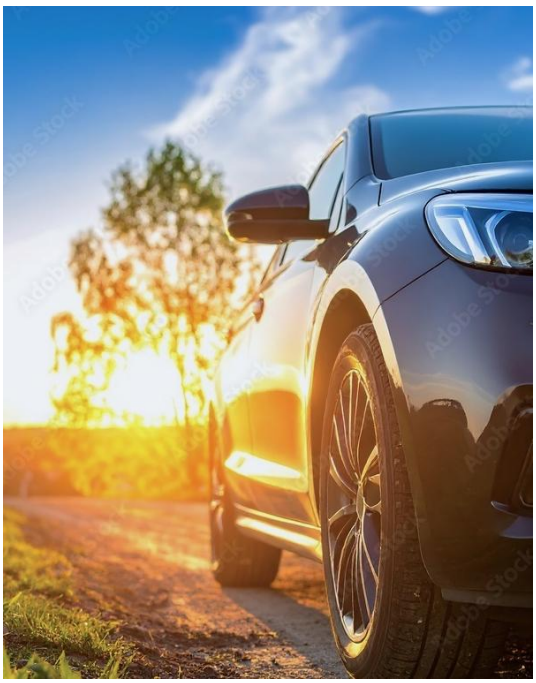
CO_2 emission regulation for passenger car and light duty applications

Recommendation • October 2025

An approach for an improved CO_2 emission legislation with optimized ecological and economic effects, taking social aspects into account.



IASTEC
international association of sustainable drivetrain and vehicle technology research

Compact Executive Summary

IASTEC welcomes the EU Commissions´ offer to start consultations on revising the current CO_2 vehicle fleet emissions legislation.

An urgent need for a revision of the current legislation exists because of ecological and economic reasons.

The quickest and most efficient procedure in terms of CO_2 reduction is a combination of an ambitious carbon correction factor (CCF), the introduction of a new vehicle class of carbon neutral vehicles (CNVC) which considers internal combustion - based vehicles in combination with CO_2 neutral reFuels and as a third step the postponement of the current date of 2035 (fleet goal of 0 grams CO_2/km) towards 2040.

The combination of these measures will significantly accelerate the overall reduction of CO_2 emissions of the EU sector traffic and promote the development of particularly fuel-efficient vehicles while improving economic and social aspects and while maintaining the current CO_2 fleet limits and the general logic of the ttw legislation [1].

In addition, the measures described should also be applied to CO_2 emission regulations for heavy-duty vehicles and likewise contribute to a significant acceleration in CO_2 emission reduction.

[1] The main messages of this elaboration are based on numerous and typically peer-reviewed publications. For the sake of readability, detailed listings of this important literature are not included in this publication.
Numerous explanations can be found, for example In the IASTEC position paper from 2021.

https://iastec.org/wp-content/uploads/2021/07/IASTEC-PositionPaper_06072021.pdf

This publication already clearly pointed out numerous challenges that have become very apparent in the meantime.

Boundary conditions of CO_2 regulation and recommendations

1. The current ttw based CO_2 light duty fleet regulation clearly violates the Paris climate goals. An insufficient consideration of energy carrier of different drivetrains in combination with a non-consideration of impact of production, end-of-life handling as well as infrastructure construction lead to a misdirection of CO_2 emission reduction. A potential reduction of CO_2 emissions of circa 10.000 million tons for the EU sector transport cannot be exploited with the current legislation.

2. In addition to ecological reasons, especially the dependence on raw materials, processes and machine tools in the field of electromobility is particularly serious, which is why long-term technological alternatives are urgently needed. ICE based drivetrains, typically designed as MHEVs and HEVs, are an important pillar of the future worldwide and must be also enabled in Europe. This requires a revision of current legislation.

3. This comprehensive revision would require a complex regulation and especially an LCA based approach including a detailed nationally specific analysis of electricity system. However, implementing this measure will take time, the complexity of regulation will increase, and planning security will be lost again for a long period of time.

4. A compromise must be sought between very precise, comprehensive, detailed legislation on the one hand and a swift, pragmatic implementation with considerable CO_2 saving potential on the other.

5. The most promising solution for enabling rapid and efficient CO_2 reduction based on current legislation is the expansion and combination of three important steps A - C.

A) Carbon Correction Factor CCF

The CCF considers the CO_2 neutral fuel content and reduces the CO_2 emissions. A reduction of at least 30% by 2030 is recommended, along with an ambitious 90 to 100% defossilization of fuel by 2040.

Impact and Comment

CO_2 accounting ruels according to Kyote protocol hardly enable a consideration of CO_2 reduced reFuels. The CCF in combination with a revision of the delegated acts on the recognition of low-carbon reFuels is necessary. All types of reFuels (biomass-based fuels, synthetic eFuels, hydrogen and hydrogen derivatives) should be considered. Additionally, the development of very fuel-efficient vehicles will be the consequence.

B) Carbon Neutral Vehicle Class CNVC

A CNVC must be established for vehicles only operated with reFuels. In parallel the CO_2 neutral class of BEV can be retained in a pragmatic way, although significant emissions are caused by BEV vehicles.

Impact and Comment

This step must go hand in hand with the general recognition of ICE based drivetrains as a sustainable solution. This will end the distortions in lending to companies investing in this technologie (taxonomy). It will also enable a long-term technology strategy for OEMs and SMEs, which is needed in light of announcements made by global competitors. The CNVC is mathematically necessary because the BEV class remains and its CO_2 emissions are significantly underestimated.

C) Shifting 2035 -> 2040

The current legislation forbids a selling of ICE based drivetrains after 2035. Due to CCF and the ambitious defossilisation of the fuels in combination with fuel efficient drive-trains the 2035 date can be shifted to 2040.

Impact and Comment

This shift enables a long term development in fuel efficient drivetrains, gives SMEs in particular planning security while accelerating the construction of reFuels production plants and refineries. A shifting without CCF and CNVC would not lead to very efficient drivetrains and the potential of significant CO_2 reduction by reFuels would not be exploited.

6. The combination of these three steps A - C will accelerate the reduction of the CO_2 impact of the sector traffic while enabling a long-term industrial focus on CO_2 neutral ICE technology, which is also intensively required for heavy duty transport, agriculture, construction machines, military, shipping etc. and can hardly survive without the volume effects of passenger vehicles.

7. Unilateral political favoritism towards special technical solutions (i.e. PHEV, REX, FC, …) leads to distortions and ultimately to additional costs, suboptimal CO_2 reduction and competitive disadvantages, which is why this is expressly discouraged because of ecological and economic reasons as well as from a social perspective.

Abbreviations

BEV	Battery electric vehicle, also known as electric car, are defined as a CO_2 neutral technology[2]
CCF	Carbon correction factor considers the fraction of CO_2-neutral reFuels components of fuel
CNVD	A carbon neutral vehicle class is a new vehicle class, according to BEV, which must only be operated with reFuels and therefore is rated as CO_2-neutral
CO_2	The correct formulation is CO_{2e} (CO_2 equivalent emissions) including i.e. the impact of N_2O or CH_4 according to their greenhouse gas potential. For reasons of simplifications, CO_2 is always used instead of CO_{2e} in this elaboration
ctc	Cradle-to-cradle analysis considers production, recycling and wtw analysis of use phase
FC	A fuel cell also needs an energy carrier as hydrogen or methanol and delivers electric energy
HEV	Hybrid electric vehicle has an additional battery and at least one additional electric motor
ICE	An internal combustion engine must be operated with CO_2 neutral reFuels in the long term
LCA	Life cycle assessment also for vehicles considers life cycle inventory, life cycle impact asessment and Interpretation of the analysis
MHEV	Mild hybrid electric vehicle typically operates with a voltage of 48 Volt and a maximum electric power in the range of 5-25 kW
OEM	Original equipment manufacturer often called automotive manufacturer
PHEV	Plugin hybrid electric vehicle offers the possibility to charge the battery with external energy from the electricity sector
reFuels	non-fossil fuels (synthetic eFuels, biomass based, blends, …) with significant CO_2-reduction
REX	The range extender drivetrain consists of a small ICE generator unit without direct axle drive and a tailor-made generator only delivering electric energy
SME	Small or medium enterprise. SMEs typically act as TIER In the automobile industry
TIER	Automobile supplier
ttw	Tank-to-wheel analysis basically considers the fuel consumption and only partially takes a comprehensive consideration of fuel production and transport into account. In contrast, the wtw or ctc analysis considers the correct impact of reFuels and the corresponding closed loop CO_2 circular processes.
wtw	Well-to-wheel legislation also considers the CO_2 footprint of the energy carrier including transport (fuel production including transport) to the tank of the vehicle in addition to the ttw analysis

[2] "CO_2 neutrality" is a political term. In reality, "CO_2 neutrality" does not exist, which is why a quantitative definition of "CO_2 neutrality" is necessary. One possible definition of "CO_2 neutrality" is the basis for calculation of the current average CO_2 footprint of the electricity system in Europe. However, this would certainly underestimate real CO_2 emissions by far. Nevertheless, a BEV with a real energy requirement of i.e. 16 kWh/100km and an average footprint of i.e. 180 g_{CO2}/kWh would be CO_2 neutral at 28,8 g_{CO2}/km according to this approach, which serves as a reference for other technologies.

Impressum

The International Association of Sustainable Drivetrain and Vehicle Technology Research, IASTEC was officially created by royal decree of the Belgian Ministry of Justice published on 4th of September 2023 under the AISBL identification number 0805453158.

This recommendation "CO_2 emission regulation for passenger car and light duty applications" has been published in October 2025.

Contact
www.iastec.org

Postal Address
IASTEC aisbl
Rue Montoyer 25
1000 Brussels
Belgium

email: info@iastec.org