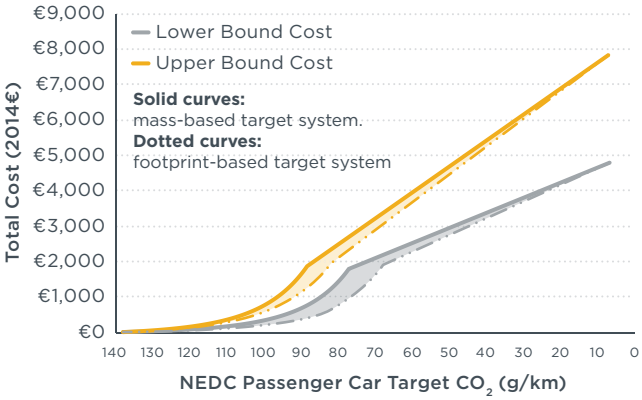

Figure 6. Total incremental cost (including indirect costs but excluding taxes) of reducing the CO_2 emissions of the average passenger car in the EU by 2020, assuming full deployment of combustion-engine technologies before transitioning to electric vehicles.

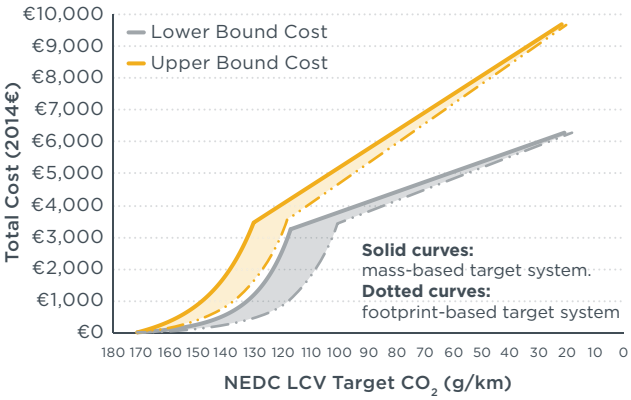

Figure 7. Total incremental cost (including indirect costs but excluding taxes) of reducing the CO_2 emissions of the average light commercial vehicle in the EU by 2020, assuming full deployment of combustion-engine technologies before transitioning to electric vehicles.

1 As measured in the New European Driving Cycle (NEDC).

FURTHER READING

CO_2 reduction technologies for the European car and van fleet, a 2025-2030 assessment - Impact of mass reduction discounting on compliance costs for future EU CO_2 standards
http://theicct.org/EU-CO2-reduction-tech-2025-2030-assessment

Wider, taller, heavier: Evolution of light duty vehicle size over generations
https://www.globalfueleconomy.org/data-and-research

Evaluation of parameter-based vehicle emissions targets in the EU
http://www.theicct.org/evaluation-parameter-based-vehicle-emissions-targets-eu

The potential for mass reduction of passenger cars and light commercial vehicles in relation to future CO_2 regulatory requirements
https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/ldv_downweighting_co2_report_en.pdf

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