



**LUFTHANSA GROUP**

**Report 2022**

**TCFD**



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Lufthansa Group believes that governments, companies, and investors have a responsibility to mitigate the impacts of a changing climate and facilitate a transition to a climate-resilient economy.

Lufthansa Group committed to align with the **Taskforce on Climate-related Financial Disclosures (TCFD)** recommendations, to help understand the impacts of climate change on its business model. The TCFD provides a framework to improve the disclosure of consistent, reliable, and clear climate-related financial information so that investors can make better capital allocation decisions in support of the transition to a low-carbon economy.

The 2022 TCFD disclosure builds on previous year's disclosures, which can be found in the corresponding sustainability and non-financial reports published by Lufthansa Group. This disclosure is also made in respect to Lufthansa Group's role as a globally operating air transport company that plays a leading role in its home markets in Europe.

For the financial year 2022, we have prepared the following table to summarize how Lufthansa Group aligns with the TCFD recommendations.

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GOVERNANCE

A.

**Describe the board's oversight of climate-related risks and opportunities**

### Supervisory Board

The highest monitoring body for sustainable management is the Supervisory Board. Effective 1<sup>st</sup> January 2023, the Supervisory Board established an ESG Committee to advise the Supervisory Board, its committees, and the Executive Board on environmental, social, and good governance issues that are essential to the sustainable economic development of the company. The ESG Committee will meet twice a year. The Supervisory Board elected Erich Clementi, Benjamin Koch, Ilja Schulz and Angela Titzrath as members of the ESG Committee and Erich Clementi as the Chairman of this committee.

### Chief Sustainability Officer

The Executive Board member in charge of Lufthansa Group's Brand & Sustainability function - the Chief Sustainability Officer (CSO) - is responsible for identifying and assessing the Company's climate-related risks and opportunities, strategy, metrics and target setting. Climate-related issues are monitored at Executive Board meetings which take place twice a month.

### Corporate Responsibility Department

The Corporate Responsibility department reports directly to the Chief Sustainability Officer and is primarily responsible for ESG strategy, ESG reporting and ratings, customer concerns and ESG communication in cooperation with the respective departments of Lufthansa Group. The Head of the Corporate Responsibility department reports to the Chief

**Lufthansa Group Annual Report 2022**,  
- Report of the Supervisory Board (p.11)

**Annual Report 2022 (Combined non-financial declaration)**, - Organisational foundations and responsibilities (p.96ff.)

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Sustainability Officer on monthly basis on progress in relation to decisions taken by Lufthansa Group on sustainability and climate change strategies.

### **Executive Board and Group Executive Committee**

A Strategic Roadmap Discussion (SRD) was held in the reporting year to discuss sustainability topics impacting the environment in greater detail. The SRD is an established format in which relevant strategic topics are discussed on a yearly basis with the Executive Board of Lufthansa Group. The definition of priorities and the further development of sustainability-related activities within Lufthansa Group took place during the reporting year in the context of the Group Executive Board's meetings, as well as in the Group Executive Committee (GEC). The GEC, which is chaired by the Chief Executive Officer, is a senior management level committee and consists of the Executive Board of Deutsche Lufthansa AG, the CEOs of the segment parent companies and the main passenger airlines and the heads of the Group's Strategy and Communications departments.

### **Group Policy Committee**

The Group Policy Committee (GPC), chaired by the Chairman of the Executive Board, discusses politically significant issues, including those relevant to sustainability, and prepares decisions. Individual managers within the committees are responsible for implementing concrete activities and projects.

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		<p><b>Sustainability Circle</b></p> <p>The Sustainability Circle, headed by the Corporate Responsibility department, was established in 2021. The sustainability circle holds monthly meetings with an objective to promote a Group-wide exchange on sustainability topics, this also includes climate-related strategies, risks and opportunities. The members of this circle are the Corporate Responsibility Officers of the Group companies and relevant Group functions.</p> <p>In addition, the Executive Board has final oversight of the combined non-financial declaration that includes the climate / environmental strategy, organization, management, measures and targets. The Supervisory Board commissioned a limited audit review of the combined non-financial declaration.</p>	
GOVERNANCE	<p><b>B.</b></p> <p><b>Describe management’s role in assessing and managing climate-related risks and opportunities</b></p>	<p>The Head of the Corporate Responsibility department – who reports directly to the Chief Sustainability Officer - is responsible for assessing climate-related risks and opportunities as well as overseeing the climate protection strategy. The Corporate Responsibility department is developing appropriate measures, while working closely with the various departments and business units of the Lufthansa Group. To address the growing importance of carbon accounting, and environmental legislation, and to provide relevant information on regulations and interpretations to the affected departments and employees, the Corporate Responsibility and Group Controlling departments have established the Emissions Management Committee. This committee regularly discusses current</p>	<p><b>Annual Report 2022 (Combined non-financial declaration),</b> Environmental Concerns (p.98ff.)</p> <p><b>CDP Report 2022,</b> C1.2, C1.2a</p>

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		<p>developments in national and supranational emissions legislation and estimates their financial impacts.</p> <p>The risks and opportunities derived from a quantitative climate scenario analysis – which was conducted in 2022 - are being discussed with the departments involved and will be brought to the attention of management through established governance processes.</p> <p>The Head of Corporate Responsibility is the risk owner of climate-related risks, including those estimated in the quantitative scenario analysis. Climate-related risks and opportunities are identified and assessed by the Corporate Responsibility department, in conjunction with the Group Risk Management department. Climate-related risks are reported and monitored within Lufthansa Group's Risk Management System. The risk assessment is conducted quarterly. The top risks are reported to the Executive Board on a quarterly basis and discussed annually in the Audit Committee of the Supervisory Board.</p>	
STRATEGY	<b>A.</b> <b>Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term</b>	<p>Climate change can influence Lufthansa Group's business strategy in two distinct ways. First, by causing climate-related business risks, whether physical, political, market or reputational. Second, by creating business opportunities that could arise from the transition to a low-carbon future.</p> <p>The transition to a low-carbon future poses fundamental strategic challenges for the aviation sector. This transition could affect Lufthansa Group's financial outlook, whether directly e.g., through changes in taxation and regulation, or indirectly through changes in customer behavior.</p>	<p><b>Lufthansa Group Annual Report 2022, - Opportunities and risk report (p.75ff.)</b></p> <p><b>Annual Report 2022 (Combined non-financial declaration), - (p.8, p.103)</b></p>

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The process for identifying, assessing and responding to climate-related risks and opportunities is integrated into the multi-disciplinary company-wide risk management process.

The following risks and opportunities have been identified over the short, medium and long term (short-term: 0-1 years, medium-term: 1-3 years, long-term: 3-10 years):

### Transition Risks

In 2022, Lufthansa Group analysed climate-related risks through a qualitative analysis of transition risks based on the IEA ETP 2020 Sustainable Development Scenario, with a timeframe of up to 10 years. Relevant climate-related risks to the company could be market, reputation, policy and legal as well technology related.

#### Market

A high market risk impact could result if passengers shift their preferred mode of transport from air transport to (high-speed) rail and if lower than expected passenger growth in certain regions (e.g., within Europe) could occur. Furthermore, competitive pressure and higher fuel costs pose a risk that would result in older and less efficient airplanes having to be retired earlier than anticipated, resulting in an impairment of their residual value.

#### Reputational

There may be a reputational risk due to increased negative public sentiment on airline transport and behavioral changes in society (flight shaming).

**CDP Report 2022,**  
C2.1 – C3.1f

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Additionally, corporate customers could reduce or shift business travel away from air transport.

### Policy and legal

A high policy risk impact may come from increased carbon pricing, fuel taxes, changing energy efficiency standards and a stronger policy focus on rail transport, making air transport less competitive. These risks could increase significantly with heterogeneous CO<sub>2</sub> pricing and increasing sustainability legislation across countries and regions.

### Technological

Technology risks and opportunities include new aircraft technologies and retrofits as well as Sustainable Aviation Fuels (SAF). Consequently, capital expenditures and expenses may increase. Currently, certified Sustainable Aviation Fuels can be used without modification in existing aircraft and supply infrastructure.

Lufthansa Group's Risk Management System ranks "Regulatory risks in connection with climate change" as a top risk for Lufthansa Group in the 2022 Lufthansa Group's Opportunities and Risk Report. It is classified as a qualitative risk with a substantial significance and extreme magnitude.

In more detail, this refers to the risk that emission-related costs will increase. Since 2012, air traffic within the EU has been part of the EU Emissions Trading Scheme (EU ETS). The emissions trading schemes of Switzerland (CH ETS, January 2020) and the United Kingdom (UK ETS, January 2021) for flights between the EEA and Switzerland and the United



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Kingdom have imposed additional obligations to surrender emission allowances.

Furthermore, there is a risk of rising costs or additional requirements during the legislative package "Fit-for-55" published by the EU Commission, which aims to ensure the reduction of CO<sub>2</sub> emissions by 55% compared to 1990. Aviation is particularly affected by the revision of the Emission Trading System (ETS). The proposal seeks to introduce a blending quota for Sustainable Aviation Fuels (SAF) as well as the proposal for the abolition of mandatory exemption for taxation and the introduction of a uniform minimum taxation on aviation fuels, used for intra-EU flights.

The planned introduction of a SAF blending quota could also lead to further distortion of competition in long-haul traffic. Airlines from outside the EU with transfer stops near the EU could then continue to use unblended fuel for part of the journey. The proposed ban on tankering, i.e., carrying fuel for the return/onward flight, would stop airlines from protecting themselves against unjustified price differences for fuel at EU airports.

The harmonization of EU-ETS and Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) has not been completely clarified yet and the risk that emissions related to the same flight need to be offset under both schemes persists. According to the latest political developments, this double burden has become less likely. Intra-EU traffic should therefore only fall into the EU-ETS and not duplicated in CORSIA. The EU-ETS has already led to a distortion of competition due to higher cost related to EU regulation, which would be exacerbated by the aforementioned measures.

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### Physical Risks

In a preliminary analysis, Lufthansa Group has identified both potential chronic and acute physical risks. Chronic physical risk, such as a higher average temperature, can potentially lead to lower passenger and cargo loads due to aircraft performance restrictions. For example, temperature-related take-off weight limitations and /or the need for increased fuel uplift to cope with unexpected weather-related rerouting due to more frequent and severe thunderstorms might reduce the available payload on those flights.

A shift of large-scale circulation patterns, such as the jet stream, could lead to changes of flight time and flight routings. In conjunction with increased atmospheric turbulence, longer flight times are likely to occur. Acute physical risk can potentially impact aircraft during take-off and landing as well as en-route. An increased number of local thunderstorms, stronger surface winds, more frequent fog conditions, heatwaves, more frequent cyclones and atmospheric turbulences could affect passenger comfort and safety as well as induce large-scale re-routings or flight cancellations.

Overall, physical climate risk could affect aircraft performance, cause re-routings and temporary closure of airspaces and airports as well as damage / destruction of infrastructure and aircraft with negative effects on cost and earnings for Lufthansa Group.

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### Opportunities

The short and medium-term opportunities Lufthansa Group identified were more efficient production processes, e.g., using more efficient or lower emissions aircraft (airframes and engines), improved air traffic management based on international agreements, and taking part in upcoming national research projects and EU projects linked to the EU Green Deal, such as the EU-ETS innovation fund. Intelligent routing and smart technologies could reduce energy intensity and operational expenses and support climate-optimized flying. Driven by the current climate change discussions, further opportunities may also arise from accelerated railway infrastructure projects at hub airports, having the potential to increasingly replace cost- and CO<sub>2</sub> intensive short-haul feeder flights with train services. Lufthansa Group is seizing this opportunity by stepping up its cooperation, not only with Deutsche Bahn but also with Austrian Railways, Schweizerische Bundesbahnen and various bus operators. Deutsche Bahn joined the Star Alliance in 2022, making it the world's first intermodal partner in an air transport alliance.

Long-term opportunities include the use of lower-emission sources of energy, i.e., Sustainable Aviation Fuels and the reduction of the use of fuel by investing in a modern and efficient fleet and working together with Lufthansa Group's upstream supply chain, i.e., contributing practical know-how to developing new types of aircraft or the innovation generated by the Lufthansa Group CleanTech Hub.

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Further details and additional information on climate-related risks and opportunities can be obtained from the CDP 2022 report.

### Scenario analysis

In order to better assess the effects of climate-related risks and opportunities on Lufthansa Group's business, a targeted quantitative scenario analysis was conducted in 2021/2022. The results of the scenario analysis have been considered in strategic and financial decisions. Lufthansa Group plans to conduct another quantitative scenario analysis in 2023.

Two selected climate scenarios developed by the International Energy Agency (IEA) were chosen to assess the quantitative effects selected risks have on Lufthansa Group's financial performance:

1. Well-below 2 degrees (~1.8°C)
2. Stated policies scenario (~2.7°C)

These scenarios use concrete assumptions such as global GDP growth, population developments, the relative use of different energy sources (renewables versus fossil), CO<sub>2</sub> price development and the penetration of SAF in air traffic to model energy systems and industries consistent with the respective underlying level of global warming.

These scenarios were linked to hot spots defined by Lufthansa Group and corresponding parameters of a previously created qualitative scenario heatmap. The Lufthansa Group's climate goals adopted in 2021 (for 2030

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and 2050, with 2019 as the base year) were defined as time frames. Several further internal and external sources were also used to analyse the effects on passenger and freight transport. The two hot spots that were subjected to quantitative analysis are:

1. Potential increase in operating costs due to rising CO<sub>2</sub> and increased use of Sustainable Aviation Fuels (SAF)
2. Potential change in market demand driven by higher ticket prices (from hot spot 1) and subsidies for other modes of transport which could increase modal shift e.g., air transport to rail transport

Important parameters relevant for the quantitative results were CO<sub>2</sub> and oil price development. Basic macroeconomic factors affecting transport demand were also included in the analysis. Likewise, technological assumptions relevant to the quantitative results such as continuous fleet modernisation and increasing SAF quotas were considered. By calculating external costs, different impact categories can be compared, and their relevance can be assessed. The analysis showed that for Lufthansa Group, the most dominant cost driver is the development of oil and SAF price, which exceed the costs for carbon emissions especially in the medium term.

In the 1.8°C scenario, which is based on an ambitious decarbonization pathway, the costs associated with this decarbonization scenario increase significantly by 2050. However, assuming no regulatory interference in market pricing, oil prices decrease because of lower general market demand in this scenario. SAF shares increase to almost 50% by 2050. In

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total, these effects could lead to only a slight increase in operating expenditure (OPEX) in the medium-term for the passenger fleet of Lufthansa Group. The long-term effects on OPEX remain insignificant.

In the 2.7°C scenario, CO<sub>2</sub> prices rise more slowly. However, higher demand for crude oil in this scenario means that fuel costs increase, potentially inducing a significant increase in OPEX both in the medium and long term. In both scenarios, the global demand for passenger transportation volume increases with global population and economic growth (especially in economically developing regions). Increased OPEX originating from hotspot 1 might threaten this development. Moreover, in this model a homogeneous implementation of CO<sub>2</sub> prices across regions and sectors was assumed. The risks related to regional differences in policy approaches and the related distortion of competition therefore exists and should be examined more closely in the next scenario analysis, which is planned for the year 2023.

Regarding the quantitative impacts of changing transportation markets resulting from shifting demand patterns and subsidy structures, both climate scenarios show an increase in demand for passenger transportation. In the 2.7°C scenario, less emphasis is put on the extension of regional rail networks and subsidy structures for alternatives to air transport compared to the 1.8°C scenario. Thus, higher demand increase can be expected in the 2.7°C scenario.

Increasing climate regulation like carbon pricing, energy efficiency standards, as well as aviation (and fuel) taxes may lead to increasing expenditures for buying new airplanes and for higher operational costs

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		<p>especially for older (less efficient) aircraft. Higher operational cost and lower margins could also result from mandatory Sustainable Aviation Fuel blending quotas, which might be more expensive than conventional fuels.</p> <p>Policy constraints (e.g., regarding the energy efficiency of the fleet, banning of short flights) may lead to early write-offs of equipment and an expansion of Lufthansa Group's investment in research and development. The above-mentioned risks generally affect the entire aviation sector, but due to geographically heterogeneous regulations in the individual countries / regions, the effects on competitiveness are likely to be significantly different, e.g., EU vs. non-EU carriers. In addition, there is a risk that ground-based means of transport, especially rail-based transport, will be significantly less affected by the regulations and thus gain competitive advantages. Both the qualitative and quantitative scenario analysis showed that Lufthansa Group's current strategy already reflects many of these findings, with climate-related issues affecting its products and services, its value chain, investments in R&amp;D and its operations.</p>	
STRATEGY	<p><b>B.</b></p> <p><b>Describe the impact of climate-related risks and opportunities on the organization's businesses,</b></p>	<p><b>The Lufthansa Group reduction path until 2030</b></p> <p>With its SBTi validation in 2022, Lufthansa Group was the first airline group in Europe with a scientifically based CO<sub>2</sub> reduction target in line with the goals of the Paris Climate Agreement of 2015. Specifically, Lufthansa Group has aligned its policies with SBTi criteria (Well below 2°C) and committed to reducing its CO<sub>2</sub> intensity, i.e., its CO<sub>2</sub> emissions per transported tonne-kilometre (passenger and freight), by 30.6% from</p>	<p><b>Annual Report 2022 (Combined non-financial declaration), -</b> (p.100-p.110)</p> <p><b>CDP Report 2022,</b> C2.3a – C3.1f.</p>

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### strategy, and financial planning

2019 to 2030. Beyond this reduction required by the SBTi targets, the Group will achieve its self-imposed target of cutting net CO<sub>2</sub> emissions in half by 2030 compared to 2019 by also including voluntary offsets. In the long run, Lufthansa Group strives to be carbon-neutral by 2050.

From Lufthansa Group's perspective, the science-based reduction targets represent the framework for a clearly defined roadmap to future-proof sustainable growth. Lufthansa Group's reduction path explains the plan to achieve this and how the business will develop accordingly. This path defines the main levers – fleet, operations and Sustainable Aviation Fuels – based on which Lufthansa Group intends to decarbonize airline operations and to achieve its targets. It is flanked by numerous investments and partnerships to drive emissions reduction in the short to medium term and support the development of technology that is required in the long term.

The strategy and the outline of the ambition is governed by the Corporate Responsibility department in close cooperation with relevant business units and functional departments. The Executive Board has the final oversight of the climate / environmental strategy, organization, management and execution. Details regarding governance and oversight are presented in chapter A “Governance”.

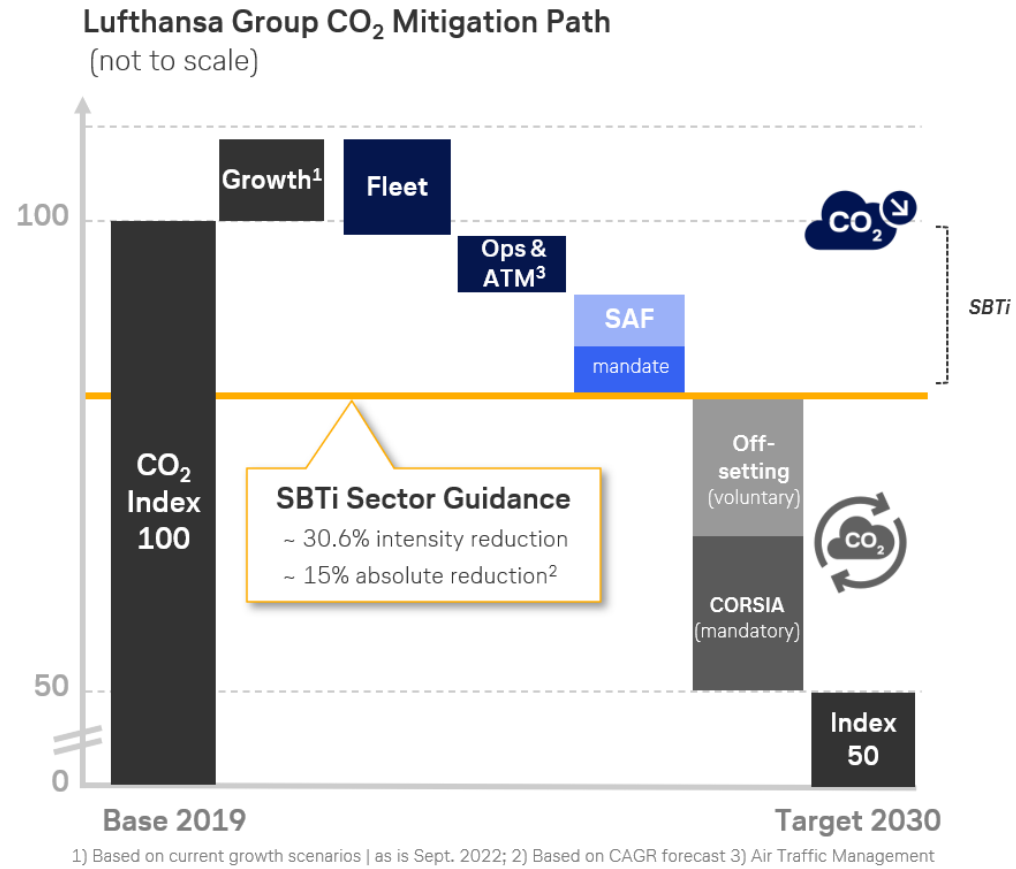
**Sustainability Fact Sheet 2022**, (p.4, p.8-p.10)



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### Fleet renewal is continuously driven forward

Fleet renewal remains the key driver for reducing CO<sub>2</sub> in the short and medium term. Lufthansa Group continuously invests (over 2.0bn EUR annually until 2030) in modern, fuel-efficient aircraft and engine technologies, which represent the most important element in reducing CO<sub>2</sub> emissions from flight operations. In 2022, a total of 24 aircraft went into service with the Lufthansa Group airlines, including Airbus A320neos, A321neos, A350-900s, Boeing 787-9s and Boeing 777Fs, which are powered by modern engines. In turn, a total of 27 older aircraft were removed from the Group fleet.

### Technical measures for the existing fleet

Measures to technically modify the existing fleet are also constantly examined and implemented in cooperation with partners from research and industry where appropriate. The AeroSHARK surface coating developed by Lufthansa Technik and BASF Coatings GmbH, reduces the air resistance of every aircraft. In 2022, the AeroSHARK technology was further improved and approved for mass production. Both SWISS and Lufthansa Cargo will fit all aircraft of these two types with AeroSHARK, which will save about 8,400 tonnes of fuel and about 26,600 tonnes of CO<sub>2</sub> annually.

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### Increasing the use of Sustainable Aviation Fuel (SAF)

Demand for SAF from private and corporate customers continued to rise in the reporting year. The key factors behind this demand included user-friendly integration in the booking platforms in the private customer segment as well as the expansion of services offered in the business travel segment as well as airfreight. Lufthansa Group has developed a proprietary process for this purpose, which, as part of emissions reporting in accordance with the Greenhouse Gas Protocol, allows Scope 1 emission reductions to be passed on as Scope 3 emission reductions to customers who are willing to pay the additional price for SAF.

Lufthansa Group uses partnerships to drive research projects on Sustainable Aviation Fuel. To safeguard the supply of SAF in the long term, Lufthansa Group has developed a three-pronged strategy:

1. In the short term, up to USD 250m has been released for the procurement of SAF on the spot market by decision of the Executive Board
2. In the medium term, options for long-term supply commitments are under consideration around the world. These offer significant production volumes and security of supply from around 2025 onwards
3. In the long term, Lufthansa Group will provide support for innovative supply concepts with the goal of transforming today's start-ups and developers into tomorrow's suppliers. In this reporting year, SWISS

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consequently made a financial investment in Synhelion, a manufacturer of solar fuels, with the aim of accelerating the market launch of the technology

### Operational measures

In 2022, the OPS Sustainability Programme was implemented to help achieve the CO<sub>2</sub> reduction targets for 2030. It was launched by the experts from the Operations Efficiency department in cooperation with all flight operations of the Lufthansa Group and will run until 2030. Measures to improve efficiency are being implemented in several areas of action along the operational production chain – from flight preparation to in-flight optimisation measures and handling services on the ground to the data-based evaluation of completed flights. The reductions in CO<sub>2</sub> emissions achieved in the OPS Sustainability Programme will be continuously tracked and reported, which makes them an essential building block for achieving Lufthansa Group's SBTi targets.

In the reporting year, a further 24 fuel-saving projects were under way across the Group and another 33 thousand tonnes of CO<sub>2</sub> emissions were permanently eliminated. More efficient concepts for take-off and landing are being implemented and the digitalisation of approach technologies are being advanced. Lufthansa Group collaborates with the German air traffic control (Deutsche Flugsicherung, DFS) to identify efficiencies. For example, Lufthansa German Airlines used a new fuel-saving RNP approach route in Frankfurt in 2022. Lufthansa German Airlines realised additional fuel savings of c.90 tonnes in 2022 by optimising the planned flight paths for arrivals and departures in Munich.

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### Economic instruments

Economic measures for climate protection, such as the mandatory Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) and voluntary offsetting of CO<sub>2</sub> are vitally important whilst Sustainable Aviation Fuel and propulsion technologies are not available in sufficient quantities. In addition to voluntary offsets by the Company, Lufthansa Group is continuously expanding the possibilities for customers to offset carbon emissions. It is worth mentioning that offsets cannot be counted as emissions reductions towards near-term science-based targets.

Lufthansa Group expanded its existing options for voluntary offset of CO<sub>2</sub> by passengers in 2022. This includes both the opportunity to reduce emissions directly by purchasing Sustainable Aviation Fuel, and to offset them via long-term projects to protect the climate. Since 2019, Lufthansa Group has been offsetting the carbon emissions of all employees' business flights globally. In 2022, 50,651 tonnes of CO<sub>2</sub> were offset via the climate protection organisation, myclimate.

### Innovation and research

The CleanTech Hub was founded by Lufthansa Group in 2021 and provided with financial resources to promote innovative projects in the field of sustainability. Additionally, in 2021 Lufthansa Technik and its partners initiated a project funded by the Hanseatic City of Hamburg in which extensive maintenance and ground processes for handling hydrogen technology were designed and tested. In 2023, an Airbus A320

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	<p>will serve as a fully functional permanently sited laboratory and be equipped with a liquid hydrogen (LH<sub>2</sub>) infrastructure.</p> <p>Experts from Lufthansa German Airlines and Lufthansa Technik joined forces with a research partner in 2022 to fit the third long-haul jet with the IAGOS Core Measurement System. This compact system will be permanently installed on an A350 in the future and will analyse, among other parameters, the ozone, carbon monoxide and water vapour in the atmosphere on every flight.</p> <p>The new D-KULT research project on the feasibility of climate-optimised flight routes was launched in 2022. The project was developed in a collaboration between Lufthansa Group, the DLR, DFS, the German Meteorological Service (DWD), Airbus and other partners and is funded by the German Federal Aviation Research Programme. SWISS participated in a project that has applied for EU for funding. From 2023 onwards, this project will focus on reducing non-CO<sub>2</sub> effects, such as those caused by condensation trail cirrus clouds.</p>		
STRATEGY	<p><b>C.</b></p> <p><b>Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios,</b></p>	<p>As part of the strategy process, Lufthansa Group analysed various industry- and macro trends to model different possible future states of the aviation industry. One key trend considered in all future states is sustainability, largely driven by climate-related market and policy risks (e.g., changing customer behavior, emissions-based taxes / fees, potential ban of ultra-short-haul flights). The base case assumes a gradual evolution of all relevant trends, whereas the "sustainability and social responsibility" case assumes that such trends (e.g., ban of domestic flights) become more relevant quickly or even turn dominant. The analysis identified success</p>	<p><b>Annual Report 2022 (Combined non-financial declaration), - (p.100-p.110)</b></p> <p><b>CDP Report 2022, C2.3a – C3.1f.</b></p>

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**including a 2°C or lower scenario**

factors and key skills necessary to successfully master the transition. Taking into consideration intense cost competition and the so far limited willingness of customers to pay for environmentally friendly flying, turning sustainability measures into value contributing business cases will be key to achieve Lufthansa Group's targets of being CO<sub>2</sub>-neutral by 2050 and reducing net CO<sub>2</sub> emissions by half by 2030.

In 2021/2022, Lufthansa Group conducted a qualitative and quantitative scenario analysis to understand the potential impact of climate change on its business and to inform its strategy and financial planning, increasing the resilience of Lufthansa Group.

Lufthansa Group used two recognized IEA climate scenarios (Well Below 2°C Scenario ~1,8°C" and the "Stated Policies Scenario ~2,7°C) to model the potential business and financial impact of two selected hot spots on its business in 2030 / 2050. Measures to strengthen and more closely integrate risk management and strategic planning were identified and discussed.

Lufthansa Group is currently preparing for the future legal requirements of the Corporate Sustainability Reporting Directive (CSRD). As this directive will have a fundamental impact on the interaction of risk management, financial planning and climate impact, the findings from the scenario analysis will be incorporated there.

The results of the quantitative scenario analysis confirm that Lufthansa Group's strategic initiatives (see above) are suitable to minimize the respective risks and to create opportunities.

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RISK  
MANAGEMENT

**A.**  
**Describe the organization's processes for identifying and assessing climate-related risks**

Lufthansa Group has implemented a systematic Enterprise Risk Management (ERM) process at Group level and at the level of larger Business Units within the Group. It aims to fully identify material risks, to present and compare them transparently and to assess and manage them. Climate-related risks and opportunities are integrated into Lufthansa Group's multi-disciplinary company-wide risk management process. Risk owners are obliged to monitor risks proactively and to include relevant information in the planning, steering and control processes.

The Group guidelines on risk management, approved by the Executive Board, define all the binding methodological and organizational standards for dealing with opportunities and risks. Risks are assessed by the respective risk owners and aggregated in a risk map by the risk management department. This process considers all kind of risks, i.e., risks related to climate change – including physical and transitional risks. Risk owners are obliged at least once a quarter to verify that the risks for which they are responsible are complete and up to date. The risk map is updated quarterly in close cooperation with different committees/departments throughout Lufthansa Group. Thereby it is ensured that various professionals and environmental experts evaluate the climate-related risks.

Based on their assessment, the financial and strategic impact on the Group from climate-related risks are made transparent. The methodological evaluation of risks within the Enterprise Risk Management at Lufthansa Group distinguishes between qualitative and quantitative risks. Financial impacts of climate-related risks are quantified where possible. Otherwise, they are described as qualitative / strategic risks. Qualitative risks are long-

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term developments and challenges with potentially adverse consequences for Lufthansa Group. At Lufthansa Group there are several processes in place to identify and assess different kinds of climate-related risks, both at group level and individual subsidiary level.

### Regulatory risks

Lufthansa Group has a dedicated department (Corporate Responsibility) that regularly monitors environmental policy and regulatory developments (e.g., through regular dialog with relevant authorities and policy makers) and analyses these developments for potential implications on the Group and its subsidiaries.

### Physical risks

Lufthansa Group has dedicated experts within the Corporate Responsibility department who are in a continuous dialogue with climate scientists and research institutions (e.g., German Aerospace Centre - Deutsches Zentrum für Luft- und Raumfahrt). Since 1994, Lufthansa Group actively participates in research projects aiming at understanding climate and atmospheric changes and their effect on air traffic. Examples see above. By these processes, Lufthansa Group experts (engineers, active pilots, scientists up to Ph.D.) can identify and assess potential physical long-term climate change risks for Group as well as potential measures to reduce, counter or adapt such risks.

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		<p><b>Reputational risks</b></p> <p>To identify and assess potential reputational climate-related risks, Lufthansa Group regularly conducts broad stakeholder surveys on sustainability matters. The responses of the stakeholders are combined with management’s assessments in a materiality matrix, which is updated on a yearly basis. Additionally, Lufthansa Group monitors relevant media reporting on climate and aviation related topics to identify potential reputational risks for the Lufthansa Group and its subsidiaries.</p>	
<p>RISK MANAGEMENT</p>	<p><b>B. Describe the organization’s processes for managing climate-related risks</b></p>	<p>Key business units and climate risk owners cooperate in managing climate-related risks and opportunities as part of Lufthansa Group’s integrated approach.</p> <p>Additionally, specialists from the Corporate Responsibility department coordinate climate-related research activities and support and facilitate climate risk and climate opportunity management activities across the Group.</p> <p>As and when required, the GEC (Group Executive Committee, see GOVERNANCE A.) handles climate-related issues at an Executive Board level.</p>	<p><b>Lufthansa Group Annual Report 2022</b>, - Opportunities and risk report, (p.75ff.)</p> <p><b>Annual Report 2022 (Combined non-financial declaration)</b>, - (p.98ff.)</p> <p><b>CDP Report 2022</b>, C2.2a</p>

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RISK MANAGEMENT	<p><b>C.</b></p> <p><b>Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management</b></p>	<p>The systematic Enterprise Risk Management of Lufthansa Group as described in GOVERNANCE A. considers all relevant risks, i.e., also risks related to climate change – including physical and transitional risks. The results of the quantitative scenario analysis mentioned in STRATEGY A. contribute, amongst other factors, to a better assessment of the previously identified climate-related risks. Furthermore, the quantitative scenario analysis highlights that climate-related risks and opportunities must be analysed regarding their short-, medium- and long-term effects.</p> <p>Lufthansa Group is currently preparing for the future legal requirements of the CSRD. As this directive will have a fundamental impact on the interaction of risk management, financial planning and climate impact, the findings from the scenario analysis will be incorporated there.</p>	<p><b>Lufthansa Group Annual Report 2022,</b> - Opportunities and risk report, (p.75ff.)</p> <p><b>CDP Report 2022,</b> C2.2</p>
METRICS AND TARGETS	<p><b>A.</b></p> <p><b>Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk</b></p>	<p>Lufthansa Group is committed to limiting the environmental impact of its business activities, including climate-related risks. The Group is strengthening its long-standing commitment to climate protection based on its understanding of responsible practices and increased demands from external stakeholders such as customers, business partners, investors and the legislature. The Group's commitment to climate protection is consistent with its own economic interests since resource consumption and emission-related fees all represent costs for the Company.</p>	<p><b>Annual Report 2022 (Combined non-financial declaration),</b> - (p.107)</p> <p><b>Lufthansa Group Annual Report 2022,</b> - Goals and Strategies (p.18ff.)</p>

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### management process

Lufthansa Group does not disclose metrics for water and land use, as the data and process landscape has not yet been established throughout the Group to make valid statements.

To measure and manage climate-related risks that are in line with the strategic target to reduce net CO<sub>2</sub> by half by 2030 and reach carbon-neutrality in 2050, Lufthansa Group monitors its CO<sub>2</sub> emissions, (specific) fuel consumption and specific carbon emissions. Lufthansa Group factors specific carbon emissions into its management system in order to enable sustainable value creation that does not come at the expense of a higher environmental impact. In fact, the aim is also to reduce specific carbon emissions continuously.

The absolute CO<sub>2</sub> emissions resulting from the combustion of aviation fuel from Lufthansa Group aircraft in 2022 increased by 68.4% to 22.9<sup>1</sup> million tonnes (previous year: 13.6 million tonnes) due to the rise in demand and the expanded flight offers. CO<sub>2</sub> emissions per tonne-kilometre transported declined by 3.7% to 837 grammes (previous year: 869 grammes). Specific CO<sub>2</sub> emissions per passenger kilometre were 11.4% lower than in the previous year at 90.0 grammes (previous year: 101.6 grammes).

The decline in the Group's fleet specific emissions compared with the previous period was mainly due to an increase in the passenger load

**Sustainability Fact Sheet 2022**, (p.3, p.16)

**CDP Report 2022**,  
C4.2, C9.1,  
C-TO9.3/C-TS9.3

<sup>1</sup> The carbon emissions resulting from fuel consumption differ slightly from the value of 23.1 million tonnes reported in the 2022 non-financial declaration. This is due to adjustments made to the system at Brussels Airlines, the inclusion of further data systems for calculating specific data in the Fact Sheet, and related rounding differences.

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factor and changes in the route network that resulted in an increase in average flight length. Longer routes typically create lower specific emissions because the emissions from take-offs and landings, which are higher than in-flight emissions, become less weighty in the calculation as the flight distance increases.

Lufthansa Group is also reporting on the status of its CO<sub>2</sub> intensity reduction target, which came to 2.2% below base year 2019.

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ENVIRONMENTAL DATA <sup>1,2,3</sup>		2022	2021	Change
<b>Resource consumption</b>				
Fuel consumption	Tonnes	7,284,584	4,324,746	+68.4%
Fuel consumption, specific, all types of transport	g/tkm	266	276	-3.7%
Fuel consumption, specific, passenger transportation	l/100pkm	3.59	4.05	-11.5%
Fuel consumption, specific, freight transportation	g/tkm	214	216	-0.9%
<b>Emissions</b>				
Carbon dioxide emissions	Tonnes	22,946,441	13,622,950	+68.4%
Carbon dioxide emissions, specific, all types of transport	g/tkm	837	869	-3.7%
Carbon dioxide emissions, specific, passenger transportation	kg/100pkm	9.00	10.16	-11.4%

<sup>1</sup>The following companies are included for the 2022 reporting year: Lufthansa (including Lufthansa CityLine, Eurowings Discover and Air Dolomiti), SWISS (including Edelweiss Air), Austrian Airlines, Eurowings (including Germanwings), Brussels Airlines and Lufthansa Cargo. Not included are other flights and services performed by third parties, as their performance is beyond our control. <sup>2</sup>Types of flight service considered: all scheduled and charter flights (excluding ground vehicles). <sup>3</sup>Actual fuel consumption/carbon dioxide emissions in tonnes from flight operations based on all flight events under the respective operating flight number. Consumption/carbon dioxide emissions are recorded from gate to gate, i.e. including taxiing on the ground and holding patterns as well as flight detours.

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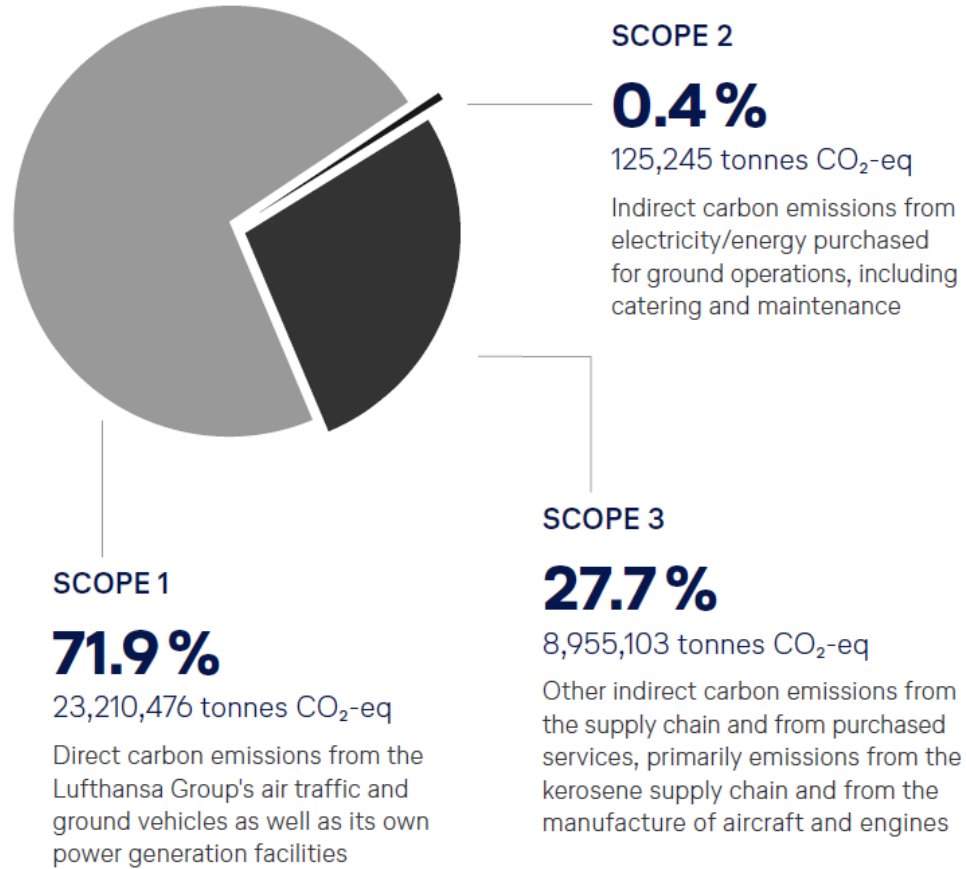
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		<p>Lufthansa Group also monitors the split of CO<sub>2</sub> emissions by passenger and freight.</p> <hr/> <p><b>CO<sub>2</sub> EMISSIONS<sup>1</sup> 2022</b></p> <p>Figures in tonnes</p> <table border="1"> <thead> <tr> <th></th> <th><u>Passengers</u></th> <th><u>PY</u></th> <th><u>Freight<sup>2</sup></u></th> <th><u>PY</u></th> <th><u>Total</u></th> <th><u>PY</u></th> </tr> </thead> <tbody> <tr> <td>CO<sub>2</sub></td> <td>18,152,426</td> <td>+99.5%</td> <td>4,794,014</td> <td>+6.0%</td> <td>22,946,441</td> <td>+68.4%</td> </tr> </tbody> </table> <hr/> <p><sup>1</sup>The following companies are included for the 2022 reporting year: Lufthansa (including Lufthansa CityLine, Eurowings Discover and Air Dolomiti), SWISS (including Edelweiss Air), Austrian Airlines, Eurowings (including Germanwings), Brussels Airlines and Lufthansa Cargo. Not included are other flights and services provided by third parties, as their performance is beyond our control. Absolute emissions in tonnes from flight operations (all scheduled and charter flights). Emissions are recorded from gate to gate, i.e. including taxiing on the ground and holding patterns as well as flight detours. <sup>2</sup>Based on freight tonne-kilometres (FTKT) transported in both cargo and passenger aircraft.</p>		<u>Passengers</u>	<u>PY</u>	<u>Freight<sup>2</sup></u>	<u>PY</u>	<u>Total</u>	<u>PY</u>	CO <sub>2</sub>	18,152,426	+99.5%	4,794,014	+6.0%	22,946,441	+68.4%	
	<u>Passengers</u>	<u>PY</u>	<u>Freight<sup>2</sup></u>	<u>PY</u>	<u>Total</u>	<u>PY</u>											
CO <sub>2</sub>	18,152,426	+99.5%	4,794,014	+6.0%	22,946,441	+68.4%											
<p>METRICS AND TARGETS</p>	<p><b>B.</b></p> <p><b>Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks</b></p>	<p>Lufthansa Group determines its CO<sub>2</sub> emissions based on the Greenhouse Gas Protocol (GHG Protocol), which divides emissions into three main categories (Scopes).</p> <p>The largest proportion of Lufthansa Group's CO<sub>2</sub> emissions are direct emissions (Scope 1) from its own operations. However, greenhouse gas emissions are also generated in other parts of the value chain. Lufthansa Group accordingly discloses Scope 1-3 emissions.</p>	<p><b>Sustainability Fact Sheet 2022</b>, (p.21, p.22)</p> <p><b>CDP report 2022</b>, C6.1, C6.3, C6.5, 10.1</p>														

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**DIRECT AND INDIRECT CO<sub>2</sub> EMISSIONS  
OF THE LUFTHANSA GROUP 2022**

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	<p>Approximately 99% of Scope 1 emissions result from the combustion of aviation fuel through Lufthansa Group aircraft. Within recorded Scope 3 emissions, about 65% originate from the upstream supply chain of the kerosene used. The main risks lie in the emissions from the extraction, transport and consumption of the kerosene used.</p> <p>Lufthansa Group ensures that GHG Protocol values are externally audited on a yearly basis.</p>		
<p>METRICS AND TARGETS</p>	<p><b>C.</b></p> <p><b>Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets</b></p>	<p>Lufthansa Group supported IATA's decision to make its existing emission reduction targets more ambitious, setting itself the goal of reducing net CO<sub>2</sub> emissions to zero by 2050 (net zero target). Lufthansa Group has set several targets combined with specific measures to reduce its climate related impact and to manage climate related risks and opportunities:</p> <p><b>Science Based Targets initiative (SBTi) validation</b></p> <p>Lufthansa Group's plan to reduce CO<sub>2</sub> emissions was validated by the Science Based Targets initiative (SBTi) in the summer of 2022. Lufthansa Group was the first airline group in Europe with a scientifically based CO<sub>2</sub> reduction target in line with the goals of the Paris Climate Agreement of 2015. It is one of the first airlines worldwide whose reduction targets have been validated by the SBTi. Specifically, Lufthansa Group has aligned its policies with SBTi criteria and committed to reducing its CO<sub>2</sub> intensity, i.e., its CO<sub>2</sub> emissions per transported tonne-kilometre (passenger and freight), by 30.6% from 2019 to 2030. This target may only be achieved by reducing fuel consumption or by substituting fossil fuel with SAF. Over and</p>	<p><b>Lufthansa Group Annual Report 2022</b>, - Goals and Strategies (p.290ff.)</p> <p><b>Annual Report 2022 (Combined non-financial declaration)</b>, - (p.101, p.105-p.107, p.110-p.114, p.119)</p> <p><b>CDP Report 2022</b>, C4.1a-C4.2c</p> <p><b>Sustainability Fact Sheet 2022</b>, (p.6, p.7, p.10, p.11, p.16, p.23)</p>

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above the reduction required by the SBTi targets, the Group will achieve its self-imposed target of cutting net CO<sub>2</sub> emissions in half by 2030 compared to 2019 by also using voluntary offsets. Lufthansa Group aims to be carbon neutral in 2050.

The use of Sustainable Aviation Fuel (SAF) reduced Lufthansa Group's fossil CO<sub>2</sub> emissions by a total of 43,900 tonnes in 2022. 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-fuel kerosene. This means that compared to the previous year, the use of SAF increased the reduction of CO<sub>2</sub> with an impact on the climate by 73.5%.

### **Emission reduction targets are part of Executive Board remuneration**

Emission reduction targets are an element of the long-term variable remuneration of the Executive Board. The Supervisory Board defines an environmental goal as a focus for the strategic and sustainability goals for the long-term variable remuneration (LTI). Reduction targets are based on the indicator CO<sub>2</sub> per tonne-kilometer transported, analogous to the target system of the validated SBTi targets. The overall level of target achievement for the "Environment" parameter was 63.33% in the reporting year.

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### **CO<sub>2</sub>-neutral mobility on the ground and selected Scope 1 and Scope 2 targets**

Lufthansa Group aims to meet the milestone of switching to carbon-neutral mobility on the ground in its home markets by 2030 with electromobility or the use of other emission-free vehicles. The existing fleet of apron vehicles and company cars will be used more efficiently, and the targeted replacement of these vehicles with electric or other alternative drive systems.

The target defined by Lufthansa Group in 2019 of meeting the electricity demand in the domestic markets of Germany, Austria, Switzerland and Belgium using 100% green electricity was achieved in 2020 and has been continued since then. Green electricity certificates for Germany and Switzerland are being purchased for this purpose. These certificates guarantee the production of green electricity from new plants (for Switzerland partially in 2022, and in full, from 2023) and contribute to the expansion of renewable energies.

Lufthansa Technik, which is a fully consolidated subsidiary, has the target to reduce 25% of Scope 1 and Scope 2 emissions at production sites until 2025 (base year 2018). The target achievement was at 119% at the end of 2022. This means that this goal has already been met 3 years before the set target date in 2025.

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### Active noise abatement

Improvements in noise abatement from modernising the operational Group fleet can be seen in the number of aircraft that meet or exceed the ten-decibel criterion set by the ICAO Chapter 4 standard. As of October 2022 (end of the summer flight timetable), 99.4% of the aircraft – virtually the Group’s entire operating fleet – met this criterion.

### Voluntary CO<sub>2</sub> compensation by customers

Lufthansa Group further expanded its existing options for the voluntary offset of CO<sub>2</sub> by passengers in 2022. This includes both the opportunity to reduce emissions directly by purchasing Sustainable Aviation Fuel, and to offset them via long-term projects to protect the climate.

### Voluntary offsetting employees’ business travel

Since 2019, Lufthansa Group has been offsetting the carbon emissions of all employees’ business flights globally. In 2022, 50,651 tonnes of CO<sub>2</sub> (not including SWISS) were offset via the climate protection organisation, “myclimate”.

### Waste management

Sustainable and efficient waste management is an essential part of Lufthansa Group’s environmental strategy and is therefore material for Group companies in all operating segments.

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The waste management strategy of Lufthansa Group covers all aspects of waste generated by passenger airlines, both on board and on the ground. This includes waste generated by passengers, crew, and ground staff, as well as waste generated during aircraft loading and handling. The focus of the strategy is on reducing waste from single-use products and food, with a variety of measures being taken to achieve this goal.

Lufthansa Group has set specific targets for reducing waste on board its flights, with a focus on reducing waste from single-use products and food. The concrete targets for 2025 in the categories of single-use waste and food waste were prioritized to reflect the urgency of the acute environmental impacts, the political environment, and customer expectations. The measures being taken to achieve these targets include reducing the amount of single-use plastic on board, intelligent planning of the loading process, and implementing a framework for dealing responsibly with in-flight waste.

### Single-use waste

The passenger airlines have decided to return all in-flight plastic and aluminum items to the circular economy and to no longer have any single-use plastic and single-use aluminum items on board from 2025 onwards.

### Food waste

The passenger airlines intend to reduce food waste on short-haul flights across the Group by 50% compared with 2019 by 2025. Food waste is also to be reduced on long-haul flights. Since the data is not yet of sufficient

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quality, the passenger airlines are working with the catering partners to sufficiently improve the data transparency regarding food waste on board, to formulate targets for long-haul flights.

### Reusable waste

As the main focus of the targets is to reduce single-use and food waste, only isolated measures have been taken occasionally to reduce reusable waste on board.

Lufthansa Cargo also concentrates on increasing its recycling quotas so that 99% of Lufthansa Cargo's waste at the hubs is used to generate energy or is recycled. Lufthansa Cargo has set two specific targets for 2025 to increase the recycling share in this field. At the Frankfurt hub, the intention is to increase the share of waste that is recycled to 40% by 2025. In addition, Lufthansa Cargo is aiming to increase its worldwide recycling quota for plastic waste to 100% by 2025 and is currently working out how to generate the metrics for this.

## **About this report:**

This report primarily contains information that have already been disclosed by Lufthansa Group (e.g., within its Annual Report 2022, the Fact Sheet Sustainability 2022 or as part of its CDP Climate reporting 2022). Under “Lufthansa Group Approach”, the Group has primarily taken information from these existing disclosures and supplemented them selectively with additional information to provide a more accurate picture of the current state of its efforts. Potential climate risks and opportunities have been further analysed by conducting a qualitative and quantitative scenario analysis. Under “Further Disclosure”, Lufthansa Group references the key sources where the interested reader can find information relating to the specific TCFD recommendations within the Group’s disclosures.



## Editorial information

### **Published by**

Deutsche Lufthansa AG  
Venloer Str. 151-153  
D-50672 Cologne

Entered in the Commercial Register of Cologne  
District Court under HRB 2168

### **Copy deadline**

20. April 2023

### **Photo credits**

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<https://unsplash.com/de/fotos/tJ1uvdf68e0>

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within the Lufthansa Group at:  
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