Life cycle **COMPACT**

(WLTP: combined fuel consumption 0.7 – 0.5 l/100 km; combined CO_2 emissions 16 – 12 g/km; combined power consumption 19.8 – 17.8 kWh/100 km)[1]
[1] The stated figures are the measured "WLTP CO_2 figures" in accordance with Art. 2 No. 3 Implementing Regulation (EU) 2017/1153. The fuel consumption figures were calculated based on these figures. Power consumption [and range] have been determined on the basis of Regulation (EC) No. 2017/1151.

360° Environmental Check Mercedes-Benz C 300 e Plug-in Hybrid

Mercedes-Benz

[2] Further information on the official fuel consumption and the official specific CO_2 emissions of new passenger cars can be found in the publication "Leitfaden über den Kraftstoffverbrauch, die CO_2-Emissionen und den Stromverbrauch neuer Personenkraftwagen" [Guide to fuel consumption, CO_2 emissions and electrical consumption of new passenger cars], which is available free of charge at all sales outlets and from Deutsche Automobil Treuhand GmbH at www.dat.de.

360° Environmental Check C 300 e Plug-in-Hybrid

The new saloon Mercedes-Benz C-Class C 300 e plug-in hybrid (WLTP: combined fuel consumption 0.7 – 0.5 l/100 km; combined CO_2 emissions 16 – 12 g/km; combined power consumption 19.8 – 17.8 kWh/100 km)[1,2] is another important milestone on the road to locally CO_2 emission-free driving.

The electrification of the Mercedes-Benz portfolio has been progressing in leaps and bounds for some time. The aim is to achieve up to 50 percent share of plug-in hybrids and BEVs in the new vehicle fleet by 2025 on the way toward going all-electric by 2030 wherever market conditions allow. Mercedes Benz Cars is pushing ahead with the development of its plug-in hybrids under the EQ Power label. On the road to purely electric mobility, plug-in hybrids are perhaps the most important bridging technology. With its EQ Power models, Mercedes-Benz is providing an efficient drivetrain package, marking a further step towards net carbon-neutral mobility.

Mercedes-Benz is consistently pursuing the goal of net carbon-neutrality along the entire value chain in the new vehicle fleet from 2039 onwards. Compared to 2020, we aim to reduce CO_2 emissions by more than 50 % by 2030. The key mechanisms for achieving this goal include electrifying the vehicle fleet, charging with green energy, improving battery technology, and extensive use of recycled materials and renewable energy in production. By 2030, it is planned to cover more than 70 percent of energy demand in our own Mercedes-Benz production plants by renewable energies.

In the life cycle of an electric vehicle, charging with electricity from renewable sources is an essential factor in reducing CO_2 emissions. Mercedes-Benz enables “Green Charging” at every one of the approximately 350,000 public charging points in the Mercedes me Charge network in Europe. Guarantees of origin are used to ensure that an equivalent amount of electricity from renewable sources is fed into the grid to compensate for the charging processes.

We have briefly summarized the results of the Mercedes-Benz C 300 e Life Cycle Assessment for you in this brochure.

By the way: This brochure can be downloaded from https://group.mercedes-benz.com/sustainability/climate/

Electrification of the powertrain

EQ Power: Plug-in hybrids deliver everyday electric mobility

The strengths of hybrid technology are its versatility, flexibility, and vehicle dynamics, without you as the driver having to make a conscious decision. This drive type combines the comfort of an electric vehicle – i.e. the almost silent and locally CO_2-emission-free electric mode – with the independence and constantly available output of the combustion engine for long distances.

Mercedes-Benz is appealing to a broad customer base with an ever-increasing number of models in its selection of plug-in-hybrid technology. This trend is making an important contribution to achieving the net carbon-neutral mobility, that Mercedes-Benz is committed to pursuing as part of its decarbonization strategy. Plug-in hybrid vehicles give you the option of running exclusively on electricity, thus creating zero local CO_2 emissions, especially in urban areas. EQ Power models are parallel hybrids that can also be charged from external electricity grids (plug-in).

The powertrain consists of an electric drive and an internal combustion engine that work in tandem, meaning the vehicle can be powered either individually or together. Plug-in hybrids thus offer a fast and straightforward entry into electric mobility – without the need to rely on a fully functioning, nationwide charging infrastructure.

“Plug-in hybrids bring together the best of both worlds. In the city, they can run on electricity alone; and over longer distances, they benefit from the range of the combustion engine,” explains Dr. Torsten Eder, Chief Engineer Mercedes-Benz Drivetrains. “They make the vehicle more efficient overall because they recuperate braking energy on the one hand and, on the other, can run the internal combustion engine at the most fuel-efficient speeds and loads. The different characteristics of the drives complement one another perfectly. An electric motor runs most efficiently when driving at low speeds, while a combustion engine performs most efficiently at higher speeds and loads.”

C 300 e technology

High electric range thanks to the modern plug-in hybrid

The interaction between the electric motor and the combustion engine of the C 300 e is a decisive factor for the ultramodern plug-in hybrid. The intelligent drive management can independently select the ideal combination of combustion engine and electric motor at any time in order to use energy, output, and range as efficiently as possible in every driving situation.

With the increased electric range (WLTP) brought about by the C 300 e battery and its usable energy capacity of approximately 25 kWh and an electric output of 95 kW, routes of roughly 100 km can be covered in all-electric mode without using the combustion engine. This is the two-liter variant of the ultramodern M 254 four-cylinder gasoline engine. Thanks to recuperation, kinetic energy is recovered when decelerating or driving downhill. The positioning of the battery in the vehicle brings advantages on a day-to-day basis when compared against the previous model: There is no longer a step in the trunk, thus making through-loading possible.

The intelligent, route-based operating strategy activates the electric driving mode wherever this is most appropriate for the route. It takes factors such as navigation data, topography, speed limits, and traffic conditions into account for the entire planned route. A driver wishing to influence the energy recovery rate can do so directly using three settings that are controlled via the rocker switches behind the steering wheel. This is possible in all driving modes except SPORT. In driving mode D-, for example, it is possible to experience what is known as the “one-pedal feeling”: If the driver takes his foot off the accelerator, the vehicle slows down, purely by electric means, to such an extent that the hydraulic foot brake is often not needed. The operating strategy communicates with the sensors of the assistance systems and thus efficiently can support the driver in many driving situations.

The facts

The Mercedes-Benz C 300 e 360° environmental check

Right from the early developmental stages of a new model, Mercedes-Benz starts looking at environmental performance over the car's entire life cycle. The following pages describe how the new C 300 e fares in the key areas of the comprehensive Life Cycle Assessment (LCA): Consumption of resources and emissions.

[3] The stated figures are the measured "WLTP CO_2 figures" in accordance with Art. 2 No. 3 Implementing Regulation (EU) 2017/1153. The fuel consumption figures were calculated based on these figures. Power consumption [and range] have been determined on the basis of Regulation (EC) No. 2017/1151.

Plug-in hybrid drive:
Locally CO_2 emission-free driving during electrical operation with a high vehicle range up to 116 km.

Efficient drive (figures according to WLTP)[3]:
Combined electrical consumption 19.8 – 17.8 kWh/100 km
Combined fuel consumption 0.7 – 0.5 l/100 km,
Combined CO_2 emissions: 16 – 12 g/km,
113 – 116 kilometers battery-electric range

Resource-efficient:
210 component parts with a total weight of 90.4 kilograms can be produced in part from less resource consuming materials (recycled plastics and renewable raw materials).

Resources: What is needed to produce a car

Achieve more with less

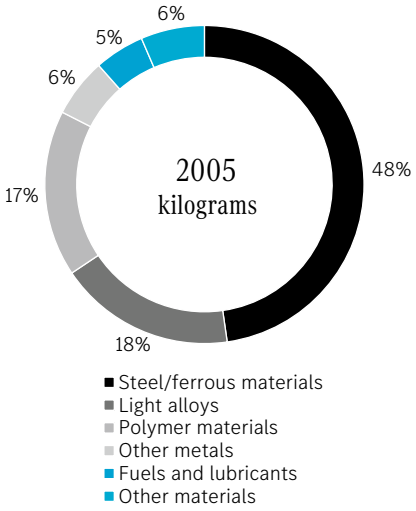
When it comes to the overall life cycle assessment, the C 300 e benefits from partially locally CO_2 emission-free operation and the high efficiency of the electrified powertrain.

Material resources

In the C 300 e, steel and ferrous materials account for the largest share of the materials at 48 %. They are followed by light alloys at 18 %, polymer materials at 17 %, and other metals (non-ferrous and special metals) at around 6 %. Fuels and lubricants account for around 5 %. The other materials (process polymers, electrics/electronics, etc.) account for approximately 6 %.

In production, the drive components of the plug-in hybrid C 300 e require a greater use of material and energy resources. The relevance of the car production therefore increases compared to conventional combustion engines.

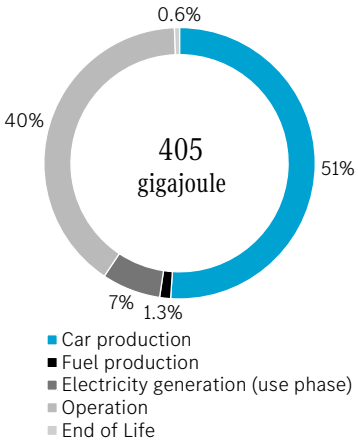
Mercedes-Benz C 300 e



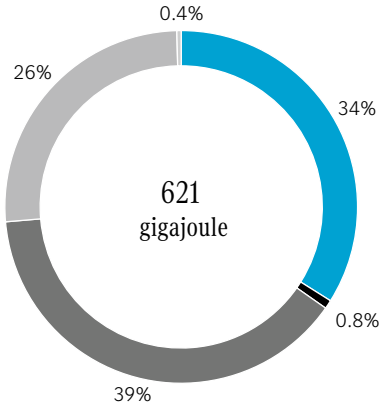
Energy resources

However, an overall picture only emerges when the entire life cycle (material manufacturing, production, operation for 200,000 kilometers, and the end of life[4]) is examined. This is because during its operating phase, the C 300 e benefits from the high efficiency of the electrified powertrain. Two sources (electricity from hydroelectric power and the EU electricity mix) for external charging of the high-voltage battery were examined in the analysis of the operating phase.

Electricity from hydropower



EU electricity mix



Values are rounded

The highest level of energy efficiency can be achieved via the use of hydroelectric power[5]. Over the entire life cycle of the C 300 e, analysis shows a primary energy demand of 405 GJ, of which 203 GJ comes from fossil sources and 202 GJ from renewable sources. However, if the EU electricity mix[5] is used for the external charging of the high-voltage battery, the proportion of the primary energy demand for electricity generation increases significantly. Over the vehicle's entire life cycle, the primary energy demand amounts to 621 GJ.

The materials used do not go to waste at the end of the vehicle's life cycle. To a large extent the valuable materials contained in the high-voltage battery can be recovered through targeted recycling. Overall, a recovery rate of 95 % is achieved for the C-Class according to ISO 22628.

[4] Not including scrap credits

[5] The 2022 LCA software and database (version: SP2022.01) by Sphera Solutions GmbH was used to carry out the life cycle assessment.

Emissions: The carbon footprint over the life cycle

It depends on the electricity mix

It is of decisive importance for the CO_2 balance, whether the electricity used for external charging is generated from the renewable sources hydroelectric or wind power, or whether the European electricity mix forms the basis.

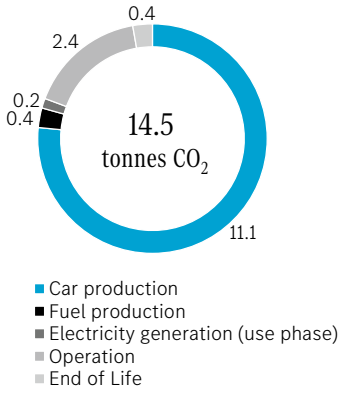
CO_2 emissions

The analysis of emissions in the individual life cycle phases makes it clear: As more and more vehicles are turning to electric power, two further factors are becoming increasingly important, the production of the high-voltage battery and the generation of electricity for external charging of the battery.

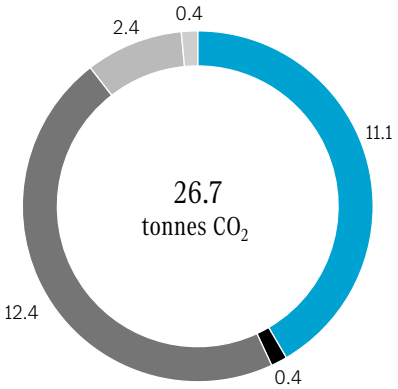
In the production of the C 300 e, about a quarter of the CO_2 emissions is caused by the high-voltage lithium-ion battery and the battery peripherals. Furthermore, the body-in-white, the wheels/tires, and the entire powertrain all make a significant contribution to the CO_2 emissions generated during passenger car production. CO_2 emissions predominantly arise through the provision of energy for material production. This results in comparatively high values for components that have a large mass and are therefore produced in a more material-intensive manner.

In addition to vehicle production, the choice of charging current in the operating phase is a decisive factor for the overall CO_2 balance. Using the EU electricity mix, the C 300 e emits a total of 26.7 tonnes of CO_2 over its life cycle (car production, driving 200,000 km, and end of life[4]). Of this, 11.1 tonnes is attributable to car production, 0.4 tonnes to fuel production, 12.4 tonnes to the generation of the charging current (EU electricity mix), and 2.4 tonnes to driving. If renewable energy (electricity from hydropower) is used to charge the C 300 e, the life cycle CO_2 emissions can be almost halved (14.5 tonnes).

Electricity from hydropower



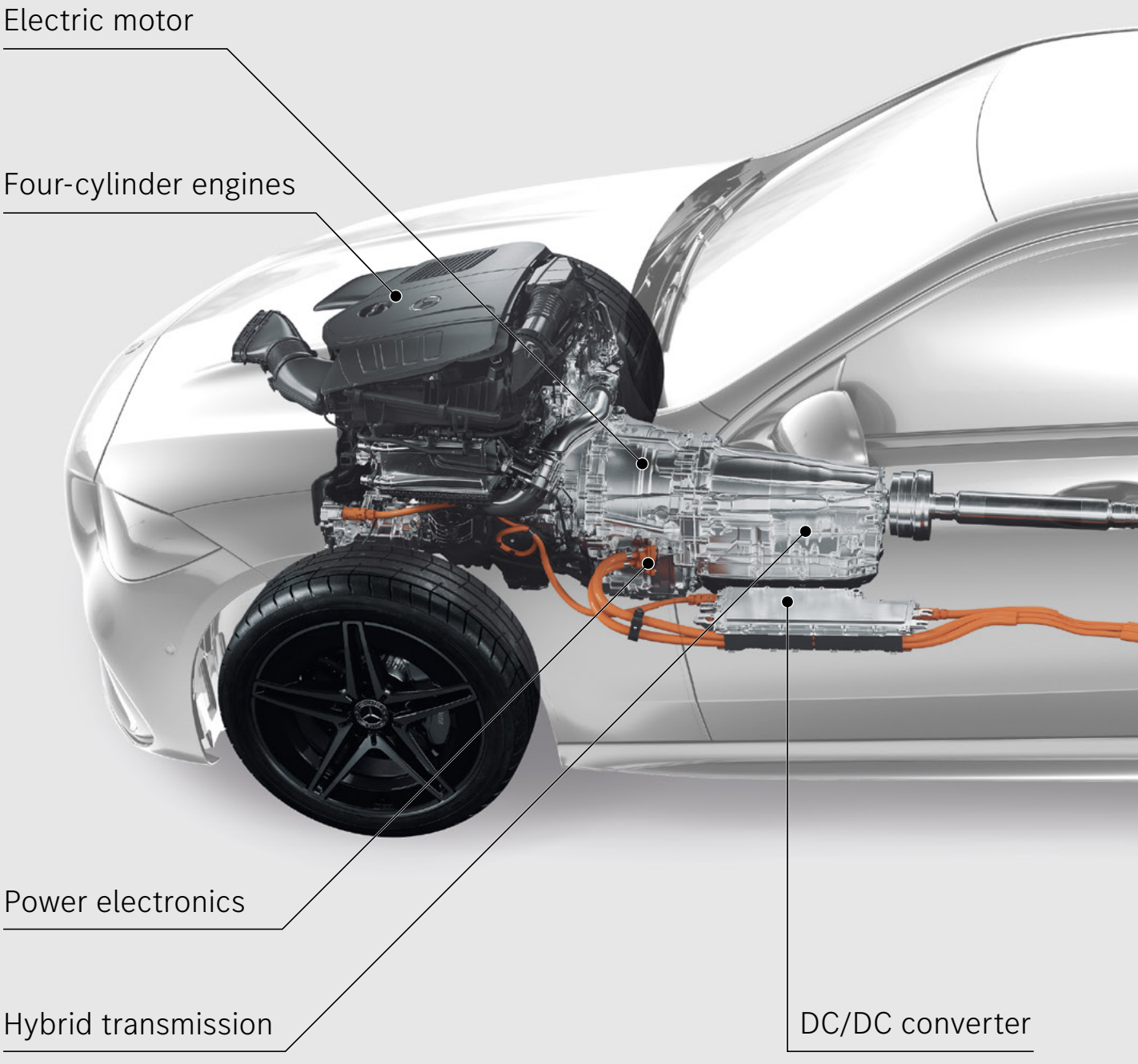
EU electricity mix

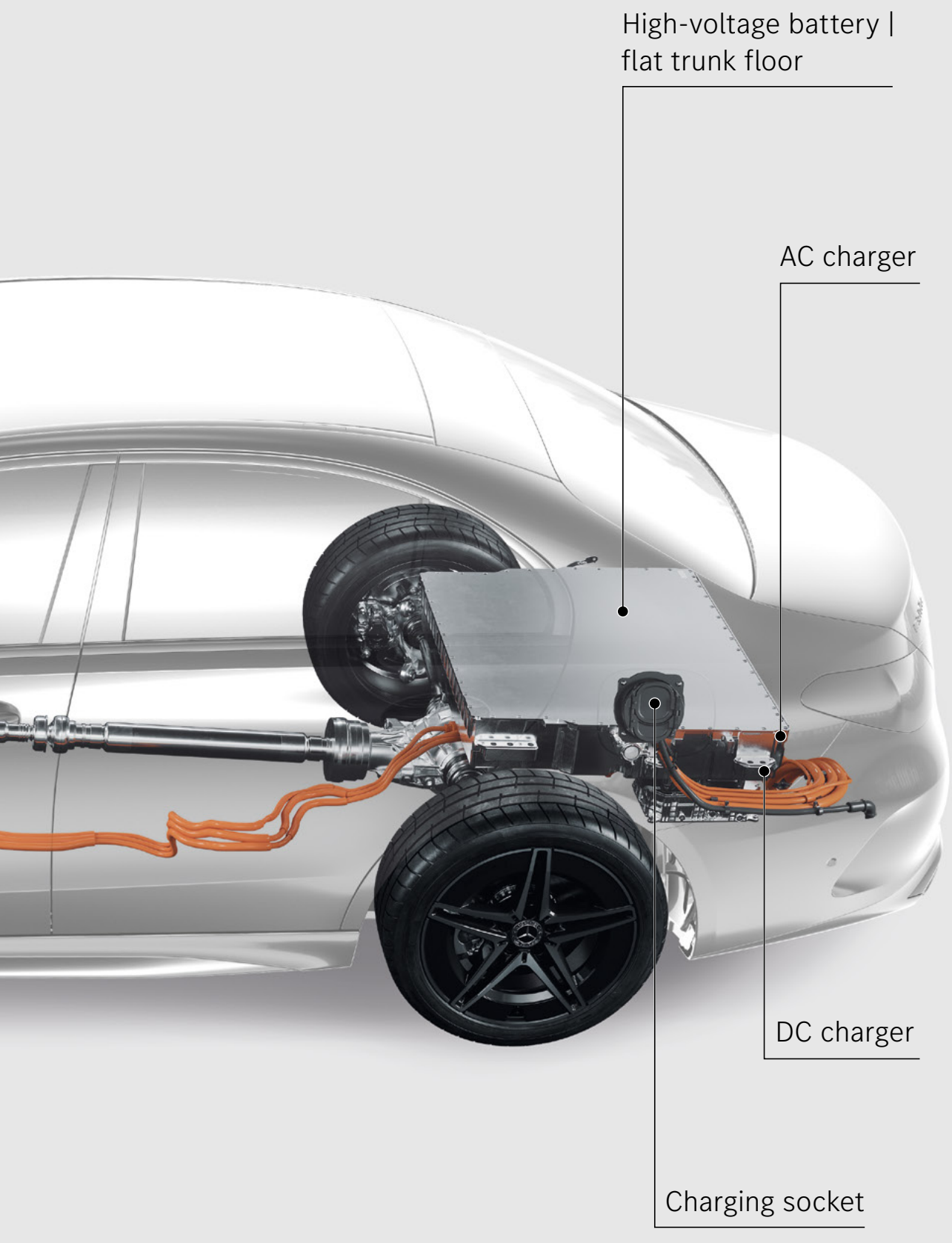


Values are rounded

X-ray view of the Mercedes-Benz C-Class plug-in hybrid

The most important drive components of the C 300 e




High-voltage battery |
flat trunk floor
AC charger
DC charger
Charging socket

Mercedes me Charge

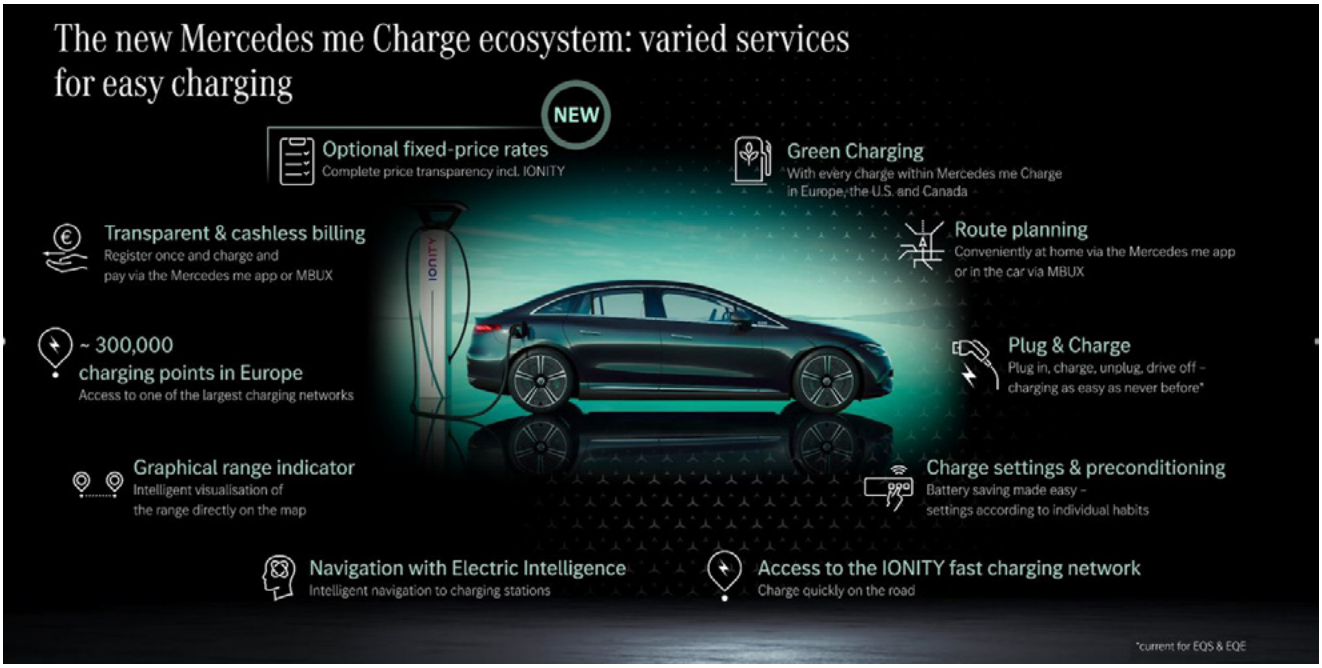
Mercedes me Charge gives customers access[6] to one of the world's largest charging networks. Currently, Mercedes me Charge includes more than 850,000 AC and DC charging points, of which more than 350,000 are in Europe.

The Mercedes me App shows the precise location, current availability, and price at the selected charging station in advance. This information can also be accessed via the navigation system in fully electric vehicles and is used by the Navigation with Electric Intelligence to calculate a convenient and time-efficient route that includes charging stops.

With the new Mercedes me Charge Plug & Charge function, the C 300 e can be charged even more conveniently at Plug & Charge-enabled public charging points: As soon as the charging cable is plugged in, the charging process starts automatically; no further authentication by the customer is required. The vehicle and the charging station communicate directly via the charging cable. Furthermore, because a charging contract is stored in the system, each charging process is debited automatically – even abroad. The customer only needs to choose their preferred payment method once. The individual charging processes are clearly listed in a monthly invoice.

Mercedes me Charge makes it possible for customers to enjoy the benefits of green charging at public charging stations in Europe, the USA, and Canada. Green Charging works by subsequently compensating for a charging process with energy from renewable resources. Guarantees of origin are used to ensure that the equivalent amounts of green energy are fed into the grid after the charging process.

[6] In order to be able to use the Mercedes me connect service "Mercedes me Charge", customers need a separate charging contract with a selected third-party provider through which the charging processes are paid for and invoiced. The use of Mercedes me connect services requires a personal Mercedes me ID and consent to the Terms of Use for the Mercedes me connect services.



Use of materials in the C-Class

Responsible utilization of resources

Closed-loop material cycles and the use of renewable raw materials are the key levers for responsible resource utilization.

Manufacturing vehicles requires high levels of material usage. For this reason, there is a developmental focus on further reducing the use of resources and the environmental impacts of the materials deployed. To this end, the use of less resource consuming materials such as recycled plastics and renewable raw materials in the vehicles is being continuously stepped up.

With the Dinamica material, high-quality secondary raw material is also now utilized in the interior of the C-Class. Dinamica is a microfiber made of recycled polyester and water-borne polyurethane. The recycled polyester contained in Dinamica is derived from textiles and PET bottles, for example. Dinamica has a suede leather look and feel and is used in the interior as a seat cover.

In the new C-Class, a total of 210 component parts with a total weight of 90.4 kilograms can be produced in part from less resource consuming materials.

Facts and figures

LCA results

Input parameters

Material resources	**C 300 e (EU electricity mix)**	**C 300 e (electricity from hydropower)**	**Delta to C 300 e (EU electricity mix)**
Bauxite [kg]	1,490	1,490	0 %
Dolomite [kg]	290	286	-1 %
Iron [kg]*	721	756	5 %
Non-ferrous metals (Cu, Pb, Zn) [kg]*	399	399	0 %
* as elementary resources			
Energy resources			
ADP fossil [GJ]**	**328**	**186**	**-43 %**
Primary energy [GJ]	621	405	-35 %
Proportionately			
Lignite [GJ]	52.6	14.1	-73 %
Natural gas [GJ]	113.0	57.3	-49 %
Crude oil [GJ]	75.6	66.5	-12 %
Hard coal [GJ]	86.2	48.2	-44 %
Uranium [GJ]	112.9	17.1	-85 %
Renewable energy resources [GJ]	180	202	12 %
** CML 2001, as of August 2016			
ADP = abiotic depletion potential			

Output parameters

Emissions to air	**C 300 e (EU electricity mix)**	**C 300 e (electricity from hydropower)**	**C 300 e (EU electricity mix)**
GWP [t CO_2-equiv.]**	**28.3**	**15.5**	**-45 %**
AP [kg SO_2-equiv.]**	**101.0**	**73.6**	**-27 %**
EP [kg phosphate-equiv.]**	**9.2**	**6.2**	**-33 %**
POCP [kg ethene-equiv.]**	**14.5**	**12.6**	**-13 %**
CO_2 [t]	26.7	14.5	-46 %
CO [kg]	236	226	-4 %
NMVOC [kg]	19.6	18.1	-8 %
CH_4 [kg]	48.3	28.0	-42 %
NO_x [kg]	52.3	37.2	-29%
SO_2 [kg]	53.9	41.1	-24 %
Emissions to water			
BOD (biological oxygen demand) [kg]	0.10	0.09	-16 %
Hydrocarbons [kg]	0.9	0.9	-9 %
NO_3- [kg]	4.1	1.6	-62 %
PO_4^{3-} [kg]	0.30	0.20	-33 %
SO_4^{2-} [kg]	57.1	31.2	-45 %
** CML 2001, as of August 2016			
AP = acidification potential, EP = eutrophication potential, GWP = global warming potential, POCP = photochemical ozone creation potential			

Validation

TÜVRheinland®

TÜV Rheinland Energy GmbH confirms that a critical review of the life cycle assessment (LCA) study and product-related environmental information of **Mercedes-Benz AG, Mercedesstraße 120, 70372 Stuttgart** for the following passenger car:

Mercedes-Benz C-Class Model: C 300 e Plug-in Hybrid – 2022 model year

was performed.

Proof has been provided that the requirements of the international standards

- ISO 14040:2006 + A1:2020: Environmental management – life cycle assessment – principles and framework
- ISO 14044:2006 + A1:2018 + A2:2020: Environmental management – life cycle assessment – critical review processes and reviewer guidelines
- ISO/TS 14071:2014: Environmental management – life cycle assessment – critical review processes and reviewer competencies: additional requirements and guidelines to ISO 14044
- ISO/TR 14062:2022: Integration of environmental aspects into product design and development.
- ISO 14020: 2000: General principles of environmental labeling and declarations and ISO 14021: 2016: Environmental supplier declarations (Type II environmental labeling).

are considered.

Results:

- The LCA study for the variants C 300 e (basis of the environmental brochure), C 300 and C 300 d were carried out according to the international standards ISO 14040:2006 + A1:2020 and ISO 14044:2006 + A1:2018 + A2:2020. The methods used and the modelling of the product system correspond to the state of the art. They are suitable to fulfill the goals stated in the study. The report and environmental brochure are comprehensive and provides a transparent description of the framework of the study.
- The assumptions used in the LCA study especially fuel and energy consumption based on the current WLTP (Worldwide harmonized Light vehicles Test Procedure) were verified and discussed.
- The assessed samples of data and environmental information included in the LCA study and environmental brochure are plausible.

Review process and level of detail:

Verification of input data and environmental information as well as the check of the LCA process was performed in course of a critical data review. The data review considered the following aspects:

- Check of the applied methods and the product model,
- Inspection of technical documents (e.g. type approval documents, parts lists, supplier information, measurement results, etc.) and

Check of LCA input data (e.g. weights, materials, fuel and energy consumption, etc.).

14th December 2022

Sustainability and Carbon Services

bility for the content of the LCA rests with Mercedes Benz AG. TÜV Rheinland Energy GmbH was commissioned to mpliance with the methodical requirements, and to verify and validate the correctness and credibility of the information

Mercedes-Benz has published product-related environmental information since 2005, reflecting the results of environmentally compatible product development and verified by independent experts.

The brochures are made available to the wider public as part of the “Lifecycle” series. They can be downloaded at https://group.mercedes-benz.com/sustainability/climate/

As at: November 2022

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