SUSTAINABLE AVIATION FUEL

HOW CAN AVIATION DECARBONIZE THROUGH SAF ?

Shaping Tomorrow's World

Aria Mavens

CONTEXT & METHODOLOGY

Defining our approach

Understanding Industry Context

- EU climate framework
- SAF as primary lever for 2050 net-zero target

01

Problem Definition

- Understanding deliverables and challenge framing

02

Data Collection & Validation

- Defined which variables are needed
- Checked source credibility, time consistency, and EU27 alignment

03

Data Architecture

- Designed a unified database
- Consolidated input into cloud instance for scalability & reproducibility

04

Analytical Workflow

- Imported data into Google Colab and applied assumptions
- Developed models to project deliverables (RIMA, Holt, ETS Growth)

05

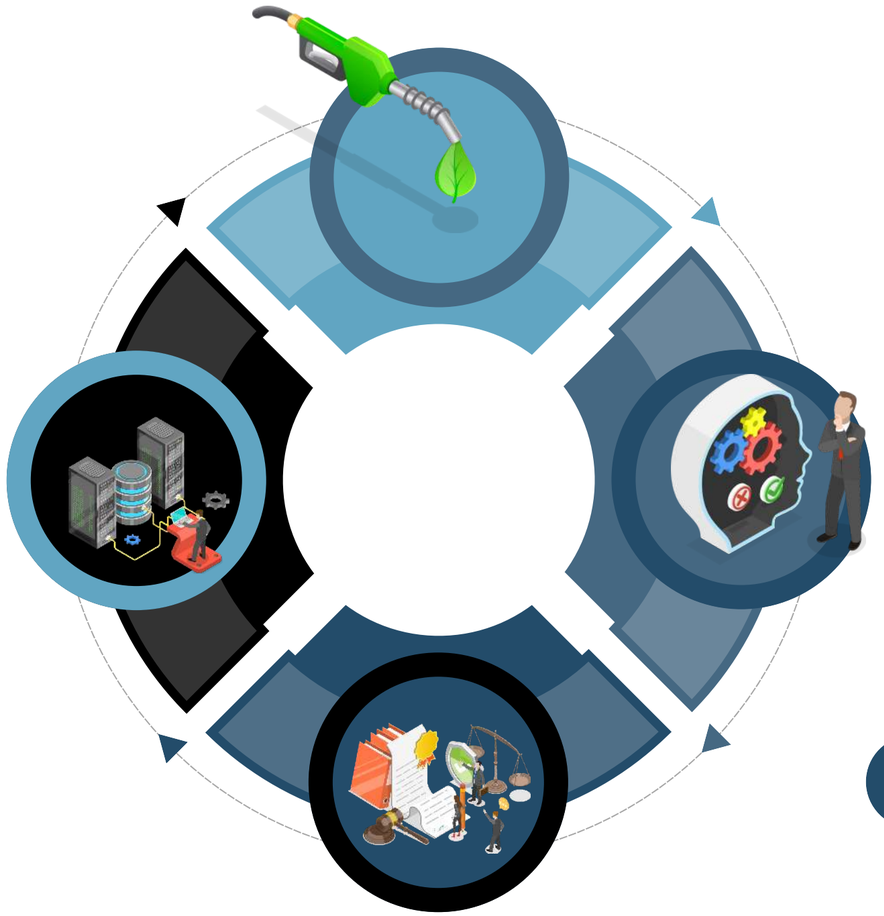
INPUTS & FOUNDATION

Core elements required to model SAF pathways

01 Scenario Logic

S0 – Market-Driven (BAU)
SAF grows organically without mandate enforcement

S1 – Policy-Accelerated
SAF follows and surpasses ReFuelEU targets to reflect scaled production



04 Data & Infrastructure

Cloud-based data warehouse
Storing unified tables (fuel demand, emissions, traffic, policy data)

Google Colab
Modelling environment pulling data from the cloud and applying all transformations

02 Core Modelling Assumptions

Baseline fuel demand
39 Mt (2025)

Aviation traffic growth
Long-term annual growth rate of 1.8%

SAF adoption S0
Linear growth from 1% - 20% (2025)

Fuel Burn Penalty
SAF Share × 10%

Emission factors
- A1 fossil jet fuel: 3.16 tCO_2 / tonne
- SAF: 0.63 tCO_2 /tonne (80% lifecycle reduction)

03 Policy Inputs (ReFuelEU Aviation)

SAF mandates
2% (2025), 6% (2030), 20% (2035), 70% (2050)

FUEL DEMAND FORECAST (2026 - 2050)

SAF's lower energy density drives a small fuel demand increase in S1.

S0

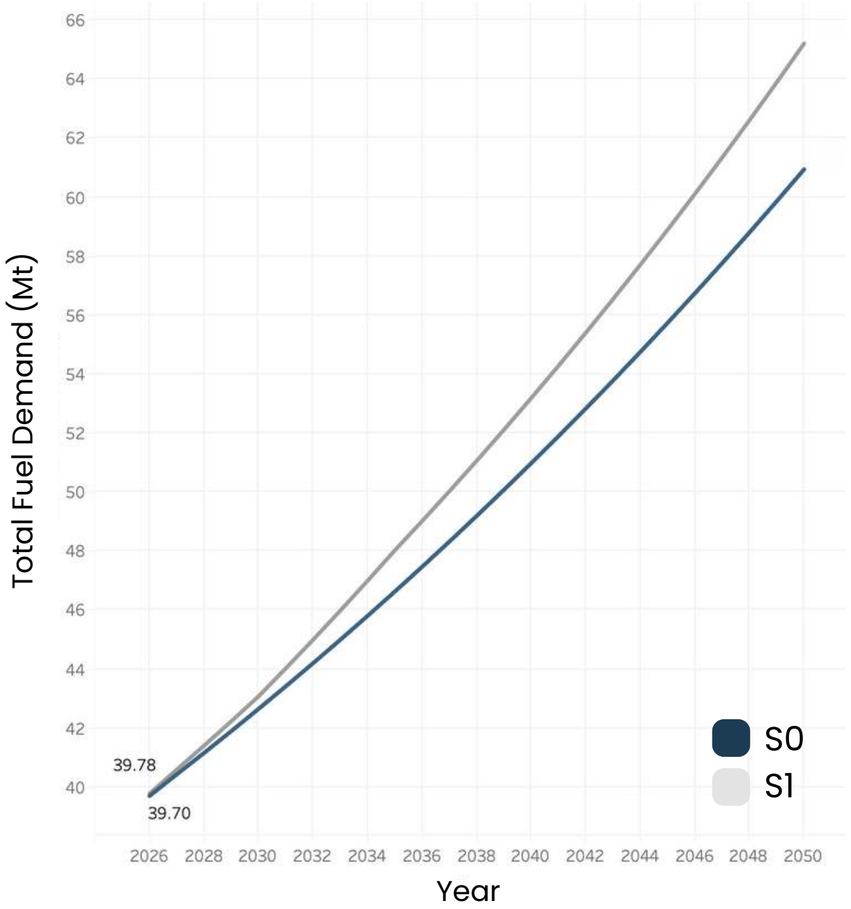
Limited SAF adoption due to no policy incentives:
2026: 1%, 2050: 20%

S1

Aggressive SAF ramp-up in line with mandate:
2026: 2%, 2050: 70%

Lower energy density → +1% fuel required per +10% SAF blended

Forecasted fuel demand S0 vs S1



65.21 Mt
required for accelerated SAF adoption

60.94 Mt
required for BAU SAF adoption

CO_2 EMISSIONS TRAJECTORY (2026 - 2050)

S1 displays lower emissions as SAF progressively replaces fossil fuel

By 2050, CO_2 emissions would look as follows:

S0

162 Mt

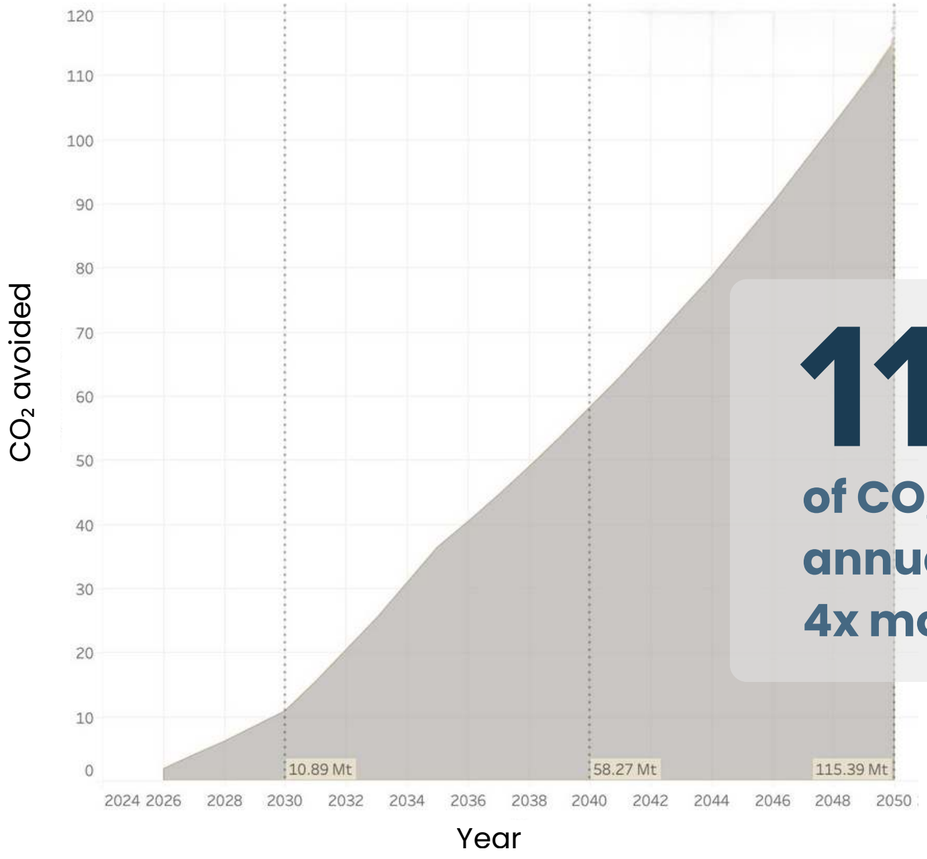
Fossil fuel emits 3.16 tCO_2 /t

S1

91 Mt

sAF has ~80% lower lifecycle, amouting to 0.63 tCO_2 /t

Annual CO_2 avoided through SAF adoption



115Mt

of CO_2 avoided annually by 2050: 4x more than S0

OBJECTIVE 1: THE BIG PICTURE

Two scenarios show one truth: only large-scale SAF achieves meaningful CO_2 reductions

Fuel demand

SAF share evolution

Decarbonization

01

Fuel demand will **continue to grow** toward 2050 under both pathways, driven by aviation activity growth. Yet fuel demand **is slightly higher under mandate-driven SAF adoption**

02

S1 is subject to mandates, whereas S0 maintains a **minimal SAF blend** only reaching **20% in 20250**

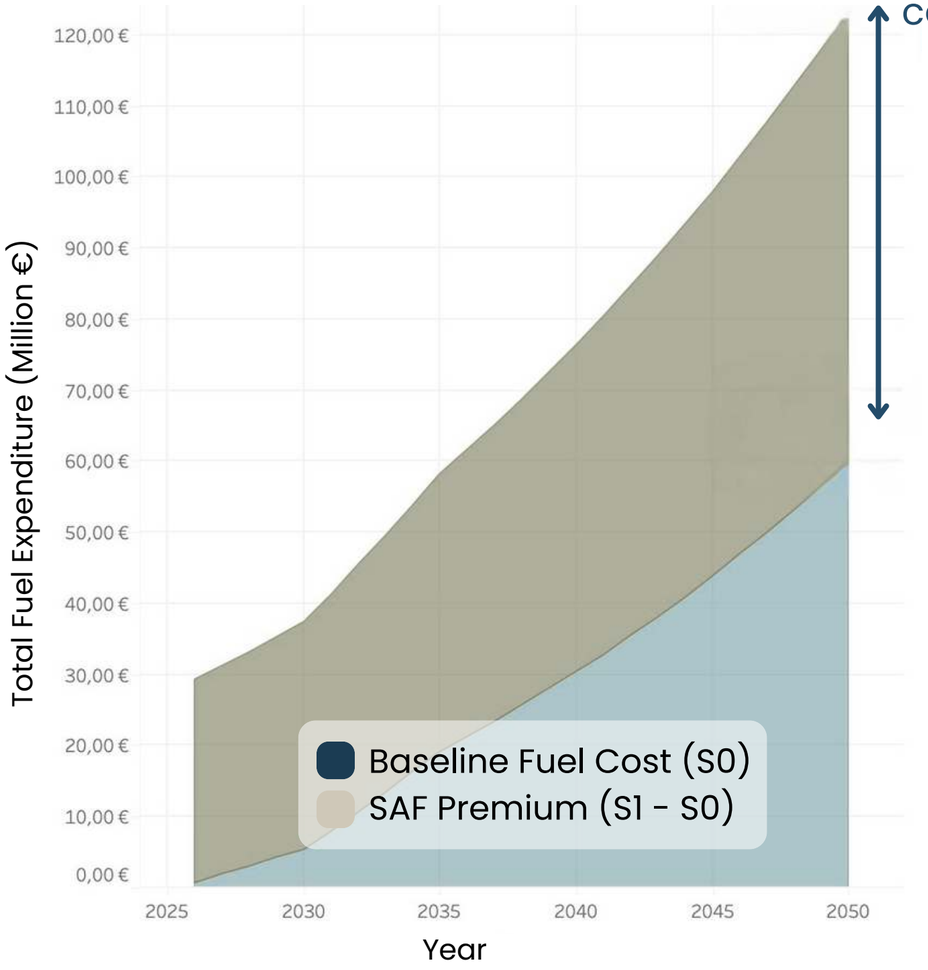
03

S1 has the potential to achieve **deep decarbonization** having a **~80 % lower lifecycle CO_2 emissions** . S1 could decrease emissions by **~4x**

THE ECONOMICS BEHIND SAF

By 2050, SAF premium represents ~48% of total fuel costs

Total fuel expenditure S0 vs S1



S0

63 M€

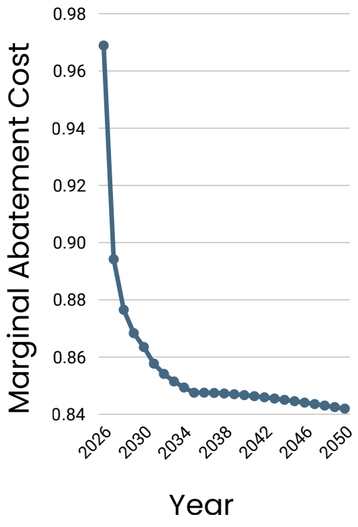
Long-run avg price at 700 €/t

S1

123 M€

With prices **~3.4× higher** the long-run avg price is at 2400 €/t

Marginal Abatement Cost



CO_2 reduction ↑ faster than ΔCost ↑

POLICY LANDSCAPE & SAF ADOPTION

SAF can scale only if Europe pairs mandates with strong economic support and major infrastructure investment—otherwise high costs, limited supply, and feedstock constraints will slow the transition

SAF Cost & Policy Impact

- SAF premiums drive fuel costs sharply **upward** as mandates increase
- Without support, SAF becomes the main driver of **future operating expenses**

Policies That Accelerate SAF

- **Mandates** that create stable demand
- **Subsidies & incentives** to close the SAF cost gap
- **Carbon pricing** to improve SAF competitiveness
- **Infrastructure investment** for storage, blending & distribution

Key Barriers & Risks

- **Limited feedstocks** & slow production scale-up
- **Limited producer competition** may keep prices elevated
- **Infrastructure gaps** across airports (storage, blending, refuelling)

OBJECTIVE 2: THE BIG PICTURE

Even though there is a large discrepancy between fuel costs for S0 and S1, the cost per CO_2 avoided stabilizes

Increasing cost

Relieving financial burden

Cost of avoiding CO_2

01

Fuel costs will be **significantly higher** in S1, due to SAF prices being **~3.4x** the price of convetional A1 jet fuel. In 2050, S1 total expenditure reaches **123M€**, compared to **63M€** in S0

02

Additional policy tools are needed to bridge the **cost gap of ~60M€** , such as SAF price subsidies, CfDs, and carbon pricing alignment

03

The **first** tonnes of CO_2 avoided are the **most expensive**, however as SAF blending share increases, **CO_2 reductions grow faster** than fuel expenditure differences

WHAT THE DATA ULTIMATELY REVEALS

subtitle

1 Decarbonization Potential

High-SAF pathway delivers **› 115 Mt CO_2** avoided annually, proving deep decarbonization is technically achievable

2 Economic Reality

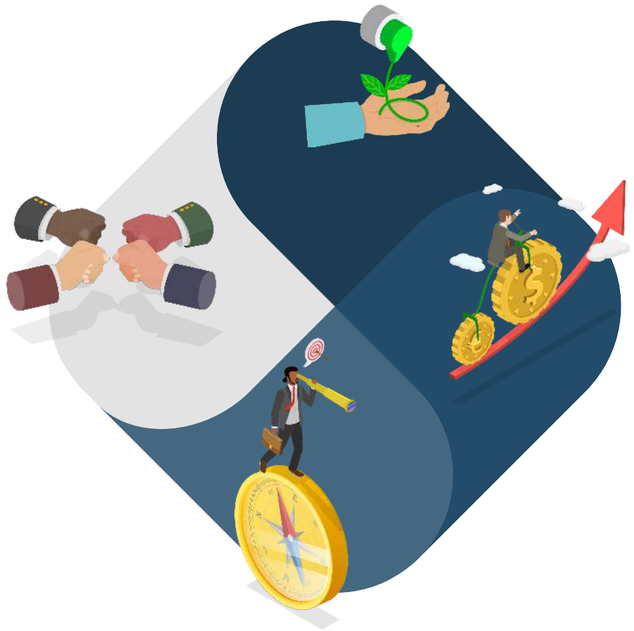
SAF remains **3–4×** more expensive than fossil jet fuel
High-SAF scenario nearly fuel expenditure **doubles**

3 Strategic Insight

SAF is essential for aviation decarbonization but requires **policy support** and large-scale deployment to become viable

4 What It Means for EU27

Europe can achieve a high-SAF, low-carbon future; but only with **strong collective action** to prevent costs from undermining competitiveness



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