

Flying green

A NORDIC POLICY ROADMAP
FOR THE IMPLEMENTATION
OF ELECTRIC AVIATION

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NORDREGIO POLICY BRIEF 2024:5

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This publication is also available online in a web-accessible version at:
pub.nordregio.org/pb-2024-5-electric-aviation-policy-roadmap



(Photo: Miia Itänen)

Summary

As at 2024, aviation is responsible for approximately 2.5% of global CO₂ emissions. While that figure may not seem critical, the aviation sector's true contribution to climate change is significantly higher. Indeed, the sector's climate impact extends to several other types of emissions, causing its overall environmental impact to balloon (Arvidsson et al., 2024).

To mitigate these impacts, electric aviation (EA)^[1] has emerged as a promising alternative. The Nordic countries in particular aspire to lead the way in adoption of this new technology and have set ambitious targets for its implementation in the near future.

However, numerous open questions and challenges must still be addressed before electric aviation can become reality. Is the political commitment in the Nordic Region sufficient to support those initiatives? Where will the necessary funding come from? Are the required technological advancements and infrastructure in place?

Those are just a few of the key issues addressed in this policy brief, which is based on the outcomes of a stakeholder workshop held in June 2024 as part of the '*Electric Aviation and the Effects on the Nordic Region*' project. The workshop was attended by seven participants, with all five Nordic countries^[2] represented. It focused on identifying the primary obstacles to implementing electric aviation and on exploring actionable solutions, with the main outcome being the creation of a policy roadmap outlining the critical steps required to make electric aviation reality in the coming years.

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1. Other sustainable alternatives (SAF and hybrid) can also have a significant positive environmental impact, especially in the journey to reaching fully electrical aviation. Nevertheless, due to the complexity of each alternative, this policy brief will focus only on electric aviation.
 2. Affiliation of the participants: NISA, NEA, IcelandAir, Isavia, Danish Civil Aviation Authority, Norwegian Ministry of Transport, Helsinki Electric Aviation Association.



(Photo: Niklas Jonasson / Unsplash)

Policy context, goals and targets

At the Nordic level, there is currently no unified legislation or strategy for aviation. Formal cooperation on transport at the ministerial level ceased in 2005 following dissolution of the Nordic Council of Ministers for Transport (MR-Transport) as part of a broader reform effort. Instead, several Nordic initiatives and collaborations related to aviation, such as NEA^[3] and NISA^[4], have emerged, alongside national strategies and targets for sustainable aviation, including a focus on electric aviation. Below we highlight some of the key initiatives. However, for a more comprehensive analysis please consult the series of reports of the '*Electric Aviation and the effects on the Nordic Region*'^[5] project. (Cavicchia et al., 2024; Löfving et al., 2023; Wendt-Lucas, 2023)

Denmark

The Danish government unveiled the 'Green Aviation for All' plan in September 2022, aiming to make all domestic flights 100% green by 2030 (Ministry of Transport et al., 2022). The initiative involves subsidised flights and primarily focuses on sustainable aviation fuels (SAFs). SAFs in Denmark will primarily come from agro-biomass and waste, unlike in neighbouring countries like Sweden and Finland, where forestry biomass is more common. Transitioning to use of SAFs is expected to help achieve 100% green domestic aviation by 2030. Furthermore, long-term goals include incorporating electric aviation after 2030.

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3. Nordic Network for Electric Aviation, see more at: <https://nordicnea.com/>
 4. Nordic Initiative for Sustainable Aviation, see more at: <https://nisa.dk/NISA/#AboutNISA>
 5. The reports are available at: <https://nordregioprojects.org/electric-aviation/>

Finland

Finland's aviation strategy addresses electric aviation as a part of its 12-year plan (2021-2032), with the aim of carbon neutrality by 2030. The government views electric aviation as a key solution for reducing emissions while improving the domestic air service. To that end, Finland is investing in research and innovation in relation to electric fuels and collaborating with ICAO^[6] and EASA^[7] ICAO and EASA to develop standards for electric and hybrid aircraft. Additionally, regulations for electric aviation continue to evolve, with consideration given to safety issues such as battery fire risks and winter airfield maintenance.

Iceland

Iceland's aviation policy, which was introduced in 2020, places a strong emphasis on reducing environmental impacts and promoting the transition to electric aviation. In line with that, a working group was established by the Icelandic parliament in 2021 to develop a strategy for using eco-friendly energy sources for domestic flights by 2030, with a focus on electricity. As with other Nordic countries, the main potential of electric planes is expected to lie in operating short domestic routes, increasing flight frequency and reducing both emissions and operating costs (Stjórnarráð Íslands Innviðaráðuneytið, 2022). Emphasis is also given to the need for improved infrastructure, such as enhanced electricity distribution at rural airports, to support those goals. Iceland plans to ensure that 20% of domestic flights use renewable energy, including electricity, by 2030 and aims for all domestic flights to run on renewable energy by 2040. Furthermore, Iceland seeks to become a testing ground for electric and hybrid aircraft by 2026.

Norway

Norway is leading the way in electric aviation among the Nordic countries. A national programme, developed in 2020, outlines goals for the introduction of commercial electric aviation with support from the Norwegian government along with partners like Widerøe, SAS and the Zero Emission Resource Organisation (Avinor, 2020). Key targets include operating the first scheduled domestic electric flights by 2030 and achieving fully electrified domestic aviation by 2040, thereby cutting emissions by 80% compared to 2020.

6. International Civil Aviation Organization, see more at: <https://www.icao.int/>

7. European Union Aviation Safety Agency, see more at: <https://www.easa.europa.eu/en>

Norway plans to be a hub for developing and testing electric aircraft, leveraging its short-haul network for early adoption. Small electric aircraft with up to 19 seats are expected to begin operating on short routes between 2025 and 2030, even in harsh winter conditions. That strategy is part of Norway's broader goal for fossil-free aviation by 2050.

Sweden

As part of its broader goal of achieving fossil-free air travel, Sweden is working towards electrifying aviation on domestic flights by 2030 and on all flights from Swedish airports by 2045. While no specific targets for aviation have been set by the government, its 2020 electrification strategy highlights the importance of electrifying aviation, with a focus on developing the infrastructure, grid capacity and charging facilities at airports (Ministry of Infrastructure, 2020). The Swedish aviation industry is also pushing forward with various initiatives.

The Swedish Transport Administration and Transport Analysis has been tasked with analysing and supporting electric aviation, with a focus on small and medium-sized enterprises and advancing innovation in aviation technologies. Swedavia, Sweden's state airport operator, has set itself the goal of making its ten airports ready for electric aircraft by 2025 and launching the first commercial electric flight route at around the same time.



(Photo: Gina Janosch / Pixabay)

Key challenges and how they can be tackled

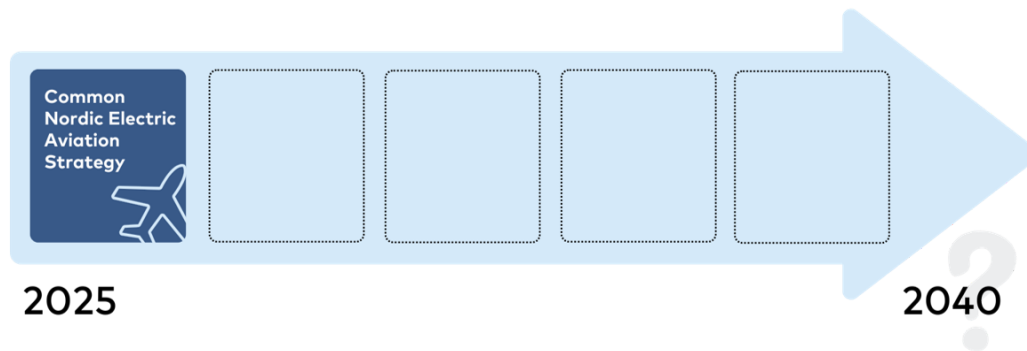
In this section, we examine the key challenges identified during the stakeholder workshop and explore potential strategies to address them. For each level of challenge, we explore solutions that will contribute to the development of a policy roadmap for the future of electric aviation.

Strategic level

There are significant political challenges with respect to implementation of electric aviation. While it is crucial for the Nordic countries to have clear visions, those are not enough to achieve the goal without concrete actions and policies. The challenges include the following:

- **Lack of political commitment** leading to insufficient international cooperation.
- **Unsolved funding issues.** There is a notable lack of political attention to funding issues, creating a significant barrier to implementation of electric aviation.
- **Lack of recognition at the EU level of the crucial role of aviation for remote communities.** The concept of "flight shame" has gained prominence, particularly as the EU increasingly focuses on reducing flights and promoting road and rail transport. Such a position is part of a broader political climate that is increasingly critical of aviation due to environmental concerns. That puts Nordic countries in a difficult position as they are more reliant on aviation than other European nations.

- **Uncoordinated approach among Nordic countries** when it comes to making a strong case for electric aviation.
- **Lack of clear guidelines from the EU.** These are needed in order to support the development and implementation of electric aircraft.



What can be done?

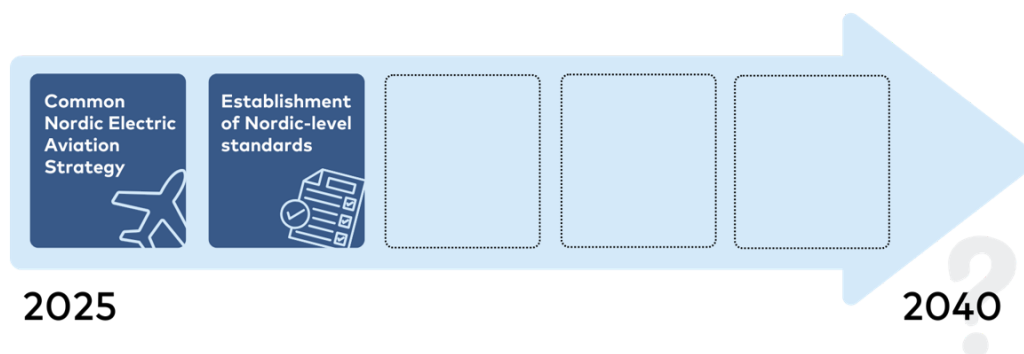
The experts taking part in the workshop noted the need for a unified Nordic strategy and an action plan for electric aviation as a crucial first step. Such a strategy would be essential for harmonising the regulatory, technological and economic development of electric aviation. Additionally, it would play a vital role in coordinating efforts to allocate national budgets and funds for zero emission aviation, while providing incentives and encouraging collaboration among stakeholders to address funding challenges.

Who should act:

National governments and the European Union

Regulatory level

- **Lack of common standards on airport infrastructure.** Such standards are needed to support international connections and technological innovation within electric aviation. Their absence risks hindering progress towards implementation of the technology.
- **Regulation on air services need to be adapted more flexibly to new technologies.** Current national and European regulations on air services are often too rigid to accommodate new technologies. While that is largely due to legitimate safety concerns connected to the implementation and operation of next-generation technologies, it can slow down overall development of the sector. European pressure to ban domestic flights threatens to slow still further efforts to advance the sector. Premature implementation of such regulations, before replacement technologies are mature and reliable, would have negative effects on existing transport networks, especially in remote areas.



What can be done?

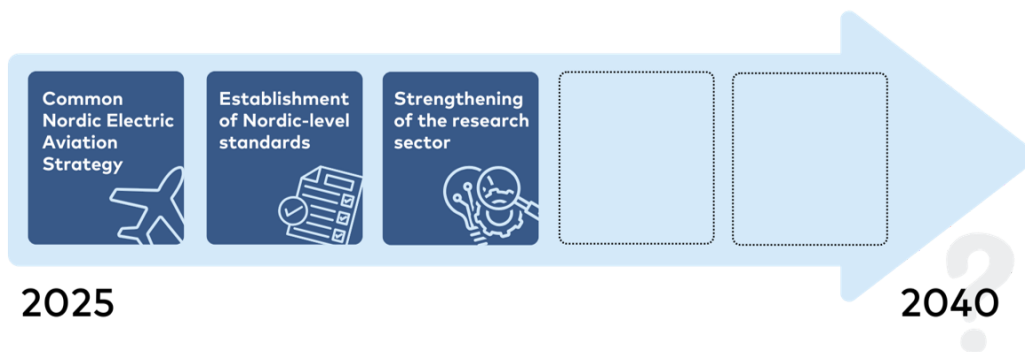
Following implementation of a unified Nordic electric aviation strategy, a common framework for harmonised standards across the region can be established. That can enhance the efficiency of cross-border electric aviation connections. Furthermore, the creation of flexible air service regulations can promote technological advancements in electric aviation.

Who should act:

Nordic governments in cooperation with one another

Environmental level

- **Lack of sufficient knowledge and research on LCA.** There is limited knowledge and research on the Life Cycle Assessments (LCAs) of electric planes. Understanding the full environmental impact of such aircraft, from production to disposal, is crucial for evaluating their sustainability, especially when it comes to battery production. It is also necessary to compare the environmental impact of electric aviation with other modes of transport, particularly regarding mineral extraction for battery production. That is essential to ensure that the shift to electric aviation does not unintentionally cause greater environmental harm due to increased demand for mining and resource extraction.



What can be done?

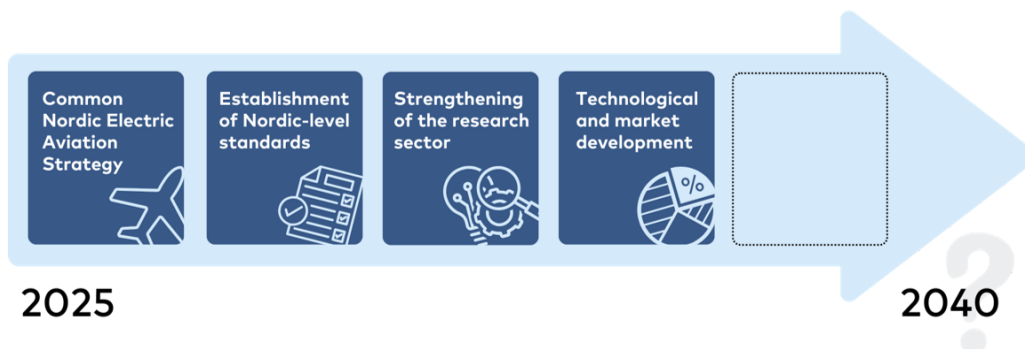
Governments and academic institutions need to set up research programmes that focus on conducting comprehensive LCAs to determine the true environmental footprint of electric planes. Moreover, it is important to compare the environmental effects of electric aviation with other modes of transport, especially in terms of resource extraction and disposal of batteries.

Who should act:

National governments and research institutions

Economic and technological level

- **Profitability.** Making profits with small electric planes is likely to prove difficult, especially in the early stages of implementation.
- **Ticket prices.** High prices, especially in the early stages, may deter potential customers and hinder market growth. Additionally, there is uncertainty about who will ultimately benefit from electric aviation services, i.e. whether those services will become affordable and accessible to broader groups or remain limited to niche markets such as tourism or business travel.
- **Development of flexible technology.** The absence of standards on energy intensity for electric aviation poses a significant barrier to technological development. Current battery technology is also insufficient, meaning that further development is required to meet the demands of electric aviation.



What can be done?

Addressing such challenges will require a combination of policy support, technological innovation and research investment.

To address the profitability issue, a combination of government subsidies and financial incentives can help offset the high initial costs, making electric aviation more viable. Initially, focusing on high-demand, short-haul routes that allow geographical barriers to be overcome and that can be served effectively by smaller electric planes may help to generate revenue and prove the viability of the market.

To overcome potential issues connected to ticket prices, financial incentives could reduce the cost for passengers, making electric flights more attractive. Differentiating ticket types by establishing different prices for residents and tourists, thereby subsidising "local tickets", might also be relevant. Furthermore, it is crucial to consider the temporal dimension: as production scales up and competition increases, the manufacturing costs of electric planes are likely to drop, ultimately leading to a lowering of ticket prices over time.

Finally, current battery limitations in terms of energy density and charging times are significant barriers to wider adoption, so public and private investments in R&D are essential to accelerate progress.

Who should act:

National governments and established actors in the industry



(Photos: Chanash / Unsplash)

A policy roadmap for the implementation of electric aviation



The policy roadmap outlines concrete milestones needed to reach the goal of implementing electric aviation. The establishment of a common Nordic electric aviation strategy is essential for sharing knowledge, developing technology, regulating standards, scaling up innovation and ultimately achieving social acceptance – a critical hurdle, especially in the early stages of adopting new technologies.

The roadmap suggests that, over time, achievement of those milestones coupled with targeted information campaigns can help increase public acceptance of electric aviation. Given the current political and regulatory landscape, as well as the state of technological and infrastructural development, making precise predictions about the timing and implementation of those steps is extremely challenging. Nevertheless, fostering and encouraging such discussions is vital, especially considering the ambitious goals that most Nordic countries have set for making domestic aviation sustainable by 2030 or 2040.

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About this policy brief

Flying green - A Nordic policy roadmap for the implementation of electric aviation

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Nordregio Policy Brief 2024:5

ISSN: 2001-3876

<http://doi.org/10.6027/PB2024:5.2001-3876>

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Communication & layout: Miia Itänen

Cover Photo: Kaur Martin / Unsplash

Electric aviation and the effects on the Nordic regions

This policy brief has been produced as a part of the '[Electric aviation and the effects on the Nordic regions](#)' project (May 2022 - December 2024). Implemented by Nordregio, Nordic Energy Research and the University of Akureyri, the project analyses the effects of electric aviation on Nordic regional development.

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