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Flying Towards Sustainability? A Study on Lufthansa Group's Sustainability Practices, Challenges, and ESG Rating Performance

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Abstract

Die Bedeutung des Klimawandels und seiner Auswirkungen auf Unternehmen hat in den letzten Jahren zunehmend an Aufmerksamkeit gewonnen. In den letzten zehn Jahren haben viele Unternehmen die Ziele für nachhaltige Entwicklung in ihre Initiativen zur sozialen Verantwortung von Unternehmen integriert, während immer mehr Investoren Umwelt-, Sozial- und Governance-Investitionen in ihre Portfolios aufnahmen. Infolgedessen hat Nachhaltigkeit zunehmend weitreichende Auswirkungen auf die Unternehmensberichterstattung, was sich in der Einführung nichtfinanzieller Kennzahlen widerspiegelt. Allerdings befinden sich die relevanten Standards und Rahmenwerke in ständiger Entwicklung, was zu nationalen und internationalen Abweichungen führt. Berichtsrahmenwerke tragen dazu bei, die Qualität, Glaubwürdigkeit und Transparenz der offengelegten Informationen für Interessengruppen wie Finanzanalysten, Investoren, öffentliche Interessengruppen und NGOs, ESG-Ratingagenturen sowie Partner in der Lieferkette zu verbessern, die diese Offenlegungen nutzen können, um Informationen über die Nachhaltigkeitsleistung und die daraus resultierenden Auswirkungen auf die Finanzleistung zu erhalten. Die Luftfahrtbranche ist aufgrund der Vielzahl messbarer Kennzahlen ein besonders interessanter Sektor im Hinblick auf die Nachhaltigkeitsberichterstattung. Es zeigt sich, dass sowohl die ESG-Berichterstattung als auch die Rating-Rahmenwerke ständig weiterentwickelt werden, was es für Unternehmen schwierig macht, vorausschauend zu planen. Darüber hinaus sind die ESG-Maßnahmen der Lufthansa Group aufgrund von Problemen in der Lieferkette sowie politischen und geopolitischen Unsicherheiten mit Risiken behaftet. Im Vergleich zu anderen europäischen Fluggesellschaften kann sich die Gruppe durch ihre ausgearbeiteten Berichtsstandards in Bezug auf ESG von anderen abheben.

I List of abbreviations

CapEx	Capital Expenditure
CBI	Climate Bonds Initiative
CDP	Carbon Disclosure Project
CDSB	Climate Disclosure Standards Board
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalents
CRRO	climate-related risks and opportunities
CSA	climate scenario analysis
CSDDD	Corporate Sustainability Due Diligence Directive
CSR	Corporate Social Responsibility
DIN	Deutsches Institut für Normung
DJSI	Dow Jones Sustainability Index
e.g.	example given
EBIT	Earnings before interest and taxes
EFRAG	European Financial Reporting Advisory Group
EMS	Environmental Management System
ERM	Enterprise Risk Management
ESG	Environmental, Social, and Governance
ESRS	European Sustainability Reporting Standards
ETS	Emission Trading System
EU	European Union
EY	Ernst & Young
GAAP	Generally accepted accounting principles
GHG	greenhouse gas
GRI	Global Reporting Initiative
HGB	German Commercial Code
IATA	International Air Transport Association
IBS	International Business Council
ICMA	International Capital Market Association
IFRS	International Financial Reporting Standards
IIRC	International Integrated Reporting Council
IMF	International Monetary Fund
ISO	International Organization for Standardization
ISSB	International Sustainability Standards Board
KPI	key performance indicator
LkSpG	German Supply Chain Act
LTi	Long-Term Incentive
MDGs	Millennium Development Goals

MRO	maintenance, repair, and overhaul
NDRF	non-financial reporting directive
NGO	non-governmental organisations
OpEx	operating expenditure
pkm	person kilometre
PwC	PricewaterhouseCoopers
R&D	Research and Development
RSCM	Responsible supply chain management
SAF	Sustainable Aviation Fuel
SASB	Sustainability Accounting Standards Board
SBTi	Science Based Targets initiative
SCM	Stakeholder Capitalism Metrics
SDGs	Sustainable Development Goals
SFDR	Sustainable Finance Disclosure Regulation
SICS	Sustainable Industry Classification System
SMEs	small- and medium-sized enterprises
SR	sustainable and responsible
TCFD	Task Force on Climate-Related Financial Disclosures
UNFCCC	UN Framework Convention on Climate Change
VRF	Value Reporting Foundation
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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1. Introduction

The importance of climate change and its effects on businesses gained increasingly more attention in the past years. Over the past decade, many companies have integrated the Sustainable Development Goals (SDGs) into their Corporate Social Responsibility (CSR) initiatives, while an increasing number of investors are incorporating Environmental, Social, and Governance (ESG) investments into their portfolios (Herman, C., Kelly, C., & Gassman, P., 2021). Subsequently, sustainability has increasingly far-reaching effects on corporate reporting. Therefore, the concept of double materiality including non-financial metrics is introduced into traditional financial reporting. However, relevant standards and frameworks constantly in development, consequently diverting nationally and internationally.

The ESG ecosystem includes several key participants. Firstly, companies themselves play a central role by integrating non-financial metrics into their annual reports alongside their financial disclosures. This practice is known as ESG disclosure. Most are currently voluntary and, in comparison to financial reports, less companies are required to release this type of information. However, companies are encouraged to do so in order to communicate transparently about their challenges and opportunities regarding sustainability. To standardise these disclosures, companies usually adopt reporting frameworks, most commonly the Task Force on Climate-Related Financial Disclosures (TCFD), the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), which this thesis will aim to address (CFI, 2022).

The aforementioned frameworks help to enhance the quality, credibility, and transparency of the disclosed information to groups of stakeholders like financial analysts, investors, public interest groups and non-governmental organisations (NGOs), ESG rating platforms or agencies, and partners in the supply chain, which may use these disclosures to obtain information regarding sustainability performance and consequent impacts on the financial performance (CFI, 2022). An issue this thesis will aim to address lies on the lack of transparency and coordination that sustainability rating issuers. Without standardisation, different factors will be reported, and other themes might be pointed out less or even ignored. This can lead to false impressions to investors, greenwashing, and therefore negatively influence investment decisions (Escrig-Olmedo, E. et al., 2019).

Consequently, higher sustainability rating scores are useful to a company as they indicate a stronger resistance in a crisis scenario, expressing that a company might rather be capable of mitigating the associated risks than another firm with a lower score in the same rating. Therefore, a firm that indicates strong ESG actions can be expected to respond better and be more resilient in an unstable economic situation, directly and indirectly affecting the financial situation of the company as well (Díaz, V. et al., 2021).

The airline industry is a particularly interesting sector in terms of sustainability reporting due to the variety of measurable metrics. Regarding its effects on the environment, flying is considered as the least sustainable mode of transport and implementing CSR measures has the potential to be beneficial to the sector's reputation (Lee, S. et al., 2018). The transportation sector ranks second globally in 2023 in greenhouse gas emissions (GHG) emissions, after the power generation industry, and contributes to 8.382 million tons of CO₂ equivalents (CO₂e) in 2023 (Statista, 2025). The commercial aviation industry specifically made up for 820 million tons of those CO₂e in 2023, roughly 10% of all air travel emissions. The combustion of kerosene creates GHG emissions which distribute globally in the atmosphere on the one hand and releases more localised pollutants on the other hand. Summarised, air pollution and climate change are fuelled strongly by using air transport, in comparison to other forms of transportation, as air transport is still relying heavily on fossil fuels (Statista, n.d.).

This master thesis employs the systematic literature overview as a method to gain a holistic overview from various stakeholder perspectives and will be divided into three main parts. The first part will concern itself with the thorough analysis of external sources on the Lufthansa Group's ESG environment and challenges resulting from changing regulations in the EU and its responsibilities in front of different stakeholder groups. Afterwards, the second part uses Lufthansa Group's sustainability disclosures within its annual report, and three additional reports using different frameworks to portray their view on main ESG themes. Next, 2023's ratings issuers as intermediaries for ESG information are analysed. In the discussion section, this thesis aims at identifying key challenges in 2023 for Lufthansa Group based on the previously presented systematic literature, current reporting and rating methodologies. The base year for the sustainability report and rating methodologies is 2023. Afterwards, findings obtained in the systematic literature review will be critically discussed and the research question will be answered.

2. Methodological and theoretical background

The research methodology describes why a method is chosen and how research is conducted. The systematic literature review was chosen as it allows to grasp a deep understanding of the sustainability themes currently more present in the literature including its potentials and challenges. Next to scientific articles which reflect the external view, the most recent documents released by Lufthansa Group itself are reviewed. The Lufthansa Group's Annual Report 2023 and additional reports using the TCFD, SASB, and CDP frameworks contribute to a differentiated and internal understanding. Finally, documents by independent rating agencies and platforms provide an additional, external perspective, as they take into consideration inside information based on questionnaires filled out by Lufthansa Group itself, as well as sustainability data gathered from various external sources.

2.1 Systematic literature review

Qualitative Research is essential to understand phenomena. It addresses questions about how, why and who. It can reveal the meaning and portray social experiences that are created (Rynes & Gephart, 2004). The meaning unfolds over time in a specific context. Therefore, the systematic literature review can serve as a methodology for contextualised explanation (Welch et al., 2011; Welch et al., 2011). Additionally, qualitative research owns the potential to promote assumption-challenging questions by using iteration and different perspectives, which compliments gap spotting strategies (Alvesson and Sandberg, 2011). Qualitative research respects the existence of multiple organisational voices: There is a voice of managers, participants, researchers and many more perspectives. When analysed over a time frame or different contexts for example, these voices and perspectives can differ, and they are never neutral (Coffey, 1991; Van Maanen, 1995). Quantitative research doesn't measure data like qualitative data does. Instead, it provides understanding and insights which could not be portrayed or would be overlooked as e.g. personal perceptions (Schwandt, 2001). With its aim, which is to explain the nature of situations and to learn about deeper relationships of variables, this thesis will be able to demonstrate the reality of challenges currently faced and possible issues that might occur (Levy, 2015).

Before starting the analysis, philosophical assumptions must be made. As a researcher, one makes assumptions about reality and balances one's position in a continuum between "Objectivist Ontology Positivist" and "Subjectivist Ontology Social Constructivist". The first extreme is based on natural sciences and describes reality as "Objective, single, measurable and totally apprehensible reality". The process described here adopts a positivist view of research, meaning the process of analysis in this thesis is directed towards the development of testable hypotheses and theory which are generalisable across different settings, e.g. the same steps of analysis could be iterated for the previous reporting years (Eisenhardt 1989). The position also suggests a single

reality which is independent of the observer and therefore called “objectivist” (Yin, 2014). In this continuum, the paper will be placed rather objectively with one reality and is therefore also less context driven (Eisenhardt, 1989). In comparison, a Positivist views reality as “socially constructed and experiential”. This case will be analysed from a “Objectivist Ontology Positivist” point of view, following the template of Eisenhardt for the following reasons:

- The use of a deductive structure which aids in gap spotting strategy
- The replication logic and search for general patterns and descriptive constructs
- The inclusion of multiple cases allows the case researcher to increase the robustness and credibility of a finding by replicating it across cases. In this thesis, four cases will be compared regarding the reporting frameworks and eight cases will be presented regarding the rating frameworks
- The use of Positivistic Quality Criteria such as external validity and reliability (Yin, 1998)

The template is helpful to the analysis of Lufthansa Group’s different sustainability reports, the cases, pointing out similarities and differences. Additionally, deeper relationships and their characteristics can be analysed as well as the complexity of the research phenomenon (Levy, 2008). Data sources can range from audio, video to text and visual data. For the purpose of this research, text data from literature and the company’s website is retrieved (Polkinghorne, 2005). Yin wrote in 2013 that case study research designs have not been codified, which complements the topic well as there is no common framework in ESG reporting standards yet either (Yin, 2013). As small samples of case studies are characteristic for a qualitative case study analysis, purposeful sampling is an important step.

Furthermore, regarding research strategy, qualitative research creates potential for promoting questions that challenge current assumptions, presented in the literature review. By this, research gaps can be identified. As it is important for the researcher in qualitative research to physically immerse in the fieldwork, a thorough literature base is inevitable and will constantly be referred to throughout the work as a guideline (Alvesson & Sandberg, 2011). Next, regarding the research design, in order to answer the research question, a largely deductive design will be adopted. Therefore, the theory and model need to provide a strong theoretical background that functions as a base that will be used to gain new insights when combined with the collected data (Verbeke & Greidanus, 2009). The literature is rather contextual as the cases as well as articles, papers and other reports focus on the same fiscal year and revolve around the same intention of creation (Evered & Louis, 1981). Concerning research philosophy, it is important to keep in mind that researchers play an important role in the analysis and use different patterns in analysing (Kuhn, 1970).

The literature is selected using certain criteria. As previously mentioned, theoretical sampling is used in order to ensure the quality of the case studies used. For the literature review, articles will only be drawn from top-tier recognized journals, like the Journal of International Business (Eisenhardt, 1989; Yin, 1994). For the selection of reports, only official documents published on Lufthansa Group's and the rating agencies' websites will be considered as well as only the most current ones from 2023. Only recent studies tried to be included and the focus lies on European regulations, excluding policies from the United Kingdom and the United States. Consequently, papers with a main focus set on the EU's corporate sustainability environment were selected for this review.

The key benefits include its ability to minimise bias, and ensure comprehensive literature coverage (Webster & Watson, 2002). However, challenges such as the time-consuming nature of the process and the potential for exclusion bias due to rigid criteria must be considered (Moher et al., 2009). Creswell added in 1999 that it takes more than one data collection procedure over a specific time period to actually collect detailed information. When this strategy is iterated, it is able to show the dynamics of a policy-making process better (Creswell, 1999). However, due to the limited scope of this master thesis, iteration for previous years can't be completed. This creates a need for further research. Another limitation in this research is obtaining the individual rating reports for Lufthansa Group stating the detailed themes and KPIs used for the rating score, as not all rating agencies and platforms publish those. Additionally, the deductive design might prohibit an open mind regarding building the main theme groups and lead to a deferred choice. Finally, defining the context may overlook other contexts and potentially ignore influences from other areas on the same phenomenon. Despite these limitations, the structured approach strengthens the credibility of research by providing a systematic and replicable framework for analysing existing literature (Snyder, 2019).

2.2 Stakeholder Theory

Next, for analysing ESG reports, it is logical to ground the assessment of this thesis in the Stakeholder Theory by Freeman, as it provides a relevant framework for evaluating corporate responsibility. This theory highlights the importance of addressing the interests and concerns of a broad range of stakeholders, including investors, communities, employees, customers, and the environment (Freeman, 1984). ESG reports are designed to illustrate how a company generates value, not solemnly and simply for shareholders but also for a wider group of stakeholders, aligning closely with the principles of Stakeholder Theory (Freeman et al., 2010). This theoretical framework supports an analysis of the material impacts of corporate activities on different stakeholder groups, a key aspect of ESG reporting. It provides a systematic approach to assessing how a company's policies and practices benefit or negatively affect its stakeholders, which is essential for evaluating the effectiveness of ESG strategies (Harrison et al., 2010).

Traditional models of value creation emphasised maximising shareholder returns, based on the notion that this approach also maximises overall corporate value. This approach assumed that stock incentive plans, corporate control mechanisms, and market efficiency would drive managerial decisions toward the best financial outcomes for shareholders. However, growing awareness of broader societal challenges has spurred criticism of this narrow view, and many now advocate for balancing shareholder and stakeholder interests. The shift toward stakeholder-focused models led to regulatory and cultural changes. For example, some jurisdictions have introduced benefit corporations, which formally commit to considering both shareholder and stakeholder interests in decision-making (Business Roundtable, n.d.; Business Roundtable, 2019). CSR activities frequently require companies to navigate complex ethical dilemmas, particularly when operating internationally. For example, cultural differences or local practices might clash with global ethical standards, complicating ethical decision-making. To address these issues, companies are encouraged to establish ethical guidelines, train employees on compliance, and foster ethical leadership (Harvard Business Review, n.d.; Institute of Business Ethics, n.d.).

For the purpose of this thesis, determining Lufthansa Group's ESG environment, the Stakeholder Theory is highly relevant as it emphasises the importance of addressing the needs and concerns of various stakeholders, and it is useful to understand the interconnections and the alignment with ESG strategy on the basis of data points from the ESG reports which aim to demonstrate how a company creates value and to assess the material impacts of corporate actions on different stakeholder groups. Freeman argues that businesses should strive to create value across this network of stakeholders, which is rewarded by enhancing trust, resilience, and long-term sustainability for the company. Stakeholder Theory still today has a significant impact on business ethics and management practices, especially in shaping CSR strategies. Overall, Freeman's theory offers a holistic management framework that integrates both ethical considerations and operational objectives into corporate decision-making (Fiveable, 2024; Stakeholdermap, n.d.).

2.3 Research gap, question and importance

The amount of research provided very recently on the topic of ESG Reporting in the airline industry and its development as well its impacts prove the importance this topic gained in a short time. However, the direct implications of regulatory changes, economic as well as political pressures and its resulting challenges are under-represented in the current literature. Consequently, this thesis aims to answer the following question:

To what extent do recent changes in Lufthansa Group's ESG environment influence its ESG practices and which challenges may arise?

This research gap is important to be filled as it can help airlines, specifically the airlines part of Lufthansa Group, to understand and tackle their upcoming challenges better, as

well as the influence of their corporate reporting practices on ESG rating scores and consequently stakeholder perceptions and investor's decisions.

3. ESG Reporting and Rating in the airline industry

This chapter summarises recent scientific papers, providing an overview of the current state of research. Initially, the development and importance in ESG Reporting will be assessed, alongside its influence on stakeholder's perception. Afterwards, a deep-dive of the current ESG environment within the airline industry will be conducted. A thorough literature review will be performed and a complete summary of the current status of literature and research in the topics of ESG Reporting, ESG Rating and sustainability challenges specifically in the airline industry will be presented. This should provide a broad overview of the area of research to provide a basic understanding about developments and the current state. The systematic literature review functions as a basis for the deductive analysis and should provide an introduction into the topic to the reader as well.

3.1 The Integration of ESG into Reporting Frameworks

Research recently pointed out the lack of current literature concerning sustainability key performance indicators (KPIs) and their resulting sustainability performance (Hristov, I. and Chirico, A., 2019). However, these factors play a crucial role in rating processes. A paper by Michalski and Kwong Yew Low explores the influence of ESG factors on corporate credit ratings using machine learning. Key findings reveal that ESG factors, particularly environmental innovation, emissions, and CSR strategies, play a significant role in credit rating predictability alongside traditional variables. The study advocates for integrating ESG variables into credit ratings for a better firm creditworthiness assessment and suggests a global mandatory ESG disclosure framework to enhance transparency and financial market functionality (Michalski, E. and Low, R., 2024). Chodnicka-Jaworska adds that the methodology used by credit rating agencies has changed. In 2020, ESG factors are used as one of several standard measures that are to verify credit rating changes, pointing out the importance of ESG factors for credit ratings related to the Covid-19 pandemic (Chodnicka-Jaworska, P., 2021).

Moreover, Kiesel and Lücke investigate the inclusion of ESG factors in Moody's credit ratings using 3.719 reports from the years 2004 to 2015 and analyse the effects on stock returns and credit default swap spreads. ESG considerations, particularly governance, are found to influence rating decisions and capital market reactions. Using latent Dirichlet allocation for ESG analysis and regression models for market impacts, the research highlights ESG's role in reducing risks and enhancing financial performance, contributing valuable insights for investors, corporations, and regulators (Kiesel, F. and Lücke, F., 2019). Furthermore, Aydoğmuş evaluates the impact of ESG performance via a rating score on the firm value and profitability, using an extensive dataset. The results indicate that a combined ESG score significantly enhances firm value, driven primarily by Social and Governance factors, while the Environmental score has no substantial effect. All ESG dimensions, however, positively influence profitability. These findings underscore

the financial benefits of strong ESG performance, highlighting its potential to boost both firm valuation and profitability, making it an attractive investment strategy (Aydoğmuş, M. et al., 2022). Finally, a study conducted with panel data from 2010 to 2014 portrays the positive influence of non-financial data from two countries, Malaysia and Singapore, on the economic performance of a company, especially the social and governance perspectives (Tamuraji, E. et al., 2016) and consequently adds another positive correlation between a stronger ESG and financial performance.

To summarise, recent literature supports the hypothesis that ESG data influences the outcome of financial data in credit ratings, portraying the current and influencing its performance of a company. However, research disagrees in the importance of the individual ESG factors while agreeing on a positive correlation between ESG efforts and financial evaluation.

3.2 ESG Ratings and Rating Scores

Moving on from credit ratings to ESG ratings, recent literature defines ESG rating platforms and ESG rating agencies as intermediaries, assisting stakeholders in interpreting ESG disclosures. They can broadly be separated into two groups, firstly there are passive platforms such as MSCI or ISS which only use publicly available data. In contrast, active platforms like CDP or S&P Global interact directly with companies to gather primary information for their ratings. Active platforms are often considered more thorough due to their direct access to company data (CFI, 2022).

To begin, Clément et al point out in their recent study that “there is little consensus among academics about the definition of ESG scores and their measures” and consequently present all definitions of ESG scores. Five different thematic definitions about how the ESG score is utilised by researchers were identified: sustainability, disclosure, CSR, the analysis of ESG scores and finance. Additionally, the ESG score is either used to express business sustainability or viewed as financial adjusted risk-return. Furthermore, ESG scores are limited as they can “express the overall performance of environmental and social issues, but they cannot be used to track specific underlying issues” (Clément, A., Robinot, É. and Trespeuch, L., 2023). Additionally, another study regarding the improvement of ESG scores with sustainability concepts suggests that an ESG score doesn’t measure sustainability concepts which are e.g. temporality, resource management and impact as well as interconnectivity. Moreover, it is suggested that sometimes the ESG score measures non-quantifiable factors and that many rating issuers lack transparency. To improve the current situation, the inclusion of more sustainability principles in the rating issuer’s methodologies is recommended (He, H., 2022).

The next study by Escrig-Olmedo examines how the criteria used by ESG rating agencies in their evaluation processes have developed during the past decade. It explores whether

these agencies are actively promoting sustainable development by incorporating sustainability principles into their assessment frameworks in line with ESG criteria. The findings indicate that ESG rating agencies have introduced new criteria into their evaluation models to enhance the accuracy and robustness of corporate performance measurement, addressing emerging global challenges. However, a detailed analysis of these criteria reveals that sustainability principles are not yet fully integrated into the corporate sustainability assessment process by ESG rating agencies (Escrig-Olmedo, 2019). A key challenge stated for investors is integrating ESG metrics with traditional financial metrics for analysis. Research has explored how each ESG factor individually impacts value creation in both the short and long term, how different weighting schemes influence return and risk assessments, and whether ESG rating components should be applied uniformly across industries or tailored to specific sectors. These considerations are reported to be essential for making informed investment decisions (Herman, Kelly, & Gassman, 2021).

In summary, there is a consensus that ESG scores lack a consistent definition and measurement framework across rating agencies and academic studies. Furthermore, many scholars agree that this lack of standardisation contributes to confusion and undermines the reliability of ESG scores. However, it is generally agreed on that ESG rating agencies have improved and expanded their assessment models over the last decade, but the integration of robust sustainability principles remains limited.

A rather under-researched topic is how companies should react to their ESG ratings in order to improve their reporting decisions. This has been pointed out for Italian companies using semi-structured interviews. It is explained that while continuously more firms are evaluated by their ESG performance by sustainability rating agencies, the reaction from the firms to these ratings is still under-researched. Furthermore, the study analyses the factors influencing the firm's response. It turns out that the responses vary strongly, with two different dimensions of a firm's behaviour. Firstly, the alignment with corporate strategy plays a role and secondly, corporate responses are influenced by managers' beliefs regarding the material benefits obtained by adjusting to ESG Ratings and scoring well. Their analysis concludes that "whether firms conform to, or resist, the requirements of ESG ratings largely depends on commercial rather than wider ethical considerations". Finally, the study discusses if ESG impacts really influence a companies' sustainability positively and explains changes made by firms in result of their ESG Score rather as Greenwashing than substantive change (Clementino, E., Perkins, R., 2021).

3.3 ESG Ratings in the airline industry

Focusing on airline industry ratings, the following study examines environmental ratings and emissions scores assigned to commercial airlines by various prominent ESG rating providers. In specific, they assess if the emissions scores effectively reflect and predict

both the absolute carbon emissions as well as the emissions intensity levels, and whether they remain consistent across different providers. A study by Cregan et al from 2024 expands on existing research by assessing the predictive capability of these ratings over a significantly longer time frame than previous studies, analysing discrepancies in carbon emissions scores within the airline industry, and utilising an industry-specific emissions intensity metric. However, the findings reveal no evidence whether emissions scores effectively reflect or predict the reported carbon emissions and highlight substantial discrepancies between scores from different providers. These persistent limitations may erode confidence in the rating industry, build trade-offs between emissions reduction efforts and ratings improvement, and obstruct the integration of climate-related data into capital allocation decisions (Cregan, C., et al., 2024). Additionally, another study sought to establish the appropriate weighting and ranking of key ESG criteria. However, inconsistencies in ESG ratings and a lack of transparency have led companies to disclose voluntary indicators without standardised reporting. The study identifies greenhouse gas emissions and critical risk management as well as systemic risk management as the most significant ESG criteria. Among the KPIs, the highest-weighted indicators are the number of flight accidents, the consumption of jet fuel and sustainable aviation fuel usage, and the number initiatives in the area of digital transformation (Caraveo Gomez Llanos et al., 2024).

Focusing more closely on the main themes and challenges in ESG Reporting for airlines, literature suggests the following topics and weightings. In order to give a broad overview of the current and previous literature on main themes and KPIs that influence the ESG score of a company in the airline industry, these papers will provide a basis for further analysis.

Johannson points out the importance of sustainability reporting and meanwhile the lack of research in this area, despite the need for transparency in a sector as polluting as the aviation industry. In 2019, globally only about one third of airlines published sustainability reports (Johannson, E., 2022). An article by Dremptetic and Zwergel points out that a detailed examination of ESG scores remains an underexplored topic in the literature. The idea behind sustainable and responsible (SR) investments emphasises that all investment decisions should align with the ethical principles of SR investors. The allocation of these SR investments toward more sustainable companies and ethical business practices is largely guided ESG scores which are provided by rating agencies. The impact of firm size, the resources available for ESG data reporting, and the accessibility of a company's ESG data on its sustainability performance are investigated. The findings reveal a significant positive correlation between these factors, which can be attributed to organisational legitimacy. These results raise concerns about whether ESG scores genuinely reflect corporate sustainability or if they disproportionately benefit larger firms with greater resources, potentially failing to provide SR investors with the necessary information (Dremptetic, S. et al., 2020).

Moreover, environmental economics explain the need for internalising externalities which can be done by the emission trading or taxation systems, which will be explained in chapter 3.5, as well as carbon-offsetting schemes which relates to projects such as planting trees. However, as conscience around these issues exist for decades, engineers have developed technological innovations in materials used in production and engines contributing to the decrease of noise pollution and emissions created through fuel consumption. Despite this reduction, total emissions of the aviation sector keep rising which is due to the overall growth. Simultaneously, technological innovations are beneficial for airlines as costs for energy and fuel decrease (Janić, M., 2016; Janić, M., 2017). Key criteria that airline industries focus on are environmental factors, rather than social or governance factors. Alongside noise pollution, this includes mainly GHG emissions which play an important role in global warming through the greenhouse effect as they are emitted higher in the atmosphere and are therefore especially damaging globally (Lee, D.S. et al., 2009). Belobaba et al added in 2016 other environmental factors related to aviation, like the local air quality and water quality. Furthermore, the corporate benefit for airlines to enhance sustainability practices, besides just for marketing purposes, is pointed out regarding advantages such as cost reduction, as well as reputational and financial damage which can eventually result from non-adjusting to ESG standards and consequently worsening stakeholder opinion (Belobaba, P. et al., 2016).

Recent technological advances, e.g. the development of SAF, are aimed at not only complying with ESG standards and improving ESG rating performance, but also cost reductions due to economies of scale. In the Lufthansa Group annual report, specific sustainability trends, such as SAF and the electric engine will be further described in chapter 4. The International Air Transport Association (IATA) stresses the importance of SAF to bridge a technological gap which needs to lower emissions emitted by airplanes long-term. In this case, the production process lowers the emissions as it is mainly made out of waste materials which don't compete with agricultural production (IATA, 2024). Lastly, a study focused on the development of ESG Reporting in the aviation industry identifies two primary approaches to CSR assessment: external ratings and the self-assessment. Additionally, it presents a theoretical framework for developing CSR assessment models tailored to airlines and airports, discussing the application of the Fuzzy Theory in establishing criteria for CSR activity reporting within the European Union as well as additionally regions in Eastern European. They conclude that "CSR can be a useful strategic focus for airlines and airports, subject to the creation of transparent, disclosed assessment methodologies that allow a comparative analysis for all interested stakeholders", adding to the impression of ESG strategies positively influencing stakeholder perception (Stevenson, I. and Marintseva K., 2019).

3.4 Lufthansa Group and its ESG objectives

The Lufthansa Group is a world-wide operating aviation group is leading in the German-speaking market and furthermore holds a leading global market position, underpinned by a diversified multi-brand portfolio, presented in the graph below, and a multi-hub strategy spanning in between key European cities. Its globally prominent cargo and maintenance, repair, and overhaul (MRO) divisions create meaningful synergies and help cushion the impact of market volatility by diversifying its range of income streams. The recent affirmation of Deutsche Lufthansa AG's rating highlights its solid standing in the global aviation sector, being the largest European airline group by fleet size and revenue. Its leading roles in cargo operations and MRO services further support stability by mitigating the effects of industry cyclicity. As of 2024, S&P evaluates the sector risk as high. Furthermore, Lufthansa Group's acquisition of ITA Airways was approved by the European Commission in 2024, which leads Fitch ratings to assume that Lufthansa Group's market position will be strengthened, e.g. through operational synergies (Fitch Ratings, 2024).

This graph provides an overview the group's structure.

Simplified Group Structure Diagram

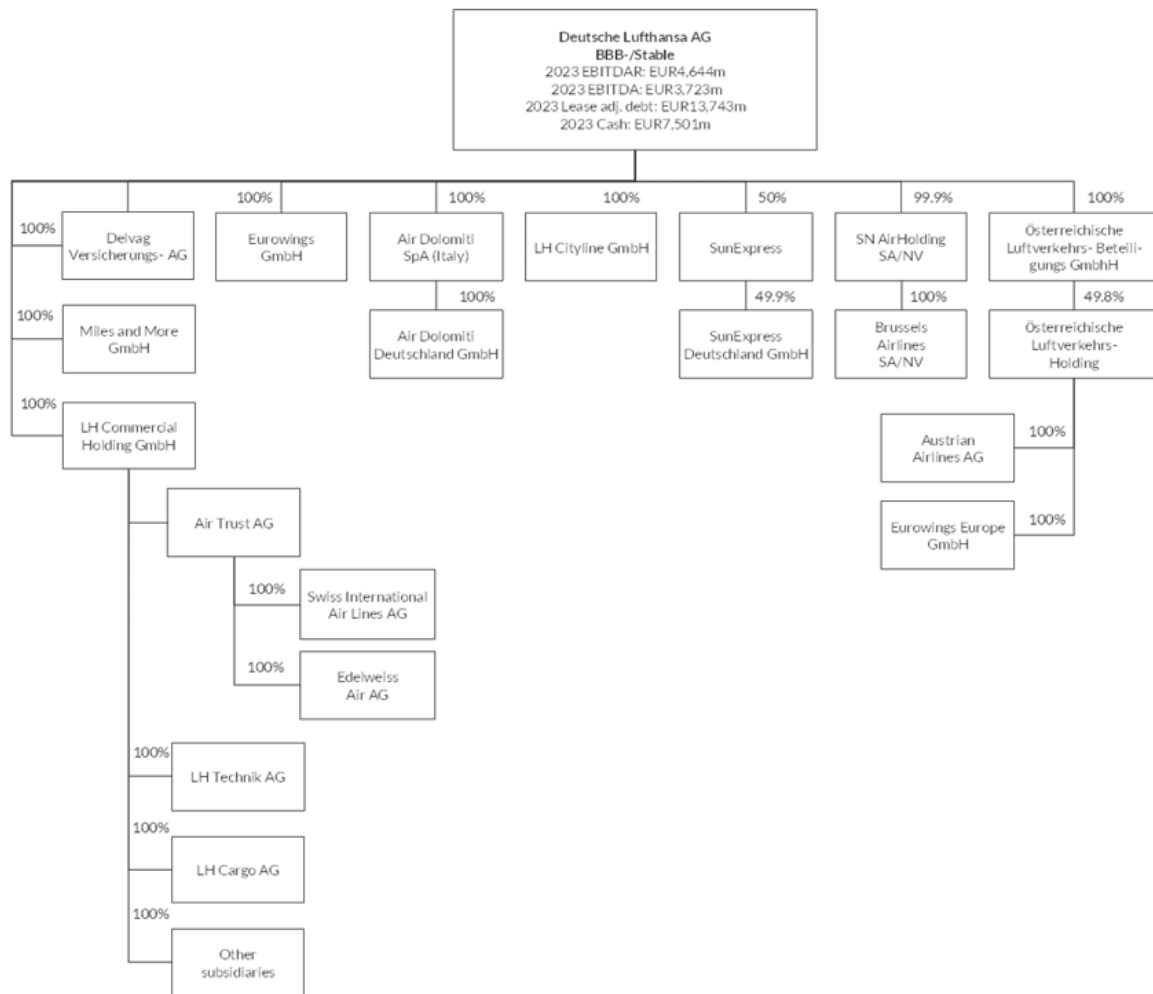


Figure 1 Lufthansa Group's corporate structure (Lufthansa Group, 2024)

Lufthansa ranks as the world's fourth-largest airline, operating from major hubs in Frankfurt, Munich, Zurich, Vienna, and Brussels through its primary brands: Lufthansa Airlines, SWISS, Austrian Airlines, and Brussels Airlines. Its passenger operations also encompass point-to-point carriers like Eurowings, Discover, Air Dolomiti, and Edelweiss. Around 75% of Lufthansa's EBIT comes from its passenger business, with the remaining 25% attributed to non-passenger segments such as maintenance, repair, and overhaul (MRO) services, as well as cargo. As one of the leading global network carriers and among the top two airline groups in Europe, Lufthansa maintains a strong presence in Germany, bolstered by its robust portfolio of regional brands. The following graph portrays Lufthansa Group's relative income streams.

Lufthansa's revenue by business segment (LTM Sep-24)

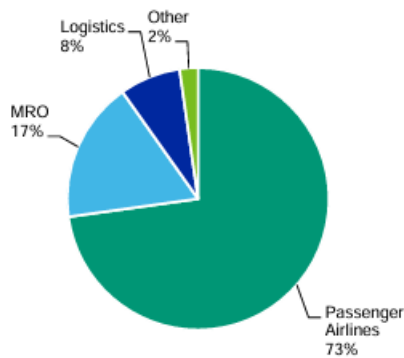


Figure 2 Relative revenue by business segment (Lufthansa Group, 2024)

Its website dedicates an entire section on responsibility and sustainability as part of their corporate strategy. Lufthansa Group is especially interesting because it offers a wide range of information by issuing reports using different reporting standards, such as TCFD, SASB, CDP in addition to the annual report which includes a non-financial statement (Lufthansa Group, n.d.).

The Lufthansa Group is one of the pioneers in the German-speaking region that has consistently embraced the management concepts of CSR and Diversity Management, which is related to the social criteria of ESG. With the goal of operating responsibly and sustainably across all business areas to ensure the company's long-term viability, Lufthansa Group has implemented a sustainability agenda comprising five dimensions. Under the dimension of "social responsibility" Diversity Management is explicitly included. A study by Scherle and Rosenbaum examined how employees, in this case the cabin crew, perceive and evaluate the airline's implemented diversity strategy. Designed to actively promote diversity within the company, using the slogan „Wertschöpfung durch Wertschätzung“ which translates to “Value creation through appreciation” it is concluded that Lufthansa Group proves high efforts which is noticed positively by the interviewees (Scherle, N., Rosenbaum, P., 2017).

Finally, Dathe et al add that in future, Lufthansa Group will aim to develop its ESG objectives in response to technological advancements and shifting industry conditions (Dathe et al., 2024). This relates to external pressure by aforementioned stakeholders as well as political developments which will be presented in the following.

3.5 ESG and Sustainable Development – A Global Path Forward

The sustainability environment includes an increasing amount of terms and guidelines which share some aspects and differ in others, adding up to a holistic picture. In the following, the main concepts relevant for the analysis of Lufthansa Group's sustainability environment will be presented.

The concept of Corporate Social Responsibility

The foundation of ESG Reporting lies in CSR, a concept that emerged in the 1950s and matured throughout the 1970s–1990s. CSR represents companies' commitment to go beyond profit-making and contribute positively to society and the environment. This includes ethical labour practices, community engagement, and responsible resource use principles that would later evolve into the more structured ESG framework (Bowen, 1953; Carroll, 1999).

CSR operates as a multi-dimensional framework where businesses seek to integrate profitability with broader ethical, social, and legal responsibilities. CSR initiatives typically address economic objectives, like consumer satisfaction and revenue generation, but they also include legal compliance, adherence to ethical standards, and voluntary societal contributions. Increasingly, CSR aligns with benchmarks such as the UN's SDGs and is tracked e.g. by the Dow Jones Sustainability Index, which evaluates top-performing companies based on criteria including environmental and social impact and corporate governance to promote accountability and transparency. These indices encourage firms to balance stakeholder expectations with business goals by setting benchmarks that integrate sustainable and ethical considerations within core business practices. The importance of CSR is further underscored by public and regulatory expectations for companies to mitigate risks of unethical conduct, a demand which has grown in response to various corporate scandals. By actively demonstrating accountability, CSR initiatives help companies foster goodwill and protect their reputations, positioning them favourably in both shareholder and community perceptions. This strategic approach enables firms to achieve a sustainable balance between financial success and positive societal influence, ultimately enhancing stakeholder trust and engagement (S&P Global, n.d.; Business for Social Responsibility, n.d.).

What is ESG?

Building on this, the concept of ESG emerged formally in 2004 with the publication of the "Who Cares Wins" report, initiated by the United Nations Global Compact. ESG provides a structured, data-driven approach to evaluate how companies handle sustainability-related issues. Unlike CSR, ESG emphasises materiality, performance metrics, and investor relevance (UN Global Compact & IFC, 2004; Khan, Serafeim & Yoon, 2016).

The term ESG has many faces. Fankhauser describes it as “equitable net-zero transition [E]), socio-ecological sustainability [S] and the pursuit of broad economic opportunities [G]”, including various indicators (Fankhauser, S., 2022). ESG metrics are non-financial indicators used to evaluate a company's environmental, social, and governance practices. While not typically included in required financial disclosures, these metrics are increasingly used by investors to assess potential risks, uncover growth opportunities, and filter investment options. Although ESG factors can generally be

quantified, assigning a precise financial value to them can be challenging due to their complex nature (Investopedia, 2022).

1. Environment

The “E” in ESG considers the company’s use of natural resources within its operations and throughout its value chain. The Environmental Criteria assesses how a company manages its impact on the natural environment, both within its operations and across its value chain. It can also pose financial risks, affecting a company's creditworthiness. These criteria also help assess a company's financial exposure to environmental challenges. Environmental criteria primarily assess the company’s environmental footprint. For instance, an oil spill could lead to penalties, reputational damage, and costly litigation. Given the increasing importance of climate change, evaluating how a company addresses environmental risks has become essential for understanding its potential future risks and financial exposure (S&P Global, 2019).

2. Social

The Social Criteria (“S”) evaluates how a company interacts with and impacts various stakeholders, including employees, consumers, communities, governments, NGOs, and civil society. The “S” in ESG focuses on how a company manages its relationships. These relationships can create positive or negative externalities, influencing the company's financial performance. Effectively managing social relationships helps mitigate risks and enhance a company's reputation and stability. For instance, labour strikes stemming from inadequate working conditions can lead to financial losses and disruptions in operations (S&P Global, 2020).

3. Governance:

Governance (“G”) addresses how power and accountability are allocated among key stakeholders and reveals the company’s internal framework of practices, procedures, and controls that guide decision-making and ensure compliance with laws and stakeholder expectations. Good governance practices are crucial for minimising unnecessary risks, as weak governance can lead to issues like corporate scandals and ethical breaches, which may result in significant financial losses, as well as reputational damage. For example, poor governance structures can allow unethical behaviours, such as data misuse or fraud, to go unchecked, potentially causing reputational and financial damage (S&P Global, 2020).

Overall, other environmental, social and governance factors can be found in the next table.

"E"	"S"	"G"
Air and Water Pollution	Collaboration with NGOs and Civil Society	Audit Committee Structure
Biodiversity	Customer Satisfaction	Board Composition
Carbon Emissions	Data Protection and Privacy	Bribery and Corruption
Climate Change	Employee Engagement	Code of Ethics and Values
Deforestation and Land Usage	Gender and Diversity	Compliance Practices
Energy Efficiency	Geopolitical Events	Conflicts of Interest
Greenhouse Gas Emissions	Impact on Local Communities	Corporate Governance Structure and Oversight
Natural Resources Scarcity and Conservation	Labor Standards	Cyber Risk Exposure
Treatment of Animals	Protection of Human Rights	Executive Compensation
Waste Management	Relationship with the Government	Lobbying
Water Scarcity		Political Contributions
		Reporting and Transparency
		Whistleblower Schemes

Figure 3 Compilation of ESG factors, according to (CFI, 2022)

The following paragraphs will summarise important political developments which influence the ESG environment of Lufthansa Group as a European company with large-scale operations today.

The Paris Agreement

A critical milestone in global sustainability efforts came in 2015 with the adoption of the Paris Agreement, a legally binding treaty aiming to limit global warming to well below 2°C above pre-industrial levels. This agreement emphasized the urgent need for climate finance, with developed nations committing to provide \$100 billion per year to support developing countries in their transition to low-carbon economies. Climate finance refers to the funding dedicated to supporting activities that address climate change, including efforts to reduce greenhouse gas emissions and enhance resilience to its impacts. Financial flows under climate finance can come from public, private, or alternative sources and are essential for both mitigation and adaptation and support projects in renewable energy, sustainable agriculture, and resilient infrastructure, among other areas (UNFCCC, 2015; Investopedia, n.d.).

The Sustainable Development Goals

Complementing this effort was the 2030 Agenda for Sustainable Development, also launched in 2015. It introduced 17 Sustainable Development Goals (SDGs) to address interconnected global challenges, from poverty and education to clean energy and climate action. The SDGs have become a universal reference for aligning strategies with global priorities (United Nations, 2015). All 193 UN member states committed to

advancing 17 SDGs and 169 specific targets by 2030. The SDGs build upon and expand the UN Millennium Development Goals (MDGs), which were in place from 2000 to 2015 as the first universally agreed-upon effort to address complex global challenges (Iberdrola, n.d.).



Figure 4 The Sustainable Development Goals by the UN

The last SDG presented refers to partnerships in order to achieve these goals. Since the implementation, many companies have integrated the SDGs into CSR strategies, while an increasing number of investors are incorporating ESG criteria into their investment decisions. The SDGs have reshaped how investors evaluate their portfolios, considering not only the impact of external factors on returns but also the broader societal and environmental consequences of their investment choices. ESG investing has emerged as a key driver of progress in this area, playing a crucial role in assessing the performance of companies and assets. However, despite the significant growth of ESG investing, the financial gap required to achieve the SDGs remains high (Morningstar, 2022).

International Agreement on sustainability norms

While international frameworks like the SDGs define the “what” of sustainable development, various global and national instruments offer guidance on the “how.” Among the most influential are the UN Guiding Principles on Business and Human Rights, the OECD Guidelines for Multinational Enterprises, and voluntary commitments like the UN Global Compact. These frameworks provide practical expectations for corporate conduct in areas ranging from human rights and supply chain accountability to environmental integrity and anti-corruption. Together, they form a normative backbone for ESG implementation in both global and regional contexts (OHCHR, 2011; OECD, 2011; UN Global Compact, 2022).

Furthermore, the UN Guiding Principles on Business and Human Rights set a base for active guidance to companies globally through concrete guidelines for action. The three pillars of these principles are:

- The state duty to protect against human rights violations by companies,
- The corporate responsibility to respect human rights across the entire supply chain, and
- Access to remedy, through implementation of grievance and complaint mechanisms.

As a German-based enterprise, Lufthansa Group must follow the German National Action Plan for Business and Human Rights, which aligns with these global standards.

Additionally, the OECD Guidelines for Multinational Enterprises provide a comprehensive code of conduct on:

- Cooperation with trade unions,
- Environmental protection,
- Anti-corruption measures,
- Respect for consumer rights, and
- Responsible practices in overseas supplier relationships and investments.

Lufthansa Group is furthermore a member of the UN Global Compact, requiring it to align with ten universal principles covering environmental, social, and governance areas.

Building on global frameworks and voluntary standards, the European Union has established its own robust regulatory infrastructure to guide corporate sustainability. This chapter will outline the most significant instruments, including the CSRD, GRI integration, and the 2025 Omnibus Law, that shape sustainability reporting within the EU.

Corporate Sustainability Reporting Directive

The CSRD is a European Union (EU) regulatory framework designed to enhance corporate transparency in ESG reporting. It expands the scope of mandatory reporting from the prior non-financial reporting directive (NFRD), increasing the number of affected organisations from 11,000 to approximately 50,000 companies. The CSRD aims to standardise sustainability disclosures across sectors to combat greenwashing and align business practices with global sustainability goals like the Paris Agreement. With the development of CSR, the integration of ESG factors into corporate reporting evolved from the NFRD which became EU law in 2014 and transposed to national law in 2016, before the CSRD which was implemented in July 2023. The NFRD portrayed the EU Commission's efforts to integrate more sustainability into the European economy. Its main aims were reliability

and comparability. However, the additional administrative burden for companies and the conceptual fundamentals needed for a reporting framework were criticised (Baumüller & Grbenic, 2021). Under the NFRD, public interest entities with over 500 employees must include non-financial disclosures in their annual reports if they meet either of the following financial thresholds: a balance sheet exceeding 20 million euros or a turnover of more than 40 million euros. The report must cover key areas such as environmental impact, social responsibility, employee treatment, human rights compliance, anti-corruption measures, and diversity on company boards. Furthermore, to ensure a high quality, the NFRD established six core principles. Reports should be material, including a double materiality perspective when reporting climate-related information, meaning they focus on relevant sustainability aspects, and must be fair, balanced, and easy to understand. They should also be comprehensive yet concise, strategic and forward-looking, and stakeholder-oriented to reflect diverse perspectives. Additionally, non-financial disclosures should be consistent and coherent, maintaining comparability across reporting periods and aligning with broader corporate strategies (Dechert LLP, 2020).

The CSRD currently applies to large EU companies meeting at least two of the following criteria: €50+ million in net turnover, €25+ million in assets, or 250+ employees. It also covers SMEs listed on European stock exchanges and extends to non-EU businesses with significant EU operations (e.g., €150+ million in turnover within the EU). Non-EU companies fall under the directive by 2028 if they meet the thresholds for EU business operations. This broad application ensures that global and European companies are held to consistent sustainability reporting standards (Normative, n.d.; European Commission, 2025). Under the CSRD, businesses are required to disclose information on environmental impacts, human rights, and governance practices using the European Sustainability Reporting Standards (ESRS) developed by EFRAG. These standards mandate detailed reporting on issues such as greenhouse gas emissions (including Scope 3), biodiversity, and resource use. Businesses are advised to start aligning their reporting systems and strategies in advance to ensure compliance when legally binding (Deloitte, n.d., Normative, n.d.). In summary, the CSRD reflects the EU's commitment to sustainability leadership by ensuring that companies report on and address their environmental and social impacts transparently.

From sustainability theory to a reporting framework

The ESRS framework ensures a comprehensive view of sustainability risks and opportunities (Deloitte, n.d., Normative, n.d.). Companies must report their sustainability data in a standardised digital format to ensure comparability and accessibility. Furthermore, the CSRD mandates third-party assurance to validate the accuracy of disclosed data. This approach is expected to

mitigate risks like greenwashing and increase stakeholder confidence in reported information (Brightest Guide, n.d., European Commission, 2025).

The initial term used for the new type of disclosure was non-financial reporting, a statement added alongside financial reports, but due to uncertainties regarding e.g. health and energy issues, actual sustainable solutions were needed. The CSRD, as a new legislative, introduced with the ESRS common, mandatory, and uniform reporting standards for all EU countries including e.g.

- Double materiality,
- A common system for sanctions, and
- External audits (Primec & Belak, 2022).

There have been recent developments altering the CSRD. In 2025, the European Commission introduced the Omnibus Law, a legislative package designed to simplify and adjust the implementation timeline of the CSRD and easing corporate reporting requirements. Currently, only large companies such as Lufthansa Group will be required to extensively document their sustainability efforts, significantly reducing the number of businesses obligated to report on their environmental and social impacts. According to a proposal from the European Commission, only 20% of the companies previously affected by the CSRD will remain subject to reporting requirements. The rationale behind this change is that larger corporations are likely have the greatest impact on people and the environment. The main goal of easing the CSRD is to relieve SMEs and reduce bureaucratic burdens. Additionally, affected companies will receive a two-year extension before they must submit their reports. This move is part of a broader effort to make European industry more competitive and resilient, especially as it faces high energy prices, regulatory challenges, and global competition. Similar calls for regulatory relief had already emerged from the German government. In addition to relaxing sustainability reporting rules, the Commission also plans to ease regulations on supply chains and sustainable investments. However, before these changes can take effect, EU member states and the European Parliament must review and approve the proposed amendments (European Commission, 2025).

The CSRD's overall aim is to harmonise reporting frameworks and therefore introduced the ESRS which is mandatory to use for the disclosure of sustainability information and takes the double-materiality perspective. This means that impacts can go both ways, risks and opportunities can arise from social and environmental issues and the other way around. The following 12 ESRS reflect the structure and sustainability issues considered in the up-coming reports (European Commission, 2023).

Group	Number	Subject	Description	
Cross-cutting	ESRS 1	General Requirements	Sets general principles	
Cross-cutting	ESRS 2	General Disclosures	Specifies essential information (mandatory)	
Environment	ESRS E1	Climate		Subject to a materiality assessment: need to report only relevant information, but not voluntary if subject to materiality
Environment	ESRS E2	Pollution		
Environment	ESRS E3	Water and marine resources		
Environment	ESRS E4	Biodiversity and ecosystems		
Environment	ESRS E5	Resource use and circular economy		
Social	ESRS S1	Own workforce		
Social	ESRS S2	Workers in the value chain		
Social	ESRS S3	Affected communities		
Social	ESRS S4	Consumers and end users		
Governance	ESRS G1	Business conduct		

Figure 5 The ESRS Framework, according to (European Commission, 2023)

To make sure which information needs to be disclosed, a robust materiality assessment must be performed. Themes that fall out of this assessment may be omitted. An exception is climate change, as due to its wide-ranging impacts, a non-materiality must be proven. The phasing-in of this new framework leads to additional work for companies. Therefore, companies with fewer than 750 employees are given the possibility to stretch the costs over a longer time period and receive more time to prepare the reports as they're affected more strongly by this change. Additionally, companies have more flexibility without the need to include all information as materiality creates a threshold to avoid irrelevant information in the report. ESRS makes companies present data points and if they're decided not to be material, the term "not material" has to be stated instead of reporting nothing. The Accounting Directive makes no changes to small- and medium-sized enterprises (SMEs). However, for SMEs to be prepared for stakeholder requests about sustainability, the European Financial Reporting Advisory Group (EFRAG) develops simpler, voluntary standards while listed SMEs are protected by a cap on information that can be requested. Non-technical support and the development of the ESRS were mainly worked out by the EFRAG, in cooperation with the International Sustainability Standards Board (ISSB). ESRS are strongly aligned with the ISSB and the GRI (European Commission, 2023).

The Global Reporting Initiative

The GRI Standards, as a globally recognised framework for sustainability reporting, are regularly reviewed to bridge the information gap between companies and stakeholders

well. Three kinds of standards are reported on: The universal, sector and topic standards (GRI, n.d.).

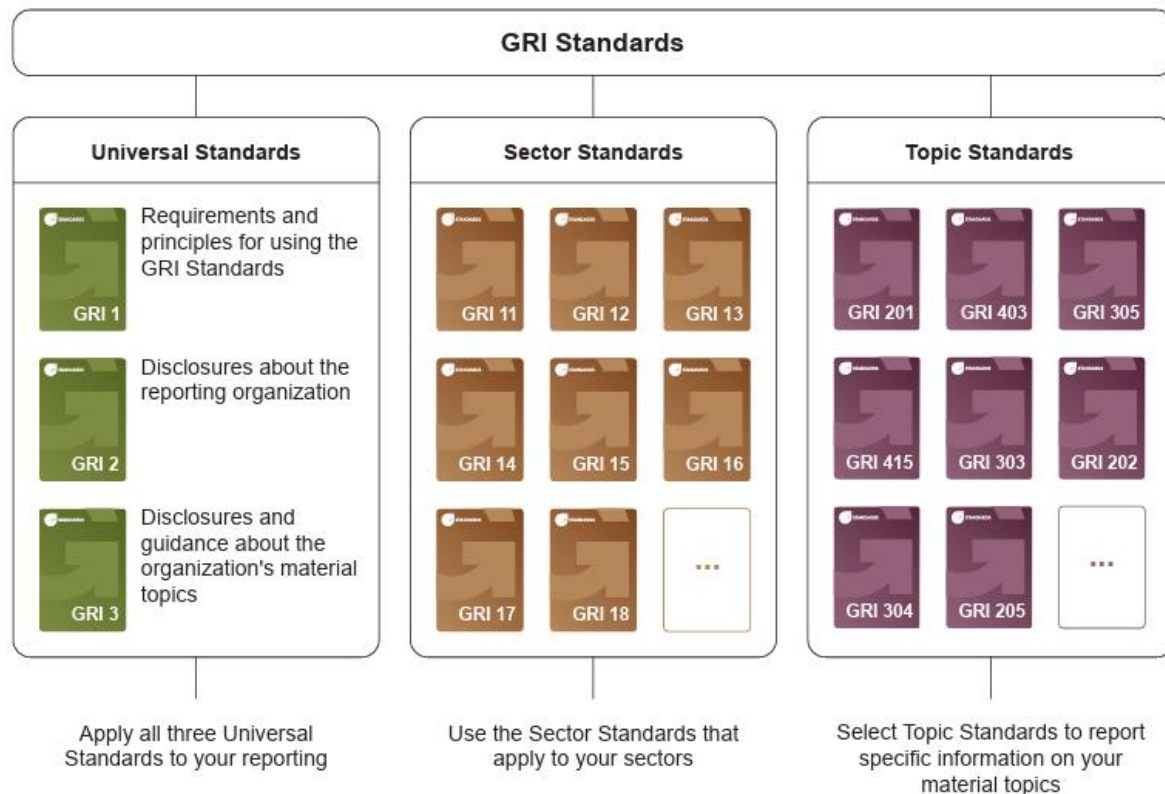


Figure 6 GRI Standards overview (GRI, n.d.)

As the EU legally requires all large companies and close to all listed companies to disclose their social and environmental impacts as well as resulting risks and opportunities without a common framework, information was fragmented and hardly comparable for investors. However, investor's decisions have impacts on ESG issues by choosing the companies to invest in. GRI set the first global standards for sustainability reporting in the world in 2016, the "GRI Sustainability Reporting Standards", which are regularly updated, after initially only providing guidelines. The current version was presented in 2021. Regarding the Lufthansa Group's business model and operations, GRI defines the materiality and afterwards, Lufthansa Group itself checks for Sector Standards, as well as for Topic Standards. The variety of stakeholder opportunities and risks that need to be considered opposes high effort on Lufthansa Group. As a non-profit organisation, GRI is financed by events, corporate engagements, commercial services, and memberships (GRI Standards website, n.d.; GRI Standards FAQs, 2022). For financial services, the Sustainable Finance Disclosure Regulation (SFDR) was introduced in 2019, which will not be further analysed (European Commission, 2023).

To provide a brief overview of recent European developments, the following figure created by Lufthansa Industry Solutions illustrates major regulatory milestones impacting Lufthansa Group.

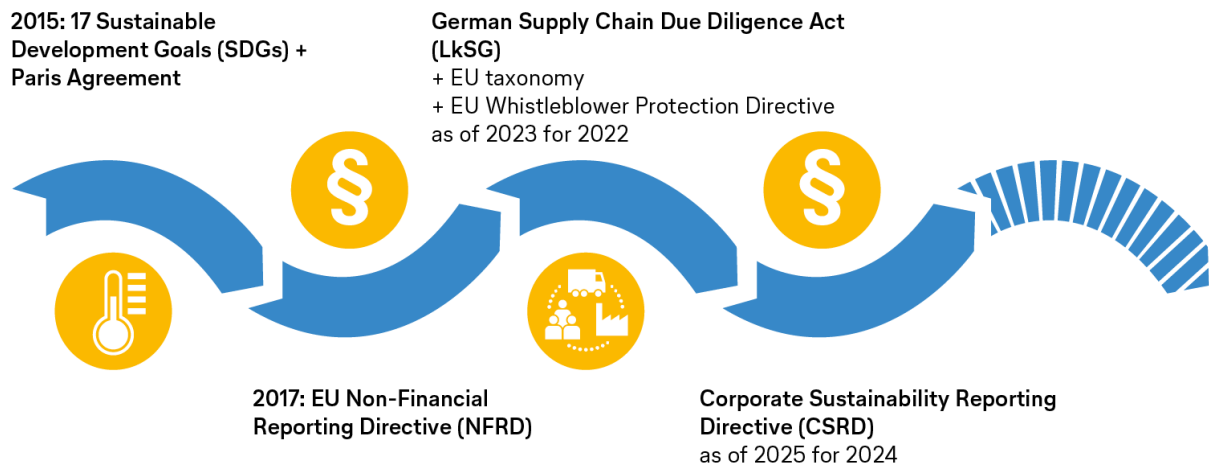


Figure 7 Overview of the EU's currently relevant political actions affecting ESG Reporting (Lufthansa Industry Solutions, n.d.)

The Greenhouse Gas Protocol

In support of the SDGs, companies began standardising how to measure their environmental impact. One of the most influential tools in this area is the Greenhouse Gas (GHG) Protocol, first published in 2001, which provides a methodology for calculating and reporting greenhouse gas emissions (WRI & WBCSD, 2001).

The GHG Protocol is a collaborative initiative that brings together businesses, NGOs, governments, and other stakeholders, facilitated by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). Established in 1998, its mission is to create globally recognised standards and tools for GHGs accounting and reporting, while promoting their widespread adoption to support the transition to a low-emission global economy (GHG Protocol, n.d.). Today, it provides an internationally recognised framework for measuring and managing GHG emissions. With the provision of standardised guidelines for organisations and governments to calculate their carbon footprints, it helps to enhance transparency and accountability in emissions reporting. Therefore, it divides emissions into three scopes: Scope 1 for direct emissions from company-owned sources, Scope 2 for indirect emissions from purchased electricity, and Scope 3 for all other indirect emissions from a company's value chain, such as those produced by suppliers and customers. This categorisation helps organisations to address emissions comprehensively across their operations and along their supply chains. With widespread adoption, the GHG Protocol has influenced global climate strategies significantly. Over 90% of Fortune 500 companies that report climate data through the Carbon Disclosure Project (CDP) use the GHG Protocol standards. Furthermore, it supports consistency in corporate reporting and provides tools to help organisations set and track their progress on emissions reduction targets in line with broader climate goals, such as those established by the Paris Agreement (World Resources Institute, n.d.; GHG Protocol n.d.).

The Carbon Footprint

Additionally, a company's total GHG emissions can be measured in form of a carbon footprint, in all scopes caused by either an individual, an organisation, a product, or an activity, typically expressed in the unit CO₂e. The calculation includes emissions from fossil fuel combustion, deforestation, manufacturing processes, transportation, and other activities contributing to global warming. The carbon footprint helps quantify the environmental impact by accounting for gases like CO₂, methane, and nitrous oxide, each of which has a different global warming potential.

The concept of a carbon footprint can apply on multiple scales, e.g.:

- The individual footprint includes emissions from personal activities such as driving, home energy use, and dietary choices.
- The corporate footprint encompasses a company's direct emissions, e.g. from owned or controlled sources, and indirect emissions, e.g. from purchased energy, and across the supply chain.
- And lastly, the product footprint can assess the total emissions from the production, transportation, use, and disposal of one single product.

Furthermore, tools and standards, such as the Greenhouse Gas Protocol and International Organization for Standardization (ISO) 14064, help individuals and businesses calculate their carbon footprints. By understanding their footprint, entities can identify and implement strategies to reduce emissions, thereby contributing to climate mitigation efforts (EPA, n.d.; WRI, n.d.). Furthermore, ISO 26000 commits businesses to operating in a socially responsible way. Consequently, Lufthansa Group is assessed by this standard in terms of sustainability and its overall performance (ISO, n.d.).

Environmental Management Systems

To manage environmental responsibilities internally, businesses adopted structured systems like Environmental Management Systems (EMS). The ISO 14001 standard, launched in 1996, provides a global framework to help organisations integrate sustainability into their day-to-day operations (ISO, 1996; ISO, 2015).

This standard provides guidelines for quantifying and reporting GHG emissions, which help organisations establish a transparent carbon footprint. The ISO develops globally recognised standards for various industries, including environmental management. One of its most significant contributions in this area is the ISO 14000 family of standards, which provides frameworks for organizations to minimize their environmental impact, comply with regulations, and improve sustainability practices. The most well-known standard in this series is ISO 14001, which sets out the criteria for an Environmental Management System. It helps organisations identify, manage, monitor, and improve their environmental performance through a systematic approach. ISO 14001 is applicable to

businesses of all sizes and sectors, promoting sustainable resource use, pollution prevention, and continuous improvement in environmental practices. Furthermore, other related standards include e.g. ISO 14004, which provides guidance on the implementation of an EMS, and ISO 14064, which focuses on greenhouse gas accounting and verification. Moreover, the ISO 50001 standard, while primarily addressing energy management, also plays a crucial role in environmental sustainability by improving energy efficiency and reducing carbon footprints. By adopting ISO environmental management standards, organisations can enhance their environmental performance, ensure regulatory compliance, and demonstrate their commitment to sustainability to stakeholders (ISO, n.d.).

The EU Taxonomy

The momentum continued with bold regulatory action in the European Union, which launched the European Green Deal in December 2019, followed by the EU Taxonomy Regulation in July 2020. These initiatives guide economic and financial activity toward a greener future, defining what counts as a "sustainable" investment (European Commission, 2020).

The EU Taxonomy for sustainable activities, short EU Taxonomy, introduced by the European Commission in March 2020, is a classification system, designed to define which economic activities qualify as environmentally sustainable. This framework is a key tool for guiding financial market participants, investors, corporations, and regulators in supporting sustainable financial decisions. It addresses the Paris Agreement's goal of steering financial investments toward a green, low-carbon, and climate-resilient economy, encouraging investments in certified "green" companies and promoting transparency through public disclosures (Business Roundtable, 2019). Its aim is to direct investments towards and creating a more transparent market by defining criteria for economic activities (European Commission, n.d.). It is aligned with the European Green Deal objectives which are namely: to „create economic growth decoupled from resource use and no net emissions of greenhouse gases by 2050, as well as leave no person and no place behind“. It is financed by the NextGenerationEU Recovery Plan and the EU's seven-year budget (acc. To European Commission, n.d.).

To meet EU Taxonomy requirements, companies must align their activities with six environmental objectives:

- Climate change mitigation,
- Climate change adaptation,
- Sustainable use and protection of water and marine resources,
- Transition to a circular economy,
- Pollution prevention and control, and

- Protection and restoration of biodiversity and ecosystems (Business Roundtable, n.d.; Pizzi, S., et al., 2020).

The Taxonomy also lays out three performance criteria for an activity to be deemed "EU Taxonomy-aligned": it must substantially contribute to at least one environmental objective, do no significant harm to other objectives, and meet minimum social safeguards. Eligible activities, such as reforestation or renewable energy generation, enable companies to label relevant portions of their revenues or expenditures as environmentally sustainable. Financial intermediaries investing in these companies must disclose the extent of their alignment with the Taxonomy in compliance with the NFRD, thus distinguishing sustainable investments from non-aligned activities (Business Roundtable, n.d.).

Carbon Markets

Alongside regulation, carbon markets have introduced as a practical incentive for decarbonisation and a powerful tool to price and reduce emissions, consequently addressing the "how" in the ESG debate. Initially formalised under the Kyoto Protocol in 1997 and expanded by the Paris Agreement in 2015, carbon markets enable companies to buy or sell carbon credits, incentivising innovation and meanwhile emissions reductions (World Bank, 2023). There are several mechanisms such as carbon markets, carbon credits, CO₂ equivalents, and the Emission Trading System (ETS) that were designed to regulate and reduce greenhouse gas emissions by putting a price on carbon. The following will explain how they function and interrelate.

Carbon markets are systems where countries or companies can buy or sell carbon credits or allowances that permit the emission of a certain amount of CO₂ or its equivalent. Carbon credits serve as a currency in these markets and represent one metric ton of CO₂ or an equivalent amount of another greenhouse gas, making it possible to compare and trade emissions of various pollutants. Through these markets, entities that emit less than their allocated amount can sell their excess credits, while those who exceed their limits can buy additional credits, creating financial incentives for reducing emissions (Clean Energy Wire, n.d.; PwC, n.d.).

This standardisation across different GHGs by their global warming potential relative to CO₂ allows for a coherent trading system where companies with emissions of various GHGs can trade on a comparable basis (World Bank, 2023). Despite only CO₂ plays a roll in Lufthansa Group's Report, there are some important differences between GHGs. GHG trap heat in the atmosphere, contributing to global warming. The most prevalent GHG is carbon dioxide (CO₂), primarily released from burning fossil fuels, deforestation, and industrial processes like cement production (NASA, 2024). Methane (CH₄) is a highly potent GHG, with a warming potential significantly higher than CO₂, and is mainly emitted from livestock digestion, rice paddies, landfills, and fossil fuel extraction (UNEP, 2021).

Nitrous oxide (N₂O), released mainly from agricultural fertilisers and fossil fuel combustion, has a warming potential hundreds of times greater than CO₂ (EPA, 2023). Fluorinated gases (F-gases) are synthetic gases with extremely high warming potential, used in refrigeration, electronics, and industrial applications. CO₂ equivalents (CO₂e) provide a standardised way to compare the global warming impact of different greenhouse gases, enabling a fair comparison and trade of diverse pollutants (PwC, n.d.).

The EU's emission trading system (ETS), launched in 2005, is the largest and most established carbon market globally. It caps the total emissions from certain sectors, such as power and manufacturing, by requiring companies to purchase and own allowances for each ton of CO₂ they emit. The cap is lowered over time to reduce overall emissions. Companies which reduce emissions to lower than their allowances can sell excess credits, while those exceeding the cap must purchase additional allowances or face penalties. Recent reforms have expanded the ETS to include more sectors, such as shipping and aviation, and increased the linear reduction factor to further drive emissions reductions by 2030 (European Commission, n.d.; Clean Energy Wire, n.d.).

Visualising a company's sustainability performance

In the private sector, tools like the Lufthansa Group's EPACTO software, introduced in 2021, show how technology is being used to manage ESG performance. EPACTO enables precise tracking of CO₂ emissions across aviation operations, highlighting sector-specific digital transformation in sustainability (Lufthansa Group, 2021).

All European companies meeting at least two of the following criteria: having more than 250 employees, the annual sales in excess reach €40 million or the balance sheet total in excess is €20 million will be obliged under the EU Taxonomy to produce annual sustainability reports and all companies with more than 500 employees already need to do so since last year, as required by the CSRD. Consequently, a big market opens for tools aiding in collecting sustainability data, assembling those in a presentative format and produce reports according to the laws and standards ESRS, CSRD, EU Taxonomy, indicators from the German Supply Chain Act (LkSpG) and the EU Corporate Sustainability Due Diligence Directive (CSDDD) to external stakeholders. Lufthansa Industry Solutions, as part of Lufthansa Group, recently introduced its own tool called EPACTO (Lufthansa Industry Solutions, n.d.).



Figure 8 Lufthansa Group's EPACTO tool (Lufthansa Industry Solutions, n.d.)

EPACTO offers four general services: ESG performance monitoring and presenting collected data in a comparative way, a step-by-step reporting guide, the calculation of the carbon footprint, and lastly, supply chain insights including the stressing of supply chain risks (Lufthansa Industry Solutions, n.d.).

The German Supply Chain Act (LkSpG)

Moreover, the LkSpG, which is effective from January 2024 on, is a law requiring Lufthansa Group to implement due diligence procedures to identify and address human rights and environmental risks within its supply chains (Lufthansa Industry Solutions, n.d.). The EU CSDDD, approved in April 2024, introduced stricter requirements for companies regarding environmental and human rights risks in their supply chains. Compared to Germany's existing LkSpG, the EU directive applies to larger companies, with more than 1,000+ employees, with a phased implementation over five years. A key difference is liability, while German law does not hold companies legally responsible for violations, the EU directive introduces legal accountability for failing to address supply chain risks (Lufthansa Industry Solutions, n.d.).

Companies must conduct comprehensive risk assessments and take preventive or corrective actions on issues like child labour, environmental damage, and forced labour. The directive does not enforce strict deadlines but requires substantial and documented efforts to work with suppliers, prioritizing collaboration over immediate contract

terminations. With stricter environmental requirements than German law, the EU directive signals a stronger push for corporate responsibility in global supply chains (Lufthansa Industry Solutions, n.d.). The implementation and effectiveness of the CSDDD in reaching its objectives, in particular in addressing adverse impacts, is and will be subject to a regular evaluation (European Commission, 2025).

The UN Global Compact

Hand in hand with the LkSpG goes the UN Global Compact which is a voluntary initiative launched in 2000 to encourage businesses worldwide to adopt sustainable and socially responsible policies. Its framework is based on Ten Principles grouped into four key areas:

1. Human Rights: Support and respect internationally recognised rights, ensuring businesses are not complicit in abuses;
2. Labour: Promote freedom of association, eliminate forced labour, abolish child labour, and combat workplace discrimination;
3. Environment: Encourage environmental responsibility and develop sustainable technologies;
4. Anti-Corruption: Work against corruption in all forms, including bribery.

These principles are drawn from major international declarations, including the Universal Declaration of Human Rights, the International Labour Organisation's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development, and the UN Convention Against Corruption (United Nations Global Compact, n.d.). Companies that join the commitment to aligning their operations with the Ten Principles focus on integrating sustainability into their strategies. The membership is voluntary and not legally binding, focusing instead on fostering a shared commitment to long-term change.

Sustainable Investing

Underlining the importance of adhering to national and European frameworks and norms, sustainable investments, sustainable and green investing has surged since the mid-2010s. Investors now routinely assess companies based on ESG performance, using financial products like green bonds, sustainability-linked loans, and ESG ETFs to align capital with sustainability goals (GSIA, 2021). Transparent ESG Reporting and the effect of ESG Rating, Green Investing, are necessary as without standardisation and clarity, shareholders can't take correct decisions, and financial markets can't properly function. An investment's value is nowadays not just defined by return and profitability, but additionally by its impact on society. Decision-making in investing is increasingly dependent on environmental, social and governance factors (Economidou, C., et al., 2023).

Tying all of this together, the rise of sustainable finance promotes positive ESG outcomes. By integrating ESG risks and opportunities into lending, investment, and underwriting, sustainable finance acts as a bridge between corporate behaviour and global sustainability goals (European Commission, 2021).

4. ESG analysis of Lufthansa Group's Annual Report

After providing a general literature overview, the current enforcement of these frameworks by Lufthansa Group will be presented, portraying its current efforts and resulting challenges. This chapter functions as an important base to understand the sustainability practices of the Lufthansa Group. After describing its actions in detail, occurring challenges regarding those practices will be summarised, reflecting their statements critically.

In its non-financial disclosure, Lufthansa Group states that it actively supports the SDGs outlined in the Agenda 2030, identifying ten key SDGs, presented in the next graph, as a base to minimise negative impacts and enhance positive contributions through its business model. Further details on its commitments can be found in the T201 Sustainable Development Goals report (Lufthansa Group, 2024). Additionally, the company enforces a Code of Conduct, which has been mandatory for all employees, managers, and governing bodies since 2017 and was updated in 2023. This is complemented by a Supplier Code of Conduct, outlining expectations for business partners and suppliers to uphold ethical standards. These principles serve as a foundation for responsible conduct, fair competition, and proactive risk management, aiming to mitigate legal and reputational risks (Lufthansa Group, 2024). The relevant SDGs will be portrayed in the graph below.



Figure 9 Relevant SDGs according to (Lufthansa Group, 2024)

Sustainability is playing an increasingly vital role in strengthening financial resilience. Lufthansa Group's financial strategy is designed to enhance the company's long-term value through sustainable growth (Lufthansa Group, 2024). At a first glance, Lufthansa Group appears very transparently on its website. A reader can easily encounter several sustainability statements. Firstly, the annual report 2023, a combined non-financial declaration, is published here. Secondly, the Lufthansa Group has participated voluntarily in the UN Global Compact since 2002 and accordingly reports on its progress in the area of sustainable corporate governance along the ten principles of the UN Global Compact annually. Additionally, Lufthansa Group participates in Corporate Transparency and thereby obliges itself to submit an annual Communication on Progress, detailing their actions and adherence to the principles (United Nations Global Compact, n.d.; Investopedia, n.d.).

Sustainability reports can be found online, dating back to 2007 and sustainability fact sheets are presented since 2019, summarising the extensive sustainability reports in key data, addressing external stakeholders as well. The Annual Report 2023 with its vision “connecting people, cultures and economies in a sustainable way” fills 329 pages with

financial and non-financial reporting information. A Materiality analysis forms the base of aspects that are mentioned in the report. This contains continuous dialogue with stakeholders through a wide-ranging survey with more than 10.000 representatives about:

- the relevance of sustainability topics,
- potential effects of business activities on the human and natural environment, and
- risks and opportunities.

In ESG Reporting, materiality is a principle used to determine which issues are significant enough to be disclosed in sustainability and financial reports. This concept helps organisations to focus their reporting on the most relevant information for their stakeholders, ensuring transparency and efficiency in communicating ESG impacts. Materiality allows companies to concentrate on areas that directly affect their performance or align with stakeholder concerns (Acuity Knowledge Partners, n.d.; Centida, n.d., PWC, n.d.). In addition to financial materiality, double materiality expands the concept by integrating impact materiality, focusing on a company's broader effects on society and the environment. It acknowledges that some issues may not immediately impact financial performance but are significant for long-term sustainability and stakeholder trust. This approach is embedded in regulatory frameworks such as the European CSRD, which emphasises reporting on both financial impacts and societal contributions as well. Challenges in materiality include defining relevant ESG issues, collecting reliable data, and adapting to the evolving nature of stakeholder priorities and regulatory expectations. Regular updates to materiality assessments are essential to staying aligned with these dynamic factors (Acuity Knowledge Partners, n.d.; PWC, n.d.).

In the following, the annual report will be analysed regarding its main themes and resulting challenges for Lufthansa Group on its sustainability pathway. To begin, the report's structure will be presented in the table below.

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Figure 10 Table of Contents of Lufthansa Group's Annual Report 2023 (Lufthansa Group, 2024)

Initially, the annual report contains financial key information about the Lufthansa Group in 2023. In its second section, economic data as well as a forecast is presented. Besides the combined non-financial declaration, which is the section of main interest for this work, the information on Corporate Governance will additionally be considered, as well as the combined management report, which provides disclosures on the business model. Finally, the report ends with the financial statements and additional reports, including the GRI Standards, which aren't fully considered in the main report as their use is not mandatory. Instead, this report is in accordance with the compulsory EU Taxonomy Regulation (2020/852) and voluntarily in accordance with TCFD, SASB and with reference to the GRI Standards (Lufthansa Group, 2024).

The combined non-financial declaration starts by stating the endeavours of the Lufthansa Group to be a leading airline regarding sustainability, incorporating corporate responsibility into its strategy. On the one hand, there is a non-financial declaration for the group and on the other hand for the company Deutsche Lufthansa AG. Legally, this report is „in accordance with Sections 315b and 315c of the German Commercial Code (HGB) in conjunction with Sections 289b to 289e HGB“. Also, the CSRD represents one of the reporting requirements. However, the report is voluntary with „limited assurance engagement in accordance with ISAE 3000“. After presenting key data, the report focuses on these six main themes (Lufthansa Group, 2024):

- „Environmental concerns,
- Customer concerns,
- Employee concerns,
- Social concerns,
- Business ethics and compliance, including anti-corruption and bribery as well as

respect for human rights, and

- Responsible supply chain management“ (Lufthansa Group, 2024).

Their ESG strategy is reviewed each year, setting a focus on the pathway of carbon transition and several supporting measures, one of which being its sustainable aviation fuel (SAF) strategy and in-flight as well as ground-based efficiency measures in 2023. Lufthansa's environmental strategy is grounded in a strong sense of responsibility and continuous engagement with stakeholders to ensure it meets societal expectations. By incorporating feedback from customers, partners, and policymakers, the Group states to align its sustainability efforts with global climate challenges. This collaboration ensures a balanced approach that reflects diverse perspectives while driving impactful environmental solutions. Concerns of their stakeholders build a base for Lufthansa Group's Environmental Strategy (Lufthansa Group, 2024). In the following, the main aspects, issues and performance indicators will be described.

4.1 Lufthansa Group's environmental sustainability practices

Regarding environmental concerns, three main issues are identified: Climate Protection, Active Noise Abatement and Waste Management. For measuring and quantifying Climate Protection, the two performance indicators CO₂ emissions and Status of CO₂ reduction target are utilised. In the case of Active Noise Abatement, the percentage of aircrafts that meet the 10dB criterion quantifies the progress of this issue. There is no indicator stated to measure Waste Management (Lufthansa Group, 2024).

Mitigation Strategies

The Lufthansa Group places environmental sustainability at the core of its operations, with clear targets to halve net CO₂ emissions by 2030 relative to 2019 and achieve carbon neutrality by 2050. These goals, aligned with the Paris Agreement, are supported by fleet modernisation, adopting SAF, and implementing operational efficiencies such as optimized flight routes. Passenger engagement initiatives, like Green Fares and COMPENSAID, empower customers to actively participate in emission reduction efforts. Additionally, Lufthansa Group is involved in national and international associations, presented previously, and sustainability initiatives and consequently actively contributes to sustainability initiatives and industry associations, including the SBTi and the UN's SDGs. These partnerships help shape global standards for sustainable aviation and foster collaboration for innovative solutions. Through these efforts, Lufthansa strengthens its leadership position and accelerates the industry's transition to greener practices (Lufthansa Group, 2024).

Moreover, the Group employs a range of initiatives, such as investing in fuel-efficient aircraft, reducing in-flight waste, and utilising SAF, to meet its environmental goals and communicates those. Transparency is a cornerstone of this strategy, with detailed reporting to ensure stakeholders are well-informed about progress and challenges.

Lufthansa's communication practices are described to not only enhance accountability but also foster trust and collaboration across its ecosystem in order to support the implementation of the Lufthansa Group's Environmental Strategy. Reducing emissions is a key focus of Lufthansa's environmental strategy, achieved through operational efficiencies, optimised flight routes, and the adoption of cutting-edge technologies like AeroSHARK. The Group continuously invests in new-generation aircraft like the Airbus A350 and Boeing 787, which significantly lower emissions compared to older models. These efforts exemplify Lufthansa's commitment to leading the aviation industry toward a low-carbon future. Furthermore, Lufthansa integrates intermodal transport options, combining air and rail travel to reduce reliance on short-haul flights and improve sustainability. In its home markets, this approach enhances passenger convenience while minimizing environmental impact. By prioritizing seamless connections between modes of transport, Lufthansa supports a shift towards greener mobility solutions (Lufthansa Group, 2024).

SAFs are central to Lufthansa's decarbonisation strategy, offering up to 80% lower lifecycle emissions compared to conventional fuels. The Group collaborates with policymakers and industry leaders to expand SAF availability and affordability, positioning SAF as a cornerstone of sustainable aviation. These efforts not only address climate goals but also drive innovation across the sector. Moreover, Lufthansa incorporates circular economy principles to reduce waste and promote sustainability throughout its operations. This includes minimizing disposable products, preventing food waste, and introducing environmentally friendly materials in catering and in-flight services. By adopting "Reduce – Recycle – Reuse – Replace" practices, the Group enhances resource efficiency and aligns with global sustainability trends. As a last environmental practice, the Lufthansa Group enables passengers to offset their flight emissions through high-quality climate protection projects facilitated by programs like COMPENSAID and Squake. These projects focus on impactful solutions such as reforestation and renewable energy. By offering transparent and user-friendly offset options, Lufthansa empowers customers to contribute directly to global climate efforts (Lufthansa Group, 2024).

4.2 Lufthansa Group's social sustainability practices

Regarding customer concerns, Operational stability and Product and services are the two main issues pointed out in 2023. Operational stability is measured by the two performance indicators Departure punctuality and Regularity, while there is a Net Promoter Score quantifying the issue of Product and services (Lufthansa Group, 2024). The aspect of Employee concerns portrays most issues out of all six aspects. According to the stakeholders and the reviewing board, Attractiveness as employer, Diversity and equality of opportunity, the capability of transformation and Health and safety at work are prominent issues in 2023. While capability of transformation is not given an indicator,

Attractiveness as an employer is measured using three different performance indicators: the Engagement Index, the Wage agreement coverage ratio, and External rankings employer ratings. The Diversity and equality of opportunity is expressed in the Share of women in management positions and the Number of nationalities employed in the Lufthansa Group. For Health and safety at work, a Health Index is calculated, and the Number of work-related injuries is chosen as a representative indicator (Lufthansa Group, 2024).

Mitigation Strategies

Lufthansa Group integrates social responsibility into its corporate strategy, reflecting its role as a global aviation leader. By connecting people, cultures, and economies, the Group enhances its corporate image, strengthens customer trust, and fosters employee loyalty. A key component of this strategy is the help alliance, the Group's aid organisation, which manages development projects to address humanitarian crises and social needs. Lufthansa Cargo also supports aid efforts through partnerships with renowned organizations, enabling emergency flights and supply deliveries. Corporate citizenship is mentioned to be an issue in social concerns and quantified with the help alliance GmbH. This charity organisation of the Lufthansa Group was founded in 1999. It is structured as a non-profit limited liability company. Its work spans a wide range of initiatives, from health and environmental protection to gender equality and income generation. With active involvement from Lufthansa employees as volunteer project coordinators, the help alliance collaborates with local partners to support over 60 projects across 29 countries. These efforts benefit more than 60,000 children, teenagers, and young adults annually. In recent years, the organisation has increased its focus on transparency and measurable outcomes to maximize the effectiveness of its contributions (Help Alliance, n.d.; BCD Travel, n.d.; Miles & More, n.d.).

Furthermore, concerning business ethics and compliance, the issue of fighting corruption and bribery is given the following two indicators: On the one hand, the training ratio should be improved and on the other hand, the number of compliance-related reports is measured (Lufthansa Group, 2024).

Additionally, high Customer Satisfaction is a Core Priority for Lufthansa Group. Ensuring safety and customer well-being is a central focus. Comprehensive safety management systems are implemented across all Group airlines, with safety audits conducted every two years under the IATA Operational Safety Audit. Maintaining operational stability and delivering innovative, high-quality services is essential for long-term customer loyalty. This includes offering reliable travel options, personalised experiences, and simplified processes, as well as investments in a modern fleet and advancements in sustainability and digital services. Finally, the Lufthansa Group emphasises digital innovation to elevate customer experiences. By introducing new tools and technologies, the Group

seeks to streamline travel processes, minimise disruptions, and offer tailored services (Lufthansa Group, 2024).

Despite consistent high demand in the reporting year, infrastructure limitations during peak travel periods disrupted operations, resulting in delays, missed connections, and luggage issues. The Group actively invested in measures to improve the operational stability of its passenger airlines and optimise the travel chain. This approach aims to ensure a seamless experience from booking and check-in to the flight itself and post-flight services at the destination (Lufthansa Group, 2024).

Regarding the attractiveness as an employer, the Lufthansa Group prioritises its role as an attractive and modern employer to maintain workforce loyalty and attract external talent. Employee satisfaction is fostered through competitive working conditions, benefits, and flexible employment models tailored to diverse needs. Key initiatives include improved parental leave policies, pension schemes, and the availability of flexitime options. To strengthen recruitment, the Group introduced an updated employer brand, “Lufthansa Group careers,” and conducted marketing campaigns resulting in the hiring of over 14.890 employees in 2023 (Lufthansa Group, 2024).

Next, promoting diversity and inclusivity increases Lufthansa Group’s attractiveness as employer, enhancing innovation and creativity while minimising legal and reputational risks. The Group aims to increase the proportion of women in management and integrates equal opportunities through long-standing measures, such as the Equal Opportunities Commissioner. These efforts underline the company’s commitment to fairness and integrity as a core employer responsibility, and the Group continuously evolves its workforce through professional development and digital transformation. In 2023, employees gained access to cloud-based tools enabling remote and flexible work. Programs like the Green Explorer train staff to integrate sustainability in daily operations. Skill-building efforts were further advanced through the Service Management Professional apprenticeship, with over 1.830 completions since its inception. Lastly, occupational health and safety are critical focus areas, with a holistic approach aimed at ensuring long-term employee well-being. Preventative measures and programs are designed to maintain employees' physical and mental fitness. In 2023, the Group expanded initiatives addressing work-life balance and workplace safety, reflecting its dedication to fostering a healthy working environment (Lufthansa Group, 2024).

4.3 Lufthansa Group’s Governance sustainability standards

Business Ethics and Compliance are of high importance as well. Consequently, the Lufthansa Group's Code of Conduct sets a clear framework for integrity and responsible behaviour, requiring all employees, managers, and board members to comply with laws, internal regulations, and voluntary commitments. Key principles include corporate responsibility for society and the environment, conducting business with integrity, and

responsibly managing the company's resources. The Code of Conduct forms the foundation of the Group's value system, guiding all actions and decision-making processes. It is accessible publicly, emphasizing transparency and accountability (Lufthansa Group, 2024).

The Group employs a centralised Compliance Management System (CMS) to ensure adherence to ethical standards and legal requirements. Following the auditing standards of the Institute of Public Auditors in Germany (IDW PS 980), the CMS includes pillars such as compliance culture, risk identification, and compliance communication. It addresses specific areas like anti-corruption, competition compliance, and export regulations. Continuous updates ensure that the CMS remains aligned with evolving legal requirements and business challenges. Anti-corruption and anti-bribery measures are integral to the Group's CMS, reflecting its commitment to fair competition and ethical operations. Guidelines provide clear instructions on handling gifts, invitations, donations, and sponsorships to avoid conflicts of interest. The Group's global operations mandate compliance with international and national anti-corruption laws, promoting transparent conduct with business partners and governmental bodies. These measures enhance trust and reinforce ethical corporate behaviour (Lufthansa Group, 2024).

Moreover, as aforementioned, as a participant in the UN Global Compact, the Lufthansa Group is committed to upholding internationally recognised human rights standards. This commitment extends to its operations and partnerships, ensuring human rights are respected throughout its value chain. Policies and procedures actively address risks such as forced labour and discrimination, underscoring the Group's dedication to ethical practices across all areas of operation. Finally, the Lufthansa Group ensures transparency in its political activities, maintaining entries in the EU Transparency Register and the German Bundestag lobbying register. It regularly publishes Policy Briefs, which detail the Group's positions on key issues such as European airspace harmonisation and SAF expansion. By openly sharing its perspectives, Lufthansa fosters informed discussions with policymakers and strengthens its role as a responsible corporate citizen (Lufthansa Group, 2024).

4.4 Lufthansa Group's interdisciplinary practices

Lastly, Responsible supply chain management (RSCM), which is an interdisciplinary aspect, refers to issues in different departments and presents issues such as Respect for human rights which can be measured in the corporate culture or the Code of Conduct. The Group collaborates with suppliers to uphold its high standards for sustainability in products and services. In 2023, the Group's external procurement amounted to approximately €19 billion, spread across 170 countries and 333 product categories. These range from aircraft and fuels to catering, uniforms, and ground handling services. The integration of sustainability into procurement is also aligned with the Lufthansa Group's Code of Conduct. The Group's procurement policy mandates SR, which applies

to all employees involved in procurement activities. Regular training on sustainable procurement is compulsory, with a 99% completion rate for relevant employees in 2023. The Supplier Code of Conduct summarises the Group's expectations regarding social, environmental, and ethical practices and ensures that suppliers align with principles such as the UN Global Compact and the International Labour Organisation standards. The Lufthansa Group employs a sophisticated risk management system to identify potential human rights, environmental, and compliance risks within its supply chain. This system uses artificial intelligence to classify suppliers based on risk levels, allowing for proactive measures. Additionally, suppliers are obligated to report any risks or violations through established whistleblower systems. This ensures transparency and compliance with the LkSpG. Moreover, procurement operations are organised under a centralised reporting structure led by the Executive Board member for Fleet & Technology. Specialised departments oversee sustainability within procurement, ensuring the integration of ESG criteria across processes. The Group's matrix organisation facilitates standardisation through IT systems, enabling consistent sustainability standards in procurement (Lufthansa Group, 2024).

Moreover, another issue raised in 2023 is Responsible political engagement. The multidisciplinary approach to RSCM is crucial because managing ESG impacts requires integrating various areas of expertise. For example, reducing carbon emissions in the supply chain often necessitates adjustments in logistics, which can have financial and operational implications. This requires collaboration between environmental experts (to measure emissions), supply chain managers (to optimise logistics), financial analysts (to manage costs), and IT professionals (to track data and ensure compliance). This approach ensures that businesses address the interconnected environmental, social, and governance challenges effectively (Lufthansa Group, 2024).

Summarising these targets, they aim to mitigate human rights, environmental, and compliance risks in its supply chain by enforcing strict due diligence requirements. Additionally, transparency regarding suppliers' carbon emissions is being improved to identify and reduce supply chain emissions. Through this, the Group aligns its sustainability goals with its overall climate objectives. In 2024, further indicators and measures are planned to monitor and enhance these efforts (Lufthansa Group, 2024).

4.5 Application of the EU Taxonomy

The report refers separately to the EU Taxonomy Regulation (2020/852) which establishes a standardised classification system for green economic activities within the EU's action plan on sustainable growth. For 2023, the Lufthansa Group was required to report on all six objectives for the first time, with eligibility reporting extended to specific aviation-related activities. Core operations, including maintenance, repair, and overhaul services, were identified as taxonomy-eligible for the first time, marking an important inclusion for the Group's sustainability efforts (Lufthansa Group, 2024).

Regarding the implementation of Reporting Standards, the Lufthansa Group analysed its economic activities against taxonomy standards to determine their alignment. Eligible activities were reviewed for substantial contributions to climate objectives and assessed for potential overlaps to avoid double counting. Revenue, capital expenditure (CapEx), and operating expenditure (OpEx) data were evaluated under IFRS standards, with only fully consolidated entities included. CapEx and OpEx calculations focused on tangible and intangible assets, as well as maintenance and operational readiness expenditures. Aforementioned challenges and limitations in reporting are confirmed. The Lufthansa Group noted challenges in interpreting undefined legal terms within the regulation, leading to potential uncertainties in compliance. Despite these difficulties, the Group disclosed taxonomy-eligible revenues and expenditures, providing transparency in its alignment with sustainability standards. Further refinement of reporting criteria and methodologies is expected as regulatory interpretations evolve (Lufthansa Group, 2024).

5. Analysis of Lufthansa Group's additional ESG reports

Besides its annual report, Lufthansa Group applies the TCFD, SASB and CDP reporting frameworks in 2023 additionally, addressing further issues regarding ESG. Other frameworks, such as the UN PRI, International Finance Corporation Performance Standards, Global Real Estate Sustainability Benchmark, International Integrated Reporting Framework or Climate Disclosure Standard Boards, are not of concern in this thesis and will therefore not be explained further.

5.1 Lufthansa Group's Task Force on Climate-related Financial Disclosures Report 2023

Since 2020, Lufthansa Group has aligned with the TCFD to enhance transparency in climate risk and opportunity reporting. The creation of the TCFD was announced in 2015 by the Financial Stability Board due to the possible risks of climate change on financial stability. With 31 multidisciplinary members, TCFD reached over 2.000 firms to use their framework. Instead of providing specific standards, four main topics and eleven principles for effective disclosures, with the final aim to integrate climate change into risk management and strategic planning, are presented. In total, the TCFD released three guiding publications (TCFD Final Report, 2017).

The Group follows TCFD recommendations in its annual TCFD Reports, which analyse climate-related financial impacts through qualitative and quantitative scenario assessments. These reports identify transitional and physical risks, outlining how climate change may affect Lufthansa Group's business strategy and operations. Structured around the four key areas Governance, Strategy, Risk Management, and Metrics & Targets, it helps companies assess and mitigate climate risks while improving investor confidence. As TCFD adoption grows globally, including in jurisdictions where reporting is now mandatory, Lufthansa Group's commitment ensures regulatory alignment, enhanced risk management, and long-term sustainability integration. Understanding the impact of climate change on Lufthansa Group's business strategy is essential for addressing the challenges it presents and adapting their operational model accordingly. (MSCI, n.d.; KPMG, n.d.; Brightest, n.d.; FSB, n.d.).

The TCFD presents recommendations and a structured framework around the following four thematic areas:

1. **Governance:** Organisations are advised to disclose their governance structures concerning climate-related risks and opportunities. This includes detailing the board's oversight and management's role in assessing and managing these climate-related factors (TCFD, 2021; Greenly, n.d.).

Regarding Lufthansa's specific 2023 TCFD report, one can encounter a rather brief tabular overview which is further disclosed Lufthansa Group Annual Report 2023.

The Board's oversight

The Supervisory Board is the highest authority overseeing sustainable management at Lufthansa Group, approving key climate-related decisions, such as fleet orders based on fuel and CO₂ efficiency. In 2023, it established an ESG Committee to advise on environmental, social, and governance issues, meeting twice to discuss emissions reduction, SAF, and sustainability reporting. Additionally, the Audit Committee monitors climate-related risks within the company's risk management framework, while emission reduction targets are integrated into executive remuneration incentives (Lufthansa Group, 2024).

The Executive Board of Lufthansa Group meets biweekly, integrating climate-related considerations into strategic, financial, and risk management decisions, including investments in aircraft and SAF. The Group's Executive Committee, composed of senior leaders, helps shape sustainability efforts, with the ESG strategy reviewed annually as part of the Strategic Roadmap Discussions, focusing on carbon transition and efficiency measures. Additionally, the Executive Board oversees the non-financial declaration, covering climate strategy, targets, and management, which undergoes an independent audit review. Next, the Executive Board Member Brand and Sustainability takes responsibility for the Lufthansa Group's environmental, climate and social impact at Executive Board level. And lastly, the Group Policy Committee, is led by the Chairman of the Executive Board, addresses politically significant matters, including sustainability-related issues, and the committee members oversee executed projects and initiatives (Lufthansa Group, 2024).

The role of Management

The second section regarding Governance describes the management's role in assessing and managing climate-related risks and opportunities.

The Executive Board is responsible for managing climate-related budgets, integrating climate issues into corporate strategy, and overseeing risk management. The Corporate Responsibility department, reporting to the Chief Sustainability Officer, identifies climate risks, develops mitigation strategies, and coordinates a climate scenario analysis, completed in early 2024, to assess risks and opportunities. Climate risks have designated owners within Lufthansa Group, who ensure ongoing monitoring and timely mitigation, with top risks reported quarterly to the Executive Board and annually to the Audit Committee. To address regulatory and financial impacts, the Emissions Management Committee discusses evolving emissions legislation, while the Sustainability Circle facilitates monthly sustainability discussions across Group companies. Additionally, the SAF Circle, an interdisciplinary committee meeting bi-weekly, focuses on SAF topics, including sourcing, sales, certification, and broader climate impacts beyond CO₂ emissions (Lufthansa Group, 2024).

2. Strategy: In the next section, organisations should disclose the actual as well as the potential impacts of their climate-related opportunities and risks with impact on their strategy, businesses, and financial planning. This encompasses describing the climate-related risks and opportunities identified over the short-, medium-, and long-term, as well as the impact. (TCFD Implementation Guidance, 2021; Greenly Blog on TCFD Standards Greenly, n.d.).

The Assessment and Identification of Risks

Climate change impacts Lufthansa Group's business strategy by introducing both risks (physical, political, market, and reputational) and opportunities linked to the low-carbon transition. To address this, the Group follows TCFD recommendations, integrating climate scenario analysis and a quarterly risk review within its corporate risk management framework, aligning risks with short- (0-1 years), medium- (1-3 years), and long-term (3-10 years) financial and strategic planning. Key climate-related financial and regulatory risks, such as CORSIA, EU ETS, and Fit for 55, are assessed in dedicated committees, while physical climate risks may impact flight and maintenance operations (Lufthansa Group, 2024).

Lufthansa Group faces transition risks related to policy, market, technology, and reputation as climate regulations evolve. Regulatory risks, ranked as a top risk, stem from rising carbon pricing, fuel taxes, SAF blending quotas, and regional disparities in sustainability regulations, potentially distorting competition in intercontinental travel. Market and technology risks include fuel price volatility, SAF supply shortages, and high procurement costs, which could significantly impact operational expenditures. Additionally, reputational risks arise from stakeholder expectations on climate performance where unmet targets could lead to financial losses, reduced investor confidence, and talent attraction challenges. The climate scenario analysis identified heatwaves as the most significant physical risk over the next one to ten years, potentially disrupting supplier operations, airport efficiency, and aircraft performance, leading to higher operational costs. Other climate risks, such as cyclones, hurricanes, and jet stream changes, are expected to become significant only after 2050 under a high-emission scenario (SSP5-8.5) (Lufthansa Group, 2024).

Moreover, Lufthansa Group sees opportunities in developing sustainable aircraft technologies like AeroShark, an additional layer that its airplanes are coated with to reduce air resistance, intelligent routing to optimise fuel efficiency, and railway infrastructure projects at hub airports to replace short-haul feeder flights, reducing costs and CO₂ emissions (Lufthansa Group, 2024).

The role of Management

The second part regarding the Strategy section focuses on the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning. Lufthansa Group integrates climate-related risks and opportunities into its corporate strategy and financial planning, ensuring that major decisions, such as fleet renewal, SAF partnerships, and fuel efficiency improvements, align with their emissions reduction goals. These efforts help mitigate climate risks while leveraging opportunities to advance sustainability and operational efficiency. Additionally, Lufthansa Group's CO₂ mitigation strategy aligns with Science Based Targets initiative-validated targets, committing to a 30,6% reduction in CO₂ intensity (per tonne-kilometre) by 2030 through fuel efficiency improvements and SAF, with a long-term goal of carbon neutrality by 2050. Beyond the SBTi requirements, the Group aims to halve its net CO₂ emissions by 2030 using voluntary offsets, while investing in fleet modernisation, operational efficiency, and SAF partnerships to drive decarbonisation. The Corporate Responsibility department oversees implementation, with Executive Board oversight, ensuring alignment with business growth and sustainability goals (Lufthansa Group, 2024).

Lufthansa Group's fleet renewal is a key driver of CO₂ reduction, with ongoing investments in fuel-efficient aircraft and engine technologies. In 2023, 29 new aircraft with up to 30% lower emissions replaced 18 older models, contributing to both sustainability and financial efficiency, with 253 aircraft on order and options for 161 more. Lufthansa Group continuously implements technical modifications to its existing fleet, including AeroSHARK surface coating. By the end of 2023, 15 Boeing 777s were equipped with AeroSHARK, with expected annual savings of 8.000 tonnes of fuel and 25.000 tonnes of CO₂ once all targeted aircraft are modified. Next, Lufthansa Group sees SAF as essential for meeting its 2050 climate targets, but acknowledges that global production remains very limited, covering only 0,2% of aviation fuel demand in 2023. To ensure SAF availability, it follows a three-part strategy: short-term procurement (with up to €250 million allocated until 2026), long-term supply commitments (securing production from 2025 onward), and supporting innovative supply concepts such as synthetic kerosene and Power-to-Liquid technology. To further accelerate SAF adoption, Lufthansa plans to launch an SAF Buyers Alliance in 2024, pooling corporate demand to support pilot production facilities (Lufthansa Group, 2024).

Moreover, Lufthansa Group is expanding sustainable flight options, notably with Green Fares, launched in February 2023, which include carbon emission compensation, along with new CO₂ offset technologies for long-term carbon reduction. Lufthansa Group's OPS Sustainability Program, which is running until 2030, follows a three-step approach to reducing carbon emissions by optimizing flight operations, ground handling, and data-driven performance tracking, contributing to the Group's SBTi targets (Lufthansa Group, 2024).

In addition, Lufthansa Group's transition methodology assesses risks and opportunities from the shift to a low-carbon economy, considering market, policy, technological, and regulatory changes. Using multiple climate scenarios and time horizons with the baseline years 2030, 2040, and 2050, the analysis evaluates potential trends across the entire value chain, including passenger airlines, cargo, and Lufthansa Technik operations. In detail, Lufthansa Group's physical risk methodology assesses both acute climate risks such as floods and storms as well as chronic climate risks like temperature shifts, using the EU Taxonomy's 28 climate hazards to identify the most relevant threats. The analysis, based on low and high emissions pathways, examined 25 key locations, e.g. airports, suppliers, maintenance sites, hubs and major routes, to evaluate potential impacts on Lufthansa's value chain across different time horizons, e.g. 2030 as well as 2050. This scenario analysis confirms that transition risks, particularly carbon and SAF and fuel price developments, are the dominant cost drivers in the short to long term, but its current strategy already addresses these challenges. While physical climate risks are expected to have only selective material impacts, primarily in the long term from 2040 or 2050, the Group plans to enhance its resilience by introducing a quantitative assessment of these risks. Additionally, Lufthansa is preparing for the CSRD, integrating findings from its scenario analysis into risk management, financial planning, and climate impact strategies (Lufthansa, 2024).

3. **Risk Management:** Organisations are encouraged to disclose how they identify, assess, and manage climate-related risks. This involves describing the processes for identifying and assessing climate-related risks, how these processes are integrated into the organization's overall risk management, and how they manage these risks (TCFD Implementation Guidance, 2021; Greenly Blog on TCFD Standards Greenly, n.d.).

The Assessment and Identification of Risks

Lufthansa Group has a systematic Enterprise Risk Management (ERM) process at both Group and business unit levels to identify, assess, and manage material risks, including climate-related risks, which are integrated into its company-wide risk management framework. Risk owners proactively monitor and manage risks, ensuring quarterly updates, while the Executive Board's risk management guidelines define organisational standards and methodologies. Risks are classified as qualitative (long-term trends) or quantitative (financial impact on Adjusted EBIT), with continuous monitoring and mitigation strategies to ensure timely adjustments (Lufthansa Group, 2024). To exemplify, the following risk categories are selected:

Lufthansa Group's Corporate Responsibility and Corporate International Relations & Government Affairs departments monitor environmental policies and regulatory changes through active engagement with authorities and policymakers, assessing their potential impact on the Group and its subsidiaries. The Group collaborates with climate scientists

and research institutions like the German Aerospace Centre, actively participating in climate and atmospheric research since 1994 to assess potential impacts on air traffic. Besides, they monitor reputational risks by conducting stakeholder surveys on sustainability, integrating insights into its annual materiality matrix, and tracking climate and aviation-related media coverage (Lufthansa Group, 2024).

The role of Management

Lufthansa Group integrates climate-related risks into its ERM framework, ensuring a systematic and continuous risk assessment process led by the Corporate Sustainability and ERM departments. The Executive Board is regularly updated on the risk situation, reporting annually to the Audit Committee, while specialised risk owners develop and implement mitigation plans (Lufthansa Group, 2024). This collaborative and adaptive approach enables Lufthansa to effectively manage both long-term climate challenges and short-term risks.

4. Metrics and Targets: According to TCFD, organisations should disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities. This includes disclosing the metrics used to assess these risks and opportunities in line with their strategy and risk management process, as well as their GHG emissions and related risks (TCFD Implementation Guidance, 2021; Greenly Blog on TCFD Standards Greenly, n.d.).

Using a quantitative approach summarising the metrics used, Lufthansa Group has set ambitious climate goals, aiming to halve net carbon emissions by 2030 (compared to 2019) and to achieve carbon neutrality by 2050, with an additional target of carbon-neutral ground mobility in home markets by 2030. The Group follows a SBTi-validated CO₂ reduction path, committing to a 30,6% reduction in CO₂ intensity by 2030. Despite a 16% increase in absolute CO₂ emissions in 2023 due to rising demand, CO₂ emissions per tonne-kilometre and per passenger kilometre decreased slightly, reflecting ongoing efficiency improvements (Lufthansa Group, 2024). Additionally, a table is presented, including environmental data with key performance indicators regarding resource consumption and emissions.

ENVIRONMENTAL DATA ^{1,2,3}		2023	2022	Change
Resource consumption				
Fuel consumption	tonnes	8,451,407	7,284,584	+16.0%
Fuel consumption, specific, all types of transport	g/tkm	265	266	-0.3%
Fuel consumption, specific, passenger transportation	l/100 pkm	3.52	3.59	-1.7%
Fuel consumption, specific, freight transportation	g/tkm	218	214	+1.8%
Emissions				
Carbon dioxide emissions	tonnes	26,621,932	22,946,441	+16.0%
Carbon dioxide emissions, specific, all types of transport	g/tkm	834	837	-0.3%
Carbon dioxide emissions, specific, passenger transportation	kg/100 pkm	8.84	9.00	-1.8%

Figure 11 Overview of environmental KPIs in 2023 and 2022 (Lufthansa Group, 2024)

Lufthansa Group measures CO₂ emissions using the GHG Protocol, covering Scopes 1-3, with Scope 1 reflecting the direct emissions from operations and being the largest contributor. All reported emissions undergo annual external audits to ensure accuracy and transparency (Lufthansa Group, 2024).

Finally, the last section regarding metrics in this 2023-based TCFD report describes the targets stated by the Lufthansa Group and compares those to the actual performance. The main focus lies on supporting the IATA's emission reduction targets aiming to reduce net carbon emissions to zero by 2050. Firstly, Lufthansa Group's CO₂ reduction target was validated by the SBTi in 2022, making it the first airline group in Europe and among the first three globally to receive this endorsement. Lufthansa Group integrates CO₂ reduction targets into the long-term variable remuneration for its Executive Board, with the Supervisory Board setting environmental goals. In 2023, specific carbon emission reductions (aligned with SBTi targets) accounted for 20% of the Long-Term Incentive plan, measured in CO₂ emissions per tonne-kilometre. Lufthansa Group aims to achieve carbon-neutral ground mobility in its home markets by 2030 through electromobility and emission-free vehicles, gradually replacing its apron and company fleet with electric or alternative drive systems. In the reporting year, this transition expanded to smaller locations like Berlin, Düsseldorf, Cologne, and Stuttgart, alongside its major operational sites (Lufthansa Group, 2024).

Moreover, Lufthansa Group has voluntarily offset the carbon emissions from all employee duty flights worldwide since 2019, compensating 74.545 tonnes of CO₂ in 2023 (Lufthansa Group, 2024). Furthermore, the TCFD offers sector-specific guidance, recognising that different industries face unique climate-related challenges and opportunities (TCFD Implementation Guidance, 2021).

5.2 Lufthansa Group's SASB Report 2023

Like the TCFD report, the Lufthansa Group publishes a SASB report since 2020 which functions as an extension of the previous ESG Reporting as it covers different issues than the disclosures in the annual report. The SASB Standards, created by the non-profit organisation Value Reporting Foundation, are designed to help companies identify, manage, and disclose financially material sustainability information relevant to investors. They are industry-specific, covering 77 different industries, each with a set of key sustainability topics and metrics. The Sustainable Industry Classification System (SICS) is used to categorise industries based on their risk exposure, allowing for further classification into sub-sectors (SASB's SICS, 2022). Established in 2011, SASB aimed to bridge the gap between financial reporting and ESG factors. The standards are aligned with traditional financial reporting frameworks like GAAP and IFRS, ensuring integrated and comparable reporting processes. Its framework is widely adopted, especially by companies aiming to meet investor demand for ESG transparency. It emphasises both qualitative and quantitative metrics, enabling organisations to assess and disclose performance consistently while addressing global and industry-specific sustainability challenges (SASB's SICS, 2022).

SASB Metrics

As the SASB Standards emphasise enterprise value creation, they offer specific, actionable metrics rather than broad guidelines. They are designed to provide investors and, in some cases, regulators with insights into sustainability factors that may impact a company's financial performance. What tears SASB from other reporting frameworks apart is its focus on quantifiable standards. Additionally, SASB enables cross-industry comparisons, with approximately 75% of the metrics being quantitative, making them widely applicable for evaluating companies within and across sectors (Value Reporting Foundation SASB Standards website, n.d.). This rather short report presents a table with sustainability disclosure topics and accounting metrics. In total, four topics are presented with one or more accounting metrics each.

Firstly, starting with GHG emissions, the Gross global Scope 1 emissions are disclosed by the Lufthansa Group and based on the Greenhouse Gas Protocol. Based on the DIN EN 16258, emissions declared derive from kerosene, gasoline, diesel, natural gas (Lufthansa Group, 2024).

In TR-AL-110a.1, the following information are declared:

- Gross global Scope 1 emissions,
- Change in specific CO₂ emissions per tonne-kilometre, and
- Change in specific CO₂ emissions per passenger-kilometre.

Lufthansa Group calculates flight emissions based on actual transport performance, using tonne-kilometres and the fixed conversion factor of 3,15 tonnes of CO₂ per tonne of kerosene burned, as per EU ETS standards. In 2023, a reduction in specific emissions was driven by higher passenger load factors and longer flight routes, which lower emissions per kilometre due to reduced take-off and landing impact. Additionally, the use of SAF reduced emissions by 43.628 tonnes, with 39.195 tonnes saved in direct combustion and 4.433 tonnes in the supply chain (Scope 3), with all Scope 1 data externally audited (Lufthansa Group, 2024).

In TR-AL-110a.2, the short-term and long-term strategy or plan to manage Scope 1 emissions, emissions reduction targets and the performance against those targets are analysed.

Lufthansa Group supports IATA's net zero target by 2050 and is a member of the Aviation Alliance Fit for 55, advocating for carbon-neutral aviation through competition-neutral solutions. Additionally, it has joined the First Movers Coalition to achieve at least 5% SAF usage by 2030, surpassing EU requirements, and has allocated up to USD 250 million for SAF procurement until 2026 (Lufthansa Group, 2024). Lufthansa Group pursues a self-imposed target to halve net emissions by 2030 using voluntary offsets, with a long-term goal of carbon neutrality by 2050. This science-based reduction path aligns with Paris Agreement goals, ensuring sustainable growth and climate resilience. The following graph depicts Lufthansa Group's CO₂ Mitigation Path. With 100% of emissions in the base year 2019, the target in 2030 is a 50% reduction, with SBTi targeting at 85%. Only CO₂ and no other GHG are emitted (Lufthansa Group, 2024).

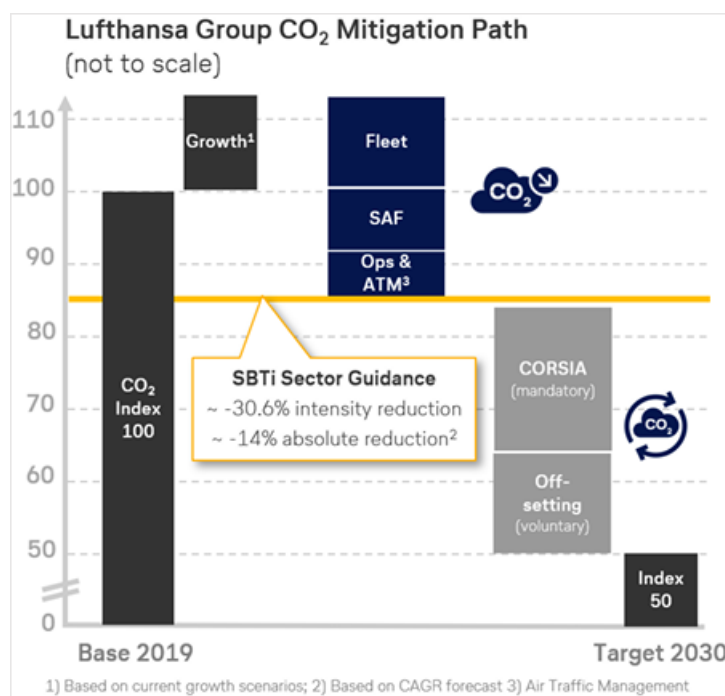


Figure 12 Lufthansa Group CO₂ Mitigation Path (Lufthansa Group, 2024)

The Group further aims for carbon-neutral ground mobility by 2030, focusing on renewable energy, energy-efficient buildings, and sustainable airport operations, while offsetting all employee duty flight emissions since 2019, compensating 74.545 tonnes of CO₂ in 2023 (Lufthansa Group, 2024).

In TR-AL-110a.3 the metrics

- Total fuel consumed,
- Percentage alternative, and
- Percentage sustainable.

are presented, whereas the percentage alternative and the percentage sustainable refer to the same amount of SAF in this report.

Next, the second topic Labour Practices presents three accounting metrics in two codes. Code TR-AL-310a.1 describes the percentage of active workforce covered under collective bargaining agreements. As of December 31, 2023, 76% of Lufthansa Group employees in Germany, 98% of Austrian Airlines employees in Europe, and 87% of SWISS employees are covered by collective bargaining agreements, with the remaining employees primarily in senior or non-pay-scale positions (Lufthansa Group, 2024). In addition, code TR-AL-310a.2 counts the number of work stoppages and total days idle which is equal to zero, but the pilot's union "Vereinigung Cockpit" called for a fifth strike in December 2023. Furthermore, topic three, Competitive Behaviour with code TR-AL-520a.1, sums up the total amount of monetary losses as a result of legal proceedings associated with anticompetitive behaviour regulations which is equal to zero as well as no fines were imposed on Lufthansa Group (Lufthansa Group, 2024).

Finally, topic number four starts with SASB code TR-AL-540a.1 which describes the implementation and outcomes of a Safety Management System. Lufthansa Group prioritises in-flight safety and passenger well-being through a comprehensive Safety Management System, which includes risk assessments, audits, flight data analysis, and incident investigations to identify safety trends early. The Group's airlines comply with EU, EASA, FAA, and ICAO regulations and operate a confidential reporting system for employees to enhance safety beyond legal requirements (Lufthansa Group, 2024). Moreover, this code states that the safety and occupational health standards are rigorously maintained through IATA Operational Safety Audits every two years, adherence to IATA air safety standards, and internal Safety Management Manual guidelines. Independent departments ensure compliance with flight operations regulations, while occupational health and safety are managed across all Group companies, integrating preventive measures, psychosocial counselling, and health management. The Medical Services department, certified under DIN ISO 9001:2015, underwent a successful external audit in 2023 and is authorised to train medical professionals in occupational medicine specialisation. In 2023, Lufthansa Group expanded its accident reporting to

cover 88% of its global workforce and 94% of employees in Germany, with a preliminary work-related injury rate of 7,8 per million hours worked. This figure, which includes incidents causing at least one day of downtime, will be compared with the employers' liability insurance association for validation.

Lastly, code TR-AL-540a.2 tells that there one aviation accident has occurred in 2023 which is not further described. The external source AeroInside explains that an engine of Lufthansa Airbus A320-200 shut down in flight (AeroInside, 2023). Lastly, code TR-AL-540a.3 briefly declares that there were no governmental enforcement actions of aviation safety regulations.

Activity Metrics

SASB CODE	ACTIVITY METRIC	LUFTHANSA GROUP RESPONSE	REFERENCE
TR-AL-000.A	Available seat kilometres (ASK)	300,582 million	Annual Report 2023 p.3
TR-AL-000.B	Passenger load factor	82,9%	Annual Report 2023 p.3
TR-AL-000.C	Revenue passenger kilometres (RPK)	249,269 million	Annual Report 2023 p.3
TR-AL-000.D	Revenue ton kilometres (RTK) ¹	31,925 million	Factsheet Sustainability 2023 p. 3
TR-AL-000.E	Number of departures ²	946,132	Annual Report 2023 p.3
TR-AL-000.F	Average age of fleet	13.4 years	Annual Report 2023 p.27

¹ Lufthansa discloses data as "Tonne kilometres (TKT)".

² Lufthansa discloses number of flights, which is nearly identical with number of departures.

Figure 13 Activity metrics following SASB (Lufthansa Group, 2024)

To sum up, this graph briefly provides an overview over the utilised metrics and Lufthansa Group's matching response with data points which mainly describe the financial health of Lufthansa Group.

5.3 CDP Response Lufthansa Group 2023

The CDP is a non-profit organisation established in 2000, which receives its funding from various sources, including EU public grants, corporate and investor fees, private grants from NGOs, and other income streams. In 2021, more than 13.000 companies disclosed their environmental data through CDP's framework. The CDP is not a regular rater, and CDP focuses exclusively on environmental topics, assessing governance and policy, risk and opportunity management, environmental targets, strategy, and scenario analysis with a focus on the following five key areas such as climate change, water security, and deforestation, and helping organisations assess and mitigate their environmental impact. It identifies risks and opportunities in three key areas which are climate change, water security, and deforestation. The Lufthansa Group's CDP Response is around 100

pages long in this year and provides a strongly detailed, tabular framework of questions which Lufthansa Group answers individually. Companies must submit responses to three questionnaires, which align with the TCFD recommendations (CDP, 2021). It collects environmental data through a voluntary disclosure system, aligned with major standards like TCFD and ESRS. However, although participation is voluntary, failing to disclose or provide comprehensive data may result in reputational risks and decreased investor confidence (Carbon Market Institute, 2024; GreenPlaces, n.d.; Schellman, n.d.).

By offering a platform for standardised and transparent reporting, CDP plays a crucial role in helping businesses and governments measure and manage their environmental impacts. As the report's questionnaire would interrupt the flow of reading, the transcript as well as summarised answers by Lufthansa Group to the individual questions can be found in the annex. In short, the questionnaires start with an introduction on the company. Moreover, the following topics regarding the Environment are tackled:

- Governance,
- Risks and opportunities,
- Business strategy,
- Targets and performance,
- Emissions methodology,
- Emissions data,
- Emissions breakdowns,
- Energy,
- Verification,
- Carbon pricing,
- Engagement, and
- Biodiversity.

Finally, the report finishes with a Sign-Off, summarising Lufthansa Group's ambitions and key challenges which are discussed in internal ESG audits: climate-related risks, a potential switch from EU ETS to ReFUEL EU Aviation, carbon off-setting, Supplier Code of Conduct, R&D on hydrogen, EU Taxonomy, waste, and lastly following the framework by TCFD. These challenges will be further analysed in detail in the discussion section (Lufthansa Group, 2024). Lufthansa Group's 2023 CDP submission outlines a strong governance framework for climate-related issues, with board-level oversight and an ESG Committee in place. The group maintains its pre-COVID climate targets, including a 50% reduction in net CO₂ emissions by 2030 and reaching net zero by 2050. Management incentives are tied to ESG goals, and climate strategy discussions regularly address initiatives such as fleet renewal and the use of SAF (Lufthansa Group, 2024).

The company uses a structured ERM system to assess climate-related risks quarterly. These include physical risks like extreme weather impacting ground operations, and

transition risks from tightening EU environmental regulations, rising SAF and CO₂ costs, and shifting market dynamics due to greener transportation subsidies. Lufthansa Group also anticipates financial impacts from the EU Green Deal, competition in voluntary carbon markets, and intercontinental disparities in climate regulation (Lufthansa Group, 2024).

Moreover, Lufthansa Group's business strategy reflects these challenges and opportunities. It integrates scenario analysis to evaluate long-term climate impacts and financial planning includes the effects of regulatory compliance and investment in low-carbon technologies. Key projects include the Hydrogen Aviation Lab and fuel-saving initiatives. The Supplier Code of Conduct ensures ESG compliance across the value chain, further embedding climate considerations into operations (Lufthansa Group, 2024).

In terms of performance, Lufthansa tracks its emissions reduction efforts and energy use and purchases green electricity certificates as part of its transition strategy. An internal carbon shadow price is used to steer investments. Though CO₂ data is extensively reported across Scopes 1, 2, and 3, challenges remain in tracking emissions from in-flight catering waste and managing indirect supply chain emissions. Engagement plays a key role in Lufthansa's climate response. The group partners with train services to offer low-carbon alternatives to short-haul flights and raises awareness among partners and customers. It is also active in industry and global initiatives like the UN Global Compact, the TCFD, and Business Ambition for 1,5°C, reinforcing its commitment to international climate goals. So as not to disturb the flow of reading, the exact questions and CDP responses, summarised by its main themes and challenges, by Lufthansa Group for the 2023 reporting year can be found in the annex.

6. Comparison of the relevant Rating Issuers 2023

The sustainability report concerns itself actively with external ratings and summarises that Lufthansa Group's sustainability management is rated positively and above the industry average. The information gained by rating agencies is important for primary and secondary bond markets. Since the 2008 financial crisis, as well as when sudden downgrades happen, the accuracy of ratings is being questioned. However, this process is necessary and with regular reviews methodologies can be adapted to current standards (Investopedia, 2022). After explaining the structures and results of the utilised ESG reporting standards, this chapter will focus on the perception of Lufthansa Group's ESG practices through the lens of rating agencies. Based on the 2023 ESG ratings, the overview of the company's ESG environment will be completed. The respective methodologies used by the individual rating agencies will be explained in the following, providing information on the most important challenges regarding the perception of its sustainability performance (Investopedia, 2022). The following graph presents an overview on the current issuers of ESG Ratings for Lufthansa Group in the fiscal year 2023, including their respective scores.

Agency	Score Type	Latest Score	Year	Change from previous scoring	Explanatory notes
 MSCI	ESG Score	AA	2023	→	Confirmation of AA Level and sector leadership . Best Scoring in "Carbon Emissions", "Corporate Governance" and "Corporate Behavior".
 SUSTAINALYTICS	Risk Score	28.3 (medium)	2023	→	Medium ESG risk rating due to high CO ₂ relevance. Strong management on essential ESG aspects.
 ISS ESG	ESG Score	C+ (Prime Status)	2023	→	Remaining a top-three " Industry Leader " in aviation, excelling in "Climate Protection", "Labor Standards", and "Transport Safety" and "Stakeholder Responsibility".
 MOODY'S ESG SOLUTIONS	ESG Score	47/100	2023	↗	Above Sector Average performance (41). Best scores in "Environmental strategy", "Non-Discrimination and Diversity Audit" and "Internal Controls and Executive Remuneration".
 FTSE4GOOD	ESG Score	3.4/5	2023	→	Above Industry Average (2.4). Lufthansa has been part of FTSE4Good Index Series since 2001. Top ratings in "Climate Change" and "Corporate Governance" categories.
 S&P Global	ESG Score	47/100	2023	↗	Above Average (35) among peer airlines. Maximum scores in "CSR Reporting Assurance", "CEO remuneration", "Climate Risk Management", "Codes of Conduct", and "Workplace Health/Safety Program".
 CDP	Climate Change	A- (Leadership Level)	2023	→	Above Sector Average (B). Top scores in "Transparent and Credible Disclosure of Climate-Related Emissions", "Reduction Measures", and "Climate Risks and Opportunities".
 ecovadis	Supply Chain Sustainability Assessment	65/100 (Silver Status)	2022/2023	→	Top 9% of all evaluated companies in the passenger air transport industry. Strong performance in categories "Environment" and "Labor and Human Rights".

Figure 14 2023 ESG Ratings for Lufthansa Group (Lufthansa Group, 2024)

As seen in the graph above, the group has received eight ESG Rating Scores in total. Active rating agencies and rating platforms, such as Sustainalytics, ISS ESG, CDP and EcoVadis, work with information directly disclosed by the company through interviews or questionnaires to evaluate a company's ESG performance. In this way, qualitative

aspects can be assessed. On the contrary, passive rating platforms or rating agencies, such as MSCI ESG Ratings, Moody's ESG Solutions, FTSE4Good and S&P Global ESG Scores, collect already public information disclosed by the rated company, and therefore only get indirectly involved with the company collecting information on ESG issues. Their methodologies are more algorithmic and data-driven.

6.1 MSCI: ESG Score

Morgan Stanley Capital International (MSCI) has been offering tools and services to support investors for over 50 years and recently included ESG ratings in order to enhance their decision-making process. As a passive rating agency, MSCI gathers publicly disclosed company data to evaluate over 35 ESG-related issues and to develop its ratings (MSCI Ratings, n.d.). The following graph depicts these 35 issues categorised by themes.

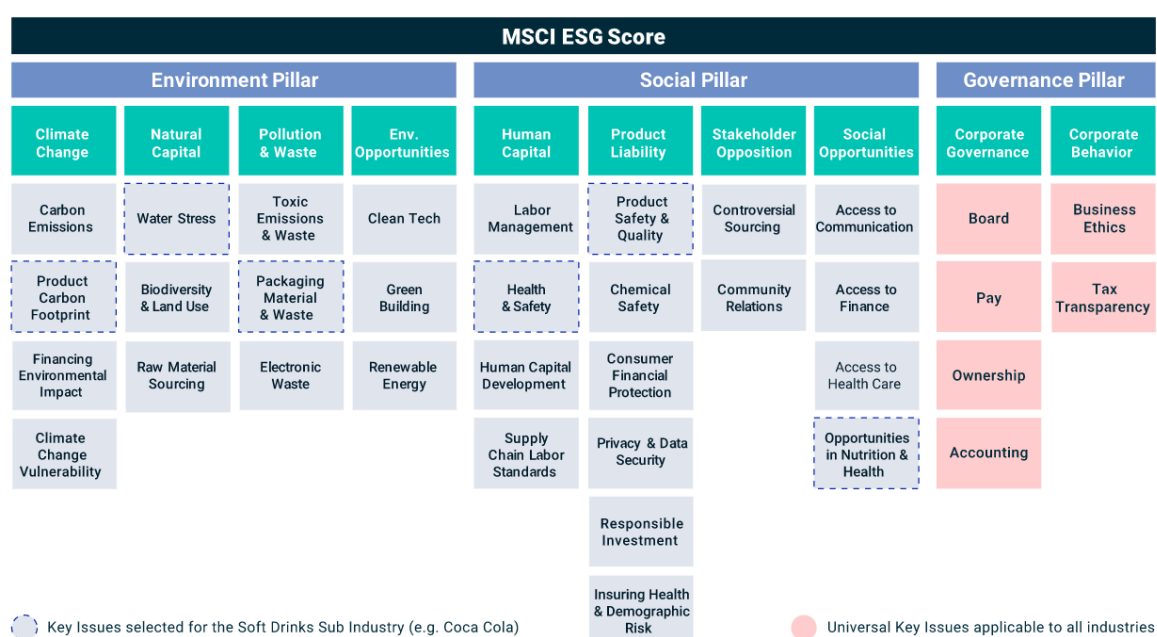


Figure 15 MSCI ESG Rating Issues (MSCI ESG Ratings, n.d.)

For each company, MSCI identifies the most material environmental and social issues, tailoring the evaluation to industry-specific factors. The four main environmental themes are Climate Change, Natural Capital, Pollution and Waste, and Environmental Opportunities. Next, the four main social factors are Human Capital, Product Liability, Stakeholder Opposition and Social Opportunities. In contrast, the governance assessment applies uniformly across all industries. Based on the analysis of these key issues, MSCI assigns scores and weights to determine the overall ESG rating. The Governance main themes focus on Corporate Governance and Corporate Behaviour. The next graph depicts the process from information and data inflow to the evaluation. The 35 key issues are assessed annually and therefore can as well change annually, as well as their weighting (MSCI ESG Research LLC, 2022).

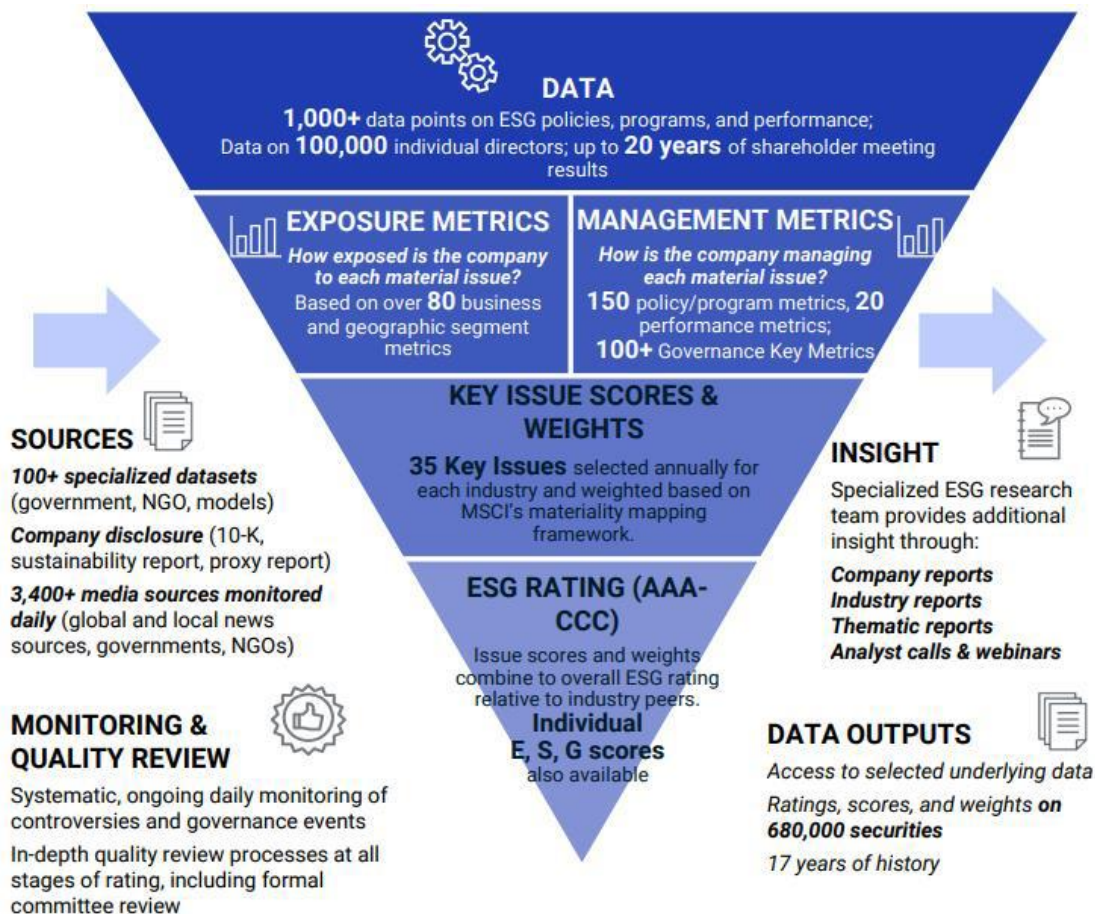


Figure 16 The MSCI ESG Rating Process (MSCI ESG Ratings, n.d.)

This will define individual E, S, and G Scores and the calculation of the final ESG Rating, ranging from AAA, the best Score achievable, to CCC. These scores facilitate the comparison with other companies and stakeholders, e.g. investors, can use the data provided in MSCI's report for evaluating risk management in investment processes. (MSCI ESG Ratings, n.d.).

MSCI's ESG Rating Report of Deutsche Lufthansa Aktiengesellschaft (Lufthansa Group) provides detailed information on their:

- Decarbonisation target,
- Emissions reduction goals in alignment with the Paris agreement,
- Management of ESG factors influencing Lufthansa Group financially, with Lufthansa being the leader among 51 companies in the airlines industry,
- Accusations of severe- to moderate-level controversial social behaviour regarding customers and product safety and quality,
- Involvement in business activities avoided by some investors as values can contradict their use of tobacco and alcohol, and

- Alignment with the SDGs, non of which are strongly aligned with Lufthansa Group's operations whereas Gender Equality and Reduced Inequalities are aligned.

In the 2023 MSCI rating, Lufthansa Group maintained its "AA" classification for the third year in a row, securing its position as an industry leader in environmental, social, and governance (ESG) management within the aviation sector. The AA score lies way above the industry average (Lufthansa Group, 2024).

6.2 Sustainalytics: Risk Score

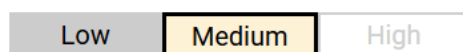
Sustainalytics, a subsidiary of Morningstar since its acquisition in 2020, provides ESG research, ratings, and data to support investors and companies in making informed sustainability decisions. In 2016, Morningstar introduced its first ESG ratings and scores, leveraging Sustainalytics' data, today covering over 20,000 companies worldwide. Sustainalytics' ESG ratings assess financially material ESG risks through two key dimensions. Firstly, similar to MSCI, exposure is measured to evaluates a company's vulnerability to ESG risks. Afterwards, management of ESG risks assesses how effectively Lufthansa Group mitigates and manages these risks. Following this analysis, Sustainalytics assigns an absolute risk score ranging from 0 to 40, categorising companies from negligible risk, over low, medium, and high to severe risk.



Figure 17 Sustainalytics' absolute rating scale (Sustainalytics, 2020)

This rating allows stakeholders to compare Lufthansa Group to other airlines, but also all companies regardless of the sector they are working in (Sustainalytics, 2020). The Deutsche Lufthansa AG, including the airlines Lufthansa German Airlines, SWISS, Austrian Airlines, Brussels Airlines, and Eurowings within the group as well as including the equity interest in SunExpress, obtained an absolute score of 28,3, medium risk, in 2023 which decreased to 26,0, medium risk as well, in 2024. Within its industry group "transportation", Lufthansa group received rank 259 out of 377 and compared to all companies rank 7903 out of 14944. The absolute score revolves around Exposure score and Management score (Sustainalytics, 2020 & Lufthansa Group, 2024)).

Deutsche Lufthansa AG's Exposure is
Medium



Deutsche Lufthansa AG's Management of
ESG Material Risk is **Strong**

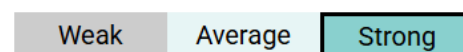


Figure 18 Exposure and Management Scores (Sustainalytics, 2020)

The Exposure Score takes the subindustry and company-specific factors, such as its business model, into consideration and the Management Score assesses the robustness of Lufthansa Group’s ESG programs, practices and policies (Sustainalytics, n.d.). Lufthansa Group received a Sustainalytics risk score of 28,3 in June 2023, classifying it as a medium risk company due to its CO₂ relevance. It ranked 24th out of 72 airlines in the sub-category, with its ESG management considered strong in key areas (Lufthansa Group, 2024).

Deutsche Lufthansa AG

Industry Group: **Transportation**

Country/Region: **Germany**

Identifier: **ETR:LHA**

Deutsche Lufthansa AG is a European airline group. The company's segments include passenger airlines, logistics, and MRO. The passenger airlines segment includes Lufthansa German Airlines, SWISS, Austrian Airlines, Brussels Airlines, and Eurowings, including the equity interest in SunExpress. Geographically, it derives a majority of its revenue from Europe.

- Show Less

Full time employees: **102,574**

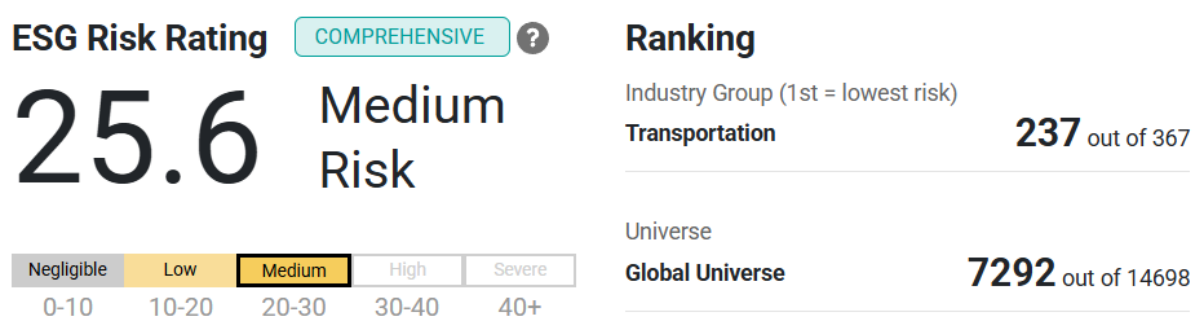


Figure 19 Sustainalytic’s ESG Risk Rating and sector comparison (Sustainalytics, 2025)

This graph portrays 2024’s ESG Risk Rating Score of 25,6 which lies 2,7 percentage points below the previous score. In the transportation sector as well as compared to companies world-wide, Lufthansa Group only ranks medium. However, compared to other airlines, the Group ranks 24th out of 72 due to its strong ESG management (Sustainalytics, 2025).

6.3 ISS ESG: ESG Score

The purpose of Institutional Shareholder Services (ISS) is to provide research on a broad range of issued concerning ESG and detailed data. Their aim is to identify ESG risks in order for them to be minimised. Furthermore, it creates investment opportunities providing tools to facilitate investors to incorporate ESG factors into their investment decisions, along the corporate value chain. ESG ratings are issued for companies, green bonds and countries. ISS points out the necessity for investors to comply with constantly changing stakeholder and regulatory requirements (ISS Governance, n.d.).

Using ISS's proper document on their methodology, it is stated that a forward-looking and holistic double materiality lens is applied with 700 indicators overall and around 100 ESG indicators are applied per rated entity. Additionally, differentiated weighting scenarios are used. Standard indicators, which are universally relevant across all industries, typically constitute approximately 40% of the metrics used in the rating, while industry-specific indicators make up about 60% (ISS Governance, n.d.).

The risks and impact of ESG differ when looking at industries and this individuality defines the importance of factors which is reflected by the distribution of weights as well as performance requirements. Additionally, the threshold to achieve "Prime" status differs in each sector. For instance, companies in the oil and gas sectors are required to demonstrate stronger performances as their environmental impact is higher on average. ISS ESG developed an industry classification system with currently 73 industries. ISS ESG developed an Industry Classification Matrix which spans the two dimensions of Social and Governance Relevance and Environmental Relevance (ISS Governance, n.d.).

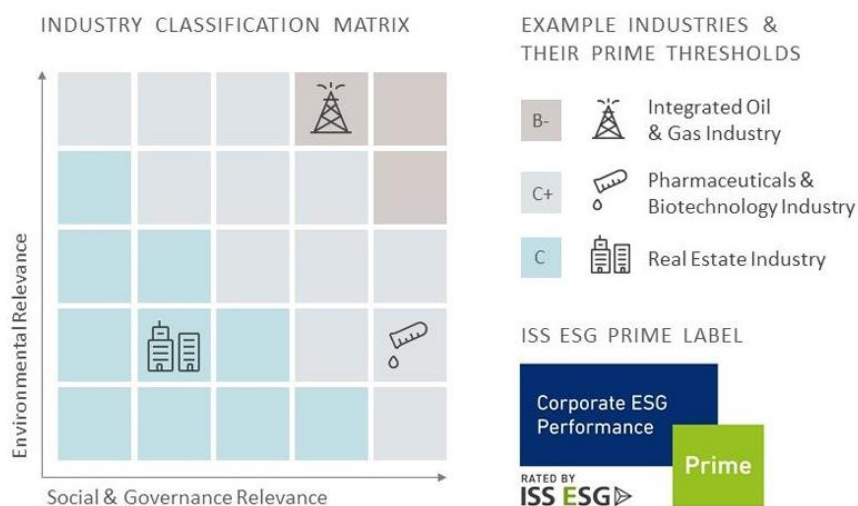


Figure 20 ISS ESG's Industry Classification Matrix (ISS Governance, n.d.)

If companies are classified in the same industry category but their risk profiles differ significantly, the "Prime" thresholds are adjusted. This helps e.g. more environmentally friendly companies to achieve the status with a lower rating. The structure of the rating starts at the highest level with two dimensions, the Social and Governance Rating and the Environmental Rating. As seen below, each dimension consists of three categories and those of different indicators and topics. When companies are classified as the same industry, they usually possess the same set of indicators. Relevance of a topic to a company influences weighting decisions. An individual topic is more strongly weighted when it entails a higher risk due to the industry. In industries where the main ESG risks, impacts, and opportunities are based on social issues, the S and G dimensions have a higher weight. The following graph lists and describes indicators and topics (ISS Governance, n.d.).

Main Rating TOPICS	Description	Examples of indicators and topics
A.1.1 Staff	Covers topics/indicators relating to labor rights and working conditions for the company's workforce, on-site contractors, and employees of franchisees	▪ Equal opportunities and non-discrimination ▪ Freedom of association and the right to collective bargaining ▪ Health and safety ▪ Training and education ▪ Work-life balance
A.1.2 Suppliers	Covers indicators relating to labor rights and working conditions in the supply chain	▪ Supplier standard with regard to labor rights and working conditions ▪ Procedures to ensure compliance with the supplier standard on labor rights and working conditions ▪ Measures to enable key suppliers to safeguard labor rights and improve working conditions
A.2.1 Society	Covers topics/indicators relating to external stakeholders of the company, excluding customers	▪ Human rights ▪ Community ▪ Relations with governments and influence on public policy ▪ Stakeholder dialogue
A.2.2.1 Social impact of products and services	Covers the SDG-based assessment of the social impact of the company's product portfolio	▪ Social impacts of the product portfolio ▪ Strategy shift towards a more socially beneficial product portfolio
A.2.2.2 Social aspects along the value chain	Covers topics/indicators relating to business model-specific customer and product responsibility issues	▪ Product safety ▪ Data privacy and information security ▪ Responsible marketing
A.3.1 Corporate governance	Covers topics/indicators relating to corporate governance	▪ Board composition and independence ▪ Remuneration ▪ Shareholder rights ▪ Auditing and accounting practices

A.3.2 Business ethics	Covers indicators relating to responsible business conduct and compliance	▪ Code of business ethics ▪ Compliance procedures
B.1 Environmental management	Covers topics/indicators relating to general managerial approaches concerning environmental aspects	▪ Environmental management system ▪ Energy management ▪ Climate change strategy ▪ Water risk and impact ▪ Environmental management in the supply chain
B.2.1 Environmental impact of products and services	Covers the SDG-based assessment of the environmental impact of the company's product portfolio	▪ Environmental impacts of the product portfolio ▪ Strategy shift towards a more environmentally beneficial product portfolio
B.2.2 Environmental aspects along the value chain	Covers topics/indicators relating to business model-specific environmental risks and impacts	▪ Biodiversity management ▪ Product lifecycle ▪ Material efficiency ▪ Substances of concern
B.3 Eco-efficiency	Covers quantitative indicators on resource use and emission intensities	▪ Carbon intensity ▪ Nitrogen oxide, Sulfur oxide, Particulate matter emission intensities ▪ Freshwater intensity

Figure 21 Description of ESG indicators and topics (ISS Governance, n.d.)

The indicators and topics mentioned above again contain sub-indicators with a core set and operational criteria. In general, it can be said that indicators relating to measures, procedures, and strategic positioning are given a higher weighting than those relating to corporate policies to emphasize the importance of actual implementation. Companies within the same industry group but with different business models have adjusted weightings as well to reflect the resulting differences in materiality and levels of materiality and specific ESG risk exposures of individual ESG topics (ISS Governance, n.d.).

A combination of qualitative and quantitative indicators is used. Quantitative indicators account for 25% and relate to a trend, a benchmark or distribution. Meanwhile, qualitative indicators account for 75% and indicate the management approach such as policies, strategies and structures regarding key issues, disclosure and controversy in business conduct. The approach to assess e.g. Lufthansa Group's GHG emission intensity of a production process as a trend or as a benchmark would be the development over time, in this case the last 3-5 years, and an industry benchmark to compare the production process to the industry average concerning the GHG emission intensity. Generally, these indicators will then be evaluated and scored based on data points of content (50%) and coverage (50%), resulting in the so-called indicator grade (ISS Governance, n.d.).

$$\text{Content grade} * 50\% + \text{Coverage grade} * 50\% = \text{Indicator grade}$$

Figure 22 Indicator grade equation (ISS Governance, n.d.)

The following graph summarizes how the coverage grade is built.

COVERAGE (OF E.G., EMPLOYEES OR OPERATIONS)	>0% - <20% or not specified	≥20% - <50%	≥50% - <80%	≥80% - 100%
GRADE*	1	2	3	4

Figure 23 Coverage assessment (ISS Governance, n.d.)

It must be noted that the absence of relevant information leads to the negative assessment of performance of an indicator, resulting in a grade of 1 (D-). After this process, the report presents an overall absolute rating grade as well as additional signals and outputs. ISS's ESG Corporate Rating measures performance on an absolute twelve-point letter and underlying numerical and alphabetical scale from D- which is equivalent to 1.00 (poor performance level) to A+ which is equivalent to 4.00 (excellent performance level). On a scale from 0 to 100, 50 represents the normalized "Prime" status threshold. The following graph shows the Prime threshold in detail (ISS Governance, n.d.).

Letter Scale	Numerical Scale	PERFORMANCE SCORE CONVERSION FOR DIFFERENT PRIME THRESHOLDS		
		C	C+	B-
A+	3.75 - 4.00	≤ 100	≤ 100	≤ 100
A	3.50 - <3.75	< 93.75	< 92.86	< 91.67
A-	3.25 - <3.50	< 87.50	< 85.71	< 83.33
B+	3.00 - <3.25	< 81.25	< 78.57	< 75.00
B	2.75 - <3.00	< 75.00	< 71.43	< 66.67
B-	2.50 - <2.75	< 68.75	< 64.29	< 58.33
C+	2.25 - <2.50	< 62.50	< 57.14	< 50.00
C	2.00 - <2.25	< 56.25	< 50.00	< 41.67
C-	1.75 - <2.00	< 50.00	< 40.00	< 33.33
D+	1.50 - <1.75	< 37.50	< 30.00	< 25.00
D	1.25 - <1.50	< 25.00	< 20.00	< 16.67
D-	1.00 - <1.25	< 12.50	< 10.00	< 8.33

Figure 24 Rating scale of the performance level (ISS Governance, n.d.)

Finally, an analyst opinion regarding opportunities, risks and governance is provided. The complete rating process can be found in the graph below.



Figure 25 ISS ESG Rating process (ISS Governance, n.d.)

In a nutshell, ISS ESG provides ratings that are individualised and differ in the factors industry, its prime threshold, the relation of the social and the governance rating and lastly its key issues (ISS Governance, n.d.).

In August 2023, ISS ESG assigned Lufthansa Group a “Prime C+” rating, positioning it among the top three airlines in a comparative assessment of 49 aviation companies. This rating emphasizes Lufthansa’s leadership in sustainability within the sector (Lufthansa Group, 2024).

6.4 FTSE4Good: ESG Score

FTSE Russell is a global provider of benchmark and index solutions, providing data analytics, indexes and rating scores covering thousands of companies globally. FTSE explains that ESG factors are increasingly considered in benchmarks and passive investments (FTSE Russell, 2024).

Starting the assessment process, the data used is retrieved from publicly available sources at the entity level. This includes:

- corporate reports,
- press releases, and
- websites.

This data is mainly backward-looking, which means that it focuses on data from the past e.g. the previous financial year. Nonetheless, some forward-looking may be included such as climate transitions targets and plans. A research cycle runs from June to March and companies are assessed annually. Usually, the annual report and the Corporate Sustainability Report or an integrated report of both are utilised. The following table provides more details regarding the different levels in the assessment process (FTSE Russell, 2024).

Hierarchy	Description	Methodology	Output
ESG Score (1)	Measure of the overall quality of a company's management of ESG issues	Calculated as the Pillar Exposure-weighted average of all three Pillar Scores	0-5 to 1 decimal point (where 5 is highest Score) ICB Supersector relative Score: 1-100 percentile (where 100 is highest percentile)
Pillars (3) Environmental Social Governance	Scores. Measure of the quality of a company's respective management of ESG issues	Calculated as the Theme Exposure-weighted average of all applicable Theme Scores	0-5 to 1 decimal point (where 5 is highest Score) ICB Supersector relative score: 1-10 decile (where 10 is highest decile)
	Exposure. Measure of the relevance for a company of respective ESG issues	Calculated by averaging the Exposure for all applicable Themes within that Pillar	1-3 to 1 decimal point (where 3 is highest Exposure, i.e. relevance)
Themes (14) 5 Environmental 5 Social 4 Governance	Scores. Measure of the quality of a company's management of the issues related to each Theme	Calculated based on the percentage of total available Indicator Points that a company has "met" in each Theme, except for the Climate Change Theme which uses TPI MQ Score (see Section 5).	0-5 as an integer (where 5 is highest Score)
	Exposure. Measure of the relevance for a company of each Theme	Determined largely on industrial activity and operational presence	0-3 as an integer (where 3 is highest Exposure, i.e. relevance, and 0 indicates that the Theme is not relevant)
Indicators (+300)	Over 300 Indicators in the model with each Theme containing 10 to 35. An average of 125 Indicators are applied per company	(i) qualitative Indicators assessing quality of management and approach; (ii) quantitative Indicators measuring corporate data disclosure; (iii) sector specific Indicators tailored for different industrial sectors; (iv) geography specific Indicators tailored for different countries; (v) performance Indicators that use the quantitative data to make performance judgements	Points are assigned and are generally 0, 1, or 2 per Indicator. However, for highly significant Indicators, the scoring can be greater

Figure 26 The FTSE4Good ESG Rating process (FTSE Russell, 2024)

The following structure reflects a company's exposure and management of ESG issues and acknowledges different dimensions. In total, FTSE uses more than 300 individual indicator assessments and applies those uniquely to the circumstances of the company, on average 125 are applied per company. The ESG Score is composed of 3 pillars with 15 themes, with each theme containing ten to 15 indicators. The next graph depicts the detailed themes, including a supply chain focus in the environmental and social perspective (FTSE Russell, 2024).

Transparent and objective ESG Scores



Figure 27 FTSE's ESG Factors (FTSE Russell, 2024)

The three pillars are the usual “E”, “S” and “G” pillars. The score of a pillar is defined as the measure of the quality of a company’s management of environmental, social or governance issues whereas the exposure of a pillar is described as the measure of the relevance of environmental, social or governance issues for a company. The same definitions are used for the 14 themes. Some examples for these themes for “E” are Biodiversity Climate Change, Pollution and Resources Supply, and Chain Water Security. Regarding “S”, there are Customer Responsibility Health and Safety Human Rights and Community Labour Standards, and Supply Chain. And lastly, concerning “G” Anti-corruption Corporate, Governance Risk Management, and Tax Transparency are utilised (FTSE Russell, 2024).



Figure 28 Hierarchy of the rating factors (FTSE Russell, 2024)

Regarding absolute scores, companies that have a higher exposure in themes such as climate change, labour standards or corporate governance are assessed with higher thresholds in comparison to lower exposure companies. Firstly, a pillar score is calculated, which equals to the weighted average of the theme score. The exposure level defines the weighting (low exposure = 1, medium exposure = 2, high exposure = 3 and negligible or not applicable = 0). The same rule for the weighting applies to the calculation of the overall FTSE ESG Score, in that case the weighting of the pillars. In addition to the absolute scores mentioned above, industry Relative ESG Scores and Peer Relative Scores are created. In the latter, a company's ESG Score is compared to other ESG. The relevance of a Theme for a company depends on its operations in each subsector. Hence, a company can be classified in more than one subsector (FTSE Russell, 2024).

Step 1: Determining Theme Exposures

The impact is divided by geography. In the following an example of a company can be found for the exposure classification in all 14 themes:

Theme	Legend	Exposure measures*	Subsector	Geography	Other
Biodiversity	EBD	H/M	✓	✓	Subsector filter
Climate Change	ECC	H/M/L	✓		
Pollution & Resources	EPR	H/M	✓		
Supply Chain: Environmental	ESC	H	✓		Subsector filter
Water Security	EWT	H/M	✓	✓	Subsector filter
Customer Responsibility	SCR	H	✓		Subsector filter
Health & Safety	SHS	H/M	✓	✓	
Human Rights & Community	SHR	H/M/L	✓	✓	
Labor Standards	SLS	H/M/L	✓	✓	
Supply Chain: Social	SSC	H	✓		Subsector filter
Anti-corruption	GAC	H/M	✓	✓	Multinational
Corporate Governance	GCG	M	All		
Risk Management	GRM	H	✓		Other Theme Exposures
Tax Transparency	GTX	M		✓	Multinational

Figure 29 Classification of themes (FTSE Russell, 2024)

In the end of this step, a brief rationale is given, and the exposure is set.

Step 2: Theme Indicator Assessment and Scoring

Next, companies with higher exposure are assessed by using higher standards than those with lower exposure, this can mean e.g. to be assessed against more indicators. For each indicator that is met in a particular Theme, points are awarded and divided. Additionally, each indicator has a weight. Some Indicators, like performance and sector-specific Indicators, are given additional weight (FTSE Russell, 2024).

Theme	Legend	Theme exposure (H/M/L)	% indicator points scored
Biodiversity	EBD	N/A	N/A
Climate Change	ECC	Medium	NAP ⁵
Pollution & Resources	EPR	High	37%
Supply Chain: Environmental	ESC	High	28%
Water Security	EWT	Medium	56%
Customer Responsibility	SCR	N/A	N/A
Health & Safety	SHS	Medium	7%
Human Rights & Community	SHR	Medium	23%
Labor Standards	SLS	High	10%
Supply Chain: Social	SSC	High	33%
Anti-corruption	GAC	High	13%
Corporate Governance	GCG	Medium	89%
Risk Management	GRM	High	30%
Tax Transparency	GTX	Medium	7%

Figure 30 Theme Indicator Assessment and Scoring (FTSE Russell, 2024)

This new column presents a relative score for each theme.

Step 3: Calculating Theme Scores

Lastly, to obtain a total score for every theme, the exposure calculated in step 1 and the percentage from step 2 are used. The percentage is transformed into percentage points ranging from 0 to 5. In combination, the following matrix presents the outcomes for the Theme Score for every of the 14 themes, which are added in a new column to the initial table (FTSE Russell, 2024).

		Theme exposure			
		Low	Medium	High	
Theme score	0	N/A	0%	0%	Percentage of Indicator Points scored
	1	0–5%	1–5%	1–10%	
	2	6–10%	6–20%	11–30%	
	3	11–30%	21–40%	31–50%	
	4	31–50%	41–60%	51–70%	
	5	51–100%	61–100%	71–100%	

Figure 31 Calculation of Theme Scores (FTSE Russell, 2024)

Step 4: Calculation of Pillar Exposures and Scores

Furthermore, in this fourth step, a similar process is executed for the three Pillars instead of the Themes. Firstly, the Pillar Exposure is calculated the weighted (high exposure = 3,

medium exposure = 2, low exposure = 1) average of the applicable Theme Exposures (FTSE Russell, 2024).

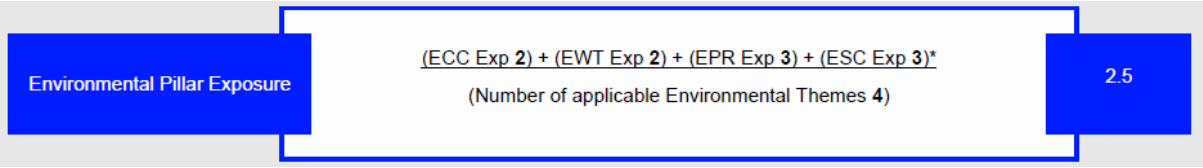


Figure 32 Calculation of Pillar Exposures (FTSE Russell, 2024)

Using the environmental pillar as an example, one can see the weightings of four themes (2, 2, 3 and 3). ECC standing for the theme of Climate Change, EWT for Water Security, EPR for Pollution and Resources and lastly, ESC for Supply Chain in an environmental context. “2,5” represents the Environmental Pillar Exposure Score. This process is continued for the social and governance pillars as well. Not all 14 themes must be applicable. Secondly, the Pillar Scores equate Exposure weighted averages of the Theme Scores. Higher Exposure Themes of a particular company again have a greater weight and results will lie between zero to five. Finally, the Pillar Supersector Relative Score is presented in deciles from one to ten (1 = bottom decile and 10 = top decile) (FTSE Russell, 2024).

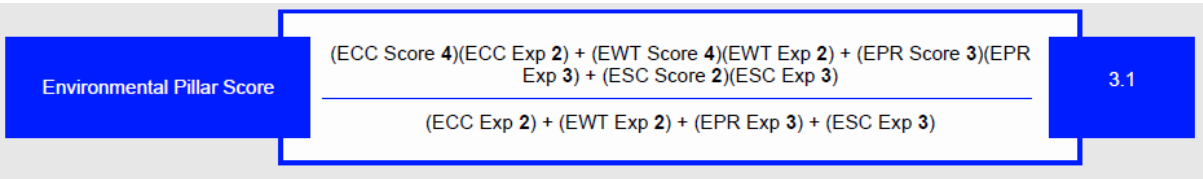


Figure 33 Calculation of Pillar Scores (FTSE Russell, 2024)

Step 5: Calculation of the Overall Score

The overall ESG Score is calculated as an Exposure-weighted average of the Pillar Scores and the ESG Score Supersector Relative Score represents the overall ESG Score. In summary, if a company is within the top 1%, its ESG Score will be 100 whereas a 1 means that the company lies in the bottom 1% (FTSE Russell, 2024).

Since its launch in 2001, Lufthansa Group has been part of the FTSE4Good Index Series, including the FTSE4Good Europe Index and the FTSE4Good Developed Index. Its inclusion was reconfirmed in June 2023, recognising its strong corporate social responsibility (CSR) efforts. Lufthansa Group performs above the industry average in the “Airlines and Customer Services” category, with top scores in Climate Change and Corporate Governance. Maximum scores were obtained in governance, climate, and anti-corruption (Lufthansa Group, 2024).

6.5 S&P Global: ESG Sore

Standard & Poor's (S&P) Corporate Sustainability Assessment bought the ESG Rating Business from RobecoSAM in 2019, with a history reaching back to 1999 when the first

CSA questionnaire was first sent to companies by RobecoSAM. In collaboration with the Dow Jones Index, known today as S&P Dow Jones Index, the Dow Jones Sustainability Index (DJSI) World Index was introduced, as the first-ever global sustainability benchmark (S&P Global Ratings, 2021).

A collaboration with the CDP in 2013 aligned both questionnaires on sustainability and in 2016, new materiality criteria was added to the assessment, identifying a company's most relevant economic, environmental and social issues and to check if these factors can be linked to business drivers. Since 2019, services concerning ESG data, ratings, and sustainability benchmarks are provided in the ESG Evaluation, which is based on industry-specific and financial-material information gathered through questionnaires and open to the public. Today, over 2000 companies are rated via this process (PRNewswire, 2019). The ESG Evaluation consists of the two key components "ESG Profile", which is further categorised into the "E", "S", and "G" pillars with assigned weights of 40%, 30%, and 40%, and the "Preparedness Opinion". The Preparedness Opinion evaluates a company's ability to anticipate and adapt to risks and long-term disruptions. This assessment involves discussions with the management team and board to gauge their awareness of potential future challenges. The goal is to support the company in developing or refining its strategy. A score is then assigned based on the Lufthansa Group's level of preparedness (S&P Global Ratings, 2021).

ESG Factors:

Entity-specific scores assessed on a relative basis, against sector peers

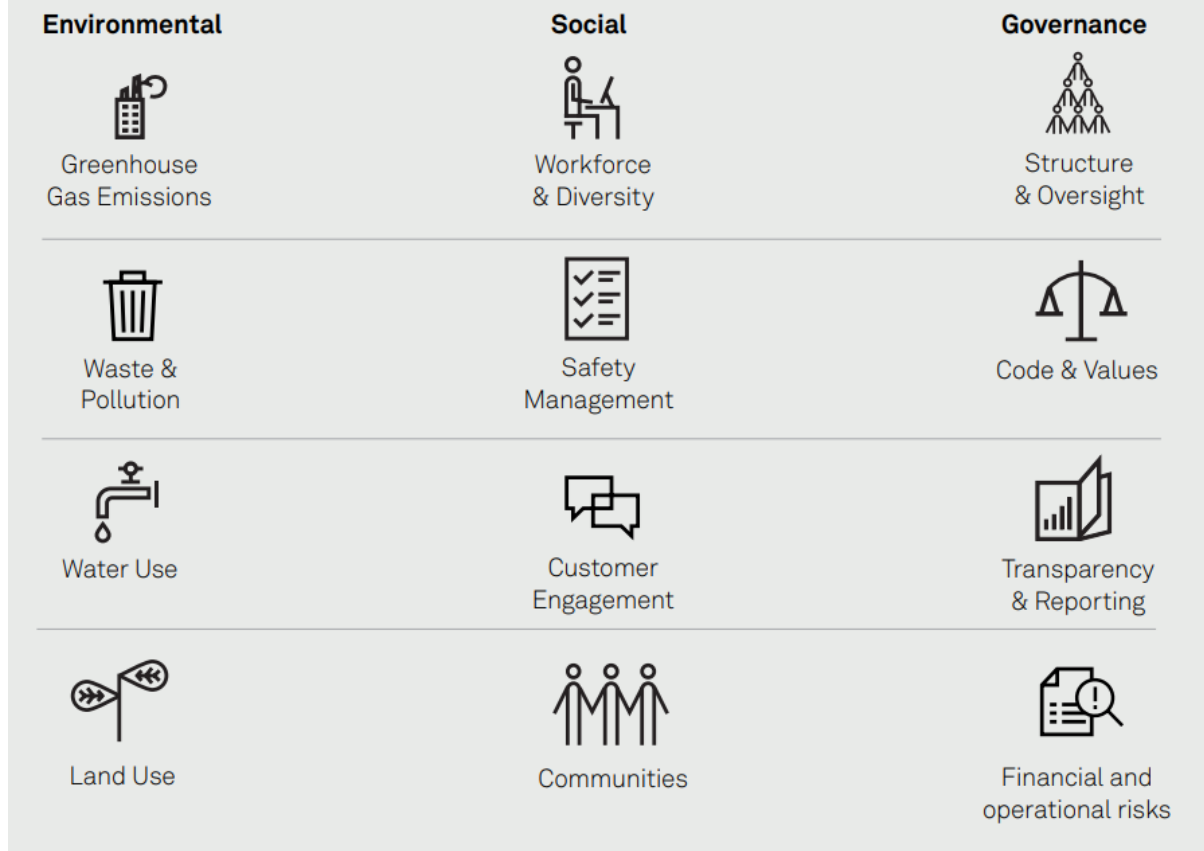


Figure 34 The ESG Profile (S&P Global Ratings, 2021)

This graph provides examples for “E”, “S”, and “G” factors analysed, e.g. Greenhouse Gas Emissions for “E”, Safety Management for “S” and Transparency and Reporting for “G”. Each factors obtains an individual score which is compared to sector peers. The following table provides more insights into the Preparedness Opinion as possible risks are mentioned (S&P Global Ratings, 2021).



Figure 35 Disruptions and Risks considered in the Preparedness Opinion (S&P Global Ratings, 2021)

The overall score is determined based on these factors, reflecting the company's ability to manage risk exposure effectively, on a 100-point scale. Companies that undergo the evaluation receive a comprehensive report detailing the analysis and rationale behind their score. This report can either be shared with investors or used internally for strategic decision-making (S&P Global Ratings, 2021). In the 2023 S&P Global Corporate Sustainability Assessment, Lufthansa Group achieved a score of 47, reflecting an improvement of 13 points compared to the previous year. The assessment awarded perfect scores in areas such as sustainability reporting assurance, CEO remuneration linked to success metrics, climate risk management, codes of conduct, and workplace health and safety. Lufthansa Group outperformed the industry average score of 30 within its peer group (S&P Global Ratings, 2021).

S&P Global's ESG Score is measured relative to peer performance and therefore can't be compared to company's in other industries.

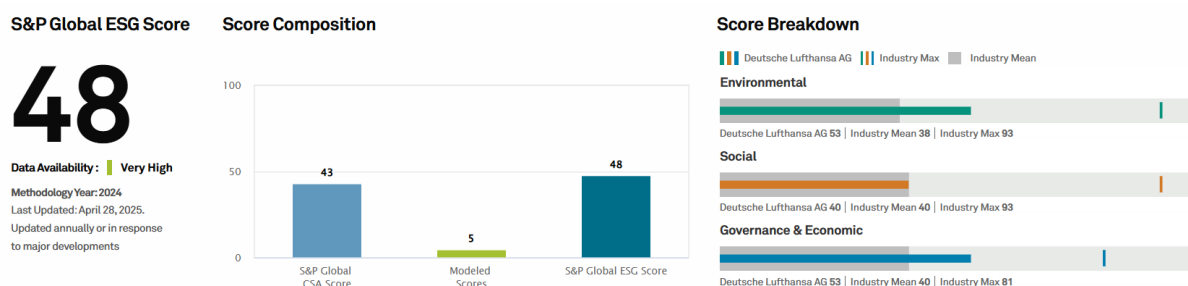


Figure 36 The ESG Score Composition (S&P Global, 2025)

For 2024, S&P currently made the score breakdown available, portraying Lufthansa Group above the industry average regarding Environmental as well as Governance & Economics sustainability practices. However, regarding social sustainability, the Group only reached industry average. As Lufthansa Group offered a variety of data and responded to questions, only very few answers had to be modelled by S&P in order to provide a complete picture of its ESG practices. Furthermore, a spider graph was made available presenting the most important criteria including their weighting in the assessment, reflecting their relevance.

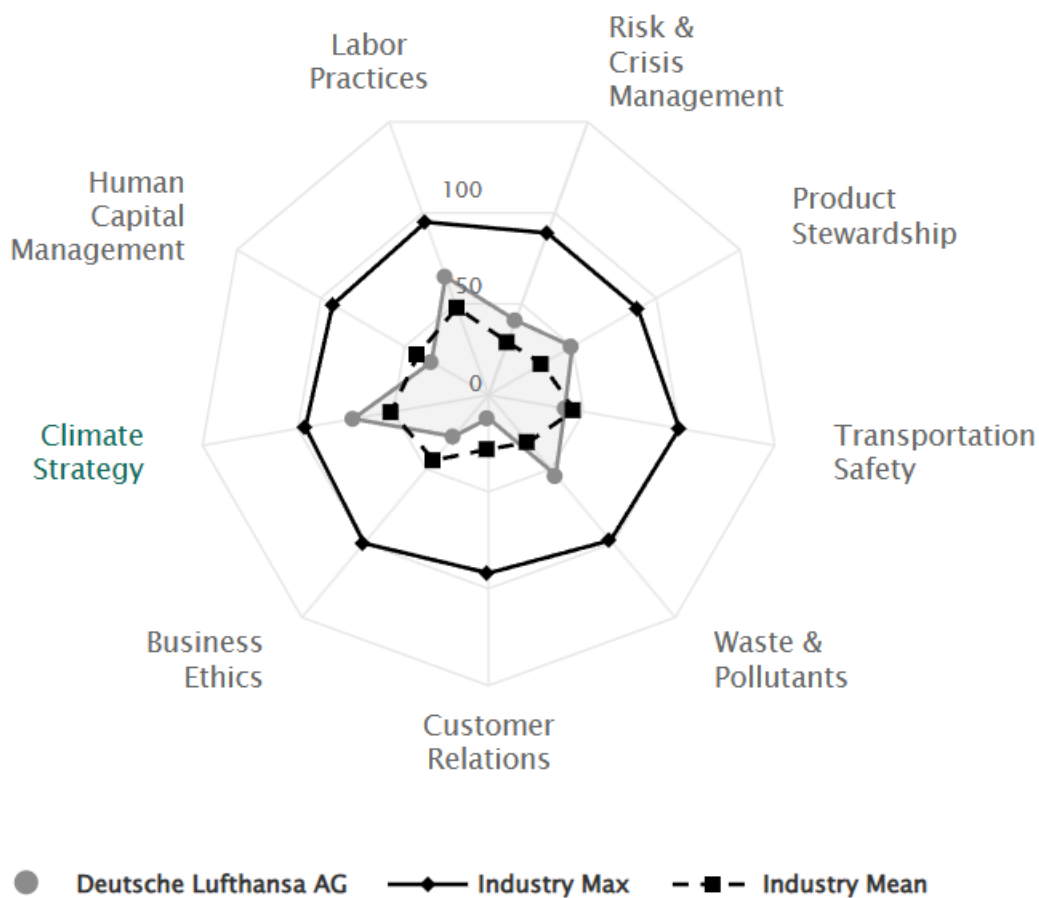


Figure 37 Spider Graph on the evaluation of ESG strengths and weaknesses (S&P Global, 2025)

According to the chart, Lufthansa Group presents itself relatively strong in Climate Strategy, Labour Practices, Product Stewardship and Waste & Pollutants, while showing weaknesses especially regarding Customer Relations and Business Ethics (S&P Global, 2025).

6.6 CDP: Climate Change Score

The Carbon Disclosure was founded in 2020 as a non-profit organisation headquartered in Berlin and nowadays, over 13.000 companies world-wide follow their standards. It is funded through a variety of sources, including public grants from the European Union (EU), corporate and investor fees, private grants from non-governmental organizations (NGOs), and other income streams. (CDP, 2021). The following graph shows the rapid increase of companies world-wide reporting ESG data following the CDP framework.

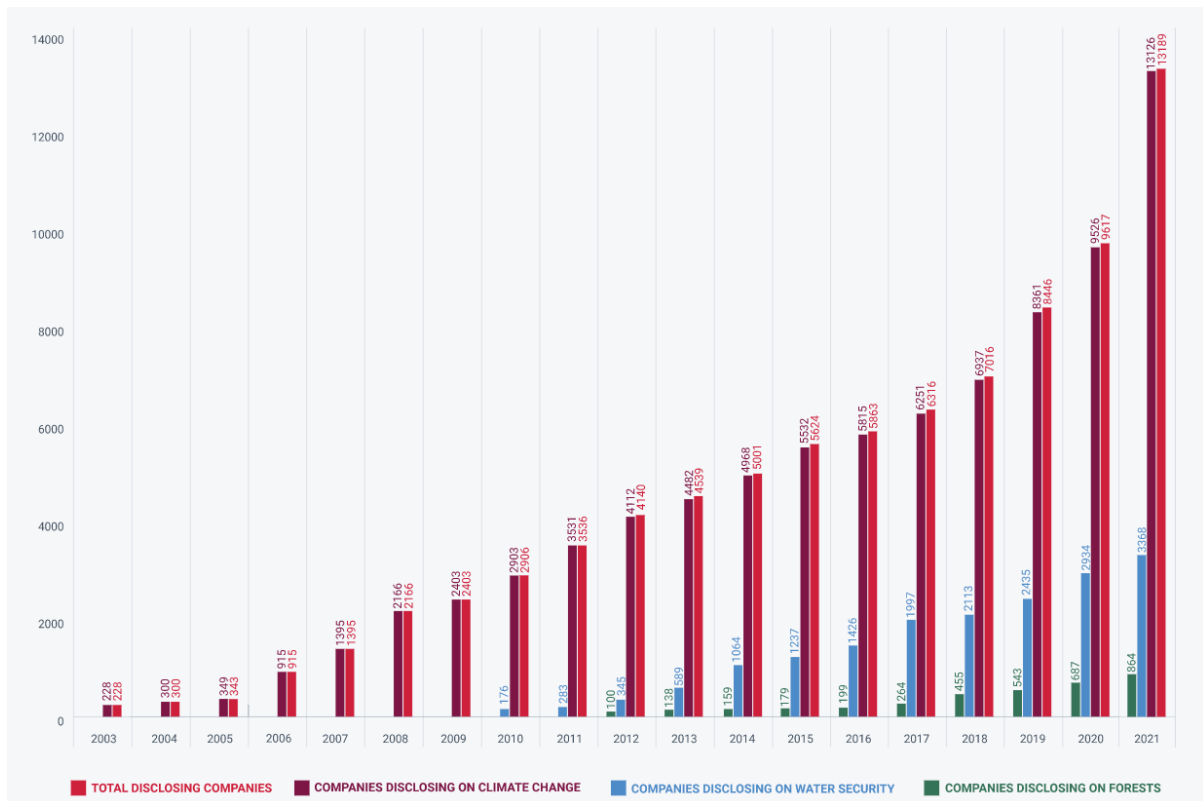


Figure 38 Growth of companies using CDP's disclosures from 2003 to 2021 (CDP, 2021)

While the CDP focuses exclusively on environmental issues, it is covering key areas such as governance and policy, risk and opportunity management, environmental targets, and scenario analysis and assesses companies based on three material topics which are climate change, water security, and deforestation. To comply with CDP standards, companies must complete three questionnaires, which are aligned with the TCFD recommendations. Based on the submitted data, CDP assigns a rating from A to D-, with A being the highest possible score and representing leadership in environmental performance. Rather than serving solely as a framework provider, CDP operates more as a governing authority by assigning scores and ranking companies. Its questionnaires are customised for various entities, including cities, corporations, states, and regions and cover key areas such as climate change, water security, and deforestation. The scoring process evaluates the level of detail and comprehensiveness of the information provided, as well as the organization's awareness of environmental issues, management methods, and progress toward action. Additionally, businesses in high-impact sectors, such as the oil industry, which has a significant environmental footprint, must complete sector-specific questionnaires. These sectors are identified based on CDP's Activity Classification System (CDP, n.d.).

For the 2022 reporting year, Lufthansa Group received a climate score of "A-", maintaining its rating from the previous year. This recognition, awarded by the international non-profit organization CDP in February 2024, highlights the Group's transparent reporting and verification of Scope 1, 2, and 3 CO₂ emissions. It also reflects Lufthansa's efforts in

reducing emissions and offering low-emission products. The A- Score was confirmed second-time in a row and especially the CO₂-reduction strategy and execution stand out as main strengths (Lufthansa Group, 2024).

6.7 EcoVadis: Supply Chain Sustainability Assessment

Stressing the importance of global and transparent ESG ratings, EcoVadis argues with understanding the risks and integrating criteria into business decisions and relationships to ensure that a company will remain competitive and reliable. Sustainability is defined as a strategic priority in procurement, finance and for investments. Benefits include risk mitigation regarding supply chains, a secure reputation and decreased costs e.g. by reducing the energy consumption. The EcoVadis solution provides dynamic scorecards to monitor the sustainability performance of stakeholder's portfolios and ultimately aid continuous improvement. Their rating methodology measures a company's policies, actions, and results to determine the quality of a company's sustainability management system. Data is retrieved from certificates, policies, and KPI reporting which are presented by Lufthansa Group. Furthermore, additional public information is utilised. The methodology is based on the ISO 26000 standard which encourages companies to surpass the simple reactive compliance with the current legal situation by actively implementing sustainable practices and actions into their management system (EcoVadis, 2023).

Initially, EcoVadis defines the three management layers of an effective sustainability management system as one that develops policies, implements actions and reports on results. Furthermore, these are broken down into seven management indicators: Policies, Endorsements, Measures, Certifications, Coverage, Deployment of Measures and Certification, Reporting (KPIs), and 360° Watch Findings which includes stakeholder viewpoints. The Reference Model covers the following 21 sustainability issues, summarised in the next table (EcoVadis, 2023).



Figure 39 CDP's Sustainability Criteria (EcoVadis, 2023)

It is noted that “E” analyses impact of a full life cycle of products and therefore, supply chain issues are included as well, which covers direct impacts by Tier 1 and indirect impacts by Tier 2 and Tier 3 suppliers. A company’s context leads to an industry-specific rating which is further defined by size and operational locations. The data obtained from the questionnaire functions as supporting documentation later. This process is a bottom-up analysis, looking at each industry individually to inform this process. The complete methodology will be presented in the following (EcoVadis, 2023).

Step 1: Data collection

The previously mentioned questionnaire is part of this process. Additionally, companies need to submit formal, recent, and credible documentation. Furthermore, EcoVadis maintains partnerships with external compliance databases, which helps with additional input to identify potential regulatory, commercial, and reputational risks (EcoVadis, 2023).

Step 2: Document Analysis

The answers given in the initial questionnaire need to be backed by data in this step. Therefore, sustainability analysts search for evidence. The supporting documentation is only considered in order to directly answer questions. Each question which is backed by document-based evidence will be considered in the following assessment (EcoVadis, 2023).

Step 3: Stakeholder Opinion: Additional quantitative and qualitative data

A 360° Watch Findings

In the third step, stakeholders are included as external source to provide more information on the company that is rated. This information is included through a combination of human analysts and Artificial Intelligence (AI). This step is crucial to identify companies with close ties to politically exposed people by screening and monitoring companies against global sanctions lists. Thus, risks related to corruption and money laundering can be spotted and ethical non-compliance can be portrayed (EcoVadis, 2023).

B Live News Monitoring

The second part in this step is concerned with Live News Monitoring which enables a permanent flow of information between Ecovadis and the rated company. Consequently, issues can be raised by stakeholders with a quick reaction in turn. This feature is initially only visible to the requesting company and after an analysis by EcoVadis also available to the rated company (EcoVadis, 2023).

C External Sustainability Audits

This last part of the step involving stakeholder opinion includes documentation from second- and third-party external sustainability audit standards or an independent auditor. This extends the sources by a non-document-based assessment with SA8000 as the audit standard (EcoVadis, 2023).

Step 4: Scoring Process

During the Scoring Process, the quality and quantity of information collected via supporting documentation is evaluated and a score from 0 to 100 is allocated to each of the seven management indicators from each theme. The following diagram portrays the five increments from zero to 100% (EcoVadis, 2023).



Figure 40 Scoring Scale (EcoVadis, 2023)

They generate a theme score, which is based on the weight allocated to each management indicator and layer. These indicators are again grouped into policies, actions and results and their weights are shown in the following table. The themes and their weights are presented in the following table as well (EcoVadis, 2023).

	Environment	Labor & Human Rights	Ethics	Sustainable Procurement	Weight Of Management Indicators and Layers	
Policies	50	50	50	25	20%	25% Policies
Endorsements	0	0	0	0	5%	
Measures	50	50	25	25	24%	40% Actions
Certifications	100	100	50	50	16%	
Coverage	50	50	50	25	x ⁹	
Reporting	50	50	0	25	14%	35% Results
360° Watch Findings	75	75	75	75	21%	
Theme Weight	● ● ● ●	● ● ● ● ●	● ● ● ●	● ● ● ●		
Depends on industry, country and size	60/100	50/100	50/100	40/100	51/100	

Figure 41 Themes and their corresponding weights for management layers (EcoVadis, 2023)

Each row and pillar have their individual weights, and each pillar represents a Theme Score and finally, the Overall Score is equal to the weighted average of the Theme Scores. The weightings depend on the initial classification of the company into an industry, its size and geography of operational locations which gives each company a unique weighting (EcoVadis, 2023).

Step 5: Scoring Scale

The Assessment Score, portrayed by the following diagram, rates the company's sustainability performance in absolute terms. This creates a comparable benchmark to other companies within the same industry (EcoVadis, 2023).

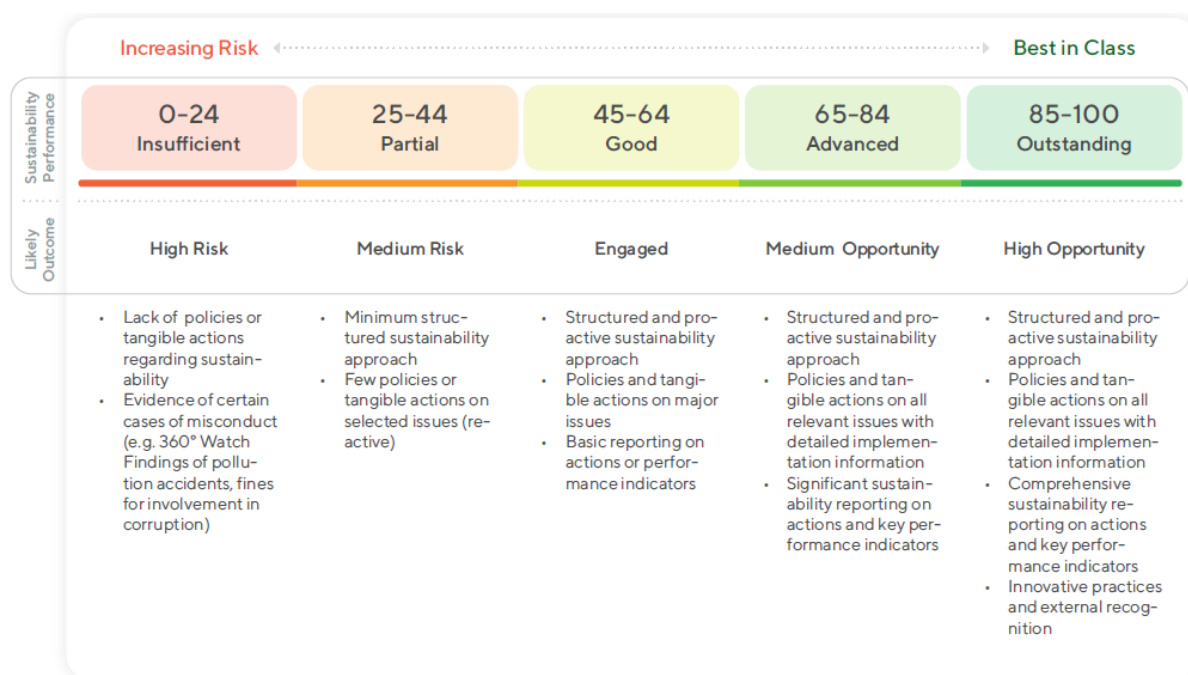


Figure 42 rating Score Classification (EcoVadis, 2023)

Lufthansa Group’s sustainability performance undergoes regular voluntary external assessments. In November 2022, the EcoVadis sustainability rating platform reaffirmed the Group’s commitment by awarding it "Silver Status," positioning it ahead of many industry peers and generally above industry average. The next evaluation is scheduled for June 2024 (Lufthansa Group, 2024).

6.8 ESG data influencing Credit Rating Reports

Since December 2024, Lufthansa Group has released rating reports on its major airline Deutsche Lufthansa AG from the “Big 3” Rating Agencies, Fitch Ratings, Standard & Poor’s and Moody’s Investor Service as well as from Scope Ratings, a just recently-growing, Germany-based Rating Agency. These reports contain data on the business profile and key financial indicators.

6.8.1 Fitch Ratings

On December 2nd 2024, Fitch Ratings released a report on Lufthansa Group’s credit rating, including relevant ESG data affecting its creditworthiness. Fitch employs Climate Vulnerability Signals as a screening tool to identify sectors with heightened exposure to climate-related transition risks, warranting closer scrutiny during rating assessments. In 2023, Lufthansa received a score of 45 out of 100, indicating elevated exposure to such risks. This score reflects the rising costs associated with the sector’s decarbonisation efforts. Currently, climate transition risks do not have a material impact on airline credit ratings, including Lufthansa’s, as disruptive changes are not expected to occur within the next eight to ten years. However, incremental costs are emerging, such as those related to carbon offsetting under the EU Emissions Trading System and the adoption of SAF. The

following graph summarises the resulting, most-relevant ESG challenges that Lufthansa must face in order to guarantee positive rating outcomes (Fitch Ratings, 2024).

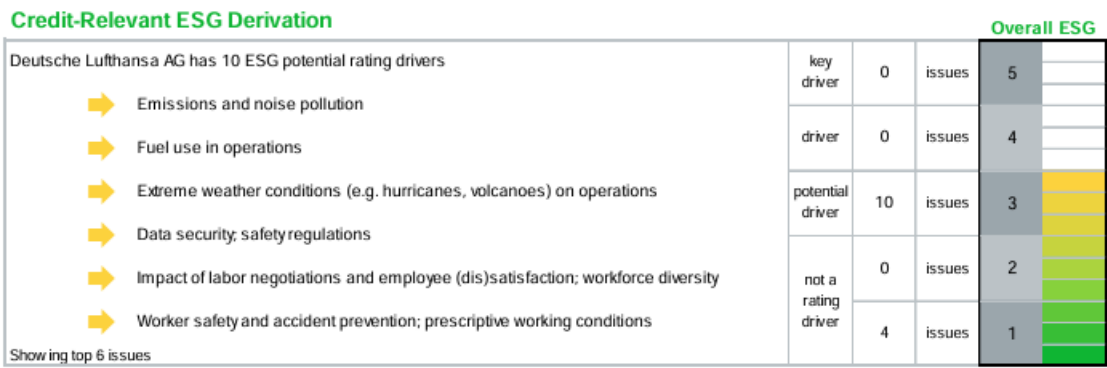


Figure 43 Relevant ESG factors influencing creditworthiness (Fitch Ratings, 2024)

A green cell signals a low impact on the credit rating score while red signifies a high relevance.

Environmental (E) Relevance Scores

General Issues	E Score	Sector-Specific Issues
GHG Emissions & Air Quality	3	Emissions and noise pollution
Energy Management	3	Fuel use in operations
Water & Wastewater Management	1	n.a.
Waste & Hazardous Materials Management; Ecological Impacts	1	n.a.
Exposure to Environmental Impacts	3	Extreme weather conditions (e.g. hurricanes, volcanoes) on operations

Social (S) Relevance Scores

General Issues	S Score	Sector-Specific Issues
Human Rights, Community Relations, Access & Affordability	1	n.a.
Customer Welfare - Fair Messaging, Privacy & Data Security	3	Data security; safety regulations
Labor Relations & Practices	3	Impact of labor negotiations and employee (dis)satisfaction; workforce diversity
Employee Wellbeing	3	Worker safety and accident prevention; prescriptive working conditions
Exposure to Social Impacts	1	n.a.

Governance (G) Relevance Scores

General Issues	G Score	Sector-Specific Issues
Management Strategy	3	Strategy development and implementation
Governance Structure	3	Board independence and effectiveness; ownership concentration
Group Structure	3	Complexity, transparency and related-party transactions
Financial Transparency	3	Quality and timing of financial disclosure

Figure 44 Main ESG factors and their weightings (Fitch Ratings, 2024)

The following table specifies Lufthansa's General ESG issues in Sector-Specific Issues. The numbers, ranging from one to five identify each issue's importance to the rating, pointing out the importance GHG Emissions and Air Quality, Energy Management, and Exposure to Environmental Impacts for E, Customer Welfare, Labour Relations and Employee Wellbeing for S, and Management Strategy, Group and Governance Structure as well as Financial Transparency for G. This rating framework is based on the classification standards published by the United Nations Principles for Responsible Investing, World Bank and SASB (Fitch Ratings, 2024).

6.8.2 S&P Global ESG Score

In S&P's credit rating report as of December 2nd 2024 as well, briefly mentions that Lufthansa Group was severely impacted by the COVID-19 pandemic, but with the lifting of travel restrictions, the group has experienced a strong rebound in European short-haul leisure travel. However, business travel and certain long-haul international routes are

recovering more gradually. In 2023, passenger demand, measured in revenue passenger kilometers, rebounded to approximately 84% of 2019 levels, up from just 30% in 2021, and the recovery is expected to continue in 2024. Like the broader airline industry, Lufthansa faces increasing pressure to reduce greenhouse gas emissions. As part of its decarbonisation strategy, the group is renewing its aging fleet, currently averaging around 13 years, with more fuel-efficient aircraft. While this transition will involve substantial capital outflows, it is expected to lower operating costs and reduce environmental impact over the long term (S&P Global Ratings, 2024).

6.8.3 Moody’s ESG Score

Next, Moody’s rating report presents a ESG credit impact score, released February 21st 2025. Lufthansa faces elevated environmental and social risks, primarily due to its exposure to carbon transition pressures. Regulatory developments and decarbonisation policies may lead to higher operating costs, while increasing environmental consciousness—especially among corporate clients—could dampen demand. Compared to younger, more efficient fleets operated by low-cost carriers, Lufthansa’s older fleet places it at a relative disadvantage in managing these risks. The airline is addressing this through ongoing fleet renewal efforts, though significant progress will take time (Moody’s Ratings, 2025). Social risks include strong unionisation, which has led to past labour disruptions, and potential shortages of skilled workers such as pilots and mechanics. However, Lufthansa’s strong brand presence in Europe has supported its ability to attract talent. On the governance front, Lufthansa maintains robust corporate governance standards and conservative financial policies aligned with its investment-grade rating. The group’s simplified capital structure and reduction of financial risk since the pandemic further support its credit profile (Moody’s Ratings, 2025).

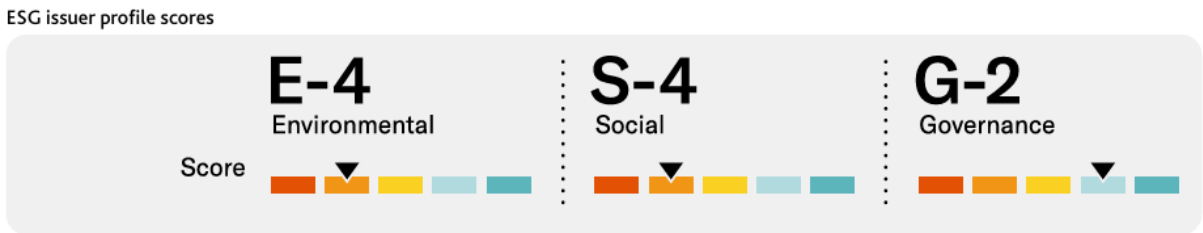


Figure 45 Lufthansa's individual ESG Scores (Moody's Ratings, 2025)

Lufthansa’s ESG Credit Impact Score indicates a limited impact on its credit profile to date, though carbon transition and associated social risks could exert pressure over time. The airline industry faces significant challenges in decarbonising, as current propulsion technologies and the limited availability of SAF are insufficient to support a rapid transition. Potential policy responses, such as stricter environmental regulations, pose further long-term risks, including social implications. To address these challenges, Lufthansa is investing in a fleet renewal program aimed at improving fuel efficiency and

reducing emissions. However, due to the size of its fleet, meaningfully lowering the average fleet age will take time. The company's investment-grade capital structure and strong access to both debt and equity markets position it more favourably than more highly leveraged peers in funding these transitions (Moody's Ratings, 2025).

On the social front, Lufthansa is exposed to elevated Human Capital risk due to its heavily unionised workforce. Labour disputes in recent years have had tangible financial consequences, highlighting the ongoing risk associated with workforce relations (Moody's Ratings, 2025).

ESG credit impact score

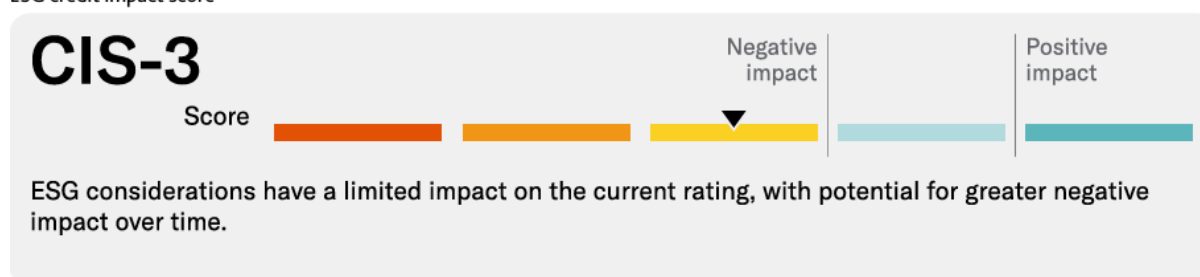


Figure 46 Negative impact of ESG factors on Lufthansa's credit rating (Moody's Ratings, 2025)

6.8.4 Scope Ratings

Lastly, on April 28th 2025 Scope Ratings released a public rating which mentions Lufthansa Group's "exposure to cyclical changes in discretionary travel (business and leisure) and event risks such as natural disasters, contagious diseases and labour strikes" as a negative rating driver as it may affect passenger volumes negatively. The table summarises the main themes of the three ESG factors which affect the airline industry currently with regards to their respective credit rating (Scope Ratings, 2025).

Environment	Social	Governance
Resource management (e.g. raw materials consumption, carbon emissions, fuel efficiency) 	Labour management 	Management and supervision (supervisory boards and key person risk) 
Efficiencies (e.g. in production)	Health and safety (e.g. staff and customers)	Clarity and transparency (clarity, quality and timeliness of financial disclosures, ability to communicate) 
Product innovation (e.g. transition costs, substitution of products and services, green buildings, clean technology, renewables)	Clients and supply chain (geographical/product diversification)	Corporate structure (complexity) 
Physical risks (e.g. business/asset vulnerability, diversification)	Regulatory and reputational risks	Stakeholder management (shareholder payouts and respect for creditor interests) 

ESG factors:  credit-positive  credit-negative  credit-neutral

Figure 47 Scope Rating's ESG factors influencing creditworthiness (Scope Ratings, 2025)

Scope's assessment suggests that the capital-intensive nature of the airline industry's transition to greater sustainability, such as fleet renewal and decarbonisation efforts, may lead to increased debt burdens or weakened cash flows, potentially affecting airlines' ability to meet financial commitments. In parallel, indirect sustainability

challenges, including shifting environmental regulations and climate-related disruptions, add long-term uncertainty to both revenue visibility and cost predictability, posing further risks to financial stability (Scope Ratings, 2025).

7. Discussion

In ESG discourse, the term “challenge” refers to complex triggers that disrupt the symmetry between financial performance and sustainability goals. These situations stress-test corporate resilience and adaptability, forcing management to navigate trade-offs between stakeholder expectations and shareholder value (MDPI, 2023). This section concerns itself with the challenges that Lufthansa Group has directly stated on the one hand or those that may arise due to political, economical and external factors from Lufthansa Group’s ESG environment on the other hand.

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7.1 Challenges regarding ESG Reporting

Independently from an airline’s business model, most airlines surprisingly neglect the economic impact of sustainability. The airline sector could improve its sustainability marketing by reporting their economic, environmental, and social impacts as well as achievements (MDPI, 2023). Historically, when the Group started reporting on sustainability issues, Lufthansa’s ESG reporting was voluntary and fragmented, characterised by standalone CSR activities and inconsistent adherence to frameworks like GRI. With the implementation of the EU Taxonomy and the transition from voluntary to mandatory reporting including constantly changing standards and reporting frameworks, Lufthansa Group has to stay updated regarding which information to disclose. In order to meet CSRD requirements, ESG metrics are now embedded in the annual reports, increasing the comparability of reports and quantifying targets by providing metrics. While the Omnibus regulation proposes changes to sustainability laws such as the EU Taxonomy, CSRD as well as CSDDD, it mainly affects SMEs. However, changes to ESRS affect the ESG Reporting of Lufthansa Group as well by setting the focus on more quantitative data than information provided in text form. Despite the additional effort needed due to the adaptations, enhanced consistency with global sustainability reporting standards can improve the perception by international third parties. The key challenge remains the constant modification of regulations, prohibiting the Group to plan effectively in advance (Accountancy Europe, 2025). The more reports have to be written according to different frameworks, the higher costs and efforts rise in the ESG department. The collection of reliable data in a world-wide operating group and on-going adaptation to stakeholder priorities create dynamic challenges. Consequently, harmonisation in reporting standards is beneficial in order to increase efficiency. Furthermore, the Group points out challenges in interpreting undefined legal terms, leading to divergencies and a lack in compliance. This limits the level of transparency Lufthansa Group is able to submit.

Moreover, the German LkSpG will be extended as well as partially replaced by the European CSDDD by 2027. Lufthansa Group will have to adapt to stricter regulations, however exact changes are currently still discussed. Analogue to the impact of the Omnibus regulation, the mandatory reporting according to the LkSpG might be eliminated shortly after its introduction, as well as respective sanctions, creating confusion as the focus will shift to more risk-based analyses (KPMG, 2025).

7.2 Lufthansa Group's ESG Actions

In the assessment of Lufthansa Group's Reporting practices, the term Greenwashing often arises and the delimitation to simple sustainable marketing. Rather than anchoring ESG objectives in its strategy, prior to 2020, sustainability actions were often based on cost-driven decisions, such as modernising aircraft to reduce fuel costs. Fleet renewal with Airbus A350s and Boeing 787s, called the Dreamliner, yields ~20 - 25% fuel savings per seat, but comes with steep capital costs and spare capacity concerns (IATA 2023; Airbus/BBC 2025). Furthermore, updating these assets is a long-term strategic operational decision which is less flexible and consequently harbours risks.

Technological process in fleet modernisation as well as SAF are linchpins in Lufthansa's near-term decarbonisation pathway. Yet, current SAF costs are 2 - 5 times higher than conventional jet fuel, coverage remains negligible (about 2% of the fuel mix), and the EU's blending quotas demand rapid scale-up by 2025 - 2030. Reuters reports that EU targets (6% SAF by 2030) are deemed unfeasible without expanded supply and policy backing (Reuters, 2025; Welt, 2024). Lufthansa has begun charging environmental surcharges (from 1€ up to 72€ per ticket) to absorb rising costs, but this strategy risks to price out climate-conscious consumers (Plucinska et al., 2024; Reuters, 2024). Modernising the fleet helps reduce per-passenger emissions and also lowers fuel costs over time. However, acquiring new aircraft involves substantial capital expenditures, which can be challenging during periods of economic uncertainty or volatile demand. Additionally, phasing out older aircraft early for environmental reasons may lead to higher depreciation costs and underutilised assets, while simultaneously supporting the effect of Greenwashing with the underutilisation of the aircrafts or externalisation of the issue by selling less environmentally-friendly aircrafts to other airlines.

While SAF supplementation and modern fleets offer clear emissions benefits, Lufthansa faces a strategic quandary: investing heavily now with uncertain returns or delaying until SAF is more affordable. Long-term technological solutions such as hydrogen and electric aircraft offer zero-emission potential but are unlikely to be used before the 2040s. Current projections suggest they may only contribute around 6 - 10% to the CO₂ reduction by 2050 (IATA 2023; Airbus/BBC 2025). For airlines, challenges manifest as conflicting incentives, e.g. investing in costly, low-emission technology that may not yield immediate returns, or complying with evolving legal requirements at the expense of short-term margins (MDPI, 2023). However, environmental factors such as the reduction

of local air pollution as well as GHG in the atmosphere can't be mitigated by the improvement of technologies like SAF and a modernised fleet. Additionally, the Group struggles with the organisation of in-flight waste. In total, the path to decarbonisation proves to be the main cost driver.

Regarding social aspects in the supply chain, under the EU's CSDDD and Germany's national LkSpG, Lufthansa Group must establish comprehensive human-rights risk assessments in operations world-wide. From aircraft manufacturers, such as Airbus and Boeing which entails recent scandals, to catering services which are usually organised more locally. This requirement introduces operational complexity and legal liability as failure to mitigate ESG breaches may result in litigation and reputational damage. Balancing detailed due diligence with operational safety, especially considering aviation's safety-first culture, presents a persistent tension in decision-making. Further social issues arose due to five strikes in the fiscal year 2023 and issues during flight operations with turbulences in flight, however no reported accidents (Lufthansa, 2024). Moreover, good governance practices are crucial for minimising unnecessary risks, as weak governance can lead to issues like corporate scandals and ethical breaches, which may result in significant financial losses, as well as reputational damage.

7.3 Challenges in the Rating process

Regarding the ESG Ratings in 2023, diverging scores are notable. After pointing out the different methodologies, the Group is assessed with, being confronted with individual themes and focus, different metrics and respective weighting divergencies, Lufthansa Group's adaptability is questioned as it is needed to avoid discrepancies in data. The more consistently the Group can disclose information with a rating methodology, the more of its sustainability practices can be regarded in the rating process. If a strength is reflected with a high weighting in the Rating Score, the adaptation turns out beneficially.

Furthermore, not just reporting frameworks but also rating methodologies are constantly in transition. Further, for the rating of the fiscal year 2023, the Group firstly included the Rating Agency Scope Group, which is based in Germany, besides the Big 3 Rating Issuers S&P Global, Moody's and Fitch Ratings. This increased the need of communication and adaptation to another methodology as well. Additionally, stakeholder scrutiny has increased: Rating agencies such as MSCI, CDP, and EcoVadis demand rigorous disclosures, creating a need to make ESG a strategic dimension, rather than just peripheral. However, the material benefits on the environment of adjusting to ESG Ratings is questioned, as managers often push for conformity out of intrinsic economic benefits, rather than ethical improvements. It is criticised that lower economic returns would lead to lower investments.

To sum up, the proliferation of ESG rating agencies has introduced confusion and diverging assessments. Empirical studies attribute around 56% of divergence to

differences in measurement, and around 38% to scope misalignment among raters (Berg et al., 2022). For Lufthansa Group, this creates strategic ambiguity as a strong CDP Rating Score may not translate into favourable Sustainalytics ratings, hindering investor confidence and complicating sustainability communication strategies. Additionally, inconsistent ESG frameworks raise Greenwashing accusations and necessitate investment in harmonising data systems, internal controls, and external disclosures (Whelan et al., 2021).

7.4 Comparative Position in European Aviation

In comparison with its peers Air France-KLM, IAG, and Ryanair as a low-cost airline, Lufthansa Group stands out for producing standalone sustainability reports with detailed materiality analyses and GRI index alignment. However, none of these airlines achieves more than 60% coverage of GRI topic disclosures, indicating pervasive reporting gaps. Lufthansa Group, while more transparent than many, still misses key indicators like water use and local sourcing (MDPI, 2023). Its comprehensive standalone format improves stakeholder reach but may also invite greater scrutiny and raise stakes for corroborating claims. The results of the study by MDPI regarding the reporting efforts are summarised in the table below.

	LHG	IAG	AF-KLM	RJR
Standalone Sustainability Report	X	--	X	--
Non-Financial Statement	X	X	X	X
Page count of main sustainability publication	138 pages	56 pages	148 pages	7 pages
Materiality Analysis	X	X	X	--
GRI Reference	X	X	X	--
GRI Content Index	X	X	--	--

Figure 48 Overview of differences in ESG Reporting formats among peers (MDPI, 2023)

It can be seen that Lufthansa Group “LHG” and Air France-KLM “AF-KLM” produce Standalone Sustainability Reports additionally to the mandatory non-financial statement incorporated into the annual report. The volumes of the publications as well as depth of the provided details differs positively from the smaller airline groups and especially the low-cost airline Ryanair. However, it can be criticised that the publishing of the standalone sustainability reports fulfills rather marketing purpose, just like the additional sustainability factsheets that can be found on Lufthansa Group’s website.

Moreover, a risk can be detected in this pioneering position: Having higher costs due to Research and Development of technologies and greater uncertainty in outcome, Lufthansa Group may suffer financially from unfavourable laws in this transition period.

7.4 External Factors: Geopolitics, Climate, and Economics

A rather under-represented theme in the ESG Reports as well as Rating Reports and methodologies are external factors influencing Lufthansa Group's ESG environment. Recent geopolitical dynamics, such as the resurgence of the US's anti-ESG sentiment under President Donald Trump threaten to disrupt global sustainable investment flows, de-incentivising CSR. Airlines relying on US-based financing may find ESG-linked loans and bonds less accessible, reducing incentives for green investment. However, after US President Donald Trump announced the withdrawal from the Paris Agreement, the resulting gap the UN's climate budget was promised to be filled by investors such as Michael Bloomberg (Cazenove Capital, 2025).

Regarding supply chains, conflict zones and sanctions can destabilize SAF supply chains, driving price volatility. In line with European requirements, the Group's efforts lay in expanding the relative use of SAF in its fuel mix as well as securing supply chains with long-term contracts compatible with existing aircraft engines and infrastructure. However, SAF currently face two major obstacles: limited availability and high costs up to five times more expensive than conventional jet fuel. Lufthansa and other carriers must begin integrating SAF into their fuel mix, especially as the EU's "ReFuelEU Aviation" regulation sets mandatory SAF blending quotas starting in 2025. Meeting these quotas will require long-term contracts, partnerships with fuel producers, and investments in new logistics infrastructure. Despite its potential, SAF alone cannot currently meet the global fuel demand of aviation, making it a transitional rather than a full solution. However, Roland Berger suggests that combining SAF procurement with monetisation strategies, e.g. if airlines can provide higher volumes, strong contractual terms and durations, supply chains can be secured (Roland Berger, 2025).

Economic pressures, from post-COVID rebounds to rising inflation, limit the ability to pass costs onto passengers without depressing demand. Although studies suggest ESG disclosure correlates with improved investor resilience, consumer willingness to pay premiums remains limited, complicating profitability of sustainability initiatives (WEF 2021).

The influence of extreme weather events are incorporated into the climate scenario analysis. Heatwaves foremost raise physical risk in the upcoming decade, having effects on supply chains and consequent inefficiencies in operations on land. However, additional challenges through changes in the atmosphere such as a diverging jet stream or occurrence of cyclones are only expected to influence flight operations after the year 2050 and is therefore not material to current reporting practices (Lufthansa Group, 2024).

Another challenge Lufthansa Group needs to face alongside other European airlines is based on the criticism of the ETS as regulations are currently changing, allowing the purchase of carbon credits from foreign countries. Critics argue that this doesn't lower

total air pollution as EU companies can simply buy certificates instead of minimising their emissions. Additionally, carbon-offsetting schemes have been strongly criticised lately after a study revealed the non-existence of projects e.g. in China. This is especially harmful to the aviation sector as electric engines are far from replacing traditional mainly kerosene-based engines which unavoidably emit CO₂ into the atmosphere. Lastly, carbon allowances are expected to be further limited. A potential switch from EU ETS to ReFUEL EU Aviation is currently discussed politically. Moreover, with an upcoming kerosene tax, Lufthansa Group as well as other European airlines have pledged for fair conditions in competition with airlines (SimpleFlying, 2022). Meanwhile, the ETS in the EU, UK and Switzerland only applies to flights within that region, excluding the capture of emissions created in long-haul flights, leaving those uncharged. However, airlines paid 3 billion € for the purchase of ETS allowances just in 2023, leaving potential for a multiple (Financial Times, 2024).

Moreover, the strategic decision of the acquisition of Italian company ITA Airways in 2024 poses operational challenges e.g. regarding the expansion of reporting practices and harmonising sustainability objectives with its integration. Further, proposed short-haul flight restrictions add operational uncertainty. Nationally, being headquartered in Germany, the aviation tax and net-zero 2045 law have additional impact on corporate ESG objectives. Lastly, the CSDDD introduces direct liability for supply chain violations. Regulatory changes in Germany can be expected as the European law aims to replace Germany's national LkSpG under which the Group currently has to report. Compliance demands extensive emissions tracking, reporting, and due diligence across supply chains (LIS, 2025).

7.5 Strategic Implications for Lufthansa

Early investment in SAF infrastructure positions Lufthansa as a pioneer in low-carbon aviation, yet success depends on scaling supply chains and institutional backing. Governance complexities, from rating inconsistencies to regulatory burdens which are still in a transition phase, require integrated data systems and cross-functional governance. Failure to adapt risks stranded assets, legal penalties, and diminished brand equity. The research problem of this thesis is based on the fast-paced transition in European as well as national ESG regulations. With Lufthansa Group's ESG environment consisting of political actors and their decisions, economics and market forces, the natural environment and its increasing risks due to climate change, rating agencies evaluating internal and published information as well as investors and as society such as customers or employees, pressures on its ESG management contradict and the main challenge is to balance the variety of external influences. In summary, these challenges demand a recalibrated corporate strategy that balances cost, compliance, and competitiveness under shifting legal frameworks.

8. Summary and Outlook

Despite these challenges, the Group successfully ended another fiscal year with extensive reporting practices above industry-average and an increase in Rating Performance. Lufthansa's ESG reports highlight several key themes. Regarding climate and environmental protection, the emphasis lies on reducing carbon emissions through Research and Development in fleet modernisation, the adoption of SAF, and operational efficiencies. Looking at employee relations and CSR, the Group focuses on fair treatment of employees, enhancing labour relations, and addressing social concerns. The company is actively working to improve its workplace culture and prevent incidents of discrimination, using tools such as regular trainings in example. Its commitment to transparent governance processes, adherence to international standards, and continuous improvement of compliance frameworks includes updating codes of conduct and ensuring effective risk management practices. Lufthansa Group actively drives sustainable change in a heavily-polluting industry, and the chance to be at the forefront of change continues to trigger sustainable investment.

Similar to other European airlines, Lufthansa Group is facing growing pressure from the public, governments, and regulators to actively contribute to climate protection. The regulatory landscape and legal pressures in the European aviation sector keeps tightening. In Europe, in particular, there is strong momentum toward decarbonisation. Lufthansa has committed to becoming carbon-neutral by 2050, aligning with international climate goals. Achieving this, however, demands far-reaching changes across operations, fleet strategy, fuel sourcing, and supply chains. The transition must balance sustainability ambitions with operational viability and competitiveness in a highly price-sensitive market. Lufthansa's ESG commitments influence financing and market perception. On the one hand, improved rating scores can reduce the cost of capital (Friede et al. 2015), on the other hand lagging performance or greenwashing concerns may lead to reputational, regulatory, and financial risks.

Corporate Reporting is essential for transparency to stakeholders and the public, but data is biased, filtered by intrinsic intentions as well. To ensure comparability between reports in order to take informed decisions, a harmonised framework is important to avoid Greenwashing. With the CSRD as a legal base, the first step is taken. The introduction of ESRS provides metrics promoting the alignment with existing frameworks, aiming at Integrated Reporting. According to the Group's objectives: Pledging net-zero CO₂ by 2050 and setting a 50% reduction target by 2030, compared to 2019 levels, was already partially achieved through changes such as the integration SAF, fleet renewal, land and flight operational efficiency as well as taking part in the ETS, capping its emissions or off-setting.

As explained before, the alignment of ESG performance and corporate strategy is necessary for the successful implementation. Lufthansa Group proved in its report the

incorporation of CSR practices enhancing social metrics such as the corporate reputation outside as well as employee satisfaction internally. Costs resulting from decarbonisation strategies are already tackled in Lufthansa Group's current strategy by higher a passenger load factor and on average a longer flight route which decreases emissions per passenger, lowering this metric occurring as an important factor in many ESG Ratings. Another aspect well-managed turns out to be reducing the impact of market volatility, decreased by the diversification of income streams, ranging from Software development to Repair and Maintenance. The integration of these criteria into business strategy ensures a long-term competitive advantage.

This paper assesses how stakeholder pressures collide onto a multinational Group in a highly polluting sector. Reflecting on all the influences from external stakeholders, the Group can understand risks and challenges regarding its competitive behaviour in the market. The paper can serve as a case study of how regulatory interventions (e.g. CSRD) affect a Group, as there are currently only few detailed case studies on ESG Ratings in the airline industry. Furthermore, it shows complexities in an international Group. Furthermore it closes the gaps between interfaces, showing the transition between sustainability theory and practice with ESG evaluation, internal as well as external. The results suggest that changes in regulation may lead to inconsistent valuation and consequently fuels the current debate on comparability of ESG Ratings by portraying immense differences in methodologies. As they lack consistency, in different agencies as well as annual adaptations internally, the paper leads to the suggestion that investors should focus less on the ESG Scores in decision making. ESG Ratings don't always accurately reflect the actual ESG actions and sustainable outcome. It is presented how internal reporting information differs from external valuation. Finally, the paper clears up about Greenwashing risks and the importance of finding best practices to be at the forefront of transition. However it points out the risk to waste resources in case of another unexpected policy change regarding ESG Reporting.

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10. Annex

10.1 Complete CDP questionnaire and summarised response

Initially, starting with an introduction (C0), the structure of the questionnaire sent to Lufthansa Group in 2023 works as follows:

C0. Introduction

- C.1 Give a general description and introduction to your organization.
- C0.2 State the start and end date of the year for which you are reporting data and indicate whether you will be providing emissions data for past reporting years.
- C0.3 Select the countries/areas in which you operate.
- C0.4 Select the currency used for all financial information disclosed throughout your response.
- C0.5 Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note this option should align with your chosen approach for consolidating your GHG inventory.

[...]

C1. Governance

- C1.1 Is there board-level oversight of climate-related issues within your organization?
 - C1.1a Identify the position(s) [...] on the board with responsibility for climate-related issues.
 - C1.1b Provide further details on the board's oversight on climate-related issues.
 - C1.1d Does your organization have at least one board member with competence on climate-related issues?
- C1.2 Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.
- C1.3 Do you provide incentives for the management of climate-related issues, including the attainment of targets?
 - C1.3a Provide further details on the incentives provided for the management of climate-related issues [...].

C2. Risks and opportunities

- C2.1 Does your organization have a process for identifying, assessing, and responding to climate-related risks and opportunities?
 - C2.1a How does your organization define short-, medium-, and long-term time horizons?

- C2.1b How does your organization define substantive financial or strategic impact on your business?
- C2.2 Describe your process(es) for identifying, assessing and responding to climate-related risks and opportunities.
 - C2.2a Which risk types are considered in your organization's climate-related risk assessment?
- C2.3 have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?
 - C2.3a Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.
- C2.4
 - C2.4a Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.

C3. Business strategy

- C3.1
 - C3.1 Does your organization's strategy include a climate transition plan that aligns with a 1,5 degrees Celsius world?
- C3.2
 - C3.2 Does your organization use climate-related scenario analysis to inform its strategy?
 - C3.2a Provide details of your organization's use of climate-related scenario analysis.
 - C3.2b Provide details of the focal questions your organization seeks to address by using climate-related scenario analysis and summarize the results with respect to these questions.
- C3.3
 - C3.3 Describe where and how climate-related risks and opportunities have influenced your strategy.
- C3.4 Describe where and how climate-related risks and opportunities have influenced your financial planning.
- C3.5 In your organization's financial accounting, do you identify spending/revenue that is aligned with your organization's climate transition?

C4. Targets and performance

- C4.1 Did you have an emissions target that was active in the reporting year?
 - C4.1b Provide details of your emissions intensity target(s) and progress made against those target(s).
- C4.2 Did you have any other climate-related targets that were active in the reporting year?

- 4.2c Provide details of your net-zero target(s).
- C4.3 Did you have emissions reductions initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.
 - C4.3a Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO₂e savings.
 - C4.3b Provide details on the initiatives implemented in the reporting year in the table below.
 - C4.3c What methods do you use to drive investment in emission reduction activities?
- C4.5 Do you classify any of your existing goods and/or services as low-carbon products?
 - C4.5a Provide details of your products and/or services that you classify as low-carbon products.

C5. Emissions methodology

- C5.1 Is this your first year of reporting emissions data to CDP?
 - C5.1a Has your organization undergone any structural changes in the reporting year, or are any previous structural changes being accounted for in this disclosure of emissions data?
 - C5.1b Has your emissions accounting methodology, boundary, and/or reporting year definition changed in the reporting year?
- C5.2 Provide your base year and base year emissions.
- C5.3 Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate emissions.

C6. Emissions data

- C6.1 What were your organization's gross global Scope 1 emissions in metric tons in CO₂?
- C6.2 Describe your organization's approach to reporting Scope 2 emissions.
- C6.3 What were your organization's gross global Scope 2 emissions in metric tons CO₂e?
- C6.4 Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1, Scope 2 or Scope 3 emissions that are within your selected reporting boundary which are not included in your disclosure?
 - C6.4a Provide details of the sources of Scope 1, Scope 2 or Scope 3 emissions that are within your selected reporting boundary which are not in your disclosure.
- C6.5 Account for your organization's gross global Scope 3 emissions, disclosing and explaining any exclusions.

- C6.5a Disclose or restate your Scope 3 emissions data for previous years.
- C6.7 Are carbon dioxide emissions from biogenic carbon relevant to your organization?
- C6.10 Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO₂e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

C-TS6.15

- C-TS6.15 What are your primary intensity (activity-based) metrics that are appropriate to your emissions from transport activities in Scope 1, 2, and 3?

C7. Emissions breakdowns

- C7.1 Does your organization break down its Scope 1 emissions by greenhouse gas type?
- C7.2 Break down your total gross global Scope 1 emissions by country/area/region.
- C7.3 Indicate which gross global Scope 1 emissions breakdowns you are able to provide.
 - C7.3c Break down your total gross global Scope 1 emissions by business activity.
- [...] Break down your organization's total gross global Scope 1 emissions by sector production activity in metric tons CO₂e.
- C7.5 Break down your total gross global Scope 2 emissions by country/area/region.
- C7.6 Indicate which gross global Scope 2 emissions breakdowns you are able to provide.
 - C7.6c Break down your total gross global Scope 2 emissions by business activity.
- C7.7 Is your organization able to break down your emissions data for the subsidiaries included in your CDP response?
 - C7.7a Break down your gross Scope 1 and Scope 2 emissions by subsidiary.
- [...] Break down your organization's total gross global Scope 2 emissions by sector production activity in metric tons CO₂e.
- C7.9 How do your gross global emissions (Scope 1 and 2 combined) for the reporting years compare to those of the previous reporting year?
 - C7.9a Identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined), and for each of them specify how your emissions compare to the previous year.

- C7.9b Are your emissions performance calculations in C7.9 and C7.9a based on location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

C8. Energy

- C8.1 What percentage of your total operational spend in the reporting year was on energy?
- C8.2 Select which energy-related activities your organization has undertaken.
 - C8.2a Report your organization's energy consumption totals (excluding feedstocks) in MWh.
 - C8.2b Select the applications of your organization's consumption of fuel.
 - C8.2c State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.
 - C8.2d Provide details on the electricity, heat, steam, and cooling your organization has generated and consumed in the reporting year.
 - C8.2e Provide details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a zero or near-zero emission factor in the market-based Scope 2 figure reported in C6.3.
 - C8.2g Provide a breakdown by country/area of your non-fuel energy consumption in the reporting year.
- C-TS8.5 Provide any efficiency metrics that are appropriate for your organization's transport products and/or services.
- C-T09.3/C-TS9.3 Provide tracking metrics for the implementation of low-carbon transport technology over the reporting year.
- [...] Does your organization invest in research and development (R&D) of low-carbon products or services related to your sector activities?
- C-T09.6a/C-TS9.6a Provide details of your organization's investments in low-carbon R&D for transport-related activities over the last three years.

C10. Verification

- C10.1 Indicate the verification/assurance status that applies to your reported emissions.
 - C10.1a Provide further details of the verification/assurance undertaken for your Scope 1 emissions and attach the relevant statements.
 - C10.1b Provide further details of the verification/assurance undertaken for your Scope 2 emissions and attach the relevant statements.
 - C10.1c Provide further details of the verification/assurance undertaken for your Scope 3 emissions and attach the relevant statements.
- C10.2 Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?

- C10.2a Which data points within your CDP disclosure have been verified, and which verification standards were used?

C11. Carbon pricing

- C11.1 Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?
 - C11.1a Select the carbon pricing regulation(s) which impacts your operations.
 - C11.1b Complete the following table for each of the emissions trading schemes you are regulated by.
 - C11.1d What is your strategy for complying with the systems you are regulated by or anticipate being regulated by?
- C11.2 Has your organization cancelled any project-based carbon credits within the reporting year?
 - C11.2a Provide details of the project-based carbon credits cancelled by your organization in the reporting year.
- C11.3 Does your organization use an internal price on carbon?
 - C11.3a Provide details of how your organization uses an internal price on carbon.

C12. Engagement

- C12.1 Do you engage with your value chain on climate-related issues?
 - C12.1a Provide details of your climate-related supplier engagement strategy.
 - C12.1b Give details of your climate-related engagement strategy with your customers.
 - C12.1d Give details of your climate-related engagement strategy with other partners in the value chain.
- C12.2 Do your suppliers meet climate-related requirements as part of your organization's purchasing process?
 - C12.2a Provide details of the climate-related requirements that suppliers have to meet as part of your organization's purchasing process and the compliance mechanisms in place.
- C12.3 Does your organization engage in activities that could either directly or indirectly influence policy, law, or regulation that may impact the climate?
 - C12.3a On what policy, law, or regulation that may impact the climate has your organization been engaging directly with policy makers in the reporting year?
 - C12.3b Provide details of the trade associations your organization is a member of, or engages with, which are likely to take a position on any policy, law, or regulation that may impact the climate.

- C12.4 Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s).
- C12.5 Indicate the collaborative frameworks, initiatives and/or commitments related to environmental issues for which you are a signatory/member.

C15. Biodiversity

- C15.1 Is their board-level oversight and/or executive management-level responsibility for biodiversity-related issues within your organization?
- C15.2 Has your organization made a public commitment and/or endorsed any initiatives related to biodiversity?
- C15.3 Does your organization assess the impacts and dependencies of its value chain on biodiversity?
- C15.4 Does your organization have activities located in or near to biodiversity-sensitive areas in the reporting year?
- C15.5 What actions has your organization taken in the reporting year to progress your biodiversity-related commitments?
- C15.6 Does your organization use biodiversity indicators to monitor performance across its activities?
- C15.7 have you published information about your organization's response to biodiversity-related issues for this reporting year in places other than your CDP response? If so, please attach the publication(s).

C16. Signoff

- C-FI use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.
- C16.1 Provide details for the person that has signed off (approved) your CDP climate change response.
- SC. Supply chain module
- SC0.0

This structure provides a clear overview on the data and information Lufthansa Group needs to disclose. Specifically, regarding challenges in 2023, the following responses are relevant to this research.

C0.1 describes the diversity business segments that Lufthansa Group works in, ranging from passenger airlines over logistics, and maintenance to catering.

C1.1a explains that Lufthansa Group wants to hold on to its sustainability targets which were set before the Covid-19 pandemic which are to reduce net CO₂ emissions by half until 2030 and to reach net zero CO₂ emissions by 2050. CO₂ emissions should be 100%

compensated and equal to zero for mobility on ground and electricity in the hubs. Additionally, the CO₂ emissions per transported tonne-kilometre should be lowered by around 30% from 2019 to 2030. Lastly, an increase in remuneration and the implementation of an ESG Committee were projects started.

C1.2 declares the regular discussion of their ESG strategy including a fleet renewal and SAFs. Moreover, an internal ESG audit takes place regularly.

C2.1b shows that climate-related risks are assessed quarterly, and risks can be unprecise, reaching from reputational problems over earnings to the entire business model.

C2.2 Lufthansa Group has implemented a systemic Enterprise Risk Management. Specifically, physical climate risks are mentioned. Moreover, environmental regulation was identified as a climate-related risk. Existing regulations are e.g. the EU ETS with a price increase and a switch to e.g. ReFUEL EU Aviation. Two further challenges mentioned are a potential increase in operating costs due to the use of SAF and rising CO₂ costs and also the potential change in the transportation market as a lower demand for air travel is expected when other transport modes are subsidised while air travel gets more expensive due to CO₂ costs and other fees. Furthermore, the EU Green Deal leads to higher financial costs with the auctioning of previously free allowances and the exemption of the energy tax for jet fuel. Next, the competition for voluntary carbon offsets is expected to increase (Lufthansa Group started the use of COMPENSAID in 2020 already), as well as intercontinental competition with countries that don't charge extra costs due to environmental regulations. Additionally, acute physical risks such as isolated extreme weather events affect ground operations individually, but don't affect the flight operations. Pilots adapt with new "Enroute Weather Displays". Lastly, due to climate change, the demand for certain destinations can decrease e.g. in seasons of extremely high temperatures.

C3.3 A Supplier Code of Conduct was introduced in 2019 to disclose ESG information regarding the supply chains. Moreover, the Hydrogen Aviation Lab was introduced which will focus on Research and Development in the area of hydrogen. In total, there were 24 projects concerning fuel saving in 2023.

C3.4 This point mentions the financial implications, such as new liabilities as Lufthansa Group had to make use of state loans, and the EU Taxonomy might influence the accessibility to capital. However, the reduction of jet fuel makes air travel a more promising investment case.

C4.3c As part of the green electricity target, green energy certificates are purchased, and an implicit carbon price can be calculated.

C6.5 The in-flight waste is mainly created through catering and disposal is difficult to track.

C11.1b Besides the ETS applied in the EU, Switzerland and the UK, Lufthansa Group did have to follow the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as well but is not required to do so regarding CO₂ emissions in 2022.

C11.2b Problems that can occur in the implementation of voluntary carbon offsetting projects are described, such as the misuse of resources.

C11.3a In decision-making, an internal carbon price in form of a shadow price is utilised.

C12.1b Lufthansa Group tries to sensitise other companies as well as individuals to mitigate CO₂ emissions.

12.1d Lufthansa Group collaborates with partners e.g. train services to connect hubs by train instead of by air travel.

C12.5 Finally, Lufthansa Group is a member of Business Ambition for 1,5 degrees, the TCFD and a signatory member of the UN Global Compact. (Lufthansa Group, 2024).

10.2 Declaration of generative AI and AI-supported technologies in the writing process

During the preparation of this thesis, ChatGPT (4.0 and o1), was used to search for relevant literature. The AI-based translation tool Deepl was used to translate between German and English. After using these tools and services, I reviewed and edited the content as needed.