POLICY BRIEF

Future of transport biofuels in the Nordics

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Oras Tynkkynen

Introduction

Domestic transport is one of the largest sources of greenhouse gas emissions in the Nordic countries. While countries have made efforts to reduce emissions, progress so far has been uneven, slow and inadequate. Reaching climate neutrality will be essentially impossible without accelerating efforts to address emissions from the transport sector.

Biofuels have been one of the key tools to cut transport emissions in the Nordics. However, concerns about fuel prices and sustainability have led to some countries revisiting their plans.

While there are understandable differences between the five Nordic countries, they share some similar challenges. All of them can also learn from the experiences of their peers. Moreover, thanks to the many shared experiences and circumstances, there is room for enhanced cooperation at the Nordic level.

This policy brief presents the current situation with transport biofuels in the Nordics. It also discusses current policies and challenges related to biofuels. Finally, it presents some recommendations for Nordic policymakers.

This policy brief is a part of the project Nordic Stocktake and Visions – Pathways to climate neutrality. The project is carried out by CONCITO, CICERO, IVL Swedish Environmental Research Institute, University of Iceland and Reykjavik University, and Tyrsky Consulting for the Nordic Council of Ministers. The project is a part of the initiative Climate transition in the Nordics to support the Nordic Vision 2030. The overall aim of the Nordic Vision is to become the most sustainable and integrated region in the world by 2030.

In the project, the consortium has taken stock of greenhouse gas emissions in the Nordic countries and described and assessed the national pathways towards climate neutrality in the Nordic region. The results are described in the report Nordic Stocktake – Pathways to climate neutrality.

As a part of the project, the consortium held five webinars on topics of special relevance for reaching climate neutrality in the region. The webinars can be viewed online on norden.org.

The policy brief builds on the analysis done for the Nordic Stocktake report. It also draws from the expert presentations and discussions in the webinar on the future of transport biofuels in the Nordics, held on 27 September 2023. The brief was written by Oras Tynkkynen from Tyrsky Consulting. Support was provided by Tyrsky's Kati Berninger and Helena Määttä.

Box: Key transport fuel terms

Advanced biofuels are produced from feedstocks that do not induce direct or indirect land use change and do not compete with food and feed. Possible feedstocks include wastes, side streams and residues from other production processes.

First-generation biofuels are fuels made with biomass feedstocks that can be used for food or feed, such as corn, palm oil or sugarcane. Biofuels produced this way – for example ethanol and diesel – can be used directly or blended with fossil fuels.

Power-to-X fuels (P2X) are hydrogen and its derivatives made through electrolysis with electricity. P2X fuels can take various different forms and are also known as synthetic fuels.

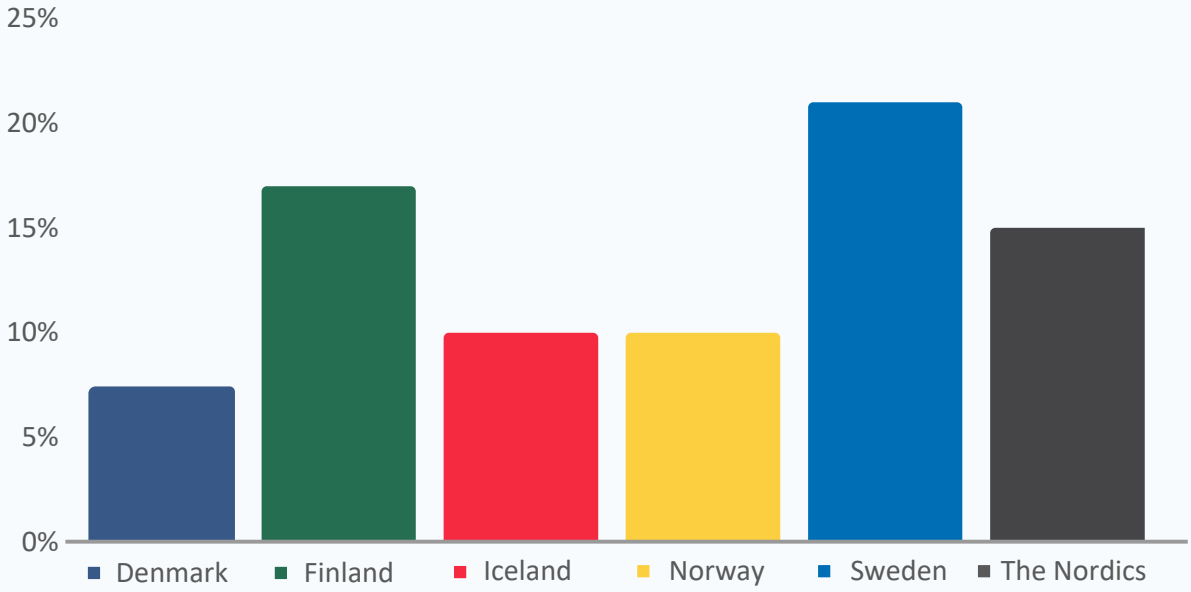
RFNBO fuels are renewable fuels of non-biological origin. They are synthetic fuels that use renewable electricity, but do not rely on biomass feedstocks.

Synthetic fuels – also known as electrofuels, efuels or P2X fuels – are fuels based on hydrogen. Combined with carbon, hydrogen can be used to produce liquid and gaseous fuels such as methane, methanol and diesel with similar qualities as equivalent fossil fuels.

Transport biofuels in the Nordics

According to 2021 data, the average share of biofuels in the transport sector in the Nordics was 15%, ranging from 7% in Denmark to 21% Sweden (figure 1). However, shares can fluctuate between years due to policy and market changes.

Figure 1: the share of biofuels in the Nordic countries in 2021



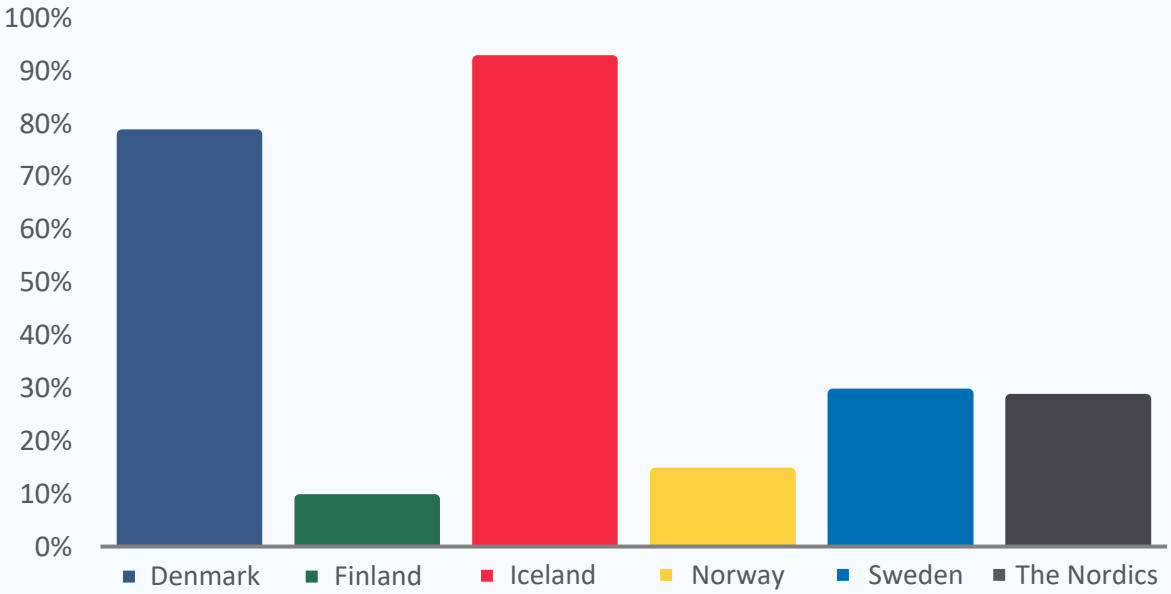
Biofuel share 2021 (eurostat, 2023, share of compliant biofuels/total fuel used in transport)

Between 2011 and 2020, Sweden, Norway and Iceland saw a relatively consistent increase in the use of renewable energy for transport. In Finland the development was more uneven and in Denmark the use remained fairly constant.

The feedstocks and sources of biofuels vary considerably between Nordic countries. The share of first-generation biofuels averaged at 29% in the Nordics, but it was as low as 10% in Finland and as high as 93% in Iceland (figure 2).

Figure 2: the share of first-generation biofuels in the Nordic countries in 2021

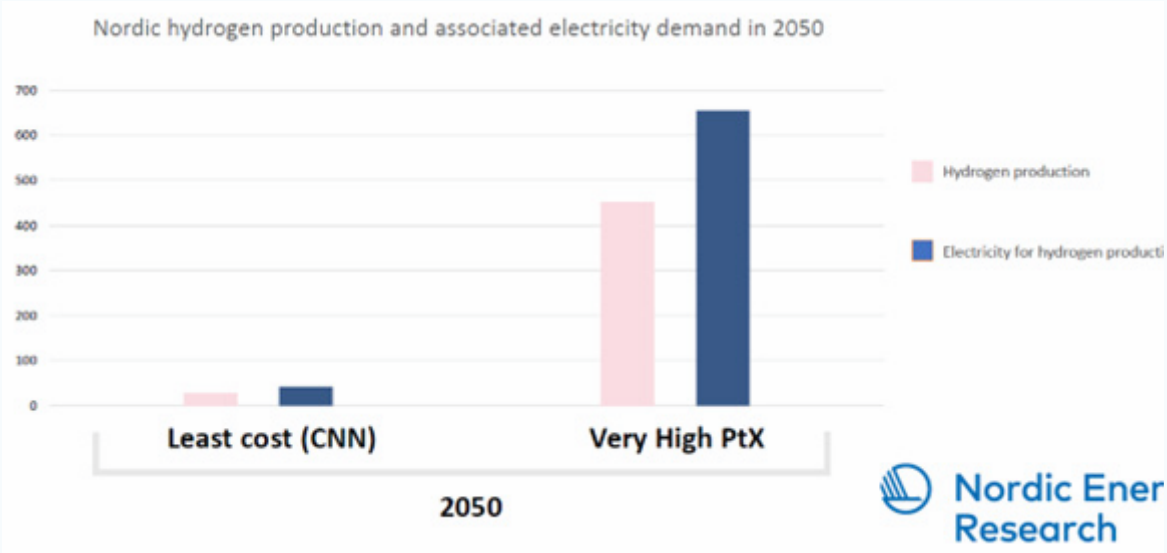
Share of food and feedstock in biofuel (Eurostat, 2023)



Most of the biofuels are imported. For instance, in Denmark only 17% of biofuels were of Danish origin. In Sweden, just 4% of the fatty acid methyl ester (FAME) biodiesel used came from Sweden.

Synthetic fuels produced with clean electricity can play a significant role both in the transport sector and more broadly. However, scenarios project very different future shares of synthetic fuels in the Nordics. For instance, in the Nordic Clean Energy Scenarios produced by Nordic Energy Research, hydrogen production in the Nordics ranges considerably depending on the scenario (figure 3).

Figure 3: hydrogen production in the Nordic countries in 2050 according to two scenarios



Key policies in the Nordics

The EU has introduced various policies to promote the use of biofuels and ensure their sustainability. The original renewable energy directive from 2009 set an overall target of 20% renewables of final energy use (including transport) by 2020, with national binding targets for each member state.

A revision of the directive set higher targets of 32% by 2030 in general and 14% in the transport sector. At least 1 percentage point of the transport target should be covered with advanced biofuels by 2025, rising to 3.5 percentage points by 2030. Fuels considered more sustainable are weighted when counting the overall share, making their use more attractive.

Biofuels counted towards the target must meet certain sustainability criteria. These include reducing lifecycle greenhouse gas emissions and limiting indirect land-use change (ILUC). Food- and feed-based fuels are capped at a maximum 7% share.

The latest revision of the directive introduces further changes. The overall renewables target rises to 42.5%. In the transport sector, the share of biofuels would be raised to 29% or emission intensity from fuels reduced by 14.5%. The share of advanced biofuels would be increased to 5.5% by 2030, including at least one percentage point from renewable fuels of non-biological origin (RFNBO). In addition, two separate directives cover sustainable fuels in aviation and shipping respectively.

All five Nordic countries have national policies to increase the share of biofuels and other low-carbon energy carriers. The two primary options have been blending obligations requiring an increasing share of biofuels in transport energy use and emission reduction mandates requiring the emissions from transport fuels to be reduced.

Since 2010, **Denmark** has had a blending obligation requiring a minimum of 7.6% biofuels. Recently it was changed to a requirement to reduce emissions by 6%, rising to 7% by 2030. The mandate also covers clean electricity used in transport.

Under the blending obligation in **Finland**, the share of biofuels was required to rise from 18% to 30% by 2030. A sub goal for advanced biofuels was set at 2% in 2021, rising to 10% by 2030. Due to policy changes, the rates have been reduced to 13.5% in 2024, 16.5% in 2025, 19.5% in 2026 and 22.5% in 2027. This is estimated to increase transport emissions by a combined 4.5 Mt CO_2 compared with the original pathway.

Since 2013, **Iceland** has also had a blending obligation. The required biofuel share was set at slightly more than 10% in 2018. However, electrification has been the primary driver for reducing transport emissions.

In **Norway**, the blending obligation was introduced in 2009. The required biofuel share in 2023 was 17%, of which 12.5 percentage points should be advanced biofuels. If the rate of advanced biofuels rises above the rate, they would be considered towards the overall target with a multiplier. Norway has also had blending obligations for aviation and non-road machinery, with a proposal for a similar obligation for maritime transport.

Sweden used to have the highest shares of biofuels driven by an emission reduction obligation. A change in government led to cutting the obligation rates significantly. Biofuel shares are expected to decline from 30.5% for diesel and 7.8% for petrol in 2023 to 6% for both in 2024–26. These changes make it increasingly unlikely that Sweden reaches its target of cutting transport emissions by 70% from 2010 levels by 2030.

Challenges with biofuels

While biofuels have been used successfully in the Nordics to reduce transport emissions, there are also many challenges associated to them. Here we highlight three key challenges.

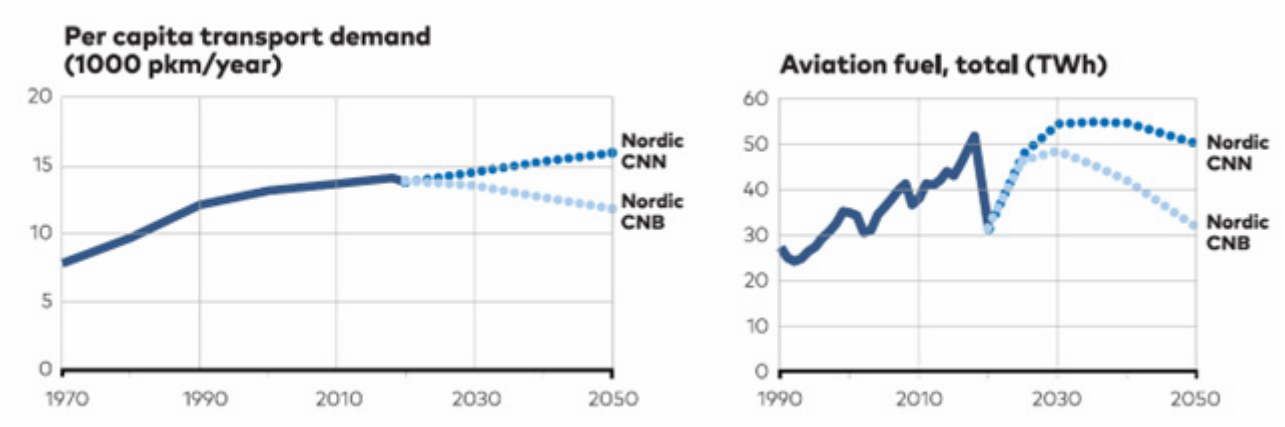
1. **Rising fuel costs.** The market prices of biofuels are higher than fossil fuels. As a result, measures to increase the share of biofuels also raise fuel costs. As price increases associated with biofuels can coincide with other mechanisms, such as rising global market prices and fuel taxes, the overall impact has created social and economic concerns. Rising fuel costs may be particularly challenging for low-income and rural households that depend on private cars as well as industries exposed to international competition. However, the cost impact of biofuels varies based e.g. on the feedstock used and demand in other countries. Fossil fuels have also unfairly benefited from direct and indirect subsidies, including not paying for their full external costs to the climate and the environment.

2. **Sustainability.** Biofuels have been associated with various sustainability concerns. Especially first-generation biofuels, derived from crops grown on agricultural land, have had fairly poor carbon footprints and contributed to rising food prices. Feedstocks such as palm oil have driven converting ecosystems rich in biodiversity and carbon stocks (indirect land use change, ILUC). Increasing the share of waste-based and more sustainable biofuels as well as increasingly stringent sustainability requirements have addressed some of the concerns, but increasing biofuel use has had the opposite effect. Burning biofuels in internal combustion engines is also significantly less energy efficient than running cars on electricity.

3. **Import dependency.** Nordic countries import a vast majority of the feedstocks used for biofuel production. Relying on imports creates concerns related to resilience. Reduced imports due to, for example, geopolitical crises would increase prices and, possibly, limit the availability of fuels. As biofuels raise costs, relying on imports also raises questions of acceptability. To what extent should Nordic citizens and companies pay for feedstocks that are produced in other countries? On the other hand – and with the notable exception of Norway – Nordic countries also need to import fossil fuels, with broadly similar concerns on vulnerability to global market fluctuations and geopolitical risks.

Behavioural changes, facilitated by policy decisions, are a key tool to alleviate these concerns. For instance, the Nordic Clean Energy Scenarios produced by Nordic Energy Research suggest significantly different levels of per capita transport demand and aviation fuel use, depending on behavioural decisions (figure 4). Reducing transport demand would also reduce the need for biofuels, limiting the pressure they put on costs, sustainability and import dependency.

Figure 4: Nordic per capita transport demand and aviation fuel use in two different scenarios



Recommendations

1 **Replace, do not remove.** Blending and emission reduction obligations have lately come under increasing political pressure. However, due to their central role in cutting transport emissions, they should not be simply removed or drastically reduced. Equally – or more – effective policies and measures should be introduced in place. These could include fuel taxes, domestic emissions trading schemes and road charges.

2 **Avoid sudden moves.** Policy certainty is on top of the wish list from business to policymakers. Imperfect but predictable policies tend to be preferable to constant and unpredictable changes in the policy landscape. Policymakers should favour long-term planning, gradual changes and cross-party agreements to maintain policy certainty.

3 **Prioritise affordable options.** Large cost increases in transport services can hurt both vulnerable households and export industries. Policies should prioritise cost-effective, affordable options. Affordability also increases policy acceptability, reducing the risk for sudden policy changes.

4 **Consider broad sustainability.** While biofuels have been successful at cutting domestic transport emissions in the Nordics, they also have sustainability issues. Depending on the feedstock and source, biofuels may have significant impacts on biodiversity, for example. Policies should factor in broad sustainability concerns and exclude unsustainable options.

5 **Avoid picking winners.** Many policies have so far been limited to biofuels only or even some specific biofuels. To allow for technological innovation and to harness the power of the markets, policies should be as technology neutral as possible. The focus should be moved from increasing the share of biofuels to phasing out the use of fossil fuels and reducing transport emissions.

6 **Invest in innovation.** Emerging technologies allow for making sustainable biofuels from alternative feedstocks (e.g. algae) and complementing or even replacing them with synthetic fuels made with clean electricity. Nordic countries should invest in the RDI of sustainable feedstocks and synthetic fuels.

7 **Factor in behavioural change.** Transport choices by citizens and companies can make it easier or harder to reduce emissions. Policies and measures can be used to enable sustainable transport choices. Scenarios, planning and policymaking should factor in behavioural change.

8 **Chart a common path for Nordic countries.** Facing broadly similar challenges, the Nordic countries would benefit from working more closely together through the Nordic Council of Ministers. This could include analysing the potential for the production of sustainable biofuels and synthetic fuels as well as creating a shared vision for these solutions (see recommendation 6). Countries could also cooperate more on exchanging lessons learnt on different policy options (see recommendations 1–5 and 7).