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Business Model for Sustainable Aviation Fuel

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Executive Summary

The aviation sector is in a critical position where it must switch to environmentally friendly alternatives in order to lessen its impact on the environment. The implementation of Sustainable Aviation Fuel (SAF) in airline business models is thoroughly examined in this thesis, which uses the Business Model Canvas (BMC) and the Triple Layered Business Model Canvas (TLBMC) as its primary conceptual frameworks. A thorough examination of the airlines' SAF pricing tactics and business models has been conducted, considering the sustainability of the environment, the economy, and society. This has made it possible to identify strategies that will effectively encourage the use of sustainable jet fuel. Through the examination and evaluation of aviation industry dynamics, legislation, and technical advancements, this research provides useful information to help direct strategic planning and decision-making within the aviation industry. The findings indicate that innovation, sustainability, and cooperation are essential for industry players to embrace in order to steer the aviation sector toward a more resilient and environmentally friendly future.

The integration of sustainable aviation fuel within the airlines' business models represents a decisive step towards sustainability in the aviation industry. In this thesis, the Triple Layered Business Model Canvas TLBMC has been used to complement the traditional Business Model Canvas BMC. Using these frameworks together offers a holistic analysis of the environmental, economic and social impacts of SAF implementation on airlines such as Scandinavian Airlines SAS and BRA Braathens Regional Airlines. Sustainable jet fuel is used as a temporary solution to reduce the aviation industry's environmental impact. However, analysis and review of the sustainable fuel's life cycle from production to consumption is needed to be able to evaluate its environmental and social benefits. From an economic perspective, sustainable jet fuel production and availability is a major challenge for airlines. In order to overcome this challenge, innovative pricing strategies and cost-sharing initiatives are required in which various stakeholders from the aviation industry are involved.

In summary, this thesis contributes to increased knowledge in changing business models in the aviation industry as well as an analysis of current price strategies for sustainable aviation fuel. Leveraging the insights from the TLBMC analysis of business models and pricing strategies for SAF integration, this research aims to inform strategic decision-making in the aviation sector and accelerate the industry's transition towards a more sustainable and environmentally conscious future.

Key words: Sustainable Aviation Fuel, SAF, Business Model Canvas, Triple Layered Business Model Canvas, Aviation Industry, Carbon Footprint, Airline Pricing Strategies, Renewable Biofuel, Sustainability, Government Policies, Greenhouse Gas Emission

1.Introduction

This section begins to provide context of the current landscape of the aviation sector, following with the problem definition and purpose of the thesis, and ending with research questions.

1.1 Background

Moving Towards Greener Skies: Why Sustainable Aviation Fuel Matters

The aviation industry is at a major turning point. As the world faces growing environmental challenges, there's increasing pressure on air travel to become more sustainable. In fact, according to the **International Energy Agency (IEA)**, airplanes were responsible for around **5% of global greenhouse gas emissions in 2023**—and these emissions are growing faster than those from cars, trains, or ships. This makes it clear that something needs to change.

Climate change is a serious global issue, with rising temperatures, damaged ecosystems, and more extreme weather events becoming more common. Because of this, governments and international organizations are stepping in with new policies and agreements to help tackle the problem. One major initiative is the **Paris Agreement**, which aims to limit global warming to below 2°C. In response to this, efforts like **CORSIA** (a carbon offsetting plan for international flights by the International Civil Aviation Organization) and the **European Green Deal** have been introduced. These aim to encourage cleaner aviation practices and promote the use of **Sustainable Aviation Fuel (SAF)**.

What is Sustainable Aviation Fuel?

SAF is a cleaner alternative to traditional jet fuel. It's made from renewable sources like plants, waste materials, or through advanced processes like turning electricity into fuel (power-toliquid). While it's not a perfect solution, SAF offers a much-needed step toward reducing the environmental footprint of air travel.

The **European Union (EU)** is leading the charge, aiming for **6% of aviation fuel to be SAF by 2030**, with countries like **Sweden aiming even higher—up to 27%**. To meet these goals, Sweden and other nations will need to ramp up SAF production and create the infrastructure to support it.

Challenges on the Path to Sustainability

Switching to SAF isn't simple. It's expensive, not widely available yet, and there are still some technical hurdles to overcome. To make it work, **collaboration is key**—governments, airlines, fuel producers, and other stakeholders all need to work together. While electric and hydrogenpowered flights are still a few years away, SAF offers a solution that can be used now.

Understanding How Airlines Can Adapt

This thesis dives into how airlines can adapt their business models to include SAF. It uses a tool called the **Business Model Canvas (BMC)** to break down and analyze how airlines operate—how they make money, serve customers, and manage resources. This helps us understand how SAF can fit into their existing systems and what strategies are most effective.

To go even deeper, the research also uses the **Triple Layered Business Model Canvas (TLBMC)**, which adds environmental and social factors to the analysis. This gives a more complete picture of what a sustainable airline business model looks like.

By comparing different airlines' approaches—like how they price SAF or communicate it to customers—this research aims to highlight best practices that can help the entire industry move forward.

A Call to Action

This thesis is more than just research—it's a call to action. It urges the aviation industry to innovate, collaborate, and commit to a more sustainable future. By offering practical insights into current trends, regulations, and technologies, this work hopes to support better decisionmaking and inspire meaningful change in how we fly.

1.2 Problem definition

The aviation industry's significant environmental impact necessitates a shift toward sustainable practices, particularly through the adoption of Sustainable Aviation Fuel (SAF). However, this transition presents multifaceted challenges, including the development of viable business models capable of addressing the economic and logistical hurdles associated with SAF integration. Key among these challenges is the disparity in production costs between traditional fossil fuels and SAF which needs innovative pricing strategies and collaborative frameworks. Therefore, this study seeks to investigate the current business models and pricing strategies for SAF among airlines with particular focus on those that have their headquarters in Sweden and are based there. Emphasis will be placed on understanding their implications and identifying opportunities for enhancing sustainability within the aviation sector.

1.3 Purpose

The purpose of this thesis is to analyze the business models and pricing strategies for Sustainable Aviation Fuel (SAF) used by airlines in Sweden, Europe, and worldwide. This study aims to identify the factors that influence SAF pricing and evaluate the effectiveness of current business models. By doing so, it seeks to highlight opportunities for improving the adoption of SAF in the aviation industry.

1.4 Research Question

The following research questions direct the thesis into the many facets of SAF adoption in the aviation industry:

- What are the Business Models for Sustainable Aviation Fuel (SAF) adopted by Airlines?

To delve into the complexity of the Business Models adopted by airlines for Sustainable Aviation Fuel (SAF), it is crucial to examine specific parts that contribute to their overall approach. Therefore, a sub-research question emerges:

- What pricing strategies do Airlines employ for Sustainable Aviation Fuel (SAF)?

1.5 Delimitations

This study will focus exclusively on the analysis of Sustainable Aviation Fuel (SAF) and will not extend to other alternative technologies, such as electric- or hydrogen-based aircraft. Additionally, the investigation will primarily utilize the Business Model Canvas framework BMC for analyzing business models, and the scope of data collection will be limited to experts in sustainable fuel within Sweden. To add to that, because of the time constraints of the thesis project, the analysis using the Business Model Canvas will focus on airlines that are based in Sweden SAS and BRA. Furthermore, the comparative analysis will encompass ten selected airlines based on their operations from Swedish Airports, representing diverse geographical regions and market segments.

1.6 Outline of the Thesis

This thesis is structured into several sections, each focusing on different aspects of Sustainable Aviation Fuel (SAF) adoption within airline business models:

- Section 2: Transition in the Aviation Industry - This section explores the regulatory and policy landscape affecting the aviation industry, including international, European, and Swedish policies, and the manufacturing processes of SAF.

- Section 3: Conceptual Frameworks - This section introduces the Business Model Canvas (BMC) and the Triple Layered Business Model Canvas (TLBMC), providing a detailed explanation of their components and relevance to the study.

- Section 4: Methodology - This section outlines the research design, data collection methods, and analytical approaches used in the thesis, including the rationale for choosing a qualitative methodology and case study approach.

- Section 5: Results - This section presents the findings from the analysis of airlines' business models and pricing strategies for SAF, using the BMC and TLBMC frameworks.

- Section 6: Discussion - This section critically discusses the implications of the findings, integrating insights from the literature and interviews, and providing strategic recommendations for enhancing SAF adoption in the aviation industry.

- Section 7: Conclusion - This section summarizes the key findings of the thesis, discusses the limitations of the study, and offers recommendations for future research.

2. **Transition in the Aviation Industry**

2.1 Policies: How the World Is Shaping the Future of Sustainable Aviation

The aviation industry is under growing pressure to reduce its carbon footprint—and one of the most promising solutions is **Sustainable Aviation Fuel (SAF)**. But for SAF to become widely used, we need strong policies at global, regional, and national levels. This section explains how different countries and organizations are pushing for greener aviation, why these policies exist, and how they're being implemented.

2.1.1 The Paris Agreement – A Global Climate Pledge

In 2015, nearly every country in the world came together in Paris to sign a historic climate deal, known as the **Paris Agreement**. Its main goal is to fight climate change by limiting global warming to **well below 2°C**, ideally **1.5°C**, compared to pre-industrial times.

To reach this goal, countries agreed to cut their greenhouse gas (GHG) emissions significantly by **2030** and beyond. Each country must submit its own plan—called a **Nationally Determined Contribution (NDC)**—which shows how it plans to reduce emissions and deal with climate impacts. These plans are updated every few years to raise ambition over time.

Although **international aviation** wasn't directly covered in the Paris Agreement, the goal of achieving **net-zero aviation emissions by 2050** is still very much aligned with the Agreement's climate targets.

2.1.2 International Aviation Policies – ICAO & CORSIA

At the global level, aviation is regulated by the **International Civil Aviation Organization (ICAO)**, a United Nations body with 193 member countries.

After the Paris Agreement, ICAO launched **CORSIA** in 2016—**Carbon Offsetting and Reduction Scheme for International Aviation**. The idea is simple: airlines that emit more than 10,000 tons of CO_2 per year must **offset their emissions** by buying carbon credits.

CORSIA is being rolled out in three stages:

- **Pilot phase (2021–2023)** – voluntary participation
- **First phase (2024–2026)** – still voluntary
- **Second phase (2027–2035)** – mandatory for most countries, except smaller and developing ones

Airlines must also **monitor and report** their annual emissions. If they don't comply, there could be legal or financial consequence

2.1.3 European Union (EU) Policies – Pushing for SAF Adoption

Europe has been especially proactive in climate action. One of its biggest plans is the **European Green Deal**, launched in **2019**, which aims to make Europe the **first climateneutral continent by 2050**.

As part of this, the **"Fit for 55"** package was introduced in 2021. Its goal is to **cut EU-wide emissions by 55% by 2030** (compared to 1990 levels). One of the aviation-focused proposals under this package is **ReFuelEU Aviation**—a regulation that sets **mandatory SAF blending targets**.

These SAF targets mean that airlines must use a **minimum percentage of SAF** in their fuel mix. Here are the original and updated targets:

Year	2025	2030	2035	2040	2045	2050
SAF% (Original)	2 %	5 %	20 %	32 %	38 %	63 %
SAF% (Updated)	2 %	6 %	20 %	34 %	42 %	70 %

By 2050, **70%** of aviation fuel used in the EU should be sustainable. Also, **synthetic fuels**, which are even cleaner, are expected to make up a growing share of that mix.

To **prevent airlines from refueling outside the EU** to avoid SAF use, a rule was introduced requiring **90% of the fuel** for a flight to be **purchased at EU airports**. If airlines or fuel providers break the rules, they face **penalties**, such as fines that could be twice the cost difference between SAF and regular fuel.

2.1.4 Swedish Policies – Leading the Way to a Fossil-Free Future

Sweden has taken bold steps in its mission to become the **world's first fossil-free welfare state** by 2045. The government has set ambitious targets, especially for aviation:

- **All domestic flights** must be **fossil-free by 2030**
- **All international flights** must reach **net-zero emissions by 2045**

Why focus on domestic flights first? There are three key reasons:

1. **Easier to manage**—domestic flights use less fuel overall.
2. **Other domestic transport** is already moving toward fossil-free goals.
3. **Lower climate impact**—domestic flights usually fly at lower altitudes, where the impact of emissions is less severe.

To support these goals, Sweden introduced the **"reduction obligation"**—a law requiring fuel suppliers to **mix a certain percentage of SAF** into aviation fuel.

Here's the yearly SAF blending target set by Sweden:

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
SAF%	0.8	1.2	2.6	3.5	4.5	7.2	10.8	15.3	20.7	27

This means that by 2030, nearly **a third** of all aviation fuel in Sweden must be sustainable.

However, SAF is still expensive—much of it has to be **imported**, mostly from **Neste** in Finland. But there's good news: a **new SAF production facility** just opened in **Gothenburg**, operated by **ST1**. This move is expected to **lower costs**, reduce imports, and boost local economic benefits.

Sweden is also exploring the use of its **abundant forests** for SAF production by turning **forest waste into biofuel**. This would make production more sustainable and cost-effective.

Although Sweden's original SAF targets were even stricter than the EU's, the **Swedish Energy Agency** has recommended aligning with the **ReFuelEU targets** starting in 2024 to ensure consistency and practicality.

Summary – What This All Means

Governments and international organizations are stepping up with clear **policies, rules, and timelines** to help the aviation industry move toward sustainability. These efforts are especially focused on encouraging the use of **Sustainable Aviation Fuels**, which can drastically cut emissions.

Sweden, the EU, and global bodies like ICAO are creating a framework where airlines must take climate action seriously. But challenges remain—especially around **high SAF costs** and **limited supply**. Still, with new production sites and smart policies, the shift to cleaner skies is well underway.

2.2 Sustainable Aviation Fuel (SAF)

The aviation industry is becoming more focused on sustainability, and one of the biggest steps it has taken is the introduction of **Sustainable Aviation Fuel (SAF)**. This type of fuel is designed to be a cleaner, greener alternative to traditional jet fuel, which comes from fossil fuels. SAF helps reduce the high levels of carbon emissions caused by flying. (Kurzawska, P. 2021)

As air travel continues to grow, it's more urgent than ever to reduce its impact on the environment. Planes are a major source of global carbon emissions. That's where SAF comes in – it's seen as a key solution for reducing pollution from aircraft. Unlike traditional fuels, SAF is made entirely from **renewable sources** such as plant oils, animal fats, or even waste materials. (Neste, 2023)

Traditional aviation fuels are made from crude oil and release a lot of harmful greenhouse gases (GHGs) when burned, contributing to **air pollution and climate change**. SAF, on the other hand, has the potential to significantly cut down on these emissions. This makes SAF very important for reaching **global climate goals** and helping the aviation industry become more sustainable. (Gössling, S. & Humpe, A., 2020)

By using renewable materials and cleaner production methods, SAF represents a big shift towards **eco-friendly aviation**. In the sections below, we'll take a closer look at how SAF is made, the raw materials used, and the challenges and benefits of each production method.

2.3 How Sustainable Aviation Fuel is Made

Understanding how SAF is produced is important because the **materials and methods used affect the cost and quality** of the final fuel. Several methods are used to produce SAF. The most common ones include:

- **HEFA** (Hydrotreated Esters and Fatty Acids)
- **Fischer-Tropsch (FT) Synthesis**

- **Alcohol-to-Jet (ATJ)**
- **Hydroprocessing of Fermented Sugars (HFS)**

Each method uses different raw materials and technologies. Let's break them down.

2.3.1 HEFA – Hydroprocessed Esters and Fatty Acids

HEFA fuel is made by treating natural oils (like vegetable oil, animal fats, or even used cooking oil) with **hydrogen at high pressure and temperature**. This breaks the oils down into components that can be turned into jet fuel.

- This method creates a fuel that can **be mixed with traditional jet fuel** and used safely in aircraft.
- According to IATA, making **1 ton of HEFA fuel requires about 1.2 tons of vegetable oil**.
- The main benefit of HEFA is that it helps reduce emissions and can be produced from **waste materials**, making it more sustainable. (Siew Ng, K et al., 2021)

2.3.2 Fischer-Tropsch (FT) Synthesis

FT fuel can be made from materials like **biomass, natural gas, or coal**. First, these materials are heated to very high temperatures to create **Syngas** (a mix of carbon monoxide and hydrogen). Then, this gas is processed into liquid fuel.

- This method creates a **very clean fuel** – it has **no sulfur** and very low levels of pollutants compared to regular jet fuel.
- According to IATA, producing **1 ton of FT fuel needs 5–6 tons of biomass**.
- One big challenge is cleaning the Syngas, which is complex and costly. More **research is needed** to improve this step. (Tijmensen, M et al., 2002; Santos & Alencar, 2019)

2.3.3 ATJ – Alcohol-to-Jet

The ATJ method turns **alcohols like ethanol or butanol** into jet fuel through a series of chemical steps.

- This fuel can also be **mixed with regular jet fuel** and used in existing planes without any engine changes.
- It's made from **renewable sources**, so it helps lower CO_2 emissions.
- However, this technology is **still developing**, and it's expensive. Balancing **cost and sustainability** is a major challenge. More **research and investment** are needed to make ATJ fuel more affordable and efficient. (Pechstein et al., 2017)

2.3.4 HFS – Hydroprocessing of Fermented Sugars

This method uses sugars from **plants like corn, sugarcane, or woody materials**. These sugars are fermented and processed into a chemical called **farnesene**, which is then upgraded into jet fuel.

- This process is promising because it uses **renewable resources** and can cut down carbon emissions.
- However, it is **technically complex and expensive**.

• There's also concern about using **valuable land for growing crops** for fuel instead of food, which makes land use a major issue. (Bauen et al., 2020)

In Summary:

Method	**Main Material**	**Key Benefits**	**Challenges**
HEFA	Natural oils (e.g., vegetable, animal)	Reduces emissions, already in use	Competes with food crops, limited supply
FT Synthesis	Biomass, natural gas, coal	Clean fuel, fewer pollutants	Expensive, complex gas cleaning
ATJ	Alcohols (ethanol, butanol)	Renewable sources, compatible with current engines	High cost, technology still developing
HFS	Fermented plant sugars	Low emissions, renewable raw materials	Costly, land use issues, technical hurdles

Conceptual Frameworks

This chapter focuses on tools used to **understand, design, and improve business strategies**, particularly in **sustainable aviation**. It explains two major conceptual models:

1. **Business Model Canvas (BMC)**
2. **Triple Layered Business Model Canvas (TLBMC)**

These models help businesses analyze how they create, deliver, and capture value — economically, socially, and environmentally.

3.1 Business Model Background 📌 Definition of Business Model:

A **Business Model** is a **strategic plan** used by a company to describe **how it delivers value to customers**, **makes money**, and **manages operations**.
It answers questions like:

- What product or service do we offer?
- Who are our customers?
- How do we deliver our product/service?

- What are the key costs and revenue streams? 📌 Importance of Business Models:
- Helps companies align with **customer needs**
- Ensures **long-term sustainability**
- Allows investors to understand how the company **generates profits**
- Guides **strategic decisions** and adaptation to market changes

📌 Business Models in SAF Context:

Sustainable Aviation Fuel (SAF) is a **new and emerging technology** in aviation. Since it's not yet widely adopted, there is **limited research and practical data**. Business models are used to:

- Understand SAF's value chain
- Analyze costs, benefits, and environmental impact
- Help policymakers and businesses **plan better strategies** for SAF adoption

3.2 Business Model Canvas (BMC) 📌 Definition of BMC:

The **Business Model Canvas (BMC)** is a **strategic management tool** developed by **Alexander Osterwalder**. It provides a **visual framework** to describe, analyze, and design business models using **nine key building blocks**.
🧩 Nine Building Blocks of BMC (with explanation):

Explanation in SAF/Aviation Building Block Definition

1.**Customer Segments**	Groups of people or organizations a Airlines, passengers, business serves.airport operators, cargo carriers.
2.**Value Proposition**	SAF provides lower emissions, The unique value a business delivers regulatory compliance, and brand to solve customer problems. reputation.
Channels	Delivery of SAF via pipelines, How a company delivers value to its trucks, or fuel hydrant systems at customer segments. airports.
4.**Customer Relationships**	Strategic partnerships, The type of interaction a company sustainability branding, loyalty has with customers. programs.

Context
SAF production plants, R&D
6. **Key Resources** Main assets needed to deliver value.
facilities, skilled workforce.

Important things a company does to SAF production, testing,
7. **Key Activities**
operate. distribution, regulatory compliance.

Network of suppliers and partners Biofuel suppliers, airlines, airport
8. Key Partnerships needed to make the business work. authorities, government bodies.

Feedstock, processing,
All the costs involved in running the
9. Cost Structure certification, logistics, business. infrastructure.

Benefits of BMC:

5.**Revenue Streams** The income a business generates. Sales of SAF, carbon credit trading, government subsidies.

- Easy to understand and communicate
- Helps identify strengths and weaknesses
- Encourages innovation and value creation
- Helps align the entire team with the business strategy

3.3 Triple Layered Business Model Canvas (TLBMC) Definition of TLBMC:

The **Triple Layered Business Model Canvas (TLBMC)** is an **advanced version of BMC**, developed by **Joyce and Paquin (2016)**. It adds **two additional layers** to the original BMC to include **social** and **environmental** aspects.

So, TLBMC includes:

1. **Economic Layer** (Same as original BMC)
2. **Social Layer** (Focus on people and society)
3. **Environmental Layer** (Focus on ecological sustainability)

Explanation of Each Layer:

1. Economic Layer

- Same as the traditional BMC.

- Focuses on **how the company earns money and delivers value**.
- All **9 building blocks** (customer segments, key activities, revenue streams, etc.) are included.

📌 **In SAF context**: Understand how SAF producers generate income, manage costs, and deliver fuel to airlines efficiently.

2. Social Layer

- Focuses on the **impact of business on society**. New elements in this layer include: o **Stakeholder engagement** o **Employee well-being** o **Fair trade practices** o **Community involvement** o **Human rights** o **Diversity and inclusion**

📌 **In SAF context**: Ensures that SAF companies:

- Create local jobs
- Support communities (e.g., farmers supplying feedstock)
- Maintain safe working conditions

3. Environmental Layer

- Focuses on **environmental sustainability**. Key elements:
  - **Resource use** (water, energy, land) o **Emissions** (GHG emissions, air pollutants)
  - **Waste and pollution** o **Eco-efficiency** o **Biodiversity impact**

📌 **In SAF context**: Evaluates:

- CO_2 emission reductions from SAF use
- Renewable resource sourcing
- Lifecycle analysis of fuel production and usage
- Waste generated during production

📌 Benefits of TLBMC:

- Offers a **holistic view** of a business – not just profit, but **people and the planet**.
- Encourages **responsible decision-making**
- Helps companies meet **ESG (Environmental, Social, Governance)** criteria
- Attracts **eco-conscious investors and customers**
- Promotes **long-term sustainability**

Model	Focus	Purpose
BMC	Economic	To design and evaluate how a company creates and captures economic value.
TLBMC	Economic + Social + Environmental	To include societal and environmental aspects for a **sustainable business model**.

3.4 Airlines Business Model

3.4.1 Change and Growth

The airline industry has changed a lot over the years to keep up with new market trends and government rules. According to IATA (2022), airlines have had to rethink how they operate in order to stay competitive. Business model innovation — or finding **new and smarter ways of doing business** — has become essential (Schneider et al., 2013). Experts like Gössling and Humpe (2023) also stress that for aviation to reach **net zero emissions**, the way airlines run their businesses needs to change.

Several factors have influenced this shift:

- **Technology** has improved, making it easier for customers to book tickets online and get better service (Tongur & Engwall, 2014).
- **Customer preferences** have changed. Many passengers now prefer to fly with airlines that are eco-friendly and support sustainable tourism.
- Airlines are also facing **regulatory pressure** from governments to reduce their environmental impact.

For example, some airlines are now investing in **green fuels**, like biofuels made from algae, as part of their strategy to reduce pollution and become more sustainable (Nair & Paulose, 2014). These innovations help airlines be more environmentally responsible while also appealing to customers who care about the planet.

3.4.2 Sustainability Integration

Sustainability has become a **major priority** for the airline industry. This is not just because of customer expectations but also due to stricter environmental regulations. Airlines are exploring **cleaner fuel options**, such as algae-based biofuels, which can replace traditional fossil fuels that produce a lot of carbon emissions (Nair & Paulose, 2014).

More airlines are also **publicly reporting** on their environmental and social performance. According to Karaman et al. (2018), these sustainability reports show what airlines are doing to reduce their environmental impact and act responsibly. However, the quality and content of these reports vary a lot from one airline to another, depending on local rules, company size, and other factors.

Upham (2012) emphasizes the need to look at sustainability from **three angles**: environmental, social, and economic. He believes that to truly make aviation sustainable, we need:

- Collaboration among **stakeholders** (airlines, governments, communities)
- New **technologies**
- Strong **policies**

This **well-rounded approach** helps balance environmental care, social responsibility, and business growth.

Schneider et al. (2013) also point out that airlines can become more sustainable by **innovating their business models**. For example, using resources more efficiently and reducing emissions can make airlines both eco-friendlier and more profitable.

Sustainable Aviation Fuel (SAF): The Way Forward

SAF (Sustainable Aviation Fuel) is seen as a **key solution** to help the aviation industry reach **net zero carbon emissions by 2050** (IEA, 2023). SAF is currently one of the **few available options** to significantly reduce greenhouse gas emissions from flying.

Studies have shown that SAF — also called **biojet fuel** — is effective in lowering the aviation industry's impact on the climate. However, **more research is needed** on its **social impact**.

What is Social Sustainability in SAF?

Social sustainability refers to things like:

- **Gender and social equality**
- **Food security**
- **Health and safety**
- **Job creation**
- **Community involvement**

To make SAF truly sustainable, we need a **balance between environmental, social, and economic goals**. This means:

- **Governments**
- **Airlines and fuel producers**
- **Researchers**
- **Local communities**

...must all work **together** at local, national, and international levels.

Only through this kind of cooperation can we successfully **develop and use SAF on a global scale** (Sharno & Hiloidhari, 2024).

Figure 6: Social sustainability elements for SAF (Sharno and Hiloidhari, 2024).

3.4.3 Sustainability Assessment Tools & Methods

Elhmoud and Kutty (2020) highlight that evaluating sustainability in aviation requires considering environmental, social, and economic aspects together. Many scholars and experts have developed different methods and models to assess how sustainable aviation operations are. One popular tool is **life cycle assessment (LCA)**, which helps track the environmental impact of aviation from start to finish. According to Karaman et al. (2018), LCA looks at every stage of aviation activities: from extracting raw materials and manufacturing to operating the aircraft and disposing of it at the end of its life. This assessment helps identify areas where improvements can be made to reduce environmental impact and make better choices, like adopting cleaner technologies.

Carbon footprinting is another key tool for measuring sustainability, as emphasized by Gössling Humpe (2023). It focuses on the amount of greenhouse gases (GHGs), particularly carbon dioxide (CO2), produced by aviation activities. This includes ground handling, flight operations, and airport infrastructure. By calculating a carbon footprint, organizations can pinpoint the biggest sources of emissions, track their progress over time, and find ways to reduce their impact—such as by using more fuel-efficient technologies or investing in carbon offset programs.

Social sustainability is also a vital consideration. This involves evaluating how aviation affects local communities, workers, and culture. For example, social impact assessments look at how air travel impacts the people living near airports, how it creates job opportunities, and how companies handle labor practices, community relations, and cultural heritage. Addressing these social impacts helps companies engage better with their stakeholders and reduce any negative effects on society.

Sharno and Hiloidhari (2024) suggest using **Social Life Cycle Assessment (SLCA)** to evaluate the social impact of biojet fuel in aviation. SLCA looks at the social effects of a product throughout its entire life cycle, helping companies understand the impact of biofuels on workers, communities, and society. This tool is especially useful for understanding the social challenges related to sustainable aviation fuel (SAF) production and use, an area that lacks research.

Upham (2012) also stresses the importance of **environmental management systems (EMS)** in improving environmental performance. For instance, ISO 14001 is a framework that helps companies establish effective environmental policies, perform audits, and set goals to comply with environmental regulations. By using such systems, aviation companies can show their commitment to sustainability and reduce their environmental footprint.

3.5 Key Takeaways

This section focuses on understanding how business models work in aviation, using the **Business Model Canvas (BMC)** to break down the key components. A business model outlines how a company generates revenue and creates value. The BMC is made up of nine building blocks, such as customer segments, value propositions, revenue streams, and cost structures. It offers a big-picture view that helps companies develop strategies and innovate.

The **Triple Layered Business Model Canvas (TLBMC)** goes a step further by adding social and environmental factors to the business model analysis. This helps organizations assess their sustainability performance in three areas: economic, social, and environmental. The TLBMC helps identify opportunities for improvement and ensures that companies align with sustainability goals.

In aviation, business models are changing due to technology, shifting customer preferences, and growing environmental concerns. Airlines are incorporating sustainability into their business models by exploring alternative biofuels and engaging in sustainability reporting. Tools like **life cycle assessment (LCA)** and **carbon footprinting** help airlines measure their environmental impacts, find areas for improvement, and implement strategies to become more sustainable.

In conclusion, adopting a comprehensive approach to business model analysis that includes sustainability considerations is essential for aviation companies. By using innovative tools and frameworks, airlines can improve their sustainability, reduce their environmental impact, and stay resilient in a rapidly changing industry.

Review of Literature

The body of literature concerning Sustainable Aviation Fuel (SAF) has grown significantly in recent years, reflecting a broader shift in aviation research toward decarbonization and climate responsibility. The current academic discourse provides a strong foundational understanding of SAF's potential and outlines various technological, economic, and policy-driven pathways toward its adoption. However, despite the breadth of coverage, certain gaps remain that limit the holistic applicability of the current research.

1. The Imperative for Sustainable Aviation

The reviewed literature effectively underscores the aviation industry's growing environmental impact, citing credible data from agencies such as the International Energy Agency (2023). The industry's share of global emissions and its accelerated growth trajectory have rightly positioned it at the forefront of climate policy discussions. Studies referencing global frameworks such as the Paris Agreement, CORSIA, and the European Green Deal (Gössling & Humpe, 2020) provide valuable policy context. However, many works tend to generalize these frameworks without critically assessing regional disparities in policy enforcement or the uneven pace of global implementation.

2. Technological Understanding of SAF

The literature presents a thorough overview of SAF feedstocks and production technologies, such as HEFA, Fischer-Tropsch synthesis, ATJ, and HFS (Siew Ng et al., 2021; Tijmensen et al., 2002). These analyses are particularly strong in assessing technical feasibility and lifecycle emissions. Nonetheless, there is often a lack of comparative data across production pathways in terms of long-term scalability, feedstock competition with food sources, and land-use impact. Additionally, emerging technologies like power-to-liquid fuels are underrepresented in comparative lifecycle assessments despite their relevance in long-term decarbonization strategies.

3. Business Models and Economic Viability

Several studies use strategic tools like the Business Model Canvas (BMC) and the Triple Layered Business Model Canvas (TLBMC) (Osterwalder & Pigneur, 2010; Joyce & Paquin, 2016) to explore integration strategies for SAF within airlines. This application is theoretically sound and relevant to managerial practice. However, the literature often assumes a linear relationship between SAF availability and airline profitability, neglecting broader macroeconomic variables such as fuel price volatility, carbon market dynamics, and consumer willingness to pay for "green premiums." Moreover, empirical case studies on real-world business adoption of SAF remain scarce.

4. Regulatory and Policy Support

Policy-related literature is robust in outlining existing government interventions—particularly in Europe and North America (European Commission, 2021; Swedish Energy Agency, 2023). Scholars agree that regulatory mandates, subsidies, and blending quotas are essential for market acceleration (Upham, 2012). However, the literature often takes a top-down policy perspective, with limited focus on the political economy of SAF—specifically, the role of lobbying, bureaucratic inertia, and conflicting sectoral interests that may slow down effective implementation.

5. Social and Environmental Trade-offs

A notable strength in recent literature is the inclusion of social considerations, particularly through tools like Social Life Cycle Assessment (SLCA) (Elhmoud & Kutty, 2020). These works are instrumental in expanding the sustainability narrative beyond carbon metrics to include job creation, local economic benefits, and social equity (Sharno & Hiloidhari, 2024). That said, the literature lacks robust quantitative frameworks to assess these impacts across diverse geographies. Most studies remain conceptual or localized, limiting their generalizability.

6. Challenges and Research Gaps

The consensus across studies highlights high production costs, supply limitations, and inadequate infrastructure as persistent barriers (Gössling & Humpe, 2020). While these challenges are well-identified, proposed solutions are often optimistic but not deeply grounded in financial modeling or risk assessment. There is a marked need for more interdisciplinary studies that bring together engineering, economics, and policy to propose feasible transition pathways. Moreover, collaboration between academia and industry stakeholders appears under-documented, limiting practical insights.

Research Methodology

This chapter explains how the research for this thesis was planned and carried out. It covers the research design, how data was collected, and the ethical aspects considered during the process.

4.1 Research Design

To answer the research questions, a solid research plan was developed. The study uses an **abductive approach**, which means it combines both theory and real-world observations to come to conclusions. This method is helpful when there isn't a lot of existing data, and we need to create the best possible explanation with what we have (Saunders et al., 2015).

The research focuses on how airlines are shaping their business models to include **Sustainable Aviation Fuel (SAF)**. Since this is a fairly new and evolving area, using a traditional approach that relies only on existing theories (like the deductive method) wouldn't work well. The abductive method allows more flexibility to explore new insights as they emerge.

Because the research questions are **exploratory**—meaning they are meant to explore and understand a new or unclear topic—a **qualitative research method** was chosen, as recommended by Saunders and colleagues. Qualitative research is especially useful for complex topics and helps build deep understanding and ideas for long-term solutions.

To collect data, the study used **interviews** as the only method—this is known as a **monomethod qualitative approach**. This approach involves only one type of qualitative research (interviews in this case) for gathering and analyzing data. This method was chosen to deeply explore the topic and uncover meaningful insights.

Key experts in the field of sustainable aviation fuel were interviewed. Speaking with these experts allowed the researcher to explore the subject in-depth, spot hidden patterns, and understand the issues more clearly. These expert insights are very helpful in forming relevant and practical solutions and recommendations for the industry.

While using a mix of interviews and surveys (multi-method approach) was considered, surveys were ultimately not used. This was because there were concerns about not knowing the right audience, the risk of receiving low-quality responses, and doubts about whether the surveys would be useful or accurate in this case. So, the study focused only on interviews to keep the findings clear, reliable, and relevant to the goals of the research (Saunders et al., 2015).

Alongside the interviews, the study also included a **comparative analysis** of various airlines to understand how different companies are integrating SAF into their business models and pricing strategies. By comparing these airlines, the study aimed to identify patterns, differences, and best practices. Even though there were some challenges—like differences in available data between airlines—this comparison helped make the study more trustworthy and offered a broader understanding of how SAF is being adopted in the industry.

In summary, a **single-case study** with **multiple points of analysis** (focusing on several airlines) was chosen. This setup allowed for a deep dive into how airlines are adopting SAF and helped provide a detailed and meaningful understanding of the topic.

4.2 Case Study

To keep the research process well-organized and effective, this case study was carried out in several planned stages—starting with the initial groundwork and ending with final analysis and conclusions. Here's how it was structured:

4.2.1 Work Stages

The study began with an **initiation phase**, where initial research was done to understand Sustainable Aviation Fuel (SAF) and its role in the aviation industry. This involved exploring what various airlines and SAF producers are doing in this space. Since SAF is still a relatively new topic, there isn't much existing research—especially when it comes to business models and pricing. This helped identify a research gap and shape the research questions around how airlines are building business models for SAF.

Next was the **interviewee selection phase**. Here, key professionals and experts working in sustainable aviation were identified and contacted for interviews. These interviews were important because they provided firsthand knowledge in an area where there's not a lot of published information yet (see section 4.3.2 for more on interviews).

At the same time, a **background review of the aviation industry** was conducted to understand how airlines currently approach SAF and their pricing strategies. This included reviewing policy efforts from global to local levels—like those in Sweden, Europe, and worldwide—that encourage the use of sustainable fuels.

Then came the **case selection phase**, where specific airlines were chosen for in-depth comparison. A method called “purposive sampling” was used to select airlines that vary in size, geographical location, and business model. The idea was to include a mix of global, European, and Nordic airlines that are connected to Swedish airports (based on information from Swedavia, 2024). Including local airlines made it easier to access relevant information and expertise.

In the **data collection phase**, tools like the Business Model Canvas and its extended version (Triple Layered Business Model Canvas) were used to study how SAF fits into different airlines' business strategies. Data came from expert interviews and literature. The information was then analyzed to find patterns, using a method called thematic analysis (more on this in section 4.3).

Finally, in the **conclusion stage**, all the findings were brought together to develop meaningful insights and recommendations. The findings were validated using different sources (called triangulation) and reviewed by industry experts to ensure accuracy. The study ends by highlighting key takeaways and suggestions for future research and industry practice.

4.3 Data Collection

To ensure high-quality information, the study used multiple ways of collecting data (Saunders et al., 2015). This included reviewing scientific articles, airline annual reports, and most importantly—conducting interviews with people who are experts in SAF and sustainability in aviation.

Using multiple sources helped give a clearer picture of this complex topic, especially since SAF and its business models are still evolving. According to research guidelines (Saunders et al., 2015), using a mix of data sources works well when the topic is new or exploratory in nature.

4.3.1 Secondary Data (Literature Review)

The literature review played a big role in understanding existing research and spotting gaps. According to Saunders (2015), reviewing earlier studies is one of the best ways to identify what hasn't been researched yet.

In this case, the literature focused on:

- SAF-related policies and business models
- Tools like the Business Model Canvas
- SAF production methods
- Broader sustainability topics

Most of the references came from reliable academic databases like **KTH Primo, Google Scholar, ScienceDirect, and Web of Science**. Preference was given to recent, highly cited articles, especially since the SAF field is rapidly changing. Older sources were used when they were still relevant, but they were carefully reviewed to ensure accuracy.

The literature review was updated regularly throughout the research. To cross-check facts and improve reliability, multiple sources were used wherever possible.

4.3.2 Interviews

Interviews were a key part of this study. As Yin (2009) suggests, they help researchers understand complex issues better and gather different viewpoints—which is perfect for a topic like SAF.

In total, **eight semi-structured interviews** were conducted with professionals from airlines, SAF producers, industry bodies, and sustainability organizations. This type of interview uses a flexible format—there's a set of prepared questions, but follow-ups are allowed based on the interviewee's responses. This gives deeper insights compared to rigid, structured interviews (Jamshed, 2014).

Finding the right people was essential. Most interviewees were contacted through LinkedIn, and only those with relevant roles—like sustainability managers or SAF experts—were selected. They were informed about the study's purpose and how their input would be used confidentially.

At the beginning of each interview, the topic and goals of the research were explained. With consent, the interviews were recorded, transcribed, and then reviewed for accuracy.

The interview questions were designed to fit each person's role. For instance, someone working at an airline was asked about SAF pricing and business models, while someone at a SAF production company was asked about supply-side challenges. These questions are available in **Appendix A**.

Interview No.	Title	Organization	Date	Duration
1	Sustainability Project Leader	Swedish Airline 1	2024-02-06	45 min
2	Sustainability Manager	Swedish Airline 1	2024-02-12	50 min
3	CEO	Non-profit organization	2024-03-15	50 min
4	CEO	SAF producer	2024-03-20	30 min
5	Sustainability Manager	Swedish Airline 2	2024-04-17	45 min
6	Marketing Manager	Swedish Airline 2	2024-04-23	30 min
7	Director, Industry Affairs	Swedish Aviation Industry	2024-04-15	30 min
8	Business Analyst	Swedish Aviation Industry	2024-05-10	30 min

4.4 Data Analysis

This section explains how the data from the case study was analyzed, especially the interview data, and how the information was sorted and categorized.

4.4.1 Qualitative Data

Since this case study focuses on one specific case, we used what's called a *within-case analysis*, as suggested by Collins and Hussey (2013). This method helps us compare and understand the similarities and differences in how different airlines operate and what pricing strategies they use. It's useful because it helps us see clear patterns and unique elements within our chosen case (Eisenhardt, 1989).

4.4.2 Coding Procedure

Before the interviews, we got permission from each participant to record the conversation. We used Microsoft Teams to record and automatically transcribe these interviews. Afterward, we manually checked each transcript to make sure it was accurate.

To analyze the data, we used a method called **coding**. First, we read through all the transcriptions to look for patterns and connections. Then, we sorted the information into categories based on the study's focus — mainly the **Business Model Canvas (BMC)** and pricing strategies for **Sustainable Aviation Fuel (SAF)**.

We used **color-coding** to organize the data according to the main themes. For example, information related to customer segments was marked in one color, while data about sales channels had a different color. Similarly, pricing strategies from different airlines were also marked in unique colors. This visual approach made it easier to identify trends and connections in the data.

To make sure our findings were reliable, we also used a technique called **triangulation** — which means comparing the interview results with other sources and methods to ensure accuracy. Here's a summary of the themes we used during coding:

- Customer Segments
- Value Proposition
- Revenue Streams
- Channels
- Customer Relationships
- Key Activities
- Key Resources
- Key Partners
- Cost Structure
- Pricing Strategies

Table 5: Themes used during data coding

4.5 Research Ethics

This study followed the ethical guidelines of the Swedish Research Council (2017). Before every interview, participants were informed about:

- The purpose of the study
- What their role and contribution would be
- How their information would be used

Participation was completely voluntary. For interviews conducted over Zoom or Teams, we asked for permission to record the conversations beforehand.

All information from interviews and emails was treated confidentially. Names and details were kept anonymous in this study. Any data from airlines or SAF producers was only used for academic purposes.

Findings

This section explains how sustainable aviation fuel (SAF) is affecting airline business models, using **Scandinavian Airlines (SAS)** and **Braathens Regional Airlines (BRA)** as examples. These two airlines were chosen because they are based in Sweden and are leading the way in adopting SAF. It also compares how different airlines handle sustainability and SAF pricing.

5.1 How SAF Is Impacting Airline Business Models

SAF is a new type of jet fuel made from renewable sources. It's cleaner and better for the environment, but it's also more expensive. This section looks at how SAF is changing how airlines do business—especially SAS and BRA.

5.1.1 SAS's Business Model Canvas

To understand how SAF is changing SAS, we use a tool called the **Business Model Canvas**. It breaks the business into 9 parts. Here's what changed for SAS after adding SAF:

1. Key Partners

SAS works with many partners like aircraft makers, travel agencies, and fuel suppliers. With SAF, they've added new partners—experts in SAF, and producers like Neste, Shell Aviation, and Air BP. They also work with Swedish organizations like **Swedavia** and **RISE** to support sustainable aviation.

"Today, we work with SAF experts to ensure passenger safety," – Sustainability Project Leader, SAS.

These partnerships are necessary because SAF is expensive to produce, and working together helps reduce those costs.

2. Key Activities

SAS's main activities include flying planes, customer service, planning routes, and ensuring safety. Now, one key activity is integrating SAF into flights. This helps them lower carbon emissions and appeal to environmentally conscious travelers.

"SAF is a good temporary solution to reduce emissions," – Sustainability Manager, SAS.

3. Value Proposition

SAS wants to give customers a comfortable and reliable flying experience. They also offer **ecofriendly flight options** like "**SAS GO SMART BIO**" and "**SAS PLUS SMART BIO**." These allow customers to buy SAF as part of their ticket, helping reduce emissions for their flight. "Sustainability is not just a trend—it's a core value for us," – Sustainability Manager, SAS.

4. Customer Segments

SAS serves both private and business travelers. Their main groups include:

- Budget-conscious travelers
- Customers wanting quality at a good price
- Premium customers

Now, they're also focusing on **sustainability-conscious travelers**—people who want to fly with a green airline.

"Not everyone knows what SAF is, so we educate our customers," – Sustainability Manager, SAS.

5. Customer Relationships

SAS builds strong customer relationships through:

- Loyalty programs (like SAS EuroBonus)
- Personalized services
- Communication through emails and apps

Since using SAF, customer trust has grown. More people see SAS as a responsible airline, which helps customer loyalty.

6. Channels

SAS reaches customers through:

- Their website and mobile app (direct channels)
- Other travel websites (indirect channels)

They also market heavily through **social media**, which they use to share their sustainability efforts and educate people about SAF.

"We share information about our green initiatives to raise awareness," – Sustainability Manager, SAS.

7. Key Resources

SAS relies on things like:

- Aircraft
- Skilled staff
- Fuel suppliers
- Technology systems
- Their brand and reputation

They've invested in **newer, eco-friendly planes** and **staff training** to safely handle SAF. They also upgraded tech systems to manage this new fuel. Their brand is now more attractive to green-minded travelers.

"The biggest changes were working with SAF producers and staff training," – Sustainability Manager, SAS.

8. Revenue Streams

SAS earns money from:

- Selling tickets
- Shipping cargo
- Extra services (like checked luggage)

SAF has made things more expensive—it's costlier than regular fuel. SAS offers biofuelinclusive tickets, but they don't profit from SAF right now. Still, **more customers are interested in these eco-friendly options**, which helps in the long run.

"SAF is expensive now, but the price should go down as more companies produce it," – SAF Producer CEO.

9. Cost Structure

The biggest costs for SAS are:

- Fuel
- Salaries
- Aircraft leasing Maintenance Airport fees
- Marketing and IT

SAF adds to fuel costs. SAS works with SAF suppliers to lower those costs—for example, by supporting SAF production near airports to reduce transportation costs. They also spend more on marketing SAF to customers.

"SAF is still pricey because not many companies make it, but this will change as the market grows," – SAF Producer CEO.

Summary: SAS Business Model After SAF Integration

SAS has made several adjustments to include SAF in its business model. These changes are helping the airline:

- Meet environmental regulations
- Build a reputation as a green airline
- Attract sustainability-focused travelers

Although SAF is expensive, SAS is investing in partnerships, technology, and marketing to make it work. As the SAF market grows, costs are expected to drop, making it easier for airlines to use SAF regularly.

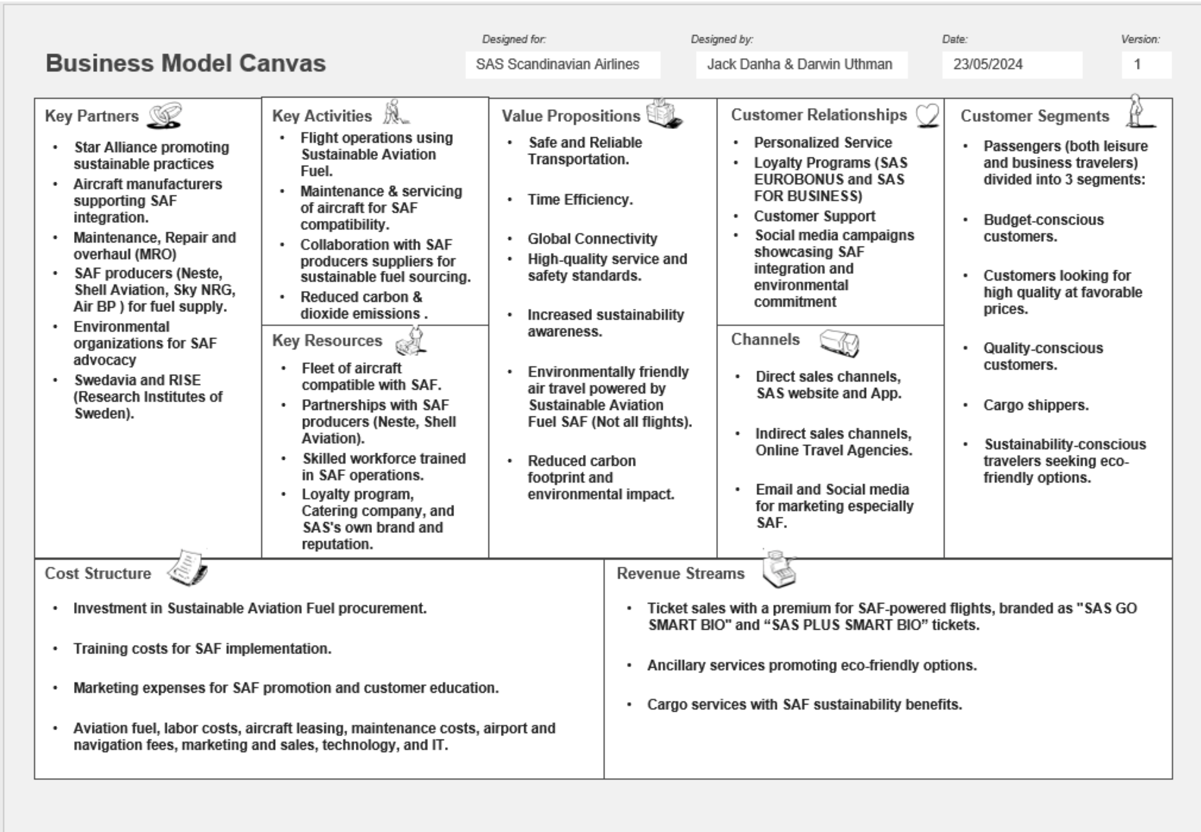


Figure 7: Scandinavian Airlines' Business Model Canvas after SAF integration.

5. Braathens Regional Airlines (BRA) Business Model – Made Simple About BRA

Braathens Regional Airlines (BRA) is a Swedish airline focused on domestic flights within Sweden. It was created in 2016 by merging several smaller airlines. BRA wants to become a green airline, aiming for **net-zero emissions** from its domestic flights by **2030**. To support this goal, it has introduced **SAF (Sustainable Aviation Fuel)** into its operations.

1. Key Partners

BRA doesn't belong to any major airline alliance and doesn't partner with other airlines. Instead, its key partners include:

- **Airports like Bromma** (BRA's main base)
- **Ving** (a tour operator)
- **Air traffic control**
- **Corporate clients**
- **ATR** (aircraft manufacturer focused on eco-friendly planes)
- **Neste** (SAF producer)

BRA also works with airport shuttle services to help passengers get to and from the airport.

However, partnering with new SAF suppliers is tough because **airport fuel systems are controlled by a few big companies** like Air BP and Shell Aviation, making it hard for new suppliers to enter the market.

2. Key Activities

BRA's main activities include:

- Operating **quick and efficient domestic flights**
- **Using SAF** in its flights to reduce carbon emissions
- **Marketing** its services via its website and social media
- Offering **excellent customer service**
- Raising **awareness about sustainability**

One of BRA's special offers is the **"Bio Flygbiljett"**, where customers pay an extra **150 SEK** to support SAF use, helping the environment.

3. Value Proposition

BRA offers:

- **Fast, efficient domestic travel**
- A variety of **ticket options** for students, seniors, and others
- Flights with **less climate impact** due to SAF use
- The chance to **support sustainability** through the Bio Flygbiljett

Its partnership with ATR for fuel-efficient planes and use of SAF helps BRA reduce emissions and attract **eco-conscious travelers**.

4. Customer Segments

BRA serves:

- **Corporate clients** (like Volvo and Northvolt)
- **Public institutions**
- **Private travelers** looking for quick and convenient travel within Sweden
- **Environmentally conscious passengers** who are willing to pay more to reduce their carbon footprint

BRA believes **sustainability-focused customers** are a growing and important part of their market.

5. Customer Relationships

BRA builds strong connections with its customers through:

- **BRA VÄNNER loyalty program** – earn points, use them to buy SAF or book flights, get free rebooking, lounge access, and discounts on airport shuttles
- **Dedicated sales team** – works closely with corporate customers
- **Communication** – via their website, email, and social media

The loyalty program even lets customers **use their points to buy SAF**, deepening the connection with eco-conscious passengers.

6. Channels

BRA uses multiple ways to reach its customers:

- **Direct** – via BRA's website and mobile app
- **Indirect** – through travel agencies like Ving

BRA actively markets its **sustainability efforts** and SAF use online. They noticed that many customers weren't aware of SAF benefits before, but now they are better informed through BRA's online campaigns.

7. Key Resources

BRA's most important assets are:

- Its **fleet of aircraft** (mainly ATRs for fuel efficiency)
- Its **trained staff** – especially trained to handle and manage SAF safely
- Its **partnerships** – with airports, SAF suppliers like Shell and Air BP
- Its **brand reputation** – as an environmentally responsible airline

They've also made **technical upgrades** to their planes to support SAF use.

8. Revenue Streams

BRA mainly earns money from:

- **Ticket sales**
- The **"Bio Flygbiljett"** – an optional add-on that helps cover SAF costs (BRA doesn't profit from it)
- **BRA VÄNNER loyalty program** – helps keep customers coming back

BRA has no other business lines. Their goal is to attract **loyal and sustainability-minded customers** willing to pay a bit more for cleaner flying.

9. Cost Structure

BRA's main costs include:

- **Aircraft leasing or purchases**

- **Maintenance and fuel costs** (SAF is more expensive than regular fuel)
- **Employee salaries and training** (they have around 1100 staff)
- **Airport and navigation fees**
- **Marketing and sales expenses**

They **share the SAF cost** with customers (via Bio Flygbiljett) since it's more expensive but necessary for reducing emissions.

Figure 8 below shows Braathens Regional Airlines' Business Model Canvas after SAF integration. It is a compilation of the various building blocks in BMC based on information and data from interviews, annual reports and recent literature on BRA's integration of SAF.

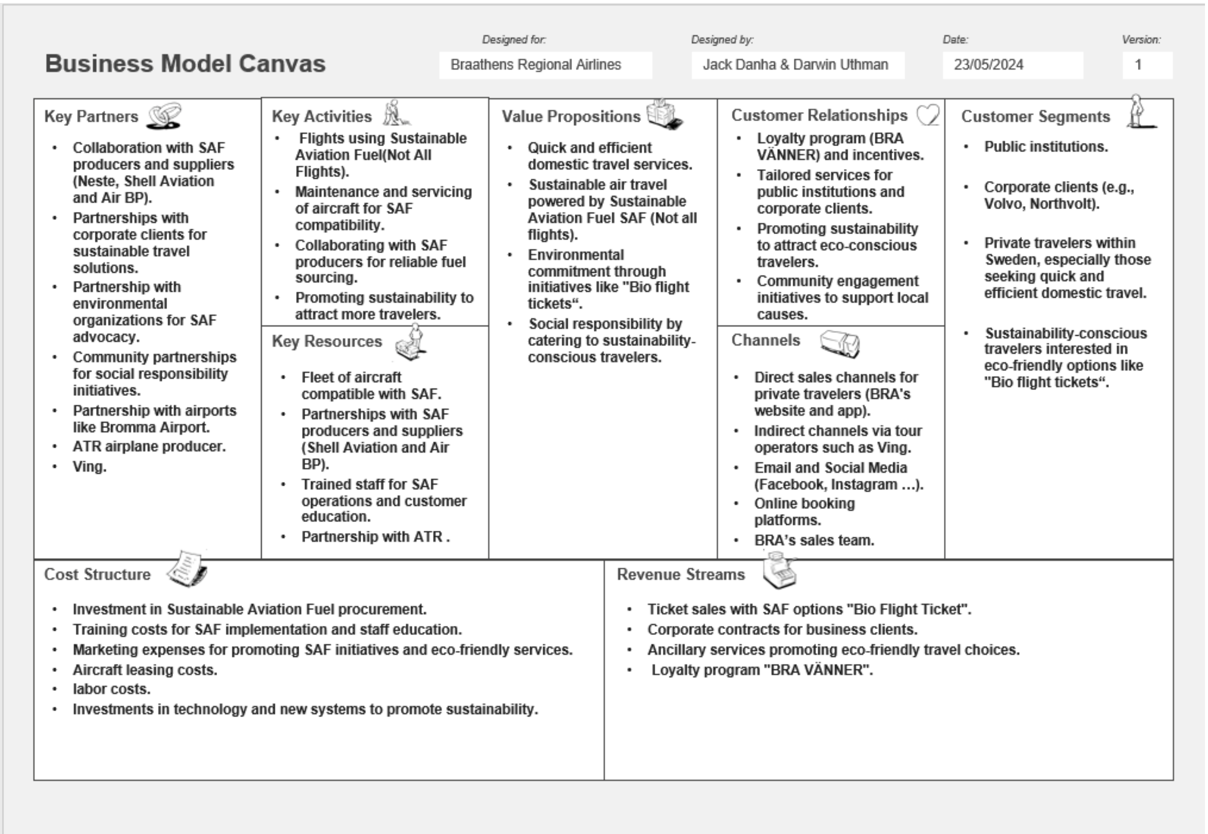


Figure 8: Braathens Regional Airlines' Business Model Canvas after SAF integration.

5.2 Comparative Analysis

This section takes a closer look at how different airlines are using **Sustainable Aviation Fuel (SAF)** and what steps they're taking to become more environmentally friendly. With growing concerns about climate change and pollution, switching to greener fuel options like SAF is becoming increasingly important—and this part of the study aims to see how seriously airlines are taking this shift.

We're focusing on **how committed airlines are to cutting down their carbon emissions** and reducing the environmental impact of flying. To do this, we analyzed 10 well-known airlines that operate in Sweden, especially those flying through **Arlanda Airport**, the country's largest commercial airport. These airlines were chosen from the **Swedavia** website under the "Airlines" section, which lists all airlines operating at Swedavia-run airports.

The 10 airlines we studied include both big international carriers and smaller regional ones, each offering a different approach to sustainability in aviation. To compare them fairly, we used specific indicators (or metrics), including:

- **How transparent they are about SAF pricing**
- **The percentage of flights using SAF**
- **Whether they offer carbon offset options**
- **If they have agreements with SAF producers**
- **What kind of SAF pricing models they use**

All of this information has been organized into a table (see Table 6) so it's easier to compare the different airlines side-by-side.

To collect this information, we used a mix of sources: **airline websites, annual sustainability reports, and interviews with industry professionals**. A list of these sources is provided in **Table 7**

Airline	SAF Pricing Transparency	SAF Utilization Percentage	Carbon Offsetting Options	Purchase Agreement with SAF Producer	SAF Pricing Model
SAS	Yes	≈ 0,5%	Yes	Yes	"SAS GO SMART BIO" & "PLUS PRO BIO"
Finnair	Yes	0.2%	Yes	Yes	Included in all flight tickets
Norwegian	No	≈ 0.4%*	Yes	Yes	Not provided
Braathens Regional Airlines (BRA)	Yes	2% - 4%	No	Yes	"Bio Flygbiljett"

Lufthansa Group	Yes	0.2%	Yes	Yes	"Economy Green" or "Business Green"
Air France-KLM	No	≈0.6%	No	Yes	Not provided
Qatar Airways	No	Not Provided	No	Yes	Not provided
Emirates	No	≈ 0,002%	No	Yes	Not provided
Air China	No	Not provided	No	Yes	Not provided
Delta Air Lines	No	≈ 0,2%	No	Yes	Not provided

Table 6: Comparing airlines' sustainability practices and pricing strategies for Sustainable Aviation Fuel.

**The data found was from the latest available annual report (2022).*

Each column represents relevant sustainability practices for airlines with focus on SAF. The cells are the results after conducting research on each airline and have been categorized with a "Yes" or "No" answer for the following columns; SAF Pricing Transparency, Carbon Offsetting Options, Purchase Agreement with SAF Producer. "Yes" means the airline does offer or have information available on that particular metric, while "No" means the opposite, that they do not show or have information available regarding the metric. The remaining columns; SAF Utilization Percentage and SAF Pricing Model either have explicit results by taking available airline data and putting in the answers into the cells, or "Not Provided" in the cases where the data is not available to the public. Each column will be explained and further explored in the subsections down below.

Airline	Source
SAS	Sas.com & Annual Report
Finnair	Finnair.com & Annual Report

Norwegian	Norwegian.com & Annual Report
Braathens Regional Airlines (BRA)	Flygbra.se & Annual Report
Lufthansa Group	Lufthansa.com & Annual Report
Air France-KLM	Airfrance-klm.com & Annual Report
Qatar Airways	Qatarairways.com & Annual Report
Emirates	Emirates.com & Annual Report
Air China	Airchina.com & Annual Report
Delta Air Lines	Delta.com & Annual Report

Table 7: List of Sources used when analyzing the ten airlines.

Here's a more **natural and human-friendly version** of sections **5.2.1 SAF Pricing Transparency** and **5.2.2 SAF Utilization Percentage**, rewritten for better readability and flow:

5.2.1 SAF Pricing Transparency

This part looks at whether airlines make **Sustainable Aviation Fuel (SAF)** pricing clear and accessible during the ticket booking process.

SAF pricing transparency means that when passengers book their flights, they are clearly informed if SAF is included in the fare and how much it costs. This is an important part of encouraging eco-conscious travel choices. However, based on the data in **Table 6**, most airlines still do **not** offer this level of clarity. In fact, the majority of entries under this column are marked "No," indicating that customers often don't see any information about SAF when booking.

That said, a few airlines stand out for making SAF pricing visible and giving passengers the **option to choose greener tickets**:

• **SAS** offers SAF-inclusive ticket options like **“SAS Go Smart Bio”** and **“SAS Plus Pro Bio”**, which clearly show the inclusion of SAF (up to a 50% blend) during booking. **Finnair** includes SAF in all its ticket prices automatically. Although they don’t specify how much SAF is used per ticket, customers are still contributing to sustainability efforts.
• **BRA (Braathens Regional Airlines)** provides a transparent option called the **“Bio flight ticket”**, which includes a 50% SAF blend.
• **Lufthansa Group** promotes **“Green fares”** in both Economy and Business Class. These include a 20% SAF blend for European flights and a 10% blend for long-haul flights.

Interestingly, while **Norwegian** is based in the Nordics like many of these frontrunners, it does **not** display SAF pricing options during booking. It does, however, provide some information about CO_2 reduction efforts, which is a step in the right direction.

Other major carriers like **Air France-KLM**, **Air China**, **Qatar Airways**, **Delta Air Lines**, and **Emirates** are all involved in SAF in some way—either through procurement or future plans— but **don’t provide SAF pricing details during the booking process**. This lack of visibility makes it harder for passengers to make informed, eco-conscious choices.

In summary, the standout airlines in terms of SAF pricing transparency are:

- **SAS**
- **Finnair**
- **BRA**
- **Lufthansa Group**

5.2.2 SAF Utilization Percentage

This section looks at how much **Sustainable Aviation Fuel (SAF)** each airline is actually using as a percentage of their total jet fuel consumption.

The data for this came mainly from airlines’ **annual reports, financial statements**, and **official publications**. For airlines that did not share an exact SAF usage figure, we calculated it using available financial and fuel data. These findings are shown in **Table 6**, and a visual summary is available in **Figure 7**.

For **five airlines**, we had to calculate the SAF usage percentages ourselves. These were:

- **SAS**
- **Finnair**
- **Air France-KLM**
- **Emirates**
- **Delta Air Lines**

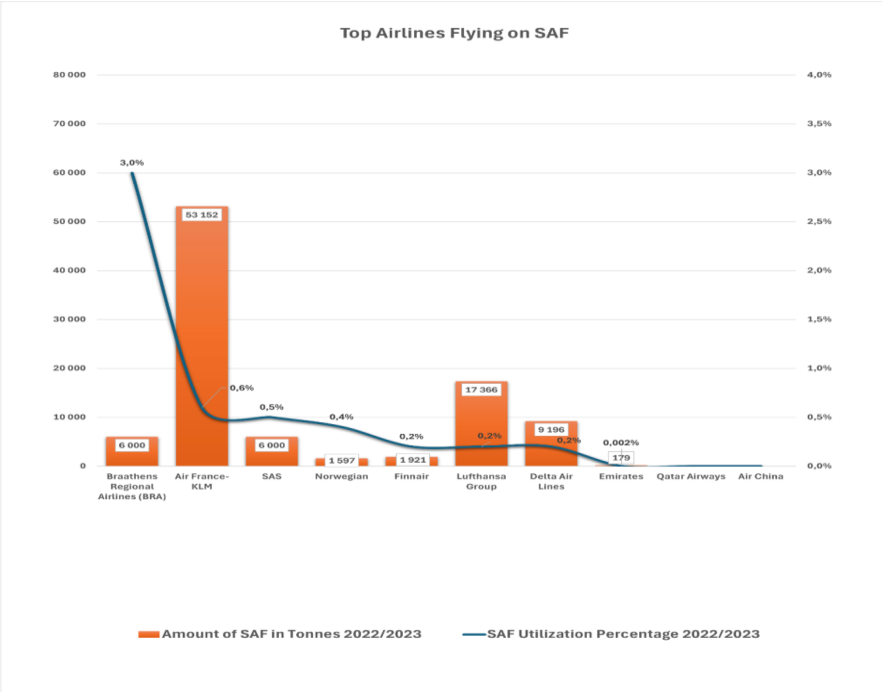
We did this by looking at how much they spent on SAF and jet fuel, then converting these costs into **tonnes**. The **SAF percentage** was calculated by dividing the SAF tonnes by the total jet fuel tonnes for the year. More details on these calculations can be found in **Appendix B**.

The remaining airlines provided SAF utilization data directly:

• **Norwegian** and **Lufthansa Group** published their SAF usage in official reports. **BRA** shared their usage during an interview. However, since this data isn't publicly available, it couldn't be cross-verified or calculated independently.

For **Air China** and **Qatar Airways**, there wasn't enough public data to estimate their SAF usage.

In short, while some airlines are beginning to adopt SAF and report their progress, **more consistent reporting is needed** across the industry to truly measure commitment and progress toward greener aviation.



The data which is summarized in Table 6 an d can be seen in figure 9 shows that airlines worldwide are increasingly committing to integrating SAF into their operations to reduce carbon emissions. SAS, Finnair, BRA, Lufthansa Group, Air France-KLM, Emirates and Delta Air Lines are among the carriers setting ambitious targets for SAF utilization.

Furthermore, figure 9 shows that Air France-KLM is the carrier who has consumed the most SAF in 2023 out of the ten airlines. . However the amount of SAF consumed only stands for 0.6% of the airline's overall fuel consumption which is relatively low in comparison with the EU´s blend mandate goal of 2030. Lufthansa Group and Delta Air Lines have consumed the second and third most SAF and their utilization percentage is similar to Air France-KLM, very low at 0.2% each which again is quite low. Emirates, Finnair, Norwegian have consumed less SAF and have low utilization percentages. BRA and arguably SAS standout in this case. These two airlines have consumed less SAF in 2023 compared to the airlines who have higher SAF consumption. But they have a higher utilization percentage of SAF relative to their overall fuel consumption for 2023. BRA had a staggering 3% (2-4% according to interview) while SAS had 0.5% utilization percentage of SAF. It is important to note that these airlines can be seen as "smaller" in market size due to their operation size, especially BRA which is a domestic carrier in Sweden. SAS has international operations but is not as big as the other international airlines. However, compared to the other nordic based airlines, i.e Norwegian and Finnair, it is clear that BRA and SAS is leading when it comes to how much SAF was consumed of the total fuel consumption. The only airlines out of the ten who lack clear communication on utilization percentages for SAF are Qatar Airways and Air China. Calculations for these two airlines were deemed difficult because there was no available data regarding the airlines' financial statements on the area of jet fuel costs and SAF consumption.

Final result and the stand out airlines: BRA, SAS

5.2.3 Carbon Offsetting Options

Many airlines today offer carbon offset programs to help reduce the environmental impact of flying. Some airlines go a step further by giving passengers the power to choose how much they want to contribute toward offsetting emissions.

For example, **Finnair** offers a very flexible carbon offset service. It allows customers to split their contribution between Sustainable Aviation Fuel (SAF) and certified climate projects using a simple slider tool. You can set the slider anywhere from 0% to 100% for either SAF or carbon offsetting – or go half-and-half (50%-50%).

SAS (Scandinavian Airlines) also supports carbon offsetting and is heavily focused on reducing emissions through the use of SAF and new technology. Although they've stopped allowing carbon offsetting after a flight is completed, they now encourage eco-conscious travel through their **Conscious Traveler** program. This program rewards customers who take steps like choosing biofuel tickets, reducing food waste by pre-ordering meals, or donating points to charity. If travelers complete 10 or more sustainable actions in a year, they get special recognition and perks.

Lufthansa Group takes a different but effective approach. With their **Green Fares** (like Economy Green or Business Green), passengers flying within Europe can cover 20% of their emissions with SAF, and the remaining 80% is offset through climate protection projects. For long-distance flights, they cover 10% with SAF and offset 90%. Lufthansa also lets passengers offset their flight emissions **while onboard**, using Wi-Fi, by choosing between SAF and certified carbon projects — or a mix of both.

For other airlines like **Norwegian**, **BRA**, **Air France-KLM**, **Qatar Airways**, **Emirates**, **Air China**, and **Delta Air Lines**, information about carbon offsetting options is limited or not clearly visible during booking. This shows there's still room for improvement.

Standout airlines in this area: SAS, Finnair, Norwegian, and Lufthansa Group.

5.2.4 Partnerships with SAF (Sustainable Aviation Fuel) Producers

Working with SAF producers is key to making aviation more sustainable. These partnerships help airlines secure a steady supply of eco-friendly fuels and reduce their carbon emissions.

All airlines listed in Table 6 have partnerships with SAF producers. Here's a summary:

Airline	SAF Producer Partners
SAS	Neste, Shell Aviation, SkyNRG, Air BP
Finnair	Neste, Shell Aviation, Gevo
Norwegian	Neste
BRA	Neste, Shell Aviation, DCC, Air BP
Lufthansa Group	Neste, Shell Aviation, OMV
Air France-KLM	Neste, Total Energies, DG Fuels
Qatar Airways	Shell Aviation, Gevo
Emirates	Neste, Shell Aviation, ENOC
Air China	Domestic Producers
Delta Air Lines	Neste, Shell Aviation, Gevo, DG Fuels

Neste, a Finnish company, stands out for producing high-quality SAF from waste materials. They supply many global airlines. **Shell Aviation** is also a major player, providing SAF and investing in green aviation technologies, although they still produce traditional jet fuel, which adds complexity to their role.

Airlines often work with multiple SAF suppliers to avoid risks like fuel shortages, price changes, or policy updates. For instance:

- **Qatar Airways** signed deals with Shell and Gevo, agreeing to buy 25 million gallons of SAF over five years starting in 2028.
- **Delta Air Lines** has several SAF partnerships and will receive fuel at **San Francisco Airport**, a key SAF hub.
- **Air France-KLM** signed large supply deals with Neste and DG Fuels (1.6 million tons of SAF from 2023 to 2036) and agreed to buy 800,000 tons from TotalEnergies (2023– 2030).

A non-profit leader also explained their role in helping airports buy SAF and making it easier for airlines to access this fuel — without making a profit.

In short: Having multiple SAF suppliers helps airlines reduce risks and support innovation, making sustainable flying more practical and scalable.

5.1.5 SAF Pricing Models

SAF is more expensive than regular jet fuel, so airlines use different pricing strategies to manage costs and involve passengers.

Here's how some airlines handle the cost of SAF:

Airline	**SAF Pricing Approach**
SAS	Optional surcharge; buy in 20-minute blocks (100 SEK or ~$10 each)
Finnair	€0.20 included in every ticket
BRA	Optional surcharge of 150 SEK (~$13.50) per one-hour flight
Lufthansa Group	Optional Green Fares with SAF included; passengers pay the price difference

SAS

SAS lets customers buy extra SAF in 20-minute blocks. For example, if your flight is 1 hour long, you can buy 3 blocks. You can also choose special ticket types like **GO SMART BIO**, which already includes 50% SAF. Customers earn reward points (EuroBonus) when they choose these options. SAS also ensures that all SAF purchases are **in addition** to what the airline already buys — meaning your purchase makes a real difference.

Finnair

Finnair includes a €0.20 charge for SAF in every ticket. While this isn't obvious during booking, it is part of the cost and helps fund about 1,200 tons of SAF each year. This is equivalent to powering 630 short flights (like Helsinki to Tallinn).

BRA (Braathens Regional Airlines)

BRA offers a "Bio Flygbiljett" with 50% SAF, costing 150 SEK more per ticket (around $13.50). While this doesn't guarantee your specific flight uses SAF, the airline collects funds and buys SAF in bulk several times a year.

Lufthansa Group

Lufthansa offers **Green Fares** where passengers pay a bit extra to cover SAF use and carbon offsets. For example, Economy Green fares on European flights include 20% SAF and 80% offsetting. For long-haul flights, it's 10% SAF and 90% offsetting. The SAF price is calculated as the difference between fossil fuel and SAF costs, and Lufthansa guarantees the SAF will be used within six months.

6.1 How SAS and BRA Integrate SAF in Their Business Models

The Triple Layered Business Model Canvas (TLBMC) is a tool that looks at a company's business model through three lenses: environmental, economic, and social. We used this to analyze how SAS and BRA include SAF in their business strategies.

Both airlines see SAF as a big step toward more sustainable flying. But there are some big challenges: SAF is expensive to make and there's not always enough available. This makes it hard financially for airlines. SAS works with several SAF producers and other industry partners, but producing enough SAF at scale is still tough. Airlines need a stable and affordable supply chain for SAF so they don't face sudden price jumps or shortages, which would hurt their business.

Also, unclear government rules and incentives around SAF make it harder for airlines to plan. In the next parts, we'll explain how SAF affects different parts of their business models. Environmental, Economic, and Social Effects on Different Business Areas

Key Partners (Environmental Impact):

In terms of the environment, key partnerships with SAF producers are very important. Airlines need to work closely with companies like Neste, Shell Aviation, and Air BP to get enough SAF, which helps reduce harmful carbon emissions. SAS has formed these partnerships successfully, but smaller airlines like BRA have a harder time because they operate on a smaller scale. BRA also faces challenges due to strict aviation fuel regulations and dominant fuel suppliers. They need to work more with regulators and industry players to ease these barriers.

From an economic viewpoint, government support to SAF producers can lower production costs. This would help airlines like SAS and BRA buy SAF at better prices, making it easier to reach Sweden's goal of blending 30% SAF by 2030. But since airports' energy supply is tightly controlled by a few companies, new suppliers find it tough to enter the market, which keeps prices high. Opening up the market to more competitors could lower prices.

Key Activities (Environmental Impact):

Using SAF helps reduce greenhouse gas emissions from flights, which is great for the environment. However, airlines must invest in technical upgrades and staff training to use SAF safely and correctly.

While SAF reduces emissions when burned, producing SAF—especially the common type made from natural oils (like vegetable oils or animal fats)—has its own environmental risks. For example, growing or sourcing these raw materials can cause deforestation, harm wildlife habitats, or compete with food crops.

The production process for SAF also uses a lot of energy, sometimes creating emissions unless renewable energy is used. Transportation of SAF (by trucks, ships, pipelines, etc.) can add to environmental damage, including pollution from diesel engines or risks like fuel spills. Building transportation infrastructure can disturb ecosystems too.

Economically, transporting SAF is expensive, but plans to build production facilities closer to big airports (like Arlanda in Sweden) could cut these costs and reduce environmental damage from long-distance transport.

Value Proposition (Environmental, Economic, and Social Impact):

Traditionally, SAS offers comfortable and reliable flights. But as more people care about the environment, they want greener travel options. SAS offers tickets that include SAF, like "SAS GO SMART BIO" and "SAS PLUS SMART BIO," which appeal to customers wanting ecofriendly flights. This helps SAS stand out from competitors who don't yet offer sustainable fuel options. However, as more airlines add similar options, SAS will need to keep innovating to stay ahead.

BRA, focused mainly on fast and efficient travel within Sweden, also offers a "Bio Flight Ticket" option with SAF included, targeting customers interested in greener choices.

From a cost perspective, SAF is still more expensive than regular jet fuel. Airlines have to balance offering sustainable options while keeping ticket prices reasonable.

Socially, using SAF improves the airlines' reputations among eco-conscious travelers and other stakeholders like investors and regulators. Showing genuine commitment to sustainability builds customer trust and loyalty, encouraging repeat business and positive word of mouth. But to keep this goodwill, SAS and BRA must be honest and consistent about their sustainability efforts.

Final Thoughts

While SAF helps lower the environmental impact of flying, it's not a complete solution by itself. Airlines need to combine SAF with other actions, like updating their fleets, improving operations, and offsetting carbon emissions, to make a real difference.

Using SAF also comes with challenges like higher costs and operational complexity. Airlines must carefully manage supply, infrastructure, and safety concerns to make the transition smooth without hurting their business or passengers.

Customer Relationships (Social & Economic Layers)

- SAS and BRA build trust and loyalty via personalized service and sustainabilityaligned loyalty programs (e.g., SAS EUROBONUS, BRA VÄNNER).
- Rewarding SAF choices in loyalty programs encourages sustainable travel behaviors and deepens brand-customer relationships.
- Transparent, clear communication about SAF benefits and costs during booking remains an area needing improvement.
- Educating customers on environmental impact fosters engagement and shared responsibility.
- Economic viability of loyalty rewards and premium pricing must balance to maintain profitability and customer satisfaction.

Channels (Environmental & Social Layers)

- Digital platforms (websites, apps, social media) serve as main booking and communication channels.
- These channels promote sustainability by encouraging online self-service and educating customers on SAF initiatives.

- Social media enhances brand reputation by highlighting environmental efforts, helping attract and engage eco-conscious customers.
- Transparency and message clarity across channels are vital to maintain trust and effectively convey SAF's value proposition.

Resources (Environmental, Social & Economic Layers)

- Both airlines invest in eco-friendly aircraft and technical upgrades to optimize SAF use (SAS on larger scale, BRA focused on domestic flights).
- Collaboration with multiple SAF suppliers (Neste, Shell Aviation, Air BP) strengthens supply chain resilience and encourages market innovation.
- Investment in personnel training supports safe handling and smooth transition to SAF, demonstrating social sustainability commitments.
- Resource management integrates environmental goals with operational efficiency and cost considerations.

Cost Structure (Economic Layer)

- SAF's higher price compared to conventional jet fuel significantly increases operational costs.
- SAS and BRA share SAF costs with customers via premium ticket options and voluntary contributions.
- High SAF production costs call for cooperation with governments and stakeholders, plus marketing and training expenses.
- Managing fluctuating SAF prices and balancing sustainability with financial viability are key ongoing challenges.
- Anticipated market maturation is expected to lower SAF costs over time.

Revenue Streams (Economic Layer)

- SAF-inclusive tickets create a **new revenue stream** that offsets higher fuel costs while appealing to sustainability-minded customers.
- Customers' voluntary payments fund SAF procurement, supporting both environmental goals and airline finances.
- Pricing models need continuous adjustment to match customer willingness to pay and maintain profitability.
- SAF integration offers competitive advantage by attracting eco-conscious travelers, potentially increasing overall revenue despite higher costs.

Suggestions for Enhancement or Focus

1. **Highlight Transparency in Communication:** Emphasize the need for clearer SAFrelated information at the booking stage to avoid customer confusion and potential drop-off.
2. **Customer Education:** Suggest proactive strategies for educating new sustainabilityconscious travelers, such as integrated FAQs or video explainers linked directly in the booking flow.
3. **Balance Financial & Environmental Goals:** Stress the strategic importance of balancing cost increases due to SAF with pricing, loyalty incentives, and operational efficiencies.
4. **Supply Chain Resilience:** Note how diversified SAF suppliers not only secure fuel availability but also drive innovation and potentially reduce future costs.

5. **Long-term Market Evolution:** Point out that SAF is still an emerging market; pricing and adoption will improve as production scales and competition increases.

Recommendation for Improvements

To achieve the ambitious targets for SAF adoption, it is essential that enhanced government support is provided. Governments should increase their backing for SAF initiatives through subsidies, tax incentives, and grants to alleviate the financial burden on airlines and fuel producers. Implementing policies that mandate a certain percentage of SAF usage can further drive demand and production. Additionally, collaborative efforts within the industry are crucial. Airlines, fuel producers, and technology providers need to work closely together to accelerate the development and deployment of SAF. Joint ventures and partnerships can facilitate the sharing of knowledge and foster innovation, leading to more rapid advancements in SAF technology.

Investment in research and development is another critical area. Increased funding is necessary to improve SAF production processes, reduce costs, and enhance fuel efficiency. By exploring alternative feedstocks and production methods, the supply sources of SAF can be diversified, making it more resilient and scalable. Moreover, raising consumer awareness about the benefits of SAF is vital. Airlines should invest in marketing campaigns to inform customers about the environmental advantages of SAF and encourage eco-friendly travel choices. Transparent pricing and information about the environmental impact of SAF can help foster greater customer participation and support for sustainable aviation initiatives.

Infrastructure development is also essential for the widespread availability of SAF. Both governments and the private sector need to collaborate to build and upgrade facilities that support SAF logistics, ensuring that the necessary infrastructure is in place to meet increasing demand. Without these concerted efforts, the transition to sustainable aviation will remain a challenging endeavor. The current progress, as evidenced by the low utilization percentages of SAF, is not aligned with the targets set by governments such as Sweden. Addressing these key challenges is imperative if these ambitious goals are to be met.

Future Research Recommendations

The thesis has presented a comprehensive analysis of existing business models and pricing strategies for sustainable aviation fuel (SAF), with a specific focus on SAS and BRA Airlines. Despite this, there are several potential areas for future research that can contribute to deepening the understanding of this important topic. An example is expanding the analysis by including airlines from different countries. Future research may involve comparative analysis of business models across different parts of the world to identify trends and factors that affect SAF pricing and business models. Furthermore, longitudinal research that follows the development of business models and pricing strategies for SAF over time would enable a deeper understanding of the industry's dynamics and trends. By analyzing changes and adaptations over time, researchers can predict future developments in the aviation industry.

It is also important to examine the perspectives of various stakeholders in the aviation industry, including airlines, fuel suppliers, regulatory bodies and environmental organizations, to highlight challenges and opportunities from different viewpoints and thereby contribute to the design of effective policies and strategies to promote sustainable aviation practices. An analysis of the government policies, incentives and regulations that influence the adoption of SAF by airlines can provide an understanding of the wider ecosystem. By evaluating the effects of existing policies and examining opportunities for policy interventions, the research can provide guidance for decision makers and industry stakeholders. This is important to examine continuously as policies are changed over time depending on some factors.

Given that SAF is a transitional means of a temporary solution to reduce fossil carbon dioxide emissions, future research could explore the integration of other sustainable aviation technologies, such as electric or hydrogen-based aircraft, into airline business models to develop holistic sustainability strategies. It would be beneficial to analyze the entire supply chain for SAF, including production, distribution and consumption, then it could lead to the identification of bottlenecks and opportunities for optimization to ensure scalability and sustainability in the supply chain. By addressing these research areas, future research can contribute to a more comprehensive understanding of sustainable aviation and support the development of innovative solutions to reduce the industry's environmental impact.

Conclusion

The integration of Sustainable Aviation Fuel (SAF) within the business models of SAS and BRA signifies a crucial advancement towards sustainability in the aviation sector, as revealed through the comprehensive analysis using the Triple Layer Business Model Canvas (TLBMC). This transition reflects the airlines' commitment to addressing environmental imperatives by mitigating carbon emissions and aligning with global sustainability goals.

Despite the promising environmental potential of SAF, the adoption process is accompanied by significant challenges. High production costs, limited fuel availability, regulatory uncertainties, and infrastructure limitations create financial and operational hurdles for both airlines. Additionally, while SAF reduces greenhouse gas emissions, a holistic evaluation of its full lifecycle—including production and transportation impacts—is essential to confirm its net environmental benefits.

Strategically, SAF adoption reshapes the value propositions of SAS and BRA by targeting a growing segment of sustainability-conscious travelers. This shift enhances the airlines' market competitiveness and brand image by offering eco-friendly travel options that resonate with evolving customer preferences. Central to this transformation are strengthened customer relationships, built on transparent communication and proactive education about SAF's benefits, which cultivate trust, loyalty, and long-term engagement.

From an economic perspective, SAF integration challenges the traditional cost structure and revenue models. The elevated costs of SAF necessitate innovative pricing strategies, revenue optimization, and collaborative cost-sharing mechanisms to maintain financial viability without compromising sustainability goals.

In sum, the journey towards sustainable aviation through SAF integration embodies a complex balance of environmental responsibility, economic pragmatism, and social engagement. SAS and BRA's strategic initiatives highlight their leadership in this field, though continued innovation, stakeholder cooperation, and transparent communication remain vital to overcoming existing challenges and achieving long-term value creation for both the airlines and society at large.

This thesis set out to explore the challenges and prospects of Sustainable Aviation Fuel (SAF) adoption by airlines, with a specific focus on Swedish carriers. It also examined the pricing strategies currently employed to support SAF integration. The research was guided by two primary questions:

1. **RQ1:** What are the Business Models for Sustainable Aviation Fuel (SAF) adopted by Airlines?
2. **RQ2:** What pricing strategies do Airlines employ for Sustainable Aviation Fuel (SAF)?

To address these questions, a qualitative methodology was employed, utilizing semi-structured interviews and the Triple Layered Business Model Canvas (TLBMC) to analyze the business models of Scandinavian Airlines (SAS) and Braathens Regional Airlines (BRA). A comparative analysis of ten airlines was conducted to evaluate their SAF initiatives and pricing strategies.

Unveiling Sustainable Aviation Fuel Business Models

The TLBMC framework enabled a detailed exploration of how SAS and BRA incorporate SAF into their operations across environmental, economic, and social dimensions.

- **Environmental Dimension:** SAF adoption offers substantial potential for reducing greenhouse gas emissions, thus aligning with international climate goals. However, a full lifecycle assessment is essential to ensure that SAF truly delivers a net environmental benefit, considering its production and transportation impacts.
- **Economic Dimension:** The high cost of SAF remains a significant barrier. Airlines like SAS and BRA have introduced innovative pricing models, such as SAF-inclusive tickets (e.g., "SAS GO SMART BIO" and BRA's "Bio Flight Ticket"), though these have not yet proven profitable. SAS has also initiated long-term purchase agreements to stabilize supply and reduce costs, while BRA is pursuing partnerships to overcome economic hurdles. A scalable and cost-effective SAF supply chain remains a prerequisite for widespread adoption.
- **Social Dimension:** Customer acceptance is pivotal. Both SAS and BRA have leveraged loyalty programs—such as SAS EuroBonus and BRA Vänner—to raise awareness and foster customer engagement with SAF offerings. Transparent communication of SAF's benefits, combined with supportive policies, can strengthen trust and drive demand among environmentally conscious travelers.

In sum, while SAF integration poses financial, operational, and regulatory challenges, it also offers strategic opportunities. SAS and BRA exemplify how innovation, customer engagement, and collaboration can support sustainable business models. Policy support at multiple levels remains critical to accelerate this transition.

Understanding Pricing Strategies for Sustainable Aviation Fuel

The comparative analysis revealed several key pricing strategies employed by airlines to support SAF adoption:

- **Strategy 1:** SAF as an optional surcharge (e.g., SAS, BRA, Lufthansa Group).
- **Strategy 2:** Embedding SAF costs within ticket prices (e.g., Finnair).

A common shortfall across these strategies is the **lack of pricing transparency**. For instance, when SAF is offered as a surcharge, customers are often left to calculate the added cost themselves, which may deter participation. Finnair's approach, while more inclusive, raises concerns about the adequacy of its SAF contributions due to vague and minimal disclosures (e.g., €0.20 per ticket).

To address this, airlines must prioritize **clear, upfront communication** regarding SAF costs during the booking process. Digital platforms can be used more effectively to educate customers about SAF's environmental impact and value. Incentive mechanisms—such as loyalty rewards or SAF-linked discounts—can further drive adoption, provided they align with passenger priorities and budgets. Importantly, strategies must consider diverse traveler profiles, balancing sustainability ambitions with financial inclusivity.

Ultimately, improving transparency and tailoring incentives are critical steps toward expanding SAF usage and meeting sustainability expectations.

Addressing Key Challenges

The findings also highlighted several systemic challenges:

- **Lack of Ambition:** Some airlines exhibit insufficient commitment to SAF. Stronger targets and bold investments are needed, particularly in alternative technologies such as hydrogen propulsion, electric aircraft, and next-generation fuel-efficient fleets.
- **Limited Supply:** SAF is still not available in the volumes required to meet future demand. Significant investment in production infrastructure, long-term procurement agreements, and regulatory support are essential to scale up supply.
- **High Costs:** Bridging the price gap between SAF and conventional jet fuel may require subsidies, tax incentives, or levies on traditional fuel. Establishing local refineries can also help reduce costs and supply-chain dependencies.
- **Policy Inconsistencies:** Regulatory fragmentation across regions hinders progress. Harmonized global policies and widespread SAF availability are crucial to enable a fair and effective transition for all airlines.

7.4 Final Remarks

The analysis of SAS and BRA's business models and SAF pricing strategies highlights the dual reality of progress and persistent challenges in sustainable aviation. While these airlines demonstrate leadership through innovation, partnerships, and customer engagement, several obstacles remain—chiefly high costs, limited supply, and regulatory uncertainties.

Moreover, current SAF usage is **not aligned with national targets**. Sweden's ambitious goals for fossil-free domestic flights by 2030 and international flights by 2045 seem increasingly unrealistic given the present pace of adoption. Even the interim 27% SAF integration target for 2030 appears challenging under current conditions.

This discrepancy underscores the **urgent need for coordinated efforts** across government, industry, and civil society to drive investment, policy reform, and consumer engagement. Nonetheless, the strategies employed by SAS and BRA offer a roadmap for other carriers seeking to transition toward sustainable aviation.

A **holistic approach**, balancing environmental, economic, and social considerations, is imperative to achieve meaningful change. With continued innovation, collaboration, and public-private support, the aviation industry can take significant strides toward reducing its environmental impact and achieving long-term sustainability goals.

References

Air China. (2023). Financial Information and Roadshow Presentation [or Title of the specific document, if available]. Retrieved from https://www.airchina.com.cn/en/investor_relations/images/financial_info_and_roadshow/2023/04/27/4EFE8D7E37EED870939153C245AB1DE5.pdf

Air France-KLM, 2024. Financial results. [online] Available at: https://www.airfranceklm.com/en/finance/financial-results.

Bauen, A., Bitossi, N., German, L., Harris, A. and Leow, K. (2020). Sustainable Aviation Fuels. Johnson Matthey Technology Review, 64(3). doi:https://doi.org/10.1595/205651320x15816756012040.

Chiaramonti, D. (2019). Sustainable Aviation Fuels: the challenge of decarbonization.

Energy Procedia, 158, pp.1202–1207. doi:https://doi.org/10.1016/j.egypro.2019.01.308.

Delta Air Lines. (2024). Annual Report. Retrieved from https://ir.delta.com/financials/default.aspx

EASA, 2023. "Fit for 55 and ReFuelEU Aviation." www.easa.europa.eu/en/light/topics/fit-55-and-refueleu-aviation.

Elhmoud, E. R., & Kutty, A. A. (2020). Sustainability assessment in the aviation industry: A mini-review on the tools, models and methods of assessment.

Emirates. (2024). Annual Report. Retrieved from https://www.emirates.com/se/english/about-us/financial-transparency/annual-reports/

"Flygbranschen."FossilfrittSverige,"FärdplanförFossilfrittSverige",2022fossilfrittsverige.se/roadmap/flygbranschen/Accessed8Mar.2024.

Finnair (2024). Result center. Retrieved Feb 20, 2024, from https://investors.finnair.com/F/Finnair-IR-V2/Homepage/financialInformation/resultcenter.aspx.

Gassmann, O., Frankenberger, K., Choudury, M., & Csik, M. (2020). The business model navigator: the strategies behind the most successful companies. Pearson UK.

Gössling, S. and Humpe, A. (2023). Net-zero aviation: Time for a new business model?

Journal of Air Transport Management, 107, p.102353. doi:https://doi.org/10.1016/j.jairtraman.2022.102353.

Gössling, S. and Humpe, A. (2020). The global scale, distribution and growth of aviation: Implications for climate change. Global Environmental Change, [online] 65(102194), p.102194. doi:https://doi.org/10.1016/j.gloenvcha.2020.102194.

IATA (2015). IATA Sustainable Aviation Fuel Roadmap 1st Edition. [online] Available at: https://www.iata.org/contentassets/d13875e9ed784f75bac90f000760e998/safr-1-2015. pdf.

International Air Transport Association. IATA (2022). Airlines cut losses in 2022; return to profit in 2023. Retrieved from https://www.iata.org/en/pressroom/2022releases/2022-12-06-01/.

International Air Transport Association. IATA (2024). Fuel monitor. Retrieved March 16, 2024, from https://www.iata.org/en/publications/economics/fuel-monitor/.

Jamshed, S. (2014). Qualitative research method-interviewing and observation.

Journal of Basic and Clinical Pharmacy, 5(4), pp.87–88.

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. Journal of cleaner production, 135, 14741486.

Kandaramath Hari, T., Yaakob, Z. and Binitha, N.N. (2015). Aviation biofuel from renewable resources: Routes, opportunities and challenges. Renewable and Sustainable Energy Reviews, 42, pp.1234–1244. doi:https://doi.org/10.1016/j.rser.2014.10.095.

United Nations. "The Paris Agreement." United Nations, United Nations, 2015, www.un.org/en/climatechange/paris-agreement.

Upham, P. (2012). Introduction: Perspectives on sustainability and aviation. In Towards sustainable aviation (pp. 3–18). Routledge.
www.flygbra.se. (2024). Braathens Regional Airlines - Sweden's domestic airline.

[online] Available at: https://www.flygbra.se/en/about-braathens-regional-airlines .

Y, Lai. E, Karakaya. A, Björklund. Employing a Socio-Technical System Approach in

Prospective Life Cycle Assessment: A Case of Large-Scale Swedish Sustainable

Aviation Fuels. 2022. https://www.frontiersin.org/articles/10.3389/frsus.2022.912676/full .

Yin, Robert K (2009). Case study research and applications: Design and methods.
Second Edition. Vol. 5. Sage publications.

Appendices

Appendix A - Interview Template

What is your role in the company?

Business model canvas

1. What are the key partners for the company?
2. What are the company's key activities?
3. What are the company's key resources?
4. What are the costs of the company?
5. What are the revenues of the company?
6. What is the main customer segment?
7. How do you create relationships with the customer?
8. What are the main sales channels?
9. What are the company's value propositions?
10. What other environmental impacts are there to be considered based on your company's business model?
11. What are your company's environmental benefits?
12. What are the company's social impacts?
13. What are the company's social benefits?
14. What are your thoughts on SAF and its implications in your business Overall?
15. Which pricing strategies do your company use for SAF?

16. How has SAF affected your company? ● The key partners?

- The key activities?
- The key resources?
- The main costs?
- The main revenues?
- The target customer segment?
- The most important customer channel?
- The relationship with the customer?
- The value proposed by the company?

17. What are the most significant changes from the current business model?

Challenges

What are the main challenges the aviation industry is facing, regarding sustainability?

What challenges are associated with the implementation of SAF in the aviation industry? What are the most significant challenges associated with the business model due to the implementation of SAF?

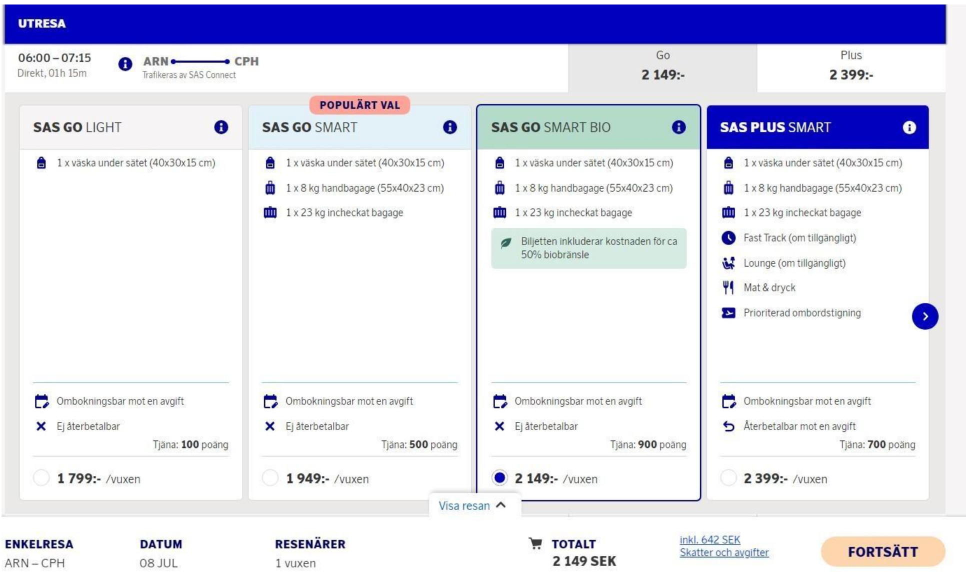
How can your company's business model be prepared to suit potential new changes like SAF?

Appendix B - Comparative Analysis

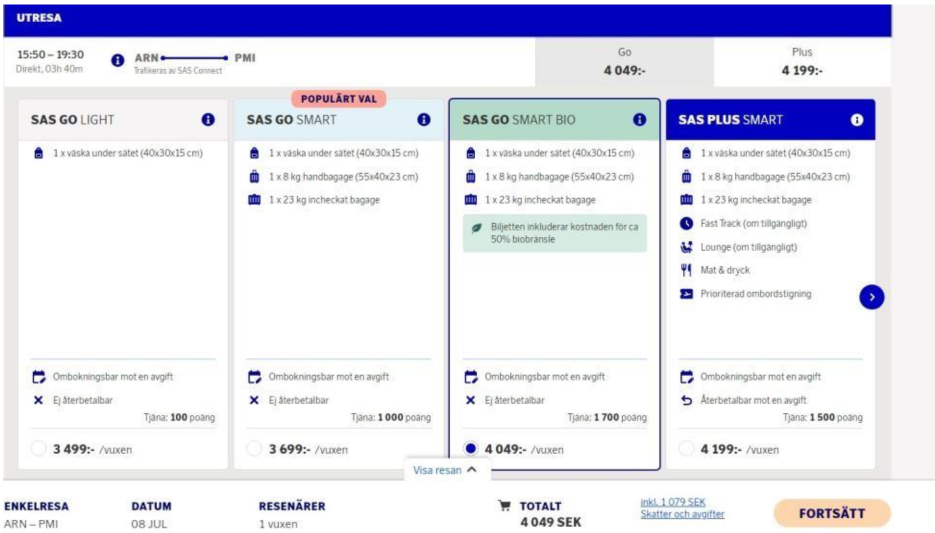
I. SAF Pricing Transparency Screenshots

This section provides screenshots showcasing the ticket types during booking for airlines that offer Sustainable Aviation Fuel (SAF) as part of their tickets.

SAS



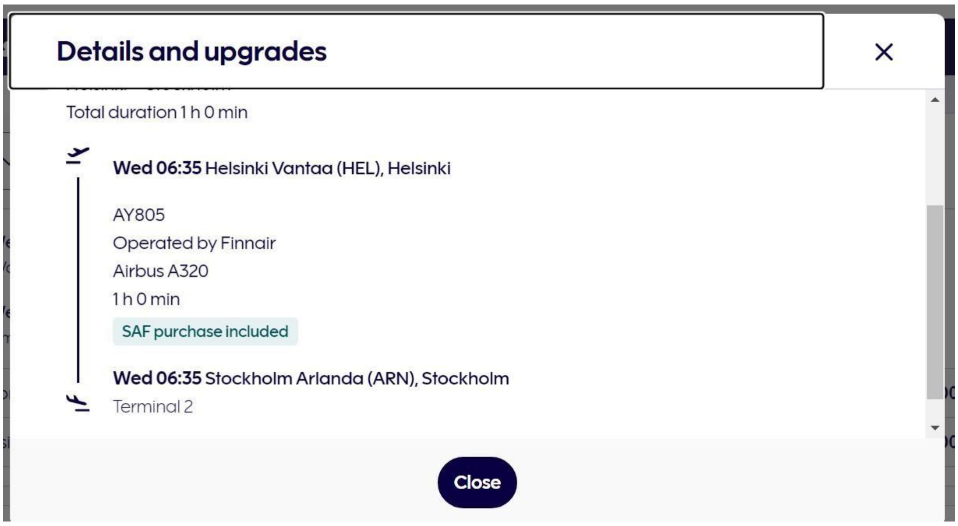
Screenshot of booking process of a SAS ticket for a short-haul flight (SAS, 2025).



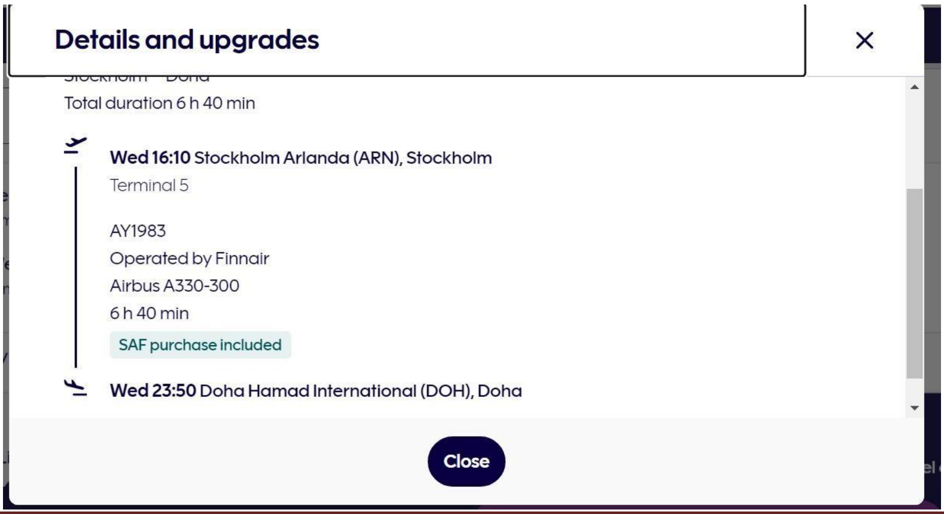
Screenshot of booking process of a SAS ticket for a medium-haul flight (SAS, 2025).

URL: www.sas.se

Finnair



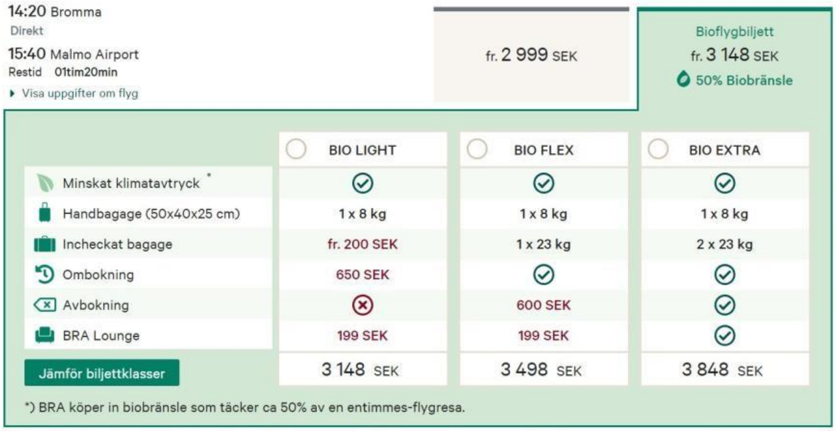
Screenshot of booking process of a Finnair ticket for a short-haul flight (Finnair, 2024).



Screenshot of booking process of a Finnair ticket for a long-haul flight (Finnair, 2025).

URL: www.Finnair.com

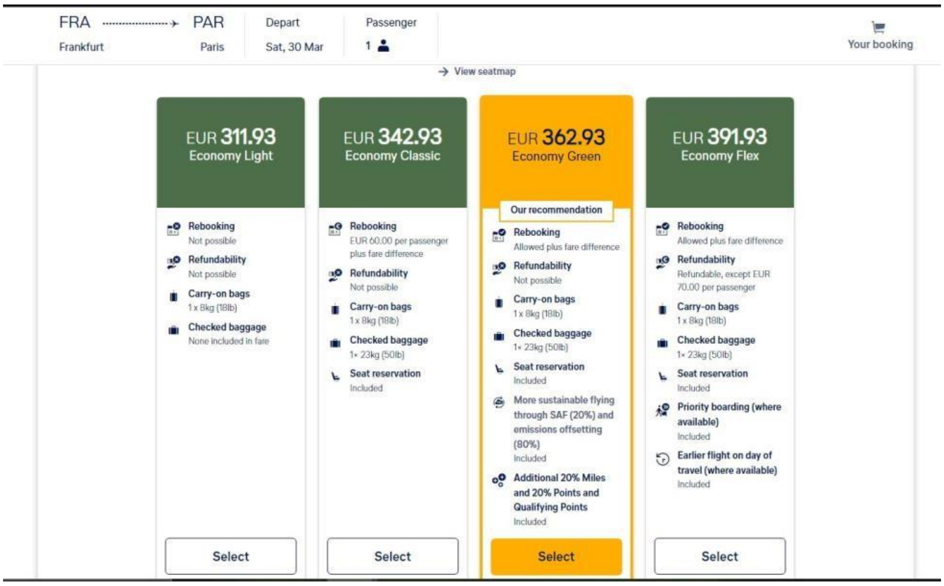
BRA



Screenshot of booking process of a BRA ticket for one of their domestic flights (Flygbra, 2025).

URL: www.flygbra.se

Lufthansa Group



Screenshot of booking process of a Lufthansa ticket for a short-haul flight (Lufthansa, 2025).

URL: www.Lufthansa.com

II. SAF Utilization Percentage Calculation

This section outlines the methodology used to calculate the SAF utilization percentage for each airline and presents the data in a tabular format

1. Data Sources:

- Annual reports of Airlines
- IATA's jet fuel price monitor

- Riksbankens USD/SEK
- Screenshots from financial statements

2. Methodology:

I. Gather the amount of jet fuel consumed (bought) by each airline in the last year, either in tonnes or dollars, from the financial statements.
II. If given in dollars, convert the amount of jet fuel consumed from SEK to USD by using Riksbankens USD/SEK average which was 10.501.
III. Convert the amount of jet fuel consumed into tonnes using the average jet fuel price per tonne.
IV. Obtained the amount of SAF purchased and consumed by each airline, either in tonnes or dollars, from the financial statements.
V. Calculated the SAF utilization percentage by dividing the amount of SAF consumed (in tonnes) by the total amount of traditional fuel consumed (in tonnes) and multiplying by 100.
3. SAF Utilization Percentage Calculations for each Airline

SAS

MSEK	Not	Nov–okt	Nov–okt
Intäkter	2	42 043	31 824
Personalkostnader	3	-8 072	-7 086
Flygbränslekostnader		-10 940	-8 511
Luftfartsavgifter		-3 800	-2 855
Övriga externa kostnader	4	-17 659	-12 058
Avskrivningar och nedskrivningar	5	-4 440	-4 763
Resultatandelar i intresseföretag	6	18	22
Resultat vid försäljning och återlämning av flygplan och övriga anläggningstillgångar	7	145	95
Rörelseresultat		**-2 705**	**-3 332**
Finansiella intäkter	8	1 068	219
Finansiella kostnader	8	-3 879	-4 733
Resultat före skatt		**-5 516**	**-7 846**
Skatt	9	-185	798
Årets resultat		**-5 701**	**-7 048**

Financial Statement of SAS for FY2023 (SAS, 2024). Gathered Data:

Annual report state: 6000 Tonnes of SAF Consumed FY2023 (SAS, 2024).

Jet fuel price average: 879 USD/Tonne (IATA, 2024).

Financial Statement state: 10,940 M SEK worth of jet fuel (SAS, 2024). USD/SEK average = 10.501 (Riksbank, 2024).

Calculations Made:

Total Jet Fuel in USD: 10,940,000,000 / 10.501 = 1.041 * 10^9 USD = 1,041,000,000,000

USD

Total Amount of Jet Fuel in Tonnes for FY2023: 1,041,000,000,000/879 = 1.18521 M Tonnes of Jet Fuel.
SAF Utilization Percentage: 6000/ 1,180,000 = ca **0.5%**

Finnair

Key Figures – Among industry sustainability leaders

		2023	2022	2021	2020	2019
Fuel consumption	tonnes	960,357	788,104	364,478	365,492	1,132,219
Flight CO_2 emissions	tonnes	3,025,124	2,482,528	1,148,107	1,151,299	3,566,491
Flight CO_2 emissions	g/ASK	83.7	79.3	94.9	89.0	75.6
Flight CO_2 emissions	g/RTK	920.5	926.9	931.7	948.6	785.3

Key Figures from annual report of Finnair for FY2023 (Finnair, 2024). Gathered Data:

Annual report state: **0.2%** of the Total Fuel consumption FY2023 was SAF (Finnair, 2024). Jet fuel consumption in Tonnes: 960,357

Calculations Made:

Total consumed SAF 2023 in tonnes: 0.2% of 960,357 = 1,921 Tonnes

Air France-KLM

NOTE 7 EXTERNAL EXPENSES

Period from January 1 to December 31 (in € millions)	2023	2022 restated [1]
Aircraft fuel	7,133	7,184
Sustainable aviation fuel	172	57
CO_2 quotas	203	141
Chartering costs	551	387
Landing fees and air route charges	1,908	1,710
Catering	829	720
Handling charges	1,856	1,608
Aircraft maintenance costs	2,549	2,256
Commercial and distribution costs	1,029	887
Other external expenses	1,909	1,488
TOTAL	18,139	16,438

(1) See Note 3 of the financial statements

Financial Statement of Air France-KLM for FY2023 (Air France-KLM, 2024). Gathered Data:

Jet Fuel 7,133,000,000 Euros

SAF: 172,000,000 Euros

SAF Utilization Percentage: 2,41% (2023) and 2022 was (0,79%)

Calculations Made:

In Tonnes: Jet fuel price avg per tonne: 879 USD/Tonne = 809 EUR/Tonne

7,133,000,000 / 809 = 8,817,058 Tonnes of Traditional Jet Fuel

Assumption: SAF 3-5 times more expensive than Traditional Jet fuel: SAF avg per Tonne:

809*4 EUR/Tonne = 3,236 EUR/Tonne

172,000,000 / 3236 = 53,152 Tonnes of SAF

SAF Utilization Percentage: 53,152 / 8,817,058 = **0,6%**

Emirates

ENVIRONMENTAL SUSTAINABILITY PERFORMANCE - EMIRATES

Priority	Performance indicator	Unit	2022-23	2021-22	Higher/ (lower) %
Aircraft fuel consumption, fuel efficiency and CO_2 intensity [1, 2, 3]	Fleet age	years	9.1	8.2	11.0
	Jet fuel (total fleet including training aircraft and engine maintenance activities)	tonnes	8,463,363	5,797,560	46.0
	Aviation gasoline (training aircraft)	tonnes	513	421	21.9
	Sustainable aviation fuel (SAF)	tonnes	179	153	17.0
	Passenger fuel efficiency (passenger fleet)	L / 100PK	4.09	5.54	(26.2)
	Freighter fuel efficiency (freighter fleet including mini-freighters)	L / FTK	0.177	0.272	(34.9)
	Combined fuel efficiency (total fleet excluding training aircraft and wet-leased freighters)	L / TK	0.316	0.329	(4.0)
	Passenger CO_2 intensity (passenger fleet)	g CO_2 / PK	101.4	137.5	(26.3)
	Freighter CO_2 intensity (freighter fleet including mini-freighters)	g CO_2 / FTK	439.1	675.0	(34.9)
	Combined CO_2 intensity (total fleet excluding training aircraft and wet-leased freighters)	kg CO_2 / TK	0.783	0.815	(3.9)
Aircraft noise and local air quality	Fleet cumulative margin to Chapter 4 noise standards	EPNdB	(12.1)	(12.1)	0.0
	Fleet cumulative margin to Chapter 4 noise standards	%	(7.1)	(7.1)	0.0 pt
	Nitrogen oxide (NOx) emissions (landing and take-off cycle)	tonnes < 3,000 ft	10,638	8,159	30.4
	Carbon monoxide (CO) emissions (landing and take-off cycle)	tonnes < 3,000 ft	6,088	4,559	33.5
	Unburnt hydrocarbons (UHC) emissions (landing and take-off cycle)	tonnes < 3,000 ft	627	460	36.3
	Fleet margins below regulatory limits for NOx	%	(11.1)	(10.2)	(0.9) pt
	Fleet margins below regulatory limits for CO	%	(57.9)	(56.5)	(1.3) pts
	Fleet margins below regulatory limits for UHC	%	(66.4)	(64.6)	(1.8) pts
	Fuel Jettison Events [4]				
	Total events		10	12	(16.7)
	Jettisoned fuel	tonnes	248	268	(7.5)

Financial Statement of Emirates FY2023 (Emirates, 2024).

Gathered Data:

Tonnes of Jet Fuel: 8,463,363 Tonnes Tonnes of SAF: 179 Tonnes

Calculations Made:

SAF Utilization Percentage: 179/8,463,363 * 100 = 0,002115% ≈ 0,002%

Delta Air Lines

Operating Statistics

Consolidated [(1)]	Year Ended December 31, 2023	2022
Revenue passenger miles (in millions)	232,241	195,480
Available seat miles (in millions)	272,033	233,226
Passenger mile yield	21.06 ¢	20.57 ¢
Passenger revenue per available seat mile ("PRASM")	17.98 ¢	17.24 ¢
Total revenue per available seat mile ("TRASM")	21.34 ¢	21.69 ¢
TRASM, adjusted [(2)]	20.10 ¢	19.55 ¢
Cost per available seat mile ("CASM")	19.31 ¢	20.12 ¢
CASM-Ex [(2)]	13.17 ¢	12.87 ¢
Passenger load factor	85 %	84 %
Fuel gallons consumed (in millions)	3,926	3,412
Average price per fuel gallon [(3)]	$ 2.82	$ 3.36
Average price per fuel gallon, adjusted [(2)(3)]	$ 2.83	$ 3.36
Approximate full-time equivalent employees, end of period	103,000	95,000

(1) Includes the operations of our regional carriers under capacity purchase agreements. Full-time equivalent employees exclude employees of regional carriers that we do not own.
(2) Non-GAAP financial measures are defined and reconciled to TRASM, CASM and average fuel price per gallon, respectively, in "Supplemental Information" below.
(3) Includes the impact of refinery segment results and fuel hedge activity.

Financial Statements from Delta Air Lines Annual Report FY2023 (Delta, 2024).

Gathered Data:

In 2023, we used over three million gallons of SAF onboard our aircraft, nearly doubling our 2022 SAF utilization.
Average Jet Fuel Price Per Gallon: 2.82 USD/Gallon (IATA, 2024).

Calculations Made:

$3,926 Million worth of Jet Fuel / $2.82 avg price per gallon = 1,392.19 M Gallons of jet fuel.

SAF utilization Percentage: 3 M gallons of SAF / 1,392.19 million gallon of jet fuel ≈ **0.2%**

Convert Gallons to Metric Tonnes: Density of jet fuel is typically around 0.81 kilograms per liter, or about 6.8 pounds per gallon. Given that 1 gallon is approximately 3.78541 liters, 3 million gallons would be approximately: 3,000,000 gallons * 3.78541 liters/gallon ≈
11,356,230 liters

Using the density of jet fuel: 11,356,230 liters / 1000 (to convert liters to cubic meters) × 0.81 kilograms/liter ≈ 9,196.54 metric tonnes

4. SAF Utilization Percentage Calculations for each Airline in Table Format

Airline Name	Total Jet Fuel Consumed [Tonnes] in Millions	Total SAF Consumed [Tonnes]	Average Jet Fuel Price [USD/Tonne]	Total Jet Fuel Expenditure [USD] in Millions	SAF Utilization Percentage [%]
SAS	1.18	6,000	879	1,041	0,5
Finnair	0.960357	1,921	879		0,2
Air France-KLM	8.817058	53,152	879	7,133	0,6
Emirates	8.463363	179	879		0,002
Delta Air Lines	4,214.487	9,196	879	3,926	0,2

Summary of SAF Utilization Percentage Calculations for each Airline.

III. Carbon Offsetting Option Screenshots

This section outlines the screenshots used to gather the Carbon Offsetting Option services for each airline that offers it.

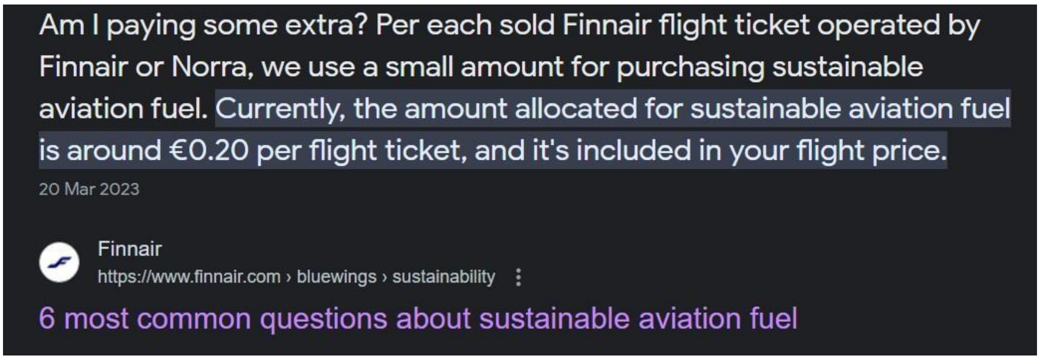
Finnair

Figure: Carbon offsetting option available as a service on Finnair's website. (Finnair, 2024).

URL: Finnair.com

5. Additional Data and Findings

This section provides any additional data and findings relevant to the sustainability metrics analysis, including any notable observations or insights.



Screenshot of the Finnair article regarding their SAF pricing (has since been removed).