Nordic Council of Ministers

How can the Nordic mix of policy instruments become more effective?

Contents

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Preface

Climate policies have top priority in all our Nordic countries. Following the Paris agreement, ambitions have been substantially raised. These policies affect the energy and transport sectors in particular, and all other sectors of the economy in varying degree. To which extent could differences in incentives and regulations between our countries reduce the effectiveness or efficiency of the policies chosen? Is there room for better coordination or at least greater awareness of cross-border impacts?

On this background, the Nordic working group for Environment and Economy (NME) and the Nordic working group for Climate and Air (NKL) announced a project on possible synergies of the policy instrument mix in the five Nordic countries. We asked for examples of policy instruments and measures that might have potentially negative spill-over effect on neighbouring countries. We also asked the consultant to consider legitimate reasons for differences in policies, and finally to offer some recommendations for possible improvements.

This report has been prepared by COWI. The project was developed between January and June 2021. It has included a desk study and stakeholder interviews. Two cross-Nordic workshops were held to verify the findings and identify joint Nordic challenges and opportunities. Members of the NME and the NKL have provided comments on a previous draft. The authors of the report are responsible for the content, and any conclusions and recommendations presented do not necessarily reflect the views of the two working groups, or of the governments in the Nordic countries.

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Bent Arne Sæther
Chair of the Nordic working group for Environment and Economy

Dansk sammenfatning

De nordiske landes økonomier er stærkt integrerede med hinanden, og de har alle høje ambitioner med hensyn til at reducere deres klimapåvirkning. Landene har dog forskellige betingelser og udfordringer og har valgt forskellige strategier og foranstaltninger til at reducere deres klimapåvirkning. Økonomiske aktører i de nordiske lande handler derfor stort set i et fælles eller meget integreret marked, men støder på forskellige incitamenter. Dette kan føre til utilsigtede effekter, der kan stå i vejen for effektiviteten af landenes klimaindsatser.

Denne rapport undersøger, om sådanne utilsigtede effekter findes i de fem nordiske lande. Specifikt undersøges effekter, der stammer fra nationale klimatiltag implementeret i et nordisk land, som har utilsigtede effekter i et andet nordisk land. Denne bivirkning kalder vi en *kontraproduktiv effekt*.

At kalde effekten *kontraproduktiv* betyder ikke nødvendigvis, at et lands klimaindsats ikke kan være samfundsmæssigt optimal eller økonomisk effektiv, kun at fraværet af den kontraproduktive effekt ville øge effektiviteten af klimaindsatsen i det land hvor effekten er indtrådt. Undersøgelsen fokuserer på, om de kontraproduktive effekter er store hindringer for at nå klimamålsætningerne og har brug for større opmærksomhed, eller alternativt om de kun er mindre udfordringer, der kan afhjælpes gennem bedre nordisk koordination. Hensigten med analysen er derfor ikke at afdække de nordiske medlemmers klimatiltag generelt og er ej heller en dybdegående analyse af, hvordan de utilsigtede effekter bedst forhindres.

Ud fra en gennemgang af klimapolitiske tiltag i transportsektoren, el- og varmesektoren, affaldssektoren, byggesektoren samt i landbrugs- og skovbrugssektoren er der udvalgt syv eksempler på utilsigtede klimaeffekter.

Kapitlet om det nordiske design af klimapolitiske tiltag konkluderer, at størstedelen af de eksisterende og nye miljø- og klimapolitikker i Norden er centreret inden for energi- og transportsektoren og sigter på at reducere enten drivhusgasser eller luftforurening. I alle de nordiske lande eksisterer der sammenlignelige klimatiltag, og de omfatter øget CO_2-beskatning, tilskud til lavemissionskøretøjer, nye skatteordninger og økonomiske incitamenter til at fremme lavemissionsløsninger. Bæredygtige kriterier i offentlige indkøb anvendes også i vid udstrækning.

De største forskelle skyldes konkrete, historiske faktorer eller tilgængeligheden af inputfaktorer eller markeder. For eksempel har Island mest opmærksomhed på transport og mindre på energi, fordi der er bæredygtig opvarmning og elektricitet til rådighed. Danmarks store anvendelse af støtte til vedvarende energiproduktion er sandsynligvis forankret i landets mangel på andre energiløsninger. Tilskud til produktion af vedvarende energi kan forklares med den tidlige udvikling af vindmøller. Norges støtte til elbiler er relateret til dets adgang til billig elektricitet, og dets tradition for finansiering snarere end at subsidiere produktionen af vedvarende energi er relateret til dets position som et olieproducerende land. Sverige har historisk set været markedsledende inden for iblandede biobrændstoffer til transport og forbrænding af bioenergi til fjernvarme baseret på restaffald fra skovindustrien.

Undersøgelsen finder også, at der i alle de nordiske lande findes klimaindsatser, der

har en økonomisk og miljømæssig effekt uden for de nationale grænser. Det omhandler for eksempel produktionsstøtte til biogas, prisstøtte til elbiler, prisregulering af affaldsforbrænding og færgefart, beskatning af luftfart og krav til blandingssatser for brændstof, træaffald og kapaciteter i elnettet. Disse kan karakteriseres som styringsinstrumenter til finansiel og markedsregulering og passer godt som klimaindsatser inden for transport, energiproduktion og affaldshåndtering. Disse sektorer opererer internationalt og ændrer adfærd i henhold til deres omkostningsfunktion og efterspørgsel.

Eksempler på kontraproduktive effekter

Undersøgelsen har kun identificeret få eksempler på kontraproduktive effekter - på trods af en grundig søgning på tværs af de nordiske sektorer. Derfor er det vores indtryk, at eksistensen af kontraproduktive effekter af de nationale klimaindsatser er meget begrænset. Undersøgelsens eksempler er derfor kategoriseret som specialtilfælde og ikke repræsentative for sektorernes klimapolitiske mix i Norden. Det betyder, at undersøgelsen ikke kan begrunde iværksættelsen af større foranstaltninger til koordinering af nordiske klimaindsatser, der rækker ud over de fundne eksempler.

I det følgende oplistes de syv udvalgte eksempler på kontraproduktive effekter. De er alle inden for transport, energiproduktion eller affaldshåndtering.

- Forskelle i subsidier og skattefritagelser skaber incitamenter til at producere biogas i et nordisk land og eksportere det til brug i et andet nordisk land. Dette resulterer i en ineffektiv klimaindsats over for national produktion af biogas på grund af for høje omkostninger set i forhold til den klimamæssige udledningsgevinst.
- Forskelle mellem de nordiske landes støtteordninger til elektriske køretøjer resulterer i handel over de nordiske grænser, hvilket begrænser effekten af de nationale styringsinstrumenter, der sigter mod at øge antallet af lavemissionskøretøjer på vejene.
- Forskelle i elektricitetsafgifter og skattefritagelse for forbrug af fossile brændstoffer reducerer effektiviteten af den grønne omstilling henimod bæredygtige færger, der drives af elektricitet og grønne biobrændstoffer.
- Affaldsforbrændingsomkostninger og affaldsforbrændingskapacitet varierer mellem de nordiske lande og skaber incitamenter til at transportere affald over grænserne. Dette kan i visse tilfælde føre til en øget udledning af klimagasser (men ikke altid).
- De styringsinstrumenter, der anvendes i de nordiske lande til støtte for bæredygtig luftfart, er forskellige med hensyn til både pris- og mængderegulering, hvilket fører til negative miljø- og klimapåvirkninger.
- Brug af træaffald i energiproduktion kan hjælpe med at nå de nordiske landes mål om kulstofneutralitet. Forskellige klassifikationer af træaffald i de nordiske lande fører imidlertid til en øget transport af træaffald over grænserne.
- Klimaindsatser, der skaber forøgelse af vedvarende energi i det nordiske transmissionssystem og øget elhandel over grænserne, har forøget behovet for foranstaltninger, der kan balancere elproduktionen i transmissionssystemet. De nordiske transmissionsoperatører samarbejder allerede om den nordiske balanceringsmodel, men i takt med udviklingen vil behovet for balancering

kunne skabe barrierer for at øge produktionen af den vedvarende energi, der er baseret på vandkraft, vindmøller og solenergi og er afhængig af vejr- og sæsonudsving.

Karakteristik af de kontraproduktive effekter

Undersøgelsen har identificeret tre typer af kontraproduktive effekter fra nabolandes klimatiltag. Den første type er reduktion af de økonomiske fordele af et klimatiltag. Den anden er reduktion af miljø- og klimapåvirkningen og dermed potentialet til at nå de nationale klimamålsætninger. Den tredje effekttype fordrejer konkurrencen i sektoren og reducerer derved de økonomiske fordele ved den grønne omstilling. Da det ikke har været muligt at gennemføre en detaljeret kvantificering af effekterne inden for rammen af opgaven, så har det heller ikke været muligt at konkludere, om de identificerede kontraproduktive effekter har været mindre end de enkelte landes fordele ved at have differentierede styringsinstrumenter.

Den miljømæssige effekt i eksemplerne omfatter udeblevne reduktioner af drivhusgasser. Størrelsen er afhængig af det pågældende klimatiltag og den omfattede sektor. Forvridning af tiltag inden for biogas reducerer miljøfordelene ved at erstatte fossile brændstoffer med biobrændstoffer. Det påvirker biodiversitet, jordkvalitet og sundhed. Da bioraffinering er en metode til at slutte den livscyklus, som rå biomassematerialer indgår i, påvirker kontraproduktive effekter tiltag, der skal fremme den, også omstillingen til en mere cirkulær økonomi. Inden for transport påvirker variationer i subsidier, der tilskynder til overgangen fra fossile brændstoffer til elektricitet, landets (i vores eksempel Sveriges) forventede udledninger af drivhusgasser og luftforurening. Transport til udlandet af specifikke affaldsfraktioner kan afstedkomme luftforurening og udledning af drivhusgasser på grund af øget transport. Dog kan denne negative effekt i visse tilfælde blive opvejet af positive effekter af en mere effektiv fraktionsbehandling.

De økonomiske effekter i eksemplerne er relativt små, set i nationalt og sektormæssigt perspektiv, da eksemplerne er få og specialtilfælde frem for effekter på generelle sektorpolitikker. For tiltag, der skal fremme biogas, er der eksempler på forvrængede marginalomkostninger ved omstilling af fossile brændstoffer til biobrændstof på grund af dobbelt finanspolitisk støtte. Inden for transport er der tale om tab som følge af konkurrenceforvridning. Forskelle i klimatiltag mellem landene har formentligt skabt større marginalomkostninger for klimavenlig skibsfart. For luftfart øger forskellene i brændstofløsninger mellem landene infrastrukturomkostningerne. I affaldssektoren ses effekter, der kan øge lokale omkostninger ved affaldshåndtering. Der er også eksempler på transport af affald, der primært tilskyndes af afgiftsforskelle, hvilket kan betragtes som overflødigt og derfor kontraproduktivt.

De undersøgte eksempler viser kun milde eksempler på forvridning i den private sektors konkurrence. Dette behøver dog ikke være tilfældet på længere sigt. Efterspørgsel efter transport og energi er meget følsom over for prisvariationer, og da begge sektorer er kritiske faktorer for den nordiske produktivitet, kan virkningerne af markedsforvridninger vise sig større på langt sigt.

Barrierer for en effektiv policy-mix

Rapporten identificerer nogle barrierer, der hindrer landene i at imødegå de kontraproduktive effekter og dermed opnå en bedre effekt af klimaindsatsen. Kun få eksempler på kontraproduktive effekter er blevet identificeret. Derfor er barriererne, der skal overvindes, også få. De identificerede eksempler viser, at de kontraproduktive effekter typisk opstår, når klimatiltagene er forskellige fra land til land. Effekternes art varierer afhængigt af det valgte styringsinstrument.

- En type forvrængning opstår, når en sektor modtager støtte fra flere lande gennem flere led i en værdikædeproduktion. For eksempel støtter nogle nordiske lande en klima- eller miljøvenlig produktionsside (eller salg), mens andre støtter forbrugssiden. Muligheden for at modtage mere støtte, end hvad der oprindeligt har været tiltænkt, skaber ikke-optimale resultater af klimatiltagene og står dermed i vejen for et bedre policy-mix.
- Den anden type forvrængning opstår, når et land subsidierer prisen, og et andet regulerer mængden af et produkt. Dette forhindrer lige konkurrencevilkår for de enkelte sektorer på tværs af Norden og kan derfor skabe en overordnet ineffektiv klimapolitik, set på nordisk niveau.
- Den tredje identificerede type forvrængning skyldes variationer i prisregulering. Alle lande har valgt prisregulering til reduktion af emissioner, men på forskellige måder. Nogle bruger skattelettelser, andre subsidier; nogle har til mål at påvirke energiforbruget og andre udledninger af CO_2. Fremme af de enkelte energikilder kan også understøttes forskelligt.
- Den sidste type forvrængning er forskelle i mængderegulering. En sådan regulering kan antage mange former og variere mellem de nordiske lande. For eksempel kan barrieren være forskelle i typeklassificeringer eller forskelle i reguleringsmæssige krav til forbruget af en ressource.

De bagvedliggende årsager til, at barriererne eksisterer, omhandler især erhvervs- og organisationsmæssige styrkeforhold; karakteren af de aftalte styringsinstrumenter og tilskudsordninger; manglen på politisk koordinering og evaluering af politiske effekter mellem landene af de klimatiltag som har potentiale til at skabe grænseoverskridende effekter eller geografiske forskelle mellem de nordiske lande.

Barriererne har meget at gøre med manglende international koordinering af klimatiltag, og at de gode eksempler ikke overføres til det øvrige Norden. Baggrunden for dette er formentligt en manglende tradition for at teste effekterne af en politik ud over de enkelte landes grænser. Politikere ser sjældent på tværs af grænser, når de udformer deres politikker.

Anbefalinger til det nordiske samarbejde om afbødning af de negative effekter kan sammenfattes i tre hovedbudskaber:

- Vær forsigtig med at kommunikere resultaterne af undersøgelsen, så det ikke leder til en tro om, at miljø- og klimaindsatserne i de nordiske lande generelt er ineffektive, og at der sjældent sker en koordination mellem landene.
- Det begrænsede antal kontraproduktive effekter, der er identificeret i denne undersøgelse, kræver ikke større justeringer på den måde, miljø- og klimaindsatserne er designet og implementeret i de nordiske lande.
- Beslutningstagere og de lovforberedende embedsfolk bør tilskyndes, f.eks. via indsatser fra Det Nordiske Ministerråd, til at koordinere klimaindsatser, hvor det er muligt og giver fordele.

Konkrete anbefalinger baseret på de syv kontraproduktive eksempler omfatter:

Tildel en organisatorisk enhed (f.eks. en eksisterende nordisk arbejdsgruppe) rollen som et forum, der kan tilskynde politikere til bedre at koordinere (miljø- og klima-) indsatser, hvor der potentielt kan opstå grænseoverskridende kontraproduktive effekter.

Styrk effekten af de nordiske indsatser ved at udbrede forståelsen af den negative effekt, som en national klimaindsats kan skabe for sine naboer:

- Udarbejd et format eller metode til at udveksle viden om nye styringsinstrumenter i planlægningen på tværs af de nordiske lande med det formål at sænke de marginale og samlede socioøkonomiske omkostninger ved de enkelte klimaindsatser.
- Samarbejd om værktøjer, der kan sammenligne de samlede og marginale reduktionsomkostninger.

Samarbejd om at vurdere de nordiske landes skatte- og tilskudssystemer i forhold til, om de valgte instrumenter bidrager til at øge effekten af de nordiske klimaindsatser. Her bør muligheder for europæisk harmonisering også overvejes.

Executive summary

The economies of the Nordic countries are highly integrated with each other, and they have all high ambitions with respect to reducing their climate impacts. However, the countries have different conditions and challenges and have chosen different strategies and measures to reduce their climate impact. Economic actors in the Nordic countries therefore act largely in a common or highly integrated market but encounter different incentives. This can lead to unintended side effects that are an impediment to the efficiency of the countries' respective policy mixes.

This study explores whether there exist such side effects in the five Nordic countries. Specifically, side effects that are unintended and stems from policy instruments implemented in another Nordic country. This side effect we call a *counterproductive* effect.

Calling the effect *counterproductive* does not necessarily mean that a country's climate effort is not effective and efficient, only that the avoidance of the counterproductive effect would overall increase the effectiveness and efficiency of the country's climate efforts where the effect appears. The study's focus is on whether these counterproductive effects are large obstacles for reaching the greenhouse gas emission reduction targets and need overall attention, or only minor inadequacies that can be attended to through better coordination. The aim is therefore not a study on uncovering the Nordic members' policy instruments in general, nor does it focus on identifying possible solutions to the challenges in depth.

The study has reviewed policy instruments in transportation, electricity and heat production, in the waste sector, the construction sector, as well as in the agriculture and forestry sectors. From those, seven examples of counterproductive effects have been identified.

The chapter on the Nordic design of policy instruments begins with a general review which concludes that the majority of the existing and new environmental and climate policies in the Nordics are centred around the energy and transportation sectors and aim at greenhouse gas reductions and air pollution. The report shows that similar instruments are found in all the Nordic countries. These include increased taxes on greenhouse gases, subsidies for low carbon emission vehicles, introduction of new taxation schemes and tax reduction incentives. Sustainable criteria in public procurement are widely used.

The chapter concludes that the main differences are due to specific historic factors or availability of input factors or markets. For example, Iceland has most attention on transportation and less on energy because there is sustainable heating and electricity available. Denmark's high use of subsidies in renewable energy production is likely to be rooted in the country's low availability of alternative energy sources. Subsidies to renewable energy production can be explained by the early development of wind turbines. Norway's support to electric vehicles is related to its access to cheap electricity, and its tradition of funding rather than subsidising the generation of renewable energy is related to its position as an oil producing country. Sweden has historically been a first mover in blend-in biofuels in transportation and combustion of bioenergy for district heating based on residues from the forest industry.

The study also finds that in all the Nordic countries climate policies exist that have

an economic and environmental impact across the national borders. They include i.e. subsidies for biogas production, electric vehicle cost support, price regulation on waste incineration and ferries, taxation on aviation and requirements on fuel blending rates, wood waste and electricity grid capacities. These can be characterized as being financial and market regulation policy instruments and likely to apply to the transportation, energy production and waste management sectors. These sectors operate internationally and change operations according to the cost function and demand.

Examples of counterproductive effects

Some of these policies have counterproductive effects in the neighbouring countries and the study identifies seven examples of them. It should, however, be underlined that in spite of an in-depth search in most sectors, only a few examples have been found. Therefore, it is our impression that there are few such counterproductive effects. This implies that it should not be concluded that our examples are general or even representative for the sector climate policy mix, nor that there is need for major changes beyond the found examples.

The identified examples of counterproductive effects are all the area of transportation, energy production and waste management. They are as follows:

- Differences in subsidies and tax exemptions create incentives to producing biogas in one Nordic country and exporting it for use in another Nordic country. This results in an inefficient policy towards the national production of biogas, i.e., too high costs compared with the benefits from reduction in CO_2 emissions.
- Differences between the Nordic countries in support schemes to reduce the costs of buying and/or operating electric vehicles result in exports/import of electric vehicles across Nordic borders, limiting the effectiveness and efficiency of the national policy instruments aimed at increasing the proportions of low emission vehicles in transportation.
- Policy instruments in some Nordic countries to support a green transition to sustainable ferries powered by electricity or green biofuel are ineffective due to taxes on electricity and tax exemptions of fossil fuels in neighbouring countries.
- Waste incineration costs and waste incineration capacities vary between the Nordic countries, creating incentives to transporting waste between countries. This may lead to excessive CO_2-emissions (but not always).
- The policy instruments applied in the Nordic countries to support sustainable aviation differ with respect to both price and quantity regulation leading to negative environmental and climate impacts.
- Using wood waste in energy production can help reaching the Nordic countries' target of carbon neutrality. However, different classifications of wood waste across the Nordic countries lead to excessive transport of wood waste across the borders.
- The increase of the renewable power sources in the Nordic transmission system and increased cross-border power exchange has caused the Nordic transmission system operators (TSO's) to collaborate on a joint program called the Nordic Balancing Model. There is a need to balance the transmission system. This constitutes a barrier to increased production of renewable energy relying on water, wind, and sun, all with weather and seasonal fluctuations.

The characteristics of the counterproductive effects

The study has identified three types of counterproductive effects. They include a reduction of the economic effectiveness of a policy instrument. A reduction of the environmental and climate impacts and thereby the potential to achieve the national targets for greenhouse gas mitigation. Thirdly, a distortion of the competition in the sector and thereby reduction of the economic benefits of the green transition. Due to the generic nature of the examples, neither quantified effects, nor indirect effect has been possible in a meaningful way within the framework of the project. Hence, any of the identified counterproductive effects may well be smaller than the benefits from having differentiated policy instruments.

The environmental side-effects for the identified examples are a national loss of greenhouse gas reductions, the size of the loss depending on the instrument and sector in question. By having distortions in biogas policy instruments, the environmental benefits of replacing fossil fuels for biofuels is reduced. This affects biodiversity, soil quality and health. Also, as biorefining is a key technology for closing loops of raw biomass materials, the distortion also affects negatively the transition to a circular economy. In transportation, variations in subsidies that encourage the transition from fossil fuels to electricity affects the country's (in our example Sweden's) expected GHG emissions and air pollutant levels. For waste incinerations of specific fractions, the effect may be negative for air pollutants and GHG emissions due to increased transportation. However, the study also points out, that the negative effect may be balanced by a positive CO_2 and environmental effect, due to a more efficient treatment of the fractions.

The adverse economic impact of a counterproductive effect is an economic efficiency loss for a society. However, it is our assessment that the impact is low in a national and sector perspective, since the examples are few and are special cases, rather than general sector policies. For the biogas policy instruments, there are examples of distorted marginal cost of replacing fossil fuels for biofuel due to double fiscal support. In transportation, the economic effects are losses due to distorted competition. Differences in policies between countries are likely to have resulted in higher marginal cost of the transition to green maritime transportation. Also in transportation, within aviation, the differences in fuel solutions in-between the countries increase the infrastructure costs. In the waste sector, the effect is due to excessive amount of waste for incineration is traded between the countries which may lead to adverse effect on the local cost of waste management. Also, there are examples of transportation of waste incentivised mainly by tax differences, which can be considered redundant and therefore counterproductive.

The studied examples show only mild examples of distortion in private sector competition. However, this does not need to be the case in the longer run. Demand in transportation and energy is highly sensitive to price variations, and as both sectors are critical to most of Nordic productivity, the effects of market distortions can be high in the long run.

Barriers for an effective policy mix

The report identifies a series of barriers to an effective policy mix. Only a few examples of counterproductive effects have been identified. Hence, the barriers to overcome are also few. The identified examples show that distortions are likely when policy instruments differ between the countries. The nature of the distortion varies, depending on the difference between the policy instruments.

- One type of distortion occurs when the sector receives support from several countries along the value chain. For example, some Nordic countries support the production (or sale) of a product with good environmental properties, while others support its use. The product may then receive more support than is optimal from an efficiency point of view – i.e. the cost of the support exceeds the benefits of the environmental and climate change reductions.
- The second type of distortion occurs when one country subsidies the price and another regulates quantity of a product. This is in itself a possible cause of a lack of a level playing field within the Nordic region as the overall support levels to the different markets may differ.
- The third identified type of distortion is due to variations in price regulation. All countries have chosen price regulation for reducing emissions but in different ways. Some use tax relief, some subsidies; some target energy consumption and some reductions of CO_2 emissions. Different energy sources may be supported differently.
- The last type of distortion is differences in quantity regulation. Such regulation can take many forms and differ between the Nordic countries. For example, the barrier can be differences in classification of resources or differences in requirements to the use of resources.

The underlying reasons for the identified barriers include industrial and organisational strengths, the nature of the agreed policy instruments and support schemes, the lack of policy coordination and evaluation of policy effects in-between the countries, where there is a risk of transboundary effects as well as geographical differences between the Nordic countries.

The barriers have much to do with a lack of coordination – or that best practices from some countries are not adopted in others. Underlying reasons for this are the lack of tradition in testing policies for counterproductive effects abroad. Policymakers seldom look much across borders when designing policies.

Recommendations to Nordic collaboration for mitigating the negative effects can be summed up as three main activities.

- Take care when communicating the findings of this study and so not to spur the belief that environmental and climate policies overall in the Nordic countries are neither effective nor efficient and that they rarely are coordinated between the countries.
- The limited number of counterproductive effects identified in this study do not call for major changes to the ways environmental and climate policies are designed and implemented in the Nordic countries.
- Policymakers should be encouraged, e.g. via awareness raising efforts by the Nordic council of ministries, to improve coordination where it is feasible and gives benefits.

Specific lessons from the seven counterproductive examples include:

- Assign a responsible body (e.g. an existing Nordic working group) to become a forum for encouraging policymakers to better coordinate (environmental and climate) policies with possible cross-border counterproductive effects.
- Strengthen the Nordic mix of policies by enhancing the understanding of the negative effect a national policy instrument may cause its neighbours.
- Apply a format for exchanging knowledge about new policy instruments in the planning across the Nordic countries to lower the marginal and total socioeconomic costs of CO_2 abatement.
- Cooperate on comparing the total and marginal abatement costs.
- Cooperate on assessing the Nordic countries' tax and subsidy systems to ensure that the chosen measures contribute to enhancing the effectiveness of the Nordic policies. Here, also European harmonisation should be given attention.

1. Introduction

The background for this study is that the Nordic countries have agreed to an ambitious vision for 2030 for the Nordic Region: that the Nordic region will become the most sustainable and integrated region in the world by 2030. The Nordic economies are strongly integrated with each other but have chosen different pathways and climate policy instruments to reduce their environment and climate impact. Some of the instruments (at least for the EU Member States) are steered by EU directives and regulations, others are developed in public-private sector collaboration and some are rooted in the countries' constitutional history and tradition.

The different pathways towards a low carbon society have from time to time shown to have unintended effects across the national borders; some have been counterproductive to the neighbouring countries' climate efforts.

The purpose of this study is to identify the nature of such counterproductive side effects, in the form of policy instruments or implemented sectoral efforts that have turned out to be counterproductive to neighbouring countries' climate efforts. The underlying hypothesis is that the Nordic climate efforts involve many interdependencies and opportunities to create interconnected solutions, but most efforts are being made within national sector co-operation, and standardisations across the Nordic region are still lagging behind. The effectiveness of climate policy does not only depend on how well it is implemented in the individual countries. National policy measures may have international spill-over-effects that partially neutralize neighbouring countries' emission reductions. The mission is to explore these interaction effects and the barriers to a more effective policy mix on a Nordic scale.

It is important here to underline that the ambition of the project is to explore whether there are counterproductive effects, whether they are large problems that need overall attention or only minor inadequacies that can be attended to through better coordination. The aim is not to study possible solutions to avoiding the side effects in depth but to increase the available knowledge for decisions on the policy instruments causing the effects.

The report presents the results of a study of the national policy instruments that have an impact on the climate and which for various reasons have a counterproductive effect on the climate efforts in the other Nordic countries. The study has reviewed policy instruments within transport, electricity, and heat production, in the waste sector, the construction sector, as well as in the agriculture and forestry sectors. The analysis has been based on a desk review, interviews, and workshops with the two Nordic working groups, respectively for environment and economy (NME) and climate and air (NKL).

The report applies a bottom-up approach by identifying and describing actual counterproductive effects and uses them to suggest possible policy coordination across the Nordic countries. The report does not intend to provide an exhaustive overview. Instead, it aims at facilitating further research and joint projects by providing sector examples on environmental and policy policies with side effects.

The report is divided into main chapters. First, the Nordic climate and environmental instruments are introduced. In chapter 3 we present seven examples of counterproductive side effects between countries. We have identified examples in the sectors of transportation, energy production, agriculture and waste management. In chapter 4, the barriers to a more effective policy-mix are discussed. Chapter 5 provides recommendations for a more effective policy mix and proposals to mitigate the counterproductive effects are presented.

Understanding of an efficient environmental and climate policy mix

The focus of this study is whether two (or more) sets of policy frameworks exist that have a counterproductive effect in another country. The counterproductive side effect is a consequence or lack of consequence of a policy, that makes a country worse off than an alternative more aligned or efficient policy.

A few studies[1] have focused on understanding the efficiency of environmental and climate policies. The instruments have been shown to exercise a rather large effect when it comes to influencing the production and consumption of a good in a specific way. They have been shown to be an efficient way to steer the countries towards more sustainable development, if used properly. For example, economic instruments can together with other policy and regulatory incentives strongly influence the development in a market, such as the Norwegian new-car market where electric vehicles now account for a significant share.

The nature of the pollutant plays a very important role when policymakers study the efficiency of a policy and decide which policy framework should be used to control pollution, also in the Nordic countries. In economic theory, the pollutant or emitter faces various options of marginal costs of abatement and the preferred choice is the lowest cost. The efficiency of a policy instrument that targets environmental and climate reductions can be expressed by its effect on the marginal cost of abatement for a sector, country, or a region like the Nordic region. According to the theories, a high cost is inefficient, if a lower cost is possible. The most efficient policy is when the marginal cost of abatement is the same for all emitters or polluters in all the countries. The argument is that if competing marginal cost of abatement exists, the most efficient policy for an emitter/polluter would be to shift production or consumption towards the country with the lowest marginal cost.

Following this, one might expect that when there are differences in the Nordic abatement policies, an alignment of them is recommended. However, this might be true in a simple world with equal history and regulation, but not necessarily in complex societies where legislation and policies are woven together across sectors and take into account externalities, such as equality distribution, transportation distances, population density, resource endowments and social norms. Therefore, this study does not take for granted that equal policies are more efficient, and recommendations are not necessarily to align policies, but to investigate different options.

1. See e.g. (Greaker, Golombek, & Hoel, 2019).

An example of an area where equal abatement costs exists is the European carbon emission trading scheme (EU-ETS). The Nordics face similar abatement cost in some sectors because of the ETS collaboration which operates under the cap-and-trade principle. The ETS covers 40% of the EU's emissions from the power sector, manufacturing industry, and aviation in the European Economic Area.

2. Nordic climate and environmental policy instruments

This chapter presents the characteristics of the Nordic environmental policy instruments in general and country-wise. The chapter sums up the findings from the desk study on the countries' similarities and differences in the design of policies that may lead to counterproductive effects in neighbouring countries.

The last decade has seen changes to the overall climate policy objectives in the Nordic countries. Most noteworthy, all countries defined ambitious greenhouse gas reduction targets and roadmaps. They are now identifying the policy instruments at sector level for meeting their commitments to the International Paris Agreement on climate change. The agreement has in many ways represented a significant shift in global climate politics, also in the Nordic countries (Nasiritousi & Bäckstrand, 2020). The policy shift can be characterized as being more domestic and driven by a more binding climate policy central to the agreement.

For example, all the Nordic countries have committed themselves to carbon neutrality by a specific year. Norway aims at achieving carbon neutrality by 2030, including emissions cuts made by other countries, Finland aims at zero net emissions in 2035, Sweden in 2045 and Denmark in 2050. Iceland aims at carbon neutrality in 2040. These targets include various sub goals. Specifically for 2030, Denmark aims at a 70% reduction in greenhouse gas emissions compared with 1990 levels, Sweden 63%[2], and Finland, Norway and Iceland 55%.

The Nordic environmental and climate policy is often driven and reinforced by the European agreements, whether it is through the 27-member commitments (which include Finland, Sweden and Denmark) or through the extended collaboration (including all Nordic countries). An example of this is the establishment of the European Emission Trading Scheme (EU ETS) in 2005, but a long series of environmental and energy directives have also made their impact on the Nordic approach. They all have sector commitments under the EU ETS (European Emissions Trading Scheme). The ESR (Effort Sharing Regulation) and the so-called LULUCF (Land-use-and-land-use changes) only involve the 27 EU members.

The Nordic countries have traditionally operated with a broad set of economic and regulatory instruments[3]; this also includes policy instruments for targeting the climate challenge. All countries have similar, high levels of taxation compared with other European countries and in all the Nordic countries, the highest attention has been given to 1) increased taxes on greenhouse gas, 2) subsidies for low carbon emission vehicles, 3) taxation schemes on transportation; and 4) tax reduction incentives for repair and maintenance of certain goods to reduce material use (Carlén & Kristrom, 2018).

An overview of the most typical climate and environmental policy measures in the Nordic countries is shown in Table 1.

2. By 2030, emissions in Sweden within the sectors covered by the EU Effort Sharing Regulation should be at least 63% lower than in 1990.
3. See e.g. (Nasiritous, et al., 2019) and (Svenningsen, et al., 2019).

Table 1 Typical Policy measures in the Nordics

Source: Based on extracts from Climate Policies in the Nordics and The Use of Economic Instruments in Nordic Environmental Policy 2014–2017, NCM, 2020 and own analyses.

MEASURES	TYPE	TRANS-PORTATION	ENERGY	WASTE	AGRI-CULTURE	CON-STRUCTION
Investments in public infrastructure	Quantity/Producers	X	X	X		
Investments in renewable energy plants	Quantity/Producers		X			
CO_2 differentiated technology taxation	Price/Users	X				
Feed-in tariff/green electricity certificates	Price/Users	X	X	X		
Energy taxation	Price/Users	X	X	X	X	X
Carbon emission taxation	Price/Users	X		X		
Quota for biofuels for transportation	Quantity/Users	X				
Technology requirements	Quantity/Producers	X	X	X	X	X
Reduced tax rates on bio-fuel use	Price/Users	X	X	X	X	
Sustainability criteria in public procurement	Quantity/Producers	X	X			X

In all five Nordic countries, many environmental and climate policies are applied in the energy and transportation sectors (European Environment Agency, 2016). Evaluations of the Nordic countries' policy instruments also show that new instruments and changes to now discontinued instruments are most often seen within these sectors, and for the benefit of greenhouse gas reductions and air pollution (Nasiritous, et al., 2019; Svenningsen, et al., 2019).

A large number of policy instruments are seen in the *energy* sector including regulation on both the production and consumption side. All Nordic countries have carbon emission and energy taxation components and are ambitious when it comes to shifting the energy sector to renewable energy (Carlén & Kriström, 2018). Except Iceland, all countries regulate energy production through lighter taxation of, subsidies to and research funding for renewable and cleaner energy sources such as wind, hydro and photovoltaics (Svenningsen, et al., 2019). This has led to a higher share of renewable energy sources in final energy consumption than in Europe on average. There is also a strong tradition for policy instruments that promote bio-energy use. Biofuels are often lower taxed than fossil fuels, and Denmark and Finland have support schemes for bio-fuel use and/or production.

Norway and Sweden have the highest use of economic instruments in the *transport* sector (Nasiritous, et al., 2019). All countries have excises on cars and vehicle taxation that are often differentiated with respect to the vehicle's energy efficiency and specific CO_2 emissions or fuel consumption. All the Nordic countries have renewable energy quotas for transportation fuels and biofuel users often pay lower

energy taxes than users of fossil fuels. Norway and Sweden are the only countries that levy road congestion charges in cities.

All countries use public procurement as a strategy to promote sustainable environmental and energy solutions (cleantech solutions) in Public Procurement (Svenningsen, et al., 2019).

The Nordic countries have a high degree of volunteering and often rely on the private sector to participate in implementing the policy measures (Svenningsen, et al., 2019). The countries have been establishing partnerships with the private sector, and except for Iceland, all countries produced sector level roadmaps for reaching the greenhouse gas targets for the coming decades.

Main characteristics of policy instruments by country

Although there is a high degree of similarities in the regulatory set-up and the chosen instruments in comparison with the rest of the world, there are also variations between the Nordic countries. In the following, some characteristics of each of the Nordic countries' environmental and climate policies on the production and consumption side is listed.

Norway has on the production side supported the production of electricity from renewable sources through funding of a public agency, Enova, and has introduced a certificate scheme for renewable energy, through which electricity certificates can be sold at market price.

Policy instruments to regulate consumption are especially seen in transportation. Norway has an annual and initial registration vehicle tax which depends the vehicle's weight, engine effect, CO_2 and NO_X emissions. Norway has a road charging scheme in cities to reduce congestion which also has a positive environmental and climate effect.

To regulate energy production, *Sweden* subsidises solar heat and biogas and like Norway operates a certificate scheme to support renewable energy. On the consumption side, Sweden has historically been a first mover in blend-in of biofuels[4] (Riksdag, 2009). This could be explained by the high availability of agricultural and forest feedstock. Sweden has historically used energy taxes and carbon taxes to regulate fossil fuel use. Sustainable high-blended biofuels are exempt from both CO_2 tax and the energy tax. Electricity is subject to a tax per kWh, but differentiated by end user, irrespective of the primary energy source from which the electricity is generated. Sweden levies like Norway road congestion charges in cities. Since the effect promotes public transportation, the scheme is likely to have a positive environmental impact, because it reduces the number of private passengers on the road. A tax exemption is offered for vehicles with a relatively low environmental impact and subsidises new cars with very low CO_2 emissions.

Denmark is the country that uses most economic policy instruments on the energy production side (Svenningsen, et al., 2019). The country subsidizes biogas plants, a

4. In 2005 the Swedish Parliament adopted the Pump Act, that states that from 1 April 2006 the major filling stations must supply renewable fuel, such as ethanol or biogas.

policy that is developed through its country's agricultural history and relative high availability of agricultural feedstock. Denmark has also since 1992 subsidised the development of renewable energy, such as wind power, solar cells, and biogas. This early support to sustainable energy was due to the country's lack of alternatives to fossil fuels during the oil crises in the 1970's and 1980's. Also, the success in developing a world leading wind power industry, further encouraged the political opinion in favour of the subsidises.

Policy instruments on the consumption side include CO_2 taxation which was introduced in 1992. Vehicle registration is tax, calculated according to fuel efficiency and the car's value, is levied as a one-off payment when the vehicle registers for the first time in the national motor registrar. Up until 2016, electric cars were fully exempt from the registration tax. The tax rate on electric cars depends on the value of the car.

Because of *Iceland*'s development of an energy system based on geothermal and hydropower, the country has not had any history in further promoting the use of renewable energy sources through subsidies. The most common policy instruments to regulate consumption is found in the transportation sector. Iceland has transportation taxes based on weight of vehicles and CO_2 emission taxation for both fiscal and environmental purposes. Since 2013, a reduced tax rate has been levied on purchases of electric vehicles, hydrogen vehicles and hybrid vehicles.

Instead of direct governmental intervention to guide the choice of energy sources, *Finland* uses a range of economic instruments to promote energy efficiency. Two-thirds of Finland's environmentally related tax revenue in 2014 came from the energy and air pollution sector. On the production side, Finland offers feed-in tariffs to produce renewable energy from wind, biogas, wood chips and wood-fuelled power plants. It also subsidises investments and research in renewable energy. Finland uses bio-fuel quotas for heating of buildings.

Finland has the highest CO_2 emission taxation and introduced CO_2 taxation as the first country in the world. In transportation, Finland has a long history of registration tax and also has an annual vehicle tax on cars, as well as providing advantages for owners of low emission cars, such as a 50% discount on parking fees (Jordal-Jørgensen, Kveiborg, & Friis-Jensen, 2017). The annual taxes increased significantly in 2015 due to CO_2 emission taxation.

This chapter has provided an overview of the Nordic environmental policy instruments in general and country-wise. The following chapter presents the examples of instruments and measures that have a counterproductive impact across national borders within the Nordic region.

3. Counterproductive effects

The climate and environmental policy instruments implemented in the Nordic countries are not always coordinated between the countries. There can be several reasons for this. As discussed in the previous chapter, the policy-making traditions may differ with respect to the choice of policy instruments. There may, for example, be differences in the use of price vs. quantity regulation, in the focus on whether to regulate the production or the use of resources, and differences in the sectors being regulated.

Furthermore, the focus on the production or the use of resources as well as the sector focus depend to some degree on the industrial strength of a given country. For example, if the production of biogas is sizeable, it is most likely to be in focus of the policy instrument. This is not least because of the relevant industrial organisations most likely being powerful. A lack of coordination may therefore also be caused by different organisational set-ups in the Nordic countries for policy making and/or policy implementation, hereunder the involvement of industrial organisations.

The focus on achieving national climate and environmental objectives also imply a choice of policy instruments that is effective in doing so, but a choice that does not necessarily take into account the efforts made in the other Nordic countries. In this context, the Nordic countries are found to have somewhat different approaches to assessing the effectiveness and efficiency of policy instruments prior to being implemented. This difference may also affect the speed at which policies are being implemented, reducing the feasibility of policy coordination between the Nordic countries.

The purpose of this chapter is to describe seven cases of counterproductive effects caused by such policy instruments. They have been identified via desk studies and stakeholder consultation. The aim has not been to identify and describe all such policy instruments, but to select climate or environmental policy instruments implemented in one or more Nordic countries that are considered to have significant adverse consequences in other Nordic countries. In other words, the ambition has been to provide a basis for identifying the most important barriers to a more effective Nordic mix of policy instruments (Chapter 4), and for recommending ways to overcome such barriers (Chapter 5).

It may, however, be argued that the purpose of the study may in itself be counterproductive in the sense that identifying such policy instruments can spur the belief that environmental and climate policies overall in the Nordic countries are neither effective nor efficient and that they differ much between the countries. This is not the case. In the overall analysis and the recommendations care has therefore been taken to underline that only few counterproductive effects have actually been identified.

Figure 3.1 gives an overview of the seven cases of policies which have caused counterproductive effects. They are all presented in detail in the following sections. They are placed in the figure according to whether environmental and climate objectives are pursued via price regulation or via quantity regulation, and whether

the regulation takes place on the producer (or sales) side of the value chain, or on the user side.

In brief, the figure shows that two of the cases, 'biogas subsidy' and 'electric vehicle cost support', are examples of policy instruments with counterproductive effects because some Nordic countries regulate producer (or sales) prices while others regulate user prices, limiting the overall Nordic effectiveness of the price regulation. For two other cases[5], 'waste incineration' and 'sustainable ferries' the counterproductivity is related to differences in price regulation of the resource use in the Nordic countries. Then there is a case called 'sustainable aviation' whose counterproductivity is due to differences in price regulation, i.e. taxes, and in quantity regulation, i.e. requirements to fuel blending rates. The next cases, 'wood waste regulation' is due to different classifications of wood waste across Nordic countries leading to excessive transport of wood waste. Finally, there is 'energy supply capacity', which is due to differences energy supply and electricity grid capacities across the Nordic countries.

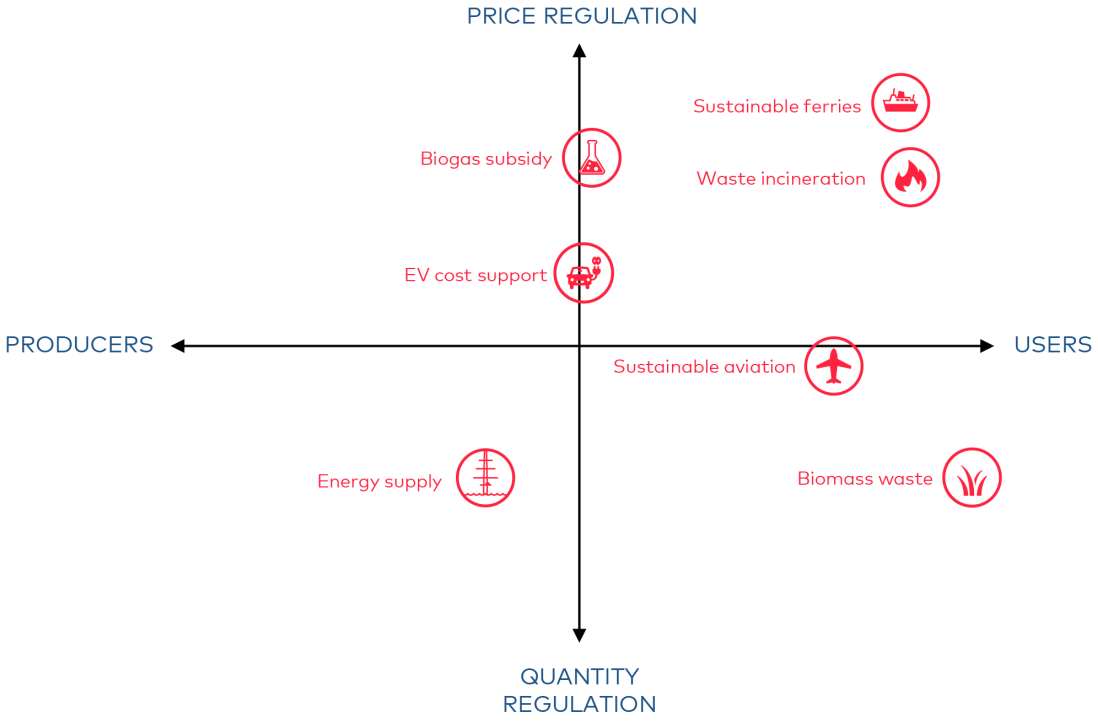

Figure 3.1 Counterproductive cases

5. Note that some of the case titles refer to the climate or environmental issues they address. This has been done to keep to titles concise, while more precise descriptions of the policy instruments and the counterproductive effects are found in the respective sections below.

3.1 Biogas subsidy

Differences in subsidies and tax exemptions create incentives to producing biogas in one Nordic country and exporting it for use in another Nordic country. This results in an ineffective use of biogas as contribution to achieving the combined Nordic climate objectives, as well as being inefficient in the sense that biogas is not always being produced at the lowest costs and used where it gives the highest benefits, e.g. in term of reductions in CO_2 emissions.

Biogas is produced by breaking down organic matter such as agricultural waste in the absence of oxygen. It consists primarily of methane and CO_2 and is a renewable energy source that is a good alternative to fossil fuels. In addition to being CO_2-neutral, its use instead of fossil fuels reduces the emissions of particulate matter.

Figure 3.2 (using data from Eurostat energy balances which also cover Norway and Iceland) shows that gross amount of available biogas in the Nordic countries has increased during the last decade – particularly in Denmark, but also in Finland, Sweden and Norway, while the availability of biogas in Iceland is very limited. Iceland is therefore not studied further in this section. At least in the three EU Member States – Denmark, Sweden and Finland – the future use of biogas is guided by the increased ambitions of the new Renewable Energy Directive (European Biogas Association, 2018).

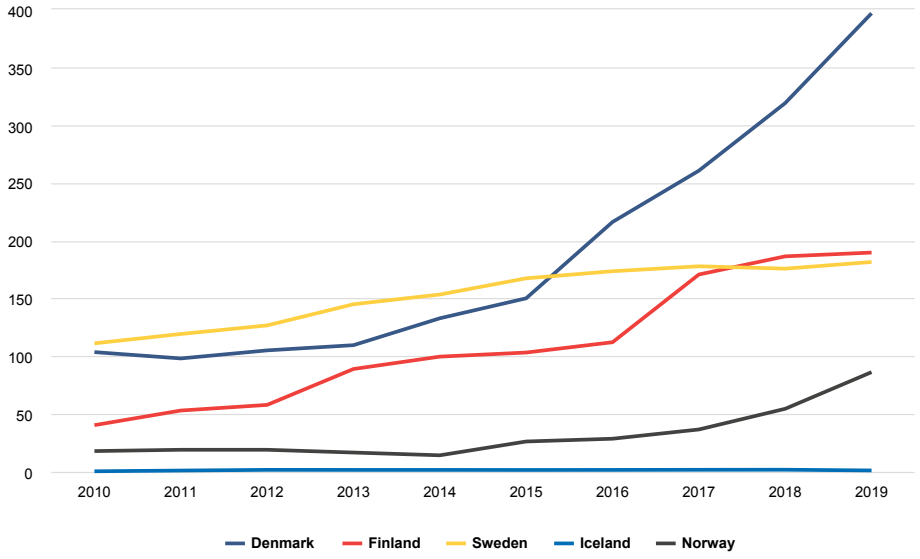

Figure 3.2 Gross available biogas in the Nordic countries, 2010–2019, 1000 tons of oil equivalent

Source: Eurostat, energy balances.

The increased use and production of biogas in the Nordic countries have been supported from the political side. In **Denmark**, the political energy agreement from 2018 contains both support to the use and to the production of biogas in existing plants until 2032, and for selected plants for at least 20 years (Danish Energy Agency, 2018). However, from 2020 current support of biogas use will cease, and a ceiling for the support to biogas production has been introduced alongside a change in the method of monitoring to avoid overcompensation.

Denmark subsidises biogas activities ranging from heating to upgrading biogas and to injecting it into the natural gas distribution net. A new funding scheme is underway for biogas and other green gasses (Danish Energy Agency, 2020; Ministry for Climate, Energy & Utilities, 2020). The subsidies will be adjusted on an ongoing basis. Furthermore, the biogas production must live up to requirements to the sustainability of the biomass feedstock.

Denmark supports the production of biogas with DKK 13.6 bn (2020 prices) to be spent over 20 years (Ministry for Climate, Energy & Utilities, 2020). The market value of biogas is at the moment (2021) around DKK 1/m^3 corresponding to DKK 25/GJ. Depending on the use of biogas, the subsidies in 2021 range from DKK 58.8/GJ (heating) to 136.6/GJ (upgrading to the natural gas distribution net) (Danish Energy Agency, 2020).

As mentioned above, attempts are made to avoid overcompensation of the biogas production (Danish Energy Agency, 2020). In this context, the Danish Energinet issues biogas certificates to prove the consumption of biogas (Energinet, 2019). Hence, the certificates are cancelled when the biogas has reached the end-user who can prove its consumption. In 2020, a major part of the Danish certificates for supported biogas was cancelled at the Swedish border (1.4m MWh), while the cancellations regarding Danish consumers were 0.6m MWh. Certificates were also transferred to the German certification system (about 0.7m MWh) or cancelled at the border to Germany (almost 0.2m MWh) (Energinet, 2019).

The consumption of biogas in **Sweden** is supported through exemptions from energy and CO_2 taxes, and it is checked whether support gives rise to overcompensation (Statens Offentliga Utredningar, 2019). For transportation, biogas is exempt from CO_2 and energy tax (CO_2 tax applies to natural gas) and for heating, biogas is exempted from both energy and CO_2 taxes as well (energy and CO_2 taxes apply for natural gas except CO_2 tax for EU ETS industrial processes) (Finansdepartementet, 2020). The tax exemptions also apply to imported biogas (Statens Offentliga Utredningar, 2019).

The Swedish government decided in 2018 to support the establishment of innovation clusters for liquid biogas will 200m SEK (Finansdepartementet, 2020), (Energigas Sverige, 2019). Furthermore, investment support to produce biogas from manure (SEK 0.2/kWh in 2021) and to produce liquid biogas was provided by Klimatklivet through a temporary production support scheme in place during 2018–2019. However, uncertainty about market perspectives and co-financing stopped several projects from materialising (Statens Offentliga Utredningar, 2019).

In **Norway**, biogas is exempted from CO_2 taxes in the non-quota sector, and vehicles using biogas are exempted from road use tax, and from the yearly tax on diesel vehicles above 7.5 tonnes (Lyng, Skovsgaard, Jacobsen, & Jørgensen, 2020). There are support schemes in place for vehicles relying on biogas for at least 50% of energy use, and for public refuelling stations when the application is linked to an

application for biogas vehicle support, and new infrastructure is needed. Innovation Norway provides support to greenhouse heating based on biogas (Miljødirektoratet, 2020).

The production of biogas for transportation fuel purposes may receive support from Enova up to a certain level for establishment or upgrading of production facilities. Enova also supports technology development. Furthermore, Innovation Norway supports farm biogas production facilities as well as test projects for environmental technology. Finally, municipalities may receive support to conduct assessments and to coordinate activities aimed at increasing biogas production (Miljødirektoratet, 2020).

Finland has energy tax exemptions for biogas that also apply to imported biogas (Ministry of Finance, 2021). Furthermore, Finland has a premium program in place for electricity and heat produced from biogas (not from landfills). This electricity subsidy also applies to other renewables, and heat produced from wood may receive the heat subsidy (IEA, Finland tender based feed in premium scheme for renewable power generation, 2019). Finally, biogas producers may also receive investment support (Business Finland, 2020).

The **effect** of the different biogas production and consumption incentives is the risk that biogas imported into Sweden from Denmark, Norway and Finland receives double support. As a result, biogas from Denmark constituted about two-thirds of Swedish biogas imports, making up about one quarter of all Danish biogas production (Statens Offentliga Utredningar, 2019; Erhardtsen & Svansø, 2018). A negative consequence is that of low competitiveness of Swedish biogas producers leading them to complain about the lack of a level playing field (Statens Offentliga Utredningar, 2019). For the Nordic region as a whole, negative environmental consequences are caused by an ineffective use of biogas as contribution to achieving the combined Nordic climate objectives, as well as being inefficient in the sense that biogas is not always being produced at the lowest costs and used where it gives the highest benefits, e.g. in term of reductions in CO_2 emissions. Overall, the loss of domestic production of biogas in some of the countries lowers the contribution of biogas to the transition of the Nordic economies to circular economies (Statens Offentliga Utredningar, 2019).

The counterproductivity is as already indicated caused by different – and uncoordinated – biogas subsidy schemes. Hence, the **first barrier** to overcome is that in some Nordic countries the focus is on subsidising the production of biogas while in others the focus is on subsidising the utilisation of biogas. This gives rise to the risk of double support – i.e. that subsidised biogas production in one Nordic country is exported to another Nordic country where its utilisation again is subsidised. The result is that the biogas that is exported is neither produced nor used where it is most effective in contributing to the combined Nordic climate objectives. Furthermore, it is overall inefficient in the sense that biogas is not always being produced at the lowest costs and used where it gives the highest benefits, e.g. in term of reductions in CO_2 emissions. An example, that has been covered most in the media is that of biogas produced and subsidised in Denmark being exported to Sweden where its use again is subsidised (Erhardtsen & Svansø, 2018).

It is, however, acknowledged that efforts, e.g. the above mentioned Danish biogas certificates, have been introduced to reduce such inefficiencies in the support system. And, the more efficient the system is the better are its climate and environmental properties. This said, the long-term character of the subsidy schemes

provides a **second barrier** to overcome, e.g. the fact that the existing Danish producers have been guaranteed support until 2032 reduces the possibilities of avoiding such counterproductive behaviour in the short term.

Finally, an underlying difficulty in overcoming the barriers is obviously that in countries where the main biogas activity is that of production, biogas producer organisations are likely to be stronger than those of biogas users. There are thus strong calls for maintaining production and investment subsidies. In other words, an effective coordination between policymakers and industrial organisations across borders is limited by different focuses and bargaining strengths.

3.2 Electric vehicle cost support

Differences between the Nordic countries in support schemes to reduce the costs of buying and/or operating electric vehicles result in exports/import of electric vehicles across Nordic borders, limiting the effectiveness and efficiency of the national policy instruments aimed at reducing CO_2 emissions and other pollutants from road transport.

The Nordic countries were pioneers in electric vehicles and still have one of the highest ratios of electric vehicles per capita in the world (Nordic Council of Ministers, 2020). Registrations of passenger electric vehicles accounted for 16% of new passenger vehicle sales across the Nordic countries in 2019, with Norway as the absolute frontrunner with 56%, more than half of the regions' share of electric vehicles. The share of electric vehicles is projected to increase further, and by 2030 it is expected that that around 4 million electric vehicles will be on the roads in the region, a more than 15-fold growth in the electric vehicle stock from 2017 (IEA, 2018). This projection assumes an extensive expansion of the electric charging infrastructure.

In addition to subsidies to developing the electric charging infrastructure, national policy instruments include differentiated vehicle registration taxes based on CO_2 emissions or fuel economy ratings, and low user charges. In this context, it is envisaged that the other Nordic countries could benefit from increased dissemination of Norwegian best practices on subsidies and other support instruments. The dissemination of best practices would also help to overcome existing counterproductive impacts of the current policy. One example of such significant counterproductive character is that of the different targeting of the support in Sweden and in the other Nordic countries, such as Norway described below.

Sweden has traditionally kept purchase prices of vehicles low via not taxing vehicles as in the other Nordic countries, but instead taxing fuels (Svenningsen, et al., 2019). Furthermore, in 2018 Sweden introduced a bonus–malus system (Regeringens proposition 2017/18:1) which gives a bonus for the purchase of low emission vehicles, resulting in a reduced purchase price through a lower vehicle tax, and in turn an increased cost of vehicles that emit more greenhouse gases. The maximum bonus for a low-emission vehicle is 70,000 SEK. The Swedish government has proposed an updated law which includes a pay-back of the bonus if the car is sold within five years.

Counterproductivity stems from the fact that the bonus-malus-system encourages the export of low-emission vehicles to other countries where the purchase price is

higher. This lowers the effectiveness of the policy instrument in stimulating the Swedish transition to electrical vehicles and increases the costs borne by the Swedish government and so the Swedish taxpayers.

In **Norway**, in addition to taxation on fuels, vehicles are subject to significant purchasing taxes. Electric vehicles are exempted from these purchasing taxes in addition to VAT. They are also subject to lower operating costs such as road tolls (Svenningsen, et al., 2019). At the same time, Norwegian citizens and companies have the possibility to import used electric vehicles from other countries, and this represented 6.5% of EVs registered in 2020. Imported vehicles may be cheaper due to other mechanisms for support in other countries, such as the bonus-malus system in Sweden. It is estimated that around 400 million SEK in support have ended up in Norwegian electric vehicles.

Although the cross-market impacts are rather complex, the direct, partial environmental **effects** of the different approaches to the support comprise higher air pollution and contribution to climate change due to a slower transition to fewer electric vehicles.

The counterproductivity is as already indicated caused by different – and uncoordinated – support to increase the use of electric vehicles in the Nordic countries. A **first barrier** to overcome is that of the different approaches the support.

A **second barrier** is that such subsidies are high and their removal unpopular among car owners and their organisations. However, this barrier may be reduced over time as electric vehicles are becoming more and more competitive with respect to total costs and performance.

3.3 Sustainable ferries

Policy instruments in some Nordic countries to support a green transition to sustainable ferries powered by electricity or green biofuel are ineffective due to taxes on electricity and tax exemptions of fossil fuels in neighbouring countries.

There are numerous ferry routes between the Nordic countries as well as to other countries. While the Nordic countries are among the frontrunners in the green transition in shipping, the policy instruments that should drive the development of sustainable ferries are highly heterogenous and so uncoordinated across the Nordic countries. **Norway** has included sustainability criteria in its public procurement requirements that encourage a transition to electric ferries (Norwegian Government, 2019), which has resulted in more than 70 ferries with batteries installed by January 2021. Furthermore, while marine bunker fuels are exempt of taxes in all Nordic countries, only **Denmark** has tax exemptions on electricity for ferries (Landström, Tynkkynen, Leinonen, & Peljo, 2019). **Sweden** has reduced the tax on electricity used by ferries in ports, but not on that used during transport. Finally, the differences in fuel use in between the countries increase the infrastructure costs and lower the port and ferry operators' incentives towards using more sustainable fuels. **Finnish** electric ferries pay full electricity tax while diesel for ferries is tax free.

All Nordic countries invest in developing prototypes and demonstration projects. These include two large electric passenger ferries that travel the seven miles

between Helsingborg in Sweden and Helsingør in Denmark. In 2019, the world's largest plug-in hybrid passenger ferry started operation between Sandefjord in Norway and Strømstad in Sweden. On a ferry operating between Sweden and Germany, Stena Germanica uses methanol produced from biowaste. In 2030, Stena Line plans to start operating two fossil-free battery-powered ships on the route between Göteborg in Sweden and Frederikshavn in Denmark. Furthermore, in the Åland archipelago, Flexens already plans for green hydrogen as fuel for ferries sailing in the Baltic archipelago. Finally, Norsepower has installed so-called Flettner rotors on the Viking Grace, a ferry sailing between Finland and Sweden.

According to a recent study by Anwar et al. (2020), almost two-thirds of the electrified ships today operate in hybrid mode, while the remaining are fully electrically powered. Fully electric ferries are, however, not suitable for larger distances, due to long charging time and insufficient battery sizes. Due to the smaller size of electric ferries, they carry fewer passengers than conventional ferries.

Despite these recent and expected future advances, there still seems to be a need to find solutions and to coordinate policy instruments in the Nordic region. This goes for the price regulation/support to the fuel use via subsidies or tax exemptions, and for standardisation of ferry fuel use across the Nordic countries.

A green transition to sustainable ferries powered by electricity or green biofuel is high on the agenda for both domestic and international routes. The **effects** of ineffective policies are environmentally a loss of potential effects on GHG emissions. Current annual emissions from domestic ferries are estimated to be 0.6 $MtCO_2$ in Norway (Norwegian Government, 2019), 0.07 $MtCO_2$ in Denmark (Ministry for Climate, Energy & Utilities, 2020)[6], and around 0.18 $MtCO_2$ in Sweden i.e. for car ferries and the ferries to Gotland (Vattenfall, 2019). Increased electrification, hereunder via hybrid vessels, can take place onshore as well as offshore. CO_2 emission reductions from the electrification of ferries could add up annually to 0.4 $MtCO_2$ from reductions in diesel consumption (Landström, Tynkkynen, Leinonen, & Peljo, 2019). Hydrogen, ammonia and synthetic hydrocarbons/electro-fuels also offer low-carbon alternatives if they are produced using renewable electricity, carbon capture and storage of fossil energy resources or with renewable forms of carbon from biomass or direct air capture. Furthermore, increased electrification will reduce air, water, and noise pollution.

Other side effects are mainly due to lower incentives among the port and ferry operators' incentives to implement solutions with more sustainable fuels, due to higher marginal costs of the investments. Also, the difference in fuel solutions in-between the countries increase the infrastructure costs for the ferry companies and involved authorities.

A **first barrier** to overcome is that of a lack of unified fuel/electricity taxation and variations in the policy instruments (e.g. procurement and tax incentives) to provide incentives for increasing sustainability in ferry operations onshore (in the ports) and offshore.

A **second barrier** stems is that the ferries also may be used to sail to non-Nordic countries. It is, for example, a barrier that Germany has a tax on electricity that makes charging of ferries more expensive, while marine gas oil is exempt from energy taxation in both Germany and Denmark (Sekretariatet for afgifts- og

6. Excluding ferries between Denmark and the Faroe Islands.

tilskudsanalysen på energiområdet, 2018; European Commission, 2020).

It can also be argued that there is a **third barrier** that has more character of quantity regulation. It is that technical standards continue to give priority to conventional technology. Hence, more Nordic coordination is needed to achieve technical harmonisation. This could include the adoption of international standards for batteries, safety of steel versus aluminium, setup of a grid station and renewable energy access in port areas. Furthermore, these operational challenges involve battery energy density and disassembling, and legislation challenges involve public procurement and tax regulations.

The Nordic countries could take advantage of having a high degree of international short-distance ferry routes, many of which run between the Nordic countries themselves. This is an interesting laboratory for developing common standards for public procurement towards a unified, energy-efficient, low-carbon operation of ferries. For example, the Nordic countries could enhance their collaboration to harmonize e-ferry connections and onshore power facilities (ITF, 2020).

3.4 Waste incineration

Waste incineration costs and waste incineration capacities vary between the Nordic countries, creating incentives to transporting waste between countries, which may lead to excessive CO_2-emissions.

By constituting a source of energy and heat, waste incineration can be a sustainable way of handling waste[7]. For many years, it has been an integrated part of the heat and energy systems in the Nordic countries, leading to a large capacity for waste incineration being built up. For Denmark, Sweden and Finland, this capacity building has also been encouraged by the EU regulation in this area. The EU aims to have a sufficient capacity as a whole in the Member States and that this is efficiently utilised across borders.

However, a need has been identified to reduce waste incineration to reach recycling goals (Papineschi, Hogg, Chowdhury, & Durrant, 2019). Hence, if waste production is stable and more waste is recycled, it can be expected that competition between the waste incinerators and the waste recyclers for the reduced waste amount increases, also between the Nordic countries. This may result in increasing trade of waste for incineration across national borders if the capacity for waste incineration is not reduced accordingly. This said, an increasing transport of waste, hereunder across borders, does not necessarily result in increasing CO_2 emissions. If waste is transported to a more efficient incineration plant, it may overall lead to reduced CO_2 emissions. Furthermore, transporting waste across borders is not necessarily inefficient as this may in some cases be the shortest distance. However, it has been suggested by stakeholder that there are a number of cases of transport of waste that are not sustainable in terms of CO_2 emissions.

Different policy instruments have been applied across the Nordic countries on regulating the incineration of waste. This has resulted in varying costs of heat from waste incineration. In **Sweden**, a large capacity has been built up to generate power and heat from waste incineration, which is considered to be the cheapest way to

7. This, however, depends on the alternative treatments available for the specific waste fractions.

provide district heating. Currently, the capacity exceeds domestic waste production. As a consequence, Sweden imported about a third of the waste used for energy in 2017 (Avfall Sverige, 2018). However, Sweden has newly introduced a tax on the incineration of waste, although with biomass and hazardous waste being exempted (Avfall Sverige, 2019).

The introduction of waste incineration plants happened more recently in **Norway** than in Sweden, following Norway's ban on waste handling in landfills in 2009. This led to large investments in waste incineration plants providing heat for district heating. Although being relatively new, these plants operate at higher costs than the Swedish plants, partly due to the higher debt levels in the newer plants (Deutsche Welle, 2015). However, lower costs have been encouraged by Norway's removal of a waste incineration tax in 2010, following Sweden's removal of a similar tax (Fråne, Youhanan, Ekvall, & Jensen, 2016).

Iceland has currently no capacity for waste incineration and exports selected waste fractions for incineration e.g. to Sweden. The incineration plants in Iceland were closed some years ago due to dioxin pollution and because the price of heat could not compete with the low price of geo-thermal heat. It is more efficient to transport the waste by ship over long distances, and waste can take up otherwise unused transportation capacity, such as empty ships on return trips (Ciric, 2019).

Denmark also imports waste for its district heating plants and has the largest capacity in the Nordic countries. Taxes apply to landfill as well as waste incineration (Papineschi, Hogg, Chowdhury, & Durrant, 2019). A political agreement from 2020 increases the requirements to sorting more waste for recycling so that less waste is incinerated (Regeringen, 2020). Furthermore, the incineration capacity must be reduced to suit Danish waste amount so that less waste is imported. Finally, investments must be made in new recycling plants.

Finland has also developed an excess incineration capacity and similarly imports (and exports) waste and has a landfill tax in place. All waste incineration includes energy recovery and the country's incineration capacity has increased by several times in recent years (Papineschi, Hogg, Chowdhury, & Durrant, 2019).

There are adverse **effects** of the differences in the support to building up or reducing waste incineration capacities and/or to managing the availability of waste for incineration. It may result in increasing trade of waste for incineration across national borders if the capacity for waste incineration is not reduced accordingly. This said, as mentioned above an increasing transport of waste, hereunder across borders, does not necessarily result in increasing CO_2 emissions. If waste is transported to a more efficient incineration plant, it may overall lead to reduced CO_2 emissions. Furthermore, transporting waste across borders is not necessarily inefficient as this may in some cases be the shortest distance.

A **barrier** to overcome is thus that of differences in waste incineration plant capacities and in the market conditions for waste supply and waste demand which may lead to ineffective price signals and so inefficient use of waste for incineration. In other words, there is thus a high risk that the prices do not reflect the most sustainable choices in terms of CO_2 emissions.

3.5 Sustainable aviation

The policy instruments applied in the Nordic countries to support sustainable aviation differ with respect to both price and quantity regulation leading to negative environmental and climate impacts.

The Nordic countries regulate aviation with the aim of making it more sustainable both via price regulation and via quantity regulation. This is, however, not done in a coordinated way, i.e. countries use of different policy instruments. There is a variation in the extent to which sustainable aviation is supported via tax exemptions or subsidies, hereunder to stimulate research in new fuels and aviation technologies, such as Power-to-X and the development of electric aviation, and/or the extent to which quantity regulation is applied, such as blending requirements to the content of sustainable fuels in aviation fuel. All countries have reduced VAT on domestic flights. **Finland**, **Norway** and **Sweden** have between 10 and 12% VAT, **Iceland** has 6% and in **Denmark** flights are exempted from VAT.

The **Finnish** government set in 2019 a goal of 30% sustainable fuels in the aviation industry by 2030 by gradually increasing the content of biofuels in aviation fuel[8]. In 2020, **Norway** set a quota obligation of 0.5% advanced jet biofuels used in civil aviation in Norway. In addition, Norway has a CO_2-tax for domestic civil aviation and in 2016 introduced a tax for flight passengers. From 2021, all flights with zero emission aviation exempted of passenger tax. Furthermore, the Norwegian airport operator, Avinor, has set the aim to electrify of all domestic aviation by 2040. **Sweden** has introduced a requirement of 27% sustainable fuels in aviation fuel in 2030 and fossil free aviation by 2045. They introduced new passenger taxes for airlines. **Denmark** and **Iceland** have not introduced flight taxes or requirements of sustainable fuels in aviation fuels. Finally, all national airports maintain active roles in developing electric aviation partnerships with the private sector.

The adverse environmental **effects** of the policy instruments are particularly on the greenhouse gas emissions and air pollutants, as it gives less incentive for the aviation companies to develop and utilise sustainable fuels and thereby a less efficient transition to low carbon solutions. The difference in fuel solutions in between the countries increase the (fuel) infrastructure costs, which result in higher marginal costs of the transition to green transportation. Also, the differences distort the competition in aviation. When jet fuel or flight tickets are taxed by one or few countries only, it becomes more attractive for aviation companies to tank fuel abroad and for passengers to take alternative routes. Furthermore, when tax/VAT reductions exist for aviation but not for land transportation, aviation becomes relatively more attractive. Overall, initiatives to reduce national emissions can partly or fully be offset by increased emissions abroad and also result in a distortion of competition.

There is, however, a good reason for the Nordic countries overall supporting aviation in different ways. Geographical conditions with differences in inland transportation distances mean that really only Denmark and Iceland can rely on road and train transport. For the other three countries, a reduction of the support to domestic aviation will not be without social costs.

A **first barrier** to overcome is thus that of divergent national blending rates possibly

8. This and the following facts in this paragraph are based on Nordic Sustainable Aviation, Nordic Energy research (2020) (Ydersbod, Kristensen, & Thune-Larsen, 2020)

giving rise to purchasing fuels where the requirements are lowest. The argument is that establishing more unified national rates would create less boundary challenges between the Nordic countries but may also enhance the challenge towards especially Germany.

A **second barrier** is that of tax exemptions and reductions enhancing aviation demand. As mentioned above, all countries have reduced VAT on domestic flights. Finland, Norway and Sweden have between 10 and 12% VAT, Iceland has 6% and in Denmark flights are exempted from VAT.

3.6 Wood waste regulation

Using wood waste in energy production can help reaching the Nordic countries' target of carbon neutrality. However, different classifications of wood waste across the Nordic countries lead to excessive transport of wood waste across the borders.

Using wood waste in energy production can help reaching the Nordic countries' targets for carbon neutrality. The biomass supply is determined both by local availability and by international markets. For example, in 2013 Denmark had a net import of 32% of biomass and waste for energy (Diczfalusy, et al., 2020). At the same time, wood waste was exported that could otherwise be used in energy production. An article in Energy Supply points out that waste wood is exported from Denmark to Sweden to be used in energy production, while Denmark imports wood from Sweden for its own energy production (Energy Supply, 2018).

Regarding regulations, **Sweden** has a ban on landfilling wood waste to encourage its use for energy (Junginger, et al., 2019), (Naturvårdsverket). Biomass and hazardous waste are exempted from a newly introduced tax on incineration of waste in Sweden (Avfall Sverige, 2019). Finally, Sweden has a deposition tax on hazardous waste of SEK 500/ton[9] (Avfall Sverige, 2018).

In **Norway**, biomass waste may not be deposited, but there is insufficient infrastructure for handling hazardous wood waste (Junginger, et al., 2019).

The Danish regulation on wood waste is described in the ministerial order number 84 of 26, January 2016 which describes which fractions can be treated as biomass in **Denmark**. The ministerial order does not include wood that has a content of paint, lacquer, nails, etc. as biomass. This fraction must instead be treated as waste and is therefore subject to a disposal tax of DKK 475/ton (Danish Environmental Protection Agency, 2017). Using wood waste for energy would entail taxes on CO_2 as it is not classified as biomass (Energy Supply, 2018). Municipalities have been allowed to decide to incinerate impregnated wood waste in Denmark in appropriate plants (Danish Ministry of Environmental Protection Agency).

The adverse environmental **effects** of the different classifications are increased GHG emissions and environmental pollution due to increased transportation. There may also be a positive CO_2 and environmental effect, due to a more efficient treatment of the fractions. In some cases, transport of waste fractions can be beneficial in terms of CO_2 and environmental effects if the receiving plant treats the waste more efficient than alternative plants. Particularly, in smaller countries where available

9. Tax rates are regularly being adjusted.

amounts a particular type of waste can be small, it may be beneficial both economically and environmentally to transport such waste to specialised treatment plants with equipment to handle hazardous wood waste. The economic side effects of this case are mainly due to that transportation of waste incentivised by tax differences is in general negative.

Other effects are a reduced efficiency in recycling for energy or other uses. With increasing focus on creating circular economies and on reaching climate and biomass goals, further coordination within and across countries on cross-cutting policy areas related to resources – climate, energy, environmental – are required to ensure efficiency in the incentives for safe recycling for energy or other uses to ensure that wood waste can be reused as material or for energy purposes and thereby contribute to meeting targets on renewables.

A **first barrier** to overcome is thus that of different classification of wood waste across countries. An underlying reason for this may be that of a long tradition for using a given classification, and that it remains having support from the respective national industrial organisations. However, a long tradition may not be a so difficult barrier to overcome, as most countries regularly do and benefit from updating their standards, not least when new international standards are introduced.

A **second barrier** is that of uncoordinated taxation of waste for incineration, partly as a result of differences in classifications of waste, hereunder wood waste, e.g. painted wood. Again, the adoption of international standards may help to overcome this barrier.

3.7 Energy supply capacity

The increase of renewable energy sources in the Nordic transmission system and increased cross-border power exchange have encouraged the Nordic transmission system operators TSO's to collaborate on a joint program called the Nordic Balancing Model. There is, however, a need to balance the transmission system, which still constitutes a barrier to increased production of renewable energy from water, wind, and sun, all with weather and seasonal fluctuations.

The Nordic electricity market today is already highly integrated, and the region has a long history of cooperation for balancing production and consumption. With more fluctuating energy from solar and wind, it is more important than ever to be able to share energy across national borders.

In spite of the achievements of Nordic cooperation, there are still limits to electricity grid capacities and there are variations in the regulation of grid tariffs which affect competition among the producers and variations in the location of the renewable generation capacity (ENTSO-E, Ten-Year Network Development Plan (TYNDP) , 2018; Copenhagen Capacity, 2020). ENTSO-E has identified significant needs for additional transmission capacity in the future. The resulting lack of flexibility in the Nordic electricity distribution system limits its overall effectiveness in supporting the green transition.

Therefore, the Nordic TSOs cooperate to balance the transmission system according

to Energinet (2020) by establishing a market-based allocation method, a so-called Nordic AFRR-capacity market, to integrate the power grids between Denmark, Finland, Norway, and Sweden (Energinet, 2020). This has led to a decision in the EU Agency for cooperation of Energy regulators (ACER) in 2020 to establish rules for such a common market (ENTSO-E). However, in 2021 the Nordic countries have yet to approve the establishment of the key framework elements.

The rationale is that the cheapest produced energy from a renewable source in the whole Nordic market, a policy that supports the single Nordic power market, will also reduce the costs of decarbonisation (Copenhagen Capacity, 2020). The socio-economic **effect** for the Nordic countries of establishing the market-based allocation system is estimated by the Nordic TSO's to be 50 million EUR. This is because of the size of grid investment, the influence of market solutions and operational security measures that will be affected by an entire system (Aula, et al., 2020).

Furthermore, the Nordic electricity grid needs to be upgraded to transport much more electricity than today. The final consumption from the electricity distribution network is expected to increase from 400 TWh in 2020 to 660 in 2040 (Energinet, 2021). A more flexible market solution can limit the need for expansion, but the increased electricity production from fluctuating renewable energy sources will require more international connections.

A **first barrier** to overcome is thus that of electricity grid/exchange limitations. This is partly caused by a continuing shift towards renewable energy sources calling for more flexibility, while still maintaining energy security in the Nordic region as a whole. For example, in Denmark electricity production is largely based on wind energy which is exported at very low prices when there is an overproduction, while the import of energy when the wind is not blowing is relatively expensive. This makes electricity in Denmark relatively expensive.

A **second barrier** – which can be argued not to have much to do with counterproductivity – is that of high investment costs of maintaining a high capacity. This said, a better coordination of investments across borders may help to keep overall Nordic costs down.

A **third barrier** – which can be considered as an underlying reason for a limitation to the incentives to overcoming the above two barriers – is that of the different natural conditions. For example, while it makes most sense in Denmark to focus on wind energy capacities, in Sweden and Norway water energy capacities are in focus.

4. Barriers to an effective policy mix

Several different policy instruments are as described in Chapter 2 implemented within different sectors in the Nordic countries to achieve their environmental and climate objectives. Most of these policy instruments does not cause side or counterproductive effects across borders. In other words, the implementation of a given policy instrument in one Nordic country will in most cases not significantly reduce the effectiveness of similar policy instruments in other Nordic countries.

There are, however, as described in Chapter 3 examples of counterproductive effects, although they are few. As also mentioned in Chapter 3, there is a risk that discussing such examples in itself may be counterproductive by creating the belief that many environmental and climate policies in the Nordic countries are neither effective nor efficient. Care is therefore taken in this chapter to underline that the barriers to an effective policy mix are based on a few examples only. This said, an attempt is made to use the specifics of the examples to provide insight into the underlying reasons for the uncoordinated approaches, such as organisational set-ups.

The following presentation of barriers to an effective Nordic mix of policy instruments follows the categorisation that was introduced in Figure 3–1 in the previous chapter:

- The first barrier is about uncoordinated value chain support, i.e. that some Nordic countries regulate the production (or sales) of a product while others regulate the use
- The second barrier is that some Nordic countries regulate prices, while others regulate quantities
- The third barrier is uncoordinated price regulation
- The fourth is uncoordinated quantity regulation

4.1 Producer side versus user side support

The first type of counterproductive effects is that some Nordic countries support the production (or sales) of a product, while others support its use. A possible negative consequence is that the overall value chain obtains more support than what is optimal from an efficiency point of view, and that that the production and the use do not take place in the country where this is most efficient. Hence, there may be a risk that the overall costs, including the support, exceed the benefits of environmental and climate change reductions. In addition, the uncoordinated support may lead to excessive transport of goods across the Nordic borders and so to excessive environmental and climate impacts.

Recalling from the previous chapter, the first example of uncoordinated value chain support is that of production of biogas being subsidised in some Nordic countries, while its use is subsidised in other countries, leading to double subsidies, and that produced gas is exported to be used elsewhere – leading to an inefficient situation.

The other similar example is that of sales of electric vehicles being subsidised in one Nordic country, while their use is supported in another Nordic country – i.e. you buy it cheap in one country and use it cheap in another country.

In both examples, a central barrier for a better coordination of the policy instruments is, as already mentioned, the different focus of the support, i.e. on the producer (sales) side in some Nordic countries and on the user side in others. In the biogas case, an underlying reason is that of the focus been steered by the strength/size of the industry and its industrial organisations. For example, Denmark has a large biogas production and has focus on keeping this strength to achieve its climate targets. In the case of the electric vehicles, sales organisations in Sweden seem strong while in Norway strong user organisations seem to have been successful in keeping user costs low.

Another barrier type, not unique for this category of counterproductivity, is that of the difficulty of changing already agreed subsidies. This again is influenced by the strength of industrial organisations that have worked towards having long-term agreements as part of the policy instruments. Furthermore, if the policy expiry dates differ much between the Nordic countries, coordination is difficult.

4.2 Price versus quantity regulation

The second type of counterproductive effects that create barriers in a given policy area is that of some Nordic countries regulate prices while others regulate quantity. This may in itself cause of a lack of a level playing field within the Nordic region as the overall support levels to the different markets may differ. Furthermore, the different market conditions, particularly those caused by quantity regulations in some countries, may constitute a barrier to trading resources between the Nordic countries to make use of the resources where it is most efficient.

The example given in the previous chapter is that of sustainable aviation which in the Nordic countries is regulated via both price and quantity regulation, but in different ways. Price regulation of air transport in one country may be in conflict with quantity regulation (in the form of requirements to fuel blending rates) in another country. Such conflict may lead to negative consequences in the form of an overall inefficient supply of air transport in the Nordic region. In the given example there may be good underlying reasons for the different support strategies. For example, differences in inland distances give rise to different dependency on aviation.

In general, a reason for some Nordic countries for a given policy area choose price regulation while others choose quantity regulation may well be that of different organisational setups. For example, quantity regulation is often favoured in countries where the given policy area is dominated by technical experts, while price regulation is more likely to be favoured among economists. Such barriers can possibly be overcome by changing the organisational setups, hereunder persuading the experts of the possible benefits a multidisciplinary approach that combine the strengths of quantity regulation with the strengths of price regulation.

4.3 Price regulation variation

This third type of barrier to overcome to achieve a more effective mix of policy instruments is that prices of resources are regulated differently within a given policy area and/or different price subsidies or tax exemptions are applied in the different Nordic countries. This can be differences in the levels of price support that may distort the competition between the countries. It may also be differences in the way the price support is provided, e.g. via subsidies or via tax exemptions, and the type of resource that is targeted. Such differences may blur the comparison of the price support schemes and so lead to unclear market conditions.

The two examples, 'sustainable ferries' and 'waste incineration', concern the type of fuel to subsidise and how waste prices are affected, respectively. The counterproductive effects are thus to discourage the use of sustainable resources and inefficient use or excessive transport of waste, respectively. Hence, as mentioned, price regulation counterproductivity can be due different objectives or differences in type of subsidy/tax – hereunder whether energy or CO_2 is targeted, or the types of energy sources that are supported.

It can be argued that different price regulation schemes in between the Nordic countries are not very difficult barriers to overcome, the reason being that all policymakers and industrial organisations are used to this regulation type. Hence, it is a question of coordinating the levels of price subsidies, the designs of the price subsidies, and the resources being subsidised.

4.4 Quantity regulation variation

The fourth and final type of barrier is that of a different quantity regulation. Such regulation can take many forms and differ between the Nordic countries. For example, the barrier can be differences in classification of resources or differences in requirements to the use of resources. On the other hand, many classifications are governed by international standards, and so do many requirements, e.g. by the EU apply – at least for Denmark, Sweden, and Finland.

Regarding the two examples presented in the previous chapter, the first concerns different (requirements to) classifications of waste wood and different requirements to the quality of the waste wood. The other example concerns uncoordinated energy supply capacities. The negative consequences are in both cases that the activities do not always take place in the Nordic countries where they would be most effective and/or efficient.

An underlying reason for the use of different classifications, requirements or other quantity regulation is often that of a long tradition for doing so. However, a long tradition may not be a difficult barrier to overcome, as most countries regularly do and benefit from updating their standards, not least when new international standards are introduced.

4.5 Comparison

This section summarises the findings above in order to serve as basis for the recommendations in the next chapter. In this context, it is underlined again that only a few examples of counterproductive effects have been identified. Hence, the barriers to overcome may be few.

A first type of an underlying reasons for the identified barriers, common to the examples, is that of industrial and organisational strengths. Hence, regulatory focus in a given Nordic country will often be on the sectors and value chains where production (or use) of a given resource is important for the economy as a whole. And, strong industrial organisations will encourage policymakers to keep this in focus. Opportunities for better coordination of some policy instruments across the Nordic countries may therefore be limited by differences in industrial and organisational strengths.

A second type of underlying reasons for barriers for avoiding counterproductive effects is that of the often long-term nature of the agreed support schemes. Hence, if comparable support schemes expire at different dates, it will be difficult to coordinate new support schemes across the Nordic countries.

As mentioned above, where counterproductivity is a cause of uncoordinated price regulation, it may not be difficult to coordinate. However, if there is no Nordic forum for coordination it may not happen. Next is that of uncoordinated quantity regulation where it is more complex to establish common restrictions on quantities.

Another type of underlying reason for coordination barriers – which is more difficult to overcome – is that geographical differences between the Nordic countries, e.g. transport distances or natural resources, may require different policy instruments to be effective. Hence, any counterproductive effects may well be smaller than the benefits from having differentiated policy instruments.

Hence overall, the barriers have much to do with a lack of coordination – or that best practices from some countries are not adopted in others. Underlying reasons for this are often traditions. Another barrier is that policymakers seldom look much across borders when designing policies. Instead, it seems that some energy is used on complaining about other countries' policies that may have an adverse impact in its own country.

5. Recommendations for a more effective policy mix

The previous chapters have concluded that the climate and environmental policy instruments implemented in the Nordic countries are not always coordinated between the countries, and that this lack of coordination is counterproductive. However, despite an in-depth search for counterproductive effects, only seven examples were found within power production sector, waste management and in transportation at sea, road and air.

A first conclusion is thus that it is not a common problem, and a **first overall recommendation** is to take care when communicating the findings of this study and so not to spur the belief that environmental and climate policies overall in the Nordic countries are neither effective nor efficient and that they rarely are coordinated between the countries.

A **second overall recommendation** stemming from this first conclusion is that such limited number of policy instruments with transboundary counterproductive effects do not call for major changes to the ways environmental and climate policies are designed and implemented in the Nordic countries. Instead, it is envisaged that the identified counterproductivities can be alleviated by better coordination within the existing organisational setups in the countries.

However, a second conclusion is that there are number of barriers to overcome to achieve better coordination, and so to avoid or to alleviate uncoordinated value chain support, price, or quantity regulation. Underlying reasons for such barriers include differences in organisational focus and industrial strengths between the Nordic countries, the often long-term nature of the agreed support schemes, and geographical differences. Some of these underlying reasons are easier to deal with than others.

A **third overall recommendation** is thus that policymakers should be encouraged, e.g. via awareness raising efforts by the Nordic council of ministries, to improve coordination where it is feasible and gives benefits. This is the case for the seven examples presented in this report and will most likely help to eliminate other existing counterproductive effects and avoid future ones. Hence, regarding the latter, (Nordic) policymakers should be encouraged to take adverse cross-border effects into account in policy design.

More **specific recommendations** based on the lessons learned, hereunder from the seven examples are:

- Ensure that a responsible body (e.g. an existing Nordic working group) acts as a forum for encouraging policymakers to better coordinate (environmental and climate) policies with possible cross-border counterproductive effects, hereunder to coordinate the time periods of the support applied.
- Strengthen the Nordic mix of policies by enhancing the understanding of the negative effect a national policy instrument may cause its neighbours. To the extent possible, measures that target the same type of sector pollution or emission should be based on in-depth impact studies that identify cross-border counterproductive effects. A future effort could be to form a common method for assessing the impact of policy instruments in the Nordic countries. One way could be to look into the possibilities using the existing EU frameworks to identify a common approach to a policy instrument to a larger extent than today.
- Apply a format for exchanging knowledge of new policy instruments in the planning across the Nordic countries to lower the marginal and total socioeconomic costs of CO_2 abatement. Better coordination may be achieved via some Nordic countries making use of effective and efficient practices from other countries. In this context, one country may accept that another country has more industrial strength and so try to adapt to its policy instruments. A format for exchanging knowledge would also gain from taking into account parallel ongoing initiatives in other fora, such as the EU members collaboration with the rest of the EU.
- Cooperate on comparing the total and marginal abatement costs. Especially for transportation and waste management, which are the sectors most likely to experience counterproductive effects. But, at the same time acknowledge that e.g. different geographical settings results in different policy options as well as solutions.
- Cooperate on refining the Nordic countries' tax and subsidy systems to ensure that the chosen measures contribute to enhancing the effectiveness of the Nordic policies. Here, also European harmonisation should be given attention.

Method of the study

The report is the result of a Nordic project, developed by COWI in dialogue with the Nordic Working Group for Climate and Air (NKL) and the Nordic Working Group for Environment and Economy (NME).

The focus of the study has been to identify national climate efforts in the form of policy instruments or implemented sectoral efforts that are counterproductive to neighbouring countries' climate efforts. The underlying hypothesis is that the Nordic climate efforts involve many interdependencies and opportunities to create interconnected solutions, but most efforts are being made within national sector co-operation, and standardisation across the Nordic region is still lagging behind. The effectiveness of climate policy does not only depend on how well it is implemented in the individual countries. National policy measures may have international spill-over effects that partially neutralize neighbouring countries' emission reductions. The study explores these interaction effects.

The study focuses on policy instruments that are expected to be used more frequently as a measure for combatting climate change. Consequently, the study does not look into policies, effective or not, that are not expected to play any future role. Instead, it is based on the policy initiatives that have the potential to make a significant contribution to climate efforts - and where this is the case in all or most of the countries.

The design of the study has been based on an external analysis approach which can be categorized into three analysis stages. Firstly, the climate instruments in the Nordic countries were identified through qualitative data collection and workshops, followed by a cross-cutting barrier analysis that identified obstacles that stand in the way of harmonizing the instruments better. Finally, the project team has identified solutions to mitigate the counterproductive effects through workshops and supplementary interviews.

The project has reviewed policy instruments within transport, electricity and heat production, in the waste sector, the construction sector, as well as in the agriculture and forestry sectors. The data for the study has been collected from January to May 2021.

Activities have included an in-depth internet search and desk study of reports on the many themes of the study. Also, expert interviews on existing and planned instruments and policies were held with focus on the in key emission sectors in the five countries. Also, interviews designed to confirm the findings were carried out. Finally, two cross-Nordic workshops were held to verify the findings and dialogue on identifying joint Nordic challenges and opportunities.

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