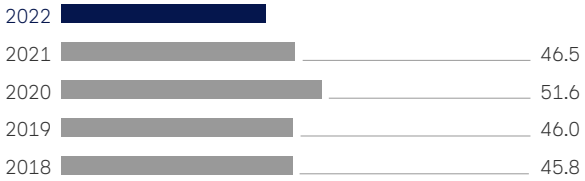
Specific further emissions broken down by passenger and cargo traffic

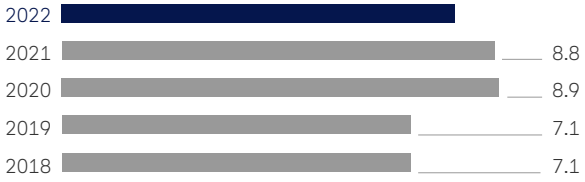
NO_x emissions

in grammes/100 passenger-kilometres (g/100 pkm) **40.7**



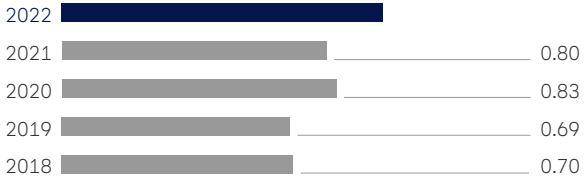
CO emissions

in grammes/100 passenger-kilometres (g/100 pkm) **8.0**



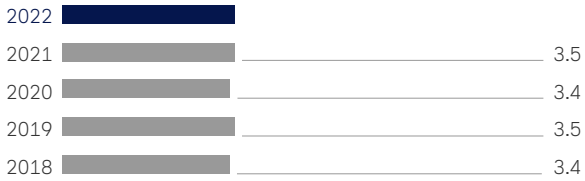
UHC emissions

in grammes/100 passenger-kilometres (g/100 pkm) **0.97**



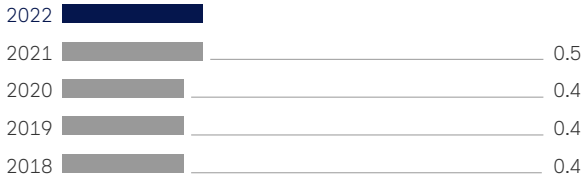
NO_x emissions

in grammes/cargo tonne-kilometre (g/tkm) **3.5**



CO emissions

in grammes/cargo tonne-kilometre (g/tkm) **0.5**



UHC emissions

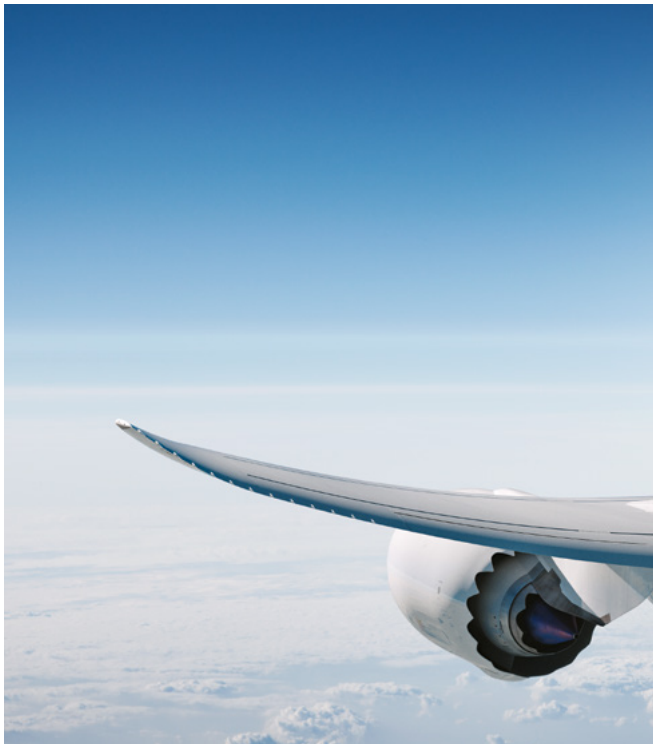
in grammes/cargo tonne-kilometre (g/tkm) **0.04**

Carbon footprint

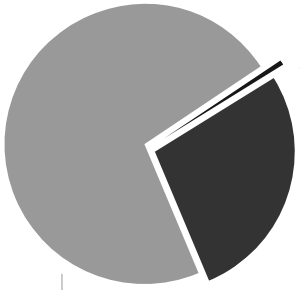
DIRECT AND INDIRECT CO_2 EMISSIONS OF THE LUFTHANSA GROUP IN COMPARISON[1]

in tonnes CO_2-eq

	2022	2021	2020
Scope 1	23,210,476 **71.9 %**	13,823,320 **74.2 %**	11,509,756 **76.0 %**
Scope 2	125,245 **0.4 %**	139,496 **0.7 %**	135,183 **0.9 %**
Scope 3	8,955,103 **27.7 %[2]**	4,667,549 **25.1 %**	3,491,821 **23.1 %**



DIRECT AND INDIRECT CO_2 EMISSIONS OF THE LUFTHANSA GROUP 2022



SCOPE 2

0.4 %

125,245 tonnes CO_2-eq

Indirect carbon emissions from electricity/energy purchased for ground operations, including catering and maintenance

SCOPE 3

27.7 %

8,955,103 tonnes CO_2-eq

Other indirect carbon emissions from the supply chain and from purchased services – here primarily included emissions from the kerosene supply chain and from the manufacture of aircraft and engines

SCOPE 1

71.9 %

23,210,476 tonnes CO_2-eq

Direct carbon emissions from the Lufthansa Group's air traffic and ground vehicles as well as its own power generation facilities

The greenhouse gas footprint indicates the total greenhouse gas emissions (Scope 1–3) of the Lufthansa Group (see certificate on p. 22). The use of Sustainable Aviation Fuel (SAF) reduced the Lufthansa Group's emissions with an impact on the climate by a total of 43,900[3] t in 2022 (well-to-wheel balancing[4])

Carbon footprint – Scope 3 emissions

The term "Scope 3" originates from the Greenhouse Gas Protocol, a widely used tool for measuring greenhouse gas emissions. Scope 3 includes emissions that are produced indirectly through activities in the upstream and downstream supply chain of a company rather than directly by the company itself. These emissions typically represent a significant portion of a company's total emissions – up to 80 % in some sectors. This makes it increasingly important for companies that want to reduce their environmental impact to address these emissions. Scope 3 emissions represent about 30–35 % of the Lufthansa Group's total carbon footprint. The vast majority of this (around 60 %) is caused by emissions from the kerosene supply chain – emissions caused by the production and transport of kerosene to the aircraft. Therefore each less tonne of kerosene consumed reduces the corresponding Scope 3 footprint in the kerosene supply chain. The measures taken by the Lufthansa Group, such as modernisation of the fleet towards fuel-efficient aircraft, are also consistently reducing its Scope 3 emissions. Greenhouse gas emissions in the supply chain can also be reduced through the use of sustainable alternative fuel (SAF) since its production and delivery generally produces fewer emissions.

1 Scope 1 for 2022 reporting year audited with high assurance. Scope 2 and 3 audited with limited assurance (see page 22). **2** The share of Scope 3 emissions in the Lufthansa Group's total carbon footprint increased compared with the previous year due to the expansion and improvement of data collection for Scope 3 emissions. **3** Of this amount, 40,400 tonnes were accounted for by direct savings in the combustion of SAF (Scope 1) and 3,500 tonnes by savings in the upstream supply chain (production and transport, Scope 3). Both figures refer to the comparison with the use of fossil kerosene. **4** Well-to-wheel balancing considers not only the CO_2 emissions from the combustion of the fuel or the source of energy, but also the emissions generated during the extraction, transportation and refining of crude oil or the generation of energy from renewable or non-renewable sources.

Methodology for calculating absolute and specific consumption and emissions

Kerosene in absolute terms

Kerosene consumption is calculated on the basis of actual flight operations (i.e. using actual load factors and flight routings) acording to the gate-to-gate principle. This covers all phases of a flight, from taxiing on the ground to flying detours and holding patterns in the air.

Emissions in absolute terms

The emissions from flight operations are calculated on the basis of actual transport performance and hence on actual load factors and the actual absolute quantity of kerosene consumed in the reporting year. Transport performance is measured in tonne-kilometres. For passengers and their luggage, an average of 100 kilograms is the standard estimate; for freight, it is its scale weight.

Carbon dioxide (CO_2) emissions do not require special calculation methods, as they are generated in a fixed ratio to the quantity of kerosene burned. The combustion of one tonne of kerosene generates 3.15 tonnes of CO_2.

Specific consumption and emission values

Calculating specific consumption and emissions entails expressing absolute values in relation to transport performance. For example, the ratio litres per 100 passenger-kilometres (l/100 pkm) is calculated on the basis of actual load factors along with the quantity of kerosene actually consumed. The distances used in the calculations are great-circle distances.
In combination flights (freight and passenger transport in one aircraft), fuel consumption is attributed on the basis of its share of the total payload to calculate the passenger- and freight-specific figures. Since 2013, the DIN EN 16258 standard has provided a framework for standardized calculation of greenhouse gas emissions for transport processes. The Lufthansa Group adheres to this guideline with respect to payload allocation. The Lufthansa Group would welcome a standardized, internationally harmonized and accepted method.

Verification statement Scope 1–3

VERIFICATION STATEMENT

verified by MÜLLER-BBM CERT GMBH

ISO 14064

Müller-BBM Cert
Umweltgutachter GmbH
Heinrich-Hertz-Straße 13
50170 Kerpen/Germany

Phone +49 2273 59280-188
Fax +49 2273 59280-11
info@mbbm-cert.com

muellerbbm-cert.de

A MEMBER OF MBBM MÜLLER-BBM GROUP

Müller-BBM Cert Umweltgutachter GmbH, accredited verification body DAkkS D-VS-18709-01-01, confirms that greenhouse gas balance according to the GHG Protocol of the

LUFTHANSA GROUP

Deutschen Lufthansa AG and affiliates*

audited according to the requirements of ISO 14064-3 and the information in the figure "Direct and indirect CO_2 emissions of the Lufthansa Group 2022" on page 21 of the Factsheet Sustainability 2022 was verified with the following uncertainties:

Scope 1 fossil	(reasonable assurance, 2% materiality)	23.170.076 t CO_{2eq}
Scope 1 biogenic***	(reasonable assurance, 2% materiality)	40.400 t CO_{2eq}
Scope 2**	(limited assurance, 5% materiality)	125.245 t CO_{2eq}
Scope 3****	(limited assurance, 10% materiality)	8.955.103 t CO_{2eq}

Kerpen, April 14th, 2023

Müller-BBM Cert Umweltgutachter GmbH

* Companies in the scope:
Deutsche Lufthansa AG, Lufthansa Cargo AG, Lufthansa Technik AG, Lufthansa CityLine GmbH, Swiss International Air Lines AG, Edelweiss Air AG, Brussels Airlines SA/NV, Austrian Airlines AG, Air Dolomiti S.p.A. Linee Aeree Regionali Europee, Germanwings GmbH, Eurowings Aviation GmbH, Eurowings Europe Limited, Eurowings Discover GmbH, Eurowings Europe GmbH, LSG Lufthansa Service Holding AG, Lufthansa AirPlus Servicekarten GmbH, Lufthansa Global Business Services GmbH, Lufthansa Seeheim GmbH, Miles & More GmbH, Lufthansa Process Management GmbH, Lufthansa Systems GmbH & Co.KG, Lufthansa Industry Solutions GmbH & Co.KG, Lufthansa Aviation Training GmbH, LZ-Catering GmbH, Lufthansa Global Tele Sales GmbH, EFM Gesellschaft für Enteisen und Flugzeugschleppen am Flughafen München GmbH, AeroLogic GmbH, SunExpress (Günes Ekspres Havacilik A.S.), N3 Engine Overhaul Services GmbH & Co. KG und EME Aero.

** market based

*** Note: These biogenic CO2 emissions reflect reduced fossil CO2 emissions in Scope 1 from use of certified biogenic sustainable aviation fuel. These reductions were realized for defined customers of LHG (incl. customers on codeshare flights of associated LHG partners) and exclusively allocated to them. They shall therefore not be claimed regularly and in principle by all LHG customers.

**** Includes changes of emissions from purchased fuels due to switch from fossil fuel to sustainable aviation fuel.