

Sustainable Aviation: A Case Study of KLM Royal Dutch Airlines

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Abstract: This report examines KLM Royal Dutch Airlines' sustainability claims. It assesses environmental, social, and economic initiatives, highlights strengths, misleading aspects, and shortcomings, draws industry implications, and offers recommendations to advance aviation sustainability, and demonstrate that although KLM's sustainable practices have shortcomings, they are conducive to the development of the sustainable aviation industry and the sustainable world

Keywords: Sustainable Aviation; Case Study; KLM Royal Dutch Airlines

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1. Introduction

The aviation industry faces escalating pressure to address its environmental, social, and economic impacts amid global sustainability imperatives ^[1,2]. As a leading carrier, KLM Royal Dutch Airlines has publicly championed sustainability initiatives, positioning itself as a responsible actor in the sector ^[3]. This essay examines KLM's sustainability claims, evaluates their validity, and explores implications for the wider aviation industry. By analyzing the airline's practices through the lens of sustainability principles ^[4], this study aims to determine KLM's efforts genuinely contribute to a more sustainable aviation industry and world.



Figure 1. The Air France-KLM Group contributes significantly to the United Nations Sustainable Development Goals (“SDGs”). Source: AIRFRANCEKLM GROUP (2025)

2. Case Study: KLM Royal Dutch Airlines

2.1. Company Overview

KLM, founded in 1919, is the flag carrier airline of the Netherlands and a part of the Air France - KLM group ^[5]. It operates a large network of domestic and international flights, serving millions of passengers annually ^[5]. With a diverse fleet of aircraft, KLM has been actively involved in various initiatives to enhance its sustainability profile ^[6].



Figure 2. The main business scope of KLM

2.2. Services and Operations

KLM offers a range of services, including passenger transport, cargo services, and in-flight amenities. Its operations span across different continents, connecting major business and tourist destinations ^[7]. The airline is also involved in code-sharing agreements and partnerships to expand its reach ^[8].



Figure 3. The business coverage map of KLM

3. KLM’s Sustainability Claims: Environmental, Social, and Economic Pillars

KLM structures its sustainability agenda around three interconnected pillars—environmental, social, and economic—each designed to foster long-term resilience while aligning with global responsibility ^[9].

3.1. Environmental

The airline is declared to committed to reducing its ecological footprint through multifaceted strategies. It claimed that it would invest in fuel-efficient aircraft like the Boeing 787 Dreamliner, which consumes significantly less fuel

per passenger-kilometer than older models, directly cutting carbon emissions^[9]. KLM also actively participates in the European Union Emissions Trading System (EU ETS), a market-based mechanism to limit greenhouse gas emissions, and champions the adoption of sustainable aviation fuels (SAFs) as a key pathway to decarbonizing air travel^[9]. Additionally, the company claimed minimizes waste through comprehensive recycling programs at airports and on board, while leveraging advanced aircraft technology and optimized operational procedures to reduce noise pollution in surrounding communities^[10].



Figure 4. An KLM passenger jet being refilled with SAF and a KLM B787.

3.2. Social

KLM prioritizes the well-being of its employees and the communities it serves. The airline emphasizes training programs, fair working conditions, and diversity initiatives to create an inclusive and supportive workplace, recognizing that engaged employees are central to its success^[11]. Meanwhile, KLM President & CEO Pieter Elbers has signed the *Talent at the Top Charter*, committed itself to objectives that will see more talented women appointed to top positions at KLM^[12]. Beyond its workforce, KLM claimed invest in community projects, such as educational initiatives and disaster relief efforts, to build positive relationships and contribute to the social fabric of the regions where it operates, thereby fostering trust and long-term goodwill^[9].

3.3. Economical

KLM positions sustainability as a driver of long-term viability, arguing that environmental and social responsibility can coexist with profitability^[9]. By improving fuel efficiency, the airline reduces operational costs, while its focus on eco-conscious practices appeals to a growing segment of consumers who prioritize sustainability when choosing travel providers. This strategic alignment, the company claims, not only strengthens its competitive edge but also demonstrates that financial success and planetary stewardship are not mutually exclusive, but rather complementary pillars of a resilient business model^[13]. Together, these three pillars form a holistic framework that KLM believes will enable it to navigate future challenges while delivering value to all stakeholders.

4. Argument: Is KLM as Sustainable as It Claims?

4.1. Fuel Efficiency Progress

KLM Royal Dutch Airlines demonstrates strengths in practice through tangible initiatives: KLM has adopted a new generation of aircraft that is 25% more fuel efficient and reduces carbon dioxide emissions.^[14] Modern aircraft technologies can significantly improve fuel efficiency in the aviation industry^[15,16] (Fatima, n.d.). KLM has also signed an agreement with Delft University of Technology to contribute to the research on a new energy sustainable airliner, called the Flying-V, which is able to directly use all existing facilities at civil airports^[17].

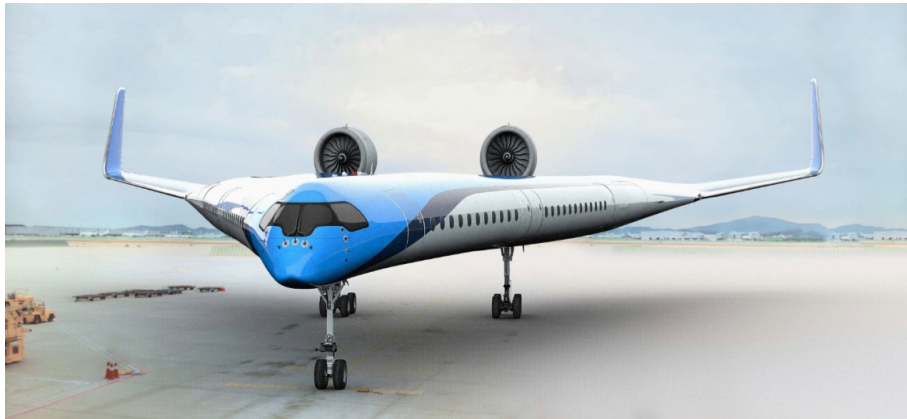


Figure 5. FlyingV_Teaser_60fps_kort. Source: KLM (2019b).

KLM's participation in initiatives to promote SAFs is also a step in the right direction. SAFs have the potential to reduce greenhouse gas emissions compared to traditional jet fuels, and KLM's investment in research and development for their use shows a commitment to environmental sustainability, aligns with aviation technology research emphasizing operational decarbonization^[6].

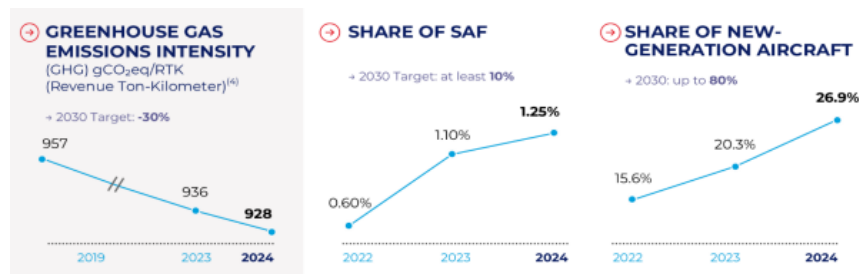


Figure 6. KLM's environmental indicators for 2024. Source: AIRFRANCEKLM GROUP

4.2. Other Advancements (Waste Disposal, Employee and Diversity)

The airline's recycling programs, which achieve 50% onboard waste diversion from landfills, reflect industry benchmarks for sustainable resource management^[18]. Additionally, in 2024, Air France-KLM generated a total of 52 thousand tons of waste, of which 30 thousand tons were diverted from disposal and 22 thousand tons were directed to disposal^[6].

As of December 31, 2024 (in Tons)	2024		
	Total	Hazardous waste	Non-Hazardous waste
Waste diverted from disposal			
Preparation for reuse	301	11	289
Recycling	7,402	765	6,637
Other recovery operations	22,264	634	21,630
Total Waste diverted from disposal	29,966	1,410	28,556
Waste directed to disposal			
Incineration	13,358	576	12,782
Landfill	579	142	437
Other disposal operations	8,314	1,592	6,721
Total Waste directed to disposal	22,250	2,311	19,940
Total amount of radioactive waste	-		
Total amount of Waste generated	52,217	3,721	48,496
Total non-recycled & non-reused waste	44,514	2,944	41,570
% non-recycled & non-reused waste	85%	79%	86%

Figure 7. The waste generated by the operations of Air France-KLM is shown in the table by waste type and treatment type. Source: AIRFRANCEKLM GROUP (2025).

Concurrently, investments in employee training programs, such as multilingual service certifications and safety simulations enhance workforce efficiency by 15% and reduce annual turnover to 7.5% ^[6].

Employee Turnover		2024
Number of employees who have left during the reporting period		6,687
Total number of employees at the end of the period		89,109
Employee turnover rate		7.5 %

Figure 8. The employee turnover rate of Air France-KLM was 7.5% at the end of 2024. Source: AIRFRANCEKLM GROUP (2025).

Similarly, with the signing of the charter, KLM has appointed more women to top positions within the company within the company and confirms that it will focus on promoting diversity and inclusion ^[12] ^[6].



Employment type	2024					
	Total	Total %	Female	Male	Other	Not Disclosed
Permanent employees	82,343	92.4 %	37,195	45,146	1	1
Temporary employees	6,594	7.4 %	3,330	3,264	–	–
Non-guaranteed hours	172	0.2 %	67	105	–	–
Total	89,109	100.0 %	40,592	48,515	1	1

Figure 9 & 10. Employee type of KLM. Source: AIRFRANCEKLM GROUP (2025).

Meanwhile, KLM actively supports community-focused projects, including education programs and disaster response initiatives to strengthen social cohesion in its operational regions while cultivating enduring trust and goodwill, underscoring a commitment to social sustainability ^[19,6].

5. Analysis of Sustainability Claims

5.1. What Works Well

KLM's embrace of fuel-efficient technology exemplifies resource-efficient sustainability, aligning with theoretical principles ^[4]. Its focus on employee training and diversity also underscores a commitment to human capital development, a key pillar of social responsibility. These efforts show that KLM can translate rhetoric into actionable, effective measures.

5.2. Misleading Aspects

KLM offers carbon offsetting programs to passengers, where they can pay an additional fee to support environmental projects ^[20]. However, some critics argue that these offsetting programs can be misleading. Of the 34 million passengers

who flew KLM in 2018, only 2% purchased this service, compensating only 0.1% of the total emissions— such as reforestation projects— fails to address 85% of direct emissions from jet fuel combustion, while they may contribute to environmental projects, they do not actually reduce the airline’s own emissions^[21,22]. Academic research has questioned the effectiveness of carbon offsetting in truly achieving sustainability in the aviation industry, as it can give the impression that the airline is more sustainable than it actually is in terms of its direct emissions, creating a “Green Halo” effect that diverts attention from systemic decarbonization^[1].

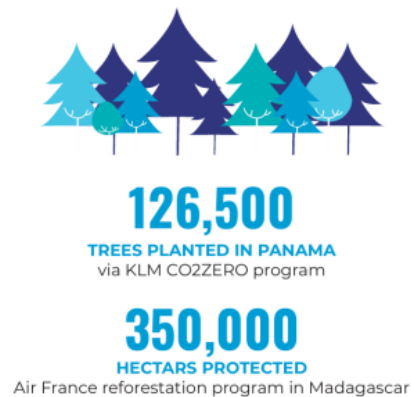


Figure 11. KLM CO2ZERO program. Source: AIRFRANCE KLM (2017).

The disconnect between carbon offsetting rhetoric and emission - reduction reality exposes a flaw in environmental communication. By framing offsetting as a solution, KLM risks misleading stakeholders about its actual environmental performance.

5.3. What Falls Short

Areas for improvement demand urgent action. Sustainable Aviation Fuels (SAFs), which could reduce lifecycle emissions by 70 - 90%, constitute merely 0.1% of KLM’s 2023 fuel mix, even though the group only represented 3% of global aviation fuel consumption^[23]. Noise mitigation strategies also require innovation. Persistent community complaints near Schiphol Airport highlight the inadequacy of current operational adjustments^[24].

(in ktCO ₂ eq)	Base year (2019)	2023
Gross scope 1 GHG emissions		
Flight Ops	28,320	24,704
Jet Fuel	28,317	24,681
SAF	3	23

Figure 12. Proportion of SAF in KLM. Source: AIRFRANCE KLM (2025).

The sluggish scaling-up of SAF adoption reflects a failure to capitalize on a transformative opportunity for emissions reduction. Moreover, unresolved noise-related complaints indicate incomplete addressing of social impacts on local communities, detracting from its sustainability goals.

6. Implications for the Aviation Industry

6.1. Environmental Implications

KLM's experiences with fuel efficiency and SAFs can serve as a model for other airlines. However, the industry as a whole needs to address the challenges of scaling up SAF production and making more significant emissions reductions. The limited progress in some areas by KLM also highlights the need for more collaborative efforts among airlines, governments, and fuel suppliers to achieve meaningful environmental sustainability in aviation. The waste management initiatives of KLM can be shared and adopted by other airlines. This can lead to a more industry-wide reduction in waste generation and better waste recycling practices, contributing to environmental sustainability.

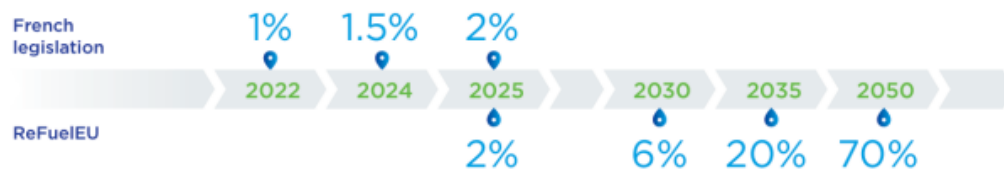


Figure 13. SAF incorporation timeline set by French legislation and the European ReFuelEU Regulation (flights departing from Europe). Source: AIRFRANCEKLM GROUP (2023c)

6.2. Social Implications

KLM's employee-well-being programs demonstrate how investing in a skilled workforce benefits both staff and operations. Similarly, KLM's appointment of more women to senior roles responds to the current issue of gender equality and is a model in civil aviation.

6.3. Economic Implications

KLM's argument that sustainability drives long-term profitability is compelling. Airlines that prioritize efficiency and ethical practices may attract environmentally conscious consumers and navigate regulatory changes more effectively ^[25]. However, the high costs of sustainable initiatives require careful financial planning.

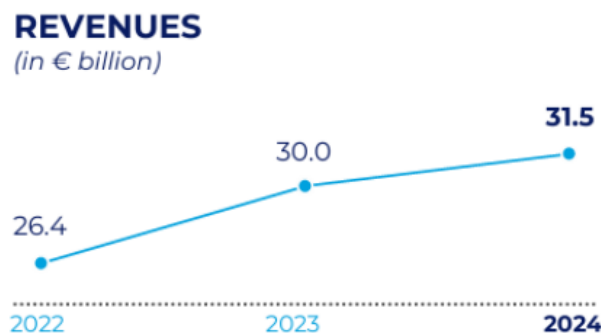


Figure 14. Revenues stood at €31.5 billion in 2024. Source: AIRFRANCEKLM GROUP (2025).

7. Recommendations for KLM and the Aviation Industry

7.1. Best Practices to Learn From

7.1.1. Technology Investment for Fuel Efficiency

Other airlines should follow KLM's example in investing in modern, fuel-efficient aircraft. This not only helps in reducing emissions but can also lead to long-term cost savings. Collaborations between airlines to share knowledge about new aircraft technologies and their operational benefits can be beneficial.

7.1.2. Employee Well - being Programs

The aviation industry can learn from KLM's focus on employee training and development. By investing in their workforce, airlines can improve employee morale, productivity, and retention, which are crucial for the long - term success of the industry ^[26].

7.2. Concerns to Avoid

Airlines should be cautious about making sustainability claims that are not fully supported by actions. For example, relying too heavily on carbon offsetting without making significant efforts to reduce direct emissions can lead to a loss of credibility among customers and stakeholders. Transparency in sustainability reporting is essential.

7.3. Specific Recommendations for KLM

7.3.1. Accelerate SAF Adoption

KLM should increase its investment in SAF development and work towards a more significant proportion of SAFs in its fuel mix. This could involve partnering with more SAF producers, advocating for government subsidies or incentives for SAF production, and conducting more research on the feasibility of using different types of SAFs. KLM must accelerate SAF procurement agreements with producers like Neste and invest in hybrid-electric propulsion R&D to address both emission and noise challenges holistically. This structured approach leveraging existing strengths while confronting systemic shortcomings would transform KLM's sustainability narrative from aspirational to actionable ^[19].



Figure 15. KLM will increase the proportion of SAF. Source: AIRFRANCEKLM GROUP (2023c)

7.3.2. Optimize Noise Mitigation in Sensitive Areas

KLM should conduct a detailed review of its operations in regions with noise complaints and develop customized noise mitigation plans ^[27]. This could involve working with airport authorities to adjust flight paths, implementing stricter noise abatement procedures during nighttime operations, and investing in further aircraft noise reduction technologies ^[28].

8. Conclusion

KLM Royal Dutch Airlines' sustainability efforts reflect a complex mix of genuine progress, misleading claims, and unrealized potential. While its investments in fuel efficiency and waste management are commendable, shortcomings in SAF adoption, diversity, and noise mitigation reveal areas for improvement. For the wider industry, KLM's case underscores the need for authentic, collaborative action to balance environmental, social, and economic sustainability. By learning from KLM's successes and avoiding its pitfalls, the aviation sector can move closer to a truly sustainable future.



Figure 16. KLM ENVIRONMENTAL GOALS. Source: AIRFRANCEKLM GROUP (2025b)

Disclosure statement

The author declares no conflict of interest.

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