Gap analysis of Swedish policy

Mapping and gap analysis of Swedish aviation-related climate policy to IATA's net zero CO_2 emissions Policy Roadmaps

29 January 2025

RAMBØLL

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Executive summary

The aviation industry contributes to approximately 2.5% (1.0 bn CO_2 emissions) of global CO_2 emissions per year (pre-pandemic levels, year 2019). IATA forecasts that these emissions will increase to about 2.0 bn per year in 2050 if passenger volumes increase with limited emissions reductions. IATA and its members support the ambitions of the Paris agreement and have therefore committed to achieving net zero CO_2 emissions from air transportation by 2050. This is a challenging task that requires ambitious effort from all actors in the aviation industry as well as coordinated and effective policy from governments and international institutions.

IATA has developed roadmaps for net zero CO_2 emissions in the aviation industry to guide the industry and policy makers on what can be done to achieve the goal. This study focuses on IATA's roadmap for policy, which includes a menu of recommended policies on sustainable aviation fuel (SAF), offsets and removals, new propulsion technologies, and policy tracking and review. This study, conducted by Ramboll, maps the Swedish national policy landscape and assesses the gap between IATA's policy roadmap and the current policy situation in Sweden.

1. Sustainable aviation fuel

SAF is the most important lever for CO_2 emissions reductions, at least in the short- and medium term. Sweden has beneficial conditions for producing, and possibly exporting, SAF thanks to national supply of renewable feedstock and cheap and secure supply of electricity. One SAF production facility opened in Sweden in 2024. Several plans for new production facilities have been announced, which, if they become reality, could produce SAF at levels equal to the total use of aviation fuel in Sweden by 2028.

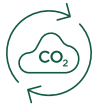
Swedish policy supporting SAF production mainly builds on general, flexible, and technology-neutral climate and renewable energy policies and investment support. There is available public financing for SAF production through research grants, investment grants, and credit guarantees. ReFuelEU, which replaces the national emissions reduction mandate (although at lower required SAF blending), will contribute to stable demand for SAF.

Despite several SAF-related policies and funding, all announced production plans may not materialize and thus make Swedish SAF production insufficient, at least for exports. To achieve high production volumes, SAF-specific policies and support as well as long-term clarity on the policy landscape will likely be necessary.

2. New propulsion technology

New propulsion technologies are important solutions that will complement SAF to reach net zero CO_2 emissions. The Swedish policy framework is generally technology-agnostic with investment support for new technologies. There are also several initiatives aimed at boosting development of electric and hydrogen-powered aviation to ensure national emissions reductions and a competitive aircraft and aviation industry, although these technologies have limitations in terms of range and aircraft size.

However, it is important to ensure that efforts to develop new propulsion technologies do not crowd out important solutions related to SAF with large emissions reductions potential.



3. Offsets and removals

Offsets and removals play an important role in addressing residual emissions for aviation, especially meeting the net zero CO_2 emissions target by 2050. Sweden is in the forefront of delivering negative emissions in several early-phase projects that have received public funding. The Swedish Energy Agency recently closed a large-scale auction for public support for BioCCS projects (SEK 36 billion during 2026-2046), and Sweden has integrated removals as a key part of its climate policy framework.

Further, Sweden makes necessary efforts to ensure CORSIA implementation in line with EU regulation and advocates strengthened harmonisation of CORSIA requirements and the EU policy framework. While the Swedish Energy Agency assesses that key aspects of developing a CORSIA offsets market, including the execution of corresponding adjustments of CO_2 emissions in accordance with the Paris Agreement, are determined and managed at the EU level, beyond the Government's direct control, Sweden should maintain its advocating role on this matter at the EU level.

4. Tracking and review

Sweden has a well-functioning and evidence-based governance and policy process. Independent authorities and legal frameworks aim to ensure balance and stability in policy making and implementation. Sweden's membership in the EU as well as its voluntary ICAO commitments adds an additional layer of tracking and review measures, boosting international harmonization but also increasing complexity.

However, most Swedish policy frameworks are general, and not specific to aviation. Although, Sweden has an aviation strategy, it has not been updated since 2017. To ensure Sweden contributes to reaching net zero CO_2 emissions in the aviation sector, more aviation specific strategies and policies are needed.

Table of contents

This report has been developed by Ramboll in dialogue with IATA. It provides a mapping of Swedish policy for CO_2 emissions reductions in the aviation sector and a gap analysis comparing the Swedish policy to IATA's policy roadmap. The gap analysis should be read as an analysis of the difference (gap) between current and/or planned Swedish policy and policy that IATA encourages at a global level.

The first chapter introduces the challenge facing the aviation sector to reduce CO_2 emissions and IATA's response to it. The second chapter briefly introduces Swedish climate policy.

The four subsequent chapters are based on the four policy themes in IATA's policy roadmap: Sustainable aviation fuel (SAF), New technology, Offsets and removals, and Tracking and review. Each chapter starts with an overview of IATA's policy objectives and actions related to the theme (e.g. SAF). Then follows a mapping and description of existing Swedish policies, regulation and public financing related to the theme. Each chapter concludes with a gap analysis comparing the existing Swedish policy to IATA's policy roadmap.

The annex provides information on which organizations Ramboll has interviewed as well as a complete overview of the policies described in the report.

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Introduction and background

- The challenge: Reaching net zero CO_2 emissions by 2050
- IATA's road to net zero CO_2 emissions in 2050
- Swedish aviation-related climate policy

The challenge: Reaching net zero CO_2 emisssions by 2050

The aviation industry is an important component of the global economy, connecting people, goods, and services worldwide. However, it is also responsible for about 2.5% (or 1.0 billion tonnes) of global CO_2 emissions.[1] Without ambitious action, global CO_2 emissions are expected to double to almost 2,000 million tonnes in 2050, according to IATA forecasts.

The aviation industry supports the long-term goal under the Paris Agreement to keep the rise in global surface temperature to well below 2˚ Celsius above pre-industrial levels. IATA and its members therefore committed to achieving net zero CO_2 emissions from air transportation by 2050.

There are generally three possible options to reduce the emissions produced by the aviation sector:

1. Change from fossil to renewable fuel. There are two main pathways for renewable fuel:
   - Electric aircrafts which store renewably produced electricity in a battery eliminating the need for fossil fuels. While this can be an important long-term solution, electric aircrafts are currently far away from being viable for large-scale commercial use (especially for long-haul flights).
   - Sustainable aviation fuel (SAF), which is aviation fuel made from renewable sources and can be used in conventional aircrafts with combustion engines, provides an available and crucial solution for reaching the sectoral climate targets. SAF still comes with challenges including current limited production capacity, limited demand, and cost disadvantages compared to fossil fuel. Despite these challenges, SAF is likely the option that can contribute the most towards net zero CO_2 emissions in the near- to mid-term. IATA estimates that about 1,100 million tonnes of yearly CO_2e emissions can be removed by SAF in 2050 (compared to a baseline scenario with no SAF).
2. Make operational efficiency improvements to reduce in-flight energy use. While this is essential for both reducing CO_2 emissions from fossil fuelled flights and keep operational costs down, the aviation industry has already delivered efficiency improvements for decades and are not expected to produce game-changing efficiency improvements in the future to take the aviation industry to net zero CO_2 emissions.
3. Reduce overall flight activity, which directly lowers emissions by cutting fuel consumption. However, this option diminishes connectivity and will come at large economic and societal costs, which makes it undesirable if other possible options exist.

The aviation industry is a ‘hard-to-abate sector’ and some of its emissions will likely remain by mid-century. Therefore, the aviation industry will have to rely on offsets and removals, which involves financing projects that reduce or avoid emissions in other sectors to counterbalance the remaining CO_2 emissions. IATA estimates that about 500 million tonnes of yearly CO_2 emissions will need to be offset in 2050.

Reaching net zero CO_2 emissions by 2050 is a massive task and cannot be done by the aviation industry in isolation. It requires coordinated efforts across sectors with support from harmonized and effective public policy, regulation, and financing.

This report primarily focuses on analysing the Swedish policy landscape related to SAF, new technology developments, offsets and removals, as well as procedures in place to track and review implemented policy.

[1] Pre-pandemic (2018) data. Source: IPCC (2022). Climate Change 2022: Mitigation of Climate Change, Chapter 10: Transport

IATA's road to net zero CO_2 emissions in 2050

IATA and its members decided in 2021 to commit to net zero CO_2 emissions by 2050 to align with the Paris agreement.

IATA identifies three main levers:

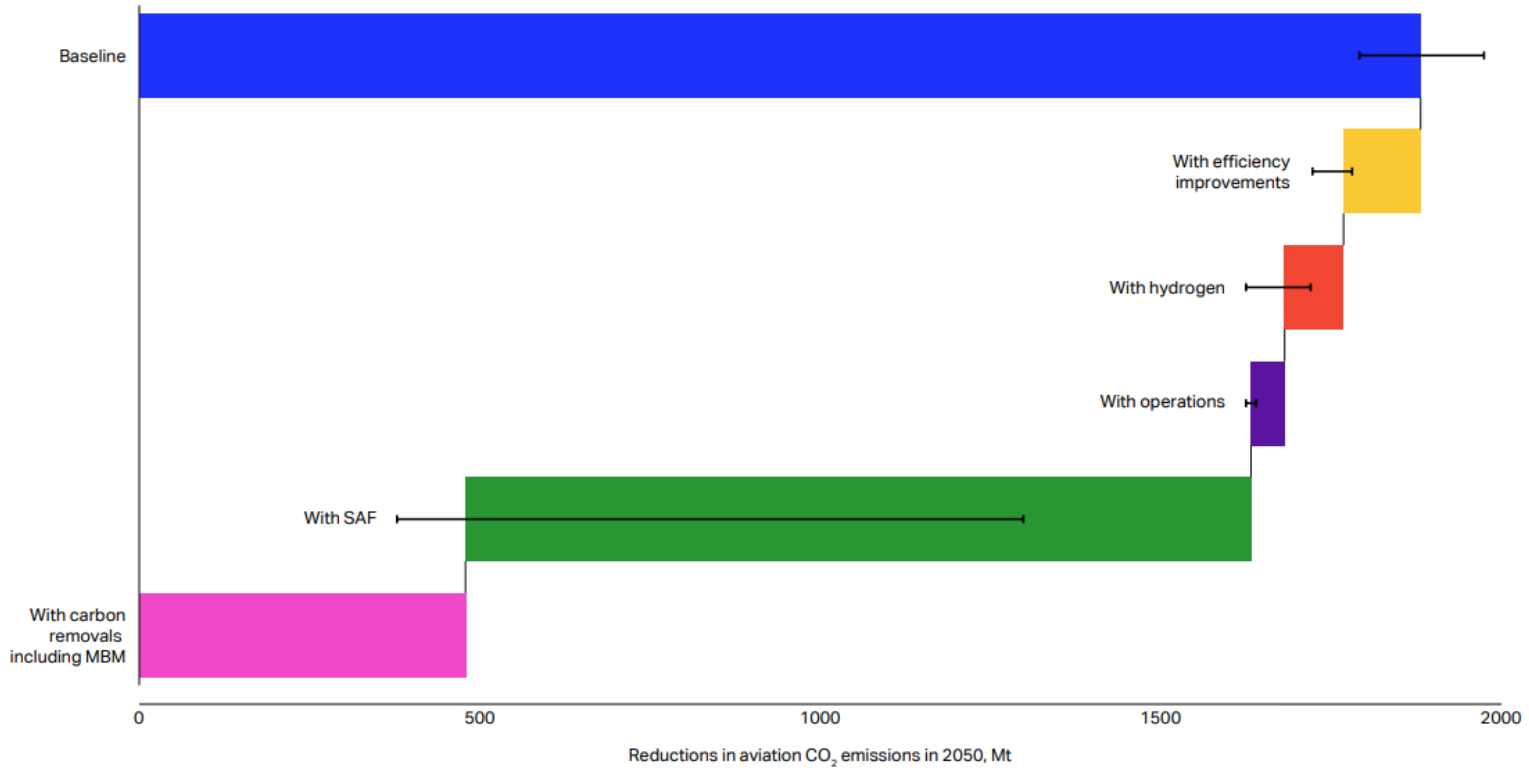
- Reduce aircraft energy use
- Change the fuel and reduce its carbon footprint
- Re-capture all the CO_2 which could not be avoided

IATA's targeted scenario for net zero CO_2 emissions to 2050 with increased passenger traffic, including all actions from the five roadmaps, is shown in the colored bars to the right, while the black lines illustrate the potential range of outcomes, depending on the outcome of the actions.

IATA has developed five different roadmaps that illustrate how the aviation industry can reach net zero CO_2 emissions to 2050 and what is needed to make it happen within aircraft technology, operations, infrastructure, policy, and finance. This study focuses on the policy roadmap.

The policy roadmap contains 12 policy objectives focusing on four themes: SAF, New technology, Offsets & removals, and Tracking & review. The mapping and gap analysis in this study follows the same thematic structure. The policy objectives are also categorised into immediate (until end 2025), mid-term (2026-2030), and long-term (2031-2050). See the annex for a visual presentation taken from the policy roadmap of the policy objectives, policy actions, thematic categorisation, and time plan.

Chart 2: Reduction in aviation CO_2 emissions in 2050 achieved through the different levers of action. The solid bar indicates the central case and the black lines indicate maximum and minimum reductions based on the scenarios modeled.



Source: IATA Sustainability and Economics, ICAO LTAG SAF availability scenarios

Swedish climate policy for transport and aviation

Swedish transport policy

Swedish transport policy aims for a socioeconomically efficient and sustainable transport system, supporting national climate goals, including a 70% emissions reduction by 2030. This is pursued through:

- Reducing total traffic
- Enhancing energy efficiency
- Transitioning to renewable and fossil-free fuels, including electrification

Aviation Policy in the Climate Action Plan

The Swedish Climate Action Plan (NCAP) emphasizes the aviation sector's role in connectivity while ensuring climate change mitigation. Key points in the Swedish NCAP are:

- Increase production and use of SAF is the most important focus in the short run
- Electric aircrafts are important complements to SAF in the long run, especially for shorter flights
- Aviation should bear its own climate cost through effective pricing of climate impact and incentives promoting sustainable practices

The Swedish aviation sector's roadmap* for fossil-free aviation

The Swedish Air Transport Society (national industry organisation) has together with Fossil free Sweden (government organisation) developed a roadmap for a fossil-free aviation sector. The roadmap sets up two important goals with corresponding actions for the sector and the government:

1. Domestic flights should be fossil-free by 2030
2. All flights (domestic and international) should be fossil-free by 2045.

Note: More detailed information can be found in the annex of this report and in the source documents.
* IATA has not been involved in developing the roadmap.
Source: Swedish Transport Agency – State action plan of Sweden 2024.
Flygbranschens-Fardplan-Uppgraderad-2024.pdf

Sustainable aviation fuel

- IATA policy objectives and actions
- Supply: Swedish policies, regulation and public financing
- Demand: Swedish policies, regulation and public financing
- Gap analysis comparing Swedish policy to IATA's policy roadmap

IATA policy objectives and actions related to SAF

Sustainable aviation fuel (SAF) will need to contribute to the largest CO_2 emission reductions to reach net zero CO_2 emissions in 2050. The table to the right presents IATA's policy objectives and actions related to SAF.

According to the Swedish climate action plan, aviation should, in the short term, decrease emissions mainly by increasing the use of sustainable and fossil-free aviation fuels, such as biofuels.

Key insights

- SAF is the solution that can deliver most CO_2 emission reductions in the short- and medium term. Therefore, most of IATA's policy objectives and actions focus on stimulating supply and demand for SAF.
- This chapter focuses on the need for SAF, current and expected SAF production in Sweden, national and international policy affecting SAF supply and demand in Sweden, as well as our gap analysis of the Swedish policy landscape compared to IATA's policy roadmap.
- The table to the right summarises IATA's policy roadmap related to SAF. It includes eight high-level policy objectives and their motivation as well as more detailed policy actions.
- Our gap analysis at the end of this chapter takes these policy objectives and actions as starting point for assessing the Swedish policy landscape.

Policy objective	Motivation	Policy action
Prioritise sustainable aviation fuel in refinery output	Increasing the share of SAF production in the product mix of existing renewable fuel production facilities, including co-processing in conventional refineries, is essential for supply to meet near-term demand.	Repurpose existing financial resources to support SAF production
		Shift existing biofuel production capacity to SAF
		Encourage co-processing
Attract investment for SAF production	The scaling up of SAF production require significant investment, and policy is needed to help reallocate capital flows more in favour of these.	Implement coordinated demand-pull and technology-push SAF policies
		Ensure incentives have realistic duration
		Increase demand for SAF through governmental commitments
		Ensure SAF policy mixes are technology and feedstock agnostic
Ensure environmental integrity of offsetting credit and aviation cleaner energies:	Establishing robust standards for offsets and alternative fuels' environmental and sustainability credentials is indispensable for proper tracking and verification so that obligations can be met.	Adopt globally harmonized sustainability criteria for offsets and alternative fuels*
Build a SAF accounting framework	Developing a robust chain of custody for SAF is essential to maintaining transparency, traceability, and trust in accounting for CO_2 emission reductions from SAF.	Adopt globally harmonized SAF accounting framework
		Facilitate dual conformance in SAF sustainability certification
Promote global, liquid, and transparent cleaner aviation energy markets	Nurture the nascent new energy markets so they develop into global, liquid, and transparent markets where competition is healthy and where new entrants and innovation can flourish.	Promote global liquid and transparent SAF markets*
Eliminate barriers to SAF distribution and use	Addressing gaps in infrastructure and lack of harmonized and supportive regulation will facilitate the widespread adoption of SAF.	Enable access to incumbent fuel infrastructure to SAF
Drive diversification and scale-up of aviation cleaner energies	The diversification of aviation cleaner energies through the promotion of a wide variety of feedstock and production pathways will ensure future resilience and scalability.	Ramp-up SAF production from non-biological feedstock
		Drive diversification of all aviation cleaner energies
Foster innovation in non-biological SAF	Supporting continuous innovation in non-biological SAF is imperative to expand fuel options, as no single technology will suffice to satisfy the needs of the air transport industry's decarbonization.	Foster continuous innovation in non-biological SAF

* The policy action has a global focus and is thus not in focus in this national study.

Swedish policies, regulation and public financing supporting **supply** of SAF

Supply of SAF is promoted in Sweden through funding for research, grants and credit guarantees

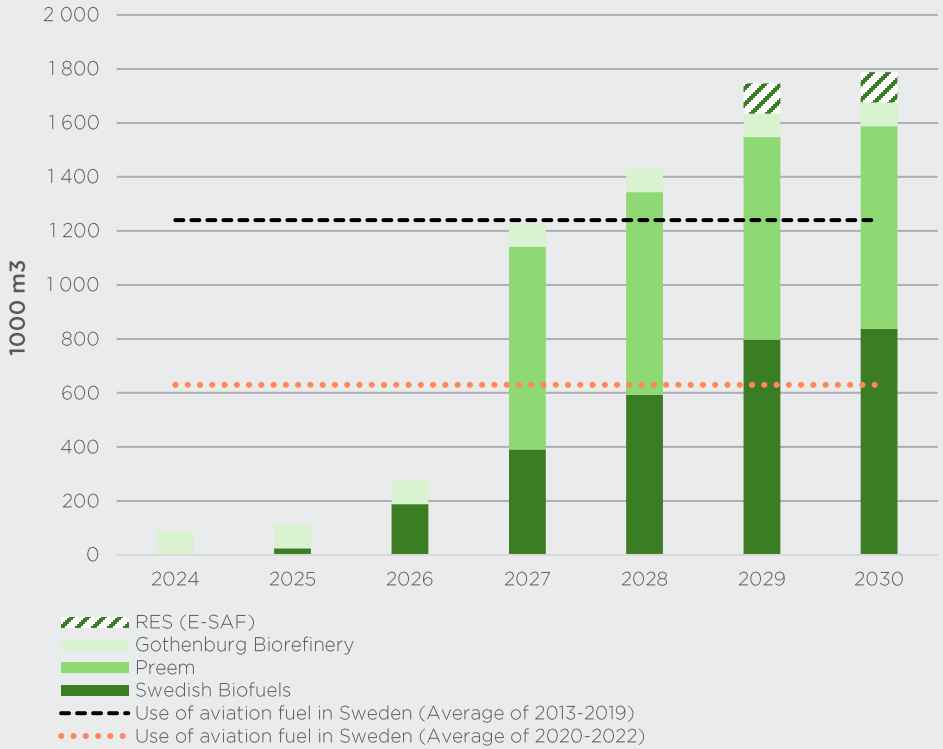
This section provides an overview of the financial and policy instruments available to promote the production and supply of Sustainable Aviation Fuel (SAF) in Sweden. The focus will be on:

- Funding for research and innovation to advance SAF technologies.
- Grants provided through the public financing programmes *Klimatklivet* and *Industriklivet* to support investments in SAF production and infrastructure.
- Credit guarantees issued to facilitate large-scale SAF projects.

The following pages will describe each of these measures in detail, highlighting their scope, eligibility criteria, and role in supporting the development of SAF in Sweden.

Swedish production capacity of SAF could reach 1.8 million m³ yearly by 2030 if announced plans become reality

Figure 1. Announced plans of *production capacity of SAF in Sweden based on planned projects and production volumes*



Note: The information is gathered from the company websites. When production numbers were expressed in tonnes, 0.8 ton/m³ are used to convert it to cubic meters. For *Swedish Biofuels* the growth is extrapolated between 2025 and 2030. The SAF numbers from the *Gothenburg Biorefinery* is the potential maximum production and might be lower if production instead is optimised for biodiesel.
Source: St1 – Frågor och svar om hållbart flygbränsle; Preem; Swedish Biofuels; REF; Aviation Fuel

Current demand for aviation fuel is met through imports, but local SAF production could potentially ramp up in the coming years

Currently, there is only one commercial-scale SAF production plant in Sweden. The Gothenburg Biorefinery, a joint venture between St1 Nordic Oy and SCA Renewable Energy, was inaugurated in April 2024. It has an annual capacity of 200,000 tons of renewable fuel, including 70,000 tons of SAF (St1, 2024). To meet current demand, imports from producers like NESTE and SkyNRG are still necessary (Lai et al., 2022).

Several new facilities are planned in the coming years. Swedish Biofuels is constructing a plant at Brista near Arlanda Airport, targeting 20,000 tons per year of alcohol-to-jet (ATJ) fuel, expected to be operational by 2025 (IEA Bioenergy, 2024). This plant, using C2-C5 alcohols, achieved ASTM* approval in August 2023 and aims to scale up to 670,000 tons per year by 2030 (Swedish Biofuels, 2024). Preem is converting its Lysekil refinery to produce renewable aviation fuel (biojet/SAF) and renewable diesel, with completion expected in 2027. This will add 1.2 million m³ of renewable production capacity, including approximately 600,000 m³ of SAF (Preem, 2024). The Alby hydrogen plant project in Ånge is expected to produce 90,000 tons of eSAF per year at full capacity, supplied with 500 MW of renewable energy from the Tovåsen substation. The plant is expected to be operational by 2028 (Biobased Diesel Daily, 2024).

Sweden could become a SAF-exporting country if the companies' plans become reality and the necessary feedstock is ensured

Some researchers and industry experts believe that Sweden's forests could provide sufficient feedstock for large-scale national SAF production. Demonstration projects, such as LTU Green Fuels and flights utilizing forestry residues in Småland, highlight the technical feasibility of such initiatives. However, concerns remain about scalability and competition for feedstock with other sectors, including pulp and paper, heat and power, and road transport.

Ramboll has interviewed one of the companies, which emphasized the same point—that the EU's definition of acceptable feedstock is too restrictive and the supply therefore too limited, which might become an issue when demand increases.

It is important to note, however, that these ambitious plans remain just that—plans. In 2024 projects focused on producing SAF, like HySkies and SkyFuelH2 have been paused or discontinued. This underlines the need for cautious optimism when forecasting the future of SAF production in Sweden, as the path from project planning to operational capacity often encounters unforeseen obstacles.

**ASTM approval is a critical step in making SAF viable for widespread use in aviation, ensuring it meets the industry's high safety and performance standards*

A SAF accounting framework could help deploy SAF efficiently

Sweden's competitive advantages as a SAF producer

Sweden is well-positioned to produce SAF (Transportstyrelsen, 2023) given that Sweden:

1. Has abundant sustainable feedstocks, such as forestry residues and other biogenic materials, supported by its well-established forestry sector.
2. Benefits from reliable and renewable energy sources, including hydro, wind, and nuclear power, essential for SAF production processes like electrofuels.
3. Has a strong research and innovation ecosystem which enables the development of advanced SAF technologies and fosters collaboration between industry, academia, and government

The SAF accounting framework strives to enable a global market for Sustainable aviation fuel

The SAF Accounting Framework enables the environmental benefits of Sustainable Aviation Fuel (SAF) to be tracked and claimed, irrespective of where the fuel is physically produced or consumed. By separating the physical fuel from its sustainability attributes, the framework allows SAF producers and users to participate in a global market.

This system uses different chain-of-custody models, including physical segregation (keeping SAF separate), mass balance (tracking SAF as part of mixed fuels), and book and claim (allowing sustainability benefits to be sold independently of the fuel itself). These approaches ensure transparency and accountability across the entire supply chain.

To verify sustainability, SAF is certified through schemes like ISCC and RSB, and a Proof of Sustainability (PoS) is issued. The PoS is updated as the fuel moves through the supply chain, documenting its environmental benefits, such as greenhouse gas reductions. Registry systems are used to record and manage these claims, prevent double counting, and ensure compliance with regulations like CORSIA and ReFuelEU.

This framework supports the production of SAF in regions with abundant feedstocks and renewable energy, without reliance on the physical demand for using SAF. By allowing the global trade of SAF's environmental benefits, it encourages broader adoption, fosters competition, and minimizes logistical challenges.

Benefits for Sweden as a SAF Producer

A global and robust SAF Accounting Framework can already be implemented, but there are areas that require alignment, such as the Swedish regulation alignment with the international accounting standards and various SAF-related frameworks, including with the EU. These questions will predominantly be handled at the EU level and Sweden can impact the discussions as a member state. Sweden has a big potential as a SAF producer and the SAF accounting framework could make SAF production more beneficial.

With its focus on decoupling production from consumption, the framework allows SAF produced in Sweden to be credited to airlines or countries worldwide, regardless of where it is physically consumed. This creates an opportunity for Sweden to leverage its sustainable energy resources, feedstocks, and technological expertise to position itself as a key supplier in the global SAF market. This flexibility could support investments in SAF production infrastructure and strengthen Sweden's green energy sector. By integrating to a global SAF market, Sweden can contribute to international decarbonization efforts while fostering innovation and economic development domestically.

SAF research has received MSEK 900 in public research grants since 2011

SAF-Projects that have received most funding:

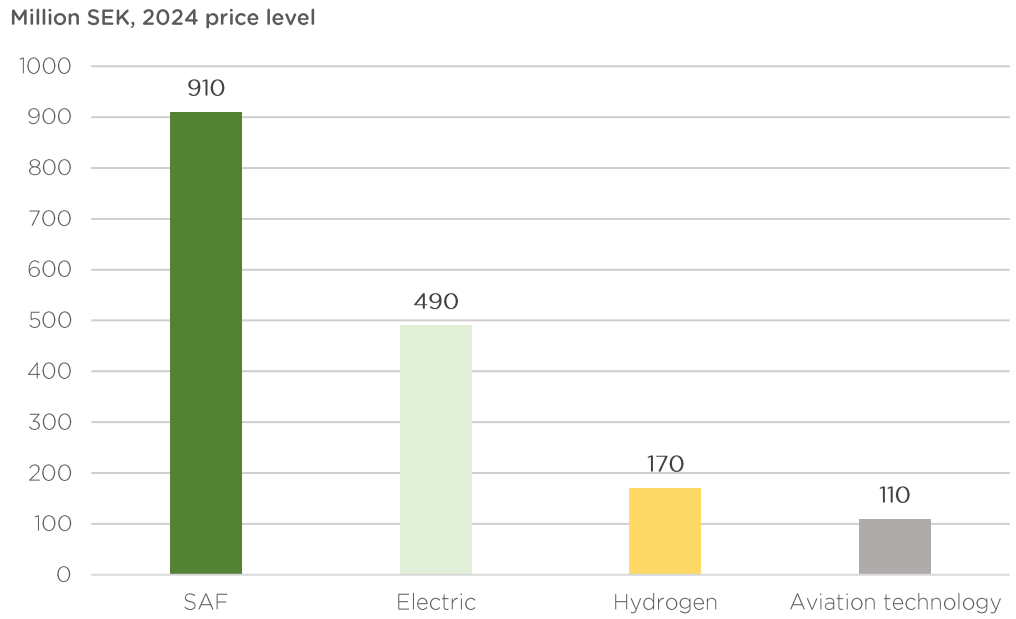
Title: *Biobased production of diesel and jetfuel.*
Coordinating organisation: Chalmers University of Technology.
Funding: 22.5 million SEK (2024 price level).
Description: Develop novel yeast cell factories for the production of hydrocarbons that can be used as jetfuel.

Title: *Increased yield of sustainable aviation fuels from Kraft lignin by multi-strategy approach: fractionation, lignin derivatization, hydroprocessing*
Coordinating organisation; Ren Fuel K2B AB
Funding: 7.2 million SEK (2024 price level).
Description: Being a lignin-based product allows for production of SAF with an inherent aromatic content

Research and development is primarily focused on the development of Sustainable Aviation Fuels

To develop the market and production of SAF in Sweden, there are available funds to apply for at several research funding bodies. According to Ramboll's categorisation, projects focusing on SAF have received 900 MSEK between 2011 and 2024, almost double the amount that has been allocated to electric aviation. And five times the amount to the development of hydrogen-based fuels and airplanes (see figure 2 below).

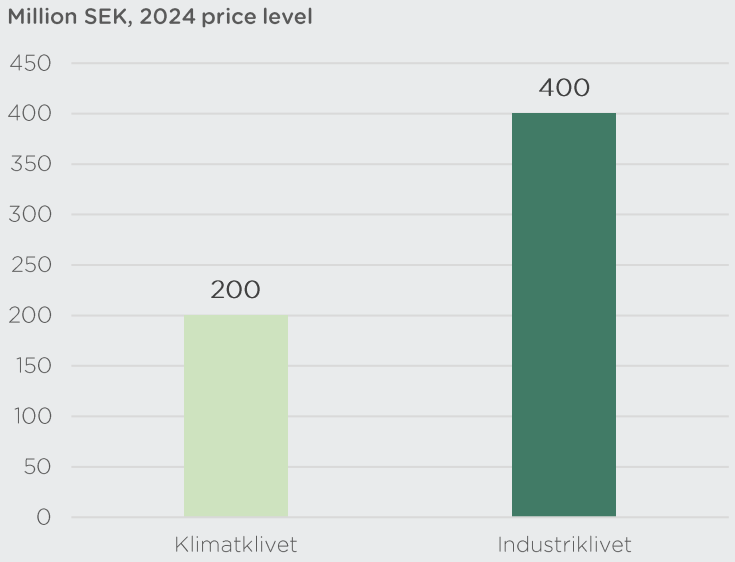
Figure 2. *Public research grants, between 2011 and 2024, categorised by propulsion technology*



Note: The information is gathered from the database Swecris. Swecris compiles information of Swedish research projects from the main research funding bodies. Ramboll have independently categorised projects as "SAF-related" or not. No objective categorisation on that level of detail exists. There are 20 research projects that have been categorised as SAF. A project is only categorised into one category.
Source: Vetenskapsrådet

Sweden uses investment grants to lower the cost of building SAF-producing facilities

Figure 3. *Amount (MSEK) allocated from Sweden's public financing programmes between 2022 and 2023 to SAF-related projects, expressed in 2024 price level*



Note: Ramboll have independently categorised projects as "SAF-related" or not. No objective categorisation exists. The projects have not received funding to only produce SAF, but every project has a clear reference to SAF.
Two SAF-project has received funding from Klimatklivet and five from Industriklivet. The investment support is expressed in 2024s price level. The programmes have been active longer than 2022, but no "SAF-project", has received funding earlier than 2022.
Source: Industriklivet; Klimatklivet

Sweden has two separate public financing programmes that promote SAF-production

Sweden has two financing programmes that co-finance projects which help the transition to net-zero. They are not exclusively focused on SAF-production, but support for SAF-production is eligible under both programmes.

Industriklivet is a Swedish government funding program aimed at supporting industrial transition to net-zero greenhouse gas emissions. It provides financial support for research, innovation, and large-scale investments, focusing on energy-intensive industries and process-related emissions. SAF production is eligible for support under Industriklivet, as it contributes to reducing emissions in line with Sweden's climate goals. The program, managed by the Swedish Energy Agency, has a significant budget of close to SEK 1 billion per year until 2027 and has allocated 7,3 billions in grants since 2018. Almost 400 MSEK has been allocated to projects with the intention of producing SAF* (see figure 3). Industriklivet plays a key role in enabling industries to implement fossil-free technologies and develop solutions that are critical for achieving Sweden's target of net-zero emissions by 2045 (Swedish Energy Agency, 2024)

Klimatklivet is a Swedish government investment program that provides financial support for local and regional initiatives aimed at reducing greenhouse gas emissions. The program funds a wide range of projects, including renewable energy solutions, energy efficiency measures, electrification, and infrastructure for sustainable fuels, such as charging stations and biogas production. Production and infrastructure for SAF are also eligible for support under Klimatklivet, as they contribute to significant emission reductions. Support for renewable hydrogen is eligible, and one project has received 40 MSEK to produce fossil-free hydrogen to replace conventional aviation fuel. Support for production of HVO for road transport *is not* eligible as the demand for HVO is deemed to be guaranteed by the reduction obligation on diesel and gasoline. Klimatklivet has allocated 15 billion SEK between 2015 and 2023. One project has received 160 MSEK to produce E-SAF from captured CO2** (Swedish Environmental Protection Agency, 2024).

Tax incentives could be more efficient than investment grants in stimulating innovation and production

Research suggests that while targeted subsidies like those provided by Industriklivet and Klimatklivet can effectively support high-risk innovations, tax exemptions might be a more efficient alternative in certain contexts. Studies, such as Svensson (2024), highlight that tax incentives can lower administrative burdens, promote broader industry engagement, and enable companies to allocate resources toward their own innovation priorities. Furthermore, a Swedish SAF-producing company interviewed by Ramboll echoed this sentiment, emphasizing that tax relief has a direct impact on the operational equation, making it easier to attract private capital. By allowing firms to retain more capital for R&D activities, tax-based approaches could stimulate more widespread and cost-effective innovation, particularly among small and medium-sized enterprises (SMEs).

**The projects have not received funding to only produce SAF, but every project has a reference to SAF.*
*** Vattenfall*

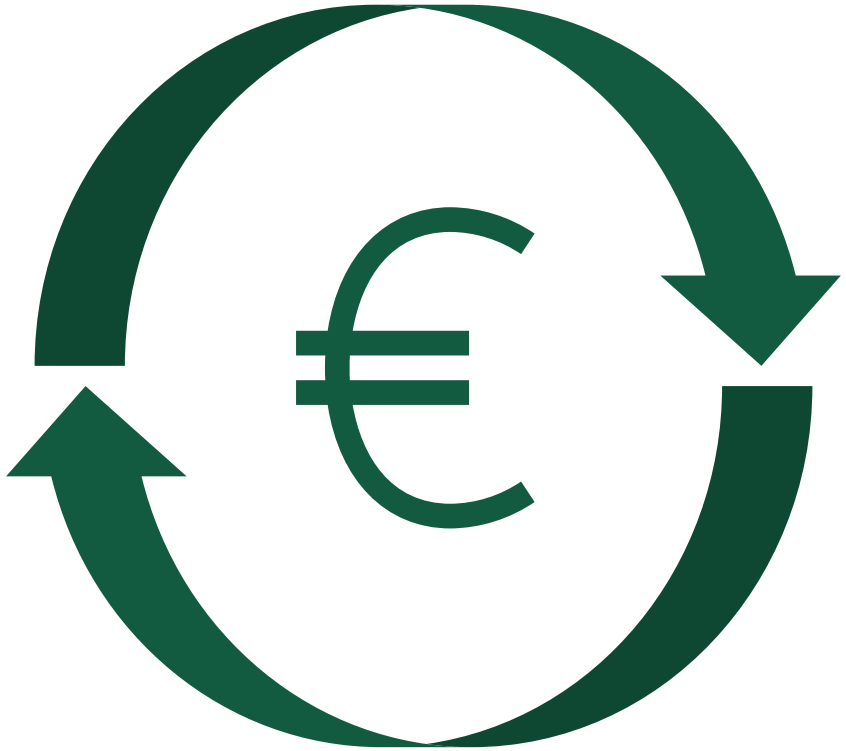
The Swedish state offers credit guarantees for green investments, including SAF production, until at least the end of 2025

To promote green industrial investments that can help Sweden reach its environmental and climate policy goals, the Government gave the Swedish National Debt Office a mandate to provide state credit guarantees (Riksgälden, n.d).

Guarantees could be issued under the scheme until the end of 2025. The guaranteed framework amount to SEK 80 billion (Regeringen, 2024).

- To be eligible for a guarantee, a loan must amount to at least SEK 500 million.
- The guarantee covers up to 80 per cent of the loan.
- Credit guarantees can be issued in Swedish kronor, euros, or US dollars.
- The maximum maturity of a guarantee is 15 years.

Preem, a leading Swedish fuel company, has received a state-backed credit guarantee to fund its transition to producing sustainable aviation fuel at scale. The Swedish National Debt Office has guaranteed 80 percent of a 240 MEUR loan (Riksgälden, 2024).



Swedish policies, regulation and public financing supporting **demand** for SAF

Sweden primarily promotes demand for SAF through regulation

This section provides an overview of the financial and policy instruments available to promote the demand and use of SAF in Sweden. The focus will be on:

- Regulation of the *differentiated take-off and landing charges* and *government grants to non-state airports*
- Subsidies from Swedavia, the state-owned company that operates Sweden´s largest airports.
- The national emission reduction mandate that will be replace by ReFuelEU implying lower, but harmonised, requirements
- Public commitments and how it could promote the use of SAF

The following pages will describe each of these measures in detail, highlighting their scope, eligibility criteria, and role in supporting the use of SAF in Sweden.

Sweden applies both carrot and stick policies to support fossil-free aviation

Overarching goal for Sweden's aviation sector's net zero transition

- All domestic flights departing from Swedish airports must be fossil free by 2030
- All flights that take off at Swedish airports mut be fossil free by 2045

"All domestic flights" is defined and interpreted as that an amount corresponding to fuel consumed within Swedish domestic flights must be refuelled at Swedish airports with fossil-free fuel. Currently, the maximum allowed SAF blend in fossil jet fuel is 50%, but it expected to increase to 100% in the future.

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Policies and regulation mostly focused on indirectly and directly promoting the demand for SAF

There are currently two regulations in Sweden that are designed to indirectly support the demand for SAF and there is one policy that directly subsidies the price of SAF to promote uptake and usage.

Differentiated take-off and landing charges aims to promote the use of SAF and other emissions-lowering activities

The ambition of differentiated take-off and landing charges is to reduce aviation's environmental impact by encouraging the use of cleaner fuels and technologies. Fees are adjusted based on factors such as CO_2 emissions and noise levels, creating incentives for airlines to operate more efficiently and environmentally friendly aircrafts. Aircrafts using SAF, which reduces CO_2 emissions, are expected to benefit from lower charges. By applying the polluter-pays principle, the system aims to support the transition to SAF (Trafikanalys, 2022).

Government grants to non-state-owned airports are conditioned on fossil-free operations and fossil-free infrastructure to ease the transition to SAF

Government grants to non-state airports in Sweden aim to secure access to regional air travel while promoting the transition to more sustainable operations. In 2025, grants come with specific requirements including that airports receiving funding have fossil free operations or can show that they have a plan to become fossil-free. This requirement applies to the airports' own operations, such as ground services, vehicles, and infrastructure (Riksdagen, 2024).

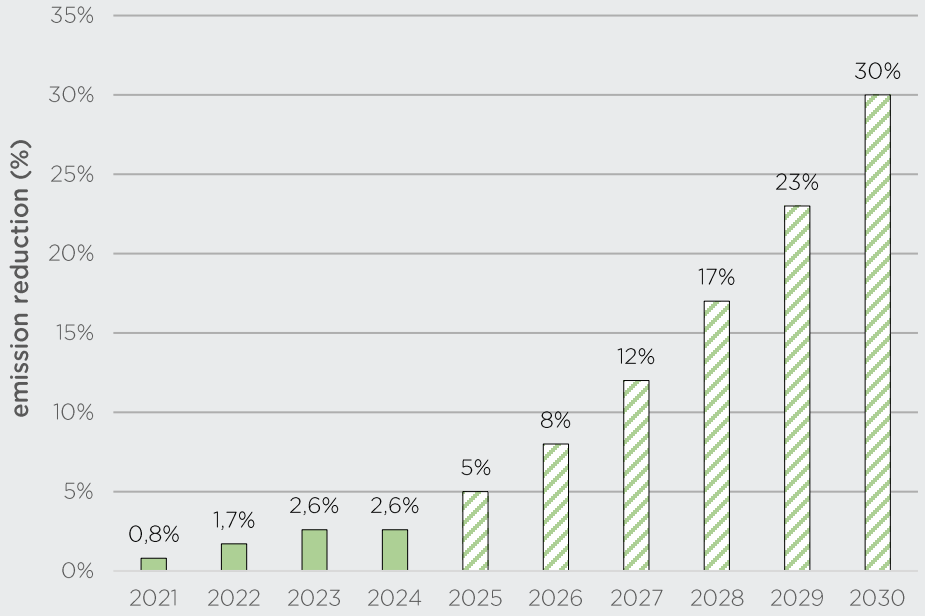
These requirements can indirectly promote the use of SAF by encouraging investments in fossil-free infrastructure, such as fuel storage, refuelling systems, and supply chains compatible with SAF. As airports adapt to meet the fossil-free criteria, they create improved conditions for airlines to access and use SAF, reducing emissions from in-flight operations.

Subsidies from Swedavia directly lower the cost of SAF

Swedavia, a state-owned company that operates Sweden's largest airports, aims for 5% of all jet fuel used at its airports to be renewable by 2025. To support airlines using SAF, Swedavia continues its Sustainable Aviation Fuel Incentive Programme, covering up to 50% of the premium cost for neat SAF for approved applications. Subsidising the price of SAF does directly stimulate demand The minimum support is 125,000 SEK, with a minimum premium cost of 250,000 SEK for an airline group. The total fund available for 2024 and 2025 is 40 MSEK per year (Swedavia Airports, 2024).

Sweden's national emission reduction mandate did not achieve its intended objective

Figure 4. *Sweden's previous national emission reduction target, specifying the required yearly emissions reduction from aviation through the use of SAF*



Note: The percentages are the decided targets, not the outcomes. Sweden's national emission reduction mandate was replaced at the end of 2024. The emission reduction levels for 2024 were frozen at the 2023 levels. The pattern filled bars are the emissions reduction levels that was decided before it was replaced by ReFuelEU.

The national emission reduction mandate was introduced to increase the use of SAF and reduce emissions

Sweden implemented a national emission reduction mandate for aviation fuel in 2021 to encourage the use of SAF and reduce GHG emissions in the aviation sector. The mandate required fuel suppliers to achieve annual reductions in GHG emissions through the blending of biofuels, targeting the reduction levels rather than specifying the share of SAF. The goal was to ensure that blended fuels achieved a certain percentage reduction in emissions compared to pure fossil aviation fuels.

Suppliers that fail to meet the blending ratio requirement during a calendar year or fail to report compliance in time face a penalty fee of 6 SEK per kilogram of CO_2-equivalent emissions. This penalty system places accountability on fuel suppliers rather than end users, such as airlines. This distinguishes the Swedish approach from the EU's ReFuelEU Aviation legislation, which, in 2025, will replace the national mandate. ReFuelEU sets a blending mandate, specifying the required SAF share, unlike Sweden's focus on GHG reduction targets.

Fuel suppliers paid fines rather than reducing emissions

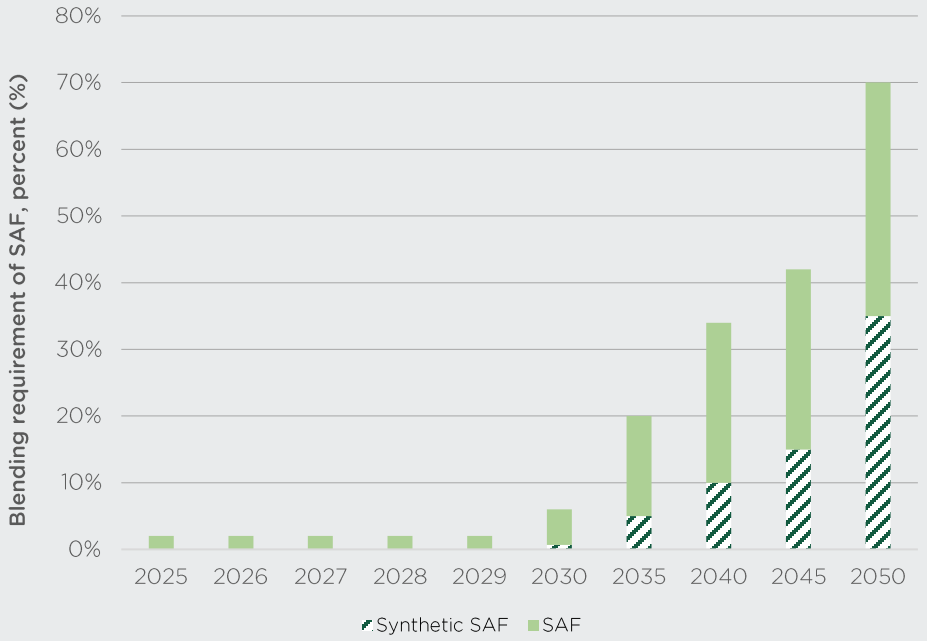
In 2022, Sweden's reduction requirement for aviation fuel was set at 1.7%. However, the actual achieved reduction was 1.2%, approximately 30% below the target. Among the five fuel suppliers subject to the mandate, three failed to meet the requirement and were fined accordingly (Energimyndigheten, 2022).

In 2023, only three out of seven suppliers followed the mandate, and the other four companies had to pay 54 million SEK in fines according to an article in Dagens Nyheter, 2025.

This demonstrates the challenges associated with the national emissions reduction mandate. That suppliers prefer to pay fines rather than buy SAF and reduce emissions means that it is not achieving its intended targets.

ReFuelEU will harmonize requirements, guarantee demand and increase the need for European production of SAF

Figure 4. *ReFuelEU and blending requirement of SAF and synthetic SAF (%) for the years 2025-2030 and 2035, 2040, 2045 and 2050.*



Note: Sweden's national emission reduction mandate was replaced at the end of 2024. Synthetic SAF are defined as aviation fuels that are "renewable fuels of non-biological origin".

ReFuelEU will ensure that demand for SAF increase substantially in the EU

In 2023, the European Union adopted ReFuelEU Aviation to accelerate the decarbonization of the aviation sector. This regulation aims to promote the use of SAF, helping to achieve the EU's climate targets of net-zero emissions by 2050 and a 55% reduction by 2030. Unlike general climate policies, ReFuelEU is tailored to address the unique challenges of aviation.

The regulation sets mandatory SAF blending requirements for aviation fuel suppliers at EU airports, with minimum SAF shares gradually increasing over time. The blending requirement for 2025 is set at 2%. The regulation specifies targets for both biofuels and synthetic fuels (see Figure 4), recognizing their potential to significantly reduce greenhouse gas emissions. By harmonizing these requirements, the EU seeks to avoid market distortions and ensure fair competition among airports and airlines.

Aviation fuel suppliers are responsible for meeting the blending requirements and reporting their SAF use annually. Non-compliance results in financial penalties, and suppliers must compensate for any shortfall in SAF supply during the next reporting period. While the regulation aims to hold suppliers accountable, it also indirectly affects airlines, as the increased costs of SAF are passed downstream from fuel suppliers to airlines.

Production of SAF have to ramp up in order to meet increased demand

The regulation is expected to drive demand for SAF, encouraging investments in production capacity and innovation. Synthetic fuels, including those made from renewable hydrogen, are highlighted as key technologies for the future. However, the transition will require collaboration between governments, suppliers, and airlines to overcome cost and supply barriers, ensuring that SAF becomes a viable alternative to fossil fuels.

ReFuelEU Aviation affects five airports in Sweden, corresponding to 80% of all flights (Transportstyrelsen, 2024). This means that SAF will primarily be delivered to these airports, while smaller airports are unlikely to be prioritized. To discourage airlines from refueling outside the EU to avoid SAF costs, the regulation includes anti-tankering provisions. Airlines must uplift at least 90% of their required fuel at EU airports. This measure aims to ensure consistent SAF usage across the EU and helps maintain the environmental integrity of the mandate. However, the anti-tankering provisions have a potential negative side effect: they could discourage the production of SAF outside the EU.

ReFuelEU and the national emissions reduction mandate results in lower emissions

The national emission reduction mandate corresponds to a higher blending mandate, compared to the ReFuelEU.

Sweden's emission reduction mandate, was not a blending mandate, but was achieved through the use of SAF. Table 1 below shows the corresponding blending mandate for Sweden's emissions reduction mandate.

Table 1. *Comparisons between Sweden's reduction obligation and ReFuelEU 2018-2030*

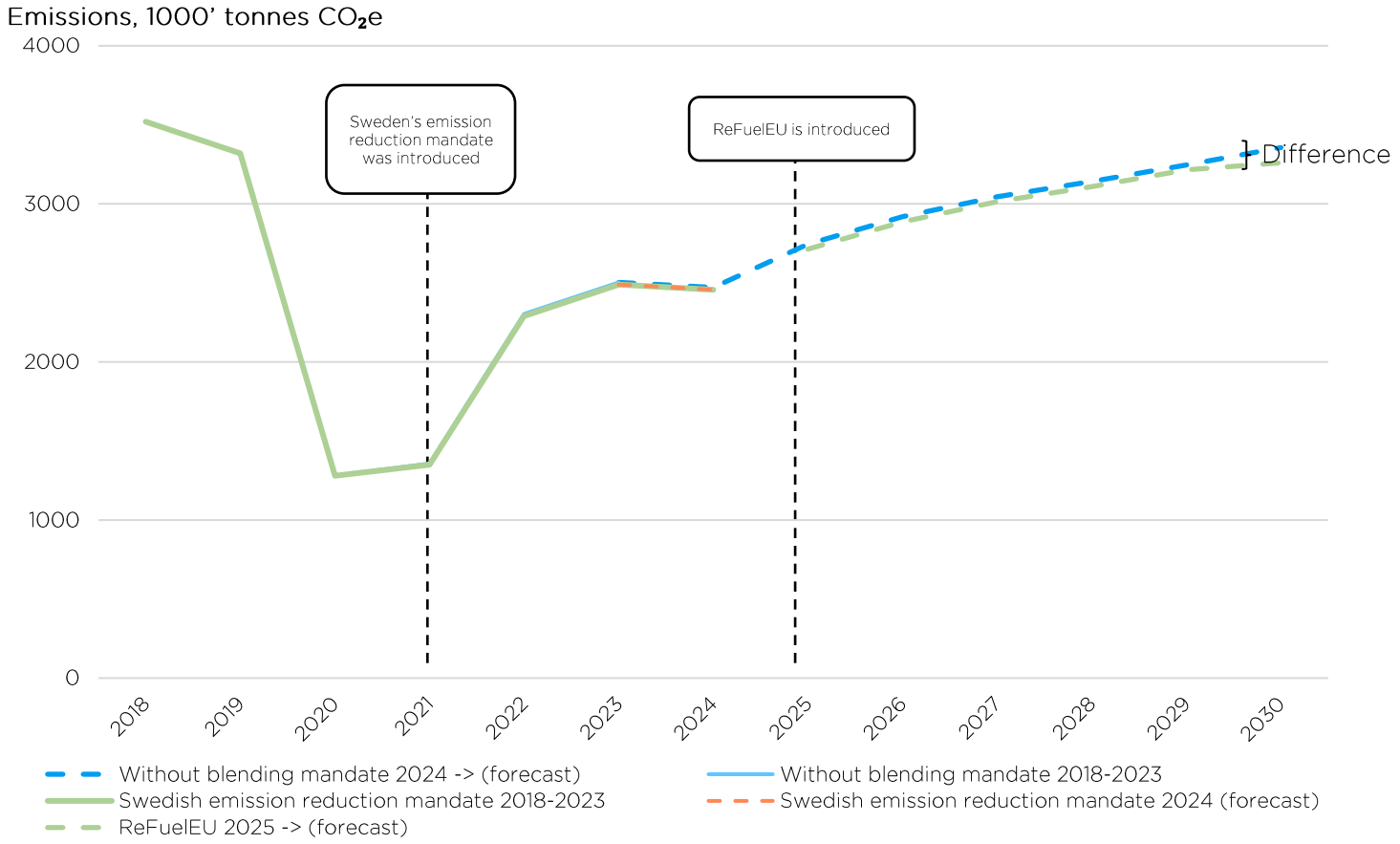
	Sweden emission reduction mandate		ReFuelEU
	Emission reduction mandate (C02e)	Corresponding blending mandate (%)	Blending mandate (%)
2018			
2019			
2020			
2021	0,8%	1%	0%
2022	1,7%	2%	0%
2023	2,6%	3%	0%
2024	2,6%	3%	0%
2025	*4,5%*	*5%*	2%
2026	*7,2%*	*8%*	2%
2027	*10,8%*	*12%*	2%
2028	*15,3%*	*17%*	2%
2029	*20,7%*	*23%*	2%
2030	*27,0%*	*30%*	6%

Note: The Swedish reduction obligation has been made comparable to the ReFuelEUs blending mandate by translating the corresponding blending mandate levels of the reduction obligation using Transportföretagen. The pattern filled part of the table are not relevant for the prognosis.

The introduction of national emission reduction mandate and the ReFuelEU have and will result in lower emissions through blending of SAF

Both Sweden's emission reduction mandate and ReFuelEU promote the demand for and use of SAF, thereby lowering emissions from aviation. The figure below illustrates the difference in how emissions would have developed if none of the policies had been enacted, compared to the situation where Sweden first had a national reduction mandate and, as of 2025, aligned with the requirements under ReFuelEU. For the years 2024–2030, the emissions are forecasted by Ramboll and should not be taken as certainties. See the next page for methods and calculations.

Figure 5. *Comparison of emissions (1000' tonnes CO_2e) from domestic and international aviation in Sweden between 2018 and 2030 depending on whether emissions reductions or blending mandates were in place or not*



Note: Ramboll calculations. The doted lines indicates it is a forecast. See input data for sources and description of calculations steps and assumptions above. Between 2021 and 2030, number of passengers are assumed to increase, explaining why emissions increase despite the blending requirement increasing. The dotted lines indicates that it is a forecast.

ReFuelEU and the national emissions reduction mandate results in lower emissions

Method for calculations

To calculate aviation emissions, we use historic figures and assume that passenger growth corresponds to increased fuel usage. Without a blending mandate, emissions are calculated by multiplying 2.54 tonnes CO_2e/m^3 (historic emission factor) by projected fuel usage.
For the years 2021–2025, which included a reduction obligation, hypothetical emissions are calculated by dividing annual emissions by the national blending mandate percentage, actual SAF usage percentage, and SAF effectiveness. Given that not all fuel suppliers complied, we use the 2022 data (p.26), where only 70% of the reduction obligation was achieved. SAF effectiveness is assumed to reduce emissions by 80% on average.

Under ReFuelEU, we assume 100% SAF uptake, but only for 80% of passengers, as the mandate applies only to flights from five Swedish airports (p.26). This means 80% of fuel is subject to the mandate, and SAF reduces emissions by 80% compared to conventional fuel.

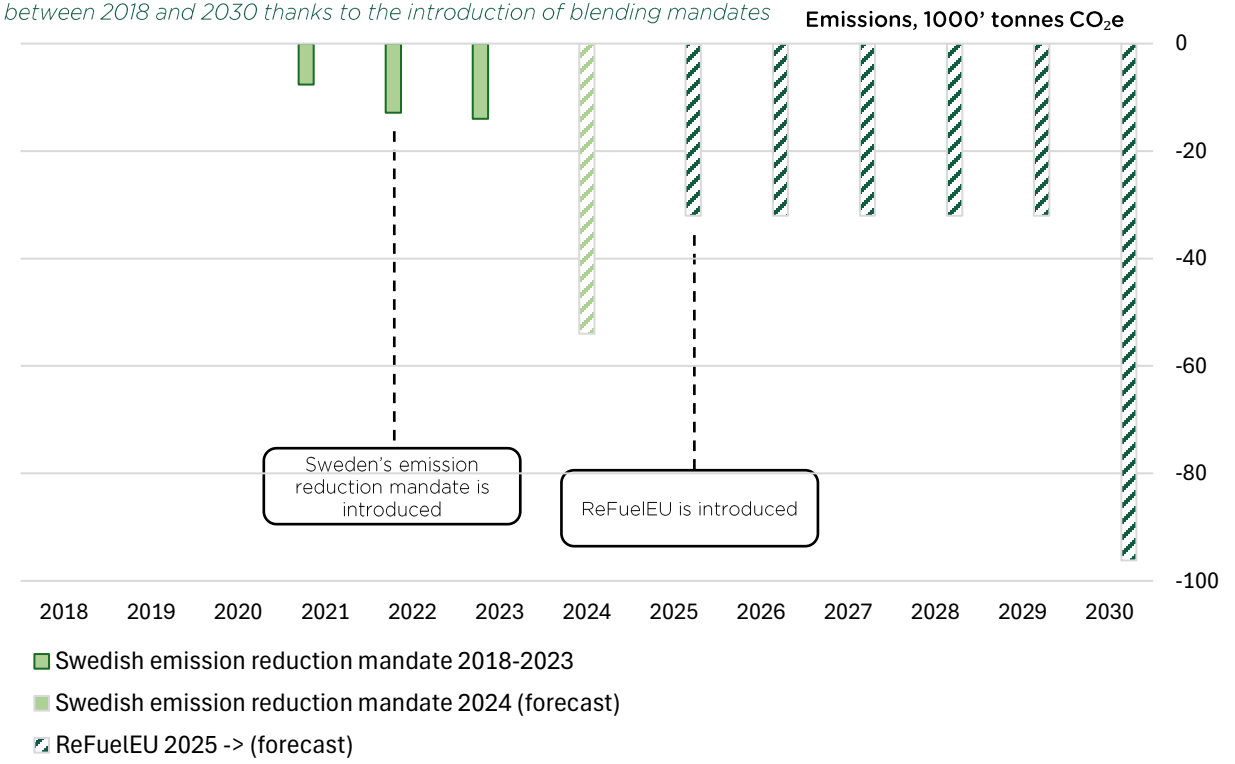
Input data

- The passenger forecast (2024-2030) is from Transportstyrelsen (2024)
- Aviation fuel consumption (2018-2023) is from Energimyndigheten (2024)
- Emissions from domestic aviation (2018-2023) is from Naturvårdsverket (2024)
- Emissions from international aviation (2018-2023) is from Naturvårdsverket (2024)

Accumulated emissions (2021-2030) from aviation in Sweden would have been 300 000 tonnes (CO_2e) higher by 2030, without ReFuelEU and Sweden's previous emission reduction mandate

Accumulated emissions, since the introduction of the Swedish emission reduction mandate (2021) would have been approximately 300 000 tonnes C02e, higher by 2030, according to Ramboll's assessment. See left for method, calculations and assumptions. Total emissions are increasing over the period (see figure 6) because the number of passengers are expected to increase.

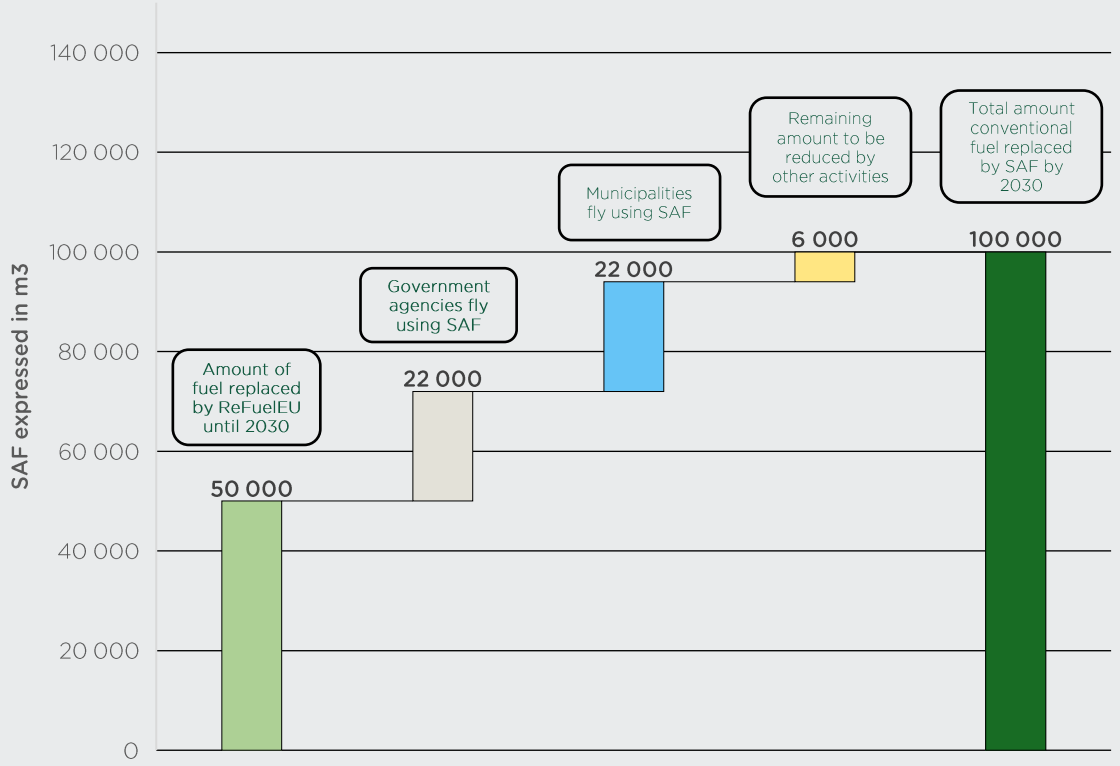
Figure 6. *Reduction of emissions (negative 1000' tonnes CO_2e) from domestic and international aviation in Sweden between 2018 and 2030 thanks to the introduction of blending mandates*



Note: Ramboll calculations. The patterned filled piles indicates it is a forecast. See input data for sources and description of calculations steps and assumptions above. Between 2021 and 2030, number of passengers are assumed to increase, explaining why emissions reductions increase despite the blending mandate.

The Swedish Air Transport Society argues for government agencies and municipalities to purchase SAF for their business travel

Figure 7. Potential pathway to replace 100 000 m3 of conventional aviation fuel with SAF until 2030



Note: 100 000 is chosen since it is approximately the amount of conventional fuel used for all domestic flights in Sweden within a year. This refers to after the pandemic. The main point is to illustrate that government commitments could be as important as ReFuelEU in shifting demand to SAF by 2030.
Source: Fossil Free Sweden – Aviation industry´s roadmap

If government agencies and municipalities change their travel policies to promote the use of SAF, it would have almost as big of an impact as ReFuelEU by 2030.

If government agencies and municipalities were to change their travel policies to promote the use of SAF, it could reduce the use of conventional aviation fuel by 44,000 m³ by 2030, a reduction with an emissions impact comparable to the ReFuelEU initiative.

Today, some agencies and municipalities apply a "flight fee" to fund tree planting and other offsetting activities. However, Fossil Free Sweden*, a government initiative, believes that these funds would be better spent on purchasing SAF. They argue that such investments would directly reduce emissions by replacing conventional jet fuel and would also help develop the SAF market.

In contrast, the Swedish Environmental Protection Agency (Naturvårdsverket) advises against the procurement of SAF for government travel. While they acknowledge that biojet fuel produces lower greenhouse gas emissions than conventional jet fuel, they emphasize that its overall impact on reducing emissions is limited, partly due to the emissions generated during the production of biojet fuel, as well as the additional climate effects of high-altitude emissions. While such a concern is acknowledged, one should note that SAF certification addresses it. SAF must demonstrate a net carbon reduction through a lifecycle analysis (LCA), which is an essential element of sustainability certification.

Naturvårdsverket also points to the high costs and limited availability of SAF, arguing that increased demand could drive up prices and negatively affect other sectors. Additionally, they highlight the lack of a clear legal framework for government agencies to purchase SAF directly. Such purchases, they argue, could undermine the "polluter pays" principle by transferring the financial responsibility for emissions from airlines to government entities.

Instead, Naturvårdsverket recommends focusing on alternative measures to reduce emissions from business travel. These include promoting digital meetings to limit the need for air travel and encouraging the use of sustainable transport options for domestic trips. They believe these solutions are more effective and sustainable for achieving long-term emission reductions.

Naturvårdsverket's recommendation likely impacts the decisions of municipalities and government agencies.

*Fossil Free Sweden has collaborated with Swedish Air Transport Society to identify policies and proposals to enable a green transition within the aviation industry.

Summary of gap analysis

Main insights from gap analysis

- Broad policy frameworks: Swedish SAF policies are embedded in general climate and energy strategies, which make them flexible and technology-neutral. Policies lack a targeted focus on SAF development, which is cause for concern since SAF is the most viable short-term solution.
- Limited SAF-specific measures: Key programs like Klimatklivet and Industriklivet support biofuels broadly but do not differentiate SAF, limiting their impact on aviation-specific needs.
- Need for increased supply: Demand-side measures, such as ReFuelEU, create a pressing need to scale up SAF production and supply. Sweden's access to renewable feedstock and infrastructure make Sweden well-suited for large-scale SAF production, but targeted policies are needed to realize the potential.
- Importance of long-term clarity: A lack of long-term, SAF-specific frameworks and commitments hinders investment and production growth, risking delays in meeting future SAF demand and climate goals.

Sweden's broad and flexible policies provide a strong foundation but risk falling short in driving SAF production

Swedish policy on SAF is embedded within broader climate and energy strategies designed to promote renewable energy and reduce greenhouse gas emissions. This approach ensures flexibility and alignment with EU directives, fostering innovation across sectors, and cost-effective emission reductions. However, the lack of SAF-specific measures risks leaving aviation underprioritized compared to other sectors and renewable energy initiatives. While broad policies provide a foundation for development, they may not adequately address the unique challenges of scaling SAF production and meeting climate goals in the aviation sector.

Key funding instruments, such as Klimatklivet and Industriklivet, offer financial support for biofuel and climate-related projects. However, these programs do not distinguish SAF from other renewable fuels, leading to resource allocation that does not specifically target aviation. Although effective for general advancement of renewable fuels, such as biofuels and electrofuels, this approach limits the ability to address aviation-specific needs. Additionally, existing measures do not provide the long-term clarity required to attract large-scale private investment in SAF production. A Swedish SAF-producing company interviewed by Ramboll echoed this sentiment, emphasizing that tax relief, that has a direct impact on the operational equation, could make it easier to attract private capital.

Demand-side measures, such as ReFuelEU, highlight the growing need for a corresponding increase in SAF supply to meet international and EU-level commitments. Sweden is considered well-suited for large-scale SAF production due to its availability of renewable feedstock, strong industrial capabilities, and established energy infrastructure. With the right policies and investments, Sweden could play a leading role in SAF production. The SAF accounting framework could support investments in SAF production in Sweden, if it is implemented successfully. However, without a clear strategy to scale up supply, it may face difficulties in fully realizing this potential and meeting future demand.

Swedish policies remains broad and technology-agnostic, which encourages innovation across renewable energy sectors. However, this generalist approach creates challenges for SAF, as it competes with other biofuels and renewable technologies for attention and funding. To capitalize on Sweden's natural advantages and increase SAF supply, clearer, long-term frameworks tailored to aviation fuel are essential. Without targeted measures to stimulate production and attract investment, Sweden may miss opportunities to strengthen its position in SAF development while contributing to its climate goals for aviation.

Overview of gap analysis (1/3)

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Prioritise sustainable aviation fuel in refinery output	Repurpose existing financial resources to support SAF production	Public money is directed towards the production and the use of biofuels and electrofuels through investment grants, (such as Industriklivet and Klimatklivet) research grants and credit guarantees. However, there is generally no distinct limitation of eligible biofuels or electrofuels (except Klimatklivet where HVO for road traffic is not eligible).	Public money is directed towards the production and the use of biofuels and electrofuels. However, since there is no separation between SAF, and other biofuels and electrofuels, there is a gap between IATA's desired policy and Swedish policy. The Swedish government could consider prioritizing SAF over biofuels for road traffic where electric vehicles are already commercially viable.
	Shift existing biofuel production capacity to SAF	There are no specific policies aimed at shifting biofuel capacity towards SAF production. However, some policies indirectly impact supply and demand for SAF through their impact on other biofuels. Klimatklivet, the investment program, does not allow support to projects with the ambition of producing HVO for road transports. The reduction obligation for gasoline and diesel for road transport currently in place, increases demand for biodiesel, which uses similar feedstock as SAF. The level of the reduction obligation has been lowered since January 2024.	The rationale behind lowering the reduction obligation for road traffic was to lower consumer prices on gasoline and diesel, not to promote production of SAF. The reasoning behind excluding HVO from Klimatklivet is that the reduction obligation for road traffic provides enough incentives for production of HVO. The conclusion is therefore that there are no policies aimed at shifting biofuel production capacity towards SAF. The Swedish government could consider prioritizing SAF over biofuels for road traffic where electric vehicles are already commercially viable.
	Encourage co-processing	To Rambolls knowledge, there are no policies that encourages or discourages co-processing in jet fuel production. For example, Preem´s Gothenburg refinery can use co-processing.	Since major biofuels producers in Sweden choose co-processing, there seems to be no need to enact policies to encourage co-processing.

Overview of gap analysis (2/3)

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Attract investment for SAF production	Implement coordinated demand-pull and technology-push SAF policies	Demand-pull: ReFuelEU has ensured that a minimum level of SAF-demand is ensured. Technology-push: Sweden has research and investment grants as well as credit guarantees, which can be used to finance biofuel production, such as SAF.	There are both demand-pull and technology-push factors impacting SAF. The difference is that the demand-pull factors are SAF-specific whilst the technology-push factors are not. It is worth noting that the demand-pull factors are EU-driven while the technology-push factors are Swedish. To ensure that neither of the demand-pull nor the technology-push factors dominate the other, continuous re-assessment of the policy mix will be necessary to ensure a coordinated and effective path forward.
	Ensure incentives have realistic duration	Klimatklivet and Industriklivet are established investment programs and can offer support until 2031. Which is a long-period. However, the support is only offered in the initial phase of a project. Sweden lacks more predictable incentives that also support operations such as SAF production. Other initiatives like state-backed green credit guarantees and the research program *Fossil free aviation for the future* will expire in 2025 and 2026.	Predictable and long-term policies will be necessary to encourage investments in large-scale SAF production facilities where the production technology is new and future demand uncertain. Klimatklivet and Industriklivet both have reasonable durations, while the credit guarantees, and the research program expire soon. In addition to incentives that lowers the cost of the initial investments, there might be benefits to consider more predictable incentives that affect operational costs, such as tax credits.
	Increase demand for SAF through governmental commitments	State-owned airports subsidize the use of SAF by covering 50% of the price premium of SAF. Swedish Environmental Agency on the other hand advises against the procurement of SAF for travel by government authorities.	Governmental commitments, in terms of guaranteeing a stable demand for SAF, is lacking in Sweden. This risks leading to deferred investments in Swedish SAF production.
	Ensure SAF policy mixes are technology and feedstock agnostic	The acceptable feedstock for producing SAF within the EU is determined by the Renewable Energy Directive. The Directive states that SAF cannot be produced from feed and food crop-based feedstock, which is allowed in other parts of the world. Sweden does not have a national feedstock regulation. Which technologies that can receive state aid are regulated by EU state aid rules and GBER, and therefore not a national matter.	While safeguarding environmental integrity of SAF, the feedstock regulation is not feedstock agnostic, which limits potential supply of SAF.

Overview of gap analysis (3/3)

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Build a SAF accounting framework	Adopt globally harmonized SAF accounting framework	There is no global SAF accounting framework ready for Sweden to adopt yet. Swedish adoption will likely be dependent on decisions made within the EU.	Since the framework could have economic benefits for Sweden as a SAF producer and exporter, it is important to ensure a globally harmonized framework that encourages SAF exports.
	Facilitate dual conformance in SAF sustainability certification	That SAF certified under either EU RED or the CORSIA requirement should be recognized by each others framework, are not a national policy matter. In Sweden's case, this is decided on EU-level.	Dual conformance would be beneficial for the development of a global SAF market, and a global SAF market could have economic benefits for Sweden as a SAF producer. It is important to ensure global harmonization to encourage SAF production.
Eliminate barriers to SAF distribution and use	Enable access to incumbent fuel infrastructure to SAF	Based on an interview with Swedavia, there are no policies or regulations in Sweden that formally limits the adoption of SAF. Airports could be bound by agreements regarding infrastructure and ground handling agents which sometimes pose as barriers to SAF distribution.	There are no formal policies that discourage distribution of SAF in airports. Still, the government could initiate an official government report to see if there are lock-in effects in infrastructure or ground handling agreements that hinder the distribution of SAF.
Drive diversification and scale-up of aviation cleaner energies	Ramp-up SAF production from non-biological feedstock	The investment program, Klimatklivet, offers support for production of non-biological SAF, such electrofuels. There is also research programs which support that type of research.	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies. The policies do not specifically support SAF production from non-biological feedstock, but their flexible and technology-neutral nature ensure that all promising technologies can participate, without having the government trying (and possibly failing) to pick winners.
	Drive diversification of all aviation cleaner energies	Research and investments into the development of electric and hydrogen aviation have and are eligible for receiving financial support.	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies.
Foster innovation in non-biological SAF	Foster continuous innovation in non-biological SAF	The investment program, Klimatklivet, offers support for production of non-biological SAF, such as electrofuels. There is also research programs which support that type of research.	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies.

New technology

- IATA policy objectives and actions
- Swedish policies, regulation and public financing
- Gap analysis comparing Swedish policy to IATA's policy roadmap

IATA policy objectives and actions related to new technology

New propulsion technologies, including electric aviation and hydrogen-powered aircrafts, are needed for aviation's long-term transition and achieving net-zero CO_2 emissions. These technologies have the potential to reduce carbon emissions while enabling more sustainable air travel. As such, several of IATA's policy objectives and actions emphasize supporting the development and scaling of these new propulsion technologies alongside the required infrastructure.

This chapter focuses on the potential of electric aviation as a key enabler of sustainable aviation in Sweden. We address the importance of electric and hydrogen aviation, and development of this technology in Sweden, and the national and policies that influence its adoption. Additionally, we provide a gap analysis of the Swedish policy landscape in comparison to IATA's roadmap.

Our gap analysis at the end of this chapter uses these policy objectives and actions as a foundation for evaluating the Swedish policy framework and identifying areas for improvement in fostering innovation and infrastructure for electric aviation and other new propulsion technologies.

Policy objective	Motivation	Policy action
Drive diversification and scale-up of aviation cleaner energies	The diversification of aviation cleaner energies through the promotion of a wide variety of feedstock and production pathways will ensure future resilience and scalability.	Drive diversification of all aviation cleaner energies
Adopt new propulsion technologies	Enabling a capitalizing on advancements in propulsion technologies is a further requirement for air transportation's energy transition	Drive diversification of all aviation cleaner energies
		Support development of new propulsion technology
		Support development of new fuelling infrastructure for hydrogen aircraft
Attract investment new propulsion technologies	The scaling up and advancement of new propulsion technologies like hydrogen require significant investment, and policy is needed to help reallocate capital flows more in favour of these.	Provide financial incentives to reduce risks and attract investment in low-carbon technologies.
		Attract investments new propulsion technologies.

National policy supports the uptake of new technology

New technology is supported through research funding, grants and potentially public procurement

This section provides an overview of the financial and policy instruments available to promote the uptake of new technology in Sweden. The focus will be on:

- Funding for research and innovation to advance SAF technologies.
- Grants provided through the public financing programmes *Klimatklivet* and *Industriklivet* to support infrastructure and facilities to promote new technology.
- Potential market introduction subsidy to subsidise purchase of electric airplanes
- Public procurement to include electric aircrafts for aviation routes under public service obligations

The following pages will describe each of these measures in detail, highlighting their scope, eligibility criteria, and role in supporting the development of new technology in Sweden.

Public funding supports research and development of new propulsion technologies

Figure 9. *Public research grants to new technologies, between 2011 and 2024, categorised by propulsion technology*

Note: The information is gathered from the database Swecris. Swecris compiles information of Swedish research projects from the main research funding bodies. Ramboll have independently categorised projects as "into their category. No objective categorisation on that level of detail exists.. A project can only exist in one category
Source: Vetenskapsrådet

The main research funding program is the Swedish Energy Agency´s research and innovation program that has financed projects focusing on new technology within aviation

The Swedish Energy Agency had an initiative, called *Fossil-free aviation* between 2018 and 2023 aimed at accelerating the transition to fossil-free aviation. This initiative focuses on developing sustainable technologies and infrastructure for electric and hydrogen-powered aviation. It has since been prolonged and the new initiative called *Fossil-free aviation for the future* supports have 50 MSEK to support projects that finishes at the end of 2026 at the latest. The time for application has closed but it was possible to apply for support for the following areas until the end of 2023 (Energimyndigheten, 2024):

- Technologies for sustainable aviation fuels
- Development of electrified- and hydrogen aviation
- System analysis – drivers for change and policies
- Innovation clusters
- Information sharing, networking and development of new research ideas

The idea behind the initiative was to complement the program Industriklivet (described at p.19) with more focus on aviation. There are currently no information regarding the initiative's continuation in the future.

Below is an overview of some key projects that have previously received funding:

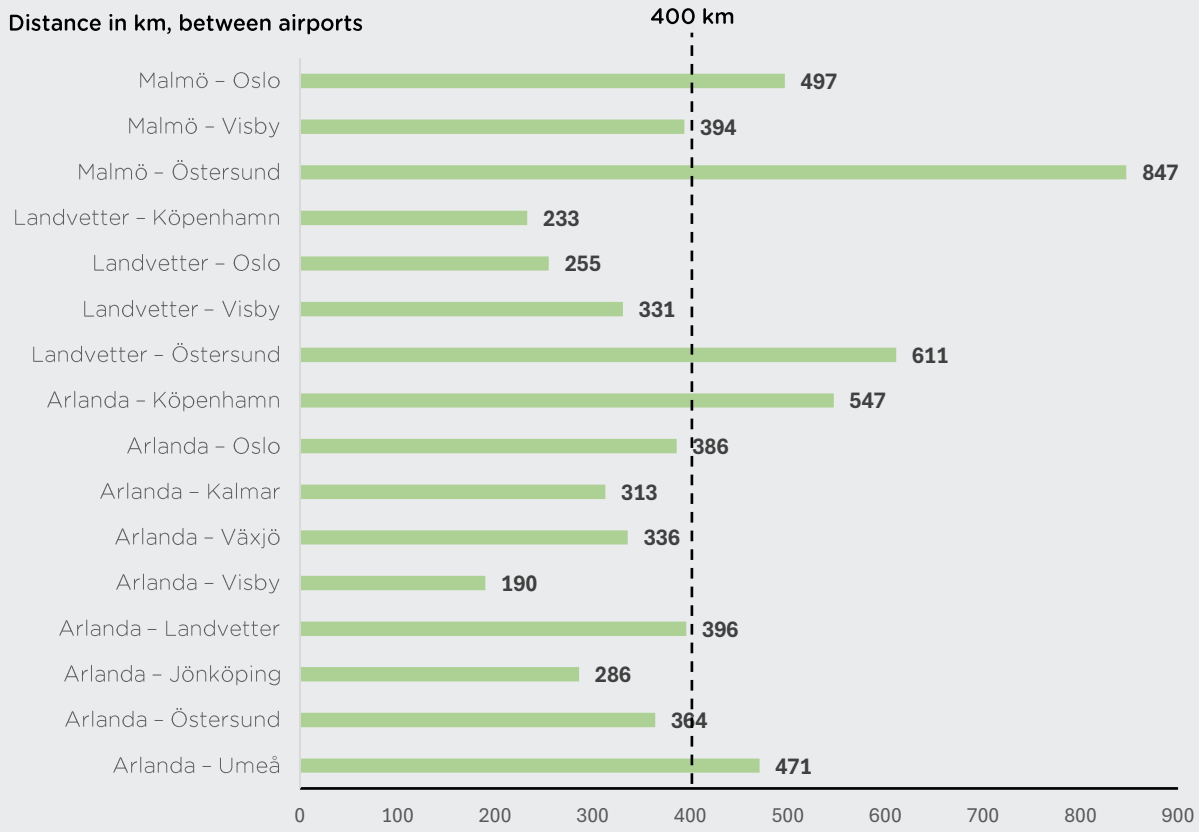
H2JET was initiated to develop critical subsystems required for the use of cryogenic hydrogen as fuel for future fossil-free aircraft. The focus areas included high-pressure fuel pumps, cryogenic fuel lines, and heat exchangers to preheat hydrogen using engine exhaust heat. The project advanced the understanding of the challenges associated with cryogenic hydrogen, delivering prototypes for key components and establishing a foundation for hydrogen-powered aviation.

Another project, *Tanks for Liquid Hydrogen*, sought to design ultra-light, durable tanks for storing liquid hydrogen in aircraft. It addressed technical challenges such as gas permeability and microcracking at extremely low temperatures. The project successfully developed and tested composite tanks under relevant conditions, demonstrating their potential for safe and efficient hydrogen storage in aviation.

The *E-THRUST project* aimed to optimize the design of hybrid-electric and hydrogen-powered aircraft for regional routes, while also conducting a techno-economic risk analysis of infrastructure and market readiness. Using multidisciplinary computational tools, the project assessed performance, environmental impact, and operational aspects. These findings provided valuable insights into the opportunities and challenges of implementing hybrid and hydrogen-powered aviation technologies.

Electric aircraft are a solution for regional aircraft

Figure 10. *Distance, in kilometres, between airports in the Nordics.*



Note: Since the travel distance of future electric aviation is still unknown, the purpose is to illustrate that many short flights could be replace by electric aviation in theory, even if 400 km is to optimistic or not.

Electric aviation can play an important role for short-haul flights in the future

In the government's latest Climate Action Plan (2023), the government highlights that aviation is critical for connectivity, but it is facing a difficult net zero transition. In the short term, the use of SAF will be critical. Electric aviation, and hydrogen, is developing and will be able to replace conventional aviation on mostly shorter routes in the future. Until then, aviation will be dependent on SAF for the transition to net-zero. Research indicates that the first commercial electric airplanes will be able to fly around 200-500 km. The figure to the left shows which flights that are shorter than 400 km and therefore could be replaced by early commercial models of electric airplanes.

The government might propose a market introduction subsidy to promote early adoption of electric aircraft

In the government's Climate Action Plan (2023) there is a proposal to introduce a market introduction subsidy to make it easier and more affordable for early adoption of electric aircraft in Sweden, with the goal of reducing the aviation sector's climate impact, encourage technological innovation, and help position the Swedish aviation sector internationally.

The proposal apply to fully electric aircrafts powered by batteries or fuel cells, as well as hybrid electric aircrafts (combining electric and conventional engines). In the future, hydrogen-powered aircrafts may also be included.

The proposed subsidy would cover part of the cost of purchasing or leasing electric aircraft. For example, the price premium for a 30-seat electric aircraft compared to a standard aircraft could be up to 32 MSEK, depending on EU regulations and the aircraft's cost. The subsidy could be introduced as early as 2026, when the first suitable electric aircraft for Swedish commercial and freight operations are expected to enter the market.

This initiative is designed to reduce the financial risks of investing in electric aircraft while accelerating technological advancements in the aviation sector (Energimyndigheten, 2023)

The Government considers using public procurement to promote early adoption of electric aircrafts on public service obligation routes

The government tasked Trafikverket (Swedish Transport Administration) with analysing the feasibility of including electric aircraft in public procurement for aviation routes under public service obligations (PSO) (Trafikverket, 2024). The aim was to assess whether current regulations permit such requirements and to identify actions to support the early adoption of electric aviation.

Trafikverket concluded that existing EU regulations do not clearly allow mandatory fossil-free aviation requirements, such as electric or hydrogen-powered aircraft, in procurement processes. This legal uncertainty poses a significant barrier unless regulatory changes are made.

They also identified economic concerns, noting that mandating electric aircrafts could reduce competition, as few operators could meet such requirements. This might increase costs for the state and discourage bidders. Furthermore, airport infrastructure is insufficient to support electric aviation, requiring significant investment, and airlines face financial challenges in adopting these technologies.

Trafikverket proposed alternative measures to encourage electric aviation. Financial support for airports and airlines could facilitate investments in necessary infrastructure and technology. Environmental criteria could also be used as non-mandatory evaluation factors in procurement, promoting fossil-free solutions without limiting competition. Additionally, they recommended pilot projects on shorter routes, such as Östersund-Umeå or Pajala-Luleå, to test and demonstrate the viability of electric aircraft in government-contracted air traffic.

Since the emissions on these routes only account for 1.5 percent of total emissions from aviation, its primary benefit is potentially to display the solutions viability.

1.5 percent (%)

- The share of emissions from aviation routes under public service obligations.

Summary of gap analysis and overview table

Sweden offers a policy mix that promotes innovation but there are risks with one-sided focus on electric aviation

Sweden's technology-neutral approach to aviation policy provides a solid foundation for fostering innovation and aligning with EU climate directives. By allocating funding for new technologies and aviation innovation, including support through the Swedish Energy Agency, Sweden demonstrates a commitment to advancing sustainable aviation. Programs like the Swedish Energy Agency's research initiative have been instrumental in driving progress and should be continued to maintain momentum in electrified and hydrogen aviation development.

While the government's focus on electric aviation is praiseworthy, it may be too narrow to address the broader needs of the aviation sector's transition to net-zero emissions. Hydrogen-powered aviation is expected to play a critical role in the future, and policies should reflect a balanced approach that supports multiple propulsion technologies.

The possible proposition for a market introduction support for electric airplanes is a positive step toward reducing adoption barriers. However, this support should not crowd out investments in SAF, which remain essential for decarbonizing medium- and long-haul flights. Furthermore, funding for electric aviation should avoid reliance on aviation taxes, as this could undermine the overall competitiveness of the sector.

A balanced and inclusive policy framework is needed, ensuring that investments in electric aviation, SAF, and hydrogen technologies are complementary, not competing, to maximize Sweden's potential in sustainable aviation.

Overview of gap analysis

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Adopt new propulsion technologies	Drive diversification of all aviation cleaner energies and Support development of new propulsion technology	Swedish policy is generally technology-agnostic and offers support for multiple propulsion technologies. Especially the Swedish energy agencies research program, *Fossil free aviation.* The suggestion to use public procurement to promote early adoption of electric aircraft can drive innovation.	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies. It is important that the research program, *Fossil free aviation* secures funding to keep promoting innovation.
	Support development of new fuelling infrastructure for hydrogen aircraft	Swedavia (state-owned airport operator and owner) Airbus, Avinor, SAS and Vattenfall have signed a Memorandum of understanding (MoU) to work together to develop infrastructure for hydrogen aviation at airports in Sweden and Norway. Klimatklivet also supports investments into fuelling infrastructure in the transport sector.	New fueling infrastructure for hydrogen is being developed at Sweden's largest airports partly thanks to the support of state-owned airports and investment grants.
Attract investment for new propulsion technologies	Provide financial incentives to reduce risks and attract investment in low-carbon technologies.	Swedish policy is generally technology-agnostic and offers support for multiple propulsion technologies. Especially the Swedish energy agencies research program, *Fossil free aviation.* The suggestion to use public procurement to promote early adoption of electric aircraft can drive innovation and the possible market introduction subsidy for electric airplanes would reduce risk and attract investments.	The policy mix is well-balanced for attracting investments in low-carbon technologies. The possible market introduction subsidy for electric airplanes will help in reducing risks and attracting investments. However, the specific focus on electric aircrafts could overlook other technologies such as hydrogen.
	Attract investments in new propulsion technologies.	See description above.	See assessment above.

Offsets and removals

- IATA policy objectives and actions
- Need for offsets and removals to reach net zero
- Swedish policy, regulation and public financing
- Gap analysis comparing Swedish policy to IATA's policy roadmap

IATA policy objectives and actions

According to IATA, offsets and removals are expected to represent around one-fifth of the emissions cuts necessary to reach net zero air traffic. To achieve this, policy support is needed both to increase supply of removals and to create a well-functioning and reliable market for offsets.

The table to the right summarizes IATA's policy roadmap related to carbon offsets and removals, including three high-level policy objectives and four policy actions.

This chapter focuses on the policy actions in IATA's roadmap for which important advancement and initiative can be implemented on national level; 1) carbon removals policy framework and 2) facilitating the CORSIA EEUs market. The other two policies are governed internationally and not within Sweden's direct control. Therefore, they are not on focus in this report.

Our gap analysis at the end of this chapter takes these policy objectives and actions as starting point for assessing the Swedish policy landscape.

Policy objective	Motivation	Policy action
Ensure environmental integrity of offsetting credits	Establishing robust standards for offsets and alternative fuels' environmental and sustainability credentials is indispensable for proper tracking and verification so that obligations can be met.	Adopt globally harmonized sustainability criteria for offsets and alternative fuels*
Enhance R&D to novel CDR technologies	Investing in research and development of innovative carbon capture and removal technologies is a must, as all levers will be needed to deliver air transportation's decarbonization.	Implement technology-agnostic policy frameworks for carbon removal
Unlock CORSIA Eligible Emissions Units (EEUs)	To maximize CO_2 emission reductions under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), states must unlock sufficient quantities of Eligible Emissions Units.	Harmonize ICAO and UNFCCC frameworks*
		Unlock market for CORSIA EEUs

* The policy action has a global focus and is thus not in focus in this national study.

Need for offsets and removals to reach net zero CO_2 emissions in aviation

According to the IPCC, three key principles must be met for a process to qualify as CDR (IPCC, n.d.):

- CO_2 must be captured and stored directly from the atmosphere. Capturing and storing emissions from fossil-fuel based processes does not result in removals.
- CO_2 must be securely stored, ensuring it is not re-released into the atmosphere.
- CDR is based on human intervention, excluding natural processes like forest regrowth or ocean uptake of CO_2.

Carbon dioxide removal (CDR) technologies will be essential to address residual emissions from air transportation

While fuel shifts and technological and operational improvements can significantly reduce emissions, some residual emissions are likely to persist by mid-century. This is the case particularly for long-haul flights where no alternative will be available within the timescale. CDR can balance out these unavoidable emissions, allowing the aviation sector to achieve net-zero by removing an equivalent amount of CO_2 from the atmosphere.

The IATA net-zero roadmap projects that carbon removal offset credits will account for approximately 20% of the total CO_2 emissions reductions towards net zero aviation (IATA, 2024). To achieve this, stronger support to research, development and deployment of CDR technologies is needed.

Deployment of CDR must allow for a diverse range of technologies

CDR technologies can be broadly categorised into conventional and novel CDR, both of which are important to achieve necessary removal levels.

- Conventional CDR include afforestation, reforestation, and soil carbon sequestration. These solutions are mature and can be implemented at scale today.
- Novel CDR encompass removal technologies at different maturity level but that are yet to reach commercialisation, including biochar, Biomass/Bioenergy with Carbon Capture and Storage (BioCCS/BECCS), Direct Air Carbon Capture and Storage (DAC), Enhanced Rock Weathering (ERW) and marine CDR technologies.

Novel CDR technologies will require policy support to deliver removals at scale. Depending on the characteristics and maturity level of CDR technologies, different instruments can be considered, such as research, development or deployment grants, tax credits, loans and de-risking mechanisms (supply) or purchasing programs, market mechanisms (demand).

Make certified carbon offset credits readily accessible for airlines

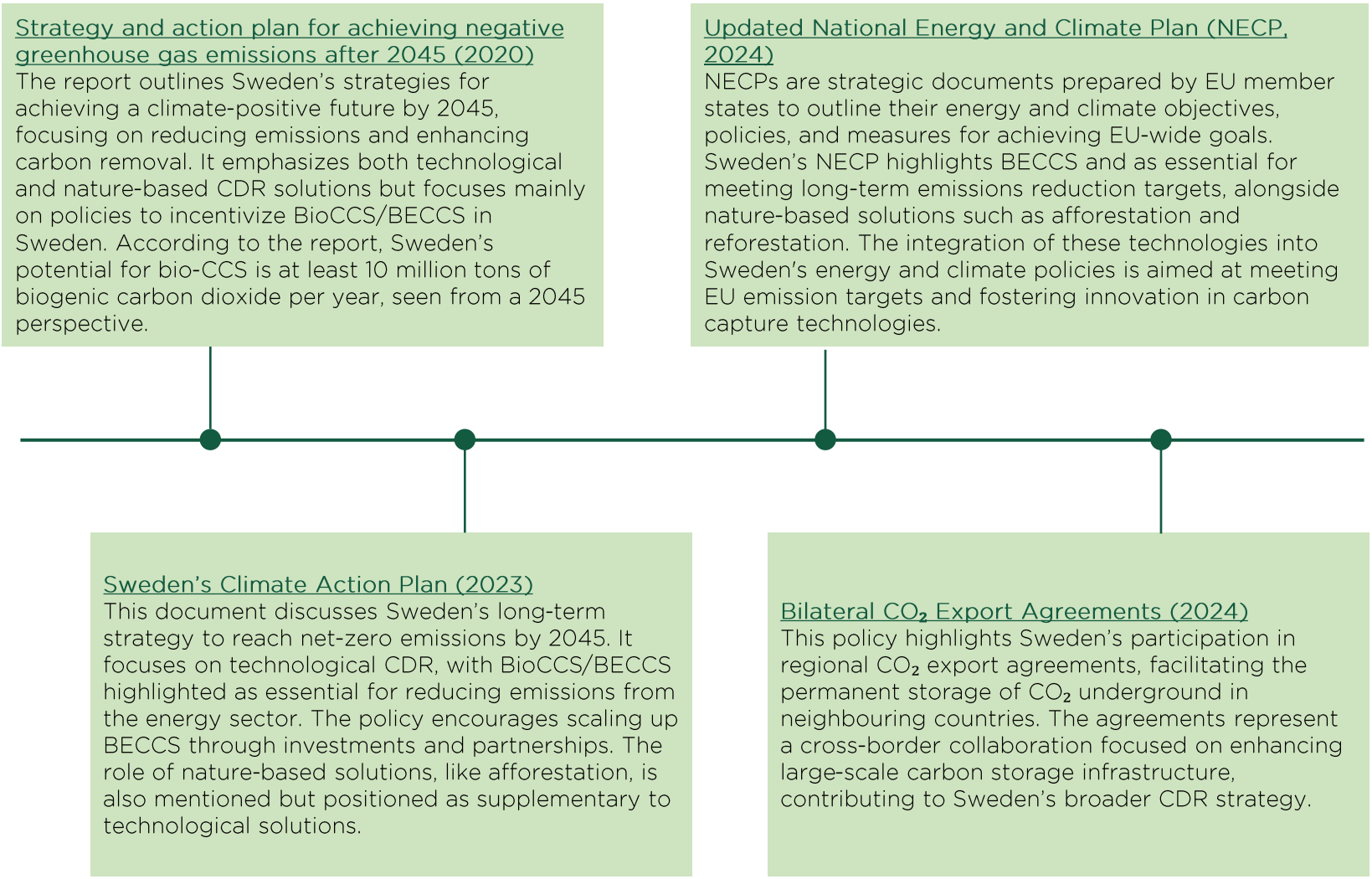
To assist airlines in meeting their offsetting obligations and reducing CO_2 emissions under CORSIA, Eligible Emission Units (EEUs) must be accessible to airlines. The country where the units come from must approve their use by issuing a Letter of Authorization (LoA) and making a corresponding adjustment in their national registry, in line with Article 6 of the Paris Agreement (ICAO, 2024).

National policy

Sweden demonstrates encouraging policy agenda to promote carbon removals

CDR policy in Sweden has developed into a central element of the country's climate strategy, with a strong focus on BioCCS/BECCS. Further, Sweden is actively fostering collaborations with neighbouring countries to scale up these technologies, particularly for CO_2 storage.

Key guiding policy documents highlight the importance of both technological and nature-based CDR solutions, with BECCS being a primary driver. The policies aim to leverage innovation, regional cooperation, and technological deployment to help Sweden meet its ambitious net-zero emissions goal by 2045.



National policy

Funding for innovation & scale-up of carbon removals mainly targets BioCCS/BECCS technologies

Sweden has two key support instruments for financing novel CDR technology scale-up; a reversed auction mechanism (below) and a grant scheme (right).

Most of the funding is directed towards BioCCS/BECCS projects, in line with Sweden's overall CDR agenda. It is also important to note the difference scale of funding between the two instruments; where the reversed auction SEK 36 billion in support over two decades (2026-2046), Industriklivet as allocated around SEK 0.3 billion between 2019-2024.

Reversed auction for BioCCS/BECCS

The Swedish Energy Agency has established a significant support system for BioCCS/BECCS projects through a reversed auction mechanisms, where companies offering the lowest compensation per ton of captured, transported and stored CO_2 are selected. The goal is to capture and store 2 Mt of biogenic CO_2 per year by 2030.

Eligible applicants include entities operating facilities in Sweden capable of contributing to secure and permanent removals through Bio-CCS. The mechanisms allocates a total SEK 36 billion (EUR 3.14 billion) between 2026-2046, covering both up-front investment and operational expenditures. Approved projects will receive support payments over a period of up to 15 years, starting from when the CO_2 storage commences.

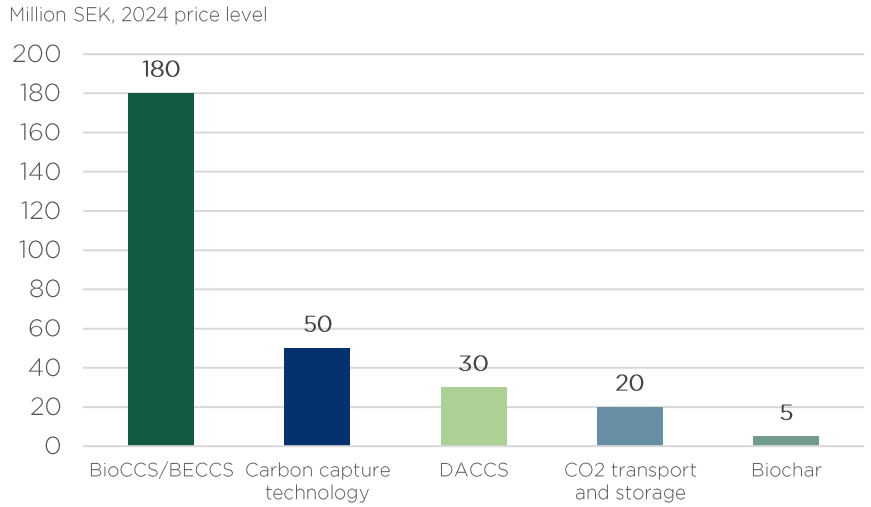
The first call closed in Q4 2024 with six applications submitted. The result was announced in January 2025 and Stockholm Exergi was granted SEK around 20 billion, to be payed out continuously to help cover both investment and operational costs (Swedish Energy Agency, 2025).

Industriklivet

Industriklivet is a Swedish government funding program aimed at supporting industrial transitions to net-zero greenhouse gas emissions (see slide 19 for more information on Industriklivet).

Industriklivet offers funding to support the development of various CDR technologies. Since 2019, Industriklivet has allocated funding to BioCCS/BECCS (180 million SEK), by DACCS (30 million SEK) and biochar (5 million SEK). Another 70 million SEK has been provided to projects within carbon capture technology (50 million SEK) and CO_2 transport and storage (20 million SEK), which provide process innovation and infrastructure necessary for BioCCS/BECCS and DACCS. Hence, improvements in capture, transport and storage technologies also play a key role in commercialising CCS-based CDR.

Figure 8. *Amount (MSEK) allocated from Industriklivet to CDR RD&D from 2019 to date, expressed in 2024 price levels*



Note: Ramboll have independently categorised projects according to the different categories. In total, 52 projects were identified; 28 BioCCS/BECCS projects, 11 carbon capture technology projects, 3 DACCS projects, 9 CO_2 transport and storage projects and 1 biochar project. Project that fall within multiple categories were allocated to the most relevant category. The projects identified in the categories 'carbon capture technology' and 'CO_2 transport and storage' focus explicitly on these processes as they can advance innovation and reduce costs for BioCCS/BECCS and DACCS; projects that promote industrial fossil-fuel CCS were not included. The investment support is expressed in 2024s price level.
Source: Industriklivet

Alignment of Swedish and international policy

Sweden is well-placed for CORSIA implementation, but actions relating to CORSIA EEUs are managed on EU level

CORSIA is a global market-based voluntary initiative by ICAO to limit CO_2 emissions from international aviation by requiring airlines to offset emissions exceeding 85% of 2019 emission levels. As of January 2025, 192 countries participate in CORSIA, including all EU countries (ICAO, 2024).

Climate impacts from EU air traffic are governed by the EU ETS and CORSIA

In the EU, CORSIA is implemented as part of the EU ETS, making it mandatory for EU countries. The revised EU ETS Directive (2023) clarified how to report and monitor emissions from European air traffic (European Commission, n.d.):

- Flights between EU ETS countries* are covered by the EU ETS and its mechanisms for emissions reductions within these countries.
- Flights to countries participating in CORSIA either departing from or arriving in EEA countries are covered by CORSIA.

Procedures for CORSIA offsetting in Sweden are mainly decided on EU level

Emission offsetting under CORSIA is achieved through acquiring and cancelling approved carbon credits, known as Eligible Emission Units (EEUs). While ICAO typically defines eligible offsets schemes, the EU is developing its own criteria for EEU carbon credits.

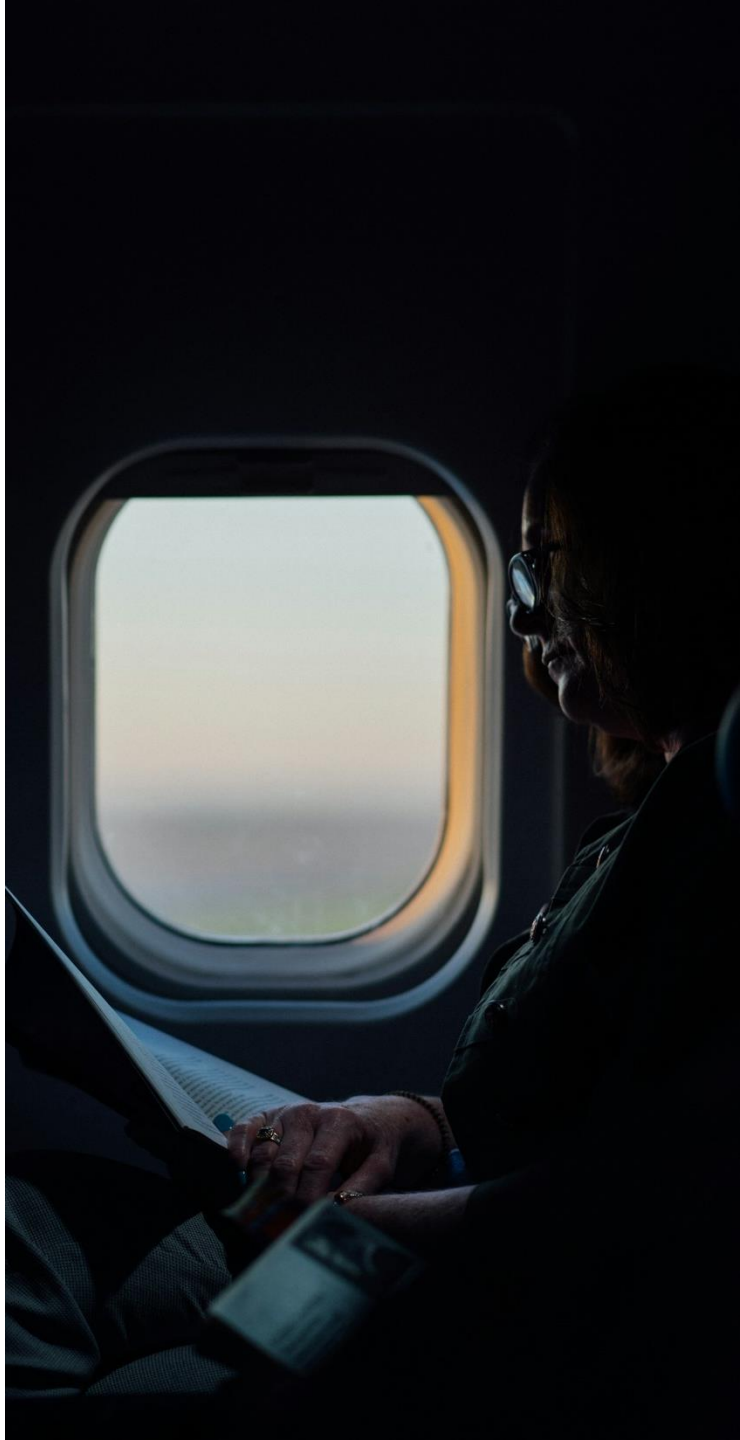
Moreover, countries are required to make EEUs available for usage in CORSIA by providing a letter of authorization and must, once the credit is purchased, adjust their emissions accounting to avoid double claiming through so called corresponding adjustments under Paris Agreement Article 6. The Swedish Energy Agency assesses that individual EU Member States are not currently allowed to make corresponding adjustments, as this responsibility is managed at the EU level, limiting Member States' ability to offer CORSIA EEUs. Certain carbon credits can still be purchased and used by airlines without the need for nations to conduct corresponding adjustments (Schneider, L. 2023). However, in this case, airlines cannot claim its use under CORSIA.

Still, Sweden promotes effective implementation of CORSIA and works to advance offset markets

Sweden sees CORSIA as an important policy for air traffic and promotes the ambitious development of CORSIA in line with the Paris Agreement. For this purpose, Sweden calls for alignment and consistency between reporting, monitoring and verification requirements of CORSIA and EU ETS while ensuring environmental integrity.

The Swedish Environmental Protection Agency coordinates Sweden's participation in EU ETS and CORSIA and organizes annual stakeholder meetings with other government agencies to aid implementation.

Sweden is also engaged in advancing global carbon markets, including several bilateral agreements under Article 6 of the Paris Agreement and a Swiss-Swedish pilot project exploring the possibility of trading negative emissions (e.g., bio-CCS) between the two countries.



* The EU ETS applies to countries within the European Economic Area (EEA); EU27, Iceland, Liechtenstein and Norway

Summary of gap analysis

Main insights from gap analysis:

- Sweden actively supports carbon removal technologies, integrating removals into its climate policy and pioneering initiatives
- Sweden's reversed auction mechanism for BioCCS/BECCS demonstrates innovative policy design, leveraging abundant biomass resources and infrastructure to scale domestic removal capacity. Differentiation of carbon removals could be achieved by increased support to other technology solutions.
- Sweden advocates for harmonizing CORSIA and EU regulations, advancing offset markets, and fostering international carbon removal credit trade, as seen in its bilateral pilot with Switzerland.

Forward-leaning Swedish efforts on carbon removals and offsets could be further improved by supporting a more diverse set of removal technologies

This analysis shows Sweden's active contribution to drive carbon removal supply and the development of well-functioning offset markets. Offsets and removals are essential components in achieving net zero emissions in aviation, providing both immediate and long-term solutions to reduce greenhouse gas emissions. However, several concerns must be addressed to maximize their potential and ensure their effectiveness for the aviation sector.

Policy and market incentives are essential to reduce costs and overcome technological uncertainties associated with the deployment of high-quality and permanent carbon removals, which remain largely underdeveloped. Sweden has made progress in this area, integrating removals as a key part of its climate policy framework. In recent years, several measures and funding instruments to scale up domestic removal capacity and facilitate cross-border CO_2 transportation and storage have been introduced.

Notably, Sweden is pioneering BioCCS/BECCS deployment, highlighted by its reversed auction mechanisms for these removal technology. This initiative stands out for its scope, design, long timeframe (2026–2046), and substantial funding amount (36 billion SEK, approximately 3.6 billion EUR). While funding is also available for other carbon removal technologies, such as direct air capture and biochar, the scale of the reversed auction underscores Sweden's more narrow focus on BioCCS/BECCS as the primary route to increase removal capacity. This focus is logical considering Sweden's large volumes of biomass resources and its well-developed wood processing industry together with a network of biomass-fueled combined heat and power plants, making it a major source of biogenic CO_2 emissions. Nonetheless, increasing support for other removal technologies could be consider to expand and differentiate carbon removal supply.

For offsets, Sweden has made necessary efforts to ensure CORSIA implementation by Swedish airlines in line with EU regulation. However, many of the procedures for securing CORSIA-eligible offsets appear to be managed at EU-level, though there are still uncertainties regarding EU vis-a-vis Member State mandates and room for action. Further, Sweden advocates for strengthened harmonization of requirements of CORSIA and the EU policy framework. Sweden also supports the advancement of offset markets and international transfers of carbon removal credits under Article 6 of the Paris Agreement, not least through an ongoing bilateral pilot project with Switzerland to explore the potential for reciprocal trade of carbon removals.

Overview of gap analysis

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Enhance R&D to novel CDR technologies	Implement technology-agnostic policy frameworks for carbon removal	Carbon removals is seen as a key element of the national climate policy, highlighted in main strategy documents such as the Swedish Climate Action Plan (2023) and the latest National Energy and Climate Plan (2024). While technology-agnostic measures are available (Industriklivet), the main instrument to support deployment of carbon removals – the reverse auction mechanism - targets BioCCS/BECCS.	Sweden's policy framework and investment support for carbon removals appear suitable to the national context and current industrial use of biomass for heating and energy-generation, although not entirely technology-agnostic. Going forward, support to a wider set of carbon removal technologies could be considered.
Unlock CORSIA Eligible Emissions Units (EEUs)	Unlock market for CORSIA EEUs	Sweden has, through its Energy Agency, proactively investigated their responsibility and mandate in relation to facilitating a CORSIA EEU market and has concluded that such are primarily managed at EU-level. For the general implementation of CORSIA, in the EU through close ties with the EU ETS, Sweden is well-prepared and has made additional efforts to guide airlines in their fulfilment of CORSIA obligations.	In general, more rigorous analysis might be needed to remove current uncertainties regarding the national mandate for Member States. This demonstrate the need for a common understanding of procedures for facilitating, purchasing and claiming CORSIA EEUs in the EU. However, this falls outside of Sweden's responsibility and should be handled by EU or international institutions.

Tracking and review

- IATA policy objectives and actions
- Swedish policy and regulation
- Gap analysis comparing Swedish policy to IATA's policy roadmap

IATA policy objectives and actions

Achieving net zero CO_2 aviation also requires advancements in tracking and review of policy.

Continuous tracking and review are crucial for several reasons:

- Performance assessment: allow for the evaluation of current strategies and technologies, determining their effectiveness in reducing emissions.
- Informed decision-making: provides data-driven insights, guiding future investments and policy adjustments.
- Transparency and accountability: fosters trust among stakeholders, including governments, industry partners, and consumers, by demonstrating commitment to environmental goals.

This chapter examines the two policy actions listed in the IATA net zero roadmap that apply to the national level; regular policy assessments and the incorporation of exit strategies for inefficient policies.

Our gap analysis at the end of this chapter takes these policy objectives and actions as starting point for assessing the Swedish policy landscape.

Policy objective	Motivation	Policy action
Conduct periodic policy reviews and assessments to guide future policies	Regular assessment of the effectiveness of the policies adopted will help guide future policy adjustments and ensure alignment with technological advancements and environmental goals	Develop and adopt a standardized CO_2 emissions tracking and reporting methodology*
		Conduct policy effectiveness assessment at least every five years to ensure the enacted policies stay fit for purpose
		Incorporate exit strategies for when policies are no longer needed

* The policy action has a global focus and is thus not in focus in this national study.

National policy

Overall framework for tracking and review is robust, but Sweden lacks a targeted strategy for the aviation sector

Sweden's governance structure, and highly formalized policy- and evaluation process means that Sweden is well-placed to perform systematic tracking and review

Sweden has a strong tradition of evidence-based policy-making, with Government official reports (Swedish: SOU) on potential policy proposals and independent authorities proposing new policy within their fields of expertise. Since 2024, development of new policy must include guidance on how the policy should be evaluated (Förordning 2024:183 om konsekvensutredningar).

The Swedish climate policy framework (see annex) helps ensure that climate policies are continuously assessed and evaluated, and includes requirements on the government to present a climate report as part of the annual Budget Bill. Further, a climate policy action plan must be developed every four years describing how the national climate targets are to be achieved.

Monitoring of climate-related aviation policy and performance is conducted as part of Sweden's commitments in the EU and on a global level

As a member of the EU, Sweden is required to develop a National Energy and Climate Plan (NECP). The plan outlines Sweden's policies and measures for achieving EU-wide climate and energy goals and includes information on how progress will be monitored and evaluated.

Within the ICAO State Action Plan Initiative, Sweden submitted its fifth action plan in December. The report provides an overview and a qualitative assessment of Sweden's strategies and measures to reduce aviation emissions.

These international commitments enhance policy harmonization and comparability but add complexity to the national review process.

However, Sweden is lacking an up-to-date strategy for aviation, including long-term goals and climate-related policies as well as provisions for continuous review

The current aviation strategy is from 2017 and was adopted by the previous government.[1] It includes measures to monitor developments and make necessary policy adjustments.

While this strategy is still referred to by industry actors (e.g., in the Swedish aviation industry's roadmap for fossil-free competitiveness), the strategy is considered outdated and does not reflect the challenges and opportunities facing the aviation sector today. Further, the present government, which entered into office in 2022, does not refer to the strategy in their official communication. As of early 2025, no updated aviation strategy has been announced by the new government.

1) The Swedish aviation strategy was launched in 2017 under the former Ministry of Enterprise (Näringslivsdepartementet), which was replace in 2022 by the Ministry of Climate and Enterprise. The strategy is still available on the Swedish goverments officlal website, see here.

National policy

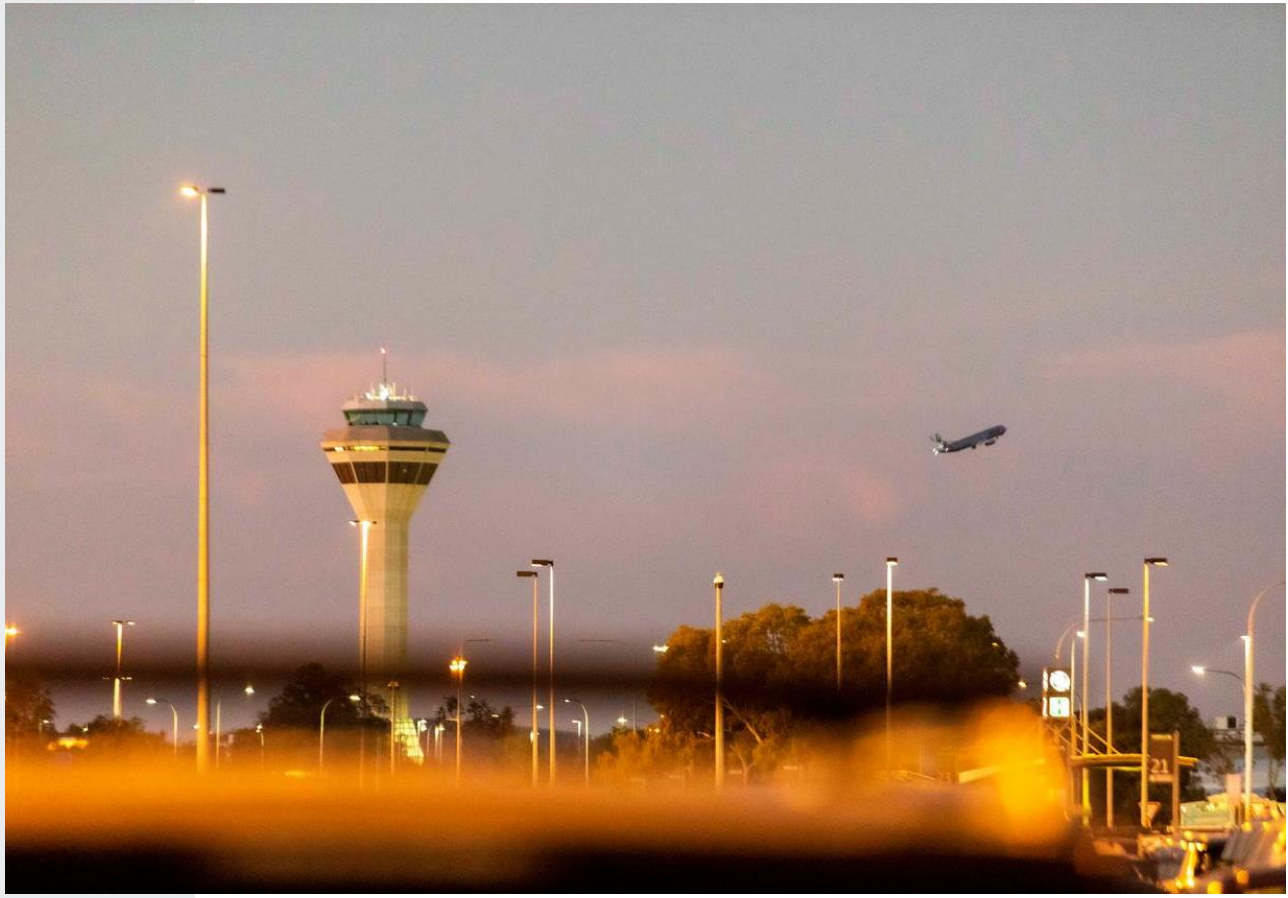
The case of the Swedish aviation tax demonstrates the need for periodic regulatory framework review

The Swedish aviation tax, introduced by the previous government in 2018, aimed to reduce emissions by implementing a fee on departures from Swedish airports, with rates varying based on travel distance (Skatteverket, n.d.). The tax sparked debate from the outset, with critics arguing the tax was ineffective due to its indiscriminate approach to taxing flights rather than targeting emissions, while proponents saw it as a useful tool for promoting aviation decarbonization though its design could have been improved.

In their 2024 Budget Bill, the current government revoked the aviation tax (starting from 1 July 2025), citing its limited effectiveness and the economic challenges it posed to the aviation sector. This decision highlights the importance of regularly assessing and, if necessary, revising or phasing-out policies that prove ineffective to ensure the policy framework remains fit-for-purpose and to avoid excessive administrative burden for industry actors.

However, the aviation tax case also shows how Swedish aviation policy is currently shaped by the priorities of the ruling political majority, rather than guided by a long-term strategic vision. Rapidly shifting policies risk undermine stability, creating unnecessary uncertainty for an industry that needs a predictable regulatory frameworks to make investments in innovation and decarbonisation.

The debate over the aviation tax underscores the need for a more holistic approach to policymaking in this sector. Rather than piecemeal measures, Sweden could benefit from a comprehensive, cross-party policy plan that balances environmental goals with industry competitiveness.



Summary of gap analysis and overview table

Sweden's policy framework ensures robust tracking and review, but a future-oriented plan for the aviation industry is lacking

Sweden's policy framework is well-positioned to support tracking and reviewing of climate policies, including those related to aviation. Sweden benefits from a strong tradition of evidence-based policymaking, formalized evaluation processes, and a legal requirement on all new policies – including climate-related aviation initiation – to include clear evaluation guidelines.

These structural features, combined with Sweden's climate policy framework mandating regular climate reports and action plans, ensure consistent oversight and adaptation of national climate goals. It also shows how policy revision is integrated into Sweden's approach, focuses on ensuring cost-effective policies that minimize unnecessary administrative burdens. Furthermore, Sweden's obligations under EU regulations and ICAO ensure that monitoring and reporting on policy performance in reducing CO_2 emissions are effectively carried out.

Despite these strengths, Sweden would benefit from an updated and long-term aviation strategy that includes clearer procedures for monitoring and, if necessary, phasing out or updating policies. This could apply to policies that are no longer effective or justified, such as those where public support is no longer needed due to market maturation.

The 2017 aviation strategy appears outdated and no longer reflects the realities of the sector, including technological advancements and shifting climate priorities. The current government has not yet announced a revised strategy, leaving a gap in long-term planning and policy alignment for aviation emissions reduction. Updating the strategy with actionable goals and review mechanisms is essential for Sweden to maintain its leadership in sustainable aviation and meet both national and international climate objectives.

Overview of gap analysis

This table provides a gap analysis of the policy objectives and actions described in the beginning of this chapter.

Policy objective	Policy action	Swedish policy situation	Gap analysis
Conduct periodic policy reviews and assessments to guide future policies	Conduct policy effectiveness assessment at least every five years to ensure the enacted policies stay fit for purpose	Comprehensive national framework for evaluation of climate policies, before introduction and regularly after adoption. No specific provisions for aviation policies.	All aviation policies are evaluated within the broader policy process. However, policies are not evaluated in a recurring cycle of e.g. five years. An up-to-date national aviation strategy is currently missing, including with a long-term plan for the sector and procedures for its follow-up.
	Incorporate exit strategies for when policies are no longer needed	Sweden emphasizes the need for effective climate policy and regular revisions/phase-out	Refining or phasing out of policies that no longer serve their purpose is part of the general policy approach; however, there is no explicit exit strategy for neither general nor aviation-specific policies.

Compiled gap analysis

Compilation of gap analysis (1/2)

The table is a summary and compilation of the content presented in previous sections. The last column contains the gap analysis where Swedish policy is compared to IATA's policy roadmap.

Policy objective	Policy action	Gap analysis: Swedish policy compared to IATA's policy roadmap
Prioritise sustainable aviation fuel in refinery output	Repurpose existing financial resources to support SAF production	Public money is directed towards the production and the use of biofuels and electrofuels. However, since there is no separation between SAF, and other biofuels and electrofuels, there is a gap between IATA's desired policy and Swedish policy. The Swedish government could consider prioritizing SAF over biofuels for road traffic where electric vehicles are already commercially viable.
	Shift existing biofuel production capacity to SAF	The rationale behind lowering the reduction obligation for road traffic was to lower consumer prices on gasoline and diesel, not to promote production of SAF. The reasoning behind excluding HVO from Klimatklivet is that the reduction obligation for road traffic provides enough incentives for production of HVO. The conclusion is therefore that there are no policies aimed at shifting biofuel production capacity towards SAF. The Swedish government could consider prioritizing SAF over biofuels for road traffic where electric vehicles are already commercially viable.
	Encourage co-processing	Since major biofuels producers in Sweden choose co-processing, there seems to be no need to enact policies to encourage co-processing.
Attract investment for SAF production	Implement coordinated demand-pull and technology-push SAF policies	There are both demand-pull and technology-push factors impacting SAF. The difference is that the demand-pull factors are SAF-specific whilst the technology-push factors are not. It is worth noting that the demand-pull factors are EU-driven while the technology-push factors are Swedish. To ensure that neither of the demand-pull nor the technology-push factors dominate the other, continuous re-assessment of the policy mix will be necessary to ensure a coordinated and effective path forward.
	Ensure incentives have realistic duration	Predictable and long-term policies will be necessary to encourage investments in large-scale SAF production facilities where the production technology is new and future demand uncertain. Klimatklivet and Industriklivet both have reasonable durations, while the credit guarantees, and the research program expire soon. In addition to incentives that lowers the cost of the initial investments, there might be benefits to consider more predictable incentives that affect operational costs, such as tax credits.
	Increase demand for SAF through governmental commitments	Governmental commitments, in terms of guaranteeing a stable demand for SAF, is lacking in Sweden. This risks leading to deferred investments in Swedish SAF production.
	Ensure SAF policy mixes are technology and feedstock agnostic	While safeguarding environmental integrity of SAF, the feedstock regulation is not feedstock agnostic, which limits potential supply of SAF.
Build a SAF accounting framework	Adopt globally harmonized SAF accounting framework	Since the framework could have economic benefits for Sweden as a SAF producer and exporter, it is important to ensure a globally harmonized framework that encourages SAF exports.
	Facilitate dual conformance in SAF sustainability certification	Dual conformance would be beneficial for the development of a global SAF market, and a global SAF market could have economic benefits for Sweden as a SAF producer. It is important to ensure global harmonization to encourage SAF production.
Eliminate barriers to SAF distribution and use	Enable access to incumbent fuel infrastructure to SAF	There are no formal policies that discourage distribution of SAF in airports. Still, the government could initiate an official government report to see if there are lock-in effects in infrastructure or ground handling agreements that hinder the distribution of SAF.
Drive diversification and scale-up of aviation cleaner energies	Ramp-up SAF production from non-biological feedstock	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies. The policies do not specifically support SAF production from non-biological feedstock, but their flexible and technology-neutral nature ensure that all promising technologies can participate, without having the government trying (and possibly failing) to pick winners.
	Drive diversification of all aviation cleaner energies	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies.
Foster innovation in non-biological SAF	Foster continuous innovation in non-biological SAF	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies.

Compilation of gap analysis (2/2)

The table is a summary and compilation of the content presented in previous sections. The last column contains the gap analysis where Swedish policy is compared to IATA's policy roadmap.

Policy objective	Policy action	Gap analysis: Swedish policy compared to IATA's policy roadmap
Adopt new propulsion technologies	Drive diversification of all aviation cleaner energies and Support development of new propulsion technology	The technology-neutral policy mix in Sweden supports innovation and the development of new and innovative technologies. It is important that the research program, *Fossil free aviation* secures funding to keep promoting innovation.
	Support development of new fuelling infrastructure for hydrogen aircraft	New fueling infrastructure for hydrogen is being developed at Sweden's largest airports partly thanks to the support of state-owned airports and investment grants.
Attract investment for new propulsion technologies	Provide financial incentives to reduce risks and attract investment in low-carbon technologies.	The policy mix is well-balanced for attracting investments in low-carbon technologies. The possible market introduction subsidy for electric airplanes will help in reducing risks and attracting investments. However, the specific focus on electric aircrafts could overlook other technologies such as hydrogen.
	Attract investments in new propulsion technologies.	See assessment above.
Enhance R&D to novel CDR technologies	Implement technology-agnostic policy frameworks for carbon removal	Sweden's policy framework and investment support for carbon removals appear suitable to the national context and current industrial use of biomass for heating and energy-generation, although not entirely technology-agnostic. Going forward, support to a wider set of carbon removal technologies could be considered.
Unlock CORSIA Eligible Emissions Units (EEUs)	Unlock market for CORSIA EEUs	In general, more rigorous analysis might be needed to remove current uncertainties regarding the national mandate for Member States. This demonstrate the need for a common understanding of procedures for facilitating, purchasing and claiming CORSIA EEUs in the EU. However, this falls outside of Sweden's responsibility and should be handled by EU or international institutions.
Conduct periodic policy reviews and assessments to guide future policies	Conduct policy effectiveness assessment at least every five years to ensure the enacted policies stay fit for purpose	All aviation policies are evaluated within the broader policy process. However, policies are not evaluated in a recurring cycle of e.g. five years. An up-to-date national aviation strategy is currently missing, including with a long-term plan for the sector and procedures for its follow-up.
	Incorporate exit strategies for when policies are no longer needed	Refining or phasing out of policies that no longer serve their purpose is part of the general policy approach; however, there is no explicit exit strategy for neither general nor aviation-specific policies.

Annex

- IATA's visual policy roadmap
- Swedish climate policy
- Interviewed organizations
- Overview of Swedish policies in the report


Immediate policy action until end of 2025
Mid-term policy action 2026–2030
Long-term policy action 2031–2050
Net Zero CO_2 Emissions
Unlock market for CORSIA EEUs
Harmonize ICAO and UNFCCC climate change frameworks
Implement technology-agnostic policy frameworks for carbon removal solutions
Enable access to incumbent fuel infrastructure to SAF
Foster continuous innovation in non-biological SAF
Adopt globally harmonized refueling standards for new propulsion aircraft
Repurpose existing financial resources to support SAF production
Shift existing biofuel production capacity to SAF
Ramp-up SAF production from non-biological feedstock
WAYPOINT
Entry into service of zero-carbon aircraft
2035 WAYPOINT
Review CORSIA and role of offsets
Encourage co-processing
Implement coordinated demand-pull and technology-push SAF policies
Develop airworthiness standards and certification process for hydrogen flights
Ensure incentives have realistic duration
Promote global, liquid, and transparent SAF markets
2030 WAYPOINT
CAAF/3's Collective Global Aspirational Vision
Support development of new propulsion technologies
Offsets/ Removals
Increase demand for SAF through governmental commitments
Ensure SAF policy mixes are technology and feedstock agnostic
Drive diversification of all aviation cleaner energies
Support development of new fueling infrastructure for hydrogen aircraft
Periodically review and assess incumbent policies
SAF
Facilitate dual conformance in SAF sustainability certification
Adopt globally harmonized SAF accounting framework
Adopt a standardized CO_2 emissions tracking and reporting methodology
New Technology
Adopt globally harmonized sustainability criteria for offsets and alternative fuels
Attract investments into SAF and new propulsion technologies
Tracking and Review
IATA

Recent climate policy developments in Sweden

Swedish climate policy mainly focuses on reaching Swedish climate policy goals, as opposed to achieving global CO_2 emissions reductions.

Since the change of government in Sweden in late 2022, Swedish climate policy now has more emphasis on cost-effectiveness, compliance and long-term targets than before. Therefore, the 2023 Swedish Climate Policy Action Plan was criticized for insufficient short-term measures to meet 2030 targets.

The most recent policy change with big impact is the lower reduction obligation for road transport, which increases the transport sector's emissions and reduces demand for biofuels.

Experts recommend boosting renewable energy production, electricity grid upgrades, and biofuels policies for the transport sector to align with 2030 targets and maintain Sweden's climate ambitions.

Based on The European Parliament Briefing - Sweden's climate action strategy and Sweden's updated National Energy and Climate Action Plan

Swedish climate policy has changed focus from international front-runner to increased focus on cost-effectiveness, compliance and long-term targets

Sweden has historically been viewed as a front-runner in climate policy. However, this view has shifted under the current government which has been in office since late 2022. In December 2023, the government unveiled its second climate policy action plan with around 70 proposals aimed at achieving net-zero emissions by 2045. However, critics argue it lacks sufficient short-term measures to meet the 2030 targets.

In light of the inflation crisis (peaking at 12% in December 2022), much of the public and political discussion about climate, energy, and transport in Sweden, has centred around ensuring household costs do not increase substantially and rapidly. This has been reflected in the Electricity support (subsidy for households' high electricity costs in Nov-Dec 2022) and the lowering of the Reduction obligation for road traffic (de facto blending mandate for gasoline and diesel) to EU minimum levels. As of 2024, the reduction obligation was lowered from 7.8% for gasoline and 30.5% for diesel to only 6% as of 2024. It will rise to 10% for diesel and gasoline from July 2025, to align with the requirements of EU energy legislation. In September 2024, the government also decided to abolish the tax on airline tickets as of July 2025. The tax, introduced in 2018, ranges from 76 to 504 Swedish crowns (€6.6 to €44) depending on the destination. The focus on costs have also sparked a growing debate about how to compensate households from any costs related to climate policy and contributed to changing the focus and ambition of Swedish climate policy.

The recent National Energy and Climate Action Plan contains some elements that are directly related to the aviation industry's transition to net zero CO_2 emissions:

- Electrification of the transport sector, as opposed to heavy reliance on blending of biobased fuels
- Increased focus on CCS as an important technology to reach long term net zero CO_2 emissions targets
- Increased focus on green hydrogen for a green transition in the industrial sector, as well as in some parts of the transport sector. The Swedish Energy Agency has a coordinating role for Swedish hydrogen initiatives.

In June 2024, the 2030-Secretariat warned that Sweden is not on track to meet its national climate targets, especially for the transport sector. The March 2024 Climate Policy Council report indicated that policies adopted in 2023, most notably the lower reduction obligation (effectively blending mandate) for biobased fuels in road transport, could increase emissions, jeopardizing 2030 goals and EU commitments. It highlighted a gap between government actions and its ambitious climate policy goals.

The European Commission's report also suggested that Sweden might miss its 2030 targets due to recent policy changes, increasing long-term costs. Recommendations included boosting renewable electricity production for electrification of industry and upgrading grids.

The International Energy Agency reviewed Sweden's energy policy, recommending the implementation of sectoral decarbonisation roadmaps and a national hydrogen strategy. It also called for a stronger biofuels policy and warned that recent policy reversals could undermine investor confidence.

An OECD report on Sweden's green industrial revolution noted that recent policy changes threaten Sweden's 2030 target and its status as a climate leader.

Sweden's climate policy framework

The climate policy framework contains 3 interrelated pillars

1. The Climate Act

- The Government's climate policy must be based on the climate goals.
- The Government is required to present a climate report every year in its Budget Bill.
- The Government is required to draw up a climate policy action plan every fourth year to describe how the climate goals are to be achieved.
- Climate policy goals and budget policy goals must work together

2. New climate goals

- Both short- and long-term climate goals to ensure Sweden contributes to the Paris agreement and are aligned with EU climate policy (see table to the right)

3. The Climate Policy Council

The Climate Policy Council is an independent, interdisciplinary expert body tasked with evaluating how well the Government's overall policy is aligned with the climate goals established by the Parliament and the Government. The council:

- Evaluates whether the focus of policy areas contributes or counteracts the climate goals.
- Highlights the effects of agreed and proposed instruments from a broad societal perspective.
- Identifies policy areas that require further action.
- Analyses how to achieve targets in a cost-effective way.
- Evaluates the bases and models on which the Government builds its policy.
- Foster more debate in society on climate policy.

The climate policy framework is intended to provide a predictable framework for climate policy that forces current and future governments to act in accordance with the Paris agreement

The climate policy framework was adopted in 2017 by a large majority of the Swedish parliament. The framework contains ambitious climate goals, a climate act and a climate policy council. The framework aims to create order and stability in climate policy. It provides business and society with the long-term conditions to implement the transition needed to address the challenge of climate change.

The act provides each Government with an obligation to pursue a climate policy based on the climate goals adopted by the parliament. Each government must provide clear reports on how work to achieve the goals is progressing, and an independent climate policy council reviews how well the Government's overall policy meets the climate goals. The reform is a key component of Sweden's efforts to comply with the Paris Agreement.

The goals are intended to reflect Sweden's aim to show international climate leadership, and to show that Sweden undertakes to achieve emission reductions that far exceed the requirements under the EU Effort Sharing Regulation.

Climate goal	Target year	Base year
Net zero GHG emissions. >85% reduction of GHG emissions from activities in Sweden. The remaining 15% can be achieved through complementary measures. After 2045, Sweden should achieve negative emissions.	2045	1990
75% reduction of GHG emissions from sectors outside of EU ETS. At most 2% reduction from complementary measures.	2040	1990
63% reduction of GHG emissions from sectors outside of EU ETS. At most 8% through complementary measures.	2030	1990
70% reduction of GHG emissions in the transport sector (exc. domestic aviation, which is indluded in the EU ETS)	2030	2010
1) Complementary measures include carbon dioxide sequestration in forests and soil as a result of additional measures, emission reductions carried out outside Sweden's borders, and the carbon capture and storage from the combustion of biofuels, so-called bio-CCS. 2) Expressed as added energy in relation to GDP		

Source: Sweden's climate policy framework - Government.se

Swedish climate policy for transport and aviation

Swedish transport policy

The overall goal of Sweden´s transport policy is to ensure a socioeconomically efficient and long-term sustainable transport system for citizens and businesses throughout the country.

The Swedish transport sector needs to contribute to Sweden's general climate goals and the sector-specific goal for transport (-70% in 2030). Swedish transport policy aims to address this through three main levers:

- Transport-efficient society (i.e. reduce total traffic)
- Energy-efficient transportation
- Renewable and fossil-free fuels, including electrification

Aviation-related policy in the Swedish Climate Action Plan

The current Swedish Climate Action Plan (NCAP) highlights the aviation sector's role in ensuring Swedish connectivity while emphasizing the need for climate transition to contribute to Swedish climate goals. According to the Swedish NCAP key points are:

SAF is important in the short run: The focus should be on increased use of SAF, such as biofuels, and increased blending of SAF in fossil-based aviation fuel. Collaboration to enhance production and distribution of fossil-free fuels is vital until electric and hydrogen technologies are commercially viable.

Electric aircrafts are important complements to SAF in the long run: In the longer term, there is increased focus on transition to electric and hydrogen-powered aircraft for shorter distances and the development of synthetic fuels (e-Fuels) to complement electrification and bio-SAF which will continue to be important in the long run.

Aviation should bear its own climate cost: The Government also highlights that aviation needs to bear more of its climate costs than today, with incentives promoting sustainable practices and effective pricing of its climate impact to promote sustainable and fossil-free fuels.

Source: Swedish Transport Agency – State action plan of Sweden 2024

The aviation industry's roadmap for fossil-free competitiveness

The Swedish aviation industry aims for fossil-free domestic flights by 2030 and fossil-free international flights by 2045

Fossilfritt Sverige is a Swedish government initiative established to support the transition to a fossil-free society by 2045. It brings together stakeholders from various industries to develop sector-specific roadmaps that outline strategies for reducing greenhouse gas emissions while maintaining competitiveness. The roadmaps, created collaboratively by industry actors, identify challenges, opportunities, and specific measures for achieving fossil-free operations. These documents guide policymaking and investments toward Sweden's climate goals.

The Swedish aviation industry's updated roadmap (developed by the Swedish Air Transport Society* together with Fosislfritt Sverige) outlines the joint roadmap between Svenskt Flyg and Fossilfritt Sverige for a fossil-free aviation sector. It contains two important goals: 1) domestic flights should be fossil-free by 2030, and 2) all flights (domestic and international) should be fossil-free by 2045. This roadmap also calls for the Swedish government to :

1. Decide on the framework for government investment support for the design and scaling of SAF facilities, support for green hydrogen production, and support for charging infrastructure at Swedish airports.
2. Require that all air travel by public organisations should be made using SAF
3. Support and fund research and development of technologies that enhance the energy efficiency of aircraft and facilitate the transition to new energy carriers, including SAF, green hydrogen, and batteries.
4. Use its responsibility for Swedish airspace should work to develop flight operations that actively use real-time data to avoid areas where high-altitude effects may occur.
5. Communicate a common public vision for the transition to fossil-free aviation, with milestones for 2030 and 2045, aligned with international goals.

* Note that IATA has not been involved in developing the roadmap.
Source: Flygbranschens-Fardplan-Uppgraderad-2024.pdf

Interviewed organisations

Ramboll held 6 interviews with government agencies, aviation industry representatives and experts

Interviewed organisations
The Swedish Environmental Protection Agency
Fly Green Fund
Swedavia
Swedish Biofuels
The Swedish Energy Agency
The Swedish Confederation of Transport Enterprises

Overview of Swedish policies in the report

Policies that are reference in the gap analysis with source, page reference and category.

Policy	Type of policy	Category	Purpose	Page reference	Source
Funding for research and development	Public research grants	SAF / New technology	Several research funding bodies provide funds to develop the market and production of SAF in Sweden and advance innovation in new propulsion technologies.	19, 35	Vetenskapsrådet
Industriklivet	Investment grant	SAF / Offsets / New technology	Finance innovative project and strategically important initiatives within the industry, including SAF production, carbon removals and new propulsion technologies.	20, 43	Energimyndigheten
Klimatklivet	Investment grant	SAF / Offsets / New technology	Lower the cost of green technology and thereby increase usage	20	Naturvårdsverket
Green credit guarantees	Credit gurantess	SAF / New technology	The Swedish National Debt Office can provide state credit guarantees in order to promote green industrial investments.	21	Riksgälden, n.d
Differentiated take-off and landing charges	Regulation	SAF / New technology	Differentiated take-off and landing charges works by adjusting fees based on factors such as carbon dioxide and noise level.	23	Transportanalys, 2022
Conditional grants to non-state owned airports	Regulation	SAF / New technology	Government grants to non-state airports in Sweden aim to secure access to regional air travel. In 2025 grants come with specific requirements including that airports receiving funding have fossil free operations or can show that is has a plan to become fossil-free.	23	Riksdagen, 2024
Subsidy from Swedavia for the purchase of SAF	Subsidy	SAF	Swedavia, a state-owned company that operates Sweden's largest airports, aims for 5% of all jet fuel used at its airports to be renewable by 2025. To support airlines using SAF, Swedavia continues its Sustainable Aviation Fuel Incentive Programme, covering up to 50% of the premium cost for neat SAF for approved applications.	23	Swedavia Airports, 2024
National emissions reduction mandate for aviation in Sweden	Regulation	SAF	A GHG reduction mandate for aviation fuel. Which meant that fuel suppliers must reduce greenhouse gas emissions from these fuels by a certain percentage every year, through the blending of biofuels. However, this mandate has been replaced by mandates in the EU legislation ReFuelEU since 1 January 2025	24, 25, 26	Energimyndigheten, 2022
ReFuelEU	Regulation	SAF	ReFuelEU is a blending mandate which specifies the share of SAF that must be mixed into aviation fuel. ReFuelEU will affect the five largest airports in Sweden.	24, 25, 26	ReFuelEU,n.d
Support for projects that contributes to a fossil free aviation	Grants	SAF / New technology	*Fossil-Free Aviation for the Future*,' focusing on accelerating the transition to fossil-free aviation. Projects or innovation clusters that have the potential to contribute to this development within 15 years are eligible to apply for funding.	35	Energimyndigheten, n.d.
Reversed auction for BioCCS/BECCS	Subsidy based on competitive bidding	Offsets	Support system for BioCCS/BECCS projects through a reversed auction mechanisms, where companies offering the lowest compensation per ton of captured, transported and stored CO_2 are selected.	43	Energimyndigheten, n.d
Swedish Aviation Tax	Tax	Tracking and review	The Swedish aviation tax was designed to levy a fixed fee on passenger flights departing from Sweden, with rates varying based on travel distance rather than actual emissions. It was revoked during autumn 2024 and will officially cease to apply from 1 July 2025.	50	Skatteverket, n.d.

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