# Corporate Environment Responsibility in Singapore Airlines 2015-2024

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## Abstract

This study presents a comprehensive examination of Singapore Airlines' environmental responsibility from 2015 to 2024, focusing on key environmental indicators including total waste generation, electricity consumption, water usage, greenhouse gas (GHG) emissions, and renewable energy adoption. Through detailed analysis of these metrics, the study identifies trends in the airline's sustainability efforts, highlighting periods of enhanced efficiency and areas necessitating improvement. The research aims to evaluate Singapore Airlines' commitment to environmental respnsibility and provide insights into effective integration of sustainable practices within the aviation industry. Findings emphasize the critical importance of implementing durable strategies to mitigate environmental impact in a sector facing increasing scrutiny for its ecological footprint. This study contributes to the broader discourse on corporate environmental responsibility in high-impact industries and offers a framework for assessing sustainability progress in commercial aviation.

**Keywords**: Corporate Environmental Responsibility, Singapore Airlines, Environmental Indicators.

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## 1. Introduction

The global aviation industry has come under acceleratinganalysis regarding its environmental impact, mainly due to its significant contribution to greenhouse gas emissions, resource consumption, and waste generation. As climate change concerns escalate and stakeholders demand moresocial and environmental corporate responsibility, airlines face increasing pressure to balance operational growth with environmental practices. Singapore Airlines, a prominent carrier in the Asian market and a global industry leader, has embarked on a multifaceted journey to enhance its environmental performance over the past decade.

Understanding the efficacy of Singapore Airlines' efforts to reduce its environmental impacts through various sustainability measures provides valuable insights into how airlines can effectively balance operational imperatives with ecological responsibilities. This study presents a detailed examination of Singapore Airlines' environmental responsibility initiatives from 2015 to 2024, evaluating trends across several critical environmental indicators: waste management, electricity and water consumption, GHG emissions, and renewable energy utilization.

By analyzing these key performance indicators over an extended period, this study aims to clarify the airline's commitment to sustainability, identify successful strategies, and highlight areas where further improvements are necessary. The research is situated within the broader context of sustainability in the aviation sector, contributing to the growing body of literature on corporate environmental responsibility in high-impact industries.

The significance of this study lies in its potential to inform industry practices, guide policy development, and enhance our understanding of the challenges and opportunities in implementing effective environmental measures in commercial aviation. By providing a comprehensive analysis of one of the industry's leading players, the study offers insights that may be applicable to other airlines and contribute to the development of more sustainable practices across this sector.

## 2. Study Objectives

The primary objectives of this research are as follows:

- To conduct a detailed analysis of Singapore Airlines' environmental performance from 2015 to 2024, using a range of quantitative indicators.
- To assess the effectiveness of Singapore Airlines' sustainability strategies and initiatives, considering both internal efforts and external factors influencing performance.
- To evaluate the airline's progress towards its stated environmental goals and commitments.
- To contribute to the academic discourse on corporate environmental responsibility and its practices in the aviation sector.

## 3. Study Methodology

The study employs an extended analysis of Singapore Airlines' sustainability reports from 2015 to 2024 to examine the evolution of the company's environmental indicators and corporate environmental responsibility (CER) practices. By systematically reviewing these reports, the study will identify trends, changes, and developments in key environmental metrics such as water consumption, electricity usage, greenhouse gas (GHG) emissions, renewable energy adoption, and waste management. This method allows for a comprehensive understanding of how Singapore Airlines has addressed environmental challenges over the years, providing insights into the effectiveness and progression of its CER initiatives.

## 4. Literature Review

Corporate environmental responsibility (CER) is steadily crucial in the aviation industry, given its important environmental impact. As concerns over emissions, resource use, and climate change grow, airlines face rising pressure to adopt sustainable practices. This section explores the literature on CER, addressing how airlines handle environmental challenges while balancing operational demands.

### 4.1 Corporate Environmental Responsibility (CER) Evolution

Corporate Environmental Responsibility (CER) has evolved substantially over the past few decades, reflecting a deeper understanding of the relationship between business practices and environmental sustainability. The following review traces this evolution, including key scholarly contributions and contextual developments from the early 1990s to the present day.

In the early 1990s, CER began to take shape as businesses responded to rising concerns about pollution, resource depletion, and environmental degradation. During this period, companies primarily viewed CER as compliance with environmental regulations, focusing on minimizing harm effects rather than integrating environmental considerations into their main strategies. Scholars of the time noted that corporate responsibility in the environmental shift was often limited to adherence to regulatory standards, with little emphasis on proactive or innovative environmental practices (Matten & Moon, 1998). Davis and Blomstrom (1975) further emphasized that decision-makers have an obligation to protect and improve the environment alongside pursuing their business interests.

By the late 1990s, a more preventive approach to environmental responsibility started to emerge, with companies beginning to recognize the importance of sustainability. Enderle and Tavis (1998) argued that environmental responsibility involved sustainable development, using fewer resources, and reducing the environmental negative effects of industrial activities. Jablonski et al. (2010) added that environmental responsibility requires conformity with various principles and standards, especially environmental protection regulations. This marked the beginning of a broader understanding of CER as a key component of corporate social responsibility (CSR), where companies not only complied with regulations but also adopted voluntary environmental initiatives.

In the 2000s, the environmental movement gained momentum, pushing businesses to go beyond compliance and integrate sustainability into their business strategies. Porter and Kramer (2006) highlighted that environmental responsibility became a source of competitive advantage and corporate reputation, as companies began to view it as part of their broader

CSR efforts. During this time, companies started to adopt more voluntary measures, such as reducing carbon emissions and improving resource efficiency, driven by both regulatory pressure and the desire to enhance their corporate image. Scholars also noted that corporate environmental policies were formalized, with companies creating environmental principles and setting specific goals to reduce their ecological impact (Mazurkiewicz, 2005).

In the 2010s, the field of CER broadened further, as companies integrated environmental sustainability into their long-term strategic goals. The rise of global reporting standards and environmental accounting, such as the Global Reporting Initiative (GRI), encouraged businesses to be more transparent about their environmental impacts. Dyllick and Muff (2016) observed that companies were increasingly focused on not just minimizing environmental harm but actively contributing to sustainability through innovation and corporate strategy. Similarly, Bendell and Huvaj (2018) noted that stakeholder engagement through corporate social and environmental behavior positively impacted corporate innovation, promoting the integration of environmental concerns into corporate governance.

As environmental responsibility became central to business strategies, the issue of "greenwashing" gained prominence. Critics such as Delmas and Burbano (2011) pointed out that some companies exaggerated their environmental efforts without substantial actions to back up their claims, leading to growing calls for real, measurable, and transparent environmental initiatives. Elkington (2018) highlighted the importance of integrating environmental responsibility into business practices in a way that is both impactful and credible.

Recent years have seen further developments in CER, with a focus on improving environmental responsibility performance. Zopf and Guenther (2015) defined environmental responsibility performance as the results achieved by managing environmental aspects such as emissions, pollution, and compliance. Lloret (2016) argued that businesses should balance profit maximization with environmental protection, emphasizing that sustainability and profitability can coexist. Lozano, Martínez, and

Pindado (2016) added that firms can achieve a competitive advantage by improving their social reputation and reducing operational costs through responsible environmental practices.

Peng Xu et al. (2022) expanded on this by discussing the role of CER in promoting technological innovation and securing legitimacy for businesses. They noted that environmental responsibility fosters collaboration between companies and stakeholders, improving the alignment between innovation and external demands. This has the added benefit of enhancing corporate legitimacy, as environmental responsibility is seen as a marker of good corporate governance.

The role of CER in securing future generations is another important consideration. As Krzysztofek (2018) suggested, caring for the natural environment is crucial for businesses, stakeholders, and future generations, with the overarching goal of preserving resources for sustainable development. Lestari et al. (2021) echoed this perception, arguing that social and environmental responsibility regulation is essential for sustainable economic development, benefiting businesses, communities, and society as a whole.

In the most recent discussions, CER is seen as an essential part of strategic management. Kasych, Suler, and Rowland (2020) posited that environmental responsibility extends beyond compliance and cost reduction; it includes strategic initiatives aimed at minimizing negative impacts on a country's natural resources. Environmental responsibility is now a complex socio-economic and legal institution, encompassing both legal and economic dimensions (Joshi, 2012).

In conclusion, the evolution of CER from a compliance-driven obligation to a strategic imperative reflects broader changes in corporate behavior and governance. Today, environmental responsibility is integral to business success, with companies expected to reduce their environmental impact and contribute positively to solving global environmental challenges.

### 4.2 Airlines Industry and the Environmental Issue

The airline industry, as a major global transportation sector, has a significant environmental impact, mainly in terms of greenhouse gas

emissions, noise pollution, and resource consumption. In recent years, growing public and regulatory pressure has pressured airlines to adopt more sustainable practices, as part of their corporate environmental responsibility (CER) initiatives. According to Gössling and Peeters (2007), aviation is responsible for approximately 2-3% of global CO2 emissions, with the sector's rapid growth contributing significantly to environmental degradation. To reduce these effects, airlines have started investing in more fuel-efficient aircraft, exploring the use of sustainable aviation fuels (SAF), and improving operational efficiency to reduce emissions. Furthermore, initiatives such as carbon offset programs have been introduced, allowing airlines to compensate for their emissions by investing in environmental projects (International Air Transport Association, 2020).

Despite these efforts, critics argue that some airlines engage in "greenwashing," exaggerating their environmental credentials without enacting substantial changes to their operations. As Delmas and Burbano (2011) noted, such practices can mislead stakeholders and undermine real environmental responsibility. However, global regulations, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) established by the International Civil Aviation Organization (ICAO), aim to hold airlines accountable for their environmental impact by setting strict emission reduction targets (ICAO, 2019). These measures are part of a broader trend where environmental responsibility is becoming central to corporate governance, particularly as consumers and investors demand more transparency and accountability regarding sustainability efforts.

In summary, the airline industry faces enormous challenges in balancing growth with environmental sustainability. While significant advances have been made in reducing emissions and adopting greener technologies, the industry must continue to enhance its CER practices to meet global climate goals and reduce its environmental impact. As stakeholders demand more substantial environmental actions, airlines are increasingly required to demonstrate real commitments to sustainability, rather than simply promoting their green credentials for reporting requirements and reputational gains.

## 5. Singapore Airlines' Environmental Performance Analysis (2015-2024)

### 5.1 Singapore Airlines Background

Singapore Airlines (SIA) is a globally renowned airline recognized for its premium service, innovation, and operational excellence. Established in 1972 after separating from Malaysia-Singapore Airlines, SIA rapidly evolved into one of the world's leading carriers, characterized by its commitment to customer service, technological advancements, and consistent profitability (Chan, 2000).

The airline is known for its pioneering efforts, such as being the first to introduce satellite-based in-flight telephones in 1991 and the first to operate the Airbus A380, the world's largest passenger aircraft, in 2007 (Heracleous& Wirtz, 2014). Over the years, Singapore Airlines has maintained a strong reputation for luxury and innovation, earning numerous awards for its premium cabin products, service quality, and overall passenger experience (Skytrax, 2023).

Environmental sustainability has become an increasingly significant focus for SIA in recent years. It has taken various initiatives to reduce greenhouse gas (GHG) emissions, improve fuel efficiency, and implement sustainable waste management practices (Singapore Airlines, 2023). The company has also invested in renewable energy sources and adopted advanced technologies to enhance environmental performance.

### 5.2 Singapore Airlines Environmental Indicators

The environmental performance of airlines has become a crucial aspect of sustainability efforts, and Singapore Airlines is no exception. This section delves into the key environmental indicators for the airline, providing an in-depth analysis of its water and electricity consumption, greenhouse gas (GHG) emissions, use of renewable energy, and waste management practices over the period from 2015 to 2024.

- **Operational Waste Generated**

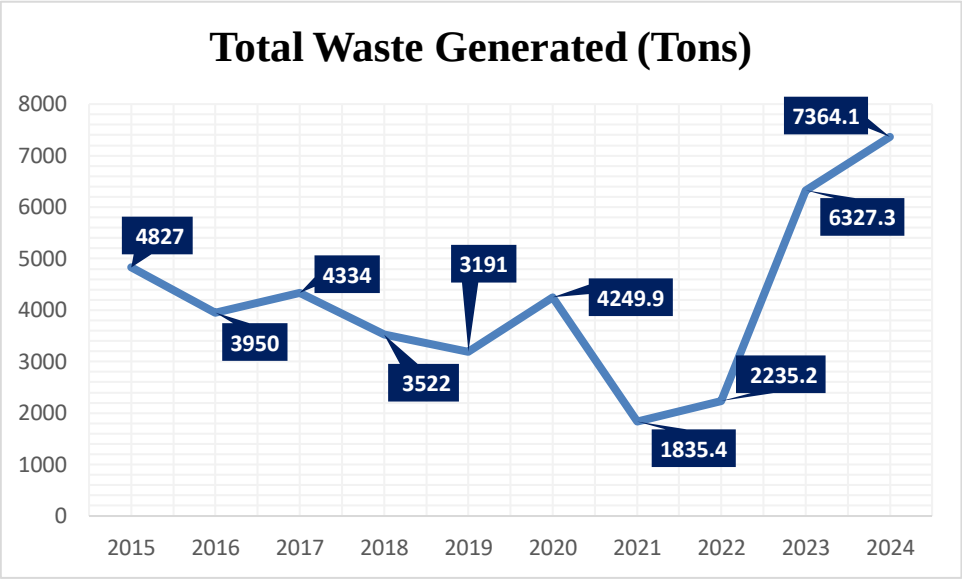
Operational waste generated by airlines refers to the waste produced during day-to-day operations, including materials from in-flight services, maintenance activities, and airport operations. Managing operational waste is significant for minimizing environmental impacts, reducing costs, and complying with regulations. Table 01 provides information about Singapore Airlines waste during 2015 - 2024.

**Table 01. Singapore Airlines Total Operational Waste (2015-2024)**

| Years | Total Waste Generated (Tons) |
|---|---|
| 2015 | 4827 |
| 2016 | 3950 |
| 2017 | 4334 |
| 2018 | 3522 |
| 2019 | 3191 |
| 2020 | 4249,9 |
| 2021 | 1835,4 |
| 2022 | 2235,2 |
| 2023 | 6327,3 |
| 2024 | 7364,1 |

**Source: Singapore Airlines Sustainability Reports (2015-2024)**

**Figure 01. Operational Waste at Singapore Airlines (2015-2024)**




**Source: Singapore Airlines Sustainability Reports (2015-2024)**

The table showing total waste generated (in tons) by Singapore Airlines from 2015 to 2024 illustrates notable fluctuations in waste production over the years. From 2015 to 2019, there was a consistent decline in waste generation, dropping from 4,827 tons in 2015 to 3,191 tons in 2019. This suggests that the airline may have been implementing effective waste reduction strategies during this period.

However, in 2020, there was a sudden increase to 4,249.9 tons, possibly due to changes in operations or waste management practices during the onset of the COVID-19 pandemic. The most dramatic decrease occurred in 2021, when total waste dropped to 1,835.4 tons, likely reflecting reduced flights and activities during the height of the pandemic.

Post-2021, as operations resumed, waste generation began to rise again, reaching 2,235.2 tons in 2022 and surging to 6,327.3 tons in 2023, followed by 7,364.1 tons in 2024. This significant increase in recent years indicates a sharp rebound in operational activities but may also highlight the need for renewed focus on waste management strategies to avoid excessive waste production as the airline returns to normal activity levels.

- **Electricity Consumption**

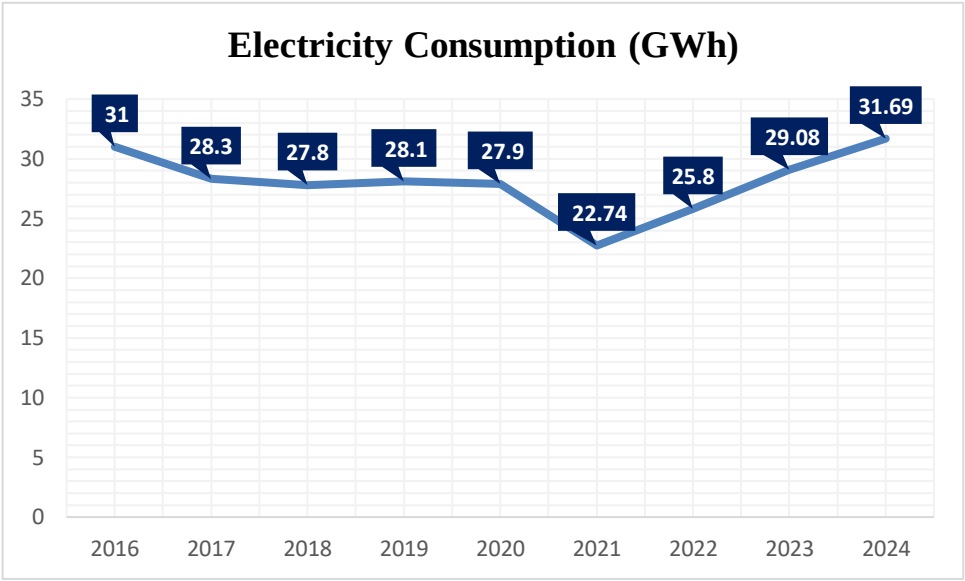
Electricity consumption is an important environmental metric for airlines, reflecting the energy used in ground operations, maintenance, and airport facilities. Managing and reducing electricity consumption is essential for minimizing the carbon footprint and operational costs. For Singapore Airlines, focusing on energy efficiency and integrating renewable energy sources can help reduce overall electricity usage while contributing to global sustainability efforts. This section will explore the trends in electricity consumption over recent years and analyze the airline's efforts in optimizing energy use.

**Table 02. Singapore Airlines Electricity Consumption (2016-2024)**

| Years | Electricity Consumption (GWh) |
|---|---|
| 2016 | 31 |
| 2017 | 28,3 |
| 2018 | 27,8 |
| 2019 | 28,1 |
| 2020 | 27,90 |
| 2021 | 22,74 |
| 2022 | 25,80 |
| 2023 | 29,08 |
| 2024 | 31,69 |

**Source: Singapore Airlines Sustainability Reports (2016-2024)**

**Figure 03. Electricity Consumption at Singapore Airlines (2016-2024)**




**Source: Singapore Airlines Sustainability Reports (2016-2024)**

The table showing electricity consumption (in GWh) for Singapore Airlines from 2016 to 2024 highlights fluctuations in usage over the years. From 2016 to 2018, there is a gradual decline in electricity consumption, decreasing from 31 GWh in 2016 to 27.8 GWh in 2018. This suggests some initial efforts in energy efficiency. However, consumption remained relatively stable from 2018 to 2020, with only minor fluctuations.

A significant drop occurs in 2021, with consumption falling to 22.74 GWh, likely due to reduced operations during the COVID-19 pandemic. Post-2021, there is a steady recovery, with consumption rising to 25.80 GWh in 2022 and continuing to increase through 2024, reaching 31.69 GWh. This rebound may reflect the resumption of regular operations alongside potential increases in energy demand. Overall, while the airline showed improvements in energy consumption during certain periods, the post-pandemic rise indicates the need for further focus on sustainable energy management.

- **Water Consumption**

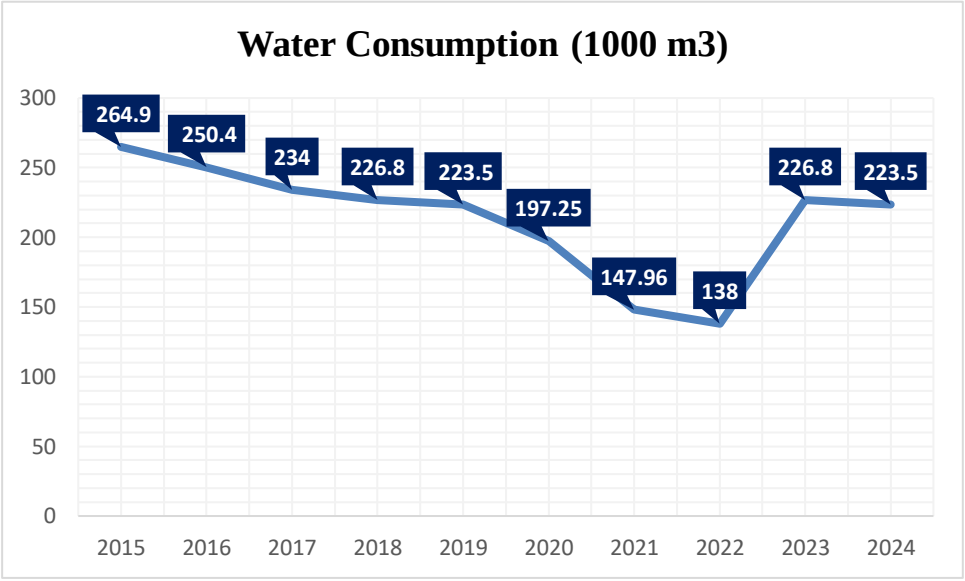
Water consumption in the aviation industry, including airlines like Singapore Airlines, is a vital environmental indicator as it reflects the usage of a critical natural resource. Water is consumed in various operations such as aircraft cleaning, passenger services, and maintenance activities. Efficient water management is essential for reducing the environmental impact, especially in regions facing water scarcity. By implementing measures like water recycling and reducing unnecessary water usage, Singapore Airlines can lower its operational costs, mitigate its environmental footprint, and contribute to global water conservation efforts, aligning with broader sustainability goals.

**Table 03. Singapore Airlines Water Consumption (2015-2024)**

| Years | Water Consumption (1000 $m^3$) |
|---|---|
| 2015 | 264,9 |
| 2016 | 250,4 |
| 2017 | 234 |
| 2018 | 226,8 |
| 2019 | 223,5 |
| 2020 | 197,25 |
| 2021 | 147,96 |
| 2022 | 138 |
| 2023 | 226,8 |
| 2024 | 223,5 |

**Source: Singapore Airlines Sustainability Reports (2015-2024)**

**Figure 03. Water Consumption at Singapore Airlines (2015-2024)**




**Source: Singapore Airlines Sustainability Reports (2015-2024)**

The table detailing water consumption (in 1,000 cubic meters) for Singapore Airlines from 2015 to 2024 shows a general downward trend with some fluctuations. From 2015 to 2019, water consumption steadily decreased from 264.9 to 223.5 thousand cubic meters, indicating efforts to improve water efficiency across operations.

In 2020 and 2021, a significant drop in water usage is observed, with consumption falling to 197.25 and then further to 147.96 thousand cubic meters, likely due to the pandemic's impact on operations and reduced flights, resulting in lower water requirements.

From 2022 onward, as operations began to recover, water consumption also increased slightly to 138 thousand cubic meters in 2022, and then nearly returned to pre-pandemic levels in 2023 (226.8 thousand cubic meters) and 2024 (223.5 thousand cubic meters). This suggests a rebound in activity, but the return to previous levels of water use may indicate the need for renewed focus on water conservation and sustainable practices to maintain long-term reductions in resource use.

- **Green House Gas Emissions**

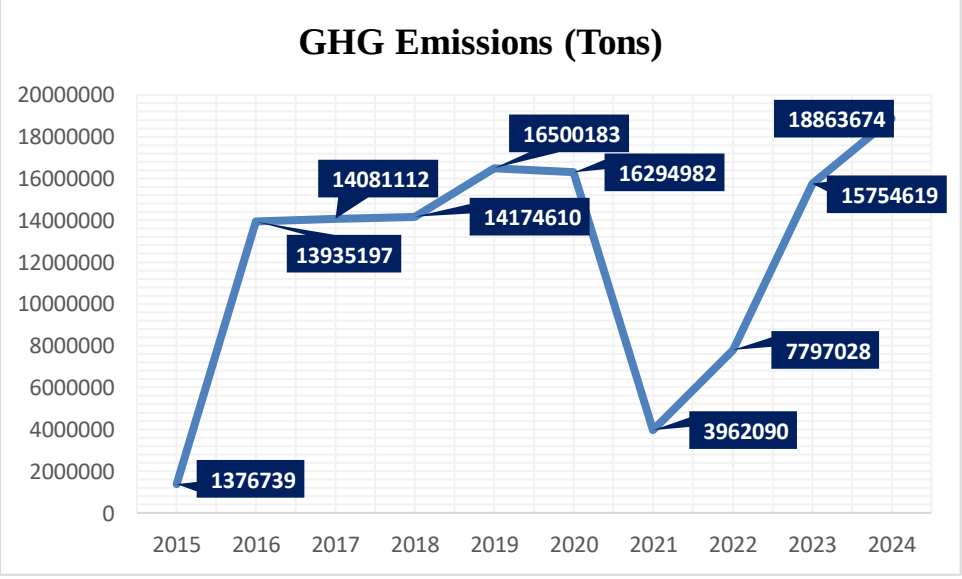
Greenhouse gas (GHG) emissions are one of the most significant environmental impacts associated with the aviation industry, largely due to fuel consumption during flights.

**Table 04. Singapore Airlines Total GHG Emissions (2015-2024)**

| Years | GHG Emissions (Tons) |
|---|---|
| 2015 | 1376739 |
| 2016 | 13935197 |
| 2017 | 14081112 |
| 2018 | 14174610 |
| 2019 | 16500183 |
| 2020 | 16294982 |
| 2021 | 3962090 |
| 2022 | 7797028 |
| 2023 | 15754619 |
| 2024 | 18863674 |

**Source: Singapore Airlines Sustainability Reports (2015 -2024)**

**Figure 04. Singapore Airlines Total Co2 Emission (2015-2024)**




**Source: Singapore Airlines Sustainability Reports (2015-2024)**

The table outlining Singapore Airlines' greenhouse gas (GHG) emissions (in tons) from 2015 to 2024 reveals some significant trends. From 2015 to 2019, there is a steady increase in GHG emissions, growing from 1,376,739 tons in 2015 to 16,500,183 tons in 2019. This rise reflects the airline's expanding operations and increased flight activity during these years.

However, in 2020 and especially in 2021, GHG emissions dropped dramatically, with 2021 emissions falling to just 3,962,090 tons an 80% decrease compared to 2019. This sharp decline is most likely due to the COVID-19 pandemic, which caused a significant reduction in global air travel and flight operations.

As the pandemic's effects waned, emissions began to rise again, reaching 7,797,028 tons in 2022. By 2023 and 2024, emissions returned to pre-pandemic levels, with figures surpassing even the previous highs, peaking at 18,863,674 tons in 2024. This sharp increase likely reflects a rebound in flight activity and overall operations, but it also suggests that further efforts are needed to manage emissions as the airline resumes normal activity. Singapore Airlines will need to adopt more aggressive sustainability measures to reduce the growing emissions as air travel recovers.

- **Renewable Energies**

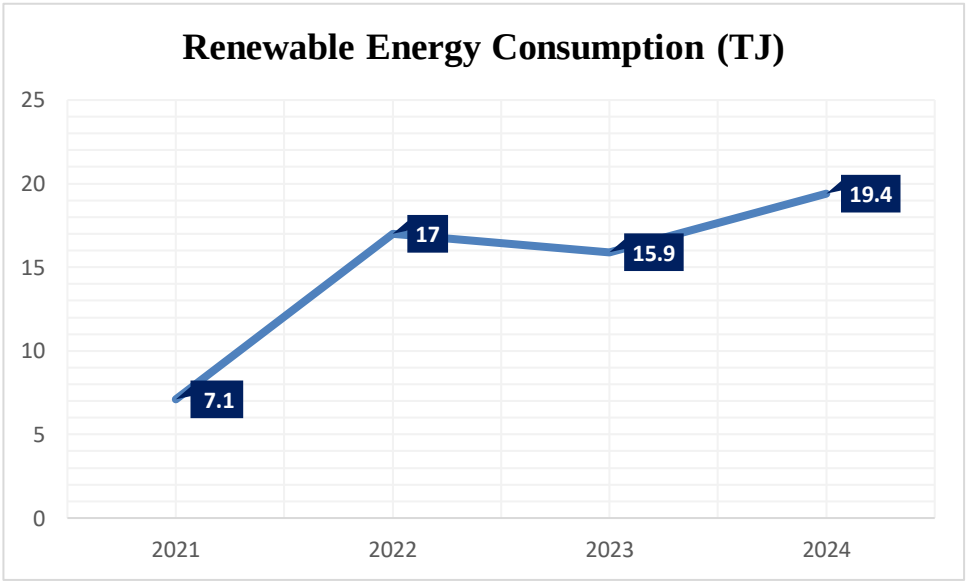
The use of renewable energy is an important focus for airlines aiming to reduce their environmental impact and dependence on fossil fuels. For Singapore Airlines, integrating renewable energy sources into its operations, such as utilizing solar power for ground services and adopting sustainable aviation fuels, helps reduce carbon emissions and supports a transition to more sustainable energy practices. Renewable energy not only contributes to mitigating climate change but also enhances energy security and lowers long-term operational costs.

**Table 05. Singapore Airlines Renewable Energy Consumption (2021-2024)**

| Years | Renewable Energy Consumption (TJ) |
|---|---|
| 2021 | 7.1 |
| 2022 | 17 |
| 2023 | 15.9 |
| 2024 | 19.4 |

**Source: Singapore Airlines Sustainability Reports (2021-2024)**

**Figure 05. Renewable Energy Consumption at Singapore Airlines (2021-2024)**




**Source: Singapore Airlines Sustainability Reports (2021-2024)**

The table showing renewable energy consumption (in TJ) for Singapore Airlines from 2021 to 2024 reflects a positive trend towards increased use of renewable energy. In 2021, renewable energy consumption stood at 7.1 TJ, marking a relatively low baseline. However, by 2022, there was a significant jump to 17 TJ, more than doubling the previous year's figure. This indicates a strong commitment to integrating renewable energy sources into the airline’s operations.

Although there was a slight dip in 2023 to 15.9 TJ, the consumption rebounded in 2024, reaching 19.4 TJ, the highest level in the observed period. This overall upward trend demonstrates Singapore Airlines' ongoing efforts to increase its reliance on renewable energy, which aligns with global sustainability goals and helps reduce its environmental footprint. The fluctuations between 2022 and 2023 might suggest operational adjustments or challenges, but the long-term progress is clear.

## 6. Conclusion

The analysis of Singapore Airlines' environmental performance from 2015 to 2024 reveals a mix of progress and challenges in sustainability. While improvements in waste reduction and energy efficiency were noted, fluctuations, particularly post-pandemic, highlight the need for more resilient sustainability strategies. Despite adopting renewable energy, its impact remains limited compared to overall consumption, indicating a need for more aggressive integration.

The study underscores the complexity of aligning aviation growth with environmental responsibility, advocating for long-term, adaptive strategies embedded in core operations. Key recommendations include setting stricter targets for GHG reduction, accelerating renewable energy adoption, enhancing reporting transparency, and aligning strategies with global sustainability goals.

Future research should explore comparative airline analyses, regulatory impacts, and emerging technologies to drive transformative change in the industry. This study serves as a call for the aviation sector to move beyond incremental improvements towards achieving meaningful sustainability goals.

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