Life cycle COMPACT

360° ENVIRONMENTAL CHECK

Mercedes-Benz C 350 e

- **Environmentally friendly:**
  up to 41 percent lower CO_2 emissions
- **Economical:**
  up to 31 kilometres on electric power alone,
  NEDC consumption just 2.1 litres/100 km
- **Resource-efficient:**
  23 percent more recycled components

Mercedes-Benz

Mercedes-Benz has long recognised the importance of vehicle interiors optimised for allergy sufferers. Interior emissions have been measured since 1992. Today designers and developers can make their choice from a database of thousands of interior materials that have been approved by the material department.

The laboratory test with the complete vehicle in a special test chamber lasts one week. Like all new model series, the C-Class bears the ECARF (European Centre for Allergy Research Foundation) seal of quality.

Editorial

“We improve the environmental performance over the entire life cycle of a car”

Dear readers,

One of our six environmental protection and energy guidelines reads as follows: “We strive to develop products that are highly responsible to the environment in their respective market segments.” To achieve this goal we have to incorporate environmental protection into our products from the very start of vehicle design.

This “Design for Environment” approach is integrated into the development process, the greater the benefits in terms of minimised environmental impact and cost.

It is likewise crucial to reduce the environmental impact caused by emissions and consumption of resources during the entire life cycle. This comprehensive and exhaustive Life Cycle Assessment (LCA) we call ‘360° environmental check‘. It scrutinises all environmentally relevant aspects of a car‘s life: from manufacture of the raw materials to production, vehicle operation and then recycling at the end of the vehicle‘s life – a long way off in the case of a new Mercedes-Benz.

As well as documenting every last detail of this LCA in-house throughout the entire life cycle, we have the results checked and confirmed by independent assessors from the TÜV Süd inspection authority. Only then does a car receive its Environmental Certificate.

This brochure briefly summarises the results of the C 350 e model‘s LCA for you. Incidentally, the C-Class Plug-In Hybrid is a good example of why a comprehensive assessment is necessary to improve on the overall environmental impact. Because the naturally higher use of resources in production is easily compensated for by the outstanding environmental performance of the car during operation.

If this compact brochure has aroused your interest in the subject, I would recommend you take a look at the detailed documentation of the C-Class’ LCA: the “Lifecycle” brochure is available for download from http://www.mercedes-benz.com.

Kind regards.
Yours,

Anke Kleinschmit
Chief Environmental Officer of the Daimler Group

* Fuel consumption C 350 e with automatic transmission (combined): 2.4-2.1 l/100km, 11.7-11.0 kWh/100km; CO_2-emissions (combined): 54-48 g/km.

Mercedes-Benz C 350 e Plug-In Hybrid

A class more efficient

In terms of quality and comfort, the new C-Class has redefined the standards in its vehicle segment. Now it is also making a clear statement on efficiency that cannot be overlooked: the C 350 e has a certified fuel consumption of just 2.4 - 2.1 litres/100 km yet delivers sports-car-like performance. The Plug-In Hybrid drive system is available for the Saloon and, for the first time, also the Estate.

The C 350 e combines its combustion engine with an electric drive system whose high-voltage lithium-ion battery with a capacity of 6.38 kWh can be charged from an external power source. Thanks to an intelligent on-board charging system, this takes approximately one hour and 30 minutes at a wallbox. A charging time of around two hours is achievable via a standard socket. In practical use, this advanced hybrid technology impresses with low consumption and emission figures, but high performance: the electric motor is able to replace or support the combustion engine and makes use of energy generated while braking by converting it into electric energy, storing it and reusing it. On electric power alone, the C 350 e has a range of up to 31 kilometres.

From a displacement of just under two litres, the four-cylinder petrol engine in the C 350 e produces 155 kW (211 hp) and has a maximum torque of 350 newton metres. The electric motor has an output of up to 60 kW and delivers torque of 340 newton metres. A total system output of 205 kW (279 hp), as well as system torque of 600 newton metres, are thus available to be called upon by the standard-fit 7G-TRONIC PLUS 7-speed automatic transmission.

The high overall system output and intelligent engine management give the car the driving dynamics of a sports car. The Saloon can sprint from zero to 100 km/h in 5.9 seconds, while the Estate, at 6.2 seconds, is almost as quick off the mark. As for top speed, the Saloon reaches 250 km/h while the Estate achieves up to 246 km/h.

Feel-good atmosphere: the driver and front passenger enjoy a great deal of space and luxury in an unobtrusive, modern style on board the new C-Class. The interior is characterised by carefully chosen high-class materials and their pleasant touch and feel as well as the precision of the finely crafted details

Fleet-footed dynamism: the dual drive system and standard-fit air suspension make driving the C 350 e pure pleasure – and these features are now also available for the Estate for the first time.
Every detail of the C-Class is in a class of its own

In each case, the certified fuel consumption is 2.4 - 2.1 litres per 100 km. This corresponds to CO_2 emissions of 54 - 48 g/km (55 - 49 g/km for the Estate).

For efficient motoring, foresighted driving that avoids unnecessary braking or accelerating manoeuvres has always been the best strategy. This gains an all new importance in the hybrid model: because braking manoeuvres serve not only to deliver deceleration, but can also be used to recuperate energy.

In the C 350 e, an intelligent engine management system works in the background to automatically select the ideal combination of combustion engine and electric motor (see page 12). If a destination is programmed into the navigation system, an intelligent operating strategy controls charge and discharge of the high-voltage battery in the C 350 e to ensure optimal use of energy over the entire route. Another aim of this route-based operating strategy is to reach urban areas with a fully charged battery if possible, so that the vehicle can be driven efficiently in stop-and-go traffic – and frequently in electric mode.

Safety at the highest level is one of the core values of the C-Class. Available assistance systems include ATTENTION ASSIST (standard), COLLISION PREVENTION ASSIST PLUS (standard), DISTRONIC PLUS with Steering Assist and integrated Stop&Go Pilot, Brake Assist BAS PLUS and PRE-SAFE® Brake, enhanced Active Lane Keeping Assist, Traffic Sign Assist with wrong-way warning function and Adaptive Highbeam Assist Plus.

In addition to 3-point safety belts with pyrotechnical belt tensioning and belt-force limitation for driver, front passenger and those in the outer rear seats, numerous airbags serve to protect the vehicle's occupants in an accident. These include pelvisbags for the driver and front passenger, a newly developed windowbag, sidebags for the outer rear seats and a kneebag for the driver.

All C-Class versions impress with their exemplary suspension and ride comfort plus fleet-footed, agile handling. The C 350 e features AIRMATIC air suspension as standard to enhance comfort. Other highlights include the extensive options for pre-entry climate control via internet.

The C 350 e is supplied with the AVANTGARDE exterior equipment line including sports radiator grille and centrally positioned star. At no extra cost, both the Saloon and Estate versions are also available with the EXCLUSIVE exterior equipment line with a classic radiator grille and three-pointed star on the bonnet.

Charging champion: even the high-voltage battery in the Estate can be fully charged in 1.5 hours at a wallbox or 2 hours via a standard socket

The facts

The Mercedes-Benz C 350 e in the 360° environmental check

Early in the development stage of a new model, Mercedes-Benz starts looking at environmental performance over the car's entire life cycle. On the following pages you can read about how the new C 350 e fares in the two key areas of the comprehensive Life Cycle Assessment: resources and emissions.

Lifecycle COMPACT
Ten years ago, the S-Class became the first-ever vehicle to be awarded the Environmental Certificate from TÜV Süd. The "Lifecycle" brochure has been presenting the Environmental Certificates since 2009. The "Lifecycle COMPACT" edition now also being released is brand new. This compact overview illustrates the high environmental compatibility of the Mercedes-Benz vehicles during the entire life cycle in an easy-to-understand way and also gets right to the heart of the company's environmental commitment.

The resources: what is needed to produce a car

Achieve more with less

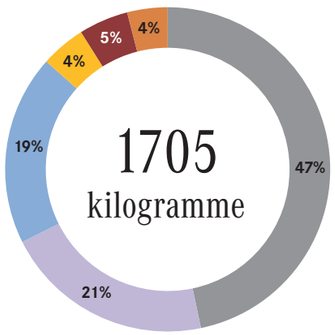
Does the considerable expenditure that goes into the Plug-In Hybrid technology pay off? The new C 350 e is characterised by low consumption of resources, low energy consumption and good recyclability. A comparison with the C 250.*

*Fuel consumption C 250 with automatic transmission (combined): 5.6-5.3 l/100km; CO_2-emissions (combined): 131-123 g/km.

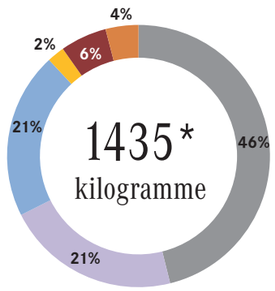
Material resources

- Steel/ferrous-materials
- Light alloys
- Polymer materials
- Other metals
- Service fluids
- Other materials

Hybrid specific components require higher material resources than is the case with the C 250. However, the high recovery quota of 95 percent ensures that the materials used are not lost.

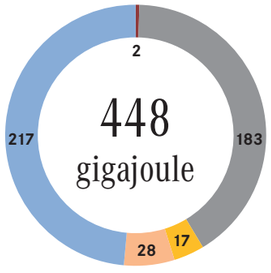


Mercedes-Benz C 350 e

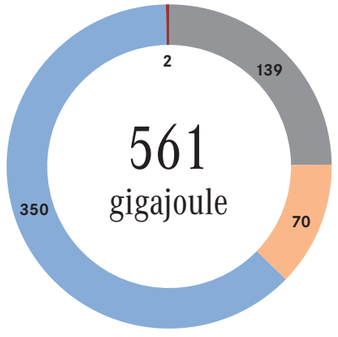


*comparably equipped as C 350 e

Mercedes-Benz C 250



Mercedes-Benz C 350 e
(hydro power)



Mercedes-Benz C 250

Energy resources

- Car production
- Electricity generation
- Fuel production
- Operation
- End of Life

Analysis of the individual life cycle phases reveals that more energy goes into manufacturing the Plug-In Hybrid vehicle. During car operation, however, energy input can be significantly reduced thanks to its high efficiency.

Analysis of the energy and material resources used for the Mercedes-Benz C 250 and C 350 e reveals that the entire life cycle must be assessed to obtain a realistic picture. Life cycle means: material manufacture, production, car operation for 200,000 kilometres and recycling are all taken into account.

Overall, the C 350 e shows a significant reduction in energy resources used. The result is best when renewable energy is used to charge the batteries. Over the entire life cycle, primary energy savings of 20 percent are possible. This equates to the energy content of around 3,500 litres of petrol. The ratio further improves by every kilometre driven beyond the 200,000 used for assessment.

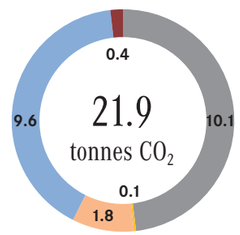
Moreover, the precious materials used are not lost. This also applies to the lithium-ion battery and other specific components of the C 350 e. Together with the suppliers and the disposal partners, innovative recycling concepts and technologies have been evolved. They enable recycling of the valuable substances contained in the vehicle.

The focus here was also on optimising the recycling processes in terms of safe and efficient dismantling and obtaining marketable products from the hybrid component recycling process.

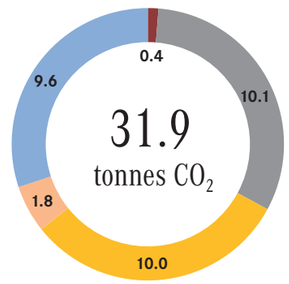
The emissions: the carbon footprint over the life cycle

It depends on the electricity mix

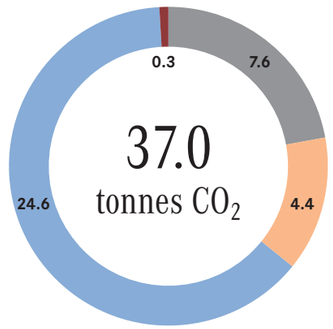
The C 350 e sets new records when it comes to emissions. However, crucial for the carbon footprint is whether the electricity is obtained from renewable sources (hydro power or wind power) or whether the EU electricity mix forms the basis.



Mercedes-Benz C 350 e
(hydro power)



Mercedes-Benz C 350 e
(EU electricity mix)



Mercedes-Benz C 250

CO_2 Emissions

- Car production
- Electricity generation
- Fuel production
- Operation
- End of Life

Comparing the carbon footprint of C 350 e and C 250, it is obvious that the emissions caused by producing the Plug-In Hybrid, which are around one quarter higher, are more than compensated for on the bottom line.

Analysis of the emissions after the individual phases of the life cycle make it clear: it is still the actual process of car operation that offers the greatest potential to reduce CO_2 emissions in particular. Incidentally, this is also an incentive for the driver to drive as efficiently as possible.

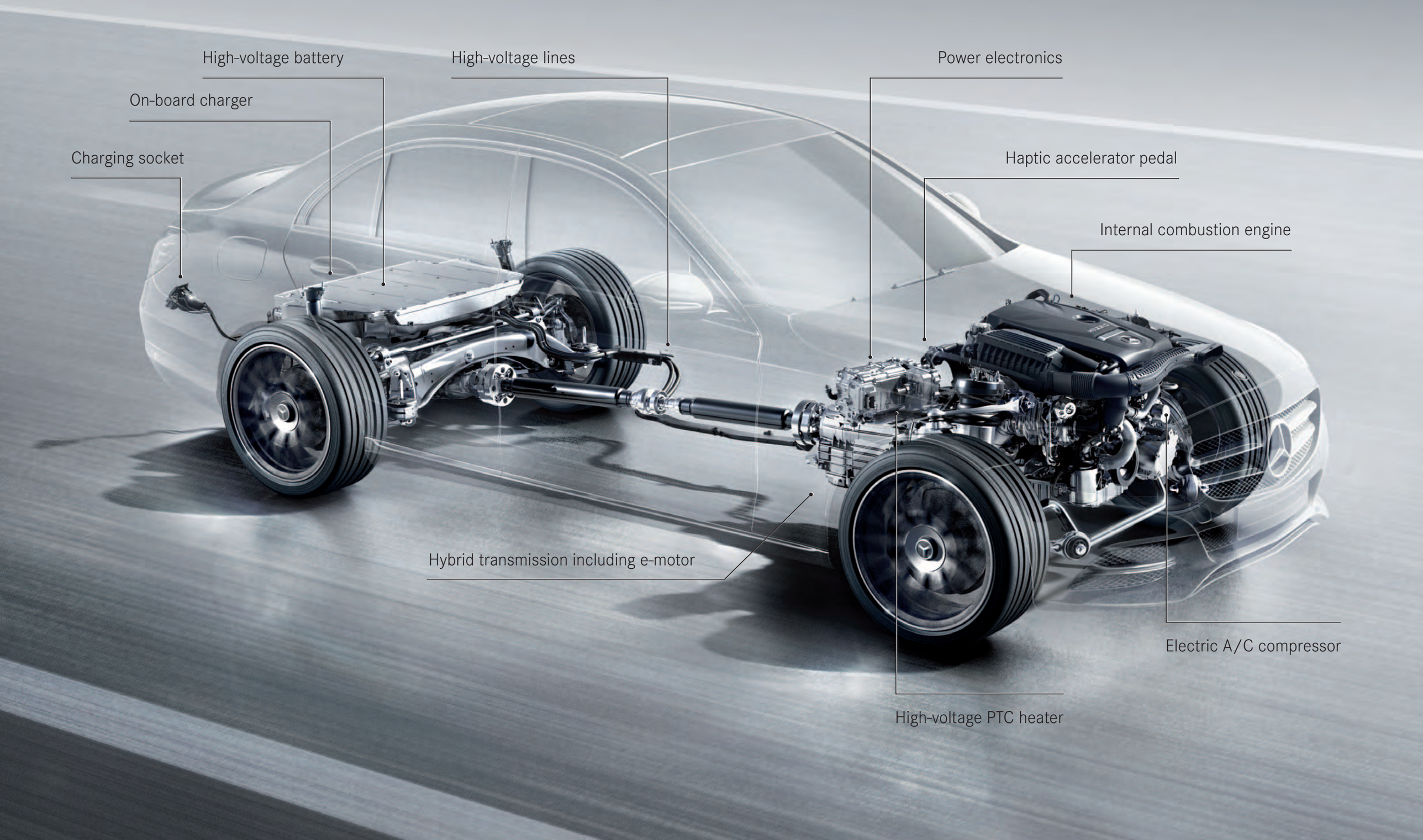
As more and more vehicles are turning to electric power, a further factor is becoming increasingly important: the generation of the electricity, especially for charging the batteries. If electricity generation is by renewable resources as in the case of wind power and hydro power, the advantage of the Plug-In Hybrid over the comparable vehicle with combustion engine is even greater still.

External charging with the European electricity mix can cut CO_2 emissions by around 14 percent (approximate 5 tonnes) compared to the C 250 petrol model. Through the use of renewably generated hydroelectricity an even more impressive 41 percent reduction (15.1 tonnes) is possible.

Gauging other environmental effects, such as summer smog potential, acidification potential, and eutrophication potential, the C 350 e powered by hydro power also shows significant improvement over the life cycle. Overall, the C 350 e achieves meaningful improvements in environmental compatibility.

X-ray view of Mercedes-Benz C 350 e

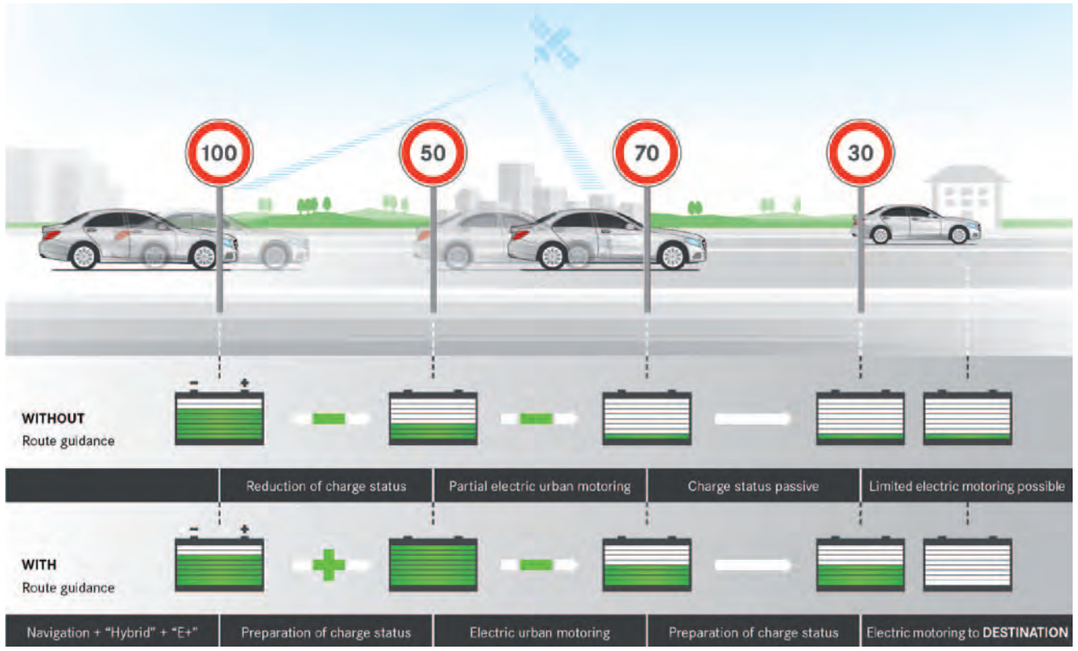
The key Plug-In Hybrid components



Clever strategists in the background

Working in the background, the intelligent powertrain management system in the C 350 e selects the ideal combination of combustion engine and electric motor automatically. Additionally, there are innovative functions such as the route-based operating strategy or the haptic accelerator pedal to help driving economically.

Driving the new C 350 e is as easy as any other automatic vehicle from Mercedes-Benz: simply climb in, start the engine and off you go. As you do so, enjoy its exemplary efficiency and, if you so wish, kick down to experience the superb acceleration of the electric motor



The complex technology employed in the C 350 e makes it no more difficult to drive than a conventional vehicle with automatic transmission. Working in the background, the intelligent powertrain management system selects the ideal combination of combustion engine and electric motor automatically. The C 350 e offers all the characteristics of a state-of-the-art hybrid vehicle. These include Silent Start, Boost (activation of the electric motor for accelerating) and Recuperation (when braking and rolling to a standstill, energy is recuperated and stored).

Those who wish can however control the hybrid interaction of the combustion engine and electric motor in the C 350 e themselves, by intervening manually to place the emphasis on economy, comfort or sportiness. For this, there are four operating modes (HYBRID, E-MODE, E-SAVE, CHARGE) and five transmission modes to choose from. They can be selected using operating mode and transmission mode switches on the centre console. A display shows the current setting.

The best strategy for efficient operation is anticipatory driving. The route-based operating strategy helps here in combination with COMAND Online: if the exact destination is known because the relevant data has been entered into the navigation system, charge and discharge of the high-voltage battery are controlled to ensure the optimal use of energy on the overall route. Another key point is the requirement that urban areas should be reached with a fully charged battery if possible, so that the vehicle can be driven efficiently in stop-and-go traffic - and frequently in electric mode.

One new feature in the C 350 e is the haptic accelerator pedal which helps ensure smooth driving in traffic and reduce fuel consumption. It even also uses the radar technology of the standard-fit proximity warning system. The haptic accelerator provides two pieces of information:

A route-based operating strategy is possible in combination with COMAND Online. Five transmission modes and four operating modes (left) can be selected manually

- If, when driving in electric mode, the driver's foot meets a point of resistance on the accelerator pedal, this is an indication that maximum electric performance is being delivered. If the driver presses the pedal any further, the combustion engine is also activated.

- If the radar system identifies a slower-moving vehicle ahead, it sends a double impulse through the haptic accelerator pedal to signal to the driver to take their foot off the accelerator. The vehicle will then adjust its deceleration automatically, using the electric motor to do so. In this way frequent braking, particularly in stop-and-go traffic, can be avoided.

Would you have known that...

...2005 Mercedes-Benz has received for the first time a Certificate from TÜV Süd Management Service GmbH for the comprehensive integration of environmental aspects into product development which are described in ISO standard TR 14062?

Reducing the environmental impact of a vehicle's emissions and resource consumption throughout its life cycle is crucial to improving its environmental performance. The environmental burden of a product is already largely determined in the early development phase. As part of the Mercedes-Benz development process, a DfE team ensures compliance with the secured environmental objectives. This team comprises specialists from a wide range of fields, e.g. life cycle assessment, dismantling and recycling planning, materials and process engineering, and design and production.

...52 components of the new C-Class are made from high-quality recycled plastics? Their total weight is exactly 49.3 kg.

This means that Mercedes-Benz has increased the weight of recycled material by 23 percent compared to the previous model. The recycled components include the wheel arch linings which are made mainly from the plastic polypropylene. Old starter batteries and bumper coverings are used for the recycled material.

...26.3 kg is the total weight of the C-Class components made from renewable raw materials?

A total of 76 components in the new C-Class are produced using natural materials. Their total weight has increased by 55 percent compared to the previous model. By way of example, paper is used in the boot floor, natural rubber for vibration dampers and bearing parts, and natural fibres for the door panelling.

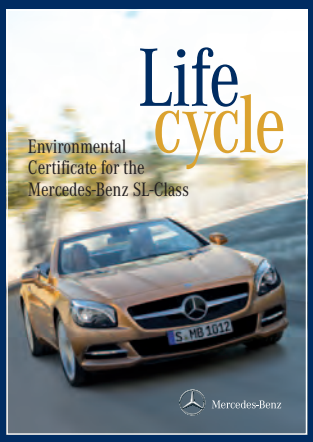
...1993 Mercedes-Benz introduced a take-back system, so it leads the way in the area of workshop disposal and recycling, too?

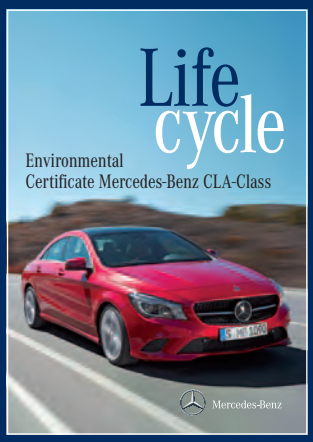
For convenient recycling, a comprehensive network of collection points and dismantling facilities is available to Mercedes customers. Owners of used cars can find out all the important details relating to the return of their vehicles via the free phone number 00800 1 777 7777.

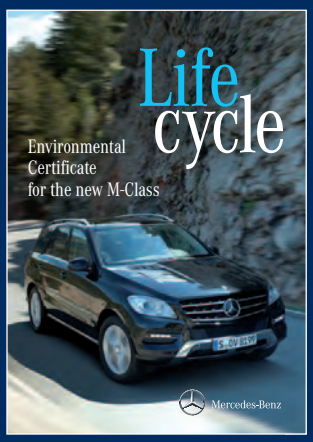
...33 years before the C 350 e arrived, Mercedes-Benz had already unveiled the first concept car with hybrid drive in the 190 model – the precursor to the C-Class?

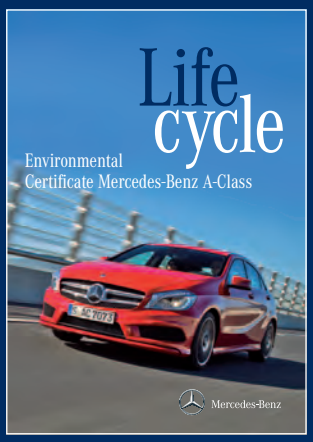
In this special version of the 190 model from the year 1982, a two-cylinder horizontally opposed engine was used to charge the battery. Many further test vehicles followed, culminating in 2009 with the debut of the world's first standard-production hybrid drive system with lithium-ion battery: for a long time this S 400 HYBRID was the most fuel-efficient petrol-powered luxury saloon and the most successful hybrid in its segment.

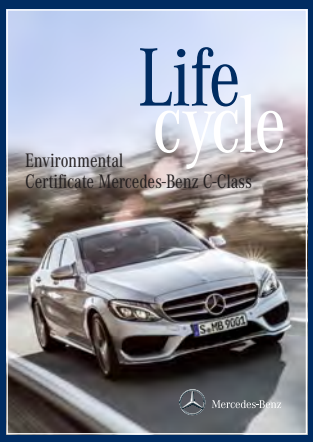
Lifecycle has been presenting and documenting the Environmental Certificates for Mercedes-Benz vehicles since 2009. If you're looking for detailed information about the complex matter of vehicles and the environment, you've come to the right place. The brochures are available for download from www.mercedes-benz.com.

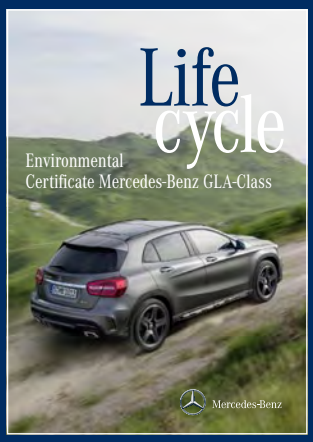


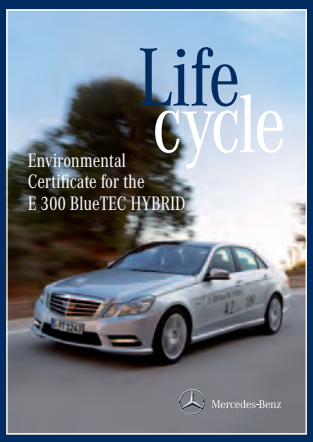


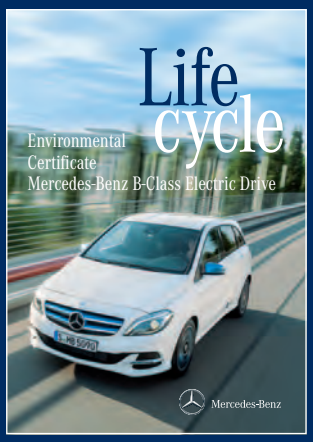


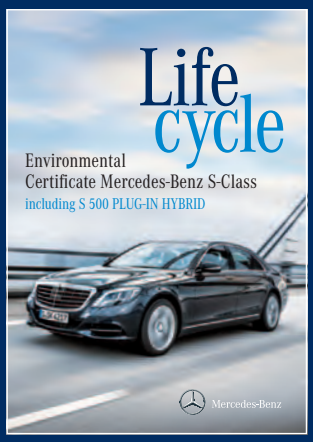












As early as 2005 the Mercedes-Benz S-Class was the first-ever vehicle to be awarded the Environmental Certificate from TÜV Süd.

For ten years now, Mercedes-Benz has been comprehensively analysing and documenting all environmentally relevant aspects of important new vehicles – from manufacture to recycling.

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