



Nordic Council  
of Ministers

# **Use of Economic Instruments in Nordic Environmental Policy 2018–2021**



# Content

|                                                                                                  |           |
|--------------------------------------------------------------------------------------------------|-----------|
| <b>Preface</b>                                                                                   | <b>5</b>  |
| <b>Executive Summary</b>                                                                         | <b>6</b>  |
| <b>Introduction</b>                                                                              | <b>14</b> |
| <b>PART 1 – THE USE OF ECONOMIC INSTRUMENTS IN THE NORDIC COUNTRIES 2018–2021</b>                | <b>17</b> |
| <b>1. International policy and central developments in Nordic environmental policy 2018–2021</b> | <b>18</b> |
| 1.1 Relevant international policy 2018–2021                                                      | 18        |
| 1.2 Revenues from national environmental taxes in the Nordic countries                           | 25        |
| <b>2. Denmark</b>                                                                                | <b>27</b> |
| 2.1 Energy, greenhouse gases and air pollution                                                   | 29        |
| 2.2 Water                                                                                        | 35        |
| 2.3 Waste                                                                                        | 36        |
| 2.4 Transport                                                                                    | 39        |
| 2.5 Agriculture and natural resources                                                            | 43        |
| <b>3. Finland</b>                                                                                | <b>47</b> |
| 3.1 Energy, greenhouse gases and air pollution                                                   | 49        |
| 3.2 Water                                                                                        | 57        |
| 3.3 Waste                                                                                        | 57        |
| 3.4 Transport                                                                                    | 59        |
| 3.5 Agriculture and natural resources                                                            | 62        |
| <b>4. Iceland</b>                                                                                | <b>65</b> |
| 4.1 Energy, greenhouse gases and air pollution                                                   | 66        |
| 4.2 Water                                                                                        | 69        |
| 4.3 Waste                                                                                        | 70        |
| 4.4 Transport                                                                                    | 71        |
| 4.5 Agriculture and natural resources                                                            | 74        |

|                                                                                                      |            |
|------------------------------------------------------------------------------------------------------|------------|
| <b>5. Norway</b>                                                                                     | <b>76</b>  |
| 5.1 Energy, greenhouse gases and air pollution                                                       | 77         |
| 5.2 Water                                                                                            | 85         |
| 5.3 Waste                                                                                            | 85         |
| 5.4 Transport                                                                                        | 87         |
| 5.5 Agriculture and natural resources                                                                | 92         |
| <b>6. Sweden</b>                                                                                     | <b>93</b>  |
| 6.1 Energy, greenhouse gases and air pollution                                                       | 95         |
| 6.2 Water                                                                                            | 103        |
| 6.3 Waste                                                                                            | 103        |
| 6.4 Transport                                                                                        | 105        |
| 6.5 Agriculture and natural resources                                                                | 108        |
| <b>PART 2</b>                                                                                        | <b>111</b> |
| OVERVIEW OF POLICES AND INSTRUMENTS TO PROMOTE<br>CLEAN TECHNOLOGIES IN THE NORDIC COUNTRIES         | 111        |
| <b>7. Economic instruments intended to foster clean technologies<br/>across the Nordic countries</b> | <b>112</b> |
| <b>8. Similarities between literature and practice</b>                                               | <b>116</b> |
| 8.1 Market-based strategies                                                                          | 116        |
| 8.2 Direct subsidies, other forms of support and renewable<br>innovations                            | 117        |
| 8.3 Technology-supporting and market-driving instruments                                             | 118        |
| 8.4 Criticism and obstacles                                                                          | 120        |
| 8.5 Conclusion                                                                                       | 122        |
| <b>9. Policy instruments needed for implementing a green<br/>transition in the industry</b>          | <b>123</b> |
| 9.1 Carbon pricing and complementary policies                                                        | 123        |
| 9.2 The three domains framework                                                                      | 124        |
| 9.3 Three examples                                                                                   | 125        |
| <b>10. Towards a cost-effective and green taxation system in the<br/>Nordic countries</b>            | <b>132</b> |
| 10.1 Cost-effective environmental taxes in theory                                                    | 132        |
| 10.2 Obstacles for cost-efficiency                                                                   | 132        |

|                                                                                                        |            |
|--------------------------------------------------------------------------------------------------------|------------|
| 10.3 Economic policies for increased cost effectiveness                                                | 133        |
| 10.4 Discussion and conclusions                                                                        | 139        |
| <b>11. Interaction between national climate policies and the EU Emissions Trading System</b>           | <b>140</b> |
| <b>12. The Nordic regions ability to affect the global environment by promoting clean technologies</b> | <b>143</b> |
| <b>References</b>                                                                                      | <b>145</b> |
| <b>Sammanfattning</b>                                                                                  | <b>168</b> |
| <b>About this publication</b>                                                                          | <b>175</b> |
| Use of Economic Instruments in Nordic Environmental Policy 2018–2021                                   | 175        |

This publication is also available online in a web-accessible version at:  
<https://pub.norden.org/temanord2023-520>



# Preface

This is the ninth overview report published by the Nordic Council of Ministers on the use of economic instruments in Nordic environmental policy. The report has been commissioned by the Nordic Working Group for Environment and Economics (NME). The previous editions of the report have been published in 1994, 1997, 1999, 2002, 2006, 2009, 2014 and 2019. In addition to the overview of the use of economic instruments in 2018-2021, a second part of the report contains a compilation and assessment of policies and instruments the Nordic countries have used to promote clean technologies. The report has been prepared by IVL Swedish Environmental Research Institute and one external consultant from Iceland. The core team consisted of Flintull Annica Eriksson (Project leader), Annacarin Karlsson, Lars Zetterberg, Jenny Von Bahr, Johan Rootzén, Kenneth Möllersten, Henrik Kloo (IVL Swedish Environmental Research Institute) and Hrafnhildur Bragadóttir (Independent expert).

The Nordic countries have been among the frontrunners in the use of economic instruments in environmental policy. This report reveals that during the period 2018-2021 a continuous development in this field has taken place, but without any dramatic shifts. The change in instrument application reflects the general development of environmental policy in the Nordic countries with more emphasis put on climate policy issues. Among the sectors especially transport and energy production have been in the focus for the use of economic instruments.

In the field of promoting clean technologies the Nordic countries usually have used a mix of taxes and subsidies. Additionally the EU ETS is an important driver of investments in clean technologies nowadays. Differences between the Nordic countries exist when it comes to the mix of instruments used for promoting clean technologies. Also, on a more general level national preferences and policy approaches are reflected in a somewhat different set of instruments in the individual countries.

Comments and inputs to the report have been provided by Members of the Nordic Working Group for Environment and Economy (NME) during the preparation of the report. The authors of the report are responsible for the content as well as the assessments and recommendations, which do not necessarily reflect the views and the positions of the governments in the Nordic countries.

*May 2023*

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# Executive Summary

## Abstract

The report contains two parts. Part 1 summarizes the most significant developments in the use of economic instruments in the environmental policies in the Nordic countries. It provides an overview of new instruments or major changes to existing instruments from 2018 to 2021 a detailed country-by-country description of these developments and a cross-country comparison and assessment. Part 1 also provides "raw data" for further analysis by policymakers and other stakeholders, and presents other findings, including policy priorities and good practices. Part 2 provides an overview overview of policies and instruments the Nordic countries have used to promote clean technologies.

The Nordic countries use a vast variety of economic instruments as part of their environmental policies. The differences in use can be attributable to country and sector characteristics, as well as national preferences. The Nordic countries have a continued focus on climate considerations, as opposed to other environmental issues, in their use of economic instruments. There have been some changes in terms of new or discontinued instruments in the examined period. The most common changes relate to adjustments in tax rates. The biggest changes are seen in the transport sector and in the field of energy and air pollution. Noteworthy changes are differentiated tax rates based on CO<sub>2</sub> emissions, implementation of the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) when calculating CO<sub>2</sub> emissions or other changes in the calculation of CO<sub>2</sub> emissions, and the implementation of new, or the extension of, support programmes and subsidy schemes for environmentally friendly investments.

The Nordic countries have constructed specific environmental and energy policies to promote clean technologies. Most commonly utilising a mix of environmental taxes and subsidies. Nevertheless, each country has chosen different technological paths depending on national and sector characteristics, as well as national preferences.

## Background and objectives

Every three to four years, the Nordic Working Group for Environment and Economy (NME, formerly known as MEG) of the Nordic Council of Ministers publishes an overview of the use of economic instruments in environmental policies of the Nordic countries. This report is part of the series. The report is structured as the previous report in the series.

The first part includes an assessment of changes to the use of economic instrument in the period 2018–2021. Economic instruments are defined broadly and include taxes, charges and subsidies which provides an economic incentive to change behaviour. The assessment in Part 1 compares the use of economic instruments across sectors and countries. The changes in the use of economic instrument in the environmental policies are seen in light of issues that have been on the international agenda. Following the overview section, Part 1 further includes a detailed assessment of each Nordic country organised by sector. The sector definition aligns with the definition used on the previous reports that is to say the sectors comprise: Energy, greenhouse gases and air pollution, Water, Waste, Transport and Agriculture and natural resources.

Part 2 of this report gives an overview of policies and instruments that the Nordic countries have used to promote clean technologies, as well as an in-dept analysis related to cost-effectiveness, interaction between national climate policies and the EU Emission Trading System, policy instruments needed for implementing a green transition in the industry and finally a discussion on how small countries like the Nordic ones can affect the global environment by promoting clean technology and a shift towards a fossil free production.

## **Key findings and conclusions**

### **Most significant changes within transport, energy, greenhouse gases and air pollution**

In the period 2018 to 2021, the Nordic countries have focused on economic instruments in the transport sector and in the field of energy, greenhouse gases and air pollution.

In the transport sector, a key objective has been to increase the number of zero or low emission vehicles, and hence decrease the use of fossil fuels. The specific economic instruments used differs among the countries, but all countries have implemented some sort of differentiated tax based on CO<sub>2</sub> emissions, which in some countries are combined with subsidies for zero or low emission vehicles. Several countries have made changes to the calculation of the carbon dioxide tax, e.g., by implementing the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) when calculating CO<sub>2</sub> emissions. Within the energy sector, Denmark, Norway, and Sweden have implemented new energy agreements meant to shape policies in the coming years. In Iceland, the carbon dioxide tax for all fuel types substantially increased in the examined period.

## **The use of economic instruments in Denmark**

During the period 2018 to 2021 Denmark has made some changes to its environmental policies, and several new political agreements have come into effect.

In 2018, the government presented an energy agreement meant to shape the energy policy between 2020 and 2030. Key elements are initiatives such as supporting renewable energy on market conditions, targeted energy savings, modernising the heat sector, strengthening energy and climate research, and continuous offshore wind energy. In December 2019, the government reached a new Climate Act, which includes legally binding targets with the aim to reach net zero emissions by 2050. One year later Denmark reached an agreement for the energy and industry sector combined with a climate agreement for waste management. Key elements include initiatives such as the establishment of an energy island in the North Sea, research in clean technologies, green district heating and support to biogas.

The Danish taxation scheme for transportation vehicles were changed in 2021. In Denmark vehicles are subject to both a registration tax and a vehicle tax based on fuel efficiency and in some cases weight, as well as taxes on transportation fuels. With the aim to promote green vehicles with high energy efficiency the registration tax was changed into three steps. For the first EUR 8 741 of the value of the car the tax is set to 25%, between EUR 8 741 to EUR 27 190 the tax is 85%, and above these levels the tax is set to 150%. This implies that electric cars will pay the full registration tax by 2035. Prior to 2021, the taxation scheme included a reduction for fuel efficiency and an increase for fuel inefficiency. This was removed and replaced by a taxation based on CO<sub>2</sub> emissions. A deduction of tax due to safety class (Euro NCAP) and other safety features were also removed.

Other noteworthy changes to Danish policies between 2018 and 2021 are the abolishment of the national tax on mineral phosphorus in animal feed. This change was made to strengthen the international competitiveness of the agricultural sector. Revenue of the energy taxes on fossil fuels decreased by 12% from EUR 4.5 million EUR 3.8 million, and the support to renewable energy decreased by 25%, mainly due to a decrease in subsidies for offshore wind energy.

## **The use of economic instruments in Finland**

Between 2018 and 2021 most of the economic instruments in environmental policy has remained unchanged. Some changes to tax levels have been made. The biggest changes include a change in the calculation of the tax for light and heavy fuel oil, natural and liquid gas, and hard coal as well as the taxable fuels. This was made in 2019 and implies that the calculation of carbon dioxide emissions considers emissions from the entire life cycle more clearly than before. The value of a tonne of carbon dioxide used in the calculation of the carbon dioxide tax on heating fuels was simultaneously reduced in order to not tighten this taxation.



Taxes on motor vehicles were also revised in the examined period. Finnish motor vehicles are charged with a one-time registration tax and an annual tax consisting of a basic tax, a driving power tax, or a combination of these. The registration tax is based on retail value and is differentiated based on the CO<sub>2</sub> emissions declared by the car manufacturer according to the Worldwide Harmonized Light Vehicles Test Procedure WLTP. The maximum tax rate has been unchanged in the examined period, but the minimum was reduced to 2.7% in 2019. The change is meant to incentivise the purchase of energy-efficient cars, such as electrical or other low emission cars. The annual tax has also remained the same for most vehicles. Since 2020 the basic tax is based on CO<sub>2</sub> emissions declared by the WLTP, and for vehicles with emissions in the lower range the tax was reduced. Before than the NED test cycle was used. The driving tax, levied on vehicles powered by anything other than petrol, were decreased from 4.9 eurocents per day 2017 to 1.5 eurocents in 2020 for electric vehicles.

During 2018 to 2021 the Finnish government implemented a few new support schemes. To improve energy efficiency and decrease the usage of oil and coal the government decided to grant subsidies for renovation projects meant to improve the energy efficiency of residential buildings, for projects meant to replace oil as an energy source in detached houses, and investment support for projects meant to replace coal as an energy source. To accelerate the climate work of municipalities and regions, funding is given to local, regional and national projects supporting the climate work of municipalities. Other noteworthy implementations are a new financial support scheme implemented in 2020 for afforestation of organic soil and wetlands, a temporary subsidy scheme for the purchase of electric cars, and a one-time competitive tendering on the production subsidy for renewable energy.

## **The use of economic instruments in Iceland**

During the period of 2018 to 2020 some new economic instruments were introduced. Tax levels of previous instruments were mostly unchanged. However, the carbon dioxide tax for all fuel types substantially increased in the period 2018 to 2021. On average this tax was 80% higher in this period compared to 2014 to 2017. A noteworthy implementation of environmental taxes is the introduction of a tax on fluorinated greenhouse gases in 2020. This was made in order to incentivise climate-friendly cooling agents and tax rates are differentiated based on the gases global warming potential. Another is the implementation of a taxation scheme meant to encourage climate-friendly investments. This allows for increased and faster depreciation of new investments that fulfil certain environment and climate related requirements. In addition to this, tax deductions for financing certain environmentally and climate-friendly activities are used since 2021.

Icelandic vehicles are subject to an excise duty based on the registered carbon dioxide emission. In 2018, the calculation of the CO<sub>2</sub> emissions was adjusted with

the introduction of new standards using the New European Driving Cycle (NEDC) and the Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Before this the rate ranged from 0% of the vehicle's value for vehicles emitting less than 80 grams of CO<sub>2</sub> per kilometre to 65% for vehicles emitting 250 grams or more per kilometre. The semi-annual vehicle tax was also changed so that the calculation is based on the NEDC and WLTP standards. For vehicles weighing more than 3 500 kg, the fee is still based on the vehicle's weight, and since 2020, this also applies to electric vehicles and hydrogen vehicles. In 2019 VAT discounts were introduced for the purchase of electric and hydrogen motorcycles, mopeds, electric bicycles, electric scooters, and regular bicycles in addition to the already existing VAT discounts offered for the purchase of electric vehicles, hydrogen vehicles and plug-in hybrid vehicles. Since 2020, 100% of the VAT related to the purchase of electric vehicle charging stations for use on residential property have been refunded, as well as a 100% refund of VAT on labour costs related to the installation to owners and builders of residential buildings.

In 2021, the goal of achieving carbon neutrality by 2040 was enshrined in law with amendments to the Climate Act No 70/2012. That same year the government announced its intention to complete the clean energy transition in Iceland no later than 2040, making Iceland the first country to become fossil-fuel independent.

### **The use of economic instruments in Norway**

For the period 2018 to 2021 has implemented a few changes to their environmental policies. Most previously instated policies have remained fairly the same, with some adjustments to e.g., tax levels.

There have however been quite a few changes for the Norwegian transport sector. In 2018 the annual excise tax on motor vehicles was replaced with a traffic insurance tax, and in 2021 the previous exemption of this tax for electrical cars were scrapped. Electrical cars are however still subject to a lower tax rate. In 2020 the road use tax, which purpose is to take external costs connected with e.g., accidents, congestion, road wear and local emissions into account was extended to include natural gas. There has also been increases in the CO<sub>2</sub> component within the taxation of motor vehicles, and since 2020 it is based on the WLTP standards. Further, in 2021 the Norwegian government announced that the flat CO<sub>2</sub> tax rate will increase by 5% each year until 2025, across all economic sectors not covered by the EU ETS scheme. The air passenger tax first introduced in 2016 was temporary terminated in 2019. However, it was introduced again in 2022.

A new climate strategy for the period 2021 to 2030 was implemented in 2021. The objective is to reduce non-quota emissions with 45% before 2030 in both the transport sector and the agriculture sector.

Other noteworthy changes made in the examined period are the subsidisation of a Carbon Capture Storage project which purpose is to find suitable places in the North Sea to store carbon dioxide, and the introduction of a tax on the fishing fleet with the purpose of financing control and supervision in the fishery industry.

## **The use of economic instruments in Sweden**

In the examined period, 2018 to 2021, Sweden has made some changes to existing instruments and implemented a few new instruments. Tax rates have been altered, e.g., the excise tax on electricity consumption, which has been increased each year. Most of the changes to pre-existing taxes are percentage-wise small.

In January 2018 a new climate policy framework entered into force. The framework establishes that Sweden's climate policy must be based on targets and specifies how the implementation will be carried out. The long-term target is to have zero net greenhouse gas emissions by 2045 at the latest.

The Swedish government implemented two other noteworthy changes in 2018. Both an emission reduction obligation scheme and a bonus-malus system targeted at new cars was implemented. The emission reduction obligation scheme implies that low-blended biofuels are subject to carbon and energy taxes that correspond to the rates of their fossil equivalents. The implementation corresponded with changes in the tax rules for petrol and diesel. The carbon tax rates were adjusted downwards to account for the share of low-blended biofuel per litre full blend, and the energy tax was lowered. High-blended and pure biofuels are not covered by the scheme and are still exempted from both the carbon tax and the energy tax. The implementation of a bonus-malus system implies that vehicles powered by diesel or petrol are subject to a higher annual tax during the first three years, and the previous tax exemption associated with low CO<sub>2</sub>-emissions was removed. A bonus is given to zero or low emission vehicles. The maximum bonus of EUR 6 803, or 25% of the retail value, will in practice only be given to zero emission vehicles. For other vehicles, such as plug-in hybrids, the bonus decreases for every gram of carbon dioxide per kilometre the car emits.

Another noteworthy change in the examined period is the reduction of tax cuts for fuels used for heat production in combined heat and power plants and in other heating plants (CHPs) made in 2019. Since then, CHPs within the EU ETS are subject to 91% of the carbon tax and 100% of the energy tax, which is an increase of 80 and 70 percentage points respectively. Lastly, the electricity certificate system, a subsidy scheme for renewable energy, was decided to be terminated by 2035, and no new electricity generation facilities are eligible for the system at the end of 2021, and the subsidy scheme for climate investments in the industry sector

was extended. The extension made in 2020 implies that the scheme now includes e.g., financing research and feasibility studies.

## **Overview of policies and instruments to promote clean technologies in the Nordic countries**

The second part of the report presents an in-depth analysis of economic instruments the Nordic countries have implemented to promote clean technologies. The analysis is presented across six different chapters. The study illustrates that almost all the Nordic countries are utilising a mix of both environmental taxes and subsidies to promote clean technologies. However, each country has chosen various technological paths depending on national interests and circumstances.

The desk research indicates that there are many similarities between theory and practice. Market-based strategies, such as environmental taxes, seems to be most common in the Nordic countries. Direct subsidies and other forms of support, such as research programmes are also common. All Nordic countries use a vast variety of policies. The interviews also highlighted that there are other challenges the countries are subject to, such as lobbying organisations who disagree with the implementation of new environmental taxes. There are a wide range of examples of similarities between what instruments or policies theory suggest and what the Nordic countries use, but there are also risks associated with the chosen instruments.

The conducted analysis that covers which policy instruments are needed for implementing a green transition in the industry shows that that pricing is not enough to drive deep decarbonisation in industry. Other types of policy instruments are needed. A three-domain framework covering different domains of behavioral processes is further highlighted within this sub-chapter.

The analysis of how cost-effective the Nordic countries taxation system for clean technologies are indicates that most countries have a low coverage level. Suggestions to increase cost-effectiveness are discussed in this chapter, and it involves proposals to increase the number of, and level of taxes to better follow the marginal cost of the emissions. Suggestions what the Nordic countries can do on a national level is also discussed.

The interaction between national climate policies and the EU Emissions Trading System was examined in the in-depth analysis. The study indicates that overlapping policies are common both at EU and member state levels. The importance for the EU ETS to manage imbalances in supply and demand that may occur due to overlapping policies is also highlighted. Suggestions to implement price floors in the EU ETS are further discussed.

Seen from a global context, the Nordic countries are relatively small thus their ability to affect the global environment is largely related to the power of leading by example. The value of leadership, what may motivate nations to be frontrunners when it comes to affect the global environment by promoting clean technologies and shifting to a fossil free production is discussed. The importance of establishing joint forces in terms of developing and improving new clean technology supply chains across the Nordic region is elaborated.



# Introduction

## Objective

The Nordic Council of Ministries publishes a quadrennial report series on the use of economic instruments in the Nordic countries. The report series serves to document and highlight examples from the use of economic instruments in the five Nordic countries, with the aim to inform and inspire policymakers around the world.

This report is part of a series and comprises of two parts. The objective of the first part, *The use of Economic Instruments in Nordic Environmental Policy 2018–2021* is to present an overview of the use of economic instruments in environmental policy in the Nordic countries for the period 2018–2021 along with the second part, *Overview of policies and economic instruments to promote clean technologies in the Nordic countries*.

The report has been prepared by IVL Swedish Environmental Research Institute in Sweden, one external consultant from Iceland as well as Nordic external experts have been interviewed in Norway, Finland, Denmark, Sweden and Iceland. The core project team consisted of Flintull Annica Eriksson (Project leader), Annacarin Karlsson, Lars Zetterberg, Jenny Von Bahr, Johan Rootzén, Kenneth Möllersten, Henrik Kloo (IVL Swedish Environmental Research Institute) and Hrafnhildur Bragadóttir (Independent expert).

The focus area has been the use of economic instruments within the period 2018–2021. Significant changes or alterations to economic instruments after 2021 are also mentioned where relevant. National currencies have been converted to Euro using national exchange rates (yearly average) collected from the European Commission.<sup>[1]</sup>

## Definition of economic instruments

The purpose of applying economic instruments in an environmental policy context is to correct for market failures by internalizing externalities i.e., to incorporate non-monetized environmental cost and benefits into the price of goods, services and activities. As the market prices on using natural resources and environmental assets do not reflect the actual costs to society, these resources become over-exploited. Through internalisation of these external costs, economic instruments provide incentives for agents to change behaviour. Several economic instruments can be introduced to correct for market failures e.g., taxes or charges, subsidies,

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1. [https://commission.europa.eu/funding-tenders/procedures-guidelines-tenders/information-contractors-and-beneficiaries/exchange-rate-infoeuro\\_en](https://commission.europa.eu/funding-tenders/procedures-guidelines-tenders/information-contractors-and-beneficiaries/exchange-rate-infoeuro_en)

and quotas (tradable permits or emission allowances) (Tietenberg, 1990):

An environmental tax or charge is a payment for using a certain resource or negatively affecting the environment. The unregulated market price does not reflect the cost to society associated with environmental deterioration. The environmental tax aims to correct the market failure by covering the gap between the market price and the social cost to society. An optimal tax should reflect the marginal social costs. An additional function of taxation is to raise revenue for the government, although this should not be the primary goal of an environmental tax. The tax should ideally be placed on the point source responsible for environmental harm. In practice this can be administratively impractical, or technical impossible, and an activity or product can instead be taxed through a proxy. A tax can be an efficient form of regulation because each actor can adjust to the regulation according to his or her own cost function. Environmental taxes do not, however, guarantee a certain level of environmental quality. Environmental taxes are best suited for regional and global environmental problems where it is the total emission or resource use that matters, and not the location of the emission-sources.

Unlike a tax, the allocation of quotas ensures that a predefined pollution level is met. This could be particularly relevant in cases where there is a risk that a change in pollution levels would lead to large damage cost to society; for example, if there is an irreversible tipping point. When quotas are made tradeable, producers who can reduce their pollution at a low cost will have an incentive to sell emission permits, while the producers facing a high cost of abatement will have an incentive to buy emission permits. It ensures abatements are made where the marginal costs are lowest. Hence, the emission reduction is achieved in the most efficient way.

Subsidies are used to support production sectors or activities which would otherwise be underprovided by the market. Subsidies are used to pay for positive externalities, or they are used as an incentive for producers to change to a more environmentally friendly form of production. Subsidies might overcompensate producers and can lead to overproduction. Subsidies also increase public spending and the need for tax revenue. This can lead to distortions in other parts of the economy.

## **Definition of clean technologies**

Part 2 of this report focuses on policies and instruments to promote clean technologies in the Nordic countries. The objective of Part 2 of this report is to present an in-dept analysis of economic instruments the Nordic countries have implemented to promote clean technologies with suggestions and recommendations to policymakers on how they can further develop and strengthen existing measures to promote clean technologies.

Clean technologies refer to avoiding environmental damage at the source through use of materials, processes, or practices by involving technologies that result in minimal or zero emissions of carbon dioxide (CO<sub>2</sub>) and pollutants. Currently, there is no set definition of clean technologies, and it can be defined in several ways. The International Energy Agency (IEA) defines clean energy technologies as low-carbon technologies which does not involve the production or transformation of fossil fuels; coal, oil and natural gas. Low-carbon energy technologies are further defined as renewable energy sources such as nuclear power, carbon capture storage, bioenergy, energy efficiency technologies that improves energy transformation e.g., LED lighting and hydrogen derived from low-carbon energy sources (IEA, 2022).

Combating climate change, securing energy supplies as well as ensuring clean air and water is becoming even more important as the global demand for energy is rising combined with increased global warming temperatures. Both the Nordic region and the rest of the worlds need for clean technologies plays an important role in tackling the global climate crisis. The use of clean technologies needs to accelerate on a global scale and related economic instruments and policies which support the green transition.



# **PART 1 – THE USE OF ECONOMIC INSTRUMENTS IN THE NORDIC COUNTRIES 2018–2021**





# 1. International policy and central developments in Nordic environmental policy 2018–2021

This chapter presents relevant international policy trends in the period and provides an overview of key developments in Nordic environmental policies. Major changes in each country and in certain sectors are reported and discussed.

## 1.1 Relevant international policy 2018–2021

The most important international policy developments for the Nordic countries are the EU policies. In addition, the development of Article 6 of the Paris agreement, which regulates international transfer of mitigation outcomes under the Paris Agreement is likely to be of importance in the future. It has focus on the following sectors: energy, industry, transportation, oceans and coast, waste, agriculture and forestry.

### Green Deal

The European Green Deal, presented by the Commission on December 11, 2019, sets the goal of making Europe the first climate-neutral continent by 2050 (European Commission, 2019a). The European Green Deal spans over all sectors in the economy. Since the Green Deal was presented, the EU Commission has presented several legislative proposals targeting different sectors and policy areas.

### EU climate law

The European Climate Law sets a legally binding target of net zero greenhouse gas emissions by 2050. Included in the law is also a new target for 2030 of reducing net greenhouse gas emissions by at least 55% compared to levels in 1990. The main elements of the law were agreed on by the European Council in December 2019. The law entered into force on July 29, 2021.

### FF55

Based on elements of the Green Deal, in July 2021 the EU Commission adopted a set of legislative proposals, called Fit-for-55, setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of an at least 55% net reduction in greenhouse gas emissions by 2030 (as compared to 1990). The package proposed to revise several pieces of EU climate legislation,

including the EU ETS, Effort Sharing Regulation, transport, and land use legislation. It also proposes a new emissions trading system for road transport and heating of buildings (sometimes referred to as ETS BRT) and a carbon border adjustment mechanism (CBAM) (European Council, 2022a).

## EU ETS

The EU Emissions Trading System was established in 2005 and is the largest emissions trading system in the world. It is described as a cornerstone of the EU policy to combat climate change. The EU ETS covers around 1.6 Gt, or 41 per cent, of the greenhouse gas emissions from the EU27 and includes the following sources: carbon dioxide (CO<sub>2</sub>) from

- electricity and heat generation,
- energy-intensive industry sectors including oil refineries, steel works, and production of iron, aluminum, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals,
- commercial aviation within the European Economic Area,
- nitrous oxide (N<sub>2</sub>O) from production of nitric, adipic and glyoxylic acids and glyoxal,
- perfluorocarbons (PFCs) from production of aluminum

Emissions in the ETS are capped by a limited number of allowances available for the participating installations. The main method for allocating allowances to the participants is through auctions, thus following the Polluter Pays Principle. But for carbon intensive and trade exposed sectors allowances are allocated free of charge based on benchmarking. The reason is to reduce the costs for the firms and risk of carbon leakage. In 2021, 57% of the allowances were sold through auctions, while 43% were allocated free of charge.

The cap is reduced each year by a linear reduction factor, LRF, currently at 2.2% per year. The limited supply of allowances results in a price on allowances, thus putting a price on GHG emissions. Over the period 2018–2021, the price has been between €8 and €85 per ton CO<sub>2</sub>e with an average price of €30 (ICAP, 2022).<sup>[2]</sup> The significant price increase was due to a reform that came into force in 2019, limiting the number of available allowances by transferring a part of the allowance surplus into a market stability reserve (Zetterberg and Elkerbout, 2019)

For the revision of the EU ETS, which is negotiated as part of the FF55 package, the Commission proposes to increase the linear reduction factor from 2.2% to 4.3%, which is a significantly faster reduction of the cap. With the previous factor the cap would reach zero in 2058, but with the new factor zero it will be reached in 2040.

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2. Although this report only covers the period 2018–2021, it can be noted that in 2022 the price on allowances has been between €58 and €96, with an average value of €82.



The Commission further proposes to phase out free allocation over a ten-year period, starting 2026. This is to be linked to the gradual introduction of the CBAM. Moreover, the Commission proposes to include shipping in the EU ETS (European Council, 2022a).

## **CBAM**

Previously, carbon leakage risk has been mitigated through free allocation. However, in the FF55 package the Commission suggests introducing a carbon border adjustment mechanism (CBAM) to mitigate the risk of carbon leakage. This will be aligned with the phase out of free allocation and thereby strengthening the EU ETS. The proposed CBAM would require importers in certain sectors to acquire 'virtual' ETS allowances, which mirror the actual ETS price. By doing so, importers face carbon costs similar to the costs that EU producers face. The CBAM will apply to fertilizers, steel, cement, aluminum and electricity, as well as some intermediate goods in these sectors, although not to final goods such as vehicles using these materials. If an exporting country itself applies a carbon price, this will be withdrawn in the calculation of the fee to pay for importing materials into the EU (European Council, 2022a).

The CBAM has not been implemented yet, but there is broad support for a CBAM among the EU institutions. The Commission presented its proposal in the summer of 2021 after the EU Member States reiterated their support in the European Council of December 2020.

## **ETS BRT – a new emissions trading system for road transport and buildings**

As part of the FF55 package, and a part of the revision of the EU ETS directive, the EU Commission proposes a separate new emissions trading system for road transport and buildings, starting in 2026, sometimes referred to as ETS BRT. The obligation to acquire allowances will be put on fuel distributors and importers rather than on individual cars and houses. This system would cover approximately 600 Mt of CO<sub>2</sub>-emissions. 100% of the allowances will be auctioned.

## **ESR**

The Effort Sharing Regulation (ESR), as adopted in 2018, sets national targets for emission reductions from road transport, fuel use for heating buildings, agriculture, small industrial installations, and waste management. These sectors which (so far) are not included in the EU Emissions Trading System (EU ETS) - currently generate about 60% of the EU's greenhouse gas emissions. To meet the EU's overall emission reduction target by 2030, the Commission proposed, through FF55, to reduce emissions by at least 40%, compared to 2005 levels, under the ESR. This is

an increase of 11 percentage points compared to the existing target of a 29% emission reduction. Based on EU's overall target, specific targets are set for the individual Member States.

## **LULUCF – Regulation on Land Use, Land Use Change and Forestry**

The Regulation on Land Use, Land Use Change and Forestry sets an overall EU target for carbon removals by natural sinks, equivalent to 310 Mt of CO<sub>2</sub> emissions per year by the Year 2030. National targets will require Member States to care for and expand their carbon sinks to meet this target. In the FF55, the EU Commission proposes that by 2035, the EU should aim to reach climate neutrality in land use and forestry sectors. The purpose was to break out agriculture from member states emission reduction targets, with the aim to establish a new combined agricultural, forestry and other land use sector.

## **Renewable Energy Directive**

The FF55 proposes an increased target aiming for 40% energy production from renewable sources by 2030. All Member States will contribute to this goal. Specific targets are proposed for renewable energy use in transport, heating and cooling, buildings, and industry. To meet both climate and environmental goals, the sustainability criteria to use bioenergy are strengthened. Member States must design support schemes for bioenergy in a way that respects the cascading principle of uses, for woody biomass, meaning that the same wood fiber is used several times before destruction.

## **Energy Efficiency Directive**

The Energy Efficiency Directive will be revised to set a more ambitious binding annual target to reduce energy use at EU-level. It will guide how national contributions are established and almost double the annual energy saving obligation for Member States. The public sector will be required to renovate 3% of its buildings each year.

## **Road transportation**

A combination of measures is required to tackle rising emissions in road transport, to complement emissions trading. More ambitious **CO<sub>2</sub> emissions standards** for cars and vans are proposed to accelerate the transition to zero-emission mobility, by requiring average emissions levels of new cars to decrease by 55% from 2030 and 100% from 2035, compared to 2021 levels. As a result, all new cars registered as of 2035 will be zero-emission. To ensure that drivers are able to charge or fuel their vehicles at a reliable network across Europe, the revised **Alternative Fuels Infrastructure Regulation** will require Member States to expand charging capacity

in line with zero-emission car sales, and to install charging and fueling points at regular intervals on major highways: every 60 kilometers for electric charging and every 150 kilometers for hydrogen refueling.

## Aviation and shipping

The Alternative Fuels Infrastructure Regulation requires that aircrafts and ships have access to clean electricity supply in major ports and airports. The **ReFuelEU Aviation Initiative** will oblige fuel suppliers to blend increasing levels of sustainable aviation fuels in jet fuel taken on-board at EU airports, including synthetic low carbon fuels, known as e-fuels. Similarly, the **FuelEU Maritime Initiative** will stimulate the uptake of sustainable maritime fuels and zero-emission technologies by setting a maximum limit on the greenhouse gas content of energy used by ships calling at European ports.

## Energy Taxation Directive

A revision of the Energy Taxation Directive proposes to align the taxation of energy products with EU energy and climate policies, promoting clean technologies and removing outdated exemptions and reduced rates that currently encourage the use of fossil fuels. The new rules aim at reducing the harmful effects of energy tax competition, helping secure revenues for Member States from green taxes, which are less detrimental to growth than taxes on labour. From January 2023, energy taxation should be based on the energy content of the energy products and electricity, and their environmental performance (EU Commission, 2021. Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast) COM/2021/563 final).

## Social Climate Fund

A new Social Climate Fund is proposed to provide dedicated funding to Member States to help citizens finance investments in energy efficiency, new heating and cooling systems, and cleaner mobility. The Social Climate Fund would be financed by the EU budget, using an amount equivalent to 25% of the expected revenues of emissions trading for building and road transport fuels. It is estimated to provide €72 billion of funding to Member States, for the period 2025–2032, based on a targeted amendment to the multiannual financial framework. With a proposal to draw on matching Member State funding, the Fund would mobilise €144.4 billion for a socially fair transition.

## **Biodiversity**

One of the key pillars in the European Green Deal is the new resolution on EU Biodiversity strategy that was launched during 2021 and later on adopted by the EU Commission in June 2022. This Biodiversity strategy contains specific commitments and actions to be implemented by 2030, at the latest. It involves enlarging existing Natura 2000 areas and measures to restore degraded ecosystems (EU Commission, 2022c).

## **Waste**

Another pillar of the European Green Deal is the adaptation of a new circular economy action plan, which was launched in March 2020. The following year, the European Commission adopted several packages with regard to new legislations for sustainable batteries, waste shipments, circular textiles as well as launched a Global Alliance on Circular Economy and Resource Efficiency. The objectives of the circular economy action plan are to make Europe cleaner and more competitive, thus taking the lead on global efforts on circular economy (European Commission, 2022d).

## **Ocean, Sea, and Coasts**

Following the initiatives from the biodiversity strategy, in October 2021 the EU Commission launched a consultation on a new action plan with the aim to conserve fisheries resources and protect marine ecosystems. This is based upon the European Union's Marine Strategy Framework Directive which was adopted in June 2008. This directive was amended in 2017 to better link ecosystem components. In June 2020, the Commission adopted a report on the first implementation cycle of the Marine Strategy Framework Directive (European Commission, 2022e).

**Table 1: Overview of relevant environmental policy with EU for the period 2018–2021**

| Sector/Policy area          | EU Policy                                                                           |
|-----------------------------|-------------------------------------------------------------------------------------|
| Energy                      | EU ETS, Renewable Energy Directive, Energy Efficiency Directive                     |
| Industry                    | EU ETS                                                                              |
| Road transportation         | ESR, ETS BRT, CO2 emissions standards, Alternative Fuels Infrastructure Regulation  |
| Aviation                    | EU ETS, ReFuelEU Aviation Initiative                                                |
| Shipping                    | EU ETS, FuelEU Maritime Initiative                                                  |
| Biodiversity                | EU Biodiversity strategy                                                            |
| Waste                       | Circular Economy Action Plan                                                        |
| Heating of buildings        | ESR, ETS BRT,                                                                       |
| Forestry, land and land use | Regulation on Land Use and Land Use Change and Forestry                             |
| All/General                 | Climate Law, Green Deal, Fit for 55, Energy Taxation Directive, Social Climate Fund |

## Article 6 of the Paris agreement

**Article 6** of the **Paris Agreement** (UNFCCC, 2015) allows for countries to voluntarily cooperate to reach their respective mitigation targets set out in their Nationally Determined Contributions (NDCs). Within Article 6, **Article 6.2** creates the basis for trading in “mitigation outcomes” (GHG emission reductions or removals) across countries under frameworks that can be established bilaterally. **Article 6.4** is expected to be similar to the Clean Development Mechanism of the Kyoto Protocol. It establishes a mechanism for trading mitigation outcomes between countries under the supervision of a body (“Supervisory Body”) designated by the Conference of Parties the decision-making body of the UN Framework Convention on Climate Change (UNFCCC). **Article 6.8** recognizes non-market approaches to promote mitigation and adaptation. It introduces cooperation through finance, technology transfer, and capacity building, where no trading of emission reductions is involved. Under Article 6, mitigation outcomes that have been authorized for transfer by the selling country's government may be sold to another country, but only one country may count the mitigation outcome toward its NDC. It is critical to avoid double



counting in order to avoid overestimating the reduction of global emissions. The agreement on Article 6 established an accounting mechanism known as "corresponding adjustment," to ensure that double counting does not occur. Corresponding adjustment requirements may also extend beyond compliance markets to the voluntary carbon markets, where demand is driven by the private sector's voluntary commitments to reduce emissions.

Initial rules as to how the Article 6 market mechanisms would function were agreed at the 26th session of the Conference of the Parties to the UNFCCC (COP26) in November 2021. These rules established a procedural framework for the functioning of the market, set out eligibility requirements for credit issuance, included an agreement as to the composition of the Article 6.4 Supervisory Body, and resolved several of the most contentious issues regarding the functioning of the Article 6 market mechanisms, including double counting of mitigation outcomes between nations. Other issues that were resolved related to the legacy of the Clean Development Mechanism ("CDM") and the level of credit transaction proceeds to be contributed to a Global Adaptation Fund. Although significant progress was made at COP26, negotiations on details concerning the functioning of article 6 continue.

According to a study from 2019, a well-functioning trade in mitigation outcomes under Article 6 of the Paris Agreement, could save the world's countries \$ 250 billion per year (IETA, 2019). When costs for reaching national targets are reduced, countries can afford to reduce emissions even further, thus increasing ambition. According to the study, Article 6 could bring about further emission reductions of around five billion tonnes of carbon dioxide per year on a global scale.

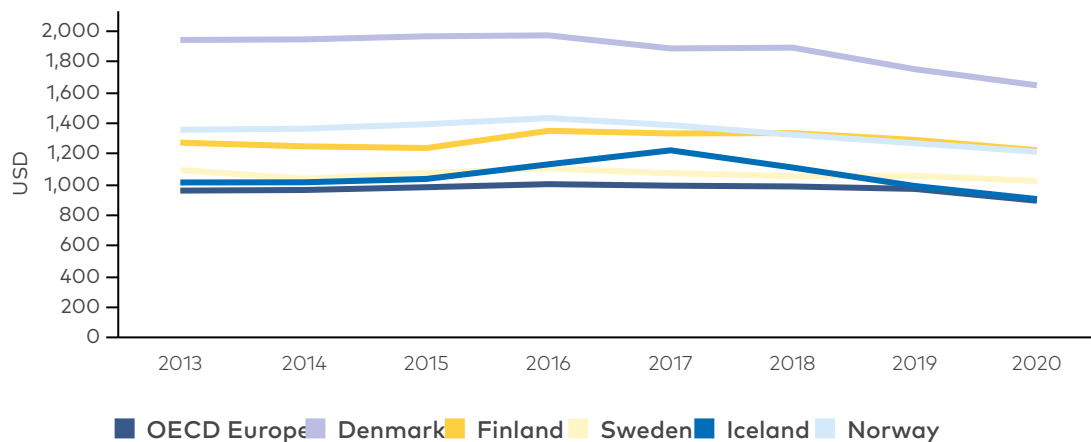
## **1.2 Revenues from national environmental taxes in the Nordic countries**

The tax revenue per capita from environmentally related taxes has been decreasing in Denmark, Finland, Norway, and Sweden since 2016 and in Iceland from 2017, see figure 1.<sup>[3]</sup> In 2020, Denmark generated the highest revenue followed by Finland and Norway, while Iceland generated the lowest total revenue per capita.

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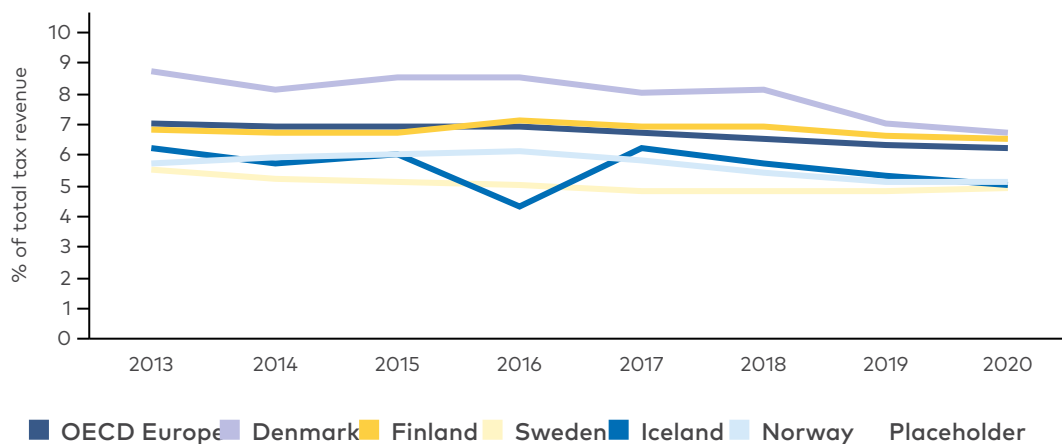
3. Data for 2021 were not available at the time of completing this report.

The share of environmental tax revenue, out of total revenue, peaked for Denmark, Finland and Norway during 2016. Iceland's share peaked in 2017 and Sweden's in 2013. Between 2018 and 2020 all Nordic countries shares decreased, except Denmark which increased by 2% in 2018. However, in 2019 Denmark experienced a sharp decrease of -14%. In 2020, Denmark's and Finland's shares converted towards each other and are now close to the OECD average of 6,2%. Sweden has in 2020, the lowest share which accounts for 4,9%, see figure 2.



**Figure 1: Total environmental taxes per capita, 2015, USD, PPP, 2013–2020**

Source: OECD, 2022a.



**Figure 2: Share of environmental tax revenue of total tax revenue, 2013–2020**

Source: OECD, 2022a.

## 2. Denmark

Denmark, along with the other Nordic countries can be seen as an ambitious country due to its long history in implementing environmental policies and the use of environmentally related instruments for the five described sectors in this publication.

Followed by the Danish Climate Law, which was passed by the parliament in 2014, the Minister for climate, energy and utility is obliged to propose national climate targets every fifth year that includes a ten-year perspective. The independent and economic advisory organisation the Danish Council of Climate Change was established in 2015. Its main objective is to provide independent analysis and policy advice to Danish policy makers.

In December 2019, the government reached an agreement on a new Climate Act. It includes legally binding targets with the aim to reduce greenhouse gases by 70%, by 2030 (compared to 1990-level), to reach net zero emissions by 2050 at the latest (Ministry of climate, energy and utilities, 2019).

On top of this updated Climate Act, the Danish government launched a new framework and a climate action plan to establish Denmark's Green Future Fund in 2020. The foundation aims to provide support for environmental projects that aligns with the Paris Agreement, by boosting green solutions and the green transition in Denmark as well as globally. It will also create a basis to potentially supporting the expansion of thousands of green jobs (State of green, 2020).

The same year, 2020, Denmark reached a broad political agreement for the energy and industry sector combined with a Climate Agreement for Waste Management, that aims to reduce emissions with 3.4 million tons CO<sub>2</sub>e by 2030. Some of the key elements in the agreement include initiatives such as the establishment of the world's first energy island in the North Sea, research in clean technologies such as Carbon Capture and Storage (CCS) and large capacity wind turbines, green district heating and support to biogas (Ministry of climate, energy and utilities, 2020).

During 2020, the Danish government launched a new strategic plan for circular economy. The strategic plan contains a vision that the waste sector should be climate neutral by 2030.

Denmark is the only Nordic country which has imposed a tax on water due to an environmental purpose, which was enforced in the late 1990's. Both water use and water management are subject to a tax. No noteworthy changes have been implemented in the water sector during the period.

Vehicles are subject to both a registration tax, a vehicle tax based on fuel efficiency and in some cases weight, and they are subject to taxes on transportation fuels. In 2021, the registration tax was changed into three levels with the aim to promote green vehicles with high energy efficiency. This most recent change implies that electric cars will pay the full registration tax by 2035.

To strengthen the international competitiveness of the Danish agricultural sector, the national tax of mineral phosphorus in animal feed was abolished during 2019. Growth promoters used as additives in animal feed was also abolished the same year, since these substances have been banned via a new legislation throughout the European Union.

Taxes, fees and charges regarding energy, transport and environment accounted for 70 million DKK (9.4 million Euro) in 2021. Environmental taxes on energy raised the highest share with 38,8 million DKK (5.2 million Euro) where the motor vehicle registration tax is the largest tax collected with 16,8 million DKK (2.3 million Euro). See Table 2 below for an overview of the ten highest revenue-generating taxes, fees, and charges.

**Table 2: Revenue from the ten highest revenue generating environmental taxes and fees in 2021, DKK (Euro)**

| Tax, fee or charge                        | DKK million          |
|-------------------------------------------|----------------------|
| Motor vehicle registration tax            | 16,381 (2203)        |
| Tax on electricity                        | 11,693 (1572)        |
| Tax on certain oil products               | 10,171 (1368)        |
| Tax on petrol                             | 7,367 (991)          |
| Motor vehicle weight duty from households | 7,052 (948)          |
| Tax on CO <sub>2</sub>                    | 3,502 (471)          |
| Motor vehicle weight duty from producers  | 3,418 (460)          |
| Tax on natural gas                        | 2,934 (395)          |
| Tax on piped water                        | 1,704 (229)          |
| Tax on coal                               | 1,797 (242)          |
| <b>Total</b>                              | <b>66,019 (8878)</b> |

*Note: Selection based on the ten highest revenue-generating taxes, fees and charges. Hence, the total revenue is larger than the sum of these.*

*Source: Statistics Denmark, 2022a.*

## 2.1 Energy, greenhouse gases and air pollution

Denmark has been in the forefront regarding the development of green technologies and has had strong policies for renewables and climate change (Dansk Industri, 2022). Economic tools such as taxes, other charges and subsidies are important parts of the Danish environmental policy. Energy taxes in Denmark are among the highest in the EU compared to the country's energy consumption, and many fuels are covered by both an energy tax and charges on other pollutants, such as CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub>.

In June 2018, an energy agreement to shape the future energy policy for the period 2020–2030 was presented by the government. Some of the key elements in the agreement include initiatives such as supporting renewable energy on market conditions, targeted energy savings, modernising the heat sector, strengthening energy and climate research, and continuous world class offshore wind energy. Additionally, the strategy aims to create a pathway for Denmark to take the lead in exporting clean energy solutions to the world (Ministry of climate, energy and utilities, 2018).

### **2.1.1 Energy tax on fossil fuels**

The global oil crisis in the 1970s guided the movement towards an energy reform, and an energy tax on fossil fuels was introduced by the Danish government in 1977. Throughout the years its scope has been expanded to include different types of fuels depending on its energy content of the product. This has created incentives to decrease the energy consumption and promote renewable energy and clean technologies (NCM, 2019).

Energy taxes has been the dominant category among the total environmental taxes since 1995. From 2018 to 2021 the energy taxes have decreased with 12% from 43.9 million DKK (4.5 million Euro) to 38.8 million DKK (3.8 million Euro) in 2021. Tax on natural gas decreased with 12% in the same period (Statistics Denmark, 2022a). See table 3 for tax rates on a selection of energy sources.

#### **Exemptions**

According to the EU Energy Taxation Directive the energy taxes on fossil fuels consumption differ between households and businesses. A vast majority of exemptions have been adopted with the purpose of ensuring that Danish companies stays competitive on the international market. Industries using fossil fuels for certain high energy industrial processes can normally receive a tax rebate for mineral products not used for heating or as transportation fuel (NCM, 2019). Businesses that produce environmental goods and services in countries where the environmental standards already are high, such as the Nordic countries, implies that innovations need to meet these requirements. This could promote the use of clean technologies (OECD, 2019).

### **2.1.2 Energy tax on waste**

Since 2010 there is a carbon tax on non-biodegradable waste. The tax is paid on the amount of CO<sup>2</sup> content in the waste. In principle, the tax is calculated on the basis of the energy content of the combustible waste. It was introduced to make waste incineration more cost effective (NCM, 2019). In 2021, the energy tax was 31.8 DKK (4.28 Euro) per GJ and has been stable since several years (Danish Ministry of Taxation, 2020a).



### 2.1.3 CO<sub>2</sub> tax

In the early 1990s the Danish government introduced a carbon tax, as an economic instrument for climate change mitigation. Initially, businesses and industries were fully exempt from paying the tax, due to competitive reasons. Since 2014, the CO<sub>2</sub> tax on electricity consumption was abolished as its being covered by the EU ETS scheme (NCM, 2019). Carbon tax revenues in 2021 were 3.5 million DKK (0.47 million euro) which is 9% of total energy taxes (Statistics Denmark, 2022a). See table 3 for different energy sources covered by the carbon tax.

**Table 3: Energy tax and CO<sub>2</sub> burden of different energy sources**

|                                                                |                                                     | 2018                               | 2019                            | 2020                            | 2021                            |
|----------------------------------------------------------------|-----------------------------------------------------|------------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Motor fuel<br>DKK öre<br>(Eurocent)<br>per litre               | Energy tax<br>CO <sub>2</sub> tax                   | 305.4<br>(40.96)<br>46.0 (6.16)    | 309.0<br>(41.4)<br>46.5 (6.22)  | 312.0<br>(42.0)<br>46.9 (6.30)  | 314.7 (42.3)<br>47.4 (6.37)     |
| Natural<br>gas<br>DKK öre<br>(Eurocent)<br>per nm <sup>3</sup> | Energy tax<br>CO <sub>2</sub> tax                   | 219.9<br>(29.47)<br>39.1<br>(5.24) | 222.5<br>(29.77)<br>39.6 (5.30) | 224.6<br>(30.2)<br>40.0 (5.37)  | 248.6<br>(33.42)<br>40.3 (5.42) |
| Pit coal<br>DKK<br>(Euro) per<br>GJ                            | Energy tax<br>CO <sub>2</sub> tax<br>(per<br>tonne) | 55.5 (7.44)<br>460.17<br>(61.67)   | 56.2 (7.52)<br>466.1<br>(62.38) | 56.7 (7.62)<br>470.6            | 62.8 (8.44)<br>474.6<br>(63.8)  |
| Waste<br>DKK<br>(Euro) per<br>GJ                               | Energy tax<br>CO <sub>2</sub> tax<br>(per<br>tonne) | 31.8 (4.26)<br>173.2<br>(23.21)    | 31.8 (4.25)<br>175.3<br>(23.46) | 31.8 (4.27)<br>177.0<br>(23.79) | 31.8 (4.28)<br>178.5<br>(24.0)  |
| Electricity<br>DKK öre<br>(Eurocent)<br>per kWh                | Energy tax<br>CO <sub>2</sub> tax                   | 89.47<br>(11.98)<br>-              | 90.52<br>(12.06)<br>-           | 91.40<br>(12.29)<br>-           | 92.19 (12.4)<br>-               |

*Note: Energy tax on coal sources is based on the energy content/weight unit and charged as DKK per GJ. For companies which do not measure the energy content of the fuel, the tax is levied on the weight. Tax on CO<sub>2</sub> measured as DKK (EUR) per tonne CO<sub>2</sub>. The energy tax on electricity is the tax on "other use of electricity".*

*Source: Danish Ministry of Taxation, 2018, 2020a, 2022c, 2022d.*

## EU emissions trading system for greenhouse gases

Denmark participates in the EU Emissions Trading System (EU ETS) since 2005 when it was established (International Carbon Action Partnership, 2021). The EU ETS is the largest emissions trading system in the world and covers power installations, cement, steel and metals, pulp and paper, oil refineries and aviation. Emissions covered by the EU ETS account for approximately 45 per cent of the emissions from EU27 and approximately 28 per cent of the greenhouse gas emissions from Denmark (International Carbon Action Partnership, 2021). The EU ETS is described in more detail in section 1.1.

### 2.1.4 Taxes on transportation fuels

Transportation fuels has been subject to taxes since 1917 in Denmark (NCM, 2019), thus mainly due to fiscal reasons until the end of 1980s. The tax was also used as economic instruments to reduce the import of oil. Excise taxes on transportation fuels have additionally been utilised to regulate the environmental harmful effects from fuel consumption.

The large differences between petrol and diesel are due to the fact that diesel is much more sensitive to trade across borders because of cross-border traffic of heavy vehicles. Industries and households do not have different tax rates in their transportation fuels. The tax rates on transport fuels for the period 2018–2021 are presented in table 4 below.

**Table 4: Excise taxes on transportation fuels, DKK öre (Eurocent) per litre**

|                               | Petrol       |                   | Diesel       |                   |
|-------------------------------|--------------|-------------------|--------------|-------------------|
|                               | 2021         | Change since 2018 | 2021         | Change since 2018 |
| Basic excise charge, leaded   | 523.5 (70.4) | 3%                | 317.2 (42.7) | 3%                |
| Basic excise charge, unleaded | 444.4 (59.8) | 3%                | -            | -                 |
| CO <sub>2</sub> tax on petrol | 43.5 (5.85)  | 3%                | 48.0 (6.45)  | 3%                |

*Source: Danish Ministry of Taxation, 2022d, NCM, 2019.*

### **2.1.5 Taxes on electricity consumption**

In June 2018, the Danish government presented a new energy agreement that aims reducing emissions via energy efficiency, thus increasing the share of renewable energy and becoming a global leader in offshore wind energy. Additionally, the agreement included a reduction of taxes on electricity and restricting regulations for surplus heat with the aim to encourage the installation and usage of heat pumps. The Danish households are subjected to pay the highest taxes in the EU. The agreement also includes phasing out coal in electricity production by 2030 (Ministry of climate, energy and utilities, 2018).

Revenues from taxes on electricity decreased with 4% from 12.1 million DKK (1.63 million Euro) in 2018 to 11.7 million DKK (1.57 million Euro) in 2021 (Statistics Denmark, 2022a).

### **2.1.6 Sulphur tax on fossil fuels**

Fossil fuels containing more than 0.05% are subject to paying the sulphur tax. The tax was introduced in 1996, with the aim to create incentives to substitute towards energy products containing less sulphur (NCM, 2019). In 2021, the rate was set to 24.2 DKK (3.25 Euro) per kilo of sulphur content, while the tax rate applied to emissions of sulphur dioxide was 12,1 (1.63 Euro) per kilo (Danish Ministry of Taxation, 2021f).

### **2.1.7 Tax on nitrous oxides (NO<sub>x</sub>)**

A tax on NO<sub>x</sub> has been in place since 2010 and applies to the NO<sub>x</sub> content in energy products or emissions of NO<sub>x</sub>, similar as for the sulphur tax. The tax on nitrous oxides is mainly targeted towards the energy and industry sectors (NCM, 2019). In 2021, the NO<sub>x</sub> tax rate was set to 5.3 DKK (Euro 0.71) per kilo of NO<sub>x</sub>, which is a small increase from 2018 where the level was equivalent to 5.1 DKK (Euro 0.68) per kilo of NO<sub>x</sub> (Danish Ministry of Taxation (2021i).

According to the European Environmental Agency, data published for Denmark related to 2018 indicated that the emissions of NO<sub>x</sub> were below its national emission ceiling (European Environmental Agency (2020).

### **2.1.8 Tax on chlorofluorocarbons (CFC)**

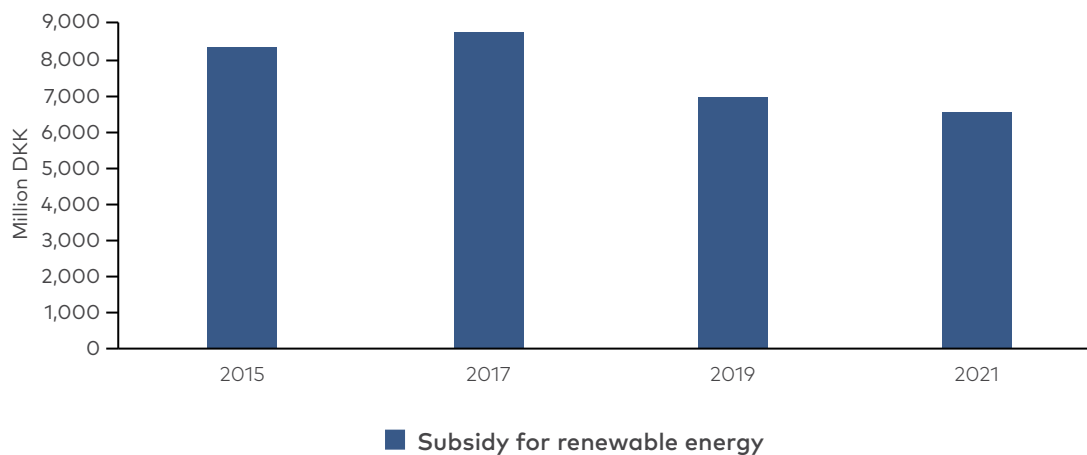
According to the Montreal Protocol chlorofluorocarbons (CFC) should be phased out as they contribute to ozone depletion. A tax on CFC were introduced in 1989 with the aim to reduce consumption of CFCs. Along the way some modifications have been made such as in 2001 when HFCs, PFCs and SF was added to the list covered by the tax (NCM, 2019).

The tax rate has been stable since the latest version of this publication in 2019, thus the rate is set at 30 DKK (4.03 Euro) per kilo of the substances net weight. The tax on HFCs, PFCs and SF varies between 15 DKK (2.02 Euro) and 600 DKK (80.66 Euro) per kilo depending on the specific substance's CO<sub>2</sub> equivalent. Imported goods which contains one or more of the CFCs substances are subject to the tax as well (Danish Ministry of Taxation, 2020c).

### 2.1.9 Subsidies to renewable energy sources

Since 1992, several subsidy schemes have been in place to support renewable energy supplies within solar, wind, biogas, biomass, and sea wave with the aim to increase production of electricity from renewable energy sources. Subsidy schemes are organised to promote renewable energy sources by subsidies once they are not able to compete on market conditions. As the technology develops, hence the energy source becomes cheaper and more competitive, their need for support decreases over time (NCM, 2019).

The development in environmental subsidies allocated to the energy sector in the period 2015–2021 can be seen in figure 3. A sharp decrease of 25% can be seen from 2017 to 2021, mainly due to the decrease of subsidies for offshore wind energy.



**Figure 3: Development in environmental subsidies allocated to the energy sector, 2015–2021, million DKK**

*Source: Statistics Denmark (2022b).*

## 2.2 Water

Economic instruments are applied towards the water sector to target both the consumption of drinking water and the generation of wastewater.

### 2.2.1 Supply tax

The supply of drinking water is taxed at the water company, which is typically owned by a municipality. The taxation has been in full effect since 1998 (NCM, 2019). In 2018–2020, the rate was DKK 6,18 (Euro 0,83) per m<sup>3</sup>, with an additional charge of DKK 0,19 (Euro 0,03) per m<sup>3</sup> designed as a general contribution towards the protection of groundwater, thus it was phased out during 2021. VAT liable companies can obtain a refund of the paid tax (Danish Ministry of Taxation, 2021b).

### 2.2.2 Wastewater tax

The charge of wastewater has like the supply of drinking water been subjected to taxes since 1998 (NCM, 2019) and is related to the material content of wastewater as seen in figure X below. This charge has been increased over time to the current level (Danish Ministry of Taxation, 2020a).

**Table 5: Taxation of wastewater by material content, DKK (EUR) per kg**

| Material content | Year 2020   |
|------------------|-------------|
| Nitrogen         | 30 (4,04)   |
| Phosphorous      | 165 (22,19) |
| Organic material | 16,5 (2,22) |

*Source: Danish Ministry of Taxation, 2020d.*

If the material content in the wastewater is not measured, the tax is based on the amount of m<sup>3</sup> water and the water purification technology. In 2020 the tax ranged from DKK 0.75 (EUR 0.10) per m<sup>3</sup> to DKK 5.70 (EUR 0.77) per m<sup>3</sup>, depending on the technology.

#### Exemptions

Output from separate systems is not taxable. Industries with wastewater-heavy processes or productions, handling fish, crustaceans, molluscs, the manufacture of cellulose or produces cane and beet sugar, can be reimbursed for the part of the tax which exceeds DKK 30,000 (EUR 4,033) annually.

## 2.3 Waste

The Danish government launched a new strategic plan for circular economy during June 2020. This new strategic initiative is valid for the period 2020–2032 but should be revised at the latest every sixth year. The strategic plan contains a vision of how the waste sector should be climate neutral by year 2030, more focus on creating and preventing less waste, better use of natural resources (biomass), obtaining larger volumes of recycling, as well as phasing out 80 percent of Danish plastic incineration by year 2030 (Ministry of Environment, 2021).

The economic instruments within the strategy to prevent and manage waste, are divided into three categories:

- Taxes levied on treatment of generated waste (Waste treatment taxes)
- Taxes levitated on content of certain materials in products on the market (Product taxes)
- Taxes designed to change the waste generating behaviour of consumers (Waste behaviour taxes)

### 2.3.1 Waste treatment taxes

All waste in Denmark is either sent for recycling, incinerated, or put in landfills. In 2019, 50 percent of the waste generated by households was recycled, while 49 percent was incinerated, and 1 percent was placed in landfills (Statistics Denmark, 2022c). The Danish government total tax revenue collected for waste, accounted for 193 million DKK (25,6 million Euro) in 2021. This amount is the highest level ever recorded (Statistics Denmark, 2022a).

A tax is levied on the amount of waste put into landfills. The owner of the landfill is charged DKK 475 (EUR 63.86) per tonne waste, and the owner passes this cost on by charging a fee for accepting waste into their landfill. This rate has been constant in the period 2014–2021 (Danish Ministry of Taxation, 2021c).

Hazardous waste, intended both for incineration and landfill, has been taxed since 2010 to 2014, at a rate of DKK 160 (EUR 21.51) per tonne, a rate which increased to the level of that of non-hazardous waste in 2015 (NCM, 2019). Since 2015, the tax rate for hazardous waste has been on the same level of DKK 475 (Euro 63.87) (Danish Ministry of Taxation, 2021d).



## 2.3.2 Product taxes

### Batteries

Batteries containing nickel-cadmium have been subject to a tax since 1996. This rate has been set to a constant level of 6 DKK (0.81 Euro) and 36 DKK (4.84 Euro) per package of round joined cells (Danish Ministry of Taxation, 2021g).

### Packaging

All paper and plastic bags, as well as disposable dishes and cutlery is subject to a weight-based fee. The government increased taxes January 1, 2020, on all carrier bags, with the aim to reduce the amount of waste from packaging and plastic consumption in Denmark. The levels can be seen in table 6 below. The PCV tax for food packages was abolished, January 1, 2019 and was reintroduced 2021 at a higher tax rate than previously (Danish Ministry of Taxation, 2021h).

The amount of total taxes collected for plastic and paper bags increased with 28 percent between 2018 and 2021. In 2021, the amount accounted for 307 million DKK (41,2 million Euro) (Statistics Denmark, 2022a).

**Table 6: Tax rates for plastic bags, disposable dishes and cutlery 2018–2021, DKK (EUR) per kg**

| Material                      | 2018         | 2019         | 2020        | 2021         |
|-------------------------------|--------------|--------------|-------------|--------------|
| Paper bags                    | 10 (1.35)    | 10 (1.35)    | 30 (4.03)   | 31.65 (4.26) |
| Plastic bags                  | 22 (2.95)    | 22 (2.95)    | 66 (8.87)   | 69.63 (9.36) |
| Disposable dishes and cutlery | 19.20 (2.58) | 19.20 (2.58) | 57.6 (7.75) | 60.77 (8.17) |
| PVC for food products         | 20.35 (2.73) | N/A          | N/A         | 40.70 (5.47) |

*Source: Danish Ministry of Taxation, 2021h.*

Beverage containers such as bottles for spirits, beer and soft drinks are subject to a tax fee per unit. These levels have been constant at similar levels during the period 2018–2021. The tax level varies between 0.08–1.05 DKK (0.01–0.14 Euro) per unit, depending on its size (Danish Ministry of Taxation, 2021h).

## **PVC and phthalates**

Between 2000 and 2018, products containing PVC, and phthalates have been taxed by the government. Which accounted for 27 million DKK in 2018 (3.6 million Euro), (Statistics Denmark, 2022a). During 2018, a new agreement took place between Danish businesses and entrepreneurs, thus the PVC tax was abolished by January 1, 2019 (NCM, 2019). However, in 2021 the product tax was introduced again with the aim to lower the use of phthalates as plasticisers and reduce the amount of PVC that is either incinerated or placed in landfills. The new tax rate varies according to the type of goods, ranging from DKK 0.25–3.60 (Euro 0.03 – 0.48) per kg for goods containing phthalates and between DKK 0.10–2.0 (EUR 0.01–0.27) per kg for goods containing other plasticisers (Danish Ministry of Taxation, 2021a). In addition, PCV folio used for food wrapping is being taxed to a rate of 40.70 DKK (5.5 Euro), (Retsinformation, 2020b).

### **2.3.3 Solvent tax**

Specific chlorinated solvents have been taxed since 1996 in Denmark. The tax rate of DKK 2 (Euro 0.27) has however not changed since it was introduced (Retsinformation, 2020a).

### **2.3.4 Waste behaviour taxes**

#### **Beverage containers**

A non-profit company named Dansk retursystem was founded in 2000 with the purpose of managing a national deposit refund scheme. By giving deposit-refunds it provides incentives to promote recycling of beverage containers. The deposit-refund rates have been stable over a longer period, and they vary between 1 DKK (Euro 0.13) to 3 DKK (Euro 0.40) depending on type of bottle and size of container (Dansk retursystem, 2021).

#### **Waste electric and electronic equipment (WEEE)**

Producer responsibility for electrical equipment, batteries, and vehicles was introduced as a policy area in Denmark during 2006. Simultaneously, an independent WEEE system was established under the Danish Environmental Protection Act (NCM, 2019).

The objective of the producer responsibility is to increase the production of environmentally friendly products as well as increase recycling and recovery. According to Danish law, producers and importers of electric and electronic goods are required to register the quantity of new electronics goods sold, plus quantities returned for recycling (Producentansvar (2021).

## **End-of-life vehicles and tyres**

The overall purpose of the end-of-life refund schemes for used car tyres, is to promote the recycling of the raw materials originally used to produce the tyres. This end-of-life refund scheme for vehicles is also managed by the Producer responsibility and applies to vehicles that are returned to an authorised car scrapper (NCM, 2019). The refund rate has been constant since 2018 and is equivalent to 2,200 DKK (Euro 296) in 2021 (Retsinformation, 2019b).

## **2.4 Transport**

Environmental externalities originating from the transportation sector are targeted both through the energy and CO<sub>2</sub> taxes mentioned in section 1 of this chapter, but also through taxes related directly to the purchase of a car and car ownership.

In December 2020, an agreement was set between the Danish Government and the political parties Radikale Venstre, Socialistisk Folkeparti and Enhedslisten about a green transformation of road transports. One of the objectives is that the Danish vehicle fleet will comprise more than 100 000 "green" vehicles. It sets the ambition to further introduce taxation and fees related to CO<sub>2</sub> emissions. For heavy trucks there is an ambition to introduce a tax based on kilometres. It is also stated that they will work within the EU to advocate the phase out of fossil driven cars and delivery vans, with ambitions to expand usage of biofuels amongst other things (Ministry of Finance, 2020).

### **2.4.1 Registration tax**

The first time a car is registered, a registration tax should be paid. Since October 2017, passenger cars are subjected of paying a registration tax of 85% of the value the car, up to DKK 185 100 (EUR 24 884). For any remaining amount, the registration tax is 150% (Danish Ministry of Taxation, 2017, NCM 2019). In 2021, this system was changed, and the registration tax was divided into three levels (Danish Ministry of Taxation, 2022e):

1. For the first 65 000 DKK (EUR 8 741) the tax is set to 25%.
2. From DKK 65 001 to DKK 202 200 (EUR 8 741 to EUR 27 190) the tax is set to 85%.
3. Above DKK 202 200 (EUR 27 190) the tax is set to 150%.

All cars have a base deduction of DKK 21 700 (EUR 2 918) on the registration tax. Prior to 2021, the taxation scheme included a reduction for fuel efficiency and an increase for fuel inefficiency. This was removed and replaced by a taxation based on CO<sub>2</sub> emissions. A deduction of tax due to safety class (Euro NCAP) and other safety features were also removed. The taxation scheme prior to, and after, 2021 is presented in table 7.

For electric cars and low emission cars the registration tax is reduced. Electric cars are subjected to paying a registration tax which is 40% of the regular tax level and low emission cars, e.g., plug in hybrids, pays 45% a registration tax that is 40% of the regular tax level. A reduction based on the battery capacity is also used and is set to DKK 1 700 (EUR 229) per kWh up to 45 kWh. That implies that a car with the price of DKK 300 000 (EUR 40 341), with 45 or more kWh of battery capacity, will receive a tax rate at the same level as a fuel car at the price of DKK 223 500 (EUR 30 054). A further reduction of DKK 170 000 (EUR 22 860) is given for electric vehicles, and DKK 50 000 (EUR 6 724) for low emission vehicles. This implies that an electric car with a price tag below DKK 300 000 (EUR 40 341) will be fully compensated for the registration tax. These tax reductions are set to gradually decrease and be phased out during the upcoming years. This change implies that electric cars will need to pay the full registration tax by 2035 (Elbilviden.dk, 2022). Hydrogen vehicles are currently exempt from paying registration tax.

**Table 7: Registration tax deduction and extra charge for fuel (in) efficiency until model year 2020 and the new scheme for model year 2021.**

| <b>Taxation Scheme 2018–2020</b>                     | <b>Reduction for fuel efficiency, DKK (EUR)</b>                                      | <b>Increase for fuel inefficiency, DKK (EUR)</b> |                                 |
|------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------|
| Petrol                                               | 4 000 (538) per km/l above 20 km/l                                                   | 6 000 (807) per km/l under 20 km/l               |                                 |
| Diesel                                               | 4 000 (538) per km/l above 22 km/l                                                   | 6 000 (807) per km/l under 22 km/l               |                                 |
| <b>New taxation scheme from 2021</b>                 | <b>All cars and delivery vans, DKK (EUR)</b>                                         | <b>Electric, DKK (EUR)</b>                       | <b>Low emission, DKK (EUR)</b>  |
| Base for calculation of registration tax             | 25% < 65 000 (8 741)<br>85% 65 001–202 200 (8 741– 27 190)<br>150% >202 201 (27 190) |                                                  |                                 |
| Reduction for battery capacity per kWh, up to 45 kWh |                                                                                      | 1 700 (229)                                      | 1 700 (229)                     |
| Increase for CO <sub>2</sub> emission (per g/km)     | <125 g/km 250 (33.5)<br>126 – 160 g/km 500 (67.2)<br>> 161 g/km 950 (127.3)          |                                                  |                                 |
| Reduction of tax for electric vehicles               |                                                                                      | Tax rate x 0.40                                  | Tax rate x 0.45                 |
| Base deduction                                       | 21 700 (2 918)                                                                       | 21 700 + 170 000 (2 918 + 22 860)                | 21 700 + 50 000 (2 918 + 6 724) |

Source: Danish Ministry of Taxation (2020c).

## 2.4.2 Vehicle tax

In addition to the registration tax, passenger car owners are subject to a periodic fee, which is based on different principles depending on when the vehicle was first registered. The periodic fee can thus be one of either a weight-based fee, a "green ownership fee" or an ownership fee. The latter is differentiated according to the level of CO<sub>2</sub> emission (Danish Ministry of Taxation, 2022f).

Cars registered before July 1, 1997, delivery vans registered before March 18, 2008, and all motorcycles are subject to a weight-based tax. The green vehicle tax is valid for cars and delivery vans registered after this up until the June 30, 2021, and is based on the fuel efficiency of the vehicle in km per liter fuel; the more km the lower the fee. For cars and vans registered from July 2021 the ownership fee is valid. The vehicle tax can be increased through an "equalization fee", which is applied to cars that run on diesel or petrol.

In addition to the tax, diesel cars are subject to an additional fee of DKK 1 000 (EUR 134) if they do not have an approved filtration system for fine particular matter (Danish Ministry of Taxation, 2022f). From July 2018 the green vehicle tax was revised to further promote vehicles with high fuel efficiency. The tax level for 2021 can be seen in table 8.

For hybrid cars the energy efficiency is calculated both from the petrol or diesel fuel consumption and electricity. The electricity usage is then recalculated to a corresponding value for fuel consumption. The total energy efficiency is presented as km/l for these vehicles.

**Table 8: Green vehicle tax in 2021 for cars, registered October 3, 2017, or later**

|             | Kilometres<br>per litre, more<br>than or equal<br>to | Biannual fee,<br>DKK (EUR) | Kilometres<br>per litre, less<br>than or equal<br>to | Biannual fee,<br>DKK (EUR) |
|-------------|------------------------------------------------------|----------------------------|------------------------------------------------------|----------------------------|
| Petrol cars | 50                                                   | 330 (44.4)                 | 4.5                                                  | 11 680 (1 571)             |
| Diesel cars | 56.3                                                 | 330 (44.4)                 | 5.1                                                  | 11 680 (1 571)             |

*Source: Retsinformation (2021).*

The level of the CO<sub>2</sub> tax subject to vehicles increases in several steps, from the lowest fee for cars and vans with an emission of less than 58 g/km at DKK 380 (EUR 51.1) to DKK 12 040 (EUR 1 619) for emission above 650 g/km.

### **2.4.3 Road charge for trucks**

Since 1994 Denmark has participated in a partnership with other EU member states (from 2017: Luxembourg, Netherlands and Sweden), where trucks with a total weight of 12 tons and above pay an identical road charge (NCM, 2019). The road charge for trucks registered in Denmark varies depending on exhaust class and the number of axles. The charge range between DKK 5 581 (EUR 748) for trucks at the highest euro class and less than three axles, to DKK 17 555 (EUR 2 350) per year for Euro-0 trucks with more than four axles (Danish Ministry of Taxation, 2022f).

## **2.5 Agriculture and natural resources**

### **2.5.1 Fertilizer and phosphorous**

Fertilizers plays a major role within agricultural production, as it replaces the nutrients the harvested crop removes from the soil. Crop yields and agricultural productivity becomes higher when fertilizers are being used. However, they also generate harmful environmental impacts by contamination of water and air pollution. In Denmark, the use of fertilizers has been regulated since the late 1980s (Danish Economic Council, 2018).

Since 1998, where the second aquatic plan was launched, the tax on nitrogen content in fertilizers have been set to a fixed rate of DKK 5 (0.67 Eurocent) per kilo nitrogen (Retsinformation, 2020c).

The use of cover crops is of great importance in Denmark. Hence, the timing and establishment of cover crops is essential, as they can collect nitrogen from the soil. In 2019, a new legislation was introduced with the aim to regulate the use of nitrogen by the agricultural sector in order to protect the environment, preserve animal and plants (Danish Ministry of Taxation, 2021c).

To strengthen the international competitiveness of the Danish agricultural businesses a long-standing tax on the content of mineral phosphorus in animal feed was abolished in 2019 (Retsinformation, 2019a).



### **2.5.2 Pesticides and biocides**

The taxation of pesticides in agriculture has a long tradition in Denmark which originates from 1996. Along the way some reforms have been made, where the latest one took place in 2012. During this tax policy reform, the tax rate became differentiated according to the characteristics of the active substances in each pesticide (NCM, 2019). Since then, the total tax rate has been unchanged, thus it is calculated according to four-subcomponents which covers health, the environment as well as the amount of active ingredient in each specific pesticide (Danish Ministry of Taxation, 2020a).

The Ministry of Environment conducted a study in 2020 which examined to what extent the pesticide tax has affected farmers use of pesticides, as well as the delimitations of this policy instrument. The analysis showed that for the 1,900 farmers included in the survey, the reduction of harmful pesticides was 16% between the planting years of 2012 and 2017 (Ministry of Environment, 2020).

The tax rate for chemical and microbiological biocides has been unchanged since the latest overview report by the Nordic Council of Ministries, published in 2019. Thus, the effective tax rate is differentiated according to the use of the product and varies between 3–40% ad valorem (Danish Ministry of Taxation, 2021b).

### **2.5.3 Growth promoters**

In 1998 a tax was introduced on antibiotics and growth promoters used as additives in animal feed. The tax aimed to reduce the use, thus protecting the welfare of animals in livestock production (NCM, 2019). However, in 2019 this tax was abolished as the substances have been banned via a new legislation throughout the European Union (Danish Ministry of Taxation, 2019).

### **2.5.4 Raw materials**

The Danish government have imposed a tax on the extraction of raw materials such as limestone, clay, rock, and gravel since the 1990s. Additionally, imported raw materials are also subject to the tax since 2006 (NCM, 2019). During 2021, the tax rate increased to DKK 5.27 (0.71 Euro) per m<sup>3</sup> of extracted materials (Danish Ministry of Taxation, 2021e).

### **2.5.5 Tradable quotas for fish**

Since 2003, Denmark's fishery sector is regulated by tradable quotas for fish by the EU's Common Fisheries Policy (CFP) where the latest major reform took place in 2013 (NCM, 2019). The EU's policy aims to ensure that all fishing activities are sustainable. Every year the European Fishery ministries meet and negotiate the tradable quotas. Each member state's fishermen are given a yearly quantity of

quotas which they can utilise themselves or trade between each other. However, in May 2018 the European Commission decided to initiate a revision of the fisheries control system with the aim to modernise and simplify the policies for monitoring activities relating to fishing, thus improving the enforcement of CFP across all member states (European Commission, 2022a). In March 2021, the proposal to revise the fisheries control system had reached a first reading vote in the European Parliament which involves several aspects such as tracking of all EU fishing vessels, reporting of all catches, monitoring of recreational fisheries (European Parliament, 2021).

### **2.5.6 Subsidies in agriculture**

Similar to the fishery area, the Danish agricultural sector is following the legislation of the European Common Agricultural Policy (CAP), which is in line with the Danish Rural Development Programme that nationally regulates subsidies for farmers, businesses, and the population. The national policy has been reformed on several occasions where the previous scheme covered the period 2014–2020 (Ministry of food, agriculture, and fisheries, 2021a).

The Danish Rural Development Programme covers four main areas, that aims to promote the competitiveness of the agricultural sector as well as enhance the green transition:

- Growth and competitiveness: Subsidising investments in technologies which reduces the agricultural sector harmful impact on the environment and nature. Thus, improves animal welfare and increases productivity.
- Ecology: Grants are given to farmers who is converting from conventional towards organic farming. As well as general support for the development of organic farming.
- Nature, environment, and climate: The majority of the programme provides grants for land-use and natural area management in the open country space. Specific grants are given for the establishment of new grasslands and wetlands.
- Rural Development (LAG): The Danish Housing and Planning Authority has directly given local action groups the opportunity to influence the prioritisation on various development projects within their local area.

Since the new European Common Agricultural Policy became delayed (European Commission, 2022b), it was decided to extend the programme period of the Danish Rural Development Programme until 2022. In October 2021, the government agreed upon a new subsidy scheme which aims to launch a green transformation of the Danish agricultural sector, thus implementing the new EU CAP plan for the period 2023–2027. The agreement ensures a reduction of greenhouse gas emission of 1.9 million tons of CO<sub>2</sub>e by 2030, combined with reductions of nitrogen emissions to the aquatic environment by 10.800 tons in 2027. Additionally, support of 575 million DKK (77.3 million Euro) will be provided towards the development of new technologies which can deliver innovative solutions that may further reduce the agricultural sectors negative impact on the climate and environment (The Danish Agricultural Agency, 2021).

### 3. Finland

Economic instruments have a long history in Finnish environmental policy. Among the different types of economic instruments available, taxes, subsidies and grants appear to be the most widely used even though there are examples of other market-based solutions e.g. the EU ETS. In the period 2018–2021, changes to existing instruments have been made, and a few new instruments have been implemented.

In 2019 the Finnish government implemented a change in the tax calculation basis for light and heavy fuel oil, natural and liquid gas, and hard coal as well as the taxable fuels that replace them; when calculating the carbon dioxide emissions, the emissions during the entire life cycle are considered more clearly than before. The aim of this change was not to tighten the taxation of heating fuels, therefore the value of a carbon dioxide tonne used in the calculation of the carbon dioxide tax on heating fuels was reduced simultaneously. This is further described in section 3.1.1.

As part of the changes in energy taxation in 2019, the government changed the tax reduction for coal, natural gas, bio-oil, and light and heavy oil used in combined heat and power (CHP). The tax reduction was shifted from the carbon dioxide tax to the energy content tax, which considering previous mentioned changes makes it possible to tax hard coal and increase emission control without the total tax burden for CHPs being increased. Table 9 present revenues from environmental taxes, fees, and charges in Finland in 2021, and the total sum of these.

Motor vehicles in Finland are charged with a one-time registration tax and an annual tax, both of which has been revised in the examined period. In 2018 the Finnish government implemented a temporary subsidy for the purchase of an electric car.

The Finnish government also implemented a few new support programmes to complement those already existing. In 2018, a competitive tendering on the production subsidy for renewable energy (so-called premium system) was completed and subsidies were granted for a total of 7 wind power projects. In 2020, the government launched subsidy schemes meant to improve energy efficiency and decrease the usage of oil and coal. Subsidies are granted for renovation projects designed to improve the energy efficiency of residential buildings, and to detached houses that abandon their use of oil heating. Investment support for projects to replace coal as an energy source are also given.

With the purpose to speed up the climate work of municipalities and regions, the government support regional projects and funds national projects supporting the climate work of municipalities. During 2018–2021, approximately 110 local, regional, and national climate projects were funded by grants and procurements.

As a complement to already existing forestry subsidies, a new financial support scheme for afforestation of organic soil and wetlands was prepared in 2020. The subsidy system is intended for private landowners and will remain in force until the end of 2023.

**Table 9: Revenue from environmental taxes, fees, and charges in EUR million, 2021**

| Tax, fee, or charge                               | Total, EUR million |
|---------------------------------------------------|--------------------|
| Excise duty on energy products                    | 4 272              |
| User charge on passenger vehicles                 | 1 134              |
| Excise duty on motor cars                         | 515                |
| Revenue from auction of emission allowances (ETS) | 238                |
| Registration fee of vehicles                      | 29                 |
| Hunting and fishing licenses                      | 27                 |
| Excise on certain beverage packages               | 18                 |
| Tax on waste                                      | 3                  |
| <b>Total</b>                                      | <b>6 236</b>       |

*Note: Selection on the eight highest revenue generating taxes, fees and charges. Hence, the Total revenue is larger than the sum of these.*

*Source: Statistics Finland, (2022).*

## 3.1 Energy, greenhouse gases and air pollution

### 3.1.1 Excise taxes on fossil fuels for energy purposes

Fuel taxes in Finland consist of an energy content tax, a CO<sub>2</sub> tax, and a strategic stockpile fee. The energy content tax reflects the volumetric energy content of the fuel, based on the calorific values specified in the RES Directive (2009/28/EC). These are levied on all fuels based on the same criteria (EUR/MJ) (Nordic Council of Ministers, 2019).

Finland was the first country to introduce carbon-based energy taxation in 1990, at EUR 1.19 per tonne CO<sub>2</sub>. The tax rate has increased several times since its introduction. In 2017, the tax rate was set at EUR 58 per tonne for fossil fuels used for energy purposes (Nordic Council of Ministers, 2019). The rate was increased in 2018, but in 2019 the tax rate was decreased to EUR 53 per tonne CO<sub>2</sub>. The reason for the decrease was a change in the calculation basis for light and heavy fuel oil, natural and liquid gas, and hard coal as well as taxable fuels that replace them; when calculating one of the carbon dioxide emissions, the emissions during the entire life cycle are considered more clearly than before. If life-cycle emissions are considered without changing the calculation bases, tax levels would rise. As the aim of the amendment was not to tighten the taxation of heating fuels, the value of a carbon dioxide tonne used in the calculation of the carbon dioxide tax on heating fuels was simultaneously reduced (Finlex, 2018). Table 10 presents the tax rate per tonne of CO<sub>2</sub> for fossil fuels for energy purposes.

**Table 10: CO<sub>2</sub> tax rate for fossil fuels for energy purposes, EUR per tonne CO<sub>2</sub>**

| Year                     | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------------|------|------|------|------|------|
| CO <sub>2</sub> tax rate | 58   | 62   | 53   | 53   | 53   |

*Note: The table shows the tax value per ton of carbon dioxide, which is the basis for calculating the carbon dioxide tax on light and heavy fuel oil, hard coal, and natural gas (Finlex, 2018). Source: Nordic Council of Ministers, NCM. (2019), Finlex (2018), and Finlex (2020a).*

Before 2019 the CO<sub>2</sub> tax for coal, natural gas, bio-oil, light and heavy oil used in combined heat and power (CHP), was halved. The aim was to improve the competitiveness of CHP and to avoid overlaps with the ETS and CO<sub>2</sub> taxation. As almost all taxable coal and natural gas is used in CHP, in practice the CO<sub>2</sub> tax rate for these fuels was halved (Nordic Council of Ministers, 2019). In 2019 the government changed the tax rebate as part of changes in energy taxation. The government argued that the halving of the carbon dioxide tax in the case of combined production weakened the control of emissions from fuels included in the environmentally related tax model in the case of combined electricity and heat production, especially with hard coal and natural gas. The tax subsidy for combined production, was therefore shifted from carbon dioxide tax to the energy content tax. This makes it possible to tax hard coal and increase emissions control in combined production without the total tax burden of increased production (Finlex, 2018).

As previously stated, fuel taxes in Finland consist of an energy content tax, a CO<sub>2</sub> tax, and a strategic stockpile fee. The basis for calculating carbon dioxide tax with respect to heating fuels where, just like stated above, adjusted to enable the consideration of the average greenhouse gas emissions during the fuel's entire life cycle when calculating the carbon dioxide emissions, The results of this can be seen in table 11, which presents a few examples of the taxes and fees levied on fossil fuels for energy purposes. An additional increase in the energy content tax was made in 2021.



**Table 11: Taxes and fees levied on fossil fuels for energy purposes, EUR**

| Product                    | Tax                     | 2018   | 2019   | 2020   | 2021   |
|----------------------------|-------------------------|--------|--------|--------|--------|
| Light fuel oil, cent/litre | Energy content tax      | 10.15  | 10.28  | 10.28  | 12.98  |
|                            | CO <sub>2</sub> tax     | 16.54  | 16.9   | 16.9   | 16.9   |
|                            | Strategic stockpile fee | 0.35   | 0.35   | 0.35   | 0.35   |
|                            | Total tax               | 27.04  | 27.53  | 27.53  | 30.23  |
| Heavy fuel oil, cent/kg    | Energy content tax      | 8.56   | 8.56   | 8.56   | 11.59  |
|                            | CO <sub>2</sub> tax     | 20.08  | 18.67  | 18.67  | 18.67  |
|                            | Strategic stockpile fee | 0.28   | 0.28   | 0.28   | 0.28   |
|                            | Total tax               | 28.92  | 27.51  | 27.51  | 30.54  |
| Coal, EUR/tonne            | Energy content tax      | 53.13  | 52.77  | 52.77  | 71.45  |
|                            | CO <sub>2</sub> tax     | 149.56 | 147.81 | 147.81 | 147.81 |
|                            | Strategic stockpile fee | 1.18   | 1.18   | 1.18   | 1.18   |
|                            | Total tax               | 203.87 | 201.76 | 201.76 | 220.44 |
| Natural gas, EUR/MWh       | Energy content tax      | 7.50   | 7.63   | 7.63   | 10.33  |
|                            | CO <sub>2</sub> tax     | 12.28  | 12.94  | 12.94  | 12.94  |
|                            | Strategic stockpile fee | 0.084  | 0.084  | 0.084  | 0.084  |
|                            | Total tax               | 19.864 | 20.654 | 20.654 | 23.354 |

Source: Finlex (2018), Tax Administration (2022b) and Tax Administration (2022c).

When the energy taxation was revised in 2011, an energy tax on peat also came into force. The tax on peat is not based on energy content or CO<sub>2</sub> emissions, as the tax for the other fuels. Peat is used in biomass mixtures, which has been mentioned as a reason for the lower tax rate on peat (NCM, 2019). In 2021 the tax rate was EUR 5.7 per MWh. The tax on peat comes into effect if the use of peat exceeds 10 000 MWh and must be paid on the excess portion (Tax Administration, 2021b).

Since 1998 energy-intensive companies have been able to get a refund of the excise taxes on energy (fuels, district heating, process steam and electricity), if the taxes exceed 0.5% of the value added for the given company (NCM, 2019). However, the tax refund is scheduled to be phased out in stages during the period 2021–2024, leading to the companies no longer being entitled to a refund by 2025. The reduction of the electricity tax to the EU's minimum tax level and the changes in the energy tax refunds, applies to the industry, mining, and professional greenhouse cultivation. The reduction in the electricity tax also applies to electricity that is used, among other things, in agriculture, which is currently carried out by refunding the difference between tax class I and II (Ministry of Finance, 2022).

### 3.1.2 Excise taxes on electricity consumption

The excise duty on electricity is divided into a lower (II) and a higher (I) category. The lower duty is levied on separately metered electricity used in industrial manufacturing, data centres and professional greenhouse cultivation (Tax Administration, 2021a). The categorisation was introduced to promote the competitiveness of the industrial sector (NCM, 2019). The higher category has been 2.24 EUR cent per kWh since 2015. The lower category was decreased to the minimum EU level in 2021 (Ministry of the Environment, 2021), 0.05 EUR cent per kWh. Table 12 shows the excise tax in 2010, 2014, 2018 and 2021.

**Table 12: Excise taxes on electricity consumption, EUR cent per kWh**

| Tax category | 2010 | 2014 | 2018 | 2021 |
|--------------|------|------|------|------|
| I            | 0.87 | 1.89 | 2.24 | 2.24 |
| II           | 0.25 | 0.69 | 0.69 | 0.05 |

*Source: Nordic Council of Ministers, NCM (2019) and Tax Administration (2021b).*

### 3.1.3 Excise taxes on transportation fuels

The components of the energy taxes on transportation fuels are the same as the ones for energy fuels: energy content tax, a CO<sub>2</sub> tax, and a strategic stockpile fee. Both the energy content tax and CO<sub>2</sub> tax were increased on August 1, 2020. Table 13 shows the development in taxes and fees levied on motor gasoline, diesel oil, jet fuel and aviation gasoline (Tax Administration, 2021c).

The taxation of light-fuel oil and diesel oil is differentiated based on their Sulphur content, and for biofuels fulfilling certain sustainability criteria, a lower CO<sub>2</sub> tax is levied. To lower the costs for operation of trucks, and thus the export industry, as well as bus transport, the energy content tax for diesel oil is set at a lower rate compared to what the environmental criteria of the tax would require. However, a vehicle tax component for driving power is used to adjust the total tax burden for diesel powered passenger vehicles (NCM, 2019).

**Table 13: Taxes and fees levied on fossil fuels for transport, EUR cent per litre**

| Type of fossil fuel    | Type of tax or fee      | 2014  | 2017  | 2020  | 2021  |
|------------------------|-------------------------|-------|-------|-------|-------|
| Motor gasoline         |                         |       |       |       |       |
|                        | Energy content tax      | 50.36 | 52.19 | 53.79 | 53.79 |
|                        | CO <sub>2</sub> tax     | 16.25 | 17.38 | 21.49 | 21.49 |
|                        | Strategic stockpile fee | 0.68  | 0.68  | 0.68  | 0.68  |
|                        | Total tax               | 67.29 | 70.25 | 75.96 | 75.96 |
| Diesel oil             |                         |       |       |       |       |
|                        | Energy content tax      | 30.7  | 32.77 | 34.57 | 34.57 |
|                        | CO <sub>2</sub> tax     | 18.61 | 19.9  | 24.56 | 24.56 |
|                        | Strategic stockpile fee | 0.35  | 0.35  | 0.35  | 0.35  |
|                        | Total tax               | 49.66 | 53.02 | 59.48 | 59.48 |
| Kerosene-type jet fuel |                         |       |       |       |       |
|                        | Energy content tax      | 54.76 | 56.76 | 57.49 | 57.49 |
|                        | CO <sub>2</sub> tax     | 17.99 | 19.24 | 23.33 | 23.33 |
|                        | Strategic stockpile fee | 0.35  | 0.35  | 0.35  | 0.35  |
|                        | Total tax               | 73.1  | 76.35 | 81.17 | 81.17 |
| Aviation gasoline      |                         |       |       |       |       |
|                        | Energy content tax      | 49.88 | 51.7  | 52.11 | 52.11 |

|                         |       |       |       |       |
|-------------------------|-------|-------|-------|-------|
| CO <sub>2</sub> tax     | 16.1  | 17.21 | 20.81 | 20.81 |
| Strategic stockpile fee | 0.68  | 0.68  | 0.68  | 0.68  |
| Total tax               | 66.66 | 69.59 | 73.6  | 73.6  |

*Note: Data for 2020 applies from August 1, 2020.*

*Source: Tax Administration (2021c).*

### 3.1.4 Economic instruments for renewable energy sources

In 2020 renewable energy sources represented about 40% of energy end-consumption (Official Statistics of Finland (OSF), 2020). The aim set in the National Energy and Climate Strategy to 2030 is to increase the use of renewable energy, increasing its share in energy end-consumption to more than 50% during the 2020s (Ministry of Economic Affairs and Employment, 2022a). To reach the goal, feed-in tariff system was introduced in 2011 (NCM, 2019). The system could approve power plants fuelled with wind, biogas, forest chips and wood-based fuels meeting the prescribed preconditions (Ministry of Economic Affairs and Employment, 2022b). In the feed-in tariff system, an electricity producer will receive a production subsidy (feed-in tariff) for a maximum of twelve years. The subsidy varies based on a three-month electricity market price, or the market price of emission allowances (Ministry of Economic Affairs and Employment, 2022b).

In 2018, a one-time competitive tendering on the production subsidy for renewable energy (so-called premium system) was completed. Subsidies were granted for a total of 7 wind power projects with a combined annual production of 1.36 TWh (Ministry of the Environment, 2021).

### 3.1.5 Energy and investment aid

Based on its assessment, the Ministry of Economic Affairs and Employment can grant aid for innovative energy projects. "Energy aid" is granted for investments and energy audits. Special aid for new energy technology and large-scale demonstration projects is granted for investments that are over 5 million euros and taking forward future energy technologies. Aid for investments replacing coal in the energy production is granted to projects that enable the substitution of coal with renewable alternatives in the energy production before the end of year 2025 (Ministry of Economic Affairs and Employment, 2022c). "Energy aid" can be granted to investment projects and studies that:

1. promote the production or use of renewable energy.
2. promote energy savings or increase the efficiency of energy generation or use.
3. otherwise promote the transition towards a low-carbon energy system.  
(Ministry of Economic Affairs and Employment, 2022f).

With the purpose to speed up the climate work of municipalities and regions the government expedited EUR 1 million per year from 2018 to 2021, and a supplementary appropriation of EUR 4 million for 2021. Municipalities and regions are aided in their own projects, and national projects supporting the climate work of municipalities are funded. During 2018–2021, approximately 110 local, regional, and national climate projects were funded by grants and procurements.

In March 2020 the government issued a support programme intended to promote voluntary phase-out of coal use by the end of 2025. Investment support for projects to replace coal as an energy source will be granted between 2020 and 2025. A total of EUR 90 million is allocated to the support programme in the General Government Fiscal Plan (Ministry of the Environment, 2021).

### **3.1.6 Economic instruments for energy efficiency**

Energy efficiency is promoted through actions such as cogeneration of heat and electricity, broad coverage of voluntary energy efficiency agreements and systematic energy auditing (Ministry of Economic Affairs and Employment, 2022d). In addition, the Act on Public Contracts encourages contracting authorities to take environmental considerations into account. Energy efficiency is a highly suitable procurement criterion alongside price and other grounds (Ministry of Economic Affairs and Employment, 2022e). As stated in the previous section, projects which advance energy efficiency are eligible for so called "energy-aid", which is also granted for renewable energy investments and research (Ministry of Economic Affairs and Employment, 2022f).

Since 2020 subsidies are granted for repair projects designed to improve the energy efficiency of residential buildings. The preliminary appropriation is EUR 40 million per year. In September 2020 the Finnish government launched a subsidy scheme to decrease the use of oil heating in residential buildings. More specifically the subsidy scheme applies to detached houses that discontinue their use of oil heating. A total of EUR 9.44 million was allocated in the 2021 budget and EUR 10 million in the 2021 supplementary budget. In addition, in 2020, EUR 14.9 million was allocated for a subsidy for discontinuing the use of oil heating in municipally owned buildings (Ministry of the Environment, 2021).

### **3.1.7 Emissions trading**

The European Union's Emissions Trading Scheme (EU ETS) covers about 40% of the CO<sub>2</sub> emissions in Finland (Ministry of Economic Affairs and Employment, 2022g). Auctioning has been the principal method of allocating emission allowances since 2013. By default, just over 50% of the allowances for the trading periods 2013–2020 and 2021–2030 are intended to be auctioned. However, the number of emission allowances available for auctioning will decrease due to the linear reduction factor. The Energy Authority is the auctioneer responsible for the auctioning of allowance on behalf of Finland. (Ministry of Economic Affairs and Employment, 2022h). The Finnish Energy Authority reports that the auctioned allowances were 7.8 million in 2021. This generated a revenue of EUR 409 million.

## **3.2 Water**

In Finland, municipalities have the primary responsibility for water supply and wastewater treatment. The fees or charges are set according to the full cost principle, meaning that the service should be fully financed by the user fees (NCM, 2019). The fee consists of basic rates, metered charges as well as connection fees and charges for connecting new customers. The basic rate price is determined by the services used by the property, the property type, and the floor area of the property (HSY, 2022).

## **3.3 Waste**

### **3.3.1 Municipal waste charges**

Municipal waste charges cover the cost of municipal waste management. The ministry of the Environment (2019) state that waste charges aim to reduce the amount of waste generated and the consequent risks, and to encourage waste recovery. In many municipalities, a smaller fee is charged for waste that is sorted and fit for use, as opposed to mixed municipal waste that is unfit for practical applications.

The waste charge is collected from the property holder or some other holder of the waste. Grounds for determining the waste charge can be found in the waste tariff approved by the municipality (Ministry of the Environment, 2019). A revision of the waste legislation came into force in 2021 (Ministry of the Environment, 2022a), which aims to increase separate collection and recycling (Ministry of the Environment, 2021).

### 3.3.2 Waste tax

Tax is levied on all waste deposited at landfill sites, provided that its utilisation is technically feasible and environmentally justifiable, and that by imposing the tax, waste can be made more commercially exploitable. As of the beginning of 2016, the waste tax is set at EUR 70 per tonne of waste sent to a landfill. All landfills where waste falling into a taxable waste category is deposited are subject to the waste tax. This covers both public and private landfills, as well as all waste disposal areas. Waste categories with no technical treatment or utilisation alternative to disposal at landfills, or with utilisation options that would do more harm than good is tax exempt. Such categories include, but are not limited to, mineral waste, waste from inorganic chemical processes and hazardous waste deposited at landfills (Ministry of the Environment, 2019). The total revenue from tax on waste was 3 million EUR in 2021, as seen in table 9.

### 3.3.3 Oil waste charges

The prices of lubrication oils include an oil waste charge. The oil waste charge has stayed unchanged since 2009, at EUR 0.0575 per kilo. The income from these charges is used to cover the costs of managing oil waste and cleaning up soil and groundwater contaminated with oil (Ministry of the Environment, 2019).

### 3.3.4 Beverage packaging tax

Beverage packaging taxes are currently paid on packaging for alcoholic beverages, beer, soft drinks, bottled water, and certain other drink packages. The ministry of the Environment (2019) states that this form of taxation aims to further encourage the re-use of drinks packages, to reduce the quantities of such materials ending up in landfill, and to prevent litter. The taxation level has since 2005 amounted to EUR 0.51 per litre (Ministry of the Environment, 2019).

The beverage packaging taxes does not apply to packaging covered by approved returnable deposit systems that involve the collection of packaging for refilling or material recycling. The system includes certain types of refillable glass and plastic bottles, as well as aluminium cans. In 2021, the return rates for all glass bottles, plastic bottles and aluminium cans covered by the system were 98%, 90% and 97%, respectively (PALPA, 2022a).

The deposit paid is returned when the bottle with a deposit is returned. The deposits are presented in Table 14.



**Table 14: Deposit for glass, plastic and aluminium can beverage containers in 2021**

| Type of container | EUR per unit |
|-------------------|--------------|
| Cans              | 0.15         |
| Glass             | 0.1          |
| Plastic*          | 0.1–0.4      |

*\*The deposit for plastic bottles depends on the size of the bottle.*

*Source: PALPA (2022b).*

### 3.3.5 Producer responsibility in waste management

Producer responsibility refers to companies' obligation to handle the waste management of products they have imported or manufactured when the products are discarded. It pertains to companies that import or manufacture the following products:

1. Batteries and accumulators (incl. inside vehicles and electrical equipment)
2. Vehicles
3. Packaging
4. Paper and paper products
5. Tyres
6. Electrical and electronic equipment (Ministry of the Environment, 2022b).

## 3.4 Transport

Motor vehicles in Finland are charged both a one-time registration tax and an annual tax. Both has been revised since 2018. From 2018 a temporary subsidy for the purchase of electric cars has been introduced, which has been prolonged for 2022 and 2023. The overall aim is to increase the sales of electric vehicles from its current level of 20% to 100% by 2030.

### 3.4.1 Registration tax

The registration tax, or car tax, is a one-time tax levied when vehicles, such as passenger cars, delivery vans and motorcycles, are registered in Finland for the first time. This tax was introduced in the 1950s to raise state revenue (NCM, 2019).

The tax is based on the retail value of the vehicle, but the rate is differentiated based on the CO<sub>2</sub> emissions declared by the car manufacturer according to the EU standard driving cycle WLTP. The tax is independent from the driving force of the vehicle, and solely based on emissions, meaning that a fully electric car has been

taxed according to CO<sub>2</sub> emissions of 0 g/km.

Where emissions data are not available, the tax rate is based on the weight and the driving force used by the vehicle. The aim of the tax, and the reduction, is to guide consumers towards choosing more energy-efficient car models while speeding up the renewal of the vehicle stock to introduce cars with better fuel efficiency and lower emissions. While the maximum tax rate has been unchanged, the minimum has been reduced from 5% in 2015 to 2.7% in 2019, which has remained on that level (Finlex, 2022).

### **3.4.2 Annual car taxes**

Besides the registration tax, motor vehicles in Finland are also subject to an annual tax (the motor vehicle tax). The tax may consist of a basic tax, a driving power tax, or a combination of these. Petrol passenger cars are only subject to the basic tax, while diesel, electric, hybrid and methane passenger cars are subject to both the basic tax and the driving power tax. Diesel lorries are only subject to the driving power tax. The driving power tax is described later in this section (TRAFl, 2022).

The basic tax is based on the CO<sub>2</sub> emissions declared by the car manufacturer. Until 2019 the emissions declared by the NED test cycle was used, while the 2020 tax also was based on the new WLTP test cycle. If emissions data are not available, or for passenger cars registered before 2001 (or 2002 if the weight of the cars is over 2 500 kg) and vans registered before 2008, the tax rate is based on the weight of the vehicle.

The basic tax was raised significantly between 2013 and 2017. Since then, the tax has remained pretty much the same. However, for vehicles with CO<sub>2</sub> emissions in the lower range, the tax was reduced in 2020. For examples, see Table 15. For cars powered by electricity or hydrogen the basic tax is the minimum amount of tax according to the tax table applied to the car. However, if such a car was put into use for the first time on the day of or after October 1, 2021, the amount of basic tax per day is the minimum tax amount of the tax table increased by 17.80 eurocents (Finlex, 2022).

**Table 15: Examples of the basic tax for passenger cars**

| CO <sub>2</sub> emissions<br>(g/km) | Tax rate (EUR/365 Days) |            |             |
|-------------------------------------|-------------------------|------------|-------------|
|                                     | 2019 (NED)              | 2020 (NED) | 2020 (WLTP) |
| 0                                   | 106.11                  | 53.29      | 53.29       |
| 90                                  | 153.66                  | 113.88     | 96.36       |
| 120                                 | 184.32                  | 151.84     | 120.81      |
| 140                                 | 210.24                  | 183.96     | 142.71      |
| 150                                 | 225.20                  | 202.21     | 160.96      |
| 170                                 | 258.05                  | 243.75     | 203.67      |
| 200                                 | 316.09                  | 316.09     | 283.43      |
| 230                                 | 380.69                  | 380.69     | 369.75      |
| Over 400                            | 654.44                  | 654.44     | 654.44      |

Source: TRAFICOM (2022).

For vehicles taxed based on weight, the rates have remained unchanged from 2017 to 2022 and ranges from EUR 222.65–632.18 per year for vehicle with a mass of less than 1 300 kg to a mass of 3 401 kg or more.

The driving power tax is levied on vehicles that are powered by some force or fuel other than petrol. The tax rate has since 2013 been 5.5 eurocents per day for every 100 kilograms of weight for passenger cars power by diesel, and 0.5 eurocents per day for electric and petrol hybrids. This tax for electric vehicles has been reduced from 4.9 eurocents per day 2017 to 1.5 eurocents 2020. For cars driven on combination of electric and diesel the tax is 4,9 eurocent and for methane driven cars 3.1. For lorries, the driving power tax is based on the weight, number of axles, and whether it is used for towing a trailer. The tax varies between 0.6–2.2 eurocents per day for every 100 kilograms of weight, which has been the same since 2017 (TRAFICOM, 2022).

### 3.4.3 Aviation noise charge

A noise charge is collected from jet aircraft which depart and land at Helsinki Airport between 23.00–06.00 LMT. The charge has remained unchanged since 2017. The charge is calculated from noise levels indicated in the aircraft noise certificate, based on take-off noise measurements in accordance with the International Civil Aviation Organization (ICAO). Aircrafts which are unable to show certificated noise levels will be charged at the highest noise rate for the same aircraft type. Charges of less than EUR 10 will not be collected. The maximum noise charge is limited to EUR 3 000 (FINAVIA, 2022).

## 3.5 Agriculture and natural resources

### 3.5.1 Agricultural support system

The Finnish agricultural support system is based on the support schemes of the European Union's Common Agricultural Policy (CAP), which include the EU's direct payments and the partially EU-funded natural constraint payments and environment payments. The support package is complemented with the Finnish national aid system to account for the special circumstances in Finland (Ministry of Agriculture and Forestry, 2022a). In 2021 a total of EUR 332 million of the state budget funds were allocated to be used for the national aid for agriculture and horticulture. The most significant type of national aid is the so-called Nordic aid, which is aid directed towards the northern regions of Finland. According to the Ministry of Agriculture and Forestry (2022b) the key objective of the Nordic aid is to maintain production in the northern region, to develop the production structures, ensure products' access to markets and to support environmental protection and the preservation of the rural areas.

The Rural Development Programme for Mainland Finland include, e.g., investment support that aims to help raise the groundwater level with controlled subsurface drainage. Financial aid can be granted for setting up controlled subsurface drainage for 40% of the eligible costs. Additionally, grants can be given for controlled irrigation, and recycling of runoff water. As part of the programme, a five-year commitment for perennial cultivation of organic soil without soil preparation was made in 2014. The amount of aid is EUR 50 per ha per year. To promote biogas production, a national biogas programme was prepared. This includes a nutrient recycling pilot programme 2020–2022 and an investment subsidy for biogas and advanced manure processing methods. The preparation of a subsidy for the production of biogas based on nutrient cycles is still in progress. Investment subsidy for renewable energy investments can be granted, e.g., for the purchase of gas components for tractors. In addition to subsidies, state guarantees can be granted for funding investments in energy production that utilises renewable energy sources. (Ministry of the Environment, 2021).

### 3.5.2 National Forest Strategy

Finland's National Forest Strategy, adopted in February 2015, specifies the main objectives for forest-based business and activities. The strategy was updated in 2019. The vision is "Sustainable forest management is a source of growing welfare", and the three strategic objectives to make the vision come true are:

1. Finland is a competitive operating environment for forest-based business.
2. Forest-based business and activities and their structures are renewed and diversified.
3. Forests are in active, economically, ecologically, socially, and culturally sustainable, and diverse use. (Ministry of Agriculture and Forestry, 2022c)

A process is under way to prepare a national forest programme extending to 2035. The need to reform the National Forest strategy arose from the rapidly changing environment where the forest sector operates. The aim of the new strategy is to consider a more comprehensive approach to sustainable development and the role of forests in climate change mitigation and adaptation (Ministry of Agriculture and Forestry, 2022d).

### 3.5.3 Forestry subsidies

In Finland, forestry subsidies are intended to support the forest management of private landowners. A limited amount of funds is used annually in the state budget. The following types of work can be financially supported: the early tending of seedling stands, young stand improvement and small tree harvesting related to it, the management of swamp forests, forest vitality fertilization, forest research, environmental support, forest nature management projects and afforestation of wastelands. The amount of support varies between different types of work (Finnish Forest Centre, 2022a).

Afforestation support can be granted to finance the afforestation of treeless unproductive lands suitable for silviculture, such as former peat production areas. The amount of aid per hectare varies according to the type of land in the area, the way the forest is regenerated and the tree species to be grown (Finnish Forest Centre, 2022b).

A new financial support scheme for afforestation of organic soil and wetlands was prepared in 2020. The fixed-term Act governing the support scheme came into effect at the beginning of 2021. (Ministry of the Environment, 2021). The subsidy system is intended for private landowners and will remain in force until the end of 2023 (Ministry of the Environment, 2022d).

### 3.5.4 Forest Biodiversity Programme

The METSO Programme 2008–2025 aims to halt the ongoing decline in the biodiversity of forest habitats and species, and to establish at least stable, or preferably favourable trends in Southern Finland's forest ecosystems (Ministry of the Environment, 2022c). Forest owners have ended up protecting their forests as permanent conservation areas under the Nature Conservation Act or sold their forests to the State as nature conservation areas. In 2021, the average compensation for permanent protection was just under EUR 6 800 per hectare. The total compensations paid to landowners for measures to protect biodiversity totalled about EUR 43 million in 2021, of which about EUR 33 million concerned permanent protection and EUR 10 million were used for fixed-term environmental subsidy agreements and nature management projects. By the end of 2021, 88% of the target of 96,000 hectares had been reached as the protected area totalled 84,000 hectares. The result for environmental forestry subsidy agreements and nature management projects was 4,500 hectares, which means that 68% of the target of 82,000 hectares are now covered by these. (METSO, 2022).

## 4. Iceland

The use of economic instruments in Icelandic environmental and climate policy has steadily increased in the last decade. Most economic instruments introduced in the last decade have been aimed at reducing greenhouse gas emissions in line with the government's climate policy. Over 90% of CO<sub>2</sub> emissions in Iceland (excluding land use, land-use change and forestry (LULUCF)) are currently covered by economic instruments (Ministry for the Environment and Natural Resources, 2020a).

In 2017, the Icelandic government announced its goal of achieving carbon neutrality by 2040 (Government Offices of Iceland, 2017). In 2021, that objective was enshrined in law with amendments to the Climate Act No 70/2012. In that same year, the government announced its intention to complete the clean energy transition in Iceland no later than 2040, thus making Iceland the first country to become fossil-fuel independent (Government Offices of Iceland, 2021). In its most recent Nationally Determined Contribution (NDC) under the Paris Agreement, Iceland pledged to reduce emissions by at least 55% by 2030 compared to 1990, acting jointly with the EU and its Member States and Norway (Ministry for the Environment and Natural Resources, 2021a). As a part of this cooperation, Iceland participates in the EU Emissions Trading System (EU ETS) and the collective delivery of targets according to the rules laid down in the Effort Sharing and LULUCF legislative frameworks.

Various new economic incentives were introduced in the period 2018 to 2021, to encourage climate-friendly behaviour and investments and to accelerate the clean energy transition, including new tax subsidies for purchases of low and zero emission vehicles. In addition, the carbon tax on fuels was substantially increased and was on average approximately 80% higher in this period than in 2014–2017. A new tax on fluorinated greenhouse gases was introduced in 2020. On the other hand, a landfill tax, which had been planned for several years, was postponed.

Table 16 illustrates state revenue generated by the highest revenue generating environmental taxes and fees in 2021. In addition to this, Iceland received revenues from auctioning of allowances in the EU ETS, which are not included in table 16. While Iceland has, under the EEA Agreement, been entitled to a share in EU ETS auction allowances since 2013, the auctioning of the Icelandic share was delayed until 2019 (Icelandic Climate Council, 2022). In the period 2019–2021, Iceland received 70.6 million euros in cumulated auction revenues (European Commission, 2021).

**Table 16: Revenue from environmental taxes, fees and charges, 2021, ISK (EUR)**

| <b>Tax, fee or charge</b>                                                             | <b>Million ISK (EUR)</b> |
|---------------------------------------------------------------------------------------|--------------------------|
| Carbon tax                                                                            | 5,815 (39)               |
| General excise on petrol and oil products                                             | 3,067 (21)               |
| Special excise on petrol (petrol charges)                                             | 5,262 (36)               |
| Excise on gas oil, diesel oil and kerosene                                            | 11,206 (76)              |
| Excise on motor vehicles                                                              | 4,761 (32)               |
| Vehicle tax based on CO <sub>2</sub> emissions                                        | 7,299 (49)               |
| Kilometre fee                                                                         | 1,398 (9)                |
| Excise, environmental duties (tax on fluorinated greenhouse gases and recycling fees) | 6,299 (43)               |
| Fishing fees                                                                          | 7,699 (54)               |
| Total                                                                                 | 52,806 (357)             |

*Source: The Financial Management Authority (2022).*

Unless otherwise stated, the information provided in this chapter is based on acts and legislative proposals from Althingi (The Icelandic Parliament) and regulations adopted in accordance with Icelandic law. A list of relevant acts is provided in References.

## 4.1 Energy, greenhouse gases and air pollution

Nearly all electricity production in Iceland is based on renewable sources, with around 70% deriving from hydropower and 30% from geothermal power operations. In addition, geothermal energy provides heating for over 90% of Icelandic households (Environment Agency of Iceland, 2022). Government efforts to reduce energy-related greenhouse gas emissions thus principally address sources such as the transport and fisheries sectors and are less focused on stationary energy production and industrial installations (Ministry for the Environment and Natural Resources, 2020b). It should be noted that while energy intensive industries account for 40% of Iceland's total greenhouse gas emissions (excluding LULUCF), their emission results from production processes and not energy use (Environment Agency of Iceland, 2022). These industries, which include aluminium and non-ferrous metals production, are covered by the European Union Emissions Trading System (EU ETS).



As described in this report, several taxes and subsidies are in place to accelerate the shift to clean energy in road transport, fisheries, and other relevant sectors in Iceland. Additionally, public grants are available to infrastructure development and various energy transition and clean innovation projects, including grants allocated annually from the Energy Fund (Orkusjóður) and the Climate Fund (Loftslagssjóður).

#### 4.1.1 Carbon Tax

A general tax on carbon has been in place in Iceland since 2010 and is one of the government's key measures to reduce greenhouse gas emissions, especially in the road transport and fisheries sectors (Ministry for the Environment and Natural Resources, 2020b). It is levied on imports and sales of gas, diesel, petrol, fuel oil, petroleum gas and other gaseous hydrocarbons. The tax does not cover aviation and jet fuel.

The average rates for all fuel types have increased by approximately 80% in the period 2018–2021 compared to the period 2014–2017. The rate of the carbon tax was increased by 50% in 2018, and again by 10% in both 2019 and 2020. See table 17.

**Table 17: Carbon tax on fuel, 2018–2021, ISK (eurocents)**

|                                                                  | 2018      | 2019      | 2020      | 2021       |
|------------------------------------------------------------------|-----------|-----------|-----------|------------|
| Gas and diesel ISK (eurocents) per litre                         | 9.45 (7)  | 10.40 (8) | 11.45 (7) | 11.75 (8)  |
| Petrol ISK (eurocents) per litre                                 | 8.25 (6)  | 9.10 (7)  | 10.00 (6) | 10.25 (7)  |
| Fuel oil ISK (eurocents) per kg                                  | 11.65 (9) | 12.80 (9) | 14.10 (9) | 14.45 (10) |
| Petrol gas and other gaseous hydrocarbons ISK (eurocents) per kg | 10.35 (8) | 11.40 (8) | 12.55 (8) | 12.85 (9)  |

*Source: Althingi, Act No 129/2009 on Environmental and Resource Taxes (and later amendments).*

### 4.1.2 Excise duty on fuels for transport purposes

Two types of excise duty are imposed on petrol: a general excise duty and a special excise duty (also called petrol charge). Excise duty is also levied on gas oil, diesel oil and kerosene. The rates of the excise duty on petrol and oils increased slightly in the period 2018–2021. See table 18. Since 2011, fuels of non-fossil origin have been exempted from the excise duty, including non-fossil additives that have been blended with petrol and oil.

**Table 18: Excise duty on petrol, 2018–2021, ISK (eurocents)**

|                                                               | 2018       | 2019       | 2020       | 2021       |
|---------------------------------------------------------------|------------|------------|------------|------------|
| General excise duty ISK (eurocents) per litre                 | 27.35 (21) | 28.05 (21) | 28.75 (18) | 29.45 (20) |
| Special excise duty / petrol charge ISK (eurocents) per litre | 44.10 (33) | 45.20 (33) | 46.35 (30) | 47.50 (32) |

*Source: Althingi, Act No 29/1993 on Excise Duty on Vehicles, Fuels, etc. (and later amendments).*

**Table 19: Excise duty on gas oil, diesel oil and kerosene, 2018–2021, ISK (eurocents)**

|                                       | 2018       | 2019       | 2020       | 2021       |
|---------------------------------------|------------|------------|------------|------------|
| Excise duty ISK (eurocents) per liter | 61.30 (46) | 62.85 (46) | 64.40 (41) | 66.00 (45) |

*Source: Althingi, Act No 87/2004 on Oil and Kilometres Charge (and later amendments).*

### 4.1.3 Tax on sale of hot water

A special tax is imposed on the sale of hot water to end users, amounting to 2% of the retail price. No tax is however imposed on sales to up to ISK 2,000,000 (EUR 13, 550) per year. Hot water is also subject to VAT but is charged a reduced rate of 11% (the general VAT rate is 24%).

#### **4.1.4 Subsidies to install heat pumps**

A system of subsidies is in place to lower heating costs of inhabitants in so-called cold spots in Iceland, i.e. areas where geothermal district heating is unavailable. The system includes grants to purchase environmentally friendly energy and to take measures that improve energy efficiency of space heating. Inhabitants in cold spots are also entitled to a refund of VAT when switching from fossil-fuel or electric heating to heat pumps.

#### **4.1.5 Taxes on fluorinated greenhouse gases**

To accelerate a shift to climate-friendly cooling agents, a new tax was introduced in 2020 on fluorinated greenhouse gases, i.e. hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>), and other greenhouse gases containing fluor or blends obtaining any of these substances. The tax is imposed on importers of fluorinated greenhouse gases. The rates are different for each type of these gases (over 50 types are listed), based on their different global warming potential. The maximum amount per kilogram is ISK 10,000 (EUR 67.75). To allow companies to adapt to the new tax, only 50% was collected in the first year, 2020.

#### **4.1.6 Green tax incentives for businesses**

To encourage climate-friendly investments, new tax incentives were introduced in 2021, allowing for increased and faster depreciation for new investments that fulfil certain environment and climate related requirements. The incentives are in place for the period 2021 to 2025. Also, since 2021, companies have been eligible for tax deductions for financing certain environmentally and climate-friendly activities, such as carbon offsetting projects.

### **4.2 Water**

No environmental charges are collected for cold water in Iceland. However, municipalities charge fees from end-users for services related to water and wastewater. The fee is intended to fund the relevant services and the price is therefore not allowed to exceed the actual cost incurred by the municipalities, although the usage by each household or company can to some extent be estimated based on property size and other factors.

## 4.3 Waste

Economic instruments have been employed for over three decades to incentivise proper waste management in Iceland. A deposit-refund system for containers has been in place since 1989 and was among the first such systems in the world. A fee system was introduced for hazardous waste in 1996 and was extended to various products a few years later. In recent years, the government's waste management policy has emphasised measures to reduce waste generation and to reduce greenhouse gas emissions, in line with climate and circular economy objectives (Ministry for the Environment and Natural Resources, 2021b). Around 5% of Iceland's total GHG emissions (excluding LULUCF) is currently attributed to the waste sector, mainly methane emission from landfills (Environment Agency of Iceland, 2022).

### 4.3.1 Treatment of municipal waste

To cover the cost of disposal, including the building and operation of treatment facilities, municipalities and operators of disposal sites collect fees from users. The fee is service-based and cannot exceed the actual cost incurred by the municipality related to waste treatment. To decrease the landfilling of organic waste and to reduce waste-related greenhouse gas emissions, the government has for the last few years been preparing to implement a tax on landfills. The most recent climate action plan since 2020 outlined this plan further, revealing the government's intention to impose a tax of ISK 15 (10 eurocents) on each kg of general waste and ISK 0.5 (0.3 eurocents) on each kg of inert waste, such as mineral, cement, tiles, ceramic and glass (Ministry for the Environment and Natural Resources, 2020b). The government abandoned this plan in 2020, but in a new comprehensive waste management policy published in 2021, the government re-introduced a plan to tax landfilling of waste from 2023 (Ministry for the Environment and Natural Resources, 2021b).

### 4.3.2 Recycling fees

Importers and producers of certain types of products are charged a recycling fee which is intended to cover the cost of waste treatment in relation to these products, including their collection, transportation, recycling, recovery and disposal. Examples of products that are subject to the fee include cars, single-use beverage packages, oil products, organic solvents, batteries, paint, car tires and electrical and electronic equipment. As a general rule, the fee is levied on each kilogram and is intended to reflect the actual cost of waste treatment related to the product. The fees for several of the covered products were increased in the period 2018–2021.

### 4.3.3 Refund systems

The refund price for bottles and cans was ISK 18 (12 eurocent) in 2021 and had been increased by ISK 2 (1.4 eurocents) since the publication of the last report in 2019 (Endurvinnslan, 2022). The recycling rate for drink containers in Iceland has historically been approximately 85%. In 2021, the recycling rate per product was around 91% for aluminium containers, 90% for plastic containers and 82% for glass containers (Endurvinnslan, 2022). Car owners are eligible for a payment of ISK 20,000 (EUR 136) for returning a vehicle for recycling or disposal.

## 4.4 Transport

Accelerating the clean energy transition in road transport is one of the key climate objectives of the Icelandic government (Ministry for the Environment and Natural Resources, 2020b). Emissions from road transport account for around one third of non-ETS emissions (excluding LULUCF) in Iceland (Environment Agency of Iceland, 2022). This emission increased by 24% between 2005 and 2019, but decreased by 13% between 2019 and 2020, mainly due to drop in tourism related to COVID-19 (Ministry of the Environment, Energy and Climate, 2021a). However, registrations of low and zero emission vehicles have grown substantially in recent years. For example, the number of registered private electric vehicles (EVs) in Iceland grew by 443% between 2018 and 2021 (from 784 to 4,261 vehicles). During the same period, new registrations of private plug-in hybrid vehicles (PHEVs) grew by 71% (from 2,868 to 4,897 vehicles) (Icelandic Transport Authority, 2022). In 2021, the market share of EVs and PHEVs was 27% and 31%, respectively (Icelandic Transport Authority, 2022). Overall, the share of renewable energy in the transport sector was over 10% in 2021 (Ministry of the Environment, Energy and Climate, 2021a). The government has announced its intention to ban registrations of private fossil fuel cars after 2030 (Ministry for the Environment and Natural Resources, 2020b).

### 4.4.1 Excise duty on vehicles

Imported vehicles are subject to excise duty which is based on registered CO<sub>2</sub> emission of each vehicle, calculated as grams per driven kilometre. Until the end of 2018, the rate for private cars ranged from 0 to 65% of the vehicle's customs value; from 0% for vehicles emitting less than 80 grams CO<sub>2</sub>/km up to 65% for vehicles emitting 250 grams CO<sub>2</sub>/km or more. In 2018, the formula for calculating the excise duty was amended with the introduction of new standards to calculate the CO<sub>2</sub> emissions, the New European Driving Cycle (NEDC) and the Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Between 2019 and 2021, the excise duty was 0.37% of the vehicle's customs value on each g/km of registered emissions exceeding 74 g/km if only using the NEDC standard. The values differed depending on which standard was used to calculate the emissions. The duty was

thus 0.34% on each g/km of registered emissions exceeding 81 g/km if using the NEDC and WLTP standards combined, and 0.31% on each g/km of registered emissions exceeding 90 g/km if using only the WLTP standard. Irrespective of standard used, the excise duty could not exceed 65% of the vehicle's customs value.

Vehicles that use methane or methanol as a primary energy source have since 2010 and 2018, respectively, been eligible for a discount from the excise duty up to the amount of ISK 1,250,000 (EUR 8,469). In addition, the excise duty can be partly refunded for up to 1,000 vehicles that have been modified to use methane instead of petrol or diesel.

Certain types of vehicles fall under a special exemption category and are excepted from the excise duty, or subject to reduced rates. Examples of these vehicles are electric motorcycles, as well as vans and other road vehicles used for the transport of goods, which only use methane, methanol, electricity, or hydrogen as energy source.

Taxis and specially equipped vehicles used in the tourism industry were subject to reduced rates until 2018. Since 2019, the calculation of excise duty for these vehicles has been based on a similar formula as the general excise duty, except with less strict values and it cannot exceed a limit of 30% of the vehicle's customs value. The difference between the general excise duty and the special excise duty for these types of vehicles can however never be greater than ISK 1,250,000 (EUR 8,469).

Rental cars were also subject to reduced rates in the period 2016–2018. In the period 2021 to 2022, special temporary subsidies were offered to car rentals in response to difficulties due to the COVID-19 pandemic. In this period, each purchased vehicle was eligible for a discount up to a maximum of ISK 400,000 (EUR 2,710) under certain conditions. One of the conditions consisted of a guarantee from the rental company of a certain share of low or zero emission vehicles of its total annual vehicle purchases. The minimum share is 15% for the year 2021 and 25% for the year 2022.

#### **4.4.2 Vehicle fee and kilometre fee**

A semi-annual vehicle tax, called vehicle fee, is levied on owners of motor vehicles. As a general rule, the fee is based on the vehicle's CO<sub>2</sub> emissions, thus resulting in lower amounts charged for clean energy vehicles. The calculation of CO<sub>2</sub> emissions has since 2019 been based on the NEDC and WLTP standards, mentioned above. In 2021, the base rate for each six-month period for vehicles weighing 3,500 kg or less was ISK 6,380 (EUR 43) for cars emitting up to 133 g of registered CO<sub>2</sub> emission (using both NEDC and WLTP), and ISK 139 (94 eurocents) for each additional g of registered CO<sub>2</sub> emission. As the fee is collected twice per year, the annual cost is twice this amount. The formula to calculate the rate for additional g of CO<sub>2</sub> varies depending on the standard used to calculate the CO<sub>2</sub> emissions. Overall, the vehicle

fee increased slightly during the period 2018 to 2021.

For vehicles weighing more than 3,500 kg, the fee is still based on the vehicle's weight. The base rate in 2021 was ISK 59,785 (EUR 405), plus ISK 2.55 (2 eurocent) for each additional kg of registered weight of the vehicle, up to a limit of ISK 94,095 (EUR 638) in each period. However, vehicles that use methane or methanol as a primary fuel instead of petrol or diesel are only subject to the base rate (no charge for additional kg). Since 2020, this also applies to electric vehicles (EVs) and hydrogen vehicles (HVs).

Private vehicles and camping trailers weighing 10,000 kg or more, and vehicles and camping trailers for special use weighing 5,000 kg or more are subject to a vehicle tax based on distance, called kilometer fee. The rate is based on the weight of the vehicle, or the camping trailer and the number of kilometers driven, measured with equipment which is installed in the vehicle or the camping trailer. The prices of the kilometer fee only changed slightly in the period 2018–2021.

#### **4.4.3 Reduced VAT for low and zero emission vehicles**

To support the clean energy transition, VAT discounts have been offered for purchases of electric vehicles (EVs), hydrogen vehicles (HVs) and plug-in hybrid vehicles (PHEVs) since the year 2013. In addition, sellers of these vehicle types can deduct a certain amount from their taxable turnover. The discounts were renewed on a yearly basis until 2017, when they were extended until the end of 2020. In 2019, the discounts for EVs and HVs were extended until the end of 2023 and the discount for PHEVs was extended until the end of 2022.

The amount of the discount differs between categories and has varied between years. In 2017 the discount was ISK 1,440,000 (EUR 10,808) for EVs and HVs and ISK 960,000 (EUR 7,206) for PHEVs and had then remained unchanged since 2013. The discounts for EVs and HVs were raised to ISK 1,560,000 (EUR 10,569) starting from July 2020 and spanning to the end of 2023. The discount for PHEVs remained ISK 960,000 for 2020–2021 and was reduced to ISK 480,000 for 2022. In 2017, a limit was set to the total number of EVs, HVs and PHEVs that were eligible for the VAT discount. In 2018 and 2019, the discount was limited to 10,000 vehicles in each category. In 2020 and 2021, the limit was 15,000 vehicles in each category.

In 2019, VAT discounts were introduced for purchases of electric and hydrogen motorcycles, mopeds, electric bicycles, electric scooters, and regular bicycles for the period 2020 to 2023. Discounts are also offered for rentals of low and zero emission vehicles, and purchases of up to 120 low and zero emission buses for public transportation, during the same period.

#### **4.4.4 VAT refund and grants for charging stations**

To accelerate the clean energy transition in road transport, owners and builders of residential buildings have since 2020 been eligible for a 100% refund of VAT on labour related to the installation of electric vehicle charging stations. Since 2020, 100% of the VAT related to the purchase of charging stations for use on residential property, has also been refunded. The current refund scheme applies until the end of 2023.

Since 2016, grants have been offered from a public fund, the Energy Fund, for a part of the installation cost of fast charging stations along roads and by tourist lodgings, recreational areas, and similar areas. In recent years, some municipalities, including the municipality of Reykjavík, have offered grants for the installation of charging stations for multi-occupied buildings.

#### **4.4.5 Accelerated year depreciation for low and zero emission business vehicles**

In the period 2020–2023, businesses can depreciate vehicles used in their operation to the minimum value in the year of purchase if the vehicle uses methane, methanol, electricity or hydrogen as its only energy source.

### **4.5 Agriculture and natural resources**

#### **4.5.1 Tradable fishing quotas and fishing fees**

Since the early 1990s, fisheries in Iceland have been subject to a property rights system which creates incentives for fishers to harvest fish stocks in a sustainable manner (OECD, 2017a). The system is based on the allocation of transferable quotas to individual fishers and fishing companies. The quotas represent a given portion of the total allowable catch (TAC) for each fish stock over one year, which is decided on basis of the advice of the Marine and Freshwater Research Institute (Ministry of Food, Agriculture and Fisheries, 2022).

Since 2002, fishing companies have been subject to a fishing fee. The amount of the fee differs between species and is determined for each year based on a formula which takes into account the annual value of the catch value. The fishing fee is intended to finance public research, control, surveillance and supervision of fisheries and seafood product processing and to ensure that the general public receives a share of the profit created by the exploitation of marine resources.



#### **4.5.2 Public support to agriculture, land use and forestry activities**

The level of public support to agriculture in Iceland is among the highest in the OECD, at 57% of gross farm receipts. The support is mostly in the form of market price measures, principally tariffs that maintain high domestic prices, complemented by direct and indirect payments to farmers (OECD, 2021).

To support the government's climate strategy, public funding for reforestation, revegetation, afforestation and wetland reclamation has increased in recent years, after having been reduced considerably following the financial crisis in 2008. This financial support takes various forms, such as grant schemes, collaborative projects, and direct financial assistance (Ministry for the Environment and Natural Resources, 2019).

## 5. Norway

Norway has a longstanding tradition of utilising green taxes as an economic instrument. Environmental taxes have been introduced to provide incentives to modify the behaviour of consumers and producers. Energy taxes, e.g. for fuels and motor vehicles, account for the largest share of all revenues related to environmentally related taxes, where they accounted for 70% in 2021.

In 2021, the Norwegian government launched a new climate strategy plan for the period 2021–2030. The objective of this strategy is a policy to reduce non-quota emissions with 45% before 2030 in the transport and agriculture sector.

For the period 2018–2021 there have been several changes related to vehicle registration and road use tax and carbon capture storage initiatives.

A noteworthy change during December 2020 is the Norwegian governments approve to subsidise a Carbon Capture Storage project named Northern Lights, with the purpose of finding suitable places in the North Sea to store carbon dioxide.

Electrical cars have throughout the years been exempt from the motor vehicle tax, but from 2021 they are obliged to pay a traffic insurance tax of NOK 5.85 (Eurocent 0.57) per day, as the annual excise tax on motor vehicles are replaced by this new traffic insurance tax. Substantial tax incentives to boost electric car sales have contributed to more than half of all new cars sold in Norway are electric.

The road use tax was extended in 2020 to further to include natural gas. Hydrogen used for transportation purposes is still fully exempt from the subjected tax. The NO<sub>x</sub> component of the registration tax has increased from NOK 72.06 (7.05 Euro) in 2018 to NOK 77.14 (7.55 Euro) in 2021. There has also been increases in the CO<sub>2</sub> component within the taxation of motor vehicles, thus it is based on new European WLTP standards since 2020.

In 2019, the air passenger tax was temporary abolished, however it was introduced again during 2022.

Water use or water pollution is not taxed in Norway. Instead, consumers pay fees to the municipalities which covers the costs for water and sewage treatment. In 2021, the Norwegian government decided to introduce a tax on controlling fishing fleets with the purpose of adding finance towards controlling and supervising the fishery industry.

Taxes on electricity and transport consumption generates the largest amount of revenue for the Norwegian government. The total amount of green taxes accounted for 74.7 million NOK (7.3 million Euro) in 2021. The electricity consumption tax generated the highest single revenue with 11.3 million NOK (11.0

million Euro), followed by the diesel tax with 10.3 million NOK (10.0 million euro). See table 20 below for an overview of the ten highest revenue-generating taxes, fees, and charges.

**Table 20: Revenue from the ten highest revenue generating environmental taxes and fees in 2021, NOK (Euro)**

| Tax, fee or charge                                           | NOK million          |
|--------------------------------------------------------------|----------------------|
| Electricity consumption tax                                  | 11 299 (1106)        |
| Diesel tax                                                   | 10 288 (1007)        |
| Motor vehicle registration tax                               | 7 984 (782)          |
| Tax on CO <sub>2</sub> emissions                             | 9 479 (928)          |
| Annual tax on motor vehicles paid by households              | 7 994 (783)          |
| Tax on CO <sub>2</sub> emissions in the petroleum sector     | 5 301 (519)          |
| Imputed tax on emission permits                              | 6 305 (617)          |
| Environmental tax on disposable beverage packaging - plastic | 2 655 (260)          |
| Annual motor vehicle tax paid by enterprises                 | 1 686 (165)          |
| Petrol tax                                                   | 4 498 (440)          |
| <b>Total</b>                                                 | <b>67 489 (6607)</b> |

*Note: Selection based on the ten highest revenue-generating taxes, fees and charges. The total revenue is larger than the sum of these.*

*Source: Statistics Norway, 2022a*

## 5.1 Energy, greenhouse gases and air pollution

The Norwegian government has been committed to the Paris Agreement since it was launched. The government has set a goal to reach a 55% reduction of greenhouse gas emissions before 2030 compared with the levels in 1990. Utilising economic instruments are of great importance to reach these targets. During 2021 a new climate strategy plan was launched for the period 2021–2030. A central element of this strategy is a policy to reduce non-quota emissions with 45% before 2030 in the transport and agriculture sector (Regjeringen, 2021a).

### 5.1.1 Electricity tax

An excise tax on electricity was introduced in 1951 with the aim to finance grid investments, hence it was earmarked until 1971 to support development of the country's electrical supply (NCM, 2019). Since 2004, the fee structure has remained the same and the tax is mainly fiscally justified today, as well as contributing to limit energy consumption. The general rate applies to households, the service industry, public sector, and administration buildings in manufacturing. In 2018, the rate was 16.58 NOK öre (Eurocents 1.70) per kWh, increasing to 16.69 NOK öre (Eurocents 1.63) per kWh in 2021.

In 2019, the Norwegian government decided that electric power supplied for datacentres who hosts cryptocurrency operations should not be covered by the reduced tax rate, as well as data centres who consume more than 0,5 MW (Government tax proposal, 2019). Between 2019 and 2018 the general rate was reduced with 4.5%. Due to the fact that the exchange rate of the Norwegian krona became weaker during 2020, it was decided to increase the reduced rate in 2021. See table 21 for an overview.

**Table 21: Electricity tax, 2018–2021, NOK öre (eurocent) per KWh**

|              | 2018         | 2019         | 2020         | 2021         |
|--------------|--------------|--------------|--------------|--------------|
| General rate | 16.58 (1.70) | 15.83 (1.57) | 16.13 (1.53) | 16.69 (1.63) |
| Reduced rate | 0.48 (0.05)  | 0.50 (0.05)  | 0.505 (0.05) | 0.532 (0.05) |

*Source: Norwegian government tax proposals 2018–2021 (St prp. Nr1 skatte-avgifts- og tollvedtak 2018–2021).*

Electricity used for the purpose of chemical reduction, electricity used in electrolytic, metallurgical and mineralogical processes, in greenhouses, rail transports and households in Finnmark County and seven municipalities in northern Troms are completely exempted from the electricity tax. Additionally, the supply of electricity for household purposes is exempted from the value added in Northern Norway (Finnmark, Troms and Nordland counties) (NCM, 2019).

### 5.1.2 Base tax on mineral oils

An excise tax on heating oil was introduced in the 1970, removed in 1993, and then re-introduced in 2000 based on the argument that increases in the tax on electricity should not lead to an increase in demand for environmentally harmful oil for heating purposes (NCM, 2019). Some sectors are exempt from the base tax such as international shipping, fishing and catching in domestic and close by seas, fish oil and meals industry, domestic flights and petroleum extraction on the continental shelf. Since 2011, the base tax has been subject to an increase in price levels. The general tax rate has been stable over a long period, where the general rate was set to a level of 1.74 NOK (Eurocent 0.17) and the reduced rate at a level of 0.227 (Eurocent 0.02) in 2021 (Norwegian government tax proposals, 2021).

### 5.1.3 CO<sub>2</sub> tax

More than 80% of Norway's greenhouse gas emissions are subject to a fee or quota obligation. From an international point of view, this is a very high proportion. In 1991, both a tax on mineral oil products and a tax on CO<sub>2</sub> emissions from petroleum activities on the continental shelf was introduced. The majority of all greenhouse gas emissions from Norway's oil and gas extraction on the continental shelf and domestic flights are covered by the quota system and fees. The Norwegian government announced in 2021 that it will increase the flat CO<sub>2</sub> tax rate by 5% annually, across all economic sectors not covered by the EU ETS scheme, until year 2025. In January 2021, the general tax rate per tonne of CO<sub>2</sub> was set to 591 NOK (Euro 58) for emissions not covered by the CO<sub>2</sub> emission trading system (Norwegian government tax proposals, 2021).

### CO<sub>2</sub> tax on mineral oil products

The tax on mineral products was introduced in the beginning of the 1990s with the purpose of contributing to cost-effective reductions of CO<sub>2</sub> emissions. Mineral oil, petrol, natural gas, LPG are all included in the tax. Since 2009, the tax has been modified on several occasions. In 2010, the tax was altered to include the domestic use of natural gas and LPG. Three years later in 2013, all the tax levels related to petroleum activities on the continental shelf were increased. The same year, a reduced tax rate on mineral oil used for fishing and catching in inshore waters was introduced (NCM, 2019). See table 22.

## **Tax on CO<sub>2</sub> emissions from the continental shelf**

Similar as the tax on mineral products, a tax on CO<sub>2</sub> emissions from petroleum activities on the continental shelf was introduced in 1991. Since 2008, emissions from these activities have been included into the emission trading system, thus the installations need to buy their respective allowances. This implies that the petroleum sector is charged twice, with both the CO<sub>2</sub> tax and the prices of the CO<sub>2</sub> emission allowances.

To boost the incentives for reducing the CO<sub>2</sub> emissions, the government decided to maintain the CO<sub>2</sub> tax which is still much higher than the price of the CO<sub>2</sub> emission allowances (NCM, 2019). In 2021, the EU ETS level was set to NOK 300 per tonne of CO<sub>2</sub> (Norwegian government tax proposals, 2021).

Since 2017, a sub scheme in the CO<sub>2</sub> tax on the continental shelf on airborne emissions from natural gas was introduced. In 2021, the tax rate was set to NOK 8.76 (Euro 0.87) per SM3.

**Table 22: CO<sub>2</sub> tax rates, 2018–2021, NOK (Euro) per litre/Sm<sup>3</sup>/kg/t/Co<sub>2</sub>**

|                              | 2018         | 2019         | 2020         | 2021         |
|------------------------------|--------------|--------------|--------------|--------------|
| Gasoline                     | 1.16 (0.12)  | 1.18 (0.12)  | 1.26 (0.12)  | 1.37 (0.13)  |
| Jet fuel                     | 1.28 (0.13)  | 1.30 (0.13)  | 1.39 (0.13)  | 1.51 (0.15)  |
| Jet fuel,<br>reduced rate    | 1.28 (0.13)  | 1.30 (0.13)  | 1.39 (0.13)  | 1.51 (0.15)  |
| <b>Mineral oil</b>           |              |              |              |              |
| Light fuel oil<br>diesel     | 1.33 (0.14)  | 1.35 (0.14)  | 1.45 (0.10)  | 1.58 (0.16)  |
| Heavy fuel oil               | 1.33 (0.14)  | 1.35 (0.14)  | 1.45 (0.10)  | 1.58 (0.16)  |
| <b>Domestic use of gas</b>   |              |              |              |              |
| Natural gas                  | 1.0 (0.1)    | 1.02 (0.10)  | 1.08 (0.10)  | 1.17 (0.12)  |
| Chemical<br>reduction        | -            | -            | -            | 0.29 (0.03)  |
| Natural gas,<br>reduced rate | 0.057 (0.01) | 0.060 (0.01) | 0.061 (0.01) | 0.065 (0.01) |
| LPG                          | 1.50 (0.15)  | 1.52 (0.15)  | 1.63 (0.15)  | 1.77 (0.17)  |
| Chemical<br>reduction        | -            | -            | -            | 0.44 (0.04)  |
| <b>Continental<br/>shelf</b> |              |              |              |              |
| Natural gas                  | 7.30 (0.75)  | 7.41 (0.73)  | 7.93 (0.78)  | 8.76 (0.87)  |

Source: Norwegian government tax proposals 2018–2021 (St prp. Nr1 skatte-avgifts- og tollvedtak 2018–2021).

#### 5.1.4 The CO<sub>2</sub> emissions trading system

Norway has been a part of the EU Emission Trading System (EU-ETS) since 2008 through the EEA Agreement. About half of Norway's emissions are included in the EU ETS, making this a cornerstone in Norwegian climate policy. In October 2019, through the EEA Joint Committee, Norway and Iceland agreed to deepen its cooperation in climate action with the EU. Norway continues to apply the EU ETS Directive, including incorporating the changes for phase four that entered into force in 2021.

During the next decade, the EU, Norway (and Iceland) will also intensify their climate cooperation by aligning their actions to reduce emissions from sectors outside the EU ETS, namely agriculture, transport, waste management and buildings; and to enhance benefits of carbon removals from land use and forestry (European Economic Area, 2019).

#### 5.1.5. Sulphur tax

A tax on sulphur dioxide was introduced in 1970, with the purpose of reducing the emissions of sulphur dioxide, SO<sub>2</sub>. Today, oils with less than 0.05% sulphur have a zero-tax rate. Norwegian-operated international maritime transport is exempted from paying this tax. Between 2018 and 2005 the emissions of sulphur dioxide, SO<sub>2</sub> has decreased with 30% and the tax rates have been stable and adjusted in line with expected inflation. In 2021, the sulphur tax rate was 14.02 compared to 13.1 NOK öre (eurocent 0.01) per litre in 2018 (Norwegian government tax proposals 2021).

#### 5.1.6 Tax on NO<sub>x</sub> emissions

A tax on NO<sub>x</sub> emissions was introduced in 2007 with the purpose of contributing to cost-effective reductions in the NO<sub>x</sub> emissions and related policies and thus support the fulfilment of Norway's obligations in the Gothenburg Protocol. The tax comprises of three elements:

1. Propulsion of machinery with a total installed engine effect of more than 750 kW
2. Engines, boilers, and turbines with a total heating effect of more than 10 MW
3. Flaring at offshore and onshore installations

The tax is covering both the Norwegian mainland and the continental shelf. Exemptions are made on the excise tax for emissions of NO<sub>x</sub> for vessels travelling between Norwegian and foreign ports, vessels used for fishing and caching in distant waters, aircrafts travelling between Norwegian airports and foreign



airports plus mission units covered by an environmental agreement signed with the Norwegian government for initiating measures to reduce NO<sub>x</sub> that are implemented in accordance with established national environmental goals (NCM, 2019). In 2021, the NO<sub>x</sub> charge was 23.48 NOK per kilogram (Euro 2.99) compared to 21.94 in 2018 NOK per kilogram (Euro 2.25) (Norwegian government tax proposals 2021).

Revenues from NO<sub>x</sub> emissions accounted for 50 million NOK (Euro 4.9 million) in 2021 which is a decrease of 14% compared with 2018, when it was 57 million (Euro 5.9 million) NOK (Statistics Norway, 2022a).

### **5.1.7 Road usage tax on petrol and auto diesel**

As early as 1931, a tax on petroleum consumption was introduced and was up until 1964 earmarked for road construction. This was the first energy-related tax to be introduced in Norway. The current road usage tax was introduced in 1993. The purpose of these taxes is to ensure that users meet external costs connected with accidents, congestion, noise, road wear and tear and harmful local emissions to air (NCM, 2019).

Throughout the years, the tax has been modified on several occasions, such as the inclusion of biodiesel in 2010 and natural gas plus LPG in 2016. Hydrogen used for transportation purposes is still fully exempt from the subjected tax. Another change was made in 2020, when the road use tax was extended further to include natural gas. See table 23 for all details.

**Table 23: Petrol and auto diesel tax, 2018–2021, NOK (EUR) per litre/Sm3/kg**

|                       | 2018        | 2019        | 2020        | 2021        |
|-----------------------|-------------|-------------|-------------|-------------|
| Petrol (<10 ppm)      | 5.17 (0.53) | 5.25 (0.52) | 4.91 (0.46) | 5.01 (0.49) |
| Auto diesel (<10 ppm) | 3.75 (0.39) | 3.81 (0.38) | 3.62 (0.34) | 3.58 (0.35) |
| Bioethanol            | 5.17 (0.53) | 5.25 (0.52) | 2.37 (0.22) | 2.45 (0.24) |
| Biodiesel             | 3.75 (0.39) | 3.81 (0.38) | 3.62 (0.34) | 3.96 (0.39) |
| Natural gas           | -           | -           | 1.02 (0.1)  | 1.82 (0.18) |
| LPG                   | 2.23 (0.23) | 2.98 (0.29) | 3.48 (0.33) | 4.27 (0.42) |

*Source: Norwegian government tax proposals 2018–2021 (St prp. Nr1 skatte-avgifts- og tollvedtak 2018–2021).*

## 5.1.8 Subsidies for energy efficiency and renewable energy

### Carbon Capture Storage

For a long time, Norway has been working on developing the Carbon Capture Storage (CCS) technology. In December 2020, the Norwegian government decided to fund the “Northern Lights” CO<sub>2</sub> transportation and storage project in the North Sea (to be operational in 2024). In the Longship project the full CCS value chain will be demonstrated. The cost of the state's part of the project is estimated at NOK 18 billion (1.7 billion Euro) (Regjeringen, 2021b).

### Renewable electricity certificate scheme

Norway and Sweden have cooperated on a common certificate market scheme for renewable energy since 2012. For every MWh of electricity produced from renewable sources, producers receive a certificate. In Norway, the scheme is administrated by the NVE (Norwegian Water Resources and Energy Directorate). Associated costs for the scheme are added to end-users’ energy invoice (NCM, 2019).

The overall goal for the joint electricity certificate scheme was to increase renewable electricity production by 46.4 TWh between 2012 and 2030. This goal was already achieved in March 2021. During September 2020, the Norwegian and Swedish government agreed to amend the previous agreement and build in a discontinue-mechanism for the electricity certificate scheme to end in year 2025. The underlying reason is that the certificate system has played out its role as a driving force to investing in building new renewable electricity production in the two countries (Energimyndigheten, 2022).

## 5.2 Water

Norway does not have any specific environmental taxes or charges targeting water pollution. Nonetheless, consumers pay a waste-water fee to the municipality or supplier of fresh water. According to national legislation, suppliers of drinking water and wastewater treatment are not allowed to charge additional costs for water-related services, except the cost required to cover the associated expenses.

About less than one percent of the total run-off in the country is withdrawn for human use. In some parts of the country, water scarcity may still occur, hence during the last years, a trend can be seen among municipalities utilizing metering and volume pricing of households and businesses use of water (NCM, 2019).

## 5.3 Waste

### 5.3.1 Tax and refund system on hazardous substances

A tax on trichloroethane (TRI) and tetrachloroethane (PER) was introduced in 2000 with the purpose of reducing the use of these chemicals, since they are harmful to the environment and the health of people. TRI and PER that are recovered for own use are exempted from the tax. For 2021, the tax rate was NOK 77,38 (Euro 7.58) per kg pure compound (Norwegian government tax proposals, 2022).

### 5.3.2. Tax and refund system for some greenhouse gases

Since 2003 excise taxes should be paid on import and production of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) with the purpose of reducing emissions of these harmful substances. The tax also includes all mixtures of HFC and PFC products containing these substances. Recovered HFC and PFC are exempt from the tax. The tax is graded according to the global warming potential (GWP) of the gases. This implies that the rates for the various HFCs and PFCs depend on of the climate effect. In 2021, the tax was 591 NOK (Euro 58) per ton CO<sub>2</sub> equivalent (Norwegian government tax proposals, 2022).

### 5.3.3 Tax and refund system for lubricating oil

A tax on lubricating oil was introduced by the government in 1988 with the aim to reduce unfavorable disposal of waste oil. Lubricating oil used in fishing and catches in distant waters, facilities on the continental shelf, supply vessels and in aircrafts, are tax exempt. As of 2021, the tax is set to a level of 2.35 NOK (Eurocent 0.23) (Norwegian government tax proposals, 2022).

### 5.3.4 Taxes on beverage containers and deposit-refund system

Ever since a tax was introduced on beverage containers in 1994 it has consisted of both an environmental tax as well as a general tax on each unit. The general tax is imposed on all beverage containers that cannot be used in its original form (NCM, 2019). See table 24 below for the different tax rates in 2021.

**Table 24: Taxes on beverage containers, 2021, NOK (Euro) per unit**

|                            | 2021        |
|----------------------------|-------------|
| Glass and metal containers | 6.20 (0.61) |
| Plastic containers         | 3.75 (0.37) |
| Carton and cardboard       | 1.53 (0.15) |
| General tax                | 1.27 (0.12) |

*Source: Norwegian government tax proposals, 2021.*

The producer responsibility supports a deposit-refund system on beverage containers. Refillable beverage containers are part of the deposit-refund system. However, non-refillable glass and one-way cartons are not part of this system, thus instead financed by product fees (NCM, 2019).

### 5.3.5 Deposit-refund system and producer responsibility for end-of-life vehicles (ELVs)

In 1979 a refund system for ELVs weighing less than 3.5 tonnes was established to encourage car owners to return their vehicles for scrapping. Later, the system included caravans, snow scooters and minibuses (NCM, 2019). A refund of 2.000 NOK (Euro 196) is given when a vehicle is returned and 500 NOK (Euro 49) when a motorcycle is returned (Skatteetaten, 2021).

The Norwegian car importers established an NGO - Autoretur AS in 2007 with the concept of circular economy, thus the business sector itself is responsible for the products put on the market, throughout the product's lifetime, even after it has become waste. It's free of charge to deliver the car to Autoretur. Since its start, the organization has contributed to the recycling of approximately 2 million cars (Autoretur, 2022).

## 5.4 Transport

Emissions from the transport sector in Norway is, as in most industrial countries, one of the major contributors to the national emissions. To meet the 2030 targets, specific goals for transport emissions have been formulated in the Granavolden platform. The Norwegian government has set the ambition to reduce the emissions from the transport sector by 50% by 2030, with 2008 as the base year (excluding sea transport and flight).

Norway has also introduced specific city agreements, with the intention that all expansion in personal transportation will be covered by public transportation, walking and bicycling.

The motor vehicle registration tax has been changed over the years in an environmentally friendly direction and preferential tax treatment of electric cars has been strengthened. This has served to increase the number of new zero- and low-emission cars, thus it has also reduced tax revenues for the central government. The CO<sub>2</sub> component of taxation of motor vehicles has also increased and is currently based on the new European WLTP standard test cycle. However, the current trend is in line with those exemptions for electric vehicles which are gradually being reduced during the upcoming years (Norwegian Ministry of Finance, 2020). Generous tax incentives over a longer period have contributed to that two thirds of all new cars sold in Norway are electric in 2021 (Statistics Norway, 2022c).

### 5.4.1 Registration tax

In order to reduce increasing problems with the trade balance, the purchase tax on passenger cars and other motor vehicles was introduced in 1955. The purchase tax increased the purchase prices on new vehicles and thus reduced demand. The tax has primarily been a fiscal tax, although it has shifted towards an environmental focus over the years (NCM, 2014, 2019).

The registration tax, or "One-off Registration tax" is calculated based on the vehicle's tax group, kerb weight, CO<sub>2</sub> emissions, NO<sub>x</sub> emissions and cylinder capacity. For some vehicles, engine power is also included in the calculation. (The Norwegian Tax Administration, 2022a). The various components in the registration tax for passenger cars between 2018 and 2021 can be seen in table 25.

**Table 25: Various components in the registration tax for passenger cars, 2018–2021, NOK (Euro)**

| Component                                                                                       | 2018              | 2019              | 2020           | 2021           |
|-------------------------------------------------------------------------------------------------|-------------------|-------------------|----------------|----------------|
| <b>Weight-based (NOK (EUR) per kg)</b>                                                          |                   |                   |                |                |
| 0–500*                                                                                          | 0 (0)             | 0 (0)             | 0 (0)          | 0 (0)          |
| 501–1200*                                                                                       | 26.93 (2.64)      | 25.42 (2.49)      | 25.9 (2.54)    | 26.81 (2.62)   |
| 1201–1400                                                                                       | 67.11 (6.57)      | 63.35 (6.20)      | 64.55 (6.32)   | 66.81 (6.54)   |
| 1401–1500                                                                                       | 209.71 (20.53)    | 197.96 (19.38)    | 201.72 (19.75) | 208.78 (20.44) |
| Over 1 500                                                                                      | 243.9 (23.88)     | 230.23 (22.54)    | 234.6 (22.97)  | 242.81 (23.77) |
| <b>NOX emissions (NOK (EUR) per mg/km)</b>                                                      | 72.06 (7.05)      | 73.14 (7.16)      | 74.53 (7.30)   | 77.14 (7.55)   |
| <b>CO2 emissions (NOK (EUR) per g/km)</b>                                                       |                   |                   |                |                |
| 0–70                                                                                            | 0 (0)             | 0 (0)             |                |                |
| 71–95                                                                                           | 929.34 (90.98)    | 943.28 (92.35)    |                |                |
| 96–125                                                                                          | 1 011.42 (99.02)  | 1 057.04 (103.48) |                |                |
| 126–195                                                                                         | 2 728.96 (267.17) | 2 769.89 (271.17) |                |                |
| Over 195                                                                                        | 3 505 (343.14)    | 3 557.58 (348.29) |                |                |
| <b>Deduction per gram of emissions, for emissions below 70 g/km, applicable down to 40 g/km</b> | 952.2 (93.22)     | 966.48 (94.62)    |                |                |
| <b>Deduction per gram of emissions for emissions below 40 g/km</b>                              | 1 120.29 (109.68) | 1 137.09 (111.32) |                |                |

**CO2 emissions (NOK (EUR) per g/km), for WLTP**

|          |                      |                      |
|----------|----------------------|----------------------|
| 0–87     | 0 (0)                | 0 (0)                |
| 88–118   | 773.91<br>(75.77)    | 985.23<br>(96.45)    |
| 119–155  | 867.25<br>(84.90)    | 1 104.05<br>(108.09) |
| 156–225  | 2 272.56<br>(222.48) | 2 352.1<br>(230.27)  |
| Over 225 | 3 625.17<br>(354.90) | 3 752.05<br>(367.33) |

**CO2 emissions (NOK (EUR) per g/km), for NEDC**

|          |                      |
|----------|----------------------|
| 0–70     | 0 (0)                |
| 71–95    | 961.2<br>(94.10)     |
| 96–125   | 1 077.12<br>(105.45) |
| 126–195  | 2 822.52<br>(276.32) |
| Over 195 | 3 625.17<br>(354.90) |

|                                                                                                           |                   |                  |
|-----------------------------------------------------------------------------------------------------------|-------------------|------------------|
| <b>Deduction per gram of emissions, for emissions below 86 g/km, applicable down to 50 g/km, for WLTP</b> | 792.25<br>(77.56) | 820.7<br>(80.35) |
|-----------------------------------------------------------------------------------------------------------|-------------------|------------------|

|                                                                              |                   |                   |
|------------------------------------------------------------------------------|-------------------|-------------------|
| <b>Deduction per gram of emissions for emissions below 50 g/km, for WLTP</b> | 932.92<br>(91.33) | 965.57<br>(94.53) |
|------------------------------------------------------------------------------|-------------------|-------------------|

|                                                                                                           |                   |
|-----------------------------------------------------------------------------------------------------------|-------------------|
| <b>Deduction per gram of emissions, for emissions below 69 g/km, applicable down to 40 g/km, for NEDC</b> | 984.84<br>(96.42) |
|-----------------------------------------------------------------------------------------------------------|-------------------|

|                                                                              |                      |
|------------------------------------------------------------------------------|----------------------|
| <b>Deduction per gram of emissions for emissions below 40 g/km, for NEDC</b> | 1 158.69<br>(113.44) |
|------------------------------------------------------------------------------|----------------------|

*\*The intervals for the weight-based charge were changed in 2019, and the first two intervals in 2018 were 0–350 and 351–1200.*

*Source: Norwegian government (2018), Norwegian government (2019), Norwegian government (2020), Norwegian government (2021).*

As a vehicle change owner a register transfer fee is paid. The fee is based on the age and type of vehicle. Other exemptions are e.g. vehicles older than 30 years, vehicles transferred between spouses and family members, or vehicles owned less than 2 months. (The Norwegian Tax Administration, 2022b).

#### 5.4.2 Annual excise tax on motor vehicles

From 2018 the annual excise tax is replaced by a traffic insurance tax for vehicles with a total weight less than 7,500 kg. This fee is collected by the insurance companies and would be around the same amount as the previous excise tax (NMC 2019). The details are presented in table 26.

**Table 26: Traffic insurance tax, 2018–2021, NOK (EUR) per day**

|                                                                                  | 2018        | 2019        | 2020        | 2021        |
|----------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| <b>Petrol vehicles and diesel vehicles with a factory-fitted particle filter</b> | 7.85 (0.81) | 7.97 (0.79) | 8.12 (0.77) | 8.40 (0.82) |
| <b>Diesel vehicles without a factory-fitted particle filter</b>                  | 9.15 (0.94) | 9.29 (0.92) | 9.47 (0.90) | 9.80 (0.96) |
| <b>Electric vehicles</b>                                                         | 0           | 0           | 0           | 5.85 (0.57) |
| <b>Motor bikes</b>                                                               | 5.46 (0.56) | 5.54 (0.55) | 5.65 (0.54) | 5.85 (0.57) |
| <b>Tractors, vintage cars, mopeds etc.</b>                                       | 1.27 (0.13) | 1.29 (0.13) | 1.31 (0.12) | 1.36 (0.13) |

*Source: Norwegian government (2018), Norwegian government (2019), Norwegian government (2020), Norwegian government (2021).*

For vehicles over 7 500 kg, an annual weight excise tax is invoiced. The fee is based on the weight of the vehicle, amount of axles and type of suspension. The fee may thus vary considerably from NOK 423 (EUR 41.4), for vehicles with air suspension and weight 7 500 11 999 kg, to NOK 10 689 (EUR 1 046), for a vehicle weighing more than 40 000 kg with two plus at least three axles and other suspension. An environmental fee is added based on the EURO class of the vehicle, from NOK 106 (EUR 10.4) for a 7 500 11 999 kg vehicle with the highest EURO class, to NOK 15 802



(EUR 1 547) for a heavy vehicle with no EURO class (The Norwegian Tax Administration, 2022c).

### **5.4.3 Air passenger tax**

On June 1, 2016, an air passenger tax was introduced which covers all flights departing from Norwegian airports. The air passenger tax was temporarily suspended in 2019, and re-instated in 2022. Exemptions are flights from the Norwegian continental shelf and airports on Svalbard, Jan Mayen and the Norwegian dependencies, military flights, rescue, emergency or ambulance services, airline employees on business travel, children under the age of two, transit and transfer passengers and NATO (The Norwegian Tax Administration, 2022d).

### **5.4.4 Road tolls**

Road tolls have been used in Norway since 2005, often as a part of the Byvekstavtalen. The revenue from road tolls has increased from NOK 3 billion (EUR 383.7 million) in 2005 to NOK 11 billion (EUR 1 130 million) in 2018 and corresponds to 18–19% of all transport related revenues. The purpose has been both to finance transport infrastructure projects and to reduce car traffic.

Road tolls were first introduced in the bigger cities such as Oslo, Bergen, Trondheim and Nord-Jaeren (in the Stavanger area) and have gradually been introduced in other municipalities. By 2021, a total of 13 municipalities have introduced a road toll, while two have been discontinued. The fee is based on the kind of vehicle and the time of the day, where rush hour passages are the most expensive. The fee is differentiated between diesel cars, petrol cars and different emission standards. From 2018, electric cars are also subject to the fee, but still at a lower level.

The general trend is that the fee has increased in the bigger cities, while many cases show a more stable fee in other areas, as the planned projects that were to be funded from the revenues has been commissioned. The fees are varying between the different cities. The average cost for commuting by car to work has increased from NOK 4.40 (Eurocent 0.46) in 2005 to NOK 19.8 (EUR 1.96) in 2019 (Sand, Øystein; Bjørn Gjerde Johansen; Askill Harkjerr Halse; Svein Olav Sæter', 2022).

### **5.4.5 Subsidies to public transport**

Public transports are subsidised to make them more competitive and to meet environmental targets. Subsidies are mostly administered at local or on county level. Overall, the usage of public transportation is increasing. From 2020 to 2021, the increase was 4,8% (Statistics Norway, 2022b). The subsidies vary on an annual basis, as well as between the different regions. In the major urban area, the government covers the main part of the public transportation projects (Norwegian Ministry of Transport, 2021).

## 5.5 Agriculture and natural resources

### 5.5.1 Tax on fishing fleet and aquaculture

The Norwegian government decided, after a recommendation from the Fisheries Control Committee in 2021, to introduce a tax on controlling fishing fleets. The purpose of the fee is to finance the work of the Directorate of fisheries in terms of control and supervision of the fishery industry. Norway has had a similar tax in the past, thus it was abolished in 2013 (Norwegian government tax proposal, 2021). In 2021, the tax on the fishing fleet generated revenues of 35 million NOK (3.4 million Euro) (Statistics Norway, 2022a).

The control and inspection of aquaculture is conducted by the Directorate of Fisheries and is financed through a sectoral fee since many years. After a revision in 2019, it was concluded that the fee only covered about 80 percent of the relevant expenses. Hence, in 2021 it was decided to increase the fee on control and inspection of aquaculture (Norwegian government tax proposal, 2021).

### 5.5.2 Tax on pesticides

Since the beginning of the 1990s a tax on pesticides have been collected by the government. The pesticides are grouped in seven classes depending on their health and environmental risk, and the tax is paid according to this scheme, plus the size of the land used. Over time, the revenue from the tax has decreased. The tax has created incentives to use pesticides with lower health and environmental risks (NCM, 2019). Revenue from taxes on pesticides decreased with 20% from 2019 to 2021 and accounted for 56 million NOK (5.48 million Euro) in 2021 (Statistics Norway, 2022a).

## 6. Sweden

Economic instruments used to correct for negative environmental externalities have been widely used in Sweden since the early 1990s. Among the different types of economic instruments available, taxes, subsidies and grants appear to be the most widely used. Since the early 1990s there has been a dominance of economic instruments in the areas of energy, greenhouse gases and air pollution. Examples are the tax on energy consumption, energy and carbon dioxide tax on fossil fuels, the sulphur tax, regulation for nitrous oxides and the subsidies and grants for energy efficiency, renewable energy, and climate investments. In the period of 2018–2021, some changes to existing instruments have been made, and a few new instruments have been implemented.

January 1, 2018, a new climate policy framework entered into force in Sweden, which consists of a climate act, climate targets and a climate policy council. The Climate Act establishes that the Government's climate policy must be based on climate targets and specifies how the implementation will be carried out. The long-term target is to have zero net greenhouse gas emissions by 2045 at the latest, which means that emissions of greenhouse gases from activities in Sweden shall be at least 85% lower in 2045 compared to 1990. Supplementary measure may be utilized to achieve the remaining reduction down to zero. The supplementary measures include increased uptake of carbon dioxide by forests, verified reductions carried out outside of Sweden, and carbon capture and storage based on the combustion of biomass (bio-CCS) (Swedish Environmental Protection Agency, 2022c). In July 2018, the Swedish government introduced an emission reduction obligation scheme, accompanied by several changes in the tax rules for petrol and diesel. Low-blended biofuels that are covered by the scheme are subject to carbon and energy tax rates that correspond to the rates of their fossil equivalents. The carbon tax rates for petrol and diesel were adjusted downwards to take account of the share of low-blended biofuel per litre full blend, and the energy tax was lowered.

In 2019, changes to the tax on fuels used for heat production in combined heat and power plants and in other heating plants (CHPs) were made. CHPs are subject to lower tax rates. However, these tax cuts were lowered. Since then, CHPs within the EU ETS are subject to 91% of the carbon tax and 100% of the energy tax (The Swedish Environmental Protection Agency, 2021).

In July 2018 the Swedish government implemented a bonus-malus system targeted at new cars. Vehicles that run on diesel or petrol are subject to a higher annual tax during the first three years, and the previously used tax exemption associated with low CO<sub>2</sub>-emissions was removed. Zero or low emission vehicles receive a bonus. The maximum bonus of SEK 70000 (EUR 6 803), or 25% of the sales price, will in

practice only be given to zero emission vehicles. For other, such as plug-in hybrids, the bonus decreases for every gram of carbon dioxide per kilometre the car emits.

In the area of energy efficiency, renewable energy, and climate investments, several changes were implemented. The government has decided that the electricity certificate system, a subsidy scheme for renewable energy that have been in place in Sweden since 2003, will be terminated by the end of 2035, and new electricity generation facilities will not be eligible for the system after the end of 2021. The subsidies for installation costs and production of renewable energy that were introduced in 2009 ended in 2020 and was replaced for private individuals by a tax reduction for green investments. Municipalities and companies were, however, still eligible for continued support in 2021.

The subsidy schemes for climate investments aimed at the industry sector was extended in 2020 to include the finance of research, feasibility studies and investments relating to other greenhouse gas emissions, such as certain combustion emissions and diffuse emissions linked to process-related emissions and strategically important initiatives in industries that contribute to greenhouse gas emissions reductions. The budget for the program increased from SEK 300 (EUR 29) million to SEK 750 (EUR 73) million between 2018 and 2021.

In 2020, the Swedish government also introduced a tax on waste incineration. The tax level has since been gradually increased. In the following chapters the economic instruments described in this section, as well as several other economic instruments used in Sweden, are described in more detail.

The excise tax on electricity consumption was increased each year between 2018 and 2021. The revenue from this excise tax, and the other nine highest revenue generating environmental taxes, fees, and charges can be seen in table 27.

**Table 27: Revenue from the ten highest revenue-generating environmental taxes, fees, and charges, 2021, SEK million (EUR million)**

|                                  |                         |
|----------------------------------|-------------------------|
| <b>Energy tax on electricity</b> | <b>27 007 (2 625)</b>   |
| Energy tax on fuels              | 26 677 (2 592)          |
| Carbon dioxide tax               | 21 921 (2 130)          |
| Vehicle tax                      | 15 590 (1 515)          |
| Congestion tax                   | 2 856 (278)             |
| Tax on road traffic insurance    | 2 801 (272)             |
| Tax on chemicals                 | 1 752 (170)             |
| Road charges                     | 1 303 (127)             |
| Emission permits                 | 1 079 (105)             |
| NOx fee                          | 528 (51)                |
| <b>Total</b>                     | <b>103 477 (10 056)</b> |

*Note: Selection based on the ten highest revenue-generating taxes, fees, and charges. Hence, the total revenue is larger than the sum of these.*

*Source: Statistics Sweden (2022).*

## 6.1 Energy, greenhouse gases and air pollution

### 6.1.1 Carbon dioxide tax

Together with the neighbouring countries Finland and Norway, Sweden was one of the first countries to implement a tax on carbon dioxide in fossil fuel in the early 1990s. The tax aims to reduce emissions of carbon dioxide in sectors outside the EU ETS. The tax has been raised in several steps since it was first implemented. In total, the tax has increased from SEK 0.25/kg CO<sub>2</sub> in 1991 to SEK 1.20/kg CO<sub>2</sub> in 2021. In addition to specific tax increases stipulated in Government bills, a yearly indexation of the tax level is applied (The Swedish Environmental Protection Agency, 2021). To compensate for increased prices due to the reduction obligation scheme, the GDP-adjustments of the carbon tax was put on hold between 2020–2022. In 2021, the revenues collected from the tax amounted to almost SEK 22 (EUR 2.1) billion (Statistics Sweden, 2022).

The tax level is proportionate to the calculated amount of carbon dioxide emissions, based on the fuel's fossil carbon content. This means that biofuels are currently not subject to carbon taxation. A reduced carbon tax is applied for diesel used in agriculture, forestry, and aquaculture (The Swedish Environmental Protection Agency, 2021).

### **6.1.2 Energy tax on fuels**

In addition to the CO<sub>2</sub> tax, fossil fuels are also subject to energy taxes. Tax rates for different fuels over the period 2018–2021 are listed in table 28. Energy tax on fuel is differentiated based on environmental impact, where a more stringent tax is levied on fuels associated with a larger environmental impact (Nordic Council of Ministers, 2019). The energy tax on fuels varies depending on whether it is used for heating purposes or as motor fuel. The tax level on heating fuels varies between industries, households, and the energy conversion sector (The Swedish Environmental Protection Agency, 2021).

**Table 28: Energy and CO<sub>2</sub> tax rates for different transportation fuels and energy sources, 2018–2021, SEK (EUR)**

| Type of transportation fuels or energy source | Type of tax         | 2018        | 2019        | 2020        | 2021        |
|-----------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
| Petrol (MK1), SEK (EUR)/litre                 | Energy tax          | 3.87 (0.38) | 3.95 (0.38) | 4.10 (0.4)  | 4.13 (0.4)  |
|                                               | CO <sub>2</sub> tax | 2.57 (0.25) | 2.62 (0.25) | 2.59 (0.25) | 2.61 (0.25) |
| Petrol (acrylate), SEK (EUR)/litre            | Energy tax          | 1.96 (0.19) | 2.00 (0.19) | 2.07 (0.2)  | 2.08 (0.2)  |
|                                               | CO <sub>2</sub> tax | 2.57 (0.25) | 2.62 (0.25) | 2.59 (0.25) | 2.61 (0.25) |
| Petrol (MK2), SEK (EUR)/litre                 | Energy Tax          | 3.90 (0.38) | 3.98 (0.39) | 4.13 (0.4)  | 4.16 (0.4)  |
|                                               | CO <sub>2</sub> tax | 2.57 (0.25) | 2.62 (0.25) | 2.59 (0.25) | 2.61 (0.25) |
| Light oil fuel                                | Energy tax          | 0.87 (0.08) | 0.89 (0.09) | 0.90 (0.09) | 0.91 (0.09) |
| SEK (EUR)/litre                               | CO <sub>2</sub> tax | 3.29 (0.32) | 3.36 (0.33) | 3.42 (0.33) | 3.44 (0.33) |
| Heavy fuel oil (MK1)                          | Energy tax          | 2.34 (0.23) | 2.39 (0.23) | 2.46 (0.24) | 2.48 (0.24) |
| SEK (EUR)/litre                               | CO <sub>2</sub> tax | 2.19 (0.21) | 2.24 (0.22) | 2.25 (0.22) | 2.26 (0.22) |
| Heavy fuel oil (MK2)                          | Energy tax          | 2.64 (0.26) | 2.69 (0.26) | 2.78 (0.27) | 2.80 (0.27) |
| SEK (EUR)/litre                               | CO <sub>2</sub> tax | 2.19 (0.21) | 2.24 (0.22) | 2.25 (0.22) | 2.26 (0.22) |
| Heavy fuel oil (MK3)                          | Energy tax          | 2.79 (0.27) | 2.85 (0.28) | 2.94 (0.29) | 2.96 (0.29) |
| SEK (EUR)/litre                               | CO <sub>2</sub> tax | 2.19 (0.21) | 2.24 (0.22) | 2.25 (0.22) | 2.26 (0.22) |
| Natural gas for transportation                | Energy tax          | 0 (0)       | 0 (0)       | 0 (0)       | 0 (0)       |

|                                 |                     |                |             |                |             |
|---------------------------------|---------------------|----------------|-------------|----------------|-------------|
| SEK<br>(EUR)/m <sup>3</sup>     | CO <sub>2</sub> tax | 2.47 (0.24)    | 2.52 (0.24) | 2.56 (0.25)    | 2.58 (0.25) |
| Natural<br>gas for<br>other use | Energy tax          | 0.96 (0.09)    | 0.98 (0.1)  | 1 (0.1)        | 1.01 (0.1)  |
| SEK<br>(EUR)/m <sup>3</sup>     | CO <sub>2</sub> tax | 2.47 (0.24)    | 2.52 (0.24) | 2.56 (0.25)    | 2.58 (25)   |
| LPG for<br>transportation       | Energy tax          | 0 (0)          | 0 (0)       | 0 (0)          | 0 (0)       |
| SEK<br>(EUR)/tonne              | CO <sub>2</sub> tax | 3 463 (337)    | 3 535 (344) | 3 598<br>(350) | 3 624 (352) |
| LPG for<br>other use            | Energy tax          | 1 117 (109)    | 1 140 (111) | 1 160 (113)    | 1 168 (114) |
| SEK<br>(EUR)/tonne              | CO <sub>2</sub> tax | 3 463 (337)    | 3 535 (344) | 3 598<br>(350) | 3 624 (352) |
| Coal                            | Energy Tax          | 661 (64)       | 675 (66)    | 687 (67)       | 692 (67)    |
| SEK<br>(EUR)/tonne              | CO <sub>2</sub> tax | 2 865<br>(278) | 2 924 (284) | 2 976 (289)    | 2 997 (291) |

*Note: Data for 2018 and 2019 concerning petrol and heavy fuel oil applies from July 1 for respective year.*

*Source: Swedish Tax Agency, 2021.*

Yearly adjustments in both energy and carbon dioxide tax on motor fuels used in road vehicles and off-road machinery have been made since 1994 to adjust for inflation in the country (consumer price index). In July 2019 tax rates were lowered by the equivalent of the GDP-adjustment for that year. In 2020 the GDP-adjustment was put on hold until 2022 to compensate for increased prices due to the reduction obligation scheme. (The Swedish Environmental Protection Agency, 2021).

In 2020, the European Commission approved a 10-year prolongation of the tax exemption for non-food-based biogas and bio-propane used for heating or as motor fuel in Sweden. The tax exemption aims to increase the use of biogas and bio-propane, as well as reduce the use of fossil fuels (The Swedish Environmental Protection Agency, 2021).

The industry sector, as well as agriculture, forestry, and aquaculture sectors, are subject to some exemptions and reductions in energy taxes on fuels used in the industrial manufacturing processes. One of the main reasons is for cost-efficiency reasons, and to avoid carbon leakage. The carbon tax reduction was rescinded from January 1, 2018. A special reimbursement for carbon tax on diesel for machinery in



agricultural, forestry and aquaculture activities were raised from SEK 1.43 (EUR 0.14) per litre to SEK 2.24 (EUR 0.22) per litre in 2019 and was also subject to a tax reduction on the energy tax. From January 1, 2020, the reimbursement was SEK 1.93 (EUR 0.19) per litre (The Swedish Environmental Protection Agency, 2021).

### 6.1.3 Excise tax on electricity consumption

In addition to the energy tax on fuels, there is also an excise tax levied on electricity consumption. Municipalities in the northern parts of Sweden pay a lower tax on their consumption. Manufacturing industries receive a significantly lower tax compared to households. Since 2004, the energy tax for manufacturing industries has been SEK öre 0.5 (EUR cent 0.05) per kWh.

In 2021 commercial activities in e.g., agriculture, forestry and aquaculture are also entitled to a tax reduction to the level of SEK öre 0.6 (EUR cent 0.06) per kWh.

**Table 29: Tax on electricity consumption, 2018–2021, SEK öre (EURO cent) per kWh**

|                                     | 2018        | 2019        | 2020        | 2021        |
|-------------------------------------|-------------|-------------|-------------|-------------|
| Energy tax, general                 | 33.1 (3.22) | 34.7 (3.37) | 35.3 (3.43) | 35.6 (3.46) |
| Energy tax, northern municipalities | 23.5 (2.28) | 25.1 (2.44) | 25.7 (2.50) | 26.0 (2.53) |
| Energy tax, manufacturing industry  | 0.5 (0.05)  | 0.5 (0.05)  | 0.5 (0.05)  | 0.6 (0.06)  |

*Source: Swedish Tax Agency (2022a).*

### 6.1.4 CO<sub>2</sub> emissions trading system

Sweden is part of the EU Emissions Trading Scheme (ETS), governed by the Emissions Trading Directive (2003/87/EC). Having a common market for reduction of greenhouse gas emissions in EU member states together with Norway and Lichtenstein, ensures that reductions are made cost-effective i.e., emission reductions are done where the costs are lowest (Nordic Council of Ministers, 2019). The Swedish Environmental Protection Agency (2021) reported that about 760 Swedish installations are included in the system. At the EU level in total, approximately 11 000 installations are covered.

In 2018, the EU ETS was reformed (EU Commission, 2018). The quantity of emissions allowed within the system is decreased every year. From 2021 onwards, the annual reduction of the cap will be increased from 1.74% to 2.2%. A market

stability reserve was introduced to reduce the surplus of emission allowances on the market. From 2023 onwards, the market stability reserve cannot hold more allowances than auctioned the year before. The remaining allowances are invalidated. Almost half of the allowances are allocated for free to installations covered by the system. This is used to avoid risks of carbon leakage in specific industrial sectors such as steel and cement. The remaining allowances, currently 57%, are auctioned (The Swedish Environmental Protection Agency, 2021).

In December 2022, the EU Commission, EU Parliament and EU Council agreed to reform the EU ETS and on 18 April 2023, the EU Parliament voted to adopt this law (EU Parliament, 2023). The reform includes a faster reduction of the cap (4.3% instead of 2.3%), a gradual phase-out of free allocation from 2026 to 2033 and linked to this, the gradual introduction of a carbon border adjustment mechanism over the same time period. In addition, a new ETS for road transport and heating will start in 2027. Also, a social climate fund will be established to abate the negative effects on poverty from the ETS-2.

### **6.1.5 Nitrogen oxide charge**

The nitrogen oxide charge was introduced in 1992 with the aim of reducing nitrogen emissions from large combustion plants. The economic instrument builds on the principle that collected revenues from the charge per unit of emitted NO<sub>x</sub> are returned to the participating plants in proportion to production of energy. In this way participants with low emission per unit of produced energy is promoted (The Swedish Environmental Protection Agency, 2021). Since 2008 the charge has been SEK 50 (EUR 4.9) (Nordic Council of Ministers, 2019).

### **6.1.6 Sulphur tax**

With the purpose of reducing emissions of sulphur dioxide from combustion processes, a tax on sulphur on certain fuels was introduced 1991. The tax is levied on fuels with high sulphur content, such as coal, peat and certain oils. The tax has been constant since the introduction in 1991 at a level of SEK 30 (EUR 2.92) per kg sulphur for solid and gaseous fuels and SEK 27 (EUR 2.62) per cubic litre for every tenth of a weight percent of sulphur in liquid fuels (Nordic Council of Ministers, 2019; The Swedish Tax Agency, 2022d).

## 6.1.7 Subsidies for energy efficiency, renewable energy, and climate investments

### The electricity certificate system

A subsidy scheme for renewable energy have been in place in Sweden since 2003. In 2012, Norway became a part of the scheme and today the countries have a common market for certificates. It is a subsidy scheme with market features where producers of renewable energy receive a certificate for every produced unit of energy (MWh). The certificate can be sold on a market where the price is decided by market mechanisms. Buyers of the certificates are operators who are enforced to have a certain share of certificates in proportion to electricity consumed or sold. These are mainly suppliers of electricity and energy intense industries (The Swedish Environmental Protection Agency, 2021). The goal was to increase the production by 46.4 TWh between 2012 and 2030. This goal was achieved in March 2021 (Energimyndigheten, 2022).

The rapid expansion of renewable electricity production means that the electricity certificate system now has a limited function. Therefore, the government has decided that new electricity generation facilities are not eligible for the system after the end of 2021 and that the electricity certificate system will be terminated by the end of 2035 (The Swedish Environmental Protection Agency, 2021).

### **Subsidy schemes for climate investments; Climate leap (Klimatklivet), Industry leap (Industriklivet) and more**

With the main purpose to reduce greenhouse gas emissions, a subsidy scheme was introduced in 2015 targeted at local and regional investments. Based on the estimated greenhouse gas reduction of each investment, applicants can compete for the grants. Examples of investments that can be granted support are infrastructure for charging electrical vehicles, biogas plants, infrastructure for biofuel and transitions from fossil fuel to biofuel or district heating. The combined budget for the program together with the Charge at home-grant amounted to SEK 1.5 (EUR 0.15) billion in 2019 and was increased to SEK 1.96 (EUR 0.19) billion in 2020. Individuals are exempted from the Climate leap, but individuals have the possibility to apply for financial support to install charging facilities on private properties through the Charge at home-grant (The Swedish Environmental Protection Agency, 2021).

The "Industrial Leap Programme", which is operated by the Swedish Energy Agency (SEA), provides funding for innovation projects to reduce process related industrial greenhouse gas emissions, including Carbon Capture and Storage (CCS). Eligible projects may include research, feasibility studies, and investments for pilot and demonstration projects. Part of the budget ("Industrial Leap Programme Negative emissions") is earmarked for projects that target the capture, transport and geological or other permanent storage of biogenic CO<sub>2</sub> or CO<sub>2</sub> that has been

separated from the air (Swedish Energy Agency, 2022b). In 2018, the government budgeted SEK 300 (EUR 29) million for the programme, and in 2021, the budget had increased to SEK 750 (EUR 73) million (The Swedish Environmental Protection Agency, 2021).

### **Subsidies for installation costs and production of renewable energy**

In 2009 a subsidy to cover parts of the installation costs of solar panels was initiated. All types of actors could obtain financial support for installing grid-connected solar electricity and solar hybrid systems. However, the support for private individuals ended December 31, 2020, and was replaced by a tax deduction for green investments. The tax deduction applies to installations of green technology including solar cells, systems for storage of self-produced electricity and at home charging stations. Municipalities and companies were still eligible for continued support in 2021. The subsidy is, however, lowered to 10% of the installation cost with the aim to end after 2021, as the Government' argue that there is no longer a long-term need for support (The Swedish Environmental Protection Agency, 2021).

Companies in agriculture, gardening and reindeer husbandry can apply for subsidies to produce renewable energy from biogas, wind power, solar power, hydro power, and geothermal energy. Energy produced can either be used in the industry or sold on the market (Swedish Board of Agriculture, 2022a). Subsidies are also available for building facilities for the production and use of manure-based biogas, as well as upgrading or building a plant to manage digestates<sup>[4]</sup> (Swedish Board of Agriculture, 2022b). Support for the production in a biogas plant is also given (Swedish Board of Agriculture, 2022c).

An income tax reduction for households' and businesses' micro-production of renewable energy was introduced in 2015. The reduction is SEK 0.60 (EUR 0.06) per kWh of renewable electricity fed into the grid in a connection point with a fuse size of up to 100 Amps. The reduction is limited to the amount of electricity received from the grid in the same connection point and capped at SEK 18000 (EUR 1749) per year (The Swedish Environmental Protection Agency, 2021).

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4. Digestate is the material remaining after decomposition under low oxygen conditions of a biodegradable feedstock. Feedstock materials for digestion typically include farm livestock manures and crop material or other non-farm organic materials such as food waste. These are biologically decomposed in a controlled process in the absence of oxygen. (Woodhead Publishing, 2023).

## 6.2 Water

### 6.2.1 LOVA – a subsidy scheme

In order to take on and stimulate creative and cost-effective initiatives on local level aimed at reducing eutrophication in the sea, a subsidy scheme, called LOVA, was introduced in 2009. The scheme includes measures not only thought to reduce eutrophication, but also to reduce environmentally hazardous substances from recreational boating and to collect lost fishing gears, so called ghost gears. Municipalities and associations are allowed to apply for financial support within the scheme and the grant can be applied for at the county administrative board. For 2021, the total budget was approximately SEK 219 (EUR 21) million (Swedish Agency for Marine and Water Management, 2021).

### 6.2.2 User charges for water supply and wastewater services

Municipalities in Sweden takes out a fee on the usage of fresh water. The fee consists of one fixed part and one part that depends on the amount of water that is being used. Different fees are levied for different types of housing (The Swedish Water and Wastewater Association, 2021). In 2021, the yearly cost for a detached single-family house without a basement comprising of 5 bedrooms, bathroom with WC, laundry room, an extra toilet room and garage varied between SEK 3 247 (EUR 315.5) and SEK 15 633 (EUR 1 519) depending on municipality (The Swedish Water and Wastewater Association, 2022).

## 6.3 Waste

### 6.3.1 Landfill tax

A tax on landfill waste was introduced in 2001. The tax is applied when more than 50 tonnes of waste is deposited in a year and is based on weight. It does not differ with regard to material or content. The tax has doubled since its implementation in 2001. During the period 2018–2021 the tax on waste was raised with 11 percent to SEK 555 (EUR 54) per ton (Swedish Tax Agency, 2022b).

In 2020 the Swedish government introduced a tax on waste incineration. The tax level was gradually increased, from SEK 75 (7.3 EUR) per ton of waste in 2020, to SEK 100 (9.7 EUR) per ton of waste in 2021 and to SEK 125 (12.1 EUR) per ton of waste in 2022 (Swedish Tax Agency, 2022c).

### **6.3.2 Waste management**

The costs for waste management are charged partly as a cleaning fee, partly as a fee for the products covered by producer responsibility (explained further in section 6.3.5). Most municipalities in Sweden take out a fee for collection of household waste. A few municipalities use a tax instead. The fee often consists of a fixed part and a part that varies with e.g. frequency of collection of waste and the size of the trash bin (Swedish Environmental Protection Agency, 2022a). Lower costs for less frequent collecting and smaller trash bins should incentivize household to produce less waste. Some municipalities incentivize separation of biodegradable waste, used to e.g. produce biogas, by offering a lower cost for households that collect biodegradable waste in separate bins (Sveriges avfallsportal, 2020).

### **6.3.3 Tax on chemicals in certain electronic products**

A tax on chemicals in certain electronic products are divided into two groups: appliances and other electronics. The tax rate levied on appliances such as washing machines, dishwashers, freezers, and refrigerators is SEK 11 (EUR 1.1) per kilo of the product. Other electronic products face a tax rate of SEK 166 (EUR 16.1) per kilo of the product (Swedish Tax Agency, 2022g).

### **6.3.4 Tax reduction for reparation of certain goods**

With the main purpose to reduce material use and the environmental effects linked to that, tax reductions for the reparation of certain goods are applied. The tax reduction builds on the principle that making reparation and maintenance of certain goods cheaper, should incentivise consumers to repair broken goods instead of replacing them (Nordic Council of Ministers, 2019). Tax reductions are applied to the reparation of appliances, such as dishwashers, washing machines and refrigerators (Swedish Tax Agency, 2022h). A tax reduction is also applied to the reparation of goods such as bicycles, leather products, clothes and shoes (Swedish Tax Agency, 2022i).

### **6.3.5 Producer responsibility in waste management**

In Sweden, there is producer responsibility for the following product groups: batteries, vehicles, tyres, electrical and electronic equipment, packaging, wastepaper, pharmaceuticals, and radioactive products (Swedish Environmental Protection Agency, 2021). This means that producers have the responsibility to collect and dispose of product, as well as to inform consumers on how and where to dispose the products. To cover the costs associated with collection and disposal, consumers are faced with an additional charge on the consumer price (NCM, 2019).

The collection of cans and bottles for beverages differs a little from the remaining product groups included in the producer responsibility. An economic incentive to recycle aluminium cans, plastic and some glass bottles in the form of a refund when recycling is given. The refund system has been in place since 1984. Producers of beverages for commercial use (dairy products and juice exempted) are required to provide a possibility to recycle cans and bottles for refund (Förordning [2005:220]; NCM, 2019).

## 6.4 Transport

### 6.4.1 Tax and subsidies for vehicles

Vehicles such as cars, trucks, buses, tractors, and motorcycles are subject to annual taxation and in some cases subsidies or extra charge linked to levels of emissions of greenhouse gases. The annual base tax is 360 SEK (EUR 35) plus 13.53 SEK (EUR 1.32) per gram of CO<sub>2</sub>/km emission as declared in the vehicle documentation. For diesel cars an extra 250 SEK (EUR 24.3) is charged as an environmental charge (Swedish Tax Agency 2022j).

In 2018, a significant change in the tax and subsidy scheme for vehicles was made through the implementation of a bonus-malus system. The idea of the system is to reward vehicles that emit relatively small amounts of carbon dioxide (bonus), while burdening vehicles that emit relatively large amounts (malus). The system only applies to new cars that are registered after July 1, 2018.

The bonus is calculated on the basis of a number of parameters, with a maximum of 25% of the sales price at the time of purchase. For pure electric cars and hydrogen cars with zero emissions, the highest possible bonus was SEK 70 000 (EUR 6 803). For other cars, such as plug-in hybrids, the bonus decreased for every gram of carbon dioxide that the car emit according to the Swedish vehicle register. For a car registered the first time between April 1, 2021 and July 11, 2022, the bonus was calculated starting at 45 000 SEK (EUR 4 373) and deducting 583 SEK (EUR 57) for every gram CO<sub>2</sub> per kilometre that the car emits. (Swedish Transport Agency, 2022a). The bonus scheme was abolished with the new Swedish government during November 2022 (Regeringen, 2022).

The malus part implies that cars with higher CO<sub>2</sub> emissions (more than 60 g/kilometre according to tests in the WLTP cycle) pay an increased tax for the first three years after registration. This e.g., implies that vehicles registered between July 1, 2018, and March 31, 2021, are, for the first three years, subject to a yearly carbon dioxide charge of 82 SEK (EUR 8) per gram of CO<sub>2</sub> per kilometre if the vehicle emits more than 95 grams, but less than 140 grams of CO<sub>2</sub> per kilometre. If the vehicle emits more than 140 grams of CO<sub>2</sub> per kilometre, the charge is 107 SEK (EUR 10.4) per gram (Swedish Transport Agency, 2022a).

### 6.4.2 Tax on aviation

In 2017, a new act (Lag (2017:1200) om skatt på flygresor) was implemented which implies a new tax on aviation from Swedish airports. The new tax applies from April 1, 2018. The tax is paid per passenger and varies according to destination. The size of the tax was raised by January 1, 2021 to SEK 64 (EUR 6.22) for domestic flights and trips inside Europe, SEK 265 (EUR 25.75) for trips outside Europe at shorter distances than 6 000 km and SEK 424 (EUR 41.2) for trips with other destinations (Swedish Tax Agency, 2022k).

### 6.4.3 Road charges for heavy trucks for goods transport

Road charges was introduced in Sweden together with several other European countries in 1998 following the EU Directive (99/62/EC). From 2017, the charges concern trucks with a total weight of 12 tons, that are driving on certain roads in Sweden, Denmark, Luxembourg and The Netherlands (Swedish Tax Agency, 2022l). The road charge for trucks registered in Sweden with a total weight of 12 or 7 tons, and equipped with a traction device, varies between SEK 7 747 (EUR 753) and SEK 24 368 (EUR 2 368) per year depending on Euro class and the number of axles of the truck. The charges had not been adjusted since 2001, but by July 1, 2019, the charges were increased. At the same time the charges were differentiated to a larger extent with regard to Euro exhaust class (Swedish Transport Agency, 2019). The charge for Euro class V and EEV was further increased by 6% in January 2021. For the current road charges, see Table 30 below. Worth mentioning when discussing road charges, is the ongoing political debate about a possible change in the road charge. The existing road charge could be replaced with a road wear tax that varies depending on distance. One reason for the change is to correct for the competitive advantages for international trucks driving on Swedish roads (Nordic Council of Ministers, 2019). However, transportation of goods through foreign heavy trucks is still subject to a road tax when driving on certain roads. This tax is at the same level as for trucks registered in Sweden (Swedish Transport Agency, 2022b).



**Table 30. Annual Road charges in 2021, SEK (EUR)**

| Exhaust class  | Max three axles SEK (EUR) | More than four axles SEK (EUR) |
|----------------|---------------------------|--------------------------------|
| 0              | 14 534 (1 412)            | 24 368 (2 368)                 |
| I              | 12 633 (1 228)            | 21 093 (2 050)                 |
| II             | 11 001 (1 069)            | 18 346 (1 783)                 |
| III            | 9 565 (983)               | 15 939 (1 549)                 |
| IV             | 8 697 (845)               | 14 503 (1 409)                 |
| V and EEV      | 8 222 (799)               | 13 707 (1 332)                 |
| VI and cleaner | 7 747 (753)               | 12 912 (1 255)                 |

*Source: Swedish Tax Agency, (2022l).*

#### 6.4.4 Road toll and congestion tax

In Stockholm, a congestion tax was introduced in 2007. The tax is levied on vehicles passing the toll stations around the city centre, going either in or out, during peak hours of heavy traffic. The tax varies during the day with a higher tax during peak hours and a lower tax or no tax on hours when there is normally less traffic. The main purpose of the tax is to reduce congestion, improve accessibility and reduce emissions of CO<sub>2</sub> and air pollutants. Gothenburg followed the example in Stockholm and introduced a congestion charge in 2013. In Stockholm, the congestion charge is, at present, SEK 45 (EUR 4.4) at rush hour during high season. In Gothenburg, the tax concerns passages between 6 am and 6.59 pm during weekdays and is set to SEK 9 – 22 (EUR 0.87 – 2.14) per passage, depending on the time of the day. The revenue from the road charges is intended to finance new infrastructure projects in the regions.

An infrastructure charge for passing certain bridges has also been introduced in the cities of Motala and Sundsvall to finance the construction of bridges (Swedish Transport Agency, 2022c).

#### 6.4.5 Other subsidies

A decision from 2017 makes it possible for private individuals to apply for financial support when purchasing electric bicycles, mopeds, and motorbikes. This subsidy was active from February to October 2018, when the budget of SEK 350 million (EUR 34 million) was used (Swedish Environmental Protection Agency, 2019).

Subsidies up to 15 000 SEK (EUR 1 460) per charging point can be applied for charging of electric vehicles through "Ladda elbilen" for organisations that installs charging at tenant houses or workplaces, or through the "Climate leap" (Klimatklivet) for public charging stations (Swedish Environmental Protection Agency, 2022b).

## **6.5 Agriculture and natural resources**

### **6.5.1 Tax on gravel**

To reduce extraction of naturally occurring accumulations of gravel, a tax was introduced in Sweden in 1995. Gravel extraction for domestic use is exempt of this tax. Gravel can be used as a component in the preparation and production of concrete. Gravel suited for extraction is a finite natural resource which play an important role in for example producing drinking water through providing a natural cleaning process (Nordic Council of Ministers, 2019). Since January 1, 2021, the tax is SEK 17 (EUR 1.65) per extracted tonne (Swedish Tax Agency, 2022e).

### **6.5.2 Subsidies in agriculture**

In line with the Swedish implementation of the European Common Agricultural Policy (CAP), subsidies were available for farmers through the Swedish Rural Development Program. The program includes investment grants for young entrepreneurs, capacity building, cooperation and innovation, support to areas with natural constraints, animal welfare subsidies, ecological farming, and environmental and climate actions. Measures specifically contributing to climate change mitigation include those aimed at: increasing energy efficiency, production and use of renewable energy, conversion from fossil to renewable energy sources, improved manure handling, more efficient use of nitrogen and climate and energy advice, among others (The Swedish Environmental Protection Agency, 2021). An additional economic instrument targeted at farmers is the reduced energy tax for machines used in agriculture as well as tax on electricity consumption mentioned in section 6.1.2 and 6.1.3.

### **6.5.3 Tax on pesticides**

Since 1984, there has been a tax on pesticides with the purpose to reduce the consumption of pesticides in agriculture and thereby to reduce environmental and health effects accordingly (Nordic Council of Ministers, 2019). The tax is targeted at production and is paid per kilogram of active substance in the pesticide. In 2021, the tax was SEK 34 (EUR 3.3) per kilogram (Swedish Tax Agency, 2022f).

#### **6.5.4 Forest Policy and the Forest Act**

Under the Forest Policy, there are no production subsidies, and forest owners have considerable freedom and responsibility to independently conduct long-term sustainable forest management. The Swedish Forest Policy (as of 1993) states that forests and forest lands should be used effectively and responsibly in order to produce sustainable yields, the natural productive capacity of forest land should be preserved, biodiversity and genetic variation in forests should be secured, forests should be managed in a manner that enables naturally occurring plant and animal species to survive in natural conditions and in viable populations, threatened species and habitats should be protected and cultural heritage assets in forests and their aesthetic and social values should be safeguarded (The Swedish Environmental Protection Agency, 2021).

The regulations concerning nature conservation and cultural heritage in the Forestry Act include not disturbing important biotopes, buffer zones and arable land, and leaving older trees, high stumps, and dead wood in situ. Sustainable forest management influences carbon dioxide removals and emissions in various ways, through the production of renewable raw materials that can replace fossil fuels and materials that generate emissions of greenhouse gases while maintaining or increasing carbon stocks in biomass, soils, and harvested wood products (The Swedish Environmental Protection Agency, 2021).

With the purpose of protecting valuable biotopes, land can be purchased by the state for permanent protection of the land, or the state can provide monetary compensation to landowners for managing the land with the purpose of preserving and developing biodiversity and related values (NCM, 2019).

#### **6.5.5 Tradable quotas for fish**

With the purpose to reduce problems related to overfishing and low profitability in the fisheries sector, individual tradable fishing quotas was introduced in Sweden in 2009. Swedish marine fishery is overall regulated through EU's Common Fisheries Policy (CFP). Through negotiations between countries in the EU, a yearly limit or cap of each commercial fish species is decided, a so called total allowable catch (TAC). The TAC is then transferred and divided into quotas that are distributed and allocated to Swedish fishermen based on historical levels of fishing (allocation principle is called grandfathering). (NCM, 2019).

#### **6.5.6 Support for aquaculture and fishing**

Companies, government authorities, regions, municipalities, universities, scientific institutes, trade associations and recognized producer organizations can receive grants given in support of marine environment and conservation measures, e.g., for conservation projects to restore aquatic diversity (Swedish Board of Agriculture,

2022d). There are also subsidies given in support for aquaculture e.g., to reduce negative environmental effects or water use (Swedish Board of Agriculture, 2022e). Subsidies in support for fishing include, e.g., investments in selective gear and equipment that reduces the environmental impact of fishing (Swedish Board of Agriculture, 2022f). The support is granted by the Swedish Board of Agriculture.

#### **6.5.7 Support for re-wetting of wetlands**

In December 2020, the Swedish government decided on a new support scheme for re-wetting drained wetlands. This aims at providing climate benefits while strengthening biodiversity, balance water flows, increase the addition to ground water and reduce eutrophication. The rewetting of wetlands on peat soils are expected to reduce the CO<sub>2</sub> emissions caused by the drainage. The initiative is based on voluntary participation by landowners and SEK 350 (EUR 34) million was allocated for the support in 2021.



# PART 2

## OVERVIEW OF POLICES AND INSTRUMENTS TO PROMOTE CLEAN TECHNOLOGIES IN THE NORDIC COUNTRIES

The second part of the report presents an in-dept analysis of economic instruments the Nordic countries have implemented to promote clean technologies. Across six different chapters, we examine specific issues that covers cost-effectiveness, the EU Emissions Trading System, the choice of instruments that can influence the conditions for implementing a green industrial policy, correspondence between policies and the academic literature as well as a discussion on how small countries like the Nordic ones can affect the global environment by promoting clean technology and a shift towards a fossil free production. In addition to literature studies, the analysis is based upon eleven interviews with experts within policy, environmental and economic instruments in all of the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden). The aim of the interviews was to complement the desk research conducted in the initial stage.



## 7. Economic instruments intended to foster clean technologies across the Nordic countries

As previously mentioned, "clean technologies" can be defined in several ways, but the most common definition according to the International Energy Agency (IEA, 2022) is that clean energy technologies are low-carbon technologies which do not involve the production or transformation of fossil fuels; coal, oil and natural gas. Although "clean technologies" can be developed by businesses without political influence there is a global demand to promote the development of such technologies. Calmfors and Hassler (2019) state that the most efficient way for the Nordic countries to contribute to policies against climate change may be by promoting clean technologies. The focus should be on technologies where the Nordic countries have special expertise and that can get widespread use globally. The International Energy Agency (2022) estimate that the combined market for clean energy technologies will exceed the oil market size by 2030, which suggest that the Nordic countries would benefit from being part of this market.

This chapter gives an overview of the economic instruments chosen by the Nordics countries to enhance the development of clean technologies across the Nordic countries. It gives an overview of the results found in the conducted interviews and the desk research, mainly presented in Part 1 of this report. Overall, our study reveals that almost all the Nordic countries are utilising a mix of both environmental taxes and subsidies to promote clean technologies.

It became clear during the interviews that Iceland, Finland, Norway Sweden and Denmark have constructed specific environmental and energy policies to promote clean technologies. Nevertheless, each country has chosen various technological paths depending on national interests and circumstances.

In **Iceland**, the desk research and interviews indicate that the country is using a mix of both environmental taxes and subsidies to promote clean technologies. The Icelandic government has set a goal of reaching carbon neutrality by 2040, and tackle the issues of climate change, as well as a commitment towards achieving the UN Sustainable Development Goals.

During one of the interviews with a national expert from **Iceland** it was highlighted that subsidies with the incentive to promote e-vehicles in the country has been in place over the time period 2012 2017. This incentive has led to the fact that Iceland



in 2021 has Europe's second largest fleet of e-vehicles (including hybrid-plug in cars) per capita, followed by Norway which has the highest (European Alternative Fuels Observatory, 2021).

The **Icelandic** government has over a long period subsidised installations of residential geothermal energy systems. The expert interviewed on behalf of the Icelandic Climate Council mentioned that, as of today, about 90% of Icelandic households are being heated by geothermal energy. This is also highlighted as one of the success stories in light of the ongoing energy crisis in Europe and the green transition. The author of the book chapter Towards an Icelandic Sustainable Energy in Successful Public Policy in the Nordic Countries, (2022) argues that in the early 1990s, it was decided to promote clean technologies such as district heating based on renewable energy across Iceland. Energy security combined with improved air quality and environmental protection have been the main political arguments put forward as incentives to shift from fossil fuels, such as coal, to sustainable energy sources, such as geothermal heating.

Another **Icelandic** example highlighted during one of the interviews is related to the fact that a new tax on fluorinated gases was introduced in 2020 (see chapter 4.1.5 in part 1 for more details). Fluorinated gases are powerful greenhouse gas that has a global warming effect of up to 25 000 times greater than carbon dioxide. This new environmental tax was introduced with the aim to promote and accelerate the shift towards more climate-friendly alternatives. The experts argue that this tax has, in its short time, had a major positive impact on the environment.

The desk research and interviews indicate that **Finland** is using a mix of both environmental taxes and subsidies to promote clean technologies. During 1990, Finland was the first country to introduce a carbon-based energy taxation. Since then, the tax level has increased, and with time it is seen as a successful policy instrument (See chapter 3.1.1 for more details). Today, the requirements in the EU ETS system are viewed as an important aspect in the energy and industry sector. During the interviews the experts highlighted that subsidies for electrical charging stations for both domestic households and businesses was introduced in Finland as an incentive with the aim to enhance the development of clean technologies. Which in the long run is believed to reduce negative environmental impact. In addition, households are entitled to receive subsidies in order to replace fossil fuel-based heating systems with systems such as heat pumps or district heating, which generally has a lower climate impact and a higher energy efficiency.

During 2021, the **Norwegian** government launched a green transition campaign that is part of the new climate strategy plan (see part 1, section 5.1). It involved targeted subsidies for replacing all of the country's fossil fuels operated ferries to electrically operated ferries. This initiative also includes development of high-speed electrical charging stations for these ferries as well as for electrical cars. Other clean technology initiatives include subsidies to promote national development of

the battery value chain in Norway, thus attracting green investments and potentially creating new green jobs throughout the country.

In 2020, the **Norwegian** government also decided to provide funding for a Carbon Capture and Storage project named "Northern Lights" that include two different projects: a cement factory and a waste-burning facility (for additional information see chapter 5.1.8 in Part 1 of the report). The national expert interviewed argued that these fundings intended to reduce negative climate impact also could be seen as an economic instrument to promote clean technologies, which in the long run could create possibilities to export this technology and knowledge into the global market.

The desk research reveals that **Sweden** is using a wide range of economic instruments such as the CO<sub>2</sub> tax in combination with targeted subsidies to promote clean technologies. In 1991, the carbon dioxide tax was implemented for the first time in Sweden (see chapter 6.1.1 in part 1 for additional details). Over time the CO<sub>2</sub> tax has proven to be an effective tool for supporting the green transition. The tax has generated incentives for energy intensive industries to commit to phasing out fossil fuels in Swedish enterprises and boosted the demand for renewable energy solutions. In the long run contributing to reducing greenhouse gas emissions. Over a 30-year period, Sweden shows significant decoupling between economic activity and the country's carbon emissions, which can be attributed to the high CO<sub>2</sub>-tax levels combined with the requirements in the EU ETS and targeted subsidies towards the demand for clean technologies.

The features within the **Swedish** initiative the Industrial Leap Programme (see chapter 6.1.7 in part 1 for additional details) has been an important aspect in Sweden's green transition. As of today, this programme in combination with other economic instruments and targeted subsidies for clean technologies can be seen as a success story for promoting the development of clean technologies. Sweden's carbon tax levels are far higher compared to other developed countries in the world (except for the other Nordic countries). The country has been able to implement a relatively high level of carbon tax targeted towards the whole economy, in combination with sustainable development and developing a competitive industry.

A recent example of researchers arguing for the success of the carbon tax and the important role it has played in Swedish environmental policy was published in the chapter The Swedish Carbon Tax: A resilient success in Successful Public Policy in the Nordic Countries, 2022. One of the main points is that it requires time and broad political agreements to implement large-scale green transitions. Political success of the Swedish carbon tax has been gradually built up over time. Sweden's economy is characterised by major industries and incentives to spur the international competitiveness of these businesses has been one of the driving forces towards promoting clean technologies across several economic sectors.



**Denmark** have been providing subsidies for wind energy for a long time, thus the country is a world leader in both onshore and offshore wind energy. However, the Danish expert interviewed indicated that today's success is a result of the country being able to overcome several failures and challenges along the way. The expert argued that the Danish carbon tax has only had a minor impact towards promoting the development of clean technologies. They argued that the tax level is not high enough to impact the promotion of clean technologies. Since Denmark does not have large manufacturing industries the impact is quite small. Instead, the expert highlighted that the main driver behind the clean technology development in Denmark is related to the financial sectors growing interest over time to be part of the green transition, thus finding new assets and green investments.

Rinie van Est, (2022) states that in order for **Denmark** to become a world leader in wind energy it has required the country to utilise a combination of policies and their integration within energy, environment and climate policies. This has continuously provided incentives for research, development and related investments.

Furthermore, the Danish expert interviewed mentioned a growing interest from businesses and a shift towards sustainability over the past 10 years. Dialogues between industries, the commercial sector and the government has intensified in regard to finding clean solutions and new green markets. Danish businesses are interested in being part of the solution, finding innovative ways of contributing to the agenda 2030. The Danish Export Credit Fund has been working closely with businesses for a long time in supporting their ambitions and their aspiration towards the international market. In 2014, an innovation fund<sup>[5]</sup> was set-up to accelerate research, innovation and product development by activity investing in ideas, knowledge and technology, combined with incentives to accelerate a global transition through partnerships.

With the agreement on a new Climate Act in December 2019, it was decided to scale up previous initiatives and establish a special fund that aimed to finance projects which support the Paris Agreement on a global scale. To additionally stimulate the export of Danish clean technology solutions and strengthening research and innovation it was decided in 2020 to launch a Green Future Fund.<sup>[6]</sup> This initiative can be seen a major change in terms of environmental and climate policy in Denmark, as the set-up of this fund is targeted towards investments in renewable energy solutions and clean technologies.

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5. <https://innovationsfonden.dk/en>

6. <https://greenfuture.fund/>

## 8. Similarities between literature and practice

Part 1 indicates that taxes, fees, and other charges are used by the Nordic countries as one of the main economic instruments in environmental policies. Other economic instruments, such as subsidies, grants, and other support programmes are also prevalent. All Nordic countries take part in EUETS, and several have tradable quotas for fish. In this chapter the correspondence between the actual policies implemented in the Nordic countries and presented in Part 1 of this report and the academic literature will be examined. Insights from the interviews conducted with experts specialised on the topic in the Nordic countries will also be added.

The literature is consistent in stating that in order to effectively mitigate climate change a combination of economic instruments and policies are needed (see e.g., Bird, 2017; Grecker, Golombek and Hoel, 2019). This is also prevalent from the interviews and the compilation presented in Part 1 shows that the Nordic countries seem to have taken this to heart, with a vast variety of economic instruments used.

### 8.1 Market-based strategies

Markets-based strategies are used in the form of e.g., cap-and-trade systems, exemplified with the countries participation in the EU-ETS. Denmark, Iceland, and Sweden use tradable quotas in the fishing sector to reduce problems related to overfishing, as well as to improve economic efficiency. Taxes are used to a large scale in all of the Nordic countries, e.g., in regard to fossil fuels and electricity, transport, waste, and various environmentally harmful substances. Bird (2017) states that taxes on energy and fossil fuels generally remain significantly higher in the Nordic countries, than the rest of Europe. One of the Swedish experts stated in their interview that Sweden has succeeded in introducing a tax regime and a CO<sub>2</sub> tax level that deviates from the international norm, where the interest of industries have been taken into account when designing the tax scheme. Sweden has a relatively high CO<sub>2</sub> tax and have been able to maintain a prosperous economic development, as well as maintaining a competitive industry.

Cullenward and Victor (2020) state that direct subsidies and renewable mandates has been far more impactful than real-world carbon prices. In interviews with Danish experts the subject of carbon dioxide tax and its influence towards promoting clean technologies was highlighted. As previously mentioned in section 7, one of the Danish experts argued that the current tax level in Denmark is not high enough to have a substantial impact towards the promotion of clean technologies. The development of clean technologies is more often driven by the financial sector and their need to look for new types of investments.

We examine the use of subsidies and other forms of support further within the next section.

## **8.2 Direct subsidies, other forms of support and renewable innovations**

Macfarlane and Mazzucato (2018) list common funding instruments in regard to environmental policy: provision of loans, grants, guarantees and equity finance, and usual advisory services: strategic planning, capacity building, and training programmes. Part 1 describe Iceland's support for reforestation, revegetation, afforestation and wetland reclamation, in which public funding is used in various forms, such as grant schemes, collaborative projects and direct financial assistance. Bird (2017) argues that all Nordic countries run wide-ranging clean energy research programmes and support industrial investments in energy-saving and low-carbon technologies. This corresponds to Part 1 of this report, see e.g., Norway's Carbon Capture Storage project with the purpose of finding suitable places in the North Sea to store carbon dioxide, the Swedish initiative the "Industrial leap" or the Danish Rural Development Programme, which aims to promote the competitiveness of the agricultural sector and enhance the green transition.

Greaker, Golombek and Hoel (2019) argue that a potential benefit for the Nordic countries when subsidising clean technology development is that other states can get access to cheaper abatement options. This may be a more efficient way to support research and development (R&D), as well as achieve technological change. However, there could be a potential conflict between developing technology for which Nordic countries have comparative advantages and developing clean technologies for foreign markets.

Bird (2017) presents some environmentally friendly innovations that are common in the Nordic countries, e.g., innovations including low-energy construction, district heating systems and waste and organic materials used as an energy source. Part 1 shows that Finland uses a feed-in tariff system for which existing power plants fueled with wind, biogas, forest chips or wood-based fuels meeting the prescribed preconditions can be approved. Both Sweden and Denmark subsidise the production of renewable energy through various renewable sources, e.g., biogas, wind, solar, and biomass.

Bird (2017) states that biogas is increasingly being produced from agricultural residues and organic household waste. Waste that cannot be recovered and recycled can today be safely incinerated to generate energy instead of being dumped into landfill sites. This can be found in several of the Nordic countries. Bird further states that the Nordic countries have incentivised the use of renewable energy sources even when it has not been the cheapest option in the short term, e.g., as seen in Part 1 Iceland uses tax incentives to encourage environmental-friendly investments. This motivates businesses to invest in environmental-friendly options even if these have a faster depreciation than other.

Bird (2017) states that the Nordic countries' advanced cross-border electricity market facilitates the greater use of renewable energy, since fluctuations in production often even out between regions, and can be balanced by flexible hydropower production. Part 1 explains the electricity certificate system between Sweden and Norway. In short, the system is a subsidy scheme with market features where producers of renewable energy receive a certificate for every produced unit of energy (MWh), which can be sold. However, the Swedish government have decided that new facilities may not be eligible for the system after December 2021.

## **8.3 Technology-supporting and market-driving instruments**

Swedish Agency of Growth Policy Analysis (2018) has together with Frishammar and Söderholm analysed the state's role in connection with sustainable capital-intensive investments. They argue that in order to achieve good 'green industry policies' a country needs to implement a combination of technology-supporting, market-driving, and system-wide policy instruments. Technology-supporting instruments aim to address systemic weaknesses in the access to information, knowledge and resources that risk leading to underinvestment in R&D and innovation, and/or lack of cooperation or institutional inertia. Market-driving instruments aim to influence weaknesses in the will or ability of potential customers/users to demand new technologies or innovations, e.g., through technology-specific support for new technology (such as feed-in tariffs, e.g., Swedish electricity certificate system for renewable electricity). Frishammar and Söderholm argue that technology-specific support for new technologies (such as feed-in tariffs for solar and wind power) tends to be more innovation- and

technology-driving than, for example, quota obligations.

Examples of technology-supporting instruments used in the Nordic countries include the Swedish support programme the Industry Leap ('Industriklivet'). As a subsidy scheme for climate investments aimed towards the industry sector, it includes financing of research, feasibility studies and investments relating to other greenhouse gas emissions. One of the Swedish experts interviewed stated that this programme has been very important for the development of clean technologies including CCS technology. Other examples are found in Denmark's energy and industry sector, where key elements include initiatives such as the establishment of the world's first energy island in the North Sea, research in clean technologies such as Carbon Capture and Storage (CCS) and large capacity wind turbines, green district heating and support to biogas. Like previously stated, Norway and Sweden have subsidised a Carbon Capture Storage project.

Examples of market-driving instruments is subsidies or tax cuts for zero or low emissions vehicles. As mentioned in Part 1, generous tax incentives have contributed to a large number of electrical cars in Norway. Statistics Norway (2022c) reported that two thirds of all new cars sold in Norway were electric in 2021. Most of the Nordic countries use market-driving economic instruments in order to incentivise purchases of zero or low emissions cars to some extent, e.g., through reduced VAT which is used in Iceland. Part 1 shows that the Nordic countries use deposit-refund systems and producer responsibility in order to steer the market towards environmental friendlier actions. Producer responsibility means that producers have the responsibility to collect and dispose of product, as well as to inform consumers on how and where to dispose the products.

Two specific types of market-driving instruments mentioned are tender procedures, where the quantity to be produced from a given technology is determined first, e.g., wind power in Denmark, and public procurement of new 'green' technology. The latter implies that public institutions are encouraged or instructed to include environmental impact as a variable when they perform a public procurement process (Swedish Agency of Growth Policy Analysis, 2018). For example, in Finland the government decided with the act on public contracts to encourage contracting authorities to take environmental considerations into account, and the Finnish government argue it is a highly suitable procurement criterion alongside price and other alternatives (Ministry of Economic Affairs and Employment, 2022e).

## 8.4 Criticism and obstacles

Although there are examples of international, as well as Nordic, cooperation (see e.g., Bird, 2017; Greaker, Golombek and Hoel, 2019) Greaker, Golombek and Hoel (2019) arguing that Nordic climate policies still have too much of a country focus. Several of the interviewed experts stated that the cooperation between the Nordic governments has slowed down over the years. One of the Swedish experts stated that it was easier and more convenient to reach out to other Nordic governmental experts in the past. Additionally, several of the experts interviewed argued that the Nordic countries should promote international acceptance across the broader society, and that governments need to present effective policy instrument to promote clean technologies and securing commitment towards a sustainable development.

Greaker, Golombek and Hoel (2019) highlight a few obstacles for the Nordic countries. They argue that the emission standards set by the Nordic countries may spur domestic research and development (R&D), but standards that are higher than other countries will, as long as trade barriers are moderate, also trigger more R&D in other countries. Consequently, the domestic green industry does not get a first-mover advantage by this policy. On the other hand, the policy may lead to more intense competition between abatement technology suppliers, thereby improving welfare. They argue that a subsidisation towards domestic firms' R&D, should always accompany the efforts to create a larger home market for clean technologies. Secondly, the aim of reducing emissions from domestic transport set by Nordic countries may be dependent on imports of first-generation biofuels from developing countries. Imports of biofuels could induce emissions from land use change in the exporting countries that off-set all, or more than, the emission reductions in the importing countries. In Finland, Sweden and Norway, there are plans for building biofuels factories based on forestry residues. Greaker, Golombek and Hoel (2019) argue that Nordic governments should ensure that the chosen bio-refining processes contribute to technological development for advanced biofuels, and that the chosen processes are relevant for other kinds of cellulosic feedstock. A third example involves the use of absolute targets as a form of instrument to promote clean technologies, which the authors above argue risks promoting technologies that are dead ends. Lastly, Greaker, Golombek and Hoel (2019) argue that ignoring interactions between domestic and foreign climate policies could undo benefits of well-meaning climate policies.

During interviews with experts from the Nordic countries a few common threads could be identified when it comes to challenges in designing and implementing different economic instruments.

Both Sweden and Denmark mentioned policies/instruments where there is an unclear relationship between the environmental problem and the incentives, their examples being related to the tax on plastic bags in Sweden and the tax on aviation tickets in Denmark. The correlation between the environmental problem and the incentives is weak, and governments tend to overestimate that imposing a new environmental policy and related economic instrument would have a positive impact without sufficient systematic economic analysis. This relates to Greaker, Golombek and Hoel (2019) who state that it is hard to say how easily consumers will adapt to e.g., flying less. Further, they argue that no country can currently predict exactly what it will cost to become a 'low-emissions society'. It is difficult to predict future cost reductions for renewable power, batteries and hydrogen-based solutions, and it is difficult to say how easily consumers will adapt.

Aviation taxes are used in several Nordic countries to mitigate the environmental impact. There are several types of aviation taxes such as ticket taxes, Value added tax, taxation on aircraft fuel, environmental taxes and taxes for air cargo. In 2019, a study by the Directorate-General for Mobility and Transport at the European Commission modelled the effect of the change in the taxation regime, in terms of various impacts, such as potential CO<sub>2</sub> emission reductions from the aviation sector across member states, including some of the Nordic countries. The different impact tax scenarios illustrated that in Sweden an abolition of the ticket tax could *increase* the CO<sub>2</sub> emissions with 4% from 2.5 to 2.7 Mton. An introduction of an aviation ticket tax in Finland, could *decrease* the CO<sub>2</sub> emissions with -4% from 2.1 to 2.0 Mton. A similar pattern can be seen for Denmark, were introducing a ticket tax could *decrease* the CO<sub>2</sub> emissions with 4% from 2.7 to 2.6 Mton.

Moreover, introducing a fuel excise duty could *decrease* the CO<sub>2</sub> emissions from the aviation sector at a higher rate, ranging between -8% in Sweden, -9% in Denmark to -12% in Finland compared to current situation according to the modelled results (European Commission, 2019b). The aviation tax can be seen a model for more climate protection to combat climate change and the goals set by the Paris Agreement. The Nordic governments could create policy programmes that aims to decrease the costs for low carbon projects that provides incentives to promote emission free aviation such as electric and hydrogen planes.

Fossil Free Sweden presented a road map in 2018 for transforming the aviation industry to 2030. The road map highlighted one of the largest obstacles for introducing fossil-free fuel into in the aviation sector is related to the lack of market forces to push the development. Governmental support for commercialising the product processes of bio-jet fuels is needed in both Sweden, and the other Nordic countries in order to create sustainable aviation sector (Fossilfritt Sverige, 2018).

Internal contradictions or bureaucracy may create problems in the green transition. One of the Danish experts interviewed mentioned that despite the country's

ambitious goals on expanding offshore renewable energy sources, the permitting process has created an obstacle. The permitting process may take up to six years. Furthermore, the expert highlighted that the shift from conventional towards organic farming is a sensitive topic in Denmark. The agricultural sector receives large subsidies from the EU, thus there are strong lobbying behind each initiative. Committing to a shift to organic farming requires large investments, which conventional farmers have small possibilities to make, due to low price elasticity for their products. As they struggle to preserve their agricultural production in the long run, it is difficult to fully commit towards the shift needed.

Several experts stated that lobbying organisations with strong opposition towards the implementation of new environmental taxes have raised issues in several Nordic countries, such as Denmark, Finland and Iceland. Many of these groups have a large influence and can negotiate to be exempt from new taxes. This also become a problem when removing a subsidy, as organisations that have benefitted from the subsidy may use their lobbying power to impact the policy outcome. The industries across the Nordic region have been given tax rebates and exemptions to protect its competitiveness on the international market. Overall, it can reduce the effectiveness of the economic instruments.

A wide acceptance of the profound consequences of climate change within the society is needed in order to make a positive policy change. Several of the experts interviewed highlighted that one of the challenges in the Nordic countries is obtaining an acceptance regarding the consequences of climate change across social groups and regions.

## 8.5 Conclusion

This chapter makes it clear that there are many similarities between theory and practice. Market-based strategies, such as environmental taxes, seems to be most common in the Nordic countries. Direct subsidies and other forms of support, such as research programmes are also common. All Nordic countries use a vast variety of policies, just like highlighted as important by scholars. However, it is also prevalent that, although there are similarities, scholars do not always agree with the instruments used. Further, there are risks associated with some of the instruments used. This is also somewhat corroborated by the interviewed experts. The reviewed literature emphasizes that more international cooperation is needed, and the experts interviewed highlight that cooperation between the Nordic countries has decreased over time. The interviews also highlighted that there are other challenges the countries are subject to, such as lobbying organisations who disagree with the implementation of new environmental taxes. Conclusively, there are a wide range of examples of similarities between what instruments or policies theory suggest and what the Nordic countries use, but there are also risks associated with the chosen instruments.



# 9. Policy instruments needed for implementing a green transition in the industry

In this chapter, we will discuss what types of policy instruments that are needed for a green transition in the industry. Our starting point is in pricing policies, and we then continue to discuss complementary policies, using a framework proposed by Michael Grubb and others (2017).

## 9.1 Carbon pricing and complementary policies

Standard economic theory suggests that carbon pricing– either through a carbon tax or cap-and trade – factoring in the environmental costs of the myriad decisions through which we emit carbon is the most cost-effective way to incentivise greenhouse gas emission reductions (Nordhaus, 1996). There are many good arguments for why a global uniform price of carbon for all sources and countries, in combination with technology policies to internalise the positive externalities of innovation, is appealing (Baranzini et al., 2017). However, the implementation of such an integrated global scheme has proven to be politically and practically challenging (Victor, 2005; Ostrom, 2014).

The global climate regime, as formalised in the Paris Agreement, is instead characterised by an increasingly decentralised and polycentric policy landscape (Jordan et al., 2018; Livingston et al., 2018). The main thrust in the global climate policy arena currently originates out of domestically or regionally driven policies including cap-and-trade systems, carbon taxes, and sectoral and regulatory policies aimed at improving energy efficiency and developing and deploying renewable energy sources and zero carbon technology (Green et al, 2014; Meckling et al., 2015). Still, progress is needed on several fronts. IPCC:s 6th assessment report (IPCC AR6 WGII, 2022) describes how limiting warming to 2°C at this point may require “unprecedented” government policy and cooperation that extend beyond what the IPCC could identify as plausible “best case” examples from history (Erickson and Achakulwisut, 2022). Thus, there is a need to develop complementary policies and business models as well as collective initiatives to be part of an overall portfolio of policies and strategies, which can complement “conventional” carbon pricing and channel an increased willingness to contribute towards combating climate change in business and among the public (Tvinneim and Mehling, 2018; Stoll and Mehling, 2021).

## 9.2 The three domains framework

Grubb et al (2017) present a framework for categorising the processes involved in transforming complex systems, for example for transforming the economy to very low carbon emissions. The framework consists of three behavioral domains (Grubb et al, 2017 pp. 23–24):

- The first domain addresses the “behavioral, social and contractual characteristics that influence (and frequently impede) the adoption of existing, cost-effective technologies”. This domain is targeted towards individuals and industries. Economists use the term ‘satisficing’ behavior – the term used to reflect situation in which people appear to be ‘satisfied enough’ not to change demonstrably sub-optimal conditions.
- The second domain characterises optimising behaviour. This domain is targeted towards industries and potentially some individuals. Here consumers, firms, and other agents, following the principles of neoclassical economics, minimise costs and maximise revenues or other benefits.
- The third domain addresses “evolutionary and institutional processes” including technological innovation, research and development, but also the role infrastructure, institutions and networks in technological and societal change processes. This domain is targeted towards governments and potentially industries.

These three domains require different types of policy instruments, which is listed below in table 31.

**Table 31: Overview of the three domains main policy instruments**

| Domain              | Main policy instruments                                  | Outcome                                                            |
|---------------------|----------------------------------------------------------|--------------------------------------------------------------------|
| Domain 1. Satisfice | Regulation, standards, information, labelling            | Smarter choices                                                    |
| Domain 2. Optimise  | Carbon pricing, use of markets to increase effectiveness | Incremental improvements leading to cleaner products and processes |
| Domain 3. Transform | Strategic investment, innovation support                 | Innovation, infrastructure, new products and services              |

*Note: Adapted based on Grubbs et al, 2017*

Pricing policies assume that self-interested individuals and organisations will adopt cost-effective technologies, but practical experience shows that people often will fall short of this. For instance, although most car owners know that pumping the tires will reduce fuel consumption and costs, they fall short of doing this.

Table 31 indicates that one type of policy instrument, for instance carbon pricing, is attributed to one domain, in this case Optimising. This is a simplification since carbon pricing is also relevant for sufficing and transforming. Environmental regulation (Domain 1) can stimulate innovation (Domain 3). To be precise, Grubb et al. (2017) presents a domain-policy matrix.

## 9.3 Three examples

Using three examples, we illustrate the role of different types of policy instruments in supporting the implementation of low carbon technologies in Sweden.

### 9.3.1 First example – Wind power

The first wind power installations were developed in the 1970s, but without being implemented in any significant scale. During the 1980s wind technologies were further developed and from approximately year 1990 wind power experienced a substantial market growth. This early growth has been attributed to R&D in combination with growing experience through testing centers and deployment (Klaassen et al, 2005, Zachman et al, 2014). After gaining experience from this initial technology development, wind power then experienced a significant market growth between year 2000 to 2020, mainly due to different policies that created market pull – state subsidies, regulation, carbon pricing and other market-based instruments.

EU policies have supported this growth. The renewable energy directive (European Parliament, 2003) regulated renewables by setting a goal to reach at least 20% renewables by the year 2020, with differentiated obligations on each member state, where Sweden was given the highest goal of 49%. In 2018, the EU directive was updated with a target of 32% renewables by year 2030 (European Parliament, 2018).

An important instrument for Sweden to reach its renewables target was the introduction of tradable green certificates, implemented jointly with Norway in 2003 (and is planned for closure in 2035). Producers of renewable power production (wind, photovoltaic new hydro) are awarded green certificates and a demand for these was created by adding a quota obligation on electricity retailers to purchase these certificates corresponding to a share of their power sales (Swedish Energy Agency, 2020). From 2020, emissions trading has also been important for the growth in wind. The EU emissions trading system (EU ETS) was established in 2005 and puts a price on carbon emissions. However, due to a surplus of emission

allowances, the carbon price was low for a long time (between €3 and €8 per ton during 2013–2017 (ICAP, 2022) and irrelevant for incentivising low carbon technologies. Nevertheless, in 2018, the EU ETS was reformed which led a significant increase in allowance price, from €8 in 2017 to between €31 and €84 in 2021 (ICAP, 2022). This has led to phasing out coal in favor of natural gas and renewables.

When the technologies became interesting alternatives in the energy systems there were impediments due to public acceptance (Klaassen et al, 2005), planning permissions, grid connections and challenges due to inherent characteristics of intermittent production with need for backup systems. In the early years it was understood that grids could cope with no more than 5 to 10% of the total production (Grubb et al, 2017). The emergence of improved power electronics, interconnecting national grids and creation of markets with responsive demand has dramatically changed this.

Looking forward, according to the industry body Wind Europe, slow permitting procedures permissions constitute the main barriers to the introduction of new wind within the EU (Komusanac, 2022). In Sweden for instance, following often long permitting procedures, municipalities can put in a veto against new establishment. This is expected to stall the development after 2026 (Energiforsk, 2022). This can be explained by split incentives - that the municipalities have few benefits of new wind power (and sometimes negative effects on recreation and tourism), while the earnings go to the owners. The Swedish defense authority also regularly puts in veto against offshore wind (Karlsson, 2021).

The example of wind power illustrates that the introduction of renewables is a result from innovation programs (Domain 3), followed by subsidies such as feed-in tariffs (Domain 3) and market mechanisms such as EU ETS and green certificates (Domain 2). Future expansion is most likely market driven (Domain 2), but also governed by public acceptance and permitting procedures (Domain 1).

### **9.3.2 Second example – Domestic heating and road transportation**

Sweden was together with the neighboring Nordic countries among the first countries in the world to adopt a carbon tax in the early 1990s (Hammar et al., 2013), and today has one of the highest carbon prices in the world (World Bank, 2022). The full carbon tax rate is levied on heating fuels (used by individual households or for district heating) and transport fuels. Evaluations of the Swedish CO<sub>2</sub> tax suggest that the tax has successfully contributed to reducing emissions from these sectors relative to a business-as-usual scenario (Tvinnereim & Mehling, 2018; Andersson, 2019). Hammar et al. (2013) describe how the CO<sub>2</sub> tax has incentivised fuel switching in the district heating sector where biofuels and other non-fossil energy sources have largely replaced fossil fuels. Dzebo and Nykvist (2015) describe a similar development related to heating of single-family houses

where the carbon tax has contributed to driving fuel switching, energy efficiency improvements and replacement and conversion of individual heating systems. However, in both cases, the phasing out of fossil fuel have been the result of a combination of economic instruments.

### **Domestic heating**

The Swedish municipal district heating systems which were expanded rapidly in the 1960s and 1970s initially relied predominantly on oil as fuel (Werner, 2017). However, the oil crisis in the 1970's spurred municipal energy companies to search for alternatives including both traditional fuels such as coal, wood fuels and peat, but also new fuels and heat sources such as municipal solid waste (MSW) and industrial surplus heat (Di Lucia and Ericsson, 2014). Thus, the diversification of the fuel mix begun well before the CO<sub>2</sub>-tax was implemented. Di Lucia and Ericsson (2014) describes how the introduction of the Swedish CO<sub>2</sub> tax, governmental investment schemes (1991–1996 and 1997–2002) to support construction of new biomass-fired CHP plants, and initially also the retrofitting of fossil-fired CHP plants for the use of biomass-based fuels, in combination with the introduction of Tradable Renewable Electricity Certificates in 2003 where all important pillars in the switch away from fossil fuels. Similarly, to promote away from fossil fuel in the single-family heating market multiple instruments including, e.g., R&D support for technological development and investment subsidies for heat pumps and wood pellets heating systems, building regulation and information campaigns promoting energy efficiency (Johansson, 2017) were enforced in parallel to the carbon tax.

The example from the heating sector illustrates how the switch away from fossil fuels in the Swedish domestic heating sector has been the result of a combination of instruments. The CO<sub>2</sub> tax (Domain 2) has been complemented with a portfolio of policy instruments including governmental innovation programs and support schemes (Domain 3) and in the case of heating in single family houses information campaigns (Domain 1).

### **Road transportation**

At 15 MtCO<sub>2</sub>-eq per year road transport account for roughly a third of Swedish territorial greenhouse gas emissions and while emissions per km travelled have gradually been reduced, emissions reductions in absolute terms have been small. While alternative drivetrains (i.e., battery electric or fuel cell vehicles) have been on the horizon for decades, but remained to costly or impractical, efforts to reduce greenhouse gas emissions from road transportation have since the 1990s largely focused on implementing stricter fuel and emissions standards, and fuel switching in internal combustion engines. Expenditures on policies (including R&D, infrastructure and sales incentives) to develop and deploy plug-in electric vehicles (PEV) in Sweden has until recently in an international comparison been relatively low (Wesseling, 2016). A recent public inquiry (SOU, 2021:48) suggested, among

other things, further public efforts to accelerate and coordinate the deployment of charging infrastructure and actions to put into place zero emissions vehicle mandates on the EU level.

Tvinnereim and Mehling (2018) describe how the Swedish carbon tax (Domain 2 policy) has contributed to incremental emissions reduction but argues that the transformative technological shift required to achieve deep emission reductions from the transport sector requires a broader policy portfolio. A combination of fuel economy and emissions standards (Domain 1) has put pressure on manufacturers in the EU and United States and beyond to improve combustion engine performance (An et al., 2010) and in the Swedish context a greenhouse gas reduction obligation (Domain 1) which mandates fuel distributors to reduce the climate impact of their gasoline and/or diesel (i.e., through gradual increases in the biofuel blend) has contributed to put downwards pressure on emission. There is plenty of evidence to suggest that the more transformative technical shift away from internal combustion engines to electric vehicles (and possibly fuel cells in certain segments) will require policies targeting all domains (Domain 1–3). Actors on the rapidly growing markets for battery electric vehicles have already benefited from e.g., spillover effects resulting from improved performance and reduced cost in battery technology in other sectors (Stephan et al. 2020), innovation driven by RD&D (Domain 3) and performance standards (Ye et al., 2021) (Domain 1), policy efforts to encourage the uptake of EVs (including e.g., traffic control incentives and fiscal incentives) (An et al., 2011; Barton & Schütte, 2017).

Further efforts to increase the market share of battery electric vehicles (and other zero emission vehicles) include information (Domain 1) to overcome skepticism (e.g., range anxiety), a massive and coordinated effort to ensure access to charging infrastructure (Domain 3) along continued measures to price CO<sub>2</sub> (Stock, 2021; Johansson et al., 2021).

Electric vehicles (battery electric, plug-in hybrid and hybrid electric) are finally becoming mainstream on the vehicle markets in many parts of the world, including in Sweden. As briefly discussed, the R&D and early deployment process has been long and involved a wide set of policy instruments, across many countries, including innovation policies (Domain 3) carbon pricing (Domain 2) and standards and information (Domain 1). The full transformation of road transportation will most likely require further infrastructural support (Domain 3) and potentially phasing-out policies, e.g., in the form of bans (Domain 1).

### 9.3.3 Third example – Bio energy carbon capture and storage in Sweden

Negative CO<sub>2</sub>-emissions are prevalent in most global emissions pathways that meet the Paris Agreement temperature targets and are a critical component for reaching net-zero emissions in year 2050. According to Sweden's climate target, greenhouse gas (GHG) emissions should be at a net-zero level by year 2045 (Swedish Government, 2017). This includes a reduction of domestic emissions of at least 85% (relative to the level in year 1990) and offsetting up to 15% of emissions. A recently conducted public inquiry in Sweden (SOU2020:4) has examined the supplementary measures (Swedish Government, 2020) and has identified BECCS as the most promising source for creating offsets, with an estimated potential in Sweden of over 20 Mt CO<sub>2</sub> per year (Johnsson et al., 2020).

In principle, there is little difference between Bio Energy Carbon Capture and Storage (BECCS) technologies and capture fossil-origin emissions (CCS). The post-combustion capture technology is a commercially available technology that has been used in the chemical industry for several decades (Bui et al., 2018) and which is also applied in current CCS schemes.

However, economic incentives supporting commercialisation and deployment of BECCS are missing. A common way to create incentives for reducing the environmental impact of emissions is the so-called *Polluter Pays Principle*, PPP. But in the case of BECCS, there is no pollution, but instead a common benefit (or a *positive externality*). Who should pay for this positive externality? This situation requires other types of funding and policy models than used for pollution abatement.

Zetterberg et al (2021) identifies five different models for creating incentives and financing for BECCS, using Sweden as an example: 1) governmental guarantees for purchasing BECCS outcomes; 2) quota obligation imposition on selected sectors to acquire BECCS outcomes; 3) allowing BECCS credits to compensate for hard-to-abate emissions within the EU ETS; 4) private entities for voluntary compensation; and 5) other states acting as buyers of BECCS outcomes to meet their mitigation targets under the Paris Agreement.

In 2021, the Swedish government commissioned the Energy Agency to implement a support system for BECCS based on Model 1 type in the form of a reversed auctioning system, where potential producers of BECCS can present bids and the government can choose producers with the most appealing bids (Swedish Energy Agency, 2021). This policy is an example of a Domain 3 policy, with the government as a procurer of BECCS, a positive externality.

BECCS has also acquired funding from two major innovation programs – the Swedish "Industriklivet" program and the EU Innovation fund (Domain 3).

Sweden's government support programme will be important for establishing the first-of-a-kind installations, which will provide lessons for the next generation of production units. Nonetheless, after this initial funding instrument, other policies are needed to scale up this technology. For instance, this could be that the government imposes a quota obligation on selected sectors to acquire BECCS credits corresponding to a share of their emissions. This would broaden the financing basis and reduce costs for the state. It would increase the demand for BECCS and contribute to scaling up and optimising the technology (Domain 2).

In later years, interest in carbon offsets on the voluntary market has increased as corporations adopt net-zero GHG targets that will require offsetting to meet their climate targets (Hamrick and Gallant, 2017). Voluntary carbon markets have so far included, inter alia, forestation activities, biochar, enhanced soil carbon sequestration, increased use of wood in buildings, direct air capture technologies, and enhanced weathering<sup>[7]</sup> (Poralla et al., 2021; PuroEarth, 2021). Once BECCS is implemented, BECCS credits could be included to this market. Voluntary markets strongly depend on engaged consumers that have expectations on the firms they want to buy products and services from (Domain 1). Voluntary markets could in the long run support the growth and optimisation of BECCS (Domain 2).

In summary, experience shows that pricing is not enough to drive deep decarbonisation in industry. Other types of policy instruments are needed. Grubb et al (2017) argue that the current landscape of policy instruments address three different domains of behavioral processes: Domain 1- satisfying behavior; Domain 2 – optimising behavior; and Domain 3 - evolutionary and transformative processes. These three domains require different types of policy instruments:

- **Domain 1** policies (addressing adoption, satisficing, engagement) requires instruments such as:
  - Standards
  - Information
- **Domain 2** policies (addressing optimising, cost effectiveness and scaling up) requires instruments such as
  - Pricing policies, for instance taxes, emissions trading
  - Tradable green certificates

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7. Enhanced weathering is a theoretical method of removing CO<sub>2</sub> by spreading finely ground rock material on land, beaches, or sea. It mimics the natural weathering of rocks, which absorbs about one billion tonnes of CO<sub>2</sub> annually.



- **Domain 3** (addressing transformative changes) requires instruments such as:
  - Innovation and investment support. This is often needed at early stages of technology development, particularly for transformative technologies, shifting from one technical solution to another whilst fulfilling the same societal needs. For instance: EVs replacing combustion engines; hydrogen direct reduction replacing blast furnaces in the iron and steel industry.
  - Support and development of infrastructure for new technologies, for instance charging infrastructure for EVs, building power transmission capacity from new wind farms and to electrified industries, transport and storage of captured carbon dioxide. This type of support is often state-run.

These three types of policies depend on each other and interact. For instance, the establishment of transformative technologies is not an outcome of mere strategic innovation, but pricing and engaging instruments are also needed.

# 10. Towards a cost-effective and green taxation system in the Nordic countries

## 10.1 Cost-effective environmental taxes in theory

Taxes directly address market failures that causes markets to ignore environmental impacts. A well-designed environmental tax increases the price of a good or activity to reflect the environmental cost it imposes on others. The cost of the environmental "externality" – is thereby internalised into the market prices (OECD, 2011). This ensures that consumers and firms take these costs into account in their decisions. In theory it is easy to introduce a cost-effective environmental tax scheme for clean technologies: Implement environmental taxes as high as the external cost for every unit of emission. According to economic theory all measures to reduce the emissions that cost less than or equal to the external cost will be implemented by actors as they take the cost of tax payments into account. Furthermore, the polluter pays principle would be fulfilled and the government will receive revenues, making it possible to lower other taxes that instead inhibit the economy, such as income taxes.

## 10.2 Obstacles for cost-efficiency

Do we have a cost-effective taxation system for clean technologies in the Nordic countries? No, the taxation system is far from cost-effective. In general, the taxation system in the different Nordic countries is non-cost-effective for several reasons:

- There are several environmental taxes on carbon dioxide, while other emissions in many cases lack taxation. Those emissions are often regulated in other ways, but if allowed, other emissions are usually free to emit up to emissions limit values of other regulatory instruments such as licenses.
- Carbon dioxide taxes have very different levels in different countries worldwide. This makes the system cost-inefficient on an international level. The marginal cost to emit one unit of carbon dioxide varies also greatly between countries.

- The same is true when we examine the Nordic levels. Carbon dioxide taxes differs significantly between the Nordic countries, see part 1 of this report. For instance, if a low carbon technology, profitable in one Nordic country, is non-profitable in another Nordic country this will lead in cost-ineffective decisions on reducing carbon dioxide on a Nordic level.
- Also, the national taxations systems for carbon dioxide are non-cost effective as different economic sectors have different tax levels for carbon dioxide. All Nordic countries have exceptions for different sectors that pay less, or no tax for climate emissions. For example, exceptions existed for the shipping industry and operators included in the European Emission Trading System, the EU ETS-system resulting in different actors facing different levels of carbon prices. Hence, a typical car owner, facing a higher carbon price will usually be willing to pay more to lower its emissions, than a typical ship owner making the investments in clean technology suboptimal. The proposal adopted by the European Commission to include maritime transport activities in the EU ETS will reduce price differences and suboptimality.

There is a plethora of reasons behind the use of different carbon prices levels, one of the most prominent relates to the fact that national policymakers tend to take international competition into account, thus avoid taxing national companies much higher than their international competitors (OECD, 2022b).

### 10.3 Economic policies for increased cost effectiveness

Since there are many reasons behind the non-cost-effectiveness of the taxation system today, there are many possible policy changes which can increase the cost-effectiveness. In this section, we will discuss what the Nordic countries can do, in order to contribute towards a more cost-efficient green taxation system on an international level. The policy changes discussed are listed below.

- Including more activities and countries in the EU ETS-system
- Use the same tax level for each type of emissions
- Less exemptions and reduced taxes
- More equal tax levels between countries
- Taxes on consumer goods, instead of on the producer
- Implement environmental taxes on other emissions as well

## Including more activities and countries in the EU ETS-system

The most common exemption from paying carbon dioxide tax in the Nordic countries are operators listed within the EU ETS system. The EU ETS system includes all EU countries and Norway, Iceland, and Lichtenstein. Starting around 10 EUR in early 2009 due to oversupply of credits, prices increased to an almost record-high of around 30 EUR in mid-2019 and has since then continued to increase. End of December 2021, the cost for the right to release one ton CO<sub>2</sub> in the system was 80 EUR (Ember, 2022). The EU ETS systems covers emissions from industries, power plants and domestic flights within EU.

This implies that many economic sectors that are exempt from paying carbon dioxide taxes - instead must pay for emitting carbon dioxide. Nonetheless, some sectors are obliged to pay both national carbon dioxide taxes and a fee to the EU ETS system, while some sectors still were not included in the EU ETS system as of 2021 and some sectors still do not pay national carbon dioxide taxes. The economic sectors which are excluded from national carbon dioxide taxes, or that qualify for lower taxes vary greatly between the Nordic countries. There are always good reasons for these exemptions, such as juridical, economic, or political reasons. However, from a socio-economic point of view such exemptions are ineffective and will lead to higher overall costs in order to reduce carbon dioxide emissions.

To increase cost-efficiency the Nordic countries can work together to achieve the following objectives:

- Work together to persuade more countries to connect to the EU ETS systems. One way to achieve this could be to use incentives for new countries to join or link other systems to the EU ETS. For instance, since 1 January 2020, there is an agreement to link the ETS registries of the EU ETS and the Swiss ETS.
- Take active part in the ongoing discussions about potentially expanding the EU ETS system to include other sectors such as transport, buildings, agricultural, and waste (European Environment Agency, 2022).

## Less exemptions and reduced taxes

Beyond the connection to EU ETS system, all Nordic countries have national carbon tax systems as described in part 1 of this report. Two reasons behind this double regulation are that the EU ETS system does not cover all emissions, thus the emission system alone is not powerful enough for the Nordic countries to reach their climate goals.

All Nordic countries have carbon tax exemptions or tax rate reductions for different sectors. We have studied data on exemptions and tax reductions from the World

Bank (2022). One important reason behind the reductions and exemptions is the international competition. If firms in some countries do not have to pay a tax, or a lower tax, they get competitive advantages and opportunities to outperform companies in countries with higher tax levels.

When studying the coverage of different carbon dioxide tax schemes in the Nordic countries (see table 32) we find large differences. If we start with the coverage of the carbon taxes, they often, but not always, exempt operators covered by EU ETS system. The Nordic country with the highest coverage of the carbon tax is Norway (63%), while Finland (36%) and Denmark (35%) has the lowest coverage. A low coverage of the tax is a sign of the tax not being cost-effective. A cost-effective tax scheme results in the same margin cost for climate investment across all sectors. A low coverage of the carbon tax will result in some climate investments being profitable in some sectors, while non-profitable in others. In the last column of Table 32 we make a comment about the coverage.

**Table 32. Overview of coverage of carbon taxes across the Nordic countries**

| Country | Coverage | Exemptions                                                                                                                                                                                                | Cost-effectiveness                                                                            |
|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Sweden  | 40%      | Operators covered by the EU ETS, except for district heating. Partial exemptions for train, shipping, aviation, power production, forestry and agriculture.                                               | The coverage of the tax is low.                                                               |
| Finland | 36%      | Commercial aviation, fuel used as raw material in industrial processes and peat.                                                                                                                          | The coverage of the tax is low.                                                               |
| Norway  | 63%      | Operators covered by the EU ETS (but not offshore oil production activities), domestic aviation and waste incineration.                                                                                   | The coverage of the tax is good.                                                              |
| Denmark | 35%      | Operators covered by the EU ETS, except for district heating and waste incineration plants. Partial exemption for energy-intensive industries, trains, shipping, aviation, and power and heat production. | The coverage of the tax is low.                                                               |
| Iceland | 55%      | Operators covered by the EU ETS, international aviation and shipping sectors.                                                                                                                             | The tax level is too high for being cost effective and the coverage of the tax is quite good. |

*Source: World Bank, 2022.*

To further increase the cost efficiency of the national carbon tax systems Nordic countries can:

- harmonize tax levels across fuels and sectors in their national carbon tax schemes which includes.
- to reduce the tax reductions for sectors which pays lower carbon taxes.

### **More equal tax levels between countries and climate duties**

The carbon tax levels vary across the different countries and include different exemptions, which leads to suboptimal investments in clean technologies on a global scale as well as lower cost efficiency. The technical cost of the measures taken into account in each country will greatly differ. In order to change this, a more homogenous carbon tax level is needed. To increase the cost-efficiency of the national carbon tax systems the Nordic countries could

- strive for a harmonisation of carbon price levels among national CO<sub>2</sub> price instruments

A study made by Nordhaus (2015), has examined the possibilities of replacing a global tax on carbon with a climate club, that hosts countries which has agreed to harmonise CO<sub>2</sub> price levels.

A big obstacle for cost-efficiency relates to the fact that producers in different countries face different environmental taxation rates, which implies that a clean technology that is introduced in one country may not be profitable in another. Typically, the Nordic countries have higher environmental taxes than the countries we import consumer goods from. Those countries often also have lower labour costs, than in the Nordic region. This leads to a non-cost-efficient consumer pattern, where consumers buy a lot of cheap consumer goods with higher environmental impact. From an environmental point of view, this high consumption of untaxed goods is non-cost effective.

To reach a more cost-effective consumer pattern, the Nordic countries, in cooperation with the EU, could implement climate change duties. That implies that goods from countries with no or very low carbon taxes must pay extra duties when exporting their goods to EU. That would make the competition between production in different countries fairer, more cost effective and make it more profitable to invest in clean technologies all across the world. With the aim to avoid carbon leakage, the European Council agreed in March 2022 to introduce the Carbon Border Adjustment Mechanism, CBAM regulation (see also chapter 1.1) (European Council, 2022b).

To increase cost-efficiency the Nordic countries can work together to achieve the following objectives:

- Promote that EU implements climate duties for countries without or with low carbon taxes.

### **Taxes on consumer goods instead of on the producer**

One of the main obstacles to cost-effective environmental taxing schemes is that national companies face international competition. That implies that if businesses in Nordic countries pay higher environmental taxes than businesses in other countries their international competitiveness decreases. During the interviews for part 1 of this report one of the experts from Denmark stated that the agricultural sector has been deeply squeezed in terms of pricing, that there is little room for bigger investments and therefore farmers struggle to survive in the long run and switch to green farming.

One way to circumvent these obstacles is to introduce environmental taxes on sectors with fierce global competition, such as avoiding taxing polluters and instead tax consumers. The construction to tax the consumer of goods instead of the producer, makes it possible to tax all goods regardless of what country they are originally produced in. There are already some examples of environmental consumer goods taxes in the Nordic countries. For instance, the Swedish tax on electronics, which aims to make the polluters pay for the environmental effects of the flame retardant that all electronics contain (by law).

The Swedish Inquiry of Circular Economy (Swedish Ministry of Environment, 2017) discussed the possibility to expand the taxation of consumer goods to include all goods in the market. An environmental tax based on what material different goods contains of, should reflect the external cost of all goods regardless how they were produced. For example, in 2020 consumer-based carbon dioxide emissions for Sweden had an estimated value of 79 billion SEK (Naturvårdsverket, 2020). If all those goods had to pay carbon dioxide tax the consumption of those goods would decrease to a cost-effective level, since part of the external effect would be included in the price. Such a taxation scheme would make consumer goods and services much more expensive, on the other hand ordinary taxes could be lowered. This would make the transition even more cost-effective since taxes on labour decrease the labour supply, thus decreased taxes on labour would therefore be a cost-effective reform.

Obviously, there are many obstacles. For example, it is much easier to collect taxes from employee's wages before they get paid, compared to succeed to tax all goods and services that are consumed in a country. In order to reach a cost-effective economy which includes environmental external effects both nationally and abroad it would be a good option to avoid suboptimal investments in clean production technologies.

To increase the cost-efficiency, Nordic countries can

- introduce environmental taxes on consumer goods in level with the marginal costs of those goods' external environmental costs.

### **Environmental taxes on other emissions**

The focus of environmental taxes is on emissions that affects the climate and in the long run causes climate change. However, not all emissions that affects the health of humans, or the environment causes climate change. Nevertheless, other emissions, even if there are exceptions, typically lack environmental taxation. For instance, there is no tax on emissions from contaminated water from industries, from chemicals in clothes or emissions of particles from combustion. Other emissions than carbon dioxide is instead mostly controlled through different regulations. For example, industries need permission from the authorities to emit contaminated water. There are EU legislations which regulate what type of chemicals that are allowed in clothes. For combustion there is technical regulations that keep down the emissions of particles. However, the emissions that are allowed are free to emit. Is the lack of environmental taxes a sign of cost-ineffectiveness? Yes, according to economic theory it is. Obviously, the emitter can, after making sure the law is followed emit those emissions without having to pay the external cost, a situation that will lead to a non-optimal level of emissions.

To increase the cost-efficiency the Nordic countries can

- introduce environmental taxes on other emissions than climate related emissions, in level with the marginal costs of those goods' external environmental costs.



## 10.4 Discussion and conclusions

The green taxation systems are far from optimal. There are suboptimal solutions on many levels. Yet, the environmental taxes that are in place do help producers and consumers to make more cost-effective choices.

However, the Nordic countries can contribute further to a more cost-effective green taxation system by introducing taxes and try to get other countries to introduce taxes that better follow the marginal costs for external environmental effects. For example, on a national level the Nordic countries can:

- include more sectors in their national carbon tax schedule.
- reduce the number of exemptions and tax reductions for sectors that pay lower carbon taxes.
- introduce environmental taxes on consumer goods in level with the marginal costs of those goods' external environmental costs.
- introduce environmental taxes on other emissions than climate related emissions, in level with the marginal costs of those goods' external environmental costs.

On a European level, Nordic countries can:

- promote a development of the European EU ETS System to include more countries and more sectors.
- strive for a harmonization of carbon price levels among national CO<sub>2</sub> price instruments.

# 11. Interaction between national climate policies and the EU Emissions Trading System

Carbon pricing policies are considered by many to be the gold standard due to their economic efficiency. Carbon pricing regimes are often preceded and accompanied by companion policies, which can include innovation support, regulatory standards, subsidies, and additional carbon pricing policies. Carbon pricing programmes hold the advantage of identifying least-cost means of reducing carbon emissions. Non-price-based companion policies provide other advantages, such as targeting specific technologies, providing infrastructure, addressing social impacts and providing additional incentives for behavioral changes when carbon prices are too low to adequately do so. Companion policies therefore play an important role in meeting climate goals, but some inefficiencies are expected when carbon pricing and companion policies interact.

Carbon pricing policies involve placing a per-unit price on carbon dioxide emissions. Carbon prices can be imposed in the form of a per-unit emission tax, or by introducing scarcity through an emissions cap. Under cap and trade, entities that are required to comply with the cap either purchase or receive freely allocated emissions allowances, and compliance entities can trade allowances amongst one another. The market for emissions allowances enables an equilibrium carbon price to emerge, representing the marginal cost of emissions reductions that compliance entities face.

The function and effectiveness of cap-and-trade programmes are complicated by companion policies, which often precede and exist alongside carbon pricing. Companion policies like technology standards and subsidies also drive down emissions, but they tend to have greater costs per unit of emissions reductions. Inefficiencies can be expected when cap-and-trade programmes are accompanied by companion policies. Generally, an emission cap not only serves as a maximum level of emissions but also as a minimum level – that is, the emissions cap determines the actual level of emissions that will occur.

Consequently, emissions reductions that are achieved by companion policies reduce the scarcity of allowances in the carbon market and drive down emissions allowance prices. In the short run, it is likely resulting in a net-zero impact on emissions. In the long run, the lower allowance price in the carbon market may trigger administrative reforms and a tightening of the cap, but the prospect of future changes in the emissions cap introduces additional uncertainty that can undermine confidence in the carbon market.

Between 2013 and 2018, the EU ETS was plagued by a consistently low price on allowances, between €3 and €8. This was due to an imbalance of allowance supply and demand, resulting mainly from the economic crisis, the influx of credits under the Clean Development Mechanism, and free allocation based on historical output levels. Moreover, renewable targets and energy efficiency policies further reduced emissions, without necessarily adjusting the supply of allowances commensurately, thereby contributing to a growing surplus. The low price was clearly not providing incentives for emissions reductions and adoption of low carbon technologies.

In response to the low allowance price, some member states introduced or wanted to introduce additional policies in order to comply with national climate objectives. However, additional emission reductions under an emissions cap are problematic for two reasons. First, if the total volume of emissions allowances is fixed, extra emissions reductions in one country can lead to emissions increasing elsewhere in the EU, undermining the effectiveness and integrity of the national policies. This is sometimes referred to as the "waterbed effect." It is like sitting down on one side of a waterbed and seeing it rise on the other side. Moreover, if additional policies are introduced, the surplus of allowances may increase even further, putting downward pressure on the carbon price and reducing the incentive to adopt new technologies even further (Burtraw et al, 2018).

In 2017, the EU ETS was reformed. From 2019 allowances corresponding to 24 percent (12 percent from 2024) of the allowance surplus are transferred into a market stability reserve (MSR). From 2023 onwards, the MSR is only allowed to hold as many allowances as were auctioned the previous year – the rest are invalidated. Estimates show that about 3 Gt of allowances will be invalidated between the years 2023 and 2030 (Burtraw et al, 2018). This has contributed to driving up allowance price from €5 and €9 per ton CO<sub>2</sub> in 2017 to between €25 and €30 in 2020, and between €38 and €96 in 2021 (ICAP climate, 2022). This development has contributed to reducing coal-based power production in the EU. Studies show that this invalidation mechanism reduces the waterbed effect to some extent, but as the cap shrinks towards 2030, the waterbed effect is expected to increase again (Burtraw et al, 2018).

The emissions reductions from companion policies, as mentioned above, often come at a higher cost than the marginal cost of reductions achieved by the trading programme. Companion policies may push down allowance prices, but actually increase overall costs without creating additional emissions reductions. This type of inefficiency is expected in a static framework, according to economic theory, but it may be less of a concern when considered in a dynamic setting. If companion policies push down emissions under a cap this creates an opportunity (and a need) for the regulator to tighten the cap. This was the case when the EU ETS was reformed in 2009 and 2018 (European Commission 2009 and 2018) resulting in a faster linear reduction factor. Although carbon pricing can lead to effective emissions reductions, companion policies have the potential to drive faster

introduction of new technologies and behavioral changes than would be achieved by carbon pricing alone. This process might enable greater emissions reductions over time, but the waterbed effect, if not addressed, erases emissions reductions in the short term, presenting a serious challenge to climate policy (Burtraw et al, 2018).

Overlapping policies are common both at EU and member state levels. It's likely that the EU ETS will continue to co-exist with other policies. For that reason, it's important that the EU ETS can manage imbalances in supply and demand that may occur due to overlapping policies. In the 2018 revision of the EU ETS, a market stability reserve was introduced. If the surplus of allowances (defined as the total number of allowances in circulation) reaches above a prescribed threshold level, 25 percent of the surplus is transferred to an allowance reserve. The reserve is only allowed to hold a maximum number of allowances, the rest are invalidated (EU Commission, 2018). Another option is to introduce a price floor in the EU ETS. A price floor can also provide resistance in the event of unexpected shocks, thereby providing investment certainty and maintaining market confidence and support. Price floors have been successfully implemented in the emissions trading systems in North America (Flachsland et al, 2019).

## 12. The Nordic regions ability to affect the global environment by promoting clean technologies

The Nordic countries are, in a global context, relatively small thus their ability to affect the global environment is largely related to the power of example – being able to show case innovative policies and technologies that can be implemented outside the Nordic countries. The value of leadership - what may motivate nations to be frontrunners is discussed as in this chapter, as well as insights from some of the Nordic experts interviewed.

Some argue that Nordic climate targets can inspire other countries to take on more ambitious climate targets. Only "copying" policies rarely works because the legal systems and political cultures in different countries are diverse. Moreover, there is evidence that at least Sweden has rather been inspired by other countries, than been the frontrunner (Romson and Forsbacka, 2020). For instance, Sweden's climate framework is based on the UK climate law.

It's more likely that in order to be credible in international negotiations and push other countries to take on more ambitious targets, a country needs to show that one has "swept in front of one's own doorstep". EU climate policy has developed bottom-up where the Member State's initiatives have been generalised and adapted at EU level. For instance, Germany's support for renewable power and recycling has inspired EU policy. Ambitious national climate targets contributed to the EU 2020- and 2030 targets (Engström, 2023). Another example is the reforming of the EU Emissions trading system in 2017 when the "Swedish proposal" led to a significantly increased carbon price (Zetterberg et al, 2021, pp. 36–37). Therefore, if the Nordic countries act as frontrunners, this can be instrumental in developing ambitious EU climate policies.

Some insights were also captured during the interviews with Denmark and Sweden, in regards how the Nordic countries can affect the global environment by promoting clean technologies and shifting to a fossil free production.

One of the national experts in Denmark argued for the importance of establishing joint forces in terms of developing and improving new clean technology supply chains across the Nordic region. The Nordic countries have a great opportunity in scaling up clean technology supply chains, thus contributing to lowering risks of supply disruptions which may occur due to conflicts or political instability which arises around the world. The expert argued that the Nordic countries are likely to have a larger impact on the global clean technology supply chains, if cooperation

within the Nordic region is further enhanced. Moreover, if direct links across the Nordic countries were to be improved within the current supply chains, it may lead to that the Nordic region would become the preferred supplier of goods and services, thus affect the global environment by promoting clean technologies (Sitra, 2023).

Similar arguments were highlighted by one of the Swedish experts interviewed. During these times of multiple challenges each country faces, the expert argued that the outcome would be better and more efficient if all the Nordic countries could focus their efforts on improve cooperation and finding solutions jointly instead of nationally. Examples that were highlighted were related to developing and improving supply chains within areas such as bioeconomy, fossil free electricity, battery manufacturing plants as well as cooperation on transforming the agricultural sector.

Both the Danish and Swedish expert argued that enhanced Nordic collaboration must occur on a high-level such as ministry and/or department level. Collaborating on a lower governmental and municipally levels is not enough to make a significant impact, thus affect the global environment. If the Nordic countries could establish joint forces, it could contribute to strengthening the Nordic region on a global scale in the new fossil-free economy that is emerging. This can be related to a recent report by the International Energy Agency (2023) which state that collaborative efforts such as strong strategic partnerships that has focus on innovation and investments will be central aspects when designing future policies for boosting clean technology supply chains. To foster regional advantages, it's of essence that industrial strategies are designed in way that they address clean technology supply chain risks and display strong joint force to the global community.

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# Sammanfattning

## Abstract

Rapporten består av två delar. Del 1 sammanfattar de mest framstående förändringarna av hur ekonomiska styrmedel använts i miljö- och klimatsyfte hos de nordiska länderna mellan 2018 och 2021. Det presenteras en översikt över nya implementeringar och de största förändringarna hos befintliga styrmedlen för samtliga länder, liksom en jämförelse mellan länderna. Därtill redogörs rådata som kan användas av beslutsfattare och andra aktörer vilket inkluderar policyprioriteringar och exempel på goda erfarenheter. Del 2 innehåller slutligen en översikt över styrmedel och ekonomiska instrument som de nordiska länderna använder för att främja utvecklingen av ren teknik.

Resultaten visar att det finns en stor variation på hur de nordiska länderna använder sig av ekonomiska styrmedel i miljö- och klimatsyfte. Skillnaderna kan hänvisas till olika karaktärsdrag hos länder och sektorer, men kan även tänkas bero på nationella preferenser. I samtliga nordiska länder ligger störst fokus på klimatåtgärder och mindre fokus på miljöåtgärder i användningen av ekonomiska styrmedel. Den mest förekommande förändringen mellan 2018 och 2021 är justerad skattesats. Detta har framför allt skett i transportsektorn inom ramen för det politiska arbetet med energi och luftföroreningar. En märkbar förändring är att skattesatser på koldioxidutsläpp har differentierats. Detta kan ses som ett resultat av implementeringen av Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Därtill tillkommer implementering av nya eller förlängning av befintliga stödprogram och subventioner för klimatvänliga investeringar.

De nordiska länderna har arbetat fram styrmedel inom klimatpolitiken för att främja utvecklingen av ren teknik. På detta område användas ofta en kombination av skatter och subventioner. Dock har respektive land valt olika vägar för teknisk utveckling beroende på nationella och sektorsspecifika karaktärsdrag liksom nationella preferenser.

## Bakgrund och syfte

Vart fjärde år publicerar Nordiska ministerrådets nordiska arbetsgrupp för miljö och ekonomi (NME) en översikt över användningen av ekonomiska styrmedel i de nordiska ländernas miljöpolitik. Denna rapport är en del av denna publikationsserie.

Rapporten är uppbyggd på samma sätt som tidigare rapporter i serien. Den första delen innehåller därför en bedömning av de förändringar som skett i användningen av ekonomiska styrmedel under perioden 2018 till 2021. Ekonomiska styrmedel är brett definierade och inkluderar skatter, avgifter och subventioner, som syftar till

att ge ett ekonomiskt incitament till beteendeförändringar. Sammanställningen i del 1 jämför användningen av ekonomiska instrument mellan sektorer och länder.

Förändringarna i användningen av ekonomiska instrument förklaras utifrån perspektiv som har haft ett internationellt fokus. Efter det internationella översiktskapitlet i del 1 följer en detaljerad sammanställning av varje land fördelat på sektorer. Det är använt detsamma sektorer som tidigare års publikationer dvs. energi, växthusgaser och luftföroreningar, vatten, avfall, transport, lantbruk och naturresurser.

Del 2 av rapporten innehåller en djupgående analys över styrmedel och ekonomiska instrument som de nordiska länderna har använt för att främja ren teknik, samt en djupgående analys relaterad till kostnadseffektivitet, samverkan mellan nationell klimatpolitik och EU:s utsläppshandelssystem, vilka styrmedel som behövs för att genomföra en grön omställning och slutligen en diskussion om hur små länder som de nordiska kan påverka den globala miljön genom att främja ren teknik och omställningen mot en fossilfri produktion.

## Huvudresultat och slutsatser

### De största förändringarna har skett inom transport, energi, växthusgaser och luftföroreningar

Mellan 2018 och 2021 har de nordiska länderna lagt stor vikt vid ekonomiska styrmedel i transportsektorn inom ramen för arbetet med energi, växthusgaser och luftföroreningar.

I transportsektorn har det främsta målet varit att åstadkomma en ökning av utsläppsfria fordon eller fordon med låga utsläpp för att fasa ut användningen av de fossila bränslena. Även om differentierade skattesatser varit det mest förekommande styrmedlet varierar de mer specifika funktionerna och innehållet. Flera länder har förändrat skattealkylen för koldioxid genom att implementera Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Danmark, Norge och Sverige har alla kommit fram till nya energiöverenskommelser som ska styra policyförslagen de kommande åren. För Islands del är den största förändringen att koldioxidskatterna ökade för samtliga bränsletyper mellan 2018 och 2021.

### Ekonomiska instrument i Danmark

Under perioden 2018 till 2021 har det skett en rad förändringar på miljö- och klimatområdet i Danmark. Flera nya politiska överenskommelser har trätt i kraft och gett effekt.

2018 presenterade regeringen en ny energiöverenskommelse med avseende att sätta präglet på den danska energipolitiken mellan 2020 och 2030. De viktigaste elementen i överenskommelsen är initiativ som att stötta den förnybara energiproduktionen under marknadsprinciper, målinriktade energibesparingar, modernisering av värmesektorn, förstärkning av energi- och klimatforskning liksom fortsatt fokus på havsbaserad vindkraft. I december 2021 nådde regeringen en överenskommelse om en ny klimatlag som inkluderar juridiskt bindande mål med syftet att nå netto noll utsläpp 2050. Ett år senare uppnådde Danmark ytterligare en överenskommelse för energi- och industrisektorn med klimatåtaganden för avfallshantering. Här läggs stor vikt vid att etablera en "energiö" i Nordsjön, men även forskning om ren teknik, klimativänlig fjärrvärme och stöd till biogas.

Det danska skattesystemet för fordonsflottan reformerades 2021. I Danmark betalar man skatt för att registrera sitt fordon men även en skattesats baserat på energieffektivitet liksom drivmedelsskatt. I vissa fall betalar danskar även skatt baserat på vikten på fordonet. Med målet att främja klimativänliga fordon med högre energieffektivitet har skatten för registrering reformerats utifrån tre steg. För de första 8 741 euros av bilens värde är skattesatsen 25 %, mellan 8 741 och 27 190 euros är skattesatsen 85 %, och över dessa nivåer är skattesatsen 150 %. Därtill innebär förändringen att elbilar kommer att betala full registreringskatt 2035. Före 2021 innebar skattesystemet en sänkning av bränsleeffektiviteten och en höjning av bränsleineffektiviteten, vilket togs bort och ersattes av en beskattning baserat på koldioxidutsläpp. Ett skatteavdrag för säkerhetsklass (Euro NCAP) och andra säkerhetsdetaljer togs även bort.

Andra anmärkningsvärda policyförändringar i Danmark mellan 2018 och 2021 är avskaffandet av nationell skatt på mineralfosfor i djurfoder. Förändringen infördes för att stärka den internationella konkurrenskraften i jordbrukssektorn. Inkomster från energiskatter på fossila bränslen minskade med 12 % från 4.5 miljoner euro till 3,8 miljoner euro och stödet till den förnybara energin minskade med 25 %, främst på grund av det minskade stödet till subventioner riktade till den havsbaserade vindkraften.

## **Ekonomiska instrument i Finland**

Mellan 2018 och 2021 har det inte skett stora förändringar av de ekonomiska styrmedelena på miljö- och klimatområdet i Finland. En del skattestaster har dock justerats. Den största förändringen omfattar hur skatten på lätt och tung förbränningsolja, naturgas och flytande gas samt brun- och stenkolk beräknas. Denna förändring trädde i kraft 2019 och innebär att beräkningar på koldioxidutsläpp i större utsträckning tar hänsyn till hela livscykeln. Värdet av ton koldioxid på uppvärmningsbränslen minskar dock samtidigt i beräkningsmodellen.

Skatten på motorfordon sågs över under perioden 2018 till 2021. Finska motorfordon behöver betala en engångsskatt vid registrering samt en årlig skatteavgift som består av en grundskatt, en körskatt eller en kombination av



dess två. Skattesatsen för registrering baseras på försäljningsvärde och differentieras efter Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Medan den högsta skattesatsen blev oförändrad 2019 minskade den lägsta till 2,7 %. Syftet med förändringen var att skapa incitament för konsumenter att köpa energieffektiva fordon. Den årliga skatteavgiften är därtill oförändrad för de flesta fordon i Finland. Sedan 2020 är grundskatten baserad på koldioxidutsläpp utifrån WLTP, och för fordon med lägre utsläpp har skattesatsen även minskat. Innan dess användes NED test cycle. Körskatten för fordon som drivs med annat bränsle än bensin, sänktes från 4,9 eurocent år 2017 per dag till 1,5 eurocent år 2020.

## **Ekonomiska instrument i Island**

Under perioden 2018 till 2021 introducerades ett par nya ekonomiska styrmedel på Island. Även om skattesatser på tidigare styrmedel behölls på samma nivåer ökade skatten på koldioxid för alla bränsletyper under samma period. Sammantaget ledde höjningarna till att skatten blev 80 % högre under 2018 till 2021 jämfört med under perioden 2014 till 2017. En nämnvärd förändring är implementeringen av skatt på fluorerade växthusgaser som trädde i kraft 2020 med avseende att skapa incitament för klimatvänliga kylmedel. En annan förändring är införandet av skattesystem för att uppmuntra klimatvänliga investeringar som uppfyller särskilda miljö- och klimatkrav. Utöver detta infördes skattelättnader 2021 för finansiering av miljö- och klimatvänliga aktiviteter.

För isländska fordon behöver man betala en punktskatt som baseras på koldioxidutsläpp. 2018 justerades koldioxidberäkningarna som en följd av nya standarder från New European Driving Cycle (NEDC) och Worldwide Harmonized Light Vehicles Test Procedure (WLTP). Innan dess låg skattesatsen på 0 % för fordon som släpper ut mindre än 80 gram koldioxid per kilometer till 65 % för fordon som släpper ut 250 gram eller mer per kilometer. Halvårsskatteavgiften ändrades till NEDC och WLTP standarder. För fordon som väger mer än 3 500 kilo baseras avgiften på vikt och från och med 2020 innefattar det även elfordon och vätgasfordon. 2019 introducerades momsrabatter för köp av el- och vätgasmotorcyklar, mopeder, elcyklar och scooters som ett tillägg till bilar. Sedan 2020 har 100 % av momsintäkterna återbetalats till privata laddstationer. Momsintäkterna för arbetskostnaderna relaterade till installationerna har även återbetalats.

2021 blev målet att nå klimatneutralitet år 2040 lag vilket är ett tillägg till klimatlag nummer 70/2012. Samma år tillkännagav den isländska regeringen att de ska vara oberoende av fossila bränslen senast 2040, och därmed bli världens första fossilfria land.

## **Ekonomiska instrument i Norge**

Under perioden 2018 till 2021 har de ekonomiska styrmedlen relaterade till miljö- och klimatåtgärder förändrats en del i Norge. I de allra senaste implementeringarna har förändringarna dock varit små och exempelvis innefattat mindre justeringar på skattesatser.

Däremot har det skett en del förändringar inom den norska transportsektorn. 2018 ersattes den årliga punktskatten på motorfordon med en trafikförsäkringsskatt och 2021 skrotades skattelättnaden som tidigare fanns för elbilar. Dock är skattesatserna fortfarande lägre för elbilar. År 2020 utvidgades vägskatten – vars syfte är att ta hänsyn till externa kostnader kopplade till exempelvis olyckor, trängsel, vägslitage och lokala utsläpp – till att omfatta naturgas. Det har också skett höjningar av koldioxidkomponenter för beskattningen av motorfordon efter WLTP-standarderna. Vidare tillkännagav den norska regeringen 2021 att den schablonmässiga koldioxidskatten kommer att öka med 5 % varje år fram till 2025 för alla sektorer som inte omfattas av EU:s system för utsläppshandel. Flygskatten som infördes 2016 avslutades tillfälligt 2019, men infördes dock igen 2022.

2021 implementerades en ny klimatstrategi för perioden 2021 till 2030 med målet är att minska de kvotfria utsläppen med 45 % före 2030 inom transport- och jordbrukssektorn.

Andra anmärkningsvärda förändringar som skett mellan 2018 och 2021 är införandet av subventioner till ett Carbon Capture Storage-projekt vars syfte är att hitta lämpliga platser i Nordsjön för att lagra koldioxid, samt införandet av en skatt på fiskeflottan i syfte att finansiera kontroll och tillsyn inom fiskerinäringen.

## **Ekonomiska instrument i Sverige**

Mellan 2018 och 2021 har Sverige gjort ett par förändringar av existerande ekonomiska styrmedel, men även implementerat nya styrmedel inom miljö- och klimatområdet. Skattesatser som exempelvis punktskatten på elförbrukning har höjts varje år. De flesta skatteförändringarna är dock procentuellt små.

I januari 2018 trädde ett nytt klimatpolitiskt ramverk i kraft. Ramverket slår fast att den svenska klimatpolitiken ska utgå från mål men anger även hur genomförandet ska gå till i praktiken. Det långsiktiga målet är att Sverige ska nå netto noll utsläpp av växthusgaser senast 2045.

Den svenska regeringen genomförde två andra anmärkningsvärda förändringar under 2018. Det implementerades både ett system med utsläppsminskningsskyldighet och ett bonus-malus-system riktat mot nya bilar. Utsläppsminskningsskyldigheten innebär att biobränslen blandas in i drivmedel för att fasa ut de fossila bränslena genom en koldioxid- och energiskatt.

Koldioxidskattesatserna justerades ned för att ta hänsyn till andelen inblandade biobränsle per liter full blandning och energiskatten sänks. Höginblandade och rena biobränslen omfattas inte av systemet och är fortfarande befriade från både koldioxid- och energiskatten. Införandet av ett bonus-malus-system innebär att fordon som drivs med diesel eller bensin är föremål för en högre årlig skatt under de första tre åren där en bonus ges till fordon med noll eller låga utsläpp. Då den maximala bonusen ligger på 6 803 euros eller 25 % av försäljningsvärdet ges bonusen i praktiken endast till fordon utan utsläpp. För andra fordon, såsom laddhybrider, minskar bonusen för varje gram koldioxid per kilometer bilen släpper ut.

En annan anmärkningsvärd förändring under perioden 2018 till 2021 är en minskning av skattesänkningarna för bränslen som används för värmeproduktion i kraftvärmeverk och i andra värmeverk (CHP). Sedan 2019 omfattas kraftvärmeverk inom EU ETS av 91 % av koldioxidskatten och 100 % av energiskatten, vilket är en höjning med 80 respektive 70 procentenheter. Slutligen är det beslutat att elcertifikatsystemet och subventioner till förnybar energi ska tas bort 2035. Därtill är inga nya elproduktionsanläggningar berättigade vid slutet av 2021. Dock förlängs subventionssystemet för klimatinvesteringar i industrisektorn som nu ska omfatta finansiering av forskning.

## **Översikt av ekonomiska instrument som främjar ren teknik**

I den andra delen av rapporten presenteras en djupgående analys av ekonomiska styrmedel som de nordiska länderna har implementerat för att främja ren teknologi. Analysen visar att nästan alla nordiska länder använder en blandning av miljöskatter och subventioner för att främja ren teknik. Varje land har dock valt olika tekniska vägar beroende på nationella intressen och andra omständigheter.

Utvärderingen visar att det finns många likheter mellan teori och praktik. Marknadsbaserade strategier, som miljöskatter, verkar vara vanligast förekommande i de nordiska länderna. Direkta subventioner och andra former av stöd såsom forskningsprogram är även vanliga. Under intervjuerna lyftes det fram att det finns utmaningar såsom exempelvis lobbyorganisationer som arbetar mot införandet av nya miljöskatter. Hos de nordiska länderna finns det många likheter mellan vad policyteorier föreslår, och vilka instrument man använder i praktiken. Dock finns det också risker förknippade med de valda styrmedlen.

Analysen visar att prissättning som styrmedel ofta inte räcker till för att driva på den gröna omställningen och en avkarbonisering av industrin. Det behövs därför andra typer av styrmedel som exempelvis tar hänsyn till beteendenaspekter.

Därtill visar analysen det finns potential att öka kostnadseffektiviteten i ländernas skattesystem för ren teknik. I kapitlet diskuteras förslag om att öka antalet och nivån på skatter för att bättre följa marginalkostnaden för utsläppen. Förslag på vad de nordiska länderna kan göra på nationell nivå diskuteras därefter.

Samspelet mellan nationell klimatpolitik och EU:s system för handel med utsläppsrätter undersöks i den fördjupade analysen. Analysen visar att överlappande politik är vanligt förekommande både på EU-nivå och medlemsstatsnivå. Det framhålls att det är viktigt att hantera obalanser i utbud och efterfrågan som kan uppstå på grund av överlappande politik i EU:s utsläppshandelssystem. Slutligen diskuteras förslag om att införa prisgolv i EU:s handel med utsläppsrätter.

Sett ur ett globalt sammanhang är de nordiska länderna relativt små, deras förmåga att påverka den global miljön är till stor del relaterad till möjligheten att föregå med ett gott exempel. Värdet av ledarskap, vad som kan motivera länder att vara föregångare när det gäller att påverka den globala miljön genom att främja ren teknik och övergå till en fossilfri produktion diskuteras. Vikten av att etablera gemensamma krafter för att utveckla och förbättra försörjningskedjor för ren teknik över hela Norden framhävs.

# About this publication

## Use of Economic Instruments in Nordic Environmental Policy 2018–2021

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TemaNord 2023:520

ISBN 978-92-893-7619-8 (PDF)

ISBN 978-92-893-7620-4 (ONLINE)

<http://dx.doi.org/10.6027/temanord2023-520>

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Cover photo: Per Pixel Petersson/imagebank.sweden.se

Photo, part 1: Suvi Maniskkasalo/Business Finland

Photo, part 2: Silvia Man/imagebank.sweden.se

Published: 16/6/2023

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