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*Hrafnhildur Bragadóttir, Carl von Utfall Danielsson,
Roland Magnusson, Sampo Seppänen, Amanda Stefansdotter
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Preface

The Nordic Council of Ministers publishes a regular overview report on the use of economic instruments in Nordic environmental policy. The report has been commissioned by the Nordic working group for environment and economics. The previous editions of the report have been published in 1994, 1997, 1999, 2002, 2006 and 2009. The report consists of two parts, of which the first part presents an overview of the development in the Nordic countries with regard to economic instruments and the second contains thematic study of environmentally harmful subsidies.

This time the report has been written by Copenhagen Economics in cooperation with GreenStream Networks. The core team behind the report consisted of David Sunden (project leader), Carl von Utfall Danielsson and Amanda Stefansdotter (Copenhagen Economics), Roland Magnusson and Sampo Seppänen (GreenStream Network), Hrafnhildur Bragadóttir, (Environice). Comments to the report have been provided by the members of the working group for environment and economics as well as other Nordic experts. The authors of the report are responsible for the content as well as the recommendations which do not necessarily reflect the views and the positions of the governments in the Nordic countries.

The report reveals that there has been a continuous development in the field of economic instruments in environmental policy. The changes in instrument application reflect the general development of environmental policy in the Nordic countries as well as a general strive for more cost-efficient policy implementation. Special activity can be observed in climate and energy policy where new instruments have been introduced and existing ones been further refined. The EU emissions trading scheme has become the main instrument in all Nordic countries to reduce emissions of greenhouse gases. Besides contributing to the achievement of environmental policy goals the economic instruments especially in the energy sector are still an important way of raising revenue to the state budgets.

The second part of the report provides an attempt to a systematic identification of environmentally harmful subsidies building on the work carried out in this field by other international organizations. This part also contains three case studies concerning environmentally harmful subsidies and the possibilities to reform them. Important aspects concerning the political economy surrounding the application of subsidies are recognized. Additionally the report presents a method for ranking environmentally harmful subsidies suitable for reform based on their environmental and budgetary effects.

May 2014

A handwritten signature in dark ink, reading 'Magnus Cederlöf'.

Magnus Cederlöf

Chairman of the Nordic working group
for environment and economics

Executive Summary

Abstract

This report contains two parts. Part 1 presents an overview of the use of economic instruments in the Nordic countries, and changes over the period 2010–2013. Part 2 contains a framework for investigating which elements, or instruments, in fiscal budgets might be considered environmentally harmful (or classified as an environmentally harmful subsidy). It also contains three case studies of such potentially harmful subsidies.

Environmental tax reform, the adoption of renewable energy action plans and the introduction of the emissions trading system EU ETS in Iceland and are some of the major changes to economic instruments used in environmental policy in the Nordic countries. Since Iceland's inclusion, the EU ETS is the primary economic instrument to curb GHG emissions in all Nordic countries. Instruments used to reach other environmental targets, such as waste reduction and marine preservation, have remained relatively unchanged since 2009, or have seen small changes.

Three environmentally harmful subsidies are assessed based on the fiscal and environmental impact of reform: 1) lower energy tax on diesel used in transport compared to petrol, 2) EU direct payments to farmers, and 3) overallocation of allowances in the EU Emissions Trading Scheme.

Background

Every three to four years, the Working Group on Environment and Economy of the Nordic Council of Ministers publishes an overview of the use of economic instruments in the environmental policies of the Nordic countries. This report is part of the series.

The first part of the report describes the use and changes of economic instruments in the environmental policies of the five Nordic countries, with a focus on the period 2010–2013. Economic instruments are those that correct market failures, such as negative externalities, by adjusting prices of goods and services so that they reflect all costs and benefits of producing and consuming them. The Nordic countries adopted economic instruments, mostly taxes, early on and currently have rather complex

regulation systems shaped by a multitude of considerations. Part 1 of the report aims to add to the information base of economic instruments in the Nordic countries.

The second part of the study investigates, in line with previous reports, a thematic issue. For the 2010–2013 report, *environmentally harmful subsidies* are given special attention. We create a framework for investigating which instruments or elements in the fiscal budget might be considered environmentally harmful. Using the framework, we assess the political possibilities for reforming three different environmentally harmful subsidies by looking at two key dimensions:

- The fiscal budget impact of reforming/eliminating the environmentally harmful subsidy.
- The environmental impact of reforming/eliminating the environmentally harmful subsidy.

The three environmentally harmful subsidies assessed are 1) lower energy tax on diesel used in transport compared to petrol, 2) EU direct payments to farmers, and 3) overallocation of allowances in the EU Emissions Trading Scheme.

Conclusions and recommendations

Largest changes within the field of energy and climate

The Nordic national environmental targets are in many cases more ambitious than EU targets. Economics instruments in energy and climate policy are particularly progressive, and have since 2009 been revised to strengthen their environmental steering effect. Apart from fiscal reasons, the purpose of energy taxes in the Nordic countries is increasingly to promote the use of environmentally friendly cars, enhance energy savings, reduce greenhouse gas emissions and increase the use of domestic energy resources.

Changes in the EU ETS scheme, such as the start of Phase III and the inclusion of aviation, have affected all the Nordic countries. Iceland has seen the largest impact, as the country was included in the EU ETS in 2012. Since Iceland's inclusion, the EU ETS is the primary economic instrument to curb GHG emissions in all Nordic countries. Instruments used to reach other environmental targets, such as waste reduction and marine preservation, have remained relatively unchanged since 2009, or have seen small changes.

Tax reform in Denmark

In 2009, a tax reform was undertaken in Denmark which contained several environmental elements, generally making environmentally harmful activities more expensive. Most tax rates on fossil fuels have increased since 2009, and the energy tax on natural gas has increased by over 30% in the last four years.

Other changes include the introduction of an additional charge for water use and waste water. In waste, a tax on incineration has been removed to be replaced by a fee on energy content, and a tax on treatment of hazardous waste has been introduced. Furthermore, a weight-based packaging tax will be removed as of 1st January 2014. Within transportation, the design of both the registration tax and the vehicle excise duty has been changed to remunerate fuel efficiency of cars. Taxation of pesticides was radically changed in 2013, from value-based, to based on the intrinsic environmental and health properties of the products.

Feed-in tariffs were introduced in Finland in 2011

As a result of an energy tax reform in Finland in 2011, energy taxes are now based on the energy content, carbon dioxide emissions and local emissions (particles) of fuels. This has resulted in higher taxes on coal, natural gas and some other fuels. Furthermore, biofuels have benefited from the reform as their relative price has fallen compared to fossil fuels. To support renewable energy (RES) production, feed-in tariffs were introduced in 2011.

Other economic instruments have also been revised and implemented to strengthen the environmental steering effect. For example, the registration tax and annual car taxes were modified so that cars with lower CO₂ emissions face a lower tax. Furthermore, a waste tax, which is one of the main policy tools for waste management and prevention, has been increased a number of times since 2009.

Iceland was included in the EU ETS

There has been a notable shift in Iceland in the last few years towards increased use of economic incentives in some fields of environmental legislation, especially energy and climate change. New government policies on climate change and energy were published in 2010 and 2011 respectively, which have led to a number of legislative amendments. The most important changes since 2009 are the implementation of the EU Emissions Trading System, which was introduced in Iceland for the first time in 2012, a new carbon tax on fossil fuels and new (or prolonged) tax discounts for non-fossil fuels and cars which use renewable energy. A new tax was imposed on energy sales in 2009 as a response to a budg-

et deficit following the economic recession in 2008. Excise duties on fuels for transport purposes were also significantly increased in 2009 for the same reason.

An important change was made in the transport sector in 2011, when excise duties and taxes on vehicles were linked to CO₂ emission instead of engine capacity or weight. Changes in other sectors have been minor.

Few changes in Norway

Changes to energy and climate taxation in Norway since 2009 include increases in the base tax on mineral oil, the CO₂ tax on natural gas and LPG, and the CO₂ tax on petroleum activities on the continental shelf. The latter was almost doubled in 2013. As of 2013, the previously exempt fishing industry is required to pay a (reduced) CO₂ tax on mineral oil.

From 1st January 2012, a renewable energy certificate scheme was put in place in Norway. The scheme implies that electricity retailers must hold a certain quota of renewable energy certificates purchased from renewable energy producers. The certificates are traded on a market which was integrated with the existing Swedish market. Additional changes include the extension of the road usage tax on fuel to cover bio-diesel for use as transport fuel.

In 2010, the tax on waste incineration in Denmark was removed and the landfill tax was reformed. In addition to a ban on putting biologically degradable material in landfills, the landfill tax was lowered by nearly 40% for waste put in landfills. In 2012, a tax on NO_x emissions was added to the vehicle registration tax.

Forestry, fisheries and agriculture activities are now levied with energy tax in Sweden

Ambitious new energy and climate targets were adopted in Sweden in 2009. Following on from the reform, industry outside the EU ETS, including forestry, fisheries and agriculture, saw the introduction of energy tax and an increase in the CO₂ tax. The 2009 reform also reduced the number of exemptions to domestic industries. Furthermore, Sweden launched an initiative for local water preservation measures in 2009.

In the waste area, the Swedish incineration tax on waste was removed, and deposit rates for aluminium cans were raised in 2010. In transport, several changes were made to the annual tax on vehicles in 2013, with most vehicles seeing a higher tax rate. A “super environmentally-friendly car grant” was introduced the same year. Additionally, as the second Swedish city, Gothenburg introduced a congestion tax as of 1st January 2013.

Environmentally harmful subsidies are widely studied

Subsidies that harm the environment, or *environmentally harmful subsidies (EHS)*, have recently been researched by several important institutions and organisations at EU and OECD level. The EU, along with others, has a long-standing commitment to removing or phasing out EHS (IEEP, 2012), as they put strain on fiscal budgets and add to global greenhouse gas emissions. Two aspects which largely determine the political possibility for EHS reform are *fiscal* and *environmental* impacts of phasing out such subsidies. By combining the impacts on the environment and the fiscal budget, it is possible to single out which environmentally harmful subsidies could be reformed to generate positive effects in both areas, and thus be politically possible to reform.

Quantitative measures can be used to classify EHS

We have developed a methodological framework and strived to estimate quantitative measures for both the fiscal and the environmental impact of phasing out environmentally harmful subsidies, which are comparable between different subsidies. This enables us to rank or group subsidies, according to which would be most beneficial to reform or remove. The aim of this exercise is to set the scene for further and more in-depth work, where more EHS can be classified according to the framework. Using the framework, a more extensive priority list for political action can be developed.

The subsidies with the most negative environmental and fiscal impact should be reformed first

An extensive list of the impacts of reforming individual EHS enables policy makers to decide and document which subsidies should be considered for reform or studied further, and which should *not* be considered for reform. Efforts should be focused where they have the largest impact. We illustrate the use of the framework in three case studies, namely:

- Lower energy tax on diesel used in transport compared to petrol.
- EU direct payments to farmers.
- Overallocation of allowances in the EU Emissions Trading Scheme.

The table shows the estimated effect for the environmental and fiscal budget, and where effects are largest in both dimensions.

Fiscal and environmental impact of removing identified EHS

EHS	Environmental impact	Fiscal impact	Environmental/ fiscal impact
Lower energy tax on diesel used in transport compared to petrol	EUR 89–223 m	EUR 1–3 bn	0.07–0.22
EU direct payments to farmers	EUR 61–135 m	EUR 218 m	0.28–0.62
Overallocation of allowances in the EU Emissions Trading Scheme	EUR 240 m	EUR 1 bn	0.24

Note: Quantification of non-monetary effect is inherently uncertain. In addition, not all environmental impacts are quantifiable. Thus, the figures should be seen as rough indications.

According to the table, the agricultural case has the lowest environmental impact and fiscal impact. The diesel case has slightly higher environmental impact, and the ETS overallocation case has the largest upper bound potential for environmental effect. Although this indicates that the ETS case should be the most eligible for reform, it is also perhaps the most sweeping one, which could hamper its potential for reform.

One aspect to consider in this framework is the size of the fiscal impact in relation to the environmental impact. A reform which has a large relative fiscal impact may be criticised for being driven more by fiscal considerations than by environmental concerns. The EU direct payments case seems to have the highest share, which means this has the most environmental impact per fiscal impact.

Other impacts of EHS reform need to be studied

In practice, environmental and fiscal concerns are weighed against other economic interests and potential other effects of environmentally harmful subsidy reform. For example, the removal of a subsidy could reduce the competitiveness of the domestic industry, affect employment, or reduce consumer welfare. In addition, there may be arguments for preserving the subsidies that are difficult to quantify in economic terms, such as food security in combination with agricultural subsidies. Such effects need to be further analysed before a reform is proposed. In addition, the current study takes into account static effects of a subsidy removal, and in some cases, some dynamic effects. Other potential dynamic effects likely arise, such as economic impacts from changes in prices and subsequent effects for production and consumption decisions.

An important dimension in reforming a subsidy is the extent to which a single Nordic country or the Nordic countries jointly can affect it. For example, in the context of the EU Emissions Trading Scheme,

there is little room for manoeuvrability. However, even in the context of the EU ETS, the Nordic countries could, individually or jointly, follow the UK example and set a CO₂ floor price for installations covered by the EU ETS.

Introduction

Background

The Working Group on Environment and Economy of the Nordic Council of Ministers regularly publishes a comparative overview of the use of economic instruments in the environmental policies of the five Nordic countries. The most recent report was published in 2009 and covers the period 2006–2009, along with a topical report on mixes of policy instruments.

Economic instruments aim to correct market failures, such as negative externalities, by adjusting prices of goods and services so that they reflect all costs and benefits of producing and consuming them. Apart from direct *monetary* costs, this includes *non-monetary* costs such as environmental impact. Economic instruments act either as a carrot (in the form of e.g. tax credits, grants and support) or a stick (in the form of e.g. taxes), to guide actions towards more environmentally friendly and sustainable use.

Other measures can be used in combination with economic instruments. In Table 39, instruments are separated into four categories, with examples of instruments in each group, based on Konjunkturinstitutet (2012).

Table 1 Groups of instruments

Administrative	Economic	Informational	Research
Legislation	Taxes	Creating awareness	Research
Norms	Tax credits	Eco-labelling	Development
Limits	Fees	Counselling	Demonstration
Long-term contracts	Grants	Education	Technology and system evaluation
Environmental classification	Subsidies	Shaping public opinion	
Regulation	Deposit-refund systems		
Technical requirements	Emissions trading		
Testing	Certificates trading		
Supervision	Environmental compensation		
Target management			

Source: Konjunkturinstitutet (2012).

Environmental taxes and fees can be used to enforce the polluter pays principle. A tax or fee on environmentally harmful activities can influence resource use towards reduced environmental damage. Economic instruments in the form of grants and subsidies may enable businesses and new technologies that are not economically profitable, but socially motivated, to develop into competitive products and services. Subsidies may be used to promote activities that generate public goods. In the context of this report, an example of a public good is food security.

The Nordic countries adopted economic instruments, mostly taxes, early on and currently have rather complex regulation systems shaped by a multitude of considerations. The report aims to add to the information base of environmental instruments in the Nordic countries, and to shed light on the direction in which Nordic environmental policy is moving.

The report also includes a second part, which looks at fiscal and budgetary elements in the Nordic countries that may be relevant to consider in the context of *environmentally harmful subsidies* (EHS). Subsidies exist for a variety of reasons. The current view, held by the OECD, is that a subsidy is harmful for the environment if it leads to higher levels of waste and emissions than what would be the case in the absence of the subsidy. The report will investigate instruments directly intended to adjust for environmental problems, as well as other instruments that can cause environmental problems.

EHS have recently been researched by several important institutions and organisations at EU and OECD level.¹ Reforming or phasing out EHS is a priority at national and international levels, but doing so is not always easy. For example, subsidies may align with other policy objectives, or the occurrence of a negative environmental impact may not be obvious. Hence, more work in this area is required in order to remove potential environmentally harmful subsidies.

Objectives

The objective of this report is to present an overview of the use of economic instruments in environmental policy in the Nordic countries for the period 2010–2013. In line with previous reports, the last one covering the period 2006–2009, the report contains two main parts:

- Part 1: An overview of the use economic instruments and changes during the period 2010–2013.
- Part 2: A framework for investigating which elements, or instruments, in the fiscal budget might be considered environmentally harmful (or classified as an environmentally harmful subsidy).

¹ OECD (2005): Environmentally harmful subsidies – Challenges for reform, Withana *et al.* for the European Commission (2012), Study supporting the phasing out of environmentally harmful subsidies, Bruvoll *et al.* for the Nordic Council of Ministers (2011). Reforming environmentally harmful subsidies – How to counteract distributional impacts.

Part I:
Overview of Economic Instruments
2010–2013

1. Summary and cross-country comparison

This chapter gives an overview of the central developments in Nordic environmental policy during the period of 2010–2013. Major changes in each country and in certain sectors are discussed.² The discussion is focused on energy and climate, as this area has seen the most changes over the period.

1.1 Long-term goals in Nordic Climate and Energy Policy

In 2009, the United Nations Climate Change Conference (or the Copenhagen Summit) ended without a legally binding climate deal or any commitment to reach one in future. The accord calls on individual countries to state what they will do to curb greenhouse gas emissions, in the wake of the expired Kyoto Protocol's targets for 2012.³

Around that time, negotiations had already begun on EU climate and energy targets for 2020, 2030 and 2050. For 2020, the EU has committed to cutting its emissions to 20% below 1990 levels. It has also offered to increase its emissions reduction to 30% by 2020 if other major emitting countries in the both the developed and developing world commit to undertake their fair share of a global emissions reduction effort.⁴ The EU targets were adopted but are not part of the EEA Agreement. In many cases, the Nordic countries' targets are more ambitious than the EU targets. Table 2 lists the EU and Nordic targets. For 2050, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80–95% compared to 1990 levels.

² Detailed descriptions of changes can be found in the respective country chapters.

³ The protocol was amended in 2012 to accommodate a second commitment period, which applies between 2013 and 2020, but this amendment has (as of October 2013) not entered into legal force.

⁴ See the European Commission's climate action targets at http://ec.europa.eu/clima/policies/brief/eu/index_en.htm

Table 2 Climate and energy targets for the Nordic countries and the EU until 2020, 2030 and 2050

	Key objectives for 2020	Key objectives for 2030 and 2050
EU	20% reduction in EU greenhouse gas emissions from 1990 levels; 20% renewable resources in EU energy consumption; 20% more efficient energy consumption in the EU.	80% reduction in EU greenhouse gas emissions from 1990 levels.
Denmark	40% reduction in greenhouse gas emissions from 1990 levels; 30% renewable resources in energy consumption; Energy efficiency: EU level target.	100% renewable energy in energy and transport sector by 2050.
Finland	16% reduction in greenhouse gas emissions from 2005 levels in non-EU ETS sector; 38% renewable resources in energy consumption; 20% renewable energy in transport; Energy efficiency: EU level target.	At least 80% reduction in greenhouse gas emissions from 1990 levels.
Iceland	30% reduction in greenhouse gas emissions by 2020, compared to 2005 levels; 64% renewable energy in energy consumption; 10% renewable energy in transport.	50–75% reduction in greenhouse gas emissions by 2050, compared to 1990 levels.
Norway	30% reduction in greenhouse gas emissions from 1990 levels; 67.5% renewable energy in energy consumption.	Carbon neutrality by 2030.
Sweden	40% reduction in greenhouse gas emissions from 1990 levels for the non-EU ETS sector; 50% renewable energy in energy consumption; 10% renewable energy in transport; Energy efficiency: EU level target.	Fossil-independent vehicle fleet by 2030; Zero net GHG emissions by 2050.

Note: All Nordic countries are part of the EU ETS, but the general EU target of 20% reduction in greenhouse gas emissions and the Effort Sharing Decision do not apply to the EEA-EFTA countries (i.e. Norway and Iceland).

Source: European Commission (2013c), and country chapters.

As can be seen in Table 2, the Nordic national targets are in many cases more ambitious than EU targets.⁵ For example, while a share of renewable resources in energy consumption of 20% is the goal at EU level, Denmark, Finland and Sweden have national targets of 30, 38, and 50% respectively. Iceland aims even higher with 64% renewable resources in energy consumption, and Norway aims the highest at 67.5%. This should be seen in the context of very different starting points for renewable energy. For example, hydropower has played a large role in Norway and Sweden while Iceland has abundant access to geothermal energy.

⁵ While the renewable directive is included in the EEA Agreement, the overall EU target on renewable energy does not form a part of the EEA Agreement.

1.2 Other environmental goals

Parts of the environmental policy of EU Member States are set at the EU level. This policy is guided by principles set out in Environmental Action Programmes (EAP). The 6th EAP covered the period 2002–2012 and a 7th EAP was agreed in 2013 which will guide EU policy until 2020.

The 7th EAP contains three thematic priority objectives:

- Protecting, conserving and enhancing the EU's natural capital.
- Turning the EU into a resource-efficient, green and competitive low-carbon economy.
- Safeguarding EU citizens from environment-related pressures and risks to health and well-being.

While the EAPs guide the common environmental policy of the EU, individual Member States are permitted to enact tougher legislation, provided that the legislation is not discriminatory, does not constitute hidden trade barriers and does not in any other way violate the internal market. For example, Sweden has applied this so-called environmental derogation for banning the use of azo colouring, a synthetic colouring agent in foods, and Denmark has sought to maintain stricter rules on the use of nitrites, nitrates and sulphites as food additives (EU Oplysningen, 2013).

Limits on emissions on some pollutants are set at EU level through the Directive on national emissions ceilings for certain atmospheric pollutants (NEC Directive 2001/81/EC). The NEC Directive sets out emission ceilings in all Member States for four pollutants: sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia. The decision on how to comply with the ceiling in terms of policy tools is largely left up to the Member States themselves to decide (European Commission, 2012).

1.2.1 *Economic instruments to achieve environmental targets*

The Nordic governments have since 2009 implemented additional economic instruments, and made changes to existing ones, to achieve these environmental goals. Instruments used to reach other environmental targets, such as waste reduction and marine preservation, have remained relatively unchanged since 2009, or have seen small changes. Economic instruments used in each country are listed in Table 3.

Table 3 Overview of the use of economic instruments in the Nordic countries in 2013

Energy and air pollution	DK	FI	IS	NO	SE
Excise tax on electricity consumption	X	X	X	X	X
Excise tax on fuel oil products etc.	X	X		X	X
Excise tax on transportation fuels	X	X	X	X	X
CO ₂ tax on fuel oil	X	X	X	X	X
CO ₂ tax on transportation fuels	X	X	X	X	X
Inclusion of GHG-intensive sectors in the EU ETS	X	X	X	X	X
SO ₂ tax	X			X	X
NO _x tax	X			X	X
Subsidy schemes for renewable energy, energy efficiency etc.	X	X		X	X
Water pollution					
Water effluent tax	X				
Water supply tax	X				
Waste					
Tax on waste put in landfill	X	X		X	X
Tax on incinerated waste	X			X	(X)
Taxes, deposit-refund systems or other collection systems on beverage containers/packaging	X	X	X	X	X
Taxes on other packaging	X				X
Charges to finance collection and treatment, or deposit-refund systems for products: ELVs, batteries, tyres, lubrication oil or pesticides	X	X	X	X	X
Tax on GHGs (industrial gases)	X			X	
Tax on PVC, phthalates and chlorinated solvents	X				
Transport					
Vehicle registration or sales tax	X	X	X	X	
Annual circulation tax	X	X	X	X	X
Environmental related or noise charges on aviation		X		X	X
Road congestion tax					X
Inclusion of aviation in the EU ETS	X	X	X	X	X
Agriculture and natural resources					
Tax on extraction of raw materials	X				
Tax on pesticides	X			X	X
Tax on fertiliser use	X				(X)
Tradable fishing quotas	X		X		

Note: Economic instruments that have been removed since 2009 are put in parentheses. Economic instruments that are new since 2009 are marked *italic*.

Source: Copenhagen Economics and GreenStream.

Within the field of energy and climate, in terms of the range of economic instruments, Iceland has experienced the largest change. Since 2009, Iceland has introduced an excise tax on electricity consumption, CO₂ tax on fuel oil and a CO₂ tax on transportation fuels. In addition, since 2009, the coverage of the EU ETS in Iceland has increased significantly (through inclusion of aviation and aluminium production in the EU ETS). After this change, the EU ETS is the primary economic instru-

ment to curb GHG emissions in all Nordic countries. Another change that has taken place since 2009 within the field of energy and climate is the introduction of tax on emissions of NO_x in Denmark. In Norway, the EU ETS covers more than 50% of national emissions after the extension of the EU ETS in 2013. As a result, more than 80% of Norwegian emissions are covered by the EU ETS and/or a tax on greenhouse gases. Within the field of water pollution, there have been few changes since 2009. Denmark is the only country that has both a wastewater tax and a water supply tax. However, all countries employ water supply charges and wastewater charges at the local level to cover the costs for supplying the services.

Within the field of waste, the only changes are the removal of taxes on waste incineration in Sweden and Denmark. In Denmark, the tax was replaced by a charge that is based on the energy content of the incinerated waste. Common instruments for all Nordic countries in the field of waste are either a tax or a deposit-refund system for beverage containers and for end-of-life products such as batteries, tyres, lubrication oils and pesticides.

Within the field of transport, with the exception of the inclusion of aviation in the EU ETS, the instruments are the same as in 2009, albeit with different tax rates. A small but noteworthy change in Sweden is the introduction of a congestion tax in Gothenburg in 2013. Currently, Stockholm and Gothenburg are the only Nordic cities with a congestion tax.

Within the field of agriculture and natural resources, few economic instruments have changed since 2009. Denmark changed the base of tax on pesticides, while Sweden removed the tax on fertiliser use.

The revenue from environmental taxes, fees and charges has developed differently in the Nordic countries. In real terms, compared to 1998, the revenue has increased in Sweden and Finland, but fallen in Iceland, Denmark and Norway,⁶ see Figure 1.

⁶ Data for all countries only available from 1998 to 2010 in EEA/OECD database.

Figure 1 Development of revenue from environmental taxes, charges and fees, index=1998, GDP normalised

Note: Revenue has been normalised with GDP by dividing nominal revenue by nominal GDP in every year.

Source: Copenhagen Economics based on data from EEA/OECD database of economic instruments (1998–2010), individual countries' budgets (2011–2012) and World Bank. Data for 2011 not included for Iceland and Finland.

As a share of total revenue, taxes related to energy and air pollution and to transport⁷ are generally the highest revenue-generating environmental taxes, cf. Table 4.

⁷ Transport taxes, e.g. vehicle registration taxes and road use charges, do not only serve as environmental taxes but are also used as fiscal taxes as well as financing the maintenance of highways and roads and reducing traffic congestion. However, the OECD considers all taxes on motor vehicles as environmental taxes as indicated in their database on instruments used for environmental policy and natural resources management. Similarly, Eurostat defines an environmental tax as "[a tax] whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment" (see http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Environmental_taxes_-_detailed_analysis), which they take to include taxes on the ownership and use of motor vehicles.

Table 4 Revenue from different types of environmentally related taxes, fees and charges

Category	Denmark	Finland	Iceland	Norway	Sweden
Energy and air pollution	47.8%	52.2%	15.9%	25.5%	58.8%
Water	2.6%	14.6%	4.8%	0.0%	0.0%
Waste	2.3%	4.0%	5.6%	2.3%	0.3%
Transport	46.4%	28.7%	53.0%	72.1%	40.6%
Agriculture and natural resources	1.0%	0.4%	20.7%	0.1%	0.3%
<i>Total (EUR m)</i>	<i>9,638</i>	<i>6,154</i>	<i>294</i>	<i>8,156</i>	<i>9,665</i>

Note: Taxes categorised according to division in country chapters.

Source: EEA/OECD database on economic instruments and country chapter for Iceland.

Given the central role of the EU ETS as the primary economic instrument to curb GHG emissions in all Nordic countries, the next subsection outlines the developments within the EU ETS during the period 2010–2013. These developments are common for all the countries that are part of the EU ETS.

1.3 The EU Emissions Trading System (EU ETS)

This subsection gives an overview of the developments within the EU ETS during the period 2010–2013. The most noteworthy change during this period was the start of Phase III of the EU ETS that runs from 2013 to 2020. Another noteworthy change during the period 2010–2013 was the inclusion of aviation in the EU ETS, on 1st January 2012.

1.4 Phase III of the EU ETS

The start of Phase III brought a number of changes to the EU ETS (European Commission, 2013b). These changes include the following.

Inclusion of new sectors and new gases in the EU ETS. Examples of new gases and sectors are nitrous oxide (N₂O) from the production of nitric, adipic, glyoxal and glyoxalic acids and perfluorocarbons (PFCs) from aluminium production. Norway unilaterally opted to include N₂O emissions from the production of nitric acid in the EU ETS as early as 2009.

An EU-wide cap for the EU ETS, which is set to decrease at a constant rate during Phase III. The cap is set to decrease beyond 2020.

An increase in the share of allowances that will be auctioned. The share of allowances that is auctioned will increase progressively between 2013 and 2020. Sectors subject to international competition will continue to receive the majority of the allowances for free, in order to prevent carbon leakage. For power generators in most Member States

this share is 100% for the whole of Phase III. During Phase II, Norway auctioned a larger share of allowances than what was required by the exemption granted to Norway.

1.5 Inclusion of aviation in the EU ETS

Emissions from aviation were included in the EU ETS on 1st January 2012. Currently, only CO₂ emissions from flights within and between countries that participate in the EU ETS are covered (European Commission, 2013b). Thus, emissions from flights to and from Norway and Iceland are also covered by the EU ETS.

Flights that originate from or arrive in countries that are not part of the EU ETS were also set to be included in the EU ETS on 1st January 2012. However, the EU has temporarily suspended the enforcement of the EU ETS for these flights because of opposition by, among others, Russia, China and the EU (European Voice, 2013). The European Commission (2013d) has proposed that only emissions that take place in European regional airspace would be included. As a result of the proposal, emissions from flights to and from countries outside the European Economic Area would not be included in the scheme if they occur outside the EEA airspace.

Aviation has a separate cap under the EU ETS, which is 5% below the average annual level of emissions in 2004–2006. Of the total allocation for the aviation sector, 15% will be auctioned (European Commission, 2013b).

1.6 Supply and demand in Phase II and outlook for Phase III

Table 5 shows the allocation and the emissions of the EU ETS during Phase II (2008–2012). It shows a surplus for each year since 2009. By 2012, the cumulative surplus had grown to 1,330 million EUAs. Whereas Phase I allowances were not transferable, between Phase II and Phase III there is unlimited and free banking of allowances. Thus, the whole surplus of 2012 will be transferred to 2013.

Table 5 Build-up of surplus during Phase II of the EU ETS (million tonnes CO₂ equivalents)

Year	2008	2009	2010	2011	2012
Allocation	1,956	1,974	1,998	2,001	2,005
Emissions	2,120	1,880	1,939	1,859	1,859
Import of carbon offsets	83	82	137	255	492
Surplus	-79	176	197	397	639
Cumulative surplus	-79	98	294	692	1,330

Note: Data for Iceland and Liechtenstein are not included.

Source: Aatola *et al.* (2013).

Projections by Aatola *et al.* (2013) show that the cumulative surplus will grow even larger during Phase III of the EU ETS, assuming that no changes are made to the allocations for Phase. Aatola *et al.* (2013) estimate that with moderate 2% EU GDP growth, the cumulative surplus will grow to 1,975 million EUAs by 2020. With less growth, the cumulative surplus will be larger.

According to the European Commission (2012), by the end of 2012, the cumulative surplus had grown close to 2 billion allowances. The Commission expects that the cumulative surplus will be around 2,200 million allowances by the end of 2020 (European Commission, 2012).

As can be seen in Figure 2, the spot price of EUAs has declined as the cumulative surplus has grown larger.

Figure 2 EUA spot price (EUR) EUA spot price in euros

Note: Spot price of exchange traded EU Allowance Units (EUAs). For 2008–2012 the graph shows the price of Phase II EUAs, for 2013 it shows the price of Phase III EUAs. Data sources: Intercontinental Exchange (ICE), European Energy Exchange (EEX).

2. Denmark

Denmark has seen some changes to its tax system in the past few years. In 2009, a tax reform was undertaken which contained several environmental elements (see Box 1), generally making environmentally harmful activities more expensive.

Denmark stands out with its ambitious targets for greenhouse gas emission reductions. Since 2010, the goal has been to be independent of fossil fuels by 2050. The Energy Strategy 2050 from 2011 and the energy agreement between the Government and opposition parties from 2012 set out long-term and short-term roadmaps for achieving this goal. Apart from taxes on energy, CO₂ and electricity, support for wind power and biomass contribute to reducing the use of fossil fuels. Most of the tax rates have increased only modestly since 2009, aside from the energy tax on natural gas which has increased by over 30% in the last four years.

Since the 1990s, water use and waste water have been taxed in Denmark. In 2012, an additional charge was introduced earmarked for groundwater protection. The expenses for groundwater protection had previously been financed by the charges that the municipalities collected for supplying the water.

The Danish Government regularly issues waste strategies outlining goals in the handling of waste. The most recent strategy was issued in 2013 and stresses the need to increase recycling and reduce landfilling, much like previous editions of the strategies. Since 2009, the tax on incineration (DKK/tonne) has been replaced by a tax differentiated by the energy content of the waste, and a new tax on treatment of hazardous waste has been introduced. The taxes on packaging and other materials and rates have remained mostly unchanged since 2009, with the exception of the tax on beverage containers which was cut by half. The weight-based packaging tax will be removed as of January 1 2014.

Within transportation, taxes on vehicle use are affected by taxes on transportation fuels, a registration tax based on the value of the car and differentiated by fuel efficiency, a vehicle excise duty based on fuel efficiency and (for certain vehicles) weight. With both the registration tax and excise duty adjusted based on the fuel efficiency of the car along with exemptions for hydrogen and electrical cars, vehicle taxes serve to incentivise the use of environmentally friendly vehicles.

Fertiliser use is regulated either by a quota system (applied to large users) or a tax on nitrogen content (applied to small users). Pesticides are also taxed and in 2013 the taxation was radically changed from a value-based tax to a tax based on the intrinsic environmental and health properties of the products.

Box 1 Danish tax reform of 2009

In the spring of 2009, the Danish Government and the Danish People's Party formed a political agreement on a tax reform to be gradually implemented in between 2010 and 2019: the so-called *Forårspakke 2.0*. The tax reform contains several measures related to the environment, in general aiming to make the use of energy and polluting activities more expensive.

The main points of the tax reform concerning energy and the environment are:

- Higher taxes on waste water.
- Higher energy taxes.
- Reduction of private sector compensation for energy taxes.
- Revenue from the sale of EU ETS allowances.
- Measures to promote environmental performance of the vehicle fleet.

As compensation for the increased cost, Danish households receive a refund in the form of a so-called green cheque amounting to DKK 1,300 for every adult and DKK 300 for up to two children under the age of 18. For high-wage earners, the amount is reduced by 7.5% above the income base of DKK 348,000 (in 2009).

Source: Danish Government (2009) & OECD (2010).

Environmental taxes, charges and fees brought in nearly DKK 72 billion in 2011. Different taxes on transport made up the largest share of this at DKK 33 billion, cf. Table 6.

Table 6 Revenue from the ten highest revenue-generating environmental taxes, fees and charges, 2011

Tax, fee or charge	DKK million	EUR million
Motor vehicle registration duty	13,563	1,820
Duty on electricity	11,944	1,603
Motor vehicle weight tax	9,873	1,325
Tax on certain mineral oil products	9,557	1,283
Duty on petrol	7,731	1,038
Duty on CO ₂	5,882	789
Duty on natural gas	4,324	580
Duty on coal	2,357	316
Duty on motor vehicle compulsory insurance	1,746	234
Tax on water quantity	1,333	179
Total	68,310	9,638

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

Source: EEA/OECD database of economic instruments.

2.1 Energy and air pollution

Denmark is described as a role model in terms of policies for renewable energy and climate change (IEA, 2012). There is broad political consensus on the country's long-term energy goal to achieve independence from fossil fuels by 2050. In 2010, the Climate Commission (*Klimakommissionen*) was commissioned by the Government to deliver recommendations for how to reach this goal. Based on these recommendations, the Energy Strategy 2050 was launched in 2011, outlining measures to be implemented in the short term. The first phase of this strategy focuses on reducing the country's dependence on fossil fuels through policies on energy efficiency and renewable energy. In 2012, the Government and the opposition parties reached a series of agreements (*energiaftalen*) on the shape of the energy policy up until 2020, see Box 1. These, as well as earlier energy agreements, shape the Danish policy on energy and climate change.

Economic tools in the form of taxes and other charges are an important part of Danish environmental policy, and many fuel types are covered by both an energy tax and charges on other pollutants, such as CO₂, NO_x and SO₂.

Box 1 Denmark's long-term goals and the energy agreements

Since 2010, Denmark's aim has been to achieve fossil fuel independence by 2050. Fossil fuel independence in this context means that the energy sector uses 100% renewable energy or a combination of renewable energy and coal or biomass in combination with carbon capture and storage (CCS) technology.

Along the way to 2050, several goals have been set out:

- 40% reduction of domestic greenhouse gas emissions by 2020
- 50% wind energy in energy mix by 2020
- 0% coal and gas burning by 2030
- 100% renewable energy in electricity and heating sector by 2035

Measures in the energy sector are the focus of the 2012 energy agreements between the Government and opposition parties. Most energy use in the energy sector is regulated by the EU Emissions Trading Scheme (ETS) and there are also policies covering the part of the energy sector outside the ETS.

The goal of 100% renewable energy is expected to be met by an increase in wind power generation. In order to compensate for the intermittency of wind power, plans have been made for a smart grid and increased capacity on the electricity connectors to Germany. Measures to reach the other goals include funds to subsidise energy efficiency measures in industry, changes in rules to make biomass more attractive compared to coal, and measures to support the production of biogas.

Source: De Økonomiske Råd (2013).

2.1.1 Energy tax on fossil fuels

The energy tax varies depending on the energy content of the product. Since its inception in 1977, the tax has been expanded to include more fuel sources and has been increased in most years to the current level, cf. Table 7. The tax was put in place as a response to the oil crises in the 1970s. The energy tax on fossil fuels has been used as a way to provide incentives to decrease the energy consumption. At first, one of the purposes was also to reduce the balance of payments deficit resulting from the import of oil products and to some extent stimulate the use of natural gas. The tax depended on the energy content of the fuels. Initially, the tax was only levied on oil products, but in 1982 the energy tax scheme was expanded so that coal was included in the tax umbrella. In 1996 the energy tax scheme was expanded further to include natural gas as well (NCM, 2009). Owing to the tax freeze in place between 2001 and 2011,

most rates have only been increased modestly. See Table 7 for tax rates on a selection of energy sources.

Exemptions

Energy taxes on fossil fuel consumption are not levied uniformly across all Danish sectors. A large number of exemptions have been adopted in order to ensure that the competitive power of Danish enterprises is not significantly weakened. Businesses using fossil fuels for industrial processes can normally receive a tax rebate for mineral oil products not used for heating or as transportation fuel ⁸ (Danish Ministry of Taxation, 2013). All biofuels are exempt from the energy tax.

2.1.2 CO₂ tax

In response to the increased awareness of the connection between emissions of greenhouse gases and climate change in the early 1990s, the Danish Parliament introduced a CO₂ tax on the burning of fossil fuels in 1992 in order to increase the incentives to substitute towards less CO₂-intensive fuels⁹ (NCM, 2006).

Furthermore, a CO₂ tax is levied on electricity but is not directly linked to the CO₂ from production, since it does not depend on how the electricity is produced. This tax will be removed for companies from 1st January 2014.

The CO₂ taxes have only seen modest increases over the past few years. For different energy sources the CO₂ tax burden is illustrated in Table 7.

This rebate was reduced by 13.1% in 2012 and by a further 14.8% in 2013.

⁹ The intention of the CO₂ tax was not to increase the price of fossil fuels, so the energy tax was lowered when the CO₂ tax was introduced to keep the overall tax burden constant.

Table 7 Energy tax and CO₂ tax burden of different energy sources

		2010	2011	2012	2013
Motor fuel øre (eurocent) per litre	Energy tax	277.50 (37.26)	282.50 (37.92)	284.00 (38.15)	292.70 (39.25)
	CO ₂ tax	41.3 (5.55)	42 (5.64)	42.8 (5.75)	43.5 (5.83)
Natural gas øre (eurocent) per nm ³	Energy tax	227 (30.48)	231.10 (31.02)	235.30 (31.61)	279.50 (37.48)
	CO ₂ tax	0	35.7 (4.79)	36.5 (4.90)	37 (4.96)
Pit coal DKK (EUR) per GJ	Energy tax	57.30 (7.69)	58.40 (7.84)	59.40 (7.98)	70.60 (9.47)
	CO ₂ tax (DKK (EUR) per tonne)	413.50 (55.52)	420.90 (56.49)	428.50 (57.57)	436.20 (58.49)
Electricity øre (eurocent) per kWh	Energy tax	68.40 (9.18)	69.60 (9.34)	70.90 (9.52)	72.10 (9.67)
	CO ₂ tax	6.2 (0.83)	6.3 (0.85)	6.4 (0.86)	6.5 (0.87)

Note: Tax on coal sources is charged per GJ. For companies which do not measure the energy content of the fuel, the tax is levied on the weight. Tax on CO₂ measured as DKK (EUR) per tonne CO₂. Source: Danish Ministry of Taxation, 2013a, 2013b, 2013c, 2013d.

Exemptions

The CO₂ taxation scheme is designed to fulfil two targets. *Firstly*, to ensure the fulfilment of the Danish CO₂ reduction targets under the Kyoto Protocol. *Secondly*, the tax scheme was designed not to increase substantially the taxes levied on the energy-intensive industries and thereby affect the competitive power of Danish enterprises. Therefore, when the CO₂ tax scheme was introduced in 1992 the companies were fully exempt from paying CO₂ tax. Later, the tax reform was revised such that the largest CO₂ tax rebates were given to heavy industrial processes in energy-intensive industries, while energy consumption in light processes was given a smaller tax rebate (Nordic Council, 2009).

Businesses which use electricity for heavy industrial processes may receive a tax rebate of 57.3% of the CO₂ tax applied to electricity. Unlike the energy tax, the energy consumption used for light processes is not exempt from the CO₂ tax. Energy used for electricity production is not levied a CO₂ tax (Danish Ministry of Taxation, 2013a).

When introducing the EU ETS system, the sectors covered by it were exempt from paying CO₂ tax (Danish Energy Agency, 2008).

CO₂ emissions trading scheme

Denmark was one of the first countries to introduce tradable carbon emission allowances. In the period 2000–2003 the electricity generation sector was exposed to an emissions trading scheme providing them with fewer and fewer allowances each year (Nordic Council, 2006).

During Phase I of the EU Emissions Trading Scheme (ETS), covering the period 2005–2007, the goal for stationary installations was to reduce the CO₂ emissions by 15% compared to a “business as usual” projection of the EU ETS sectors. In the first trading period 5% of the total amount of allowances was auctioned off and the remaining 95% allocated free of charge. The installations in the EU ETS are approximately 375 units covering most of the electricity and heat producers and energy intensive industrial units. The approximately 375 units account for about half of the Danish CO₂ emissions (Danish Energy Agency, 2008).

Phase II of the EU ETS lasted from 2008 to 2012. During Phase II, all the allowances were allocated free of charge. According to the Danish National Allocation Plan for 2008–2012, the total amount of allowances available per year was 24.5 million, 24 million of which were freely given to existing ETS enterprises. In the heating and industrial sector, allocations were based on a share of historical CO₂ emissions (87% of fuel-related emissions and 98% of process-related emissions). In the electricity sector, the allocations were based on historical electricity production. However, the electricity producing sector only received allowances corresponding to 57% of the allowance basis due to the assessment that there was potential for significant reduction in emissions from substituting to less greenhouse-gas intensive fuel sources (Danish Energy Agency, 2008). A pool of emission allowances was set aside for new or expanded capacity.

Phase III started in 2013 and will last until 2020. From 2013, CO₂ emission allowances will mostly be auctioned. Across the EU, 57% of allowances to industry will be auctioned and nearly 100% of allowances to electricity generation. Denmark will receive 75 million allowances for free during Phase III and is expected to auction some 97 million allowances, 13 million of which in 2013 (CDC Climate Research, 2013). Auctions are held by the individual member countries using a common EU platform.¹⁰ In Denmark, the revenue generated from the auctioning will be used to finance tax cuts of primarily income taxes in the tax reform of 2009.

¹⁰ Germany, Poland and the United Kingdom have opted out of the common platform and hold their own auctions.

2.1.3 Excise duties on transportation fuels

Taxation of transportation fuels was introduced in 1917. Until the late 1980s, taxes on transportation fuel were mostly imposed for fiscal reasons and they were also seen as an instrument to limit oil imports. The excise duties on transportation fuels have, however, also been seen as a deliberate means to regulate the environmentally harmful effects from the fuel consumption. In the 1980s the fuel tax scheme was used as a means to reduce the use of petrol containing lead (Nordic Council, 2006).

The tax rates on transportation fuels for the period 2010–2013 are illustrated in Table 8.

Table 8 Excise duties on transportation fuels, øre (eurocent) per litre

	Petrol		Diesel	
	2013	Change since 2010	2013	Change since 2010
Basic excise charge, leaded	481.80 (64)	+5%	292.70 (39)	+5%
Basic excise charge, unleaded	409.50 (54)	+6%	-	-
CO ₂ tax on petrol	39.30 (5)	+5%	43.50 (5)	+5%

Source: Danish Ministry of Taxation, 2013b, 2013d.

2.1.4 Excise duty on electricity consumption

Excise duty on electricity consumption was introduced in 1977. The tax was introduced as a response to the first oil crises in order to give incentives to reduced electricity consumption. The excise duties on electricity are levied on all electricity consumption in Denmark regardless of its origin (NCM, 2006).

The excise duty on electricity consumption was revised in 1999. That year the electricity market was opened to international trade and in response a distribution tax and an energy saving tax were added to the electricity tax (Danish Energy Authorities, 1999).

Exemptions

Electricity used for space heating has a reduced energy tax rate. For the amount of electricity used above 4,000 kWh per year in dwellings heated by electricity, the energy tax is only 34.1 øre (4 eurocent) per kWh. Furthermore, electricity used for light and heavy processes are exempt from paying energy tax except for a 1 øre per kWh energy tax for the first 15 million kWh consumed each year (Danish Ministry of Taxation, 2013e). From 1st January 2014 electricity used for light and heavy processes will be totally exempt.

2.1.5 Sulphur tax on fossil fuels

The sulphur tax was introduced in 1996 and was gradually scaled up until 2000 and has remained stable since then (Nordic Council, 2006). The sulphur tax is levied on fossil fuels containing more than 0.05% sulphur and was introduced to increase the incentives to substitute towards energy products containing less sulphur. The tax paid is either based on the sulphur content of the energy product or the emissions of sulphur dioxide (Nordic Council, 2006).

In 2006, the rate was set at DKK 20 (EUR 2.68) per kg of sulphur and has increased gradually to DKK 22.20 (EUR 2.98) in 2013 (Danish Ministry of Taxation, 2012a).

2.1.6 Tax on nitrous oxides (NO_x)

Since 2010, a tax on emissions of nitrous oxides has been in place. Emissions of nitrous oxides in Denmark have been falling during the 2000s and the targets for 2010 set out in the NEC Directive¹¹ of the EU were nearly met on time. The tax paid is based on either the NO_x content of the energy product or the emissions of NO_x.

When the tax was introduced in 2010, the rate was DKK 5 (EUR 0.67) per kg. The duty was increased to DKK 5.20 (EUR 0.68) per kg in 2012 and again more substantially to DKK 25.50 (EUR 3.42) per kg in 2013 (Danish Ministry of Taxation, 2013f). There is also a tax on NO_x emissions from fuels. Currently, this is between 4.6 and 14.1 øre per litre for fossil fuels (De Økonomiske Råd, 2012).

2.1.7 Renewable energy sources

In order to promote the use of renewable energy and reduce the CO₂ emissions from electricity and heat production, several support schemes have been introduced by the Danish authorities. Since 1992, there have been subsidies to producers of electricity from natural gas, biofuels and wind turbines (Nordic Council of Ministers, 2006).

Since 2008, the subsidy for land-based windmills has been 25 øre (3 eurocent) per kWh (Nordic Council of Ministers, 2009). In 2012, the scheme was changed so that the subsidy is gradually reduced by 1 (0.1

¹¹ Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants.

eurocent) øre for every øre by which the electricity price exceeds 33 øre (4 eurocent) per kWh. Hence, when the electricity price is 58 (8 eurocent) øre per kWh the subsidy is zero. The subsidy is paid by consumers as a part of their electricity bills (De Økonomiske Råd, 2013).

Following the 2012 energy agreement, the support for biofuels was increased compared to the previous agreement. Biogas used in power plants and supplied to the natural gas network can receive support of up to DKK 115/GJ (EUR 15.42/GJ). Biogas used in industrial processes can receive up to DKK 75/GJ (EUR 10.06/GJ). This support will gradually decrease with time and with the expected rise in the price of natural gas (De Økonomiske Råd, 2013).

2.2 Water

Municipal drinking water and wastewater services are charged at a fixed part and a part which varies according to consumption, including the taxation on drinking water and wastewater (Nordic Council of Ministers, 2009).

The green tax on the supply of water was phased in from 1994 to 1998. In response to the introduction of this tax, Danish household water consumption decreased by 21% from 1993 to 2002. In 2013 the rate was DKK 5.46 (EUR 0.73) per m³. In 2012, an additional charge of DKK 0.67 (EUR 0.09) per m³ was introduced which will be used to pay for groundwater protection. This charge will be in place until 2017 (Danish Ministry of Taxation, 2013g). The expenses to groundwater protection had previously been financed by the charges that the municipalities collected for supplying the water.

In addition to the green tax on water supply, a wastewater tax was introduced in 1997 and fully implemented in 1998 (Nordic Council, 2002). The purpose of the tax was to give incentives to reduce the amount of waste water, to improve the cleaning technologies of the wastewater treatment plants and to reduce the amount of rain water in the waste water system (Danish Ministry of Taxation, 2013h). Waste water is charged according to the content of bioorganic material, nitrogen and phosphorus, see Table 9.

Table 9 Wastewater tax on contents of polluters, DKK (EUR) per kg

	2010–2013
Bioorganic material	11 (1.48)
Nitrogen	20 (2.68)
Phosphorous	110 (14.77)

Source: Danish Ministry of Taxation (2013h).

2.3 Waste

Every four years, the Danish Government issues waste strategies which outline goals for waste treatment. All waste in Denmark must be returned for recycling, incinerated or put in landfills. A set of fees is in place on the consumer side in order to ensure that the most socioeconomically efficient manner of waste disposal is achieved, and on the producer side in order to incentivise the production of recyclable goods and packaging (De Økonomiske Råd, 2013).

The previous couple of strategies have all put a strong emphasis on increasing the recycling rate compared to using incineration and landfills. In 2011, 61% of waste was recycled, 29% incinerated and 6% put in landfills. The latest waste strategy, issued in 2013, aims to double the amount of household waste recycled compared to today (Danish Government, 2013).

2.3.1 Waste taxes¹²

A tax of DKK 475 per tonne is levied on waste put in landfills. The tax is paid by the owner of the landfill who passes the cost on through a fee on accepting waste. Until 2009, there was a tax on incineration which was replaced by a tax based on the energy content of the waste.

Since 2010, there is a tax on treatment of hazardous waste as well (both incineration and landfill). In 2013, it was set at DKK 160 per tonne and will increase in 2015 to the level for non-hazardous waste. Hazardous waste is handled by special treatment plants.

¹² The municipalities are responsible for handling waste from households and firms for which they charge a fee. It is not necessarily dependent on the amount of waste treated or the type, and is therefore not a waste tax.

2.3.2 Deposit-refund schemes

Beverage containers

The deposit-refund system for refillable beer and carbonated drinks bottles dates back to 1910 when breweries put in place a scheme to reduce the cost of reusing bottles. In the 1950s, the Government started regulating the deposit-refund schemes and in 2000 Dansk Retursystem A/S, a private non-profit outfit, was given responsibility for operating the system (De Økonomiske Råd, 2013). From September 2002, the system also extends to beer and soft drinks in non-refillable bottles, as well as cans that contain certain types of beverages. The deposit refund rates for 2013 are listed in Table 10. The system is funded by levying charges on the producers and importers of beverages.

Table 10 Deposit-refund rates for refillable and non-refillable beverage containers, DKK (EUR) per unit

	Size	Rates
Glass – refillable	under 0.5 l	1 (0.13)
	over 0.5 l	3 (0.40)
Plastic – refillable	under 1 l	1.50 (0.20)
	over 1 l	3 (0.40)
Plastic bottles (single use)	under 1 l	1.50 (0.20)
Other bottles and cans (single use)	under 1 l	1 (0.13)
Other bottles and cans (singles use)	over 1 l	3 (0.40)

Source: Dansk Retursystem (2013).

WEEE

Waste electrical and electronic equipment is hazardous to the environment as it may contain mercury, cadmium, lead, copper, flame retardants and PVC. As a response to the EU directive on waste electrical and electronic equipment (WEEE), a WEEE system was established in 2006 with the purpose of organising the collection and handling of waste from electrical and electronic equipment. Producer responsibility is applied and in order to be allowed to sell electric and electronic goods in Denmark, producers or importers are required to be registered in a system run by the Danish Environmental Protection Agency. Producers who mainly sell to businesses mostly collect WEEE themselves, whereas those who sell to private consumers are mostly members of one of five groups dealing with WEEE collection (De Økonomiske Råd, 2013).

End-of-life vehicles and tyres

The refund schemes for end-of-life vehicles and tyres have not changed since 2009. The recycling of tyres is handled by *Dækbranchens miljøfond* and the refund is either DKK 1,350 (EUR 182) or DKK 1,850 (EUR 248) per tonne of tyres depending on the type. The recycling of end-of-life vehicles is handled by *Miljøordningen for biler* and remains at DKK 1,750 (EUR 235) for vehicles de-registered after July 2002 and returned to an authorised car breaker.

2.3.3 Product taxes

Batteries

The tax on nickel-cadmium batteries was introduced in April 1996. The tax applies to unattached batteries and those sealed inside products. Rates have remained stable at DKK 6 (EUR 0.80) per single battery or DKK 36 (EUR 4.83) per pack for round cells joined in a unit since 1996 (for more details, see Nordic Council of Ministers, 2002).

Packaging

Taxes on packaging are meant to influence the producer in terms of the amount of packaging and the materials used. Packaging taxes cover a wide range of items, including beverage containers, plastic bags, paper, board and disposable cutlery. Packaging taxes have existed in various forms since 1978, while the current weight-based taxes were introduced in 1999 (Nordic Council Ministers, 2006).¹³

Beverage containers are taxed on a per-unit basis, see Table 11 and Table 12. The levies on beverage containers containing spirits, wine or fruit wine were reduced by 50% in connection with the Danish Tax Reform adopted by the Danish Parliament in May 2009. The rest have remained unchanged since 2009.

¹³ From 2001 the weight-based packaging tax was revised to take account of the relative environmental impact and weight of the packaging types rather than relative fiscal equality, and has since remained stable (for a detailed discussion see Nordic Council, 2002). Since February 2004, the volume-based packaging tax on beverage containers has been differentiated to distinguish between containers for wines and spirits and those for beer and carbonated drinks, with lower rates applying to the latter than previously.

Table 11 Beverage containers containing spirits, wine or fruit wine, DKK (EUR) per unit

	Cardboard/laminate	Other materials (e.g. glass, plastic, metal)
< 10 cl	0.08 (0.01)	0.13 (0.02)
10–40 cl	0.15 (0.02)	0.25 (0.03)
40–60 cl	0.25 (0.03)	0.40 (0.05)
60–110 cl	0.50 (0.07)	0.80 (0.11)
110–160 cl	0.75 (0.10)	1.20 (0.16)
> 160 cl	1 (0.13)	1.60 (0.21)

Source: Danish Ministry of Taxation (2013i).

Table 12 Beverage containers containing beer, soft drinks, cider 2010–2013, DKK (EUR) per unit

	All materials, e.g. cardboard, glass, plastic or metal
< 10 cl	0.05 (0.01)
10–40 cl	0.10 (0.01)
40–60 cl	0.16 (0.02)
60–110 cl	0.32 (0.04)
110–160 cl	0.48 (0.06)
> 160 cl	0.64 (0.09)

Source: Danish Ministry of Taxation (2013i).

Other types of packaging are taxed according to weight, cf. Table 13 and Table 14. The weight-based packaging tax will be repealed from 1st January 2014 due to being too burdensome for the companies to administer (Skatteministeriet, 2013).

Table 13 Weight- and volume-based packaging taxes 2010–2013, DKK (EUR) per kg

Material	Tax rate
Paper and cardboard, primary material ¹ and textiles	0.95 (0.13)
Paper and cardboard, secondary material ²	0.55 (0.07)
Plastic (except EPS ⁴ and PVC) primary material ¹	12.95 (1.74)
Plastic (except EPS ⁴ and PVC) secondary material ²	7.75 (1.04)
Plastic (except EPS ⁴ and PVC), "højfyld" ³	7.75 (1.04)
Plastic (except EPS ⁴ and PVC), UN-approved	10.35 (1.39)
EPS ⁴ and PVC	20.35 (2.73)
Aluminium	33.30 (4.47)
Tinplate and steel	9.25 (1.24)
Tinplate and steel	7.40 (0.99)
Glass and ceramic	1.85 (0.25)
Woods	0.55 (0.07)

Note: 1) Primary material: newly produced material (virgin), 2) Secondary material: recycled material (documentation needed), 3) The plastic materials are partly substituted with other materials (documentation needed), 4) EPS: "expanded polystyrene".

Source: Danish Ministry of Taxation (2013i).

Table 14 Taxes for plastic bags, disposable dishes and cutlery 2010–2013, DKK (EUR) per kg

Material	Tax rate
Paper bags	10 (1.34)
Plastic bags	22 (2.95)
Disposable dishes and cutlery	19.20 (2.58)
PVC for food products	20.35 (2.73)

Source: Danish Ministry of Taxation (2013i).

2.3.4 Tax on PVC and phthalates

Certain goods are subject to a tax on PVC and phthalates. Goods containing PVC normally have a tax of DKK 3.00–3.60 (EUR 0.40–0.48) per kg if they contain phthalates and a reduced rate of DKK 1.08–1.60 (EUR 0.14–0.21) if they contain some other plasticiser (Danish Ministry of Taxation, 2013k).

2.4 Transport

There are three types of economic instruments used in the Danish transport sector:

- Energy and CO₂ tax levied on transportation fuels (covered above).
- Registration tax .
- Vehicle excise duty (ownership fee and weight-based fee).

2.4.1 Registration tax

As of 2012, the registration tax is 105% of the car's value up to DKK 79,000 and 180% for the rest of the value (De Økonomiske Råd, 2013). This value is either deducted or increased depending on the fuel efficiency of the car. Before 2007 the registration tax was not dependent on the fuel efficiency.

The registration tax is differentiated to incentivise fuel economy of cars so that cars with fuel economy above 16 km/l in the case of petrol cars and 18 km/l in the case of diesel receive a deduction from their registration tax. Conversely, a fuel economy below this threshold is penalised by a higher registration tax, cf. Table 15.

Table 15 Registration tax deduction and extra charge for fuel (in)efficiency since October 2013

	Reduction for fuel efficiency	Increase for fuel inefficiency
Petrol cars	DKK 4,000 (EUR 536) per km/l above 16 km/l	DKK 1,000 (EUR 134) per km/l under 16 km/l
Diesel cars	DKK 4,000 (EUR 536) per km/l above 18 km/l	DKK 1,000 (EUR 134) per km/l under 18 km/l

Source: De Økonomiske Råd (2013).

In addition to the reduced registration tax for fuel-efficient vehicles, hydrogen cars and electric cars are exempt from registration tax until 2015. This exemption does not apply to hybrid vehicles (De Økonomiske Råd, 2013). Delivery vans pay a lower registration fee and certain types of vehicles pay no fee at all, such as trucks and buses.

2.4.2 Vehicle excise duty

Private cars and delivery vans are subject to an ownership fee differentiated by the fuel efficiency of the vehicle. The biannual rate varies between DKK 290 (EUR 39) (for cars with a fuel efficiency of at least 20.0 km/litre) and DKK 10,800 (EUR 1,450) (less than 4.5 km/litre) for petrol cars, and between DKK 120 (EUR 16) (at least 32.1 km/litre) and DKK 15,090 (EUR 2,026) (less than 5.1 km/litre) for diesel cars. Diesel vehicles are subject to an extra fee to balance the lower energy tax on diesel compared to petrol. Diesel vehicles without an approved filtration system are also subject to an additional DKK 1,000 (EUR 134.1) fee per year (Danish Ministry of Taxation, 2013j).

Private cars, delivery vans and other vehicles such as taxis, buses and trucks are also subject to a weight-based fee (Danish Ministry of Taxation, 2013l).

2.5 Agriculture and natural resources

2.5.1 Fertiliser and phosphorous

Fertiliser use is regulated mainly by a quota system. However, for small users (e.g. households, small businesses and non-farming use) a tax on nitrogen content is imposed. Danish farmers with a turnover of more than DKK 20,000 (EUR 2,685) per year from agricultural production are obliged, in the case of large farms, to keep an account of their use of fertiliser depending on their actual size of livestock. For small farms, keeping these accounts is voluntary. Farmers that keep accounts of their fertiliser use are exempt from paying the nitrogen levy. Furthermore, they have to

report the amount used to the public authority. The account forms the basis of farmers' fertiliser quotas, which are non-tradable. Farmers who exceed their quotas are subject to a fine. The fine is proportional to the violation of the quota restriction (Retsinformation, 2009).

In 1998 a tax on fertiliser based on nitrogen content was introduced in response to the second aquatic plan. The rate was set at DKK 5 (EUR 0.67) per kg and has remained constant since. Farmers who are regulated by fertiliser quotas and who are obliged to keep an account of their use of fertiliser are not charged with this tax (Danish Ministry of Taxation, 2013j). The duty is only applied if nitrogen makes up more than 2% of the total weight of the fertiliser.

A tax on phosphorous was adopted in 2005. The tax is imposed on mineral phosphorous when used in animal feed phosphates, with the exception of pet food. The tax rate is DKK 4 (EUR 0.54) per kg of mineral phosphorous as of 2013 (Danish Ministry of Taxation, 2012c).

2.5.2 Pesticides

The tax on pesticides was changed in 2013. Previously, the tax was based on the value of the pesticide. From 1st July 2013, the tax rate is paid per kilo or litre of pesticide. The tax has four components, based on the intrinsic properties on health and the environment as well as the concentration of the active ingredient in the pesticide. The average rate for the tax was also increased. Since the tax now depends on the properties of the product, a few products will have a lower tax than before, whilst others have a significantly higher tax.

A tax on chemical biocides and microbiological pesticides is based on the use of the product. For example, chemical biocides for combating insects and birds face a higher tax rate (30% *ad valorem*) than biocides used for combating fungus and algae (3% *ad valorem*) (Danish Ministry of Taxation, 2013m).

2.5.3 *Raw materials*

Since 1990 a tax levied on the extraction of raw materials has been fixed at DKK 5 (EUR 0.67) per m³ of raw material¹⁴ extracted, an amount that has remained fixed since its introduction. Other changes have been added, which means that imported raw materials since 1st January 2006 have been included in the tax.

2.5.4 *Tradable quotas for fish*

Fishing in Denmark is regulated through the issuing of quotas for individual fisheries. The quotas are updated continuously and new quotas for every EU Member State are set annually (biannually for deep-sea species) at EU level.

Denmark has a system of transferable fishing concessions (TFCs) for both its pelagic (introduced in 2003) and demersal (introduced in 2007) fleets, which has led to the size of both fleets decreasing and profits increasing (European Commission, 2013). Most fishermen are members of a closed market called Puljefisker.dk where quotas are traded business-to-business (Puljefiskeri.dk (2013)).

¹⁴ This includes various raw materials such as gravel, limestone, sand, clay and rock. For a complete list, see Retsinformation, 2013

3. Finland

Economic instruments have been a part of Finnish environmental policy for several decades. Since 2009, some important changes to economic instruments have taken place.

An energy tax reform was undertaken in 2011, as a result of which energy taxes are now based on the energy content, carbon dioxide emissions and local emissions (particles) of fuels. This improves the effect of the energy taxes as instruments for environmental policy and has also resulted in higher taxes on coal, natural gas and some other fuels which have led to increased government revenue. Furthermore, biofuels have benefited from the reform as their relative price has fallen compared to fossil fuels. An energy tax on peat has been re-introduced after having been phased out in 2005.

Feed-in tariffs were introduced in 2011 to support renewable energy (RES) production. In order to achieve Finland's RES target under the RES directive and increase the amount electricity produced by renewable sources, a guaranteed minimum price was set through a premium feed-in tariff for new wind power, biogas power, wood-fuelled power and wood chip power plants. In 2012, the tax subsidies for electricity produced from renewable energy sources were abolished. The subsidy levels in the feed-in tariffs system are significantly higher than in the previous tax subsidy system. In addition to feed-in tariffs, investment and research subsidies are also key elements of supporting renewable energy generation in Finland.

In 2012 and 2013, the EU ETS was expanded to include more sectors, most notably aviation. This increased the number of industries and economic operators under the EU ETS in Finland. The European Union's Emissions Trading Scheme (EU ETS) remains one of the main economic instruments for reducing CO₂ emissions in Finland. As auctioning plays a larger role as an allocation method from 2013 onwards, the state revenues from the EU ETS are set to increase.

Other economic instruments have also been revised and implemented to strengthen the environmental steering effect. For example, the registration tax and annual car taxes were modified so that cars with lower CO₂ emissions face a lower tax. Furthermore, a waste tax, which is

one of the main policy tools for waste management and prevention, has been increased a number of times since 2009.

Table 16 shows the tax revenue generated by taxes and fees related to the environment in Finland during 2012. It shows that more than half of the revenue originated from taxes on vehicles and motor fuels. Interestingly, the revenue from the auction of CO₂ allowances was infinitesimal compared with revenue from taxes on vehicles and motor fuels. However, the revenues from auctioning the allowances are expected to increase in the future, due the larger share of allowances auctioned.

Table 16 Revenue from the ten highest revenue-generating environmental taxes, fees and charges, 2012

Tax, fee or charge	EUR million
Motor fuel taxes	2,368
Taxes on other energy products	1,586
Vehicle taxes	1,766
Water and wastewater charges	999
Other environmental taxes and fees	100
Waste disposal and management charges	175
EU Emissions Trading Scheme allowance auctions	13
Total	6,154

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

Source: Statistics Finland, Finnish Energy Market Authority.

3.1 Energy and air pollution

The main changes in the use of economic instruments to influence emissions and energy consumption in Finland after 2009 have been the introduction of the energy tax reform and feed-in tariffs in 2011.

The energy tax reform in 2011 introduced significant changes to energy taxation. The main change was to base the energy tax on the fuel's energy content, carbon dioxide and local (particle) emissions of the fuel. Previously the fuel taxes in Finland were divided into a basic tax and an additional tax. Energy taxes are charged on electricity, coal, natural gas, fuel peat, tall oil and liquid fuels. A lower tax level is applied to heating fuels than to transport fuels. In addition of the tax, a strategic stockpile fee is also levied on liquid fuels, electricity, coal, and natural gas to cover the expenses incurred by the State with a view to emergency stockpiling and other measures to secure supplies (Customs Authority, 2013).

The reasons for the tax reform were to have a neutral and objective tax component, to improve taxation as an environmental steering tool and to reduce energy use, CO₂ and other emissions, especially in non-ETS.

The 2011 tax reform did not mean automatically higher taxation levels. However, taxes on coal, natural gas and some other fuels were increased significantly and biofuels clearly benefited from the reform. According to estimations, the energy taxes were raised by a total of EUR 740 million in 2011. At the same time, the abolishment of the so-called KELA-charge on employers was carried out in combination with raising energy taxes by around the same magnitude (Ministry of Finance, 2011a).

Feed-in tariffs entered into force in 2011, when a guaranteed minimum price through a premium feed-in tariff for new wind power, biogas and wood-fuelled power plants was set. The purpose of the feed-in tariff scheme for renewable electricity is to increase the use of renewable energy sources in electricity production in Finland. The main driver of increasing the renewable share in electricity production is to decarbonise power production and achieve the national RES target set by the EU. In 2012, the tax subsidies for electricity produced from renewable energy was abolished.

3.1.1 Excise taxes on fossil fuels for energy purposes

In Finland, carbon-based taxation was introduced in 1990. Since the introduction, the tax rate has increased a number of times.

From 2008 to 2010, the CO₂ tax was calculated using the price of CO₂ at EUR 20/tonne for heating fuels. In 2011, the new tax base was introduced and the CO₂ tax was increased. From 2011 to 2012, the tax was calculated by using the price of EUR 30/tonne (Ministry of Finance, 2010). In 2013, the CO₂ tax was revised again, when the price of CO₂ was increased to EUR 35/tonne to achieve a better steering effect. At the same time the share of the energy content of the tax was reduced from EUR 7.70/MWh to EUR 6.65/MWh (Ministry of Finance, 2012b).

Table 17 illustrates how the tax rate per tonne of CO₂ has developed since its introduction.

Table 17 Development of the CO₂ tax rate, EUR per tonne CO₂

	1990	2007	2009	2011	2013
CO ₂ tax rate	1.19	18.05	20.00	30.00	35.00

Source: NCM (2009), Ministry of Finance 2010, 2012b.

However, there are some exceptions in the CO₂ taxation. To improve the competitiveness of combined heat and power production (CHP) and to avoid overlaps with the ETS and CO₂ taxation, the CO₂ tax for coal, natu-

ral gas, bio-oil, light and heavy oil used in combined heat and power production was halved (Ministry of Finance, 2010).

The energy content tax reflects the volumetric energy content of the fuel, which is based on the calorific values specified in the RES Directive (2009/28/EC), and is levied on fossil fuels and bio liquids according to the same criteria and levels (EUR/MJ) (Ministry of Finance, 2011a). The taxation for natural gas increased significantly via the energy tax reform in 2011. However, the energy content tax of natural gas differs from the other fuels and will be charged at a lower level until the end of 2014 (Ministry of Finance, 2012b).

Table 18 Taxes and fees levied on fossil fuels for heating

Product	Tax	2010	2011	2012	2013
Light oil, c/l	Energy content tax/Basic tax (2010)	2.94	10.35	10.35	9.30
	CO ₂ tax	5.41	8.00	8.00	9.34
	Strategic stockpile fee	0.35	0.35	0.35	0.35
	<i>Total tax</i>	<i>8.70</i>	<i>18.70</i>	<i>18.70</i>	<i>18.99</i>
Heavy fuel oil, c/kg	Energy content tax/Basic tax (2010)	-	8.79	8.79	7.59
	CO ₂ tax	6.42	9.72	9.72	11.34
	Strategic stockpile fee	0.28	0.28	0.28	0.28
	<i>Total tax</i>	<i>6.70</i>	<i>18.79</i>	<i>18.79</i>	<i>19.21</i>
Coal, EUR/t	Energy content tax/Basic tax (2010)	-	54.54	54.54	47.10
	CO ₂ tax	49.32	72.37	72.37	84.43
	Strategic stockpile fee	1.18	1.18	1.18	1.18
	<i>Total tax</i>	<i>50.50</i>	<i>128.08</i>	<i>128.08</i>	<i>132.71</i>
Natural gas, EUR/MWh	Energy content tax/Basic tax (2010)	-	3.00	3.00	4.45
	CO ₂ tax	2.016	5.94	5.94	6.93
	Strategic stockpile fee	0.084	0.084	0.084	0.084
	<i>Total tax</i>	<i>2.10</i>	<i>9.02</i>	<i>9.024</i>	<i>11.46</i>

Source: Ministry of Finance (2010) and Customs Authority, 2010, 2013a.

The low energy tax on peat also entered into force when the energy taxation was revised.¹⁵ Until 2011, peat had been free from taxation since 2005. The rates for peat tax in heating are (Customs Authority, 2010 and 2013a):

- EUR 1.90 per MWh (01/01/2011–31/12/2012).
- EUR 4.90 per MWh (01/01/2013–31/12/2014).

¹⁵ Peat used in small plants (producing less than 500 MWh/a) is exempt from the energy tax.

The taxation on peat differs from other fuels used for energy purposes, and the level of the tax is lower than other fuels.

A refund scheme was introduced in 1998 for the energy-intensive companies. The precondition for the refund scheme is that the total burden of excise duties on energy (fuels,¹⁶ district heating, process steam and electricity) exceeds 0.5% of the value added for the given company. Before 2012, the rate of the total burden level was 3.7%. The company is then entitled to a refund of the taxes paid, and it can apply for a refund of up to 85% of the taxes paid exceeding EUR 50,000. This means that a very limited number of industrial facilities can claim a tax refund (Hyrynen M., 2013 and NCM, 2009).

3.1.2 Excise taxes on electricity consumption

Taxes on fuels for electricity production have not been in force since 1997 and all the fuels used in the production of electricity are exempted from all taxes in line with the EU directive on energy taxation. The taxation of electricity is carried out on the consumption of electricity. In the energy tax reform in 2011, electricity taxation remained outside the energy content and carbon dioxide emissions-based levies. However, the tax levels for electricity consumption were increased significantly (Ministry of Finance, 2010).

The tax has been divided into two different taxation categories to promote the competitiveness of the industrial sector:

- The higher rate (category I tax) is paid by consumers and businesses (other than industry).
- The lower rate (category II tax) is paid by industry and professional greenhouses.

¹⁶ Biofuel oil was included in the scheme in 2012.

Table 19 Excise taxes on electricity consumption

Product	Tax	2009	2010	2011	2012	2013
Electricity	c/kWh					
Tax category I	Tax	0.87	0.87	1.703	1.703	1.703
	Strategic stockpile fee	0.013	0.013	0.013	0.013	0.013
Tax category II	Tax	0.25	0.25	0.703	0.703	0.703
	Strategic stockpile fee	0.013	0.013	0.013	0.013	0.013

Source: Customs Authority, 2010, 2013a.

3.1.3 Excise taxes on transportation fuels

In 2011, tax for fuels in the transport sector was readjusted. When the new taxation was planned, the starting point was that the old motor petrol (gasoline) tax rate would remain the same (62.7 eurocent/l) and other transportation fuels would be defined on that basis. However, the energy tax rate on diesel, natural gas and electricity is lower than the environment tax model presumes (VATT 2011). The CO₂ tax for transportation fuels was calculated using the price of CO₂ at EUR 50/tonne before 2012 and after that EUR 60/tonne. The higher CO₂ tax level on transportation fuels than on fossil fuels for energy purposes was due to the need for a stronger steering effect for the transport sector. In addition to the energy content and CO₂ emissions of the fuel, there are quality scales, which will also take the local emissions of the fuel into account. Before 2011, the transportation fuel taxation was based on four different components: basic tax, CO₂ tax, strategic stockpile fee and oil pollution fee (Ministry of Finance, 2010).

Table 20 Tax rates on transportation fuels

Product	Tax	2010	2011	2012	2013
Motor gasoline, c/l	Energy content tax/Basic tax (2010)	57.24	50.36	50.36	50.36
	CO ₂ tax	4.78	11.66	11.66	14.00
	Strategic stockpile fee	0.68	0.68	0.68	0.68
	<i>Total tax</i>	<i>62.70</i>	<i>62.70</i>	<i>62.70</i>	<i>65.04</i>
Diesel oil, c/l	Energy content tax/Basic tax (2010)	30.67	30.70	30.70	30.70
	CO ₂ tax	5.38	13.25	13.25	15.90
	Strategic stockpile fee	0.35	0.35	0.35	0.35
	<i>Total tax</i>	<i>36.40</i>	<i>44.30</i>	<i>44.30</i>	<i>46.95</i>
Jet fuel, c/l	Energy content tax/Basic tax (2010)	33.32	54.76	54.76	54.76
	CO ₂ tax	5.38	12.74	12.74	15.28
	Strategic stockpile fee	0.35	0.35	0.35	0.35
	<i>Total tax</i>	<i>39.05</i>	<i>67.85</i>	<i>67.85</i>	<i>70.39</i>
Aviation gasoline, c/l	Energy content tax/Basic tax (2010)	37.54	49.88	49.88	49.88
	CO ₂ tax	4.78	11.30	11.30	13.56
	Strategic stockpile fee	0.68	0.68	0.68	0.68
	<i>Total tax</i>	<i>43.00</i>	<i>61.86</i>	<i>61.86</i>	<i>64.12</i>

Source: Ministry of Finance (2010) and Customs Authority, 2010, 2013a.

3.1.4 Economic instruments for renewable energy sources

According to the EU RES directive, Finland has to increase its renewable energy share of the gross final consumption to 38% by the end of 2020 (EC Directive 2009/28). One of the main policy tools for achieving the target is feed-in tariffs, which were introduced in 2011. Other policy instruments to increase and develop power generation based on renewable energy in Finland are investment and research subsidies.

Finland set a guaranteed minimum price through a premium feed-in tariff for:

- New wind power plants.
- New biogas power plants (gas produced by digestion).
- New wood-fuelled power plants, which also produce heat for utilisation (The nominal capacity of the generator must be between 100 kVA and 8 MVA.).
- Timber chip power plants.

The power plants for generating electricity from wind, biogas and bio-mass receive a variable premium feed-in tariff on top of the wholesale electricity price for a period of 12 years. For new wind, biogas and wood-fuelled power plants, the guaranteed price is EUR 83.50/MWh. So the basic subsidy level is the difference between EUR 83.5/MWh and the market price. For wind power plants, an increased (EUR 105.30/MWh)

target price has also been set until the end of 2015. In the case of wood fuel plants, if a plant has produced gains of more than EUR 750,000 in four consecutive obligation periods, the subsidy will be ceased. For biogas there is also an additional EUR 50/MWh heat premium and for new wood-fuelled power plants a EUR 20/MWh heat premium on top of the basic subsidy (Energy Market Authority, 2013).

For the timber chip power plants, the level varies and is determined by the three-month mean price of EUAs and the energy tax on peat. Basically, the paid subsidy level for 2013 was between EUR 0–13.13/MWh and for 2011–2012 was between EUR 0–18/MWh. In 2013, an additional gasifier premium of EUR 0–6.46/MWh was set on top of the basic subsidy (Energy Market Authority, 2013).

Before the feed-in tariffs, the energy taxation was, besides investment subsidies, one of the main instruments for supporting renewable energy power generation. Timber chips, wind power, small hydro, biogas and recycled fuel plants received refunds from power generation (Finlex, 152/2010).

The subsidy levels (refund amounts) before 2011 were:

- 0.69 eurocent/kWh for wind and timber chips.
- 0.42 eurocent/kWh hydro and biogas.
- 0.25 eurocent/kWh for recycled fuel.

The refund rates were the same since 2003 and 2011. But in 2012, the tax subsidies for electricity produced from renewable energy were abolished (Finnish Energy Industries, 2012).

Finland also provides financial incentives for thinning in young forest stands through the KEMERA law. The goal of the subsidy is to increase the amount of first-thinning wood used in energy production. The total subsidy level has been around EUR 17–18 million per year from 2011 to 2013 (Hyrynen M., 2013).

In addition to feed-in tariffs, the Government of Finland provides grants for investments in RES production facilities and related research projects. All technologies are eligible for this so-called “energy aid”, which is available to companies, municipalities and other communities. The grant for investments in renewable energy production facilities can be up to 30% of the project’s overall investment cost. With the new technology, the grant can increase up to 40% of the project’s total cost. At least 25% of the total project costs have to be financed from non-state funding (RES Legal, 2013).

The grants will be also allocated for companies and organisations (including municipalities) for different research purposes, which will promote deployment of renewable energy, such as energy audits, analysis of the new methods and development of services. The support provided for research can constitute up to 60% of the project's total cost (TEM, 2013).

3.1.5 *Economic instruments for energy efficiency*

In addition to grants for investments in RES production facilities and related research projects, the so-called "energy aid" also provides subsidies for projects which advance energy efficiency. The subsidy levels are the same as in the renewable energy sector: normally 30% of the project's overall investment cost and with the new technology grant can increase up to 40% of the project's total cost. Other requirements are also roughly the same as for investments in RES production (RES Legal, 2013).

To enhance energy efficiency, the grants will also be allocated to companies and organisations (incl. municipalities) for different purposes, which will promote energy efficiency measures like energy audits, analysis of new methods and development of services (RES Legal, 2013).

3.1.6 *Emissions trading*

One of the main economic instruments to reduce CO₂ emissions in Finland is the European Union's Emissions Trading Scheme (EU ETS). The EU ETS covers about half of the CO₂ emissions in Finland.

In the first phase of the EU ETS (2005–2007), the total volume of emission allowances allocated to energy production and industry in Finland for the period 2005–2007 was approximately 136.5 million tonnes, whereas the total volume of verified emissions for the same period was 120.28 million tonnes. Allowances equal to 2.5 million tonnes of the total volume of allowances were reserved for new entrants. The allowances were allocated free of charge (NCM, 2009).

During the second emissions trading period (2008–2012), the scope of the Emissions Trading Directive was broader compared to the first emissions trading period. On February 2008, the Finnish Government decided the amount of emission allowances to be allocated free of charge to energy production and industry for the second emissions trading period. The total volume of allowances for the period 2008–2012 was 187.8 million tonnes, corresponding to 37.6 million tonnes per year. It was decided at the time that emission allowances would be allocated for

566 installations in Finland and allowances equal to 7 million tonnes of the total volume of allowances were reserved for new entrants for the entire emissions trading period (NCM, 2009).

The allocation of emission allowances was based on the calculation principles laid down in the Emissions Trading Act. Sub-category-specific efficiency and reduction coefficients were also applied to the calculations (NCM, 2009).

A total of 187.6 million allowances were allocated for free for installations covered by the EU ETS in 2008–2012. The total emissions during the same time period in the EU ETS sector were 176.5 million tonnes of CO₂. So the surplus of the allowances in phase 2 was around 11 million tonnes (Energy Market Authority, 2013b). Finland did not apply auctioning of allowances during the period 2008–2012.

In phase 3 (2013–2020) of the EU ETS, there is only one EU-wide cap on emissions instead of national caps, which applied in phase 1 and 2.

Another major change for phase 3 was that auctioning plays a key role as an allocation method, especially in the energy industry sector. According to the European Commission, the total volume of the auctioned allowances will be over 800 million in 2013 and the share of the Finland's auctioned allowances will be around 15 million. In 2011, a total of 474 installations in Finland applied free allowances for phase 3. According to the estimations of the Ministry of Employment and the Economy of Finland, free allowances totalling 25,474 million will be allocated in 2013. The amount will decrease to 20,556 allowances by 2020. With the free allocation and auctioned volume the total "cap" for Finnish installations in 2013 is around 40.5 million tonnes (Ministry of Employment and the Economy, 2012). Finland has a high share of free allocation of allowances due to its industrial structure.

The aviation sector was included in the Emissions Trading Scheme in 2012, and additional sectors and gases were included in 2013, which increased the number of Finnish operators in the EU ETS.

3.2 Water

Water supply and sewerage policies in Finland guarantee the availability of good quality drinking water, and ensure that waste water is efficiently collected and suitably treated to acceptable standards.

Municipalities are responsible for water supply and sanitation within population centres. In urban areas, municipalities may have the primary

responsibility for providing water supply and wastewater treatment or outsource it to private companies.

These services are financed by charges to the user based on a full-cost principle, which means that the total cost of providing the water services should be paid by the users.

However, the situation may differ to some extent due to state subsidies for water management.¹⁷ In addition, water and waste water tariffs are decided by each municipality.

In addition to volume charges, there are also fixed components, for instance a connection charge designed to cover the investment costs by the municipality in water service management. Industry often abstracts its water directly from surface water or groundwater sources, and is also responsible for the treatment of the wastewater produced.

So the user charges for water supply and wastewater services are combined with the drinking water and wastewater fee, including a connection fee for investment, a fixed monthly fee for the fixed cost of the water utility and a consumption fee in EUR/m³. The charges for water supply and wastewater service both vary from one municipality to another (Finnish water forum, 2013 and NCM, 2009). Finland does not apply any emission-related charges on water services.

3.3 Waste

In the Government Programme 2003, an ecological tax reform, aiming to reduce the use of non-renewable natural resources and preventing damage to the environment, was announced. Recycling, improved ecological efficiency of products, consumption, energy use and the cutting of subsidies detrimental to the environment played a major role in the programme.¹⁸ The new national waste plan until 2016, aiming to develop the Finnish waste management system and promote waste prevention,

¹⁷ Finland's 13 regional environment centres supervise the water supply and sewerage systems in their respective regions, while also controlling the planning of improvements and allocating financial subsidies for such purposes.

¹⁸ Further aims included the use of economic and technical incentives to reduce the volume of waste, increased use of waste as a raw material and as a source of energy, an environmental guidance system based on excise tax for beverage packaging, minimisation of the adverse effects on the environment of the final disposal of non-recyclable waste and extension of the polluter-pays principle to further product groups, and the responsibility of the trade sector for packaging waste (Nordic Council, 2006).

was approved by the Finnish Government in 2008. The plan included a separate national waste prevention programme (NCM, 2009).

The new Finnish Waste Act entered into force in May 2012. The main purpose of the new legislation was to implement the EC waste directive in national law and to clarify the rules relating to waste. The main features of the law remained almost unchanged (Association of Finnish Local and Regional Authorities, 2012).

The economic instruments used in waste management and waste prevention are municipal waste charges and waste taxes.

3.3.1 *Municipal waste charges*

Municipalities are responsible for the collection, treatment and reuse of household waste. Municipal waste charges cover the costs incurred by waste transportation, the establishment, maintenance, decommissioning and after-care of treatment facilities, and the costs of register maintenance and waste guidance.

Waste charges aim to reduce the amount of waste, make it less harmful and encourage its use. Many municipalities set a smaller fee for waste that is sorted and can be reused than for mixed municipal waste that is unfit for recycling. The municipality defines the level of waste charge and it must be in line with the provided service level. The charge is collected from the property holder or some other holder of the waste (Ministry of the Environment, 2013).

3.3.2 *Waste tax*

Finland's Waste Tax Act came into force in 1996 and was revised in 2011 and 2013. Tax is levied on all waste deposited at landfill, provided that its utilisation is technically feasible and environmentally justifiable, and that by imposing the tax, waste can be made more commercially exploitable. Waste taxes are paid on waste left at public landfill sites and from 2011 onwards also at private or industrial landfills.¹⁹ The owner of the landfill pays the taxes and is able to pass on the cost through fees charged for the reception of waste.

¹⁹ Storage of waste lasting less than three years, waste composting or utilisation areas and dumping areas, are not subject to the waste tax.

The waste tax level has been raised a few times since 2009. Before 2011, the waste tax was EUR 30 per tonne. In 2011–2013, the tax was EUR 40 per tonne and in 2013 the tax increased to EUR 50 per tonne.

Hazardous waste from households can be delivered to collection points and waste treatment centres free of charge. Companies are charged a fee at the waste treatment centres according to the type and weight of the waste (Ministry of the Environment, 2013, NCM, 2009).

3.3.3 Oil waste charges

The oil waste charges have stayed unchanged since 2009. The prices of lubrication oil include an oil waste charge of 5.75 eurocent per kilo. The income from this charge is used to cover the cost of managing oil waste and cleaning up soil and groundwater contaminated with oil (Ministry of the Environment, 2013).

3.3.4 Beverage packaging tax

Beverage packaging taxes are currently paid on packages for alcoholic beverages, soft drinks, bottled water and certain other drinking packaging. The taxation system aims to encourage the reuse and recycling of drinking packages, to reduce the quantities of such materials ending up in landfills and to prevent littering. The tax does not apply the packaging covered by deposit-refund systems that involve the collection of packaging for refilling or material recycling.

Since 2005, the tax level has been EUR 0.51 per litre. Finland's beverage packaging taxation system has effectively encouraged consumers to return used drinks packages. The current deposit-refund scheme applies to both refillable and non-refillable beverage containers for reuse and recycling, respectively.

Beverage packages with a deposit include certain types of refillable glass and plastic bottles, as well as aluminium cans that are recycled or re-used. The return rate of glass bottles for beer and soft drinks is close to 100%. For plastic bottles with a deposit the return rate was around 94% in 2012, and for aluminium cans with deposit 96% (Ministry of the Environment, 2013 and PALPA, 2013).

The rates for refund on aluminium beverage cans, glass and plastic containers are presented in Table 21.

Table 21 Refund rates for glass, plastic and aluminium can beverage containers and crates in 2013

Containers	EUR per unit
Glass for re-use (0.33, 0.35, 0.5 litre)	0.10
Glass for re-use (1.0 litre)	0.40
Glass for recycling (all)	0.10
Plastic (0.35 litre or less)	0.10
Plastic (0.5 litre)	0.20
Plastic (1.0, 1.5 litre)	0.40
Crates (24 * 0.33 litre)	2.20
Aluminium can	0.15

Source: Palpa (2013).

3.3.5 Producer responsibility in waste management

Producer responsibility obliges producers to organise the reuse, recovery or suitable treatment or disposal of their products and the wastes derived from them, and to cover the related costs. The regulation of the producer responsibility is described in the Waste Act. Some parts of the revised regulation (the new Finnish Waste Act in May 2012) relating to producer responsibility entered into force in May 2013, and some parts will enter into force in May 2014.

The producer means the manufacturers and importers of the products; or where packaging is concerned, the packagers and importers of packaged products.

Producer responsibility covers electronic and electrical appliances, batteries and accumulators,²⁰ tyres from motor vehicles, other vehicles and equipment, cars, vans and comparable vehicles, newspapers, magazines, copy paper, and other comparable paper products and packaging (Ministry of the Environment, 2013b and NCM, 2009).

Tyres

The systematic recycling of used vehicle tyres in Finland started in 1996.

Finnish Tyre Recycling Ltd, which is owned by major Finnish tyre manufacturers and importers, is responsible for recycling used vehicle tyres. The target by 2015 for reuse and recovery of vehicle tyres is 95% in Finland. This is 5% more than the previous target. The realised recovery rate in 2011 was 137%. The scheme is financed by a recycling fee paid by the consumer on buying a new tyre. The profits are passed on

²⁰ Since 26th September 2008, consumers have been allowed to return used portable accumulators and batteries to retail traders free of charge.

from the retailer to the producer or the importer, who will pass on the funds to Finnish Tyre Recycling Ltd to cover the associated treatment and disposal costs. The fees are determined by the size of the tyre. Some examples of the charges for different types of tyre in 2004, 2009 and 2013 are presented below (Ministry of the Environment, 2013c and NCM, 2009).

Table 22 Examples of tyre recycling charges for different types of tyre, EUR per unit

Products	2004	2009	2013
Moped and motorcycle tyres	1.85	1.85	1.97
Car tyres	1.85	1.85	2.17
Delivery van tyres	1.85	1.85	2.17
Lorry and coach tyres	8.30	8.65	10.60
Tractor tyres	2.45	2.45	2.68
Retreated lorry tyres	2.45	5.00	6.39

Note: EUR per unit includes 22% VAT in 2004 and 2009 and 24% VAT in 2013.

Source: Finnish Tyre Recycling Ltd (2013), NCM (2009).

End-of-life vehicles (ELVs)

The producer responsibility legislation entered into force in September 2004. The regulation is based on the ELV Directive (2000/53/EC). It applies to passenger cars, vans and special vehicles such as recreational vehicles. The legislation states that total utilisation (re-use, recycling and recovery) of vehicles should be 85% of their weight by 2006, and 95% by 2015.

The importers are responsible for the utilisation of end-of-life vehicles, and Finnish Car Recycling Ltd coordinates the collection, treatment and recycling of end-of-life vehicles in Finland. Finnish Car Recycling Ltd is owned by the Association of Automobile Importers in Finland. Vehicle owners can return ELVs without charge to authorised collection points (Finnish Car Recycling Ltd, 2013).

Electrical and Electronic Equipment (WEEE)

In Finland, the electrical and electronic equipment waste legislation is based on the WEEE Directive, which has been enacted in national legislation by the Government Decree on Waste Electrical and Electronic Waste (852/2004). The target of the legislation is to prevent the generation of waste electrical and electronic equipment and promote the reuse, recycling and other methods of utilisation of waste in order to decrease the amount of waste ending up in final treatment. The main requirements for the producers is to organise the collection, transport and treatment at an approved facility of separately collected equipment, finance the recovery and other waste management, ensure proper mark-

ing, provide the necessary information for users, register with the corresponding regional environment centre, submit annual reports and provide a guarantee (either a financial guarantee or by joining a collective scheme) (Tukes, 2013 and NCM, 2009).

3.4 Transport

Motor vehicles in Finland are charged with both a one-time registration tax and an annual tax. The tax base of the both car taxes has been modified since 2009.

3.4.1 *Registration tax*

The registration tax (also called a car tax) is levied on passenger cars, delivery vans and motorcycles when the vehicles are registered for the first time in Finland. This tax was introduced in the 1950s to raise state revenue.

The registration tax was changed in 2008 to guide consumers towards choosing car models which use less fuel while speeding up the renewal of the vehicle stock to introduce cars with better fuel efficiency and lower emissions. The car tax levied on passenger cars upon registration is differentiated now in proportion to the carbon dioxide emissions resulting from the vehicle's specific consumption of fuel. The new taxation applies to all passenger cars. The tax rate is based on the carbon dioxide emissions declared by the car manufacturer for a combination of city and road driving. Where emissions data are not available, the tax rate is based on the weight of the vehicle. In practice, the latter applies to passenger cars which have entered into service before 2001.

This means that the taxable value of the passenger car is still based on the common retail value, but in the new taxation system the differentiation is enforced in such a way that each gram of carbon affects a level of the tax rate. Vans were included in the new tax system from the beginning of April 2009 (NCM, 2009).

In April 2012, the registration tax was modified. The tax share of the CO₂ emissions below 100 grams per kilometre for cars was reduced, and the tax share of the CO₂ emissions above 100 grams per kilometre for cars was increased. Before the change in 2012, the minimum registration tax was 12.2% (max. 48.8%) of the taxable value. After the change in 2012, the minimum is 5% and the maximum 50% of the taxable value (Ministry of Finance, 2012).

Table 23 Examples of the registration tax (car tax) from 2012 onwards

CO2 emissions of the car (g/km)	Tax rate of the taxable value
90	14.9%
120	20.1%
140	23.8%
150	25.8%
170	29.7%
200	35.1%
230	39.8%

Source: Veroimaksajain keskusliitto (2012).

Annual car taxes

Besides the registration tax, motor vehicles in Finland are charged an annual tax (the motor vehicle tax). The vehicle tax may consist of the following elements:

- Basic tax – e.g. a petrol passenger car.
- Driving power tax – e.g. a diesel lorry.
- Basic tax + driving power tax – e.g. a diesel passenger car.

In 2011, major changes for vehicle taxes entered into force, when the base tax for passenger cars and vans was changed to be based on CO₂ emissions reported by the vehicle manufacturer. In the case of older cars, the tax is levied on the basis of total mass. In 2013, the basic vehicle tax was raised significantly (see Table 24). Tax for vehicles for which the sole driving power is electricity is determined according to an emission level of 0 g/km (Finnish Transport Safety Agency, 2013).

The rates for the basic annual tax for passenger cars based on CO₂ emissions are presented in Table 24.

Table 24 Examples of the basic tax for passenger cars

The CO ₂ emissions of the car (g/km)	Tax rate (EUR/365 days)	
	2011	2013
100	41.97	85.05
120	59.13	101.84
140	79.20	122.64
150	90.52	134.69
170	114.97	162.43
190	142.35	195.28
210	172.64	233.24

Source: Finnish Transport Safety Agency (2013).

Older cars will be taxed on the basis of total mass. Basic tax based on total mass varied until 2013 between EUR 75–485 (total mass 1,300–3,401 kg) and after 2013 between EUR 126–535.5. Around 80% of the passenger cars in Finland have a total mass of 1,301–2,000 kg, which means a tax level of EUR 137–218 in 2013.

The driving power tax is imposed on vehicles that are powered by some force or fuel other than petrol. In 2012 and 2013, the basic tax of driving power was modified. For passenger cars, the tax on driving power decreased in 2012 from 6.7 eurocent/day to 5.5 eurocent/day for every 100 kilograms of vehicle weight. The tax on driving power decreased by 29–45% for lorries (Finnish Transport Safety Agency, 2013).

Aviation noise charge

A noise charge is applied to departures at Helsinki–Vantaa Airport between 23.00–06.00 LMT with turbojet aircrafts. The noise charge for an aircraft is calculated according to the aircraft's noise certificate in accordance with the International Civil Aviation Organisation (ICAO). Aircraft which are unable to show certificated noise levels will be charged at the highest noise rate for the same aircraft type. Charges less than EUR 10 will not be charged. There is no limit for the maximum charge (Finavia, 2012).

3.5 Agriculture and natural resources

The basis of support policy for Finnish agriculture and horticulture has remained roughly the same since 2009. The Finnish agriculture and horticulture support policy is based on the support schemes of the EU's Common Agricultural Policy (CAP). The largest environmental-based aid is granted under environmental aid for agriculture, around EUR 300 million²¹ every year. In the period 2007–2013, 90% of the farmers and 95% of the field area were covered by the subsidy system. The target for commitment for farmers is 93% and 98% of the field area.

Farmers who are participating to the subsidy system sign up to five-year contracts in which they agree to implement general or supplementary environment protection schemes on farms. The main focus has been on water protection and the subsidy stipulates certain restrictions on

²¹ The proposal for 2012 was EUR 360 million.

phosphorous and nitrogen use. According to the new Council of State decision-in-principle, the aim is to reduce one-third of the nutrient loading from agricultural activity by 2015 from the average loading levels in 2001–2005. Support may also be granted for enhancing biodiversity and landscape management (Hyyrynen M, 2013).

The Act on the Funding of Sustainable Forestry entered into force at the beginning of 1997. The State can offer direct aid or loans via the Act to finance measures intended to maintain the biological diversity of forests, protect the sustainability of wood production and carry out projects for managing forests and other supportive measures. Mostly private, or in some cases other, landowners can obtain financing from the Act. Private forest owners are granted environmental support for all but minor losses involved in preserving important habitats referred to in the Forest Act (NCM, 2009)

In 2002, the Finnish Government first introduced the Forest Biodiversity Programme for Southern Finland 2003–2007 (the METSO Programme). The decision for a new Forest Biodiversity Programme, including the period 2008–2016, was made in 2008. The programme has been designed to halt the on-going decline in the biodiversity of forest habitats and species, and to establish stable favourable trends in forest ecosystems.

The programme covers both private and state-owned land, and one of the main goals is to establish 120,000 hectares of new conservation areas. Conservation schemes will largely be based on the voluntary participation of landowners. The landowners enter into temporary or permanent agreements, where they will commit to a voluntary contract concerning the maintenance or enhancing of natural values in their forests for a fixed term and receive a premium for this. The price and terms of contract were negotiated on a case-by-case basis, and when the term (10–13 years) ends the forest owner is free to manage the area according to his own wishes. Some areas may also be purchased by the State for designation as permanently protected areas. Compensation will be paid to landowners according to legislation in the Nature Conservation Act or the Act on the Financing of Sustainable Forestry. The METSO Programme will largely be financed through the annual framework budgets allocated to the Ministry of the Environment and the Ministry of Agriculture and Forestry. In 2008, the Government decided to guarantee funding for the programme amounting to EUR 182 million by 2012 (Government resolution, 2008 and NCM, 2009).

4. Iceland

Economic instruments have not been as widespread in Icelandic environmental policy and legislation as in the other Nordic countries in recent decades. Apart from the tradable quota system in fisheries, the use of economic instruments has mostly been limited to waste and recycling fees and taxes on vehicles and fuels. However, there has been a notable shift in the last few years towards increased use of economic incentives in some fields of environmental legislation, especially energy and climate change. New government policies on climate change and energy were published in 2010 and 2011 respectively, which have led to a number of legislative amendments. The most important changes since 2009 are the implementation of the EU Emissions Trading System, which was introduced in Iceland for the first time in 2012, a new carbon tax on fossil fuels and new (or prolonged) tax discounts for non-fossil fuels and cars which use renewable energy. A new tax was imposed on energy sales in 2009 as a response to a budget deficit following the economic recession in 2008. Excise duties on fuels for transport purposes were also significantly increased in 2009 for the same reason.²²

An important change was made in the transport sector in 2011, when excise duties and taxes on vehicles were linked to CO₂ emission instead of engine capacity or weight. Changes in other sectors have been minor.

Table 25 illustrates state revenue generated by taxes, fees and charges related to the environment in Iceland during 2012. Excises and taxes on fuels and vehicles account for the largest part of the revenue. Revenues from fishing fees surged in 2012 due to an increase in the general fishing fee and the adoption of a special fishing fee. It should be noted however that after a new government came into power in 2013 the special fishing fee was lowered substantially for the fishing year 2012–2013.

²² 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.

Table 25 Revenue from environmental taxes, fees and charges, 2012

Tax, fee or charge	ISK million	EUR million
Carbon tax	7,477	47
General excise on petrol and oil products	6,893	43
Special excise on petrol	6,456	40
Excise on gas oil, diesel oil and kerosene	5,092	32
Excise on electricity and geothermal water	4,699	29
Recycling charges	4,480	28
Excise on motor vehicles	4,244	26
Vehicle tax based on CO ₂ emissions	3,061	19
General fishing fee on fishing rights	2,630	16
Special fishing fee	2,261	14
Total	47,293	294

Source: The Financial Management Authority (2012).

4.1 Energy and air pollution

The use of economic instruments in this field has increased substantially since 2009. Important changes include the implementation of the EU Emissions Trading System, new taxes on energy and fossil fuels and reforms of the tax system for cars and fuels to promote the use of renewable energy. The development of regulation in these areas, including the use of economic instruments, has in many ways differed from the other Nordic countries, mainly due to an unusual energy supply situation and a different greenhouse gas emissions profile. In Iceland, over 90% of households are heated with geothermal energy and a large part of electricity for the industrial sector comes from renewable sources (Ministry of Industries and Innovation, 2013). Measures to curb greenhouse gases have therefore not focused on energy production but have mostly been aimed at industrial processes and transportation, which are the two largest emission sources (Ministry for the Environment and Natural Resources, 2013).

In 2007 the Icelandic Government adopted a long-term strategy of reducing net greenhouse gas emissions in Iceland by 50–75% by 2050, compared to 1990 levels (Ministry for the Environment and Natural Resources, 2007). In the short term, Iceland aims to reduce emissions by up to 30% until 2020, compared to 2005 levels (Ministry for the Environment and Natural Resources, 2010). In order to realise that objective, the Icelandic Government adopted a Climate Change Action Plan in late 2010, which sets forth ten key measures to reduce emissions from major sources. The proposed measures include the use of important economic instruments, such as the EU Emissions Trading System and a shift to environmentally based taxes and charges on cars and fuels (Ministry for the Environment and Natural Resources, 2010).

Following the incorporation of the EU Renewable Energy Directive into the EEA Agreement, Iceland is committed to ensuring that at least a 10% share of energy in transport will come from renewable sources in 2020. In November 2011 the Icelandic Government published a report laying down the government emphasis in energy strategy and energy policy for the next years. The report puts forward a number of actions to increase energy savings and promote the use of renewable energy in transportation in order to fulfil this goal. One of the measures proposed was that taxes and charges on vehicles, car parts, ships and fuels should be revised with a view to promoting the use of renewable energy (Ministry of Industries and Innovation, 2011).

4.1.1 The EU Emissions Trading System

Participation in the EU Emissions Trading System (ETS) is now one of the key measures for reaching both the long-term and short-term targets for the reduction of greenhouse gas emissions (Ministry for the Environment and Natural Resources, 2010). Iceland has formally been a part of the ETS since the relevant EU rules were incorporated into the EEA Agreement in 2007. However, since the installations that fell under the scope of the ETS at that time were both very few and small, these particular installations were exempted. Consequently, Iceland was not required to publish a National Allocation Plan and allocate transferable allowances to stationary installations in the period 2008–2012. Instead, Iceland created a national quota system in order to fulfil its Kyoto obligations. Emission rights were allocated free of charge to installations in carbon-intensive industries, based on previous emissions. The emission rights were however not transferable and did not therefore constitute an economic incentive.

Iceland became an active participant in the ETS in 2012 when aviation activities were included in the system. Due to its geographical location, Iceland is the administering state for a large number of aircraft operators, most of which are based outside the European Economic Area. Following the extension of the ETS to new sectors and gases in 2013, including aluminium production, the system now also covers a small number of stationary installations in Iceland, which collectively account for over 40% of Iceland's total greenhouse gas emissions (Ministry for the Environment and Natural Resources, 2010). To limit the administrative burden of the system for small installations, Iceland decided to make use of a provision in the ETS Directive allowing states to exclude small emitters from the system's scope. In line with the requirements of

the Directive, Iceland has imposed a special charge on greenhouse gas emissions from excluded installations, which is collected annually on the basis of the previous year's emissions. The emission charge reflects the market price of ETS allowances and shall be updated every year in accordance with price developments in the market with ETS allowances. Emissions from excluded installations are furthermore only subject to the charge to the extent that it would have exceeded the installation's free allocation in the ETS. The emission charge for 2013 is ISK 1,338 (EUR 8.26)/tonne of CO₂ equivalent.

4.1.2 Carbon tax

In 2009 the Icelandic Parliament imposed a new carbon tax on gas, diesel, petrol, aviation fuel, aviation kerosene and fuel oil. Apart from fiscal reasons, the purpose of the tax was to promote the use of environmentally friendly cars, enhance energy savings, reduce greenhouse gas emissions and increase the use of domestic energy resources.

The tax was added to existing taxes and charges on oil and petrol. The tax level was determined by taking the CO₂ content of each fuel type into account and was initially based on the price of emission allowances in the ETS market in the previous year. Stationary installations that are covered by the EU ETS are however not exempted from the carbon tax. The tax rate is illustrated in Table 26.

The tax on aviation fuel and aviation kerosene was in practice never fully enforced for international aviation and was finally abolished in 2013, for both domestic and international flights.

Table 26 Carbon tax on fuel

	2010	2011	2012	2013
<i>Gas and diesel</i> ISK (eurocent)/litre	2.90 (1.79)	4.35 (2.69)	5.75 (3.58)	5.75 (3.55)
<i>Petrol</i> ISK (eurocent)/litre	2.60 (1.61)	3.80 (2.35)	5.00 (3.11)	5.00 (3.09)
<i>Aviation fuel and kerosene</i> ISK (eurocent)/litre	2.70 (1.67)	4.10 (2.54)	4.10 (2.55)	-
<i>Fuel oil</i> ISK (eurocent)/kg	3.60 (2.22)	5.35 (3.31)	7.10 (4.42)	7.10 (4.38)
Petroleum gas and other gaseous hydrocarbons ISK (eurocent)/kg	-	-	-	6.30 (3.89)

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

4.1.3 *Excise duties on fuels for transport purposes*

As in the other Nordic countries, taxation of fuel for transport purposes has a long tradition in Iceland. Apart from the differentiation of tax levels between leaded and unleaded petrol, the taxes have only been linked to environmental considerations to a minor extent, having mostly been intended to finance road construction. However, in the last few years certain tax incentives have been introduced with the objective of increasing the share of environmentally friendly energy.

Sales of petrol are subject to excise duties which are calculated in two steps: the general excise duty is ISK 24.46 (15.09 eurocent)/litre, and in addition there is a special excise duty set at ISK 39.51 (24.38 eurocent)/litre (ISK 41.87 (25.84 eurocent)/litre if the petroleum contains lead). The general excise duty was doubled in 2009 following the economic recession in 2008, but both the general and special excise duty have only increased slightly in the period 2009–2013. Petrol that is intended for use by aircraft is exempted from the duty.

An excise duty is also imposed on gas oil, diesel oil and kerosene that can be used as a fuel for vehicles. The duty is ISK 54.88 (33.86 eurocent)/litre and has only increased slightly in the period 2009–2013. Sales for various purposes are exempt from the duty, for example if the oil is intended for use by ships or boats, for heating houses, in industry, by tractors and for energy production.

In line with both the Government's climate change policy and energy policy, various amendments have been made to the taxation system for fuel and cars with the objective of increasing the share of renewable energy in transportation. From 2011, both petrol and oil that have been blended with non-fossil fuels have been granted a reduction from the excise duties above to the percentage of the non-fossil fuel blended.

4.1.4 *Tax on sales of electricity and geothermal water*

Taxes on sales of electricity and geothermal water were introduced in 2009. They are imposed at the last stage of sale, i.e. on the sale to end users. The tax level for electricity is currently ISK 0.126 (0.08 eurocent). The tax on electricity expires at the end of 2015. The tax on geothermal water was set at two per cent of the retail price.

4.2 Water

Freshwater resources in Iceland are abundant and water quality is generally considered high. There is however pressure on the water resources in certain areas, such as in urban areas and near industrial installations and power plants. Examples of problems include untreated sewage, contaminated drainage water and use of fertilisers and pesticides (Environment Agency, 2013).

No changes have been made as regards water charges since 2009. Municipalities are responsible for supplying water to both households and industry in urban areas. Water charges vary between municipalities as they can be based on either the size of the property or calculated as a fixed price with additional charges based on the size of the property and/or actual usage. The price may however, not exceed 0.5% of the rateable value of the property. Special charges apply for industrial activities, which shall be based on the actual volume of water used (per m³).

New legislation was adopted in 2009 which made municipalities responsible for wastewater services. Such services are now subject to a fee that can either be based on the size of the relevant building or calculated as a fixed price with additional charges based on the size of the property or actual usage. Special charges apply for industrial activities, which shall be based on the actual volume of water used (per m³). Wastewater charges shall be determined with the objective of covering the operational costs of the sewer (along with other revenues).

4.3 Waste

4.3.1 *Fee for treatment of waste*

No substantial changes have been made to general fees for treatment of waste since 2009. As before, municipalities are responsible for the collection, handling and treatment of municipal waste and shall ensure that waste treatment facilities are available. The operator of each facility shall collect fees for the disposal of waste. The fees shall cover all costs of disposal, including the building and operation of the facility. Where waste is put in landfill the fee shall also cover insurance costs and estimated costs for closing the facility and 30 years of subsequent monitoring.

Furthermore, municipalities can collect fees for any treatment of waste and related activities, such as technology development, research and education related to waste treatment. The price of the fee can be

based on various factors, but shall reflect the cost of treating the waste in question. The price can also be fixed for each unit of property based on the number of waste containers and/or level of service. The fees vary from one local authority area to another.

4.3.2 *Recycling fees*

The system of recycling fees, which was established in 2002, has mostly remained unchanged since 2009. The recycling fees are levied on products, including cars and hazardous substances, in order to finance their collection, transportation, recycling, recovery or disposal. The Recycling Fund of Iceland was set up in 2003 to collect and administer the recycling fees. The fees were raised in 2011 since the revenues had not been sufficient to operate the Fund.

4.3.3 *Deposit refund system for bottles and cans*

No substantial changes have been made to the deposit refund system for bottles and cans. Iceland was the first country in the world to establish a deposit system on a national scale for all disposable beverage packages. The deposit-refund system dates back to 1989 and has been so successful that the recycling rate is now between 82 and 90% depending on the type of container (Endurvinnslan, 2013). Since 2010 the deposit has been ISK 14.0 (9 eurocent) for all bottles and cans.

4.3.4 *Electrical and Electronic Equipment (WEEE)*

A WEEE system was established in 2008 to implement the EU WEEE Directive which had been incorporated into the EEA Agreement. The main new feature of the system is that importers and producers are made responsible for financing and managing the disposal of electrical and electronic equipment. A collective system, RR-SKIL, was established in 2008. From 2012 local producers and importers of electrical and electronic equipment have had to register with the Environment Agency of Iceland. A registration fee and an annual fee must be paid to the agency.

4.3.5 *End-of-life vehicles*

A deposit system for end-of-life vehicles has been in force since 2003 and has not changed since the previous report. Car owners are given ISK 15,000 (EUR 92.56) for returning a vehicle for recycling or disposal.

4.4 Transport

4.4.1 Excise duty on vehicles

An excise duty was, until the end of 2010, imposed on vehicles based on the customs value of an imported vehicle. The excise ranged from 30 to 45%. Special percentages, ranging from 10 to 30%, were however applied for certain types of vehicles, such as taxis, rental cars, motor vehicles for the transport of 10–17 passengers and motorcycles. Some types were fully exempted from the tax, such as motor vehicles for the transport of eighteen or more persons, fire engines and ambulances.

In 2011 the calculation of the excise duty was fundamentally changed. It is now based on registered CO₂ emission of the vehicle, calculated as g/km. The excise percentages are illustrated in Table 27.

Table 27 CO₂ excise duty for vehicles

CO ₂ emission (g/km) %	
0–80	0
81–100	10
101–120	15
121–140	20
141–160	25
161–180	35
181–200	45
201–225	55
226–250	60
over 250	65

Source: Althingi, Act No 29/1993 on Excise Duties on Vehicles, Fuels, etc.

Certain types of vehicles are however still subject to lower excise duty percentages, ranging from 0 to 30%, and some other exemptions and discounts are applied. Most notably in the context of economic instruments related to environmental policy, vehicles which use methane as a primary energy source are eligible for a discount of a maximum of ISK 1,250,000 (EUR 7,713). Owners of vehicles that have been modified to use methane instead of petrol or diesel have also been able to apply for a refund of a maximum of ISK 100,000 (EUR 617), which will be awarded to up to 1,000 vehicles. Before 2011, excise duties had been lowered or abolished for some years for vehicles powered by methane gas, hydrogen or electricity, but apart from the discounts which were mentioned earlier all such provisions expired at the end of 2010.

4.4.2 Vehicle tax based on CO₂ emissions

Most motor vehicles are subject to a vehicle tax which is collected twice a year. The tax was traditionally based on weight, but following a legislation amendment which entered into force in 2011 the tax for every taxation period (6 months) is calculated as follows:

For vehicles weighing 3,500 kg or less: ISK 5,255 (EUR 32.42) for emission of up to 121 g of CO₂ and ISK 126 (EUR 0.78) for each additional g after that.

For vehicles weighing more than 3,500 kg: fixed charge of ISK 49,229 (EUR 304) plus ISK 2.10 (1.3 eurocent) for each registered kg of the vehicle weight exceeding 3,500 kg. However, the tax cannot exceed ISK 77,495 (EUR 478) in each taxation period.

Vehicles that have been modified to use methane instead of petrol or diesel shall be subject to a minimum tax.

4.4.3 Vehicle tax based on distance

No major changes have been made to this tax from the previous report and prices have only changed slightly. The tax is imposed on private vehicles and camping trailers weighing 10,000 kg or more. The tax is also imposed on vehicles and camping trailers weighing 5,000 kg or more if they are registered for special use. The price of the tax is calculated on the basis of the weight of the vehicle or the camping trailer and the number of kilometres driven, measured with equipment that is installed in the vehicle or camping trailer, see Table 28 and Table 29.

Table 28 Weight distance tax for motor vehicles in excess of 10 tonnes

Weight in kg	Tax per km ISK (eurocent)	Weight in kg	Tax per km ISK (eurocent)
10,000–11,000	0.28 (0.17)	21,001–22,000	6.78 (4.18)
11,001–12,000	0.87 (0.54)	22,001–23,000	7.37 (4.55)
12,001–13,000	1.46 (0.90)	23,001–24,000	7.96 (4.91)
13,001–14,000	2.06 (1.27)	24,001–25,000	8.54 (5.27)
14,001–15,000	2.65 (1.64)	25,001–26,000	9.13 (5.63)
15,001–16,000	3.24 (2.00)	26,001–27,000	9.73 (6.00)
16,001–17,000	3.83 (2.36)	27,001–28,000	10.32 (6.37)
17,001–18,000	4.41 (2.72)	28,001–29,000	10.91 (6.73)
18,001–19,000	5.00 (3.09)	29,001–30,000	11.50 (7.10)
19,001–20,000	5.59 (3.45)	30,001–31,000	12.09 (7.46)
20,001–21,000	6.19 (3.82)	31,001 and over	12.68 (7.82)

Source: Althingi, Act No 87/2004 on Oil and Kilometres Charge.

Table 29 Weight distance tax for motor vehicles in excess of 5 tonnes

Weight in kg	Tax per km ISK (eurocent)	Weight in kg	Tax per km ISK (eurocent)
5,000–6,000	8.31 (5.13)	18,001–19,000	21.94 (13.54)
6,001–7,000	8.99 (5.55)	19,001–20,000	22.93 (14.15)
7,001–8,000	9.68 (5.97)	20,001–21,000	23.94 (14.77)
8,001–9,000	10.37 (6.40)	21,001–22,000	24.93 (15.38)
9,001–10,000	11.04 (6.81)	22,001–23,000	25.92 (15.99)
10,001–11,000	12.02 (7.42)	23,001–24,000	26.91 (16.60)
11,001–12,000	13.31 (8.21)	24,001–25,000	27.91 (17.22)
12,001–13,000	14.58 (9.00)	25,001–26,000	28.90 (17.83)
13,001–14,000	15.85 (9.76)	26,001–27,000	29.89 (18.50)
14,001–15,000	17.13 (10.57)	27,001–28,000	30.89 (19.06)
15,001–16,000	18.40 (11.35)	28,001–29,000	31.89 (19.68)
16,001–17,000	19.67 (12.14)	29,001–30,000	32.88 (20.29)
17,001–18,000	20.96 (12.93)	30,001–31,000	33.86 (20.89)
		31,001 and over	34.87 (21.52)

Source: Althingi, Act No 87/2004 on Oil and Kilometres Charge.

4.5 Agriculture and natural resources

The most important economic instrument in this field is still the individual transferable quota system for fisheries. The system is based on allocation to individual vessels of a certain share of the total allowable catch of the relevant species, which can, subject to certain conditions, be traded among vessels. (Icelandic Fisheries, 2013). Moreover, fishing companies are subject to both general and special fees on fishing rights or actual fishing catch, which are intended to finance public research, control, surveillance and supervision of fisheries and seafood product processing, and furthermore to ensure that the Icelandic nation gets its share of the profit created by the exploitation of marine resources.

Of the other economic instruments, the public support to agriculture and forestry are the most important. Agricultural support to farmers is one of the highest in Europe in terms of percentage of farm income, or 47% (OECD, 2013). The Soil Conservation Service of Iceland has supported farmers since 1990 through a collaborative project to revegetate their land. This support includes financial assistance for the purchase of fertiliser (Soil Conservation Service of Iceland, 2013). Furthermore, most afforestation activities in Iceland are financed by a grant scheme operated through five Regional Afforestation Projects (RAPs) which cover the whole country (Iceland Forestry Service, 2013).

5. Norway

Since the 1990s, economic instruments have been a central part of the Norwegian green taxation system. Contributing to a better environment is one of the Government's major objectives in collecting taxes (Ministry of Finance, 2013). With substantial energy and environmental taxation in place, increases in tax rates have been modest over the past few years.

Norway taxes electricity, mineral oils, motor vehicles and other environmentally harmful products and emissions. The environmental profile of many taxes has been strengthened since 2009. The base tax on mineral oil was raised in 2011 from NOK 0.89 to NOK 0.98 per litre, to equal electricity tax including surcharge on grid tariff. The CO₂ tax was extended to include natural gas and LPG in September 2010. The CO₂ tax on petroleum activities on the continental shelf was almost doubled in 2013. Since 2013, CO₂ emissions from domestic aviation included in the EU ETS face a reduced tax rate of NOK 0.43 per litre compared to a rate of NOK 0.71 for other domestic aviation. Fishing and catching in inshore waters has previously been exempt from the CO₂ tax. Since 2013, the fishing industry pays a reduced CO₂ tax on mineral oil.

Charges are levied on emissions of sulphur and nitrous oxides (NO_x).

In 2010, the road usage tax on fuel was extended to cover biodiesel for use as transport fuel. The rate is half of that of fossil diesel fuels.

From 1st January 2012, a renewable energy certificate scheme was put in place in Norway. The scheme means that electricity retailers must hold a certain quota of renewable energy certificates purchased from renewable energy producers. The certificates are traded on a market which was integrated with the existing Swedish market.

In 2013, the public enterprise Enova was endowed with NOK 30 billion to fund technological improvements in technologies which aim to reduce greenhouse gas emissions. The fund is financed through a surcharge on electricity bills.

Water use or water pollution is not taxed in Norway. However, consumers pay fees to the local municipality which cover costs for water and sewage treatment.

In 2010, the tax on waste incineration was removed and the landfill tax was reformed. In addition to a ban on putting biologically degradable material in landfills, the landfill tax was lowered by nearly 40% for

waste put in landfills. However, some goods are exempt from the ban and are taxed at the previous level.

Norwegian drivers face taxes on fuel use, a registration tax and an annual excise duty (one for light vehicles and one for heavy vehicles).²³ Since 2009, the registration tax has been tweaked in order to give more weight to environmental concerns, with more emphasis on emissions of pollutants and less on engine effect. In 2012, a tax on NO_x emissions was added.

Taxes related to transport generate the most revenue for the Norwegian Government. Of the roughly NOK 64 billion (EUR 8.2 billion) which environmental taxes, fees and charges brought in to the Norwegian Government in 2011, NOK 46 billion (EUR 5.9 billion) came from vehicle and transport fuel taxes. The motor vehicle registration tax generated over NOK 20 billion (EUR 2.6 billion), and is by far the largest individual source of revenue among environmental taxes, fees and charges, cf. Table 30.

Table 30 Revenue from the ten highest revenue-generating environmental taxes, fees and charges, 2011

Tax, fee or charge	NOK million	EUR million
Motor vehicle registration tax	20,123	2,582
Road usage tax on auto diesel	9,179	1,178
Annual tax on motor vehicles (Total weight below 7,500 kg)	9,035	1,159
Electricity consumption tax	7,337	941
Road usage tax on petrol	6,938	890
CO ₂ tax on mineral products	4,800	616
Tax on CO ₂ emissions in petroleum activities on the continental shelf	2,189	281
Basic tax on mineral oil	1,430	183
Basic tax on disposable packaging	865	111
Product tax on beverage containers	413	53
<i>Total</i>	<i>63,564</i>	<i>8,156</i>

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

Source: OECD/EEA database on environmentally related taxes.

5.1 Energy and air pollution

The Norwegian Government has set a target to be carbon-neutral²⁴ by 2050. For the second commitment period of the Kyoto Protocol, Norway is committed to limiting average annual emissions over the period 2013–2020 to 84% of the 1990 emission level. This commitment is con-

²³ Vehicles are subject to only one of the excise duties. The ordinary annual tax is for vehicles under 7,500 kg, and the weight based annual tax is for vehicles over 7,500 kg.

²⁴ This includes emission reduction activities abroad.

sistent with the Norwegian target of a 30% reduction in emissions by 2020, compared to 1990 (IEA, 2011). Economic instruments are important for achieving these targets.

In 2005 a national emissions trading system was established. From 2008 the system was expanded and integrated into the EU ETS, and the CO₂ tax system has been adjusted to avoid “double taxation” or, as regards the offshore sector, an increase in carbon price. Since 2009, the environmental profile of many taxes has been strengthened.

5.1.1 Electricity tax

An excise duty on electricity was introduced in 1951 to finance grid investments. The present electricity tax is mainly fiscally justified, but it also supports energy efficiency. The ordinary rate applies to households, service industries and the public sector, except in Finnmark County and seven municipalities in northern Troms. The ordinary rate also includes supplies to administration buildings in manufacturing. In 2010, the ordinary tax rate was 11.01 øre per kWh, increasing to 11.61 øre per kWh in 2013, cf. Table 31.

Table 31 Electricity tax, øre (eurocent) per kWh

	2010	2011	2012	2013
General rate	11.01 (1.38)	11.21 (1.44)	11.39 (1.52)	11.61 (1.52)
Reduced rate	0.45 (0.06)	0.45 (0.06)	0.45 (0.06)	0.45 (0.06)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

Manufacturing, petroleum extraction, mining and quarrying, and district heating pay a reduced electricity tax amounting to 0.45 øre per kWh, equivalent to the minimum rate stipulated by the EU Directive 2003/96/EF concerning restructuring of EU regulation for taxation on energy products and electricity. According to approval of the EFTA Surveillance Authority (ESA) under the guidelines for environmental support, the reduced tax rate cannot be set lower than EUR 0.5 per MWh. This approval lasts until 30th June 2014. However, electricity used for the purpose of chemical reduction, as well as electricity used in electrolytic, metallurgical and mineralogical processes and in greenhouses, are totally exempted from the electricity tax. In addition, energy-intensive firms in the pulp and paper industry that implement approved energy-efficiency measures are also totally exempt from electricity tax. This derogation also lasts until 30th June 2014 (Ministry of Finance, 2013).

Business activities in the far north of Norway, northern Troms and Finnmark, are subject to the reduced electricity tax of 0.45 øre per kWh. The public sector and households in this area are totally exempted from the electricity tax. Moreover, the supply of electricity for household purposes is exempted from value added tax in North Norway (Finnmark, Troms and Nordland counties).

5.1.2 Base tax on mineral oils

An excise duty on heating oils was introduced in 1970 and removed in 1993. Similar taxation was re-introduced in 2000, based on the argument that the increase in the tax rate on electricity in 2000 should not contribute to an environmentally harmful substitution of electricity by oil for heating purposes (Nordic Council, 2009). The base tax applies to kerosene, fuel oils, marine gas oils and diesel oil exempt from road usage tax. Exemptions from the base tax include international shipping, domestic cargo and passenger sea transportation, fishing and catching in domestic and international seas, petroleum extraction on the continental shelf, the fish oils and meal industry, and rail transport.

The tax rate was raised in 2000 to the same level as the electricity tax, based on energy content. Households and most businesses also face a surcharge on the grid tariff, which is allocated to the Energy Fund (a government fund financing Enova, which supports energy efficiency and conversion). In 2011, the base tax was raised equivalently. Since 2011 the ordinary tax rate has increased with the price level and the reduced rate has been nominally unchanged, cf. Table 32.

Table 32 Base tax on mineral oils

	2010	2011	2012	2013
General rate	0.89 (0.11)	0.98 (0.13)	1.00 (0.13)	1.02 (0.13)
Reduced rate	0.13 (0.02)	0.13 (0.02)	0.13 (0.02)	0.13 (0.02)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

Considering Mainland Norway, exemptions from the base tax are less comprehensive than those for the electricity tax. The pulp and paper industry was exempt from the tax until 2008, and since then it has been charged a reduced rate of NOK 0.13 per litre. The reduced rate also applies to the production of dyes and pigments, while the fish oils and meal industry is totally exempted. With these exceptions the Mainland industries pay the ordinary tax rate. Finally, users in Finnmark and northern Troms are subject to the ordinary tax rate, while they are exempted from or pay a

reduced rate of the electricity tax. Mineral oils are charged CO₂ tax in addition to the base tax. Thus, there is a considerable tax incentive to substitute heating oil with electricity in Mainland Norway. The *Storting* has asked for the use of fuel oils in households and as a base load in other buildings to be abolished by 2020. Such regulation, if implemented, would reduce the impact of taxation on CO₂ emissions from heating.

5.1.3 CO₂ tax

CO₂ tax on mineral oil products

Since 2009, the CO₂ tax has been modified in two ways. *Firstly*, it has been extended to the use of inland gas as of 1st September 2010. *Secondly*, it has been raised for petroleum activities on the continental shelf as of 2013. In addition, a reduced tax rate on mineral oil used for fishing and catching in inshore waters was introduced in 2013.

The CO₂ tax on mineral oil products was introduced in 1991. The objective of the tax is to contribute to cost-effective reductions of CO₂ emissions. The tax includes mineral oil, petrol, natural gas and LPG. From 1st January 2003, all use of coal and coke became exempted from the CO₂ tax as part of the adaptation process to new regulations set out by the EFTA Surveillance Authority (ESA). From this moment on the CO₂ tax has only been levied on mineral products.

Among other activities, mineral products used in vessels in international transport, fishing and catching in distant waters and international aviation are exempted from the CO₂ tax. From 1st September 2008 mineral oil supplied for use in activities subject to emissions trading are also exempted.

In 2012, CO₂ emissions from aviation were included in the EU ETS which also affects Norway. Quotas apply to flights to and from the EU, i.e. flights within the EU and flights originating and terminating in the EU. Domestic flights which are subject to quotas are also subject to a reduced CO₂ tax of 43 øre per litre in 2013. In practice, most flights are subject to the quota system and thus pay the reduced rate.

Until 2013, fishing and catching in inshore waters was exempted from the CO₂ tax on mineral oil. As of 2013, a CO₂ tax on mineral oil of 13 øre per litre, corresponding to NOK 49 per tonne of CO₂, is levied.

From 1st September 2010 the Government also introduced a CO₂ tax on natural gas and LPG. Companies in industry and mining or covered by the emissions trading scheme pay a reduced rate in the case of natural gas and are completely exempt in the case of LPG.

Tax on CO₂ emissions from the continental shelf

The tax on CO₂ emissions from the petroleum activities on the continental shelf was introduced in 1991. From 2008 CO₂ emissions from these activities have been included in the emissions trading system, and the installations have had to buy all their allowances (i.e. no allocation of allowances free of charge). To keep the incentives to reduce emissions at about the same level as before and avoid increased costs for the installations, the CO₂ tax rate was reduced in 2008 (Nordic Council, 2009).

In 2013, an increase in the CO₂ tax from the offshore petroleum industry of NOK 200 per tonne was introduced, almost twice the previous level. The petroleum industry is also included in the EU ETS.

The development in the various CO₂ tax rates since 2010 is shown in Table 33.

Table 33 CO₂ tax rates, NOK (EUR) per litre/Sm³/kg/tCO₂

	2010	2011	2012	2013	Effective CO ₂ price in 2013
Gasoline	0.86 (0.11)	0.88 (0.11)	0.89 (0.12)	0.91 (0.12)	393 (51.50)
Jet fuel	0.68 (0.08)	0.69 (0.09)	0.70 (0.09)	0.71 (0.09)	278 (36.43)
Jet fuel, reduced rate	-	-	0.42 (0.06)	0.43 (0.06)	169 (22.15)
Mineral oil					
Light fuel oil diesel	0.58 (0.07)	0.59 (0.08)	0.60 (0.08)	0.61 (0.08)	229 (30.01)
Heavy fuel oil	0.58 (0.07)	0.59 (0.08)	0.60 (0.08)	0.61 (0.08)	195 (25.55)
Mineral oil reduced rate					
Light fuel oil, diesel	0.30 (0.04)	0.31 (0.04)	0.31 (0.04)	0.31 (0.04)	116 (15.20)
Heavy fuel oil	0.30 (0.04)	0.31 (0.04)	0.31 (0.04)	0.31 (0.04)	99 (12.97)
Domestic use of gas					
Natural gas	0.43* (0.05)	0.44 (0.06)	0.45 (0.06)	0.46 (0.06)	231 (30.27)
Natural gas, reduced rate	0.05* (0.01)	0.05 (0.01)	0.05 (0.01)	0.05 (0.01)	25 (3.28)
LPG	0.65* (0.08)	0.66 (0.08)	0.67 (0.09)	0.68 (0.09)	227 (29.75)
Continental shelf					
Light fuel oil, diesel	0.47 (0.06)	0.48 (0.06)	0.49 (0.07)	0.96 (0.13)	361 (47.31)
Heavy fuel oil	0.47 (0.06)	0.48 (0.06)	0.49 (0.07)	0.96 (0.13)	306 (40.10)
Natural gas	0.47 (0.06)	0.48 (0.06)	0.49 (0.07)	0.96 (0.13)	410 (53.73)

Note: *) Introduced 1st September 2010.

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.1.4 The CO₂ emissions trading system

Norway joined the EU ETS at the start of Phase II in 2008. Prior to that, Norway had its own emissions trading scheme which mirrored the EU's, with a first phase running from 2005 to 2007. During this first phase, only sectors which were not covered by the tax on CO₂ were covered, corresponding to between 10 and 15% of total emissions. In 2007, the Norwegian ETS was amended to make its features compatible with the

EU ETS. The two systems were officially linked in 2008 which then covered about 36% of Norwegian emissions (OECD, 2011).

During Phase II of the EU ETS, running from 2008 to 2012, half the Norwegian allowances were auctioned and 39% were freely allocated. The free allocation varied between sectors, however, with land-based industries receiving free allowances corresponding to 92% of their 1998–2001 emissions whereas offshore oil and gas production received no free allowances.

In Phase III, 100% of allowances must be purchased through auction or on secondary markets. From 2013, approximately 50% of Norway's emissions will be covered by the ETS. Some sectors are covered both by the ETS and tax on CO₂, such as the petroleum sector. As mentioned above, the CO₂ tax was increased for the offshore petroleum industry in 2013 but this tax may be reduced if EU ETS prices increase (International Emissions Trading Association, 2013).

5.1.5 Sulphur tax

The tax on sulphur in mineral oil was introduced in 1970. It was the first tax in Norway that had an explicit environmental purpose. The objective of the tax has been to reduce emissions of sulphur, and to fulfil the various international protocols on sulphur emission reductions that Norway has signed over the years. Oils with less than 0.05% sulphur content (by weight) today have a zero tax rate. Mineral oil used in vessels in international shipping, fishing and catching in domestic and international seas and international aviation are exempted from the sulphur tax.

The tax rate was nominally unchanged between 1991 and 2007 but since 2008 it has been adjusted in line with expected inflation, see Table 34. The sulphur content of mineral oil has been considerably reduced over the years, and today mainly heavy fuel oil has sulphur content above 0.05% and is thus subject to the sulphur tax.

Table 34 Sulphur tax, øre (eurocent) per litre

	2010	2011	2012	2013
Sulphur tax	7.50 (0.94)	7.60 (0.98)	7.70 (1.03)	7.80 (1.02)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

The tax is refunded in full or in part if the emissions of sulphur are less than the sulphur content in the products, i.e. because of cleaning of the emissions or when the sulphur is tied in the final product.

5.1.6 Tax on NO_x emissions

The tax on NO_x emissions was introduced in 2007. The purpose of the tax is to contribute to cost-efficient reductions in NO_x emissions and together with other policy measures contribute to fulfilling Norway's obligations according to the Gothenburg Protocol (Nordic Council, 2009). The tax comprises:

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

The tax duty arises when NO_x is emitted, and the rates from 2010 to 2013 are shown in Table 35. There are exemptions for emissions from vessels in direct traffic between Norwegian and foreign harbours, aircraft on direct routes between Norway and foreign airports, vessels used for fishing and catching in distant waters and emission sources comprised by environmental agreement with the Government regarding the implementation of NO_x reducing interventions in accordance with a fixed goal. The Ministry of the Environment and 14 trade organisations entered into such an agreement on 14th May 2008. The EFTA Surveillance Authority (ESA) approved the agreement shortly afterwards. The business organisations were to facilitate concrete reductions of NO_x through a NO_x fund established by the business organisations. The stated purpose of the fund was to finance emission reductions where abatement costs are lowest. The affiliated enterprises are entitled to be exempted from the NO_x tax. The fee paid by the enterprises to the NO_x fund is lower than the NO_x tax and differentiated between sectors (The offshore sectors pay by far the highest fee rate.). A new agreement which extends the agreement was entered into in 2010 and runs until 2017.

Table 35 Nitrous oxide tax, NOK (EUR) per kg

	2010	2011	2012	2013
Nitrous oxide tax	16.14 (2.02)	16.43 (2.11)	16.69 (2.23)	17.01 (2.23)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.1.7 Road usage tax on petrol and auto diesel

A tax on petroleum consumption was introduced as early as in 1931 to finance road construction, and was the first energy-related tax to be introduced in Norway (NOU, 2007:8). The present road usage tax on auto diesel and petrol was introduced in 1993 in connection with the phasing-out of an excise duty scheme on distance travelled. Today the purpose of these taxes is to ensure that users meet the external costs connected with accidents, congestion, noise, road wear and tear and harmful local emissions to air (Government tax proposal, 2013, Prop. 1 LS (2012–2013) Skatter, avgifter og toll 2013).

In 2010, the road usage tax was extended to include biodiesel used as transport fuel as well. The rate is half of the fossil diesel tax. There have only been modest changes in the tax rates since 2009, cf. Table 36.

Table 36 Petrol and auto diesel tax, NOK (EUR) per litre

	2010	2011	2012	2013
Petrol				
Sulphur free (<10 ppm)	4.54 (0.57)	4.62 (0.59)	4.69 (0.63)	4.78 (0.63)
Low sulphur (between 10 and 50 ppm)	4.58 (0.57)	4.66 (0.60)	4.73 (0.63)	4.82 (0.63)
Other petrol	4.58 (0.57)	4.66 (0.60)	4.73 (0.63)	4.82 (0.63)
Auto diesel				
Sulphur free (<10 ppm)	3.56 (0.44)	3.62 (0.46)	3.68 (0.49)	3.75 (0.49)
Low sulphur (between 10 and 50 ppm)	3.61 (0.45)	3.67 (0.47)	3.73 (0.50)	3.80 (0.50)
Other diesel	3.61 (0.45)	3.67 (0.47)	3.73 (0.50)	3.80 (0.50)
Biodiesel	1.78 (0.22)	1.81 (0.23)	1.84 (0.25)	1.87 (0.25)

Note: Petrol and auto diesel are also levied a CO₂ tax as described in the previous section. Petrol with a blend of ethanol and auto diesel with a blend of biodiesel is granted a reduction in the CO₂ tax according to the percentage of ethanol and biodiesel blended. Compressed natural gas (CNG), biogas and hydrogen used for transportation purposes are fully exempt from road usage and CO₂ taxes.

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.1.8 Subsidies for energy efficiency and renewable energy

The public agency Enova, which has been in operation since June 2001, is the most important tool for promoting energy efficiency and more heat and electricity production from renewable sources. Enova's activities are financed through a surcharge of 1 øre per kWh on the grid tariff paid by all electricity users, annual grants from the Government budget and yields from the Basic Energy Fund.

Following the Government's white paper on climate efforts from 2012, a fund to promote technological advances in industry under Enova has been introduced. The fund will provide financing to projects developing technology that reduce greenhouse gas emissions. The size of the

fund is NOK 30 billion in 2013 and will gradually increase to NOK 50 billion by 2020.

The Norwegian Government also grants funds for research and development concerning energy and oil production and consumption. The Government also provides large subsidies to research and establishing test facilities for carbon capture and storage.

Renewable electricity certificate scheme

On 1st January 2012, a certificate scheme for renewable electricity was introduced in Norway. Producers of electricity from renewable sources get a certificate for every MWh of electricity they produce. All electricity retailers are required to purchase certificates corresponding to a certain quota of their electricity sales. The costs are added to the energy bill of the end-user. Certificates are traded on a market where supply and demand determine their price. They can also be bought directly from electricity producers. Each year, companies required to hold certificates report their holding through a system run by the transmission service operator Statnett (Norwegian Water Resources and Energy Directorate, 2013).

The scheme is administrated by the Norwegian Water Resources and Energy Directorate (NVE) who receives and approves applications for certificates and supervises the Norwegian rules for the scheme.

With the introduction of the certificate scheme, Norway joined the Swedish certificate market. Certificates issued in Norway are tradable in Sweden and vice versa. The common market will last until 2036. The certificate schemes of each country will obey national legislation, which means that there are some differences between the countries' systems. For example, in Sweden, electricity generated from peat burning is eligible for electricity certificates but not in Norway.

5.2 Water

There are no environmental taxes or charges on water pollution or water use in Norway. Municipalities and other suppliers of drinking water and wastewater treatment are not permitted to charge more for water-related services than required to cover the associated costs (Nordic Council, 2009).

Consumers pay a fee to the local municipality or other supplier of freshwater. The charge includes costs for water treatment to ensure the supply of safe drinking water and good water quality. Consumers can often choose to pay fixed rates, according to actual metered usage or a

mixture of the two systems. In the event of payment using the consumption-based method, a minimum payment often applies which also varies according to municipality (Nordic Council, 2006).

5.3 Waste

5.3.1 *Waste disposal tax*

A tax on waste disposal was introduced in 1999. It originally consisted of a tax on waste for landfills²⁵ and a tax on emissions from waste incineration. In 2010, the tax on emissions from waste incineration was removed.

On 1st July 2009 it was prohibited to dispose of biological degradable waste by landfilling. Thus, the composition of the waste for landfilling changed, implying that emissions of greenhouse gases and toxic substances were reduced. Accordingly, the landfill tax was lowered by nearly 40%, from NOK 447 to NOK 275 per tonne, cf. Table 37. However, the Norwegian Environment Directorate may grant exemptions from the ban on landfilling biological degradable waste. For such waste, the tax rate follows the previous tax for landfills with high environmental standards.

Table 37 Waste disposal tax, NOK (EUR) per tonne

	2010	2011	2012	2013
Waste for landfills	275 (34.36)	280 (35.93)	284 (37.99)	289 (37.87)
Waste exempt from ban on landfilling of biologically degradable material	455 (56.84)	463 (59.41)	470 (62.88)	479 (62.77)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.3.2 *Tax and refund system on hazardous substances*

A tax on the use of trichloroethylene (TRI) and tetrachloroethylene (PER) was introduced in 2000 to reduce the use of these toxic substances. The current rates are shown in Table 38. The tax also includes use of recovered TRI and PER, and their inclusion as parts in other products with more than 1 and 0.1% respectively. TRI and PER that are recovered for own use are exempted from the tax. The tax rate has been adjusted

²⁵ The tax on waste put in landfills was previously differentiated according to the environmental standard of the landfill.

according to the price level since 2006. For products that only partly contain TRI and PER, a tax is calculated according to the content.

By delivering waste containing TRI and PER to a certified waste collector, a part of the tax is refunded. In 2011, this amounted to NOK 25 per kg.

Table 38 Tax on TRI and PER, NOK (EUR) per kg pure compound

	2010	2011	2012	2013
Tax on TRI and PER	62.06 (8.33)	63.18 (8.48)	64.19 (8.62)	65.41 (8.77)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.3.3 Tax and refund system for some greenhouse gases

Since 2003 a tax has been levied on the import and production of hydrofluorocarbons (HFC) and perfluorocarbons (PFC), cf. Table 39. The purpose of the tax has been to reduce emissions of the substances through stimulating the use of alternative gases and developing new technology and products that do not use HFC and PFC. The tax also comprises all mixtures of HFC and PFC and products containing these substances. Recovered HFC and PFC are exempted from the tax.

Table 39 Tax on HFC and PFC, NOK (EUR) per tonne CO₂ equivalent

	2010	2011	2012	2013
Tax on HFC and PFC	208.68 (26.07)	212.44 (27.26)	225 (30.10)	229 (30.01)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

Since 2004 an associated refund scheme for waste containing these substances and delivered for waste treatment has been in operation. Upon delivery to a waste treatment facility, the entire tax is refunded.

5.3.4 Tax and refund system for lubricating oil

The tax on lubricating oil was introduced in 1988. The purpose of the tax is to reduce unfavourable disposal of waste oil (used lubricating oil) and thus reduce damage to human health and the environment. The current rates are shown in Table 40.

Table 40 Tax on lubricating oil, NOK (EUR) per litre

	2010	2011	2012	2013
Tax on lubricating oil	1.80 (0.22)	1.83 (0.23)	1.86 (0.25)	1.90 (0.25)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

The tax rate has been adjusted in line with expected inflation since 2001.

Exemptions are given for use in *inter alia* vessels in international transport, fishing and catching in distant waters, off-shore sites, supply ships and aircraft.

5.3.5 Taxes on beverage containers

The tax on beverage containers consists of an environmental tax and a general tax on each container unit, cf. Table 41. The general tax is imposed on all beverage containers that cannot be reused in their original form. This tax was introduced in 1994.

Table 41 Taxes on beverage containers NOK (EUR) per unit

Environmental tax	2010	2011	2012	2013
Glass and metal containers	4.97 (0.62)	5.06 (0.65)	5.14 (0.69)	5.24 (0.69)
Plastic containers	3.05 (0.38)	3.05 (0.39)	3.10 (0.41)	3.16 (0.41)
Carton and cardboard	1.24 (0.15)	1.26 (0.16)	1.28 (0.17)	1.30 (0.17)
General tax	1.02 (0.13)	1.04 (0.13)	1.06 (0.14)	1.08 (0.14)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

The purpose of the environmental tax is to put a price on the cost of littering the natural environment with the empty containers. The different tax rates on containers of various materials are justified by the fact that the environmental harm they cause is different. The environmental tax is differentiated according to their recycling level, implying that containers that are part of a certified recycling system have their tax reduced according to the recycling rate. Containers with a recycling rate of 95% or more are fully exempted from the tax.

5.3.6 Deposit-refund and other systems for refillable and non-refillable beverage containers

The system of taxation on beverage containers is supported by producer responsibility in the form of a deposit-refund system (Nordic Council, 2006). Norsk Resirk (www.resirk.no) is a trade and industry organisation with whom manufacturers and importers of beverages in cans or non-refillable PET bottles can register their products, enabling them to benefit from reduced rates of the environmental tax (see Table 41) by participating in the deposit-refund system.

In addition to Norsk Resirk's refundable deposit scheme, three other return systems operate for one-way drinks cartons (Grønt Punkt Norge AS), non-refillable glass bottles (Norsk Glassgjenvinning) and refillable

glass and plastic bottles. The latter are collected through a system operated by the Norwegian Brewers and Soft Drinks Producers. For refillable beverage containers the same deposit/refund rates apply as to non-refillable bottles and cans described above. For one-way cartons and non-refillable glass, no deposit-refund system applies, and the system is financed through fees on the products (Nordic Council, 2009).

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

The refund system for ELVs weighing less than 3.5 tonnes was established in 1978 to encourage car owners to return their vehicles to a certified treatment plant. Today the system also covers caravans, snow scooters and minibuses. A charge of NOK 20 is paid on the purchase of a new car, and a refund of NOK 2,500 is given when a vehicle is returned. Until 2007 the system was operated by the Norwegian Pollution Control Authority (SFT), and the car dismantlers themselves received a fee per car for removing the environmentally hazardous elements. Further funding was also provided for costs associated with compressing and transporting the scrapped cars.

As a follow up to the requirements of the European Commission's amendment to the End of Life Vehicle Directive 2000/53, car importers and producers from 2007 took over responsibility for the collection and recycling of scrap cars from SFT. Despite the producer responsibility, the public deposit-refund system will still be operated for some years.

5.4 Transport

5.4.1 *Registration tax*

The purchase tax on passenger cars and other motor vehicles was introduced in 1955 to reduce the increasing problems with the trade balance through increasing purchase prices on new vehicles, and thus reduce demand. Today this tax is primarily a fiscal tax, although the environmental objectives have been given more focus in recent years²⁶ (Nordic Council, 2006).

The tax scheme has been changed several times; the last major change took place in 2007. Subsequently, the environmental component of the vehicle registration tax has been strengthened with the emissions of CO₂ and NO_x having a larger weight than vehicle size on the tax rate. Details of the tax are shown in Table 42.

²⁶ The registration tax system in 2006 indirectly taxed CO₂ emissions through the weight, displacement and engine effect components. However, the transformation of the tax system in 2007 facilitates a more overall treatment of for example hybrid and electric vehicles. All cars will have engine effect and weight, but in the future there will be an increased supply of cars without displacement, like electric cars.

Table 42 Various components in the registration tax for passenger cars

	2010	2011	2012	2013
Specific weight (NOK (EUR) per kg)				
First 1,150 kg	35.67 (4.46)	36.31 (4.66)	36.89 (4.94)	37.59 (4.93)
Next 250 kg	77.74 (9.71)	79.14 (10.15)	80.41 (10.76)	81.94 (10.74)
Next 100 kg	155.51 (19.43)	158.31 (20.31)	160.84 (21.52)	163.90 (21.48)
Rest	180.85 (22.59)	184.11 (23.62)	187.06 (25.02)	190.61 (24.98)
Engine effect (NOK (EUR) per kW)				
First 65 kW	55.10 (6.88)	0 (0)	0 (0)	0 (0)
Next 25 kW	481 (60.09)	466 (59.79)	315 (42.14)	275 (36.04)
Next 40 kW	1,297.33 (162.08)	1,320.68 (169.46)	895 (119.73)	790 (103.53)
Rest	2,702.77 (337.66)	2,751.42 (353.04)	2.22 (0.30)	1.96 (0.26)
NOx emissions (NOK (EUR) per kg)	0 (0)	0 (0)	22 (2.94)	35 (4.59)
CO₂ emissions (NOK (EUR) per g/km)				
First 120 g/km (115 g/km from 2011 and 110 g/km from 2012)	0 (0)	0 (0)	0 (0)	0 (0)
Next 20 g/km (15 g/km from 2013)	725 (90.58)	738 (94.70)	750 (100.33)	764 (100.12)
Next 40 g/km	731 (91.33)	744 (95.47)	756 (101.14)	770 (100.91)
Next 70 g/km	1,704 (212.89)	1,735 (222.62)	1,763 (235.85)	1,796 (235.36)
Rest	2,735 (341.69)	2,784 (357.23)	2,829 (378.46)	2,883 (377.81)
Deduction per gram of emissions for emissions below 110 g/km, applicable down to 50 g/km and only to cars emitting less than 110 g/km (115 g/km in 2011)	609 (76.08)	620 (79.55)	750 (100.33)	814 (106.67)
Deduction per gram of emissions for emissions below 50 g/km, applicable only to cars emitting less than 50 g/km	609 (76.08)	738 (94.70)	850 (113.71)	966 (126.59)

Note: Passenger cars defined as cars not exceeding 6 metres in length and having more no than 17 seats.

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

In 2012, a tax on NO_x emissions was added in order to encourage the take-up of cars with low nitrous oxide emissions. Today the registration tax consists of vehicle weight, engine effect, CO₂ and NO_x emissions components. All the elements, except the NO_x element, are progressive but the engine effect component has been reduced over time.

From 2009 the progression has been further developed with a deduction for low emission cars (less than 120 g/km), but total registration tax cannot be negative. High emissions vehicles (more than 250 g/km) have been penalised by the tax system.

The registration taxes for motor cycles and snow scooters have similar, progressive tax systems based on displacement and engine effect as

well as a general tax per unit (motorcycles), and on weight, displacement and engine effect (snow scooters).

5.4.2 Tax on boat engines

The tax on boat engines was introduced in 1978. One purpose of the tax is to reduce the inconvenience related to noise and high speed through changing the demand towards smaller engines. The tax is levied on engines of at least nine horse power when imported or taken from a warehouse. Engines used in fishing vessels and shipping are exempt from the tax. The tax was NOK 137.50 per horse power in 2006, and the rate has only been adjusted for the general price level increase since 2006. In 2013, the tax was 158.50 per horse power.

5.4.3 Annual excise duty on motor vehicles

The predecessor of this tax was introduced in 1917 as part of a taxation regime on luxury goods. The tax is a fiscal tax and is today paid annually by the owners of vehicles with a total weight of less than 7,500 kg.

From 2008 the annual tax is differentiated according to whether the diesel vehicle has an originally installed particle filter or not, cf. Table 43. This change was made to put a price on the external costs connected with local emissions and to encourage the purchase of diesel cars with particle filters. The change should be seen in the light of the change in the registration tax in 2007 that led to the purchase of more diesel cars.

Table 43 Vehicle excise duty, NOK (EUR) per vehicle

	2010	2011	2012	2013
Diesel vehicles without factory-fitted particle filter	3,245 (405.41)	3,305 (424.08)	3,360 (449.49)	3,425 (448.83)
Petrol and diesel vehicles with factory-fitted particle filter	2,790 (348.56)	2,840 (364.41)	2,885 (385.95)	2,940 (385.28)
Motor cycles	1,705 (213.01)	1,735 (222.62)	1,765 (236.12)	1,800 (235.88)
Camping trailers	1,045 (130.55)	1,065 (136.65)	1,080 (144.48)	1,100 (144.15)
Tractors, mopeds etc. (including electric cars)	395 (49.35)	400 (51.33)	405 (54.18)	415 (54.38)

Source: Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.4.4 Annual weight excise duty

This tax consists of a weight component and an environmental component. Before 2006 this tax applied to all vehicles and combinations of vehicles with an allowed total weight of more than 12 tonnes, but from 2006 it was broadened to comprise all vehicles with a total weight of 7,500 kg or more.

The weight-related tax component is dependent on the total weight of the vehicle, suspension system and number of axles. The component is designed to cover wear and tear of the roads. The environmental component is differentiated according to weight and emission standards that the vehicle fulfils. The emission standards follow the EURO classification, which has emission limits for nitrogen oxides and particles.

The tax rates are highly differentiated and detailed, and the rates have only been adjusted for the general price level increase since 2006.

5.4.5 Road tolls

To finance road construction and bridges, tunnels etc. there are several toll roads around the country where vehicles have to pay to use the road, bridge or tunnel. Several larger Norwegian cities also have toll rings where all vehicles entering the city centres have to pay a fee (OECD, 2011). In most cases the fees are differentiated between small (less than 3.5 tonnes) and large vehicles, but hardly anyone has fees differentiated during the day or the week (www.vegvesen.no). Thus, the environmental effect of the tolls may be limited.

5.4.6 Landing charges

Flights to and from Norwegian airports are levied a starting charge, passenger charge, en route charge, security charge and de-icing charge to finance operation costs and investments at Norwegian airports. All these charges contribute to increased travel costs and might thus reduce passenger air travel demand which could have environmental consequences. Since 1990 there has been a noise-differentiated surcharge on the start charge at Bodø Airport, differentiated by airplane noise and time of the day. The purpose of this charge has been to encourage airlines to use low-noise airplanes at this airport.

5.4.7 *Transport subsidies*

Public transport is subsidised to make it more competitive and to achieve the aims of the national transport policy, including reducing emissions to air. Subsidies vary on an annual basis.

5.5 Agriculture and natural resources

5.5.1 *Environmental tax on pesticides*

Until 2009, the tax on pesticides was levied by the Ministry of Agriculture. The tax is now an excise duty under the Ministry of Finance. The pesticides are grouped in seven tax classes depending on their health and environmental risk, and the tax is paid according to this and the size of the land used. The tax has led to the use of pesticides with lower health and environmental risks (Government tax proposals, 2013, St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

5.5.2 *Funding for conservation of land*

Public funding for conservation and protection of forest land, national parks and other protected areas and to make coastal areas available for the public are provided by the Ministry of the Environment. Funds are mainly spent on establishing conservation areas on private land according to the Nature Conservation Act through the purchase of private land, and/or to compensate for inconvenience connected with the restriction of use of private land areas. The amount of funding provided varies considerably from one year to another, depending on the establishing of new protected land areas (Nordic Council, 2009).

6. Sweden

Sweden currently has sixteen environmental quality objectives covering different areas – from unpolluted air and lakes free from eutrophication and acidification, to functioning forest and farmland ecosystems.²⁷ The objectives describe the state of the Swedish environment to be achieved. Since 2009, several environmentally related economic instruments used in Sweden have been introduced or altered in order to achieve these objectives.

Energy and climate

The first objective; “reduced climate impact” comprised a temperature target and a concentration target for greenhouse gases in the atmosphere. In line with the objective, ambitious new energy and climate targets were adopted in 2009 under the “integrated climate and energy policy” framework. Following on from the reform, industry outside the EU ETS, including forestry, fisheries and agriculture, saw the introduction of energy taxes and an increase in CO₂ from 2011 onwards. The 2009 reform also reduced the number of exemptions to domestic industries, thereby enhancing the effectiveness of the energy and carbon dioxide taxes as environmental signals and revenue bases. Altogether, the Swedish energy and climate targets are more ambitious than the ones set at the EU and international levels.

Water

Sweden also has a “zero eutrophication” target, which states that nutrient levels in soil and water should not adversely affect human health. Several initiatives have been launched under the objective, and in August 2009, an initiative for local water preservation measures, the Local Water Preservation Grant (LOVA), was introduced. The aim of the grant is to develop local measures to improve marine environment, primarily by reducing phosphorus and nitrogen levels in the Baltic Sea and the Kattegat and the Skagerrak. Municipalities and non-profit organisations can apply for LOVA grants.

²⁷ For a complete list of the environmental quality objectives, see <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Sveriges-miljomal/Miljokvalitetsmalen/>

The Swedish Environmental Protection Agency has also, on behalf of the Government, proposed an economic incentive to reduce the discharge of nitrogen from wastewater treatment plants into the Baltic Sea. However, no final decision has been made, and most the system will probably be operational in 2016 at the earliest.

In the waste area, the Swedish incineration tax on waste was removed in September 2010, and waste intended for incineration is now exempted from tax. The tax was removed since it was shown to have an insignificant steering effect, and to lead to unnecessary transportation of household waste. The tax cut was financed by the general carbon tax increase. Deposit rates for aluminium cans were raised in 2010.

Transport

In 2013, several changes were made to the annual tax on vehicles with most seeing a higher tax rate, and the base of tax rebate for cars with better environmental performance was changed to be differentiated by weight.

The Government decided on 22 December 2011 to introduce a “super environmentally-friendly car grant” of up to SEK 40,000 (EUR 4,651). The purpose of the grant is to stimulate the market introduction of the most environmentally friendly cars. Additionally, as the second Swedish city, a congestion tax was introduced in Gothenburg as of 1st January 2013.

The aviation industry experienced a major change in 2012 from the inclusion of aviation in the EU ETS. Both scheduled and charter services are affected by this, with an exception for airplanes over 5,700 kg.

Agriculture and natural resources

The first period for the Swedish rural development programme, which includes support for environmental improvements, expires at the end of 2013. A new period for the programme starts in 2014 and continues until 2020. Delays at EU and national levels mean that the new programme will be in place in 2015, one year later than planned. The new programme will lead to changes in the support available today.

Sweden’s largest individual source of revenue comes from the CO₂ tax, accounting for roughly 30% of the total revenue from environmental taxes, fees and charges, cf. Table 44. As in the other Nordic countries, taxes related to transport make up a large share of the taxes, but to a smaller extent than in its neighbours.

Table 44 Revenue from the ten highest revenue-generating environmental taxes, fees and charges, 2010

Tax, fee or charge	SEK million	EUR million
Tax on CO ₂	27,334	2,866
Energy tax on electricity	21,061	2,208
Energy tax on fuels	20,146	2,112
Motor vehicle tax	11,875	1,245
Tax on nuclear power	3,997	419
Tax on road traffic insurance	2,948	309
Tax for reduction and storage of nuclear waste	1,033	108
Environmentally differentiated fairway dues	855	90
Tax on congestion	799	84
Road user charge	778	82
<i>Total</i>	<i>92,180</i>	<i>9,665</i>

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

Source: EEA/OECD database of economic instruments.

6.1 Energy and air pollution

In recent decades, Sweden has led an ambitious climate policy, with a carbon tax as its most important component. As a result, Sweden has the world's highest CO₂ tax imposed on the non-EU ETS sectors and households (IEA, 2013). High energy taxes on fuel and electricity as well as high CO₂ taxes on fossil fuels steer demand through environmental signals while providing state revenue.

In December 2009, energy and CO₂ taxation was restructured, to achieve the then newly adopted 2020 targets for GHG emissions reductions, renewable energy use and energy efficiency.²⁸ The targets are based on the EU environmental objectives for 2020, and include the following:

- For non-ETS activities, emissions of greenhouse gases are to be 40% lower in 2020 than in 1990.
- Renewable energy should represent at least 50% of total energy use.
- Energy consumption is to be 20% more efficient than in 1990.
- There is to be at least 10% renewable energy in transport.

Based on the targets, the Swedish Parliament decided to gradually limit CO₂ tax exemptions outside the EU ETS between 2011 and 2015. It abolished

²⁸ Government Bill 2009/10:41, in line with the proposed revision of the EU Fuel Quality Directive, the recast of the Energy Taxation Directive 2003/96/EC and the new ETS period as of 2012/13.

the special CO₂ tax break to some non-EU ETS industrial installations, and reformed energy taxes on heating fuels to strictly reflect the energy content. Altogether, Sweden aims to achieve the targeted 40% reduction of greenhouse gases by two-thirds with domestic efforts outside the EU ETS, and one-third by international flexible mechanisms, see Table 45.

Table 45 Means to achieve the 40% reduction of greenhouse gases target

Measure	Emission reduction
Emissions reductions between 1990 and 2007	4 Mt CO ₂ eq
Forecast adopted national measures 2008–20	5 Mt CO ₂ eq
New environmental taxes and green investments	2 Mt CO ₂ eq
National implementation of joint EU decisions	2 Mt CO ₂ eq
Other measures	0.3 Mt CO ₂ eq
Investments in other EU Member States and flexible mechanisms such as CDM	6.7 Mt CO ₂ eq
<i>Total</i>	<i>20 Mt CO₂ eq = 40%</i>

Note: The 2020 target to cut GHG emissions by 40% translates into a reduction of about 20 Mt CO₂ eq between 1990 and 2020 in the non EU ETS sector.

Source: IEA (2013).

Sweden also has a prioritisation of a fossil-independent vehicle fleet by 2030, and a 2050 vision of zero net GHG emissions. A committee was set up to address the vehicle target, which reported back to the Government on 16 December 2013. The committee proposed to raise the tax on diesel fuel and extend tax deductibility to hydro treated vegetable oil as short-term measures, as well as an investigation into the overhaul of road traffic taxation so that rate better reflects the social cost of climate change (SOU 2013:84). The Swedish Environmental Protection Agency, in cooperation with a number of other government agencies, was commissioned to present a proposal on the 2050 decarbonisation goal, which resulted in a report forming the basis for a roadmap for achieving this goal, see Box 3.

Box 3 Climate Roadmap 2050

On 11 December 2012, the Swedish Environmental Protection Agency in collaboration with the Swedish Energy Agency and other national authorities presented a report which is to form the basis of a Climate Roadmap 2050 to the Swedish Government. The report gives examples of measures to achieve the 2050 vision of zero net GHG emissions, on the basis of different emission trajectories in different sectors. The report foresees a reference scenario with all energy and climate policies in place to assess whether Sweden will reach its 2020 targets and the developments beyond 2020.

The report concludes that the vision of Sweden without net emissions of greenhouse gases by 2050 can be achieved by:

- significant domestic emissions reductions as the most important long-term measure
- contributions from an increased net uptake of carbon in forests and fields
- purchasing allowances on the international markets.

The report also proposes increased investment in research and innovation as a key element in a long-term roadmap. Reducing primary industry emissions to near zero is a big challenge and requires new technology, especially in the different industries, such as mining, iron and steel, cement, basic chemistry and the paper and pulp industry. In addition, the transport sector needs research and commercialisation of new technologies, in particular to obtain fossil-free and energy-efficient vehicles and renewable fuels. In parallel with the technical measures for vehicles and fuels, community planning and infrastructure investments need to be improved.

Source: IEA (2013).

Carbon dioxide tax is, beside the EU ETS system, the main economic instrument for reducing emissions of carbon dioxide. The tax is levied on energy use, and is in principle calculated as a single price on emissions from fossil fuels (oil, coal and natural gas) and fuels (petrol and diesel). In practice, there are exceptions to the uniform price for certain market participants (e.g. agriculture and forestry) and certain fuels (e.g. peat).

In addition to the carbon dioxide tax, energy use is also taxed with a *general energy tax* (hereinafter referred to as an energy tax). The energy tax has historically been an important source of revenue for the Swedish

Government and has primarily been used as a fiscal tax (Konjunkturinstitutet, 2012).²⁹ Today, the energy tax is increasingly used to govern behaviour; mainly to reduce energy consumption and to achieve the energy efficiency target. A sign of this transition is the change in the tax base for energy tax from type of fuel to energy content in fuels. The uniform energy tax per energy content increases the cost-effectiveness in achieving the energy efficiency goal, according to Konjunkturinstitutet (2012).

6.1.1 Carbon dioxide tax

The CO₂ tax constitutes the most significant part of the excise duties levied on energy in Sweden, and has been successively increased since its introduction in 1991. The objective of the tax is to achieve cost-effective reductions of CO₂ emissions. The tax covers mineral oils, petrol and diesel, natural gas and LPG, coal and coke, as well as crude pine oil for use in the non-EU ETS sector.³⁰ Since the adoption of the Government bill in 2009 (2009/10:41), industry *within* the EU ETS does not face a CO₂ tax.

The 2009 reform also entails several changes in the carbon tax for activities in the non-EU ETS sector.

Reduced number of tax exemptions to domestic industries (see Table 48 below).³¹

Gradual increase in the overall carbon tax level from 21 to 60% until 2015, on fuels for 1) heating and operation of stationary installations in non-EU ETS industries, 2) agriculture, 3) forestry, 4) aquaculture, and 5) diesel consumed in certain mining industry operations.

Decreased repayment of carbon tax for diesel used in agricultural and forestry machinery according to Table 46.

Table 46 Repayment of carbon tax for diesel in agricultural and forestry machinery, SEK (EUR) per litre

	2009	2011	2013	2015
Repayment	2.38 (0.28)	2.10 (0.24)	1.70 (0.20)	0.9 (0.10)

Source: Konjunkturinstitutet (2012).

²⁹ Government revenue from energy taxes in 2010 was SEK 41 billion (excluding VAT) (EUR 4.3 billion). Energy tax on gasoline and diesel accounts for a large share, along with taxes on electricity consumption in households and industry.

³⁰ Peat is considered to be a biofuel and is therefore not charged with the CO₂ tax.

³¹ There are still tax incentives for combined heat and power production (CHP), while heat-only production faces higher taxes than electricity production. This differentiation aims to increase the share of renewable energy in co-combustion.

6.1.2 Energy tax

The energy tax comprises two kinds of taxes; 1) Selective sales taxes on fuels, and 2) Taxes on electrical power.

Selective sales taxes on fuels

Fuel tax is levied according to volume,³² and the rate is differentiated by dividing products into environmental classes, and by taking account of the use of the fuel. The energy tax is imposed on fossil fuels used in:

- heating and operation of stationary equipment in industry
- agriculture
- forestry
- aquaculture
- heat production in CHP plants
- diesel consumed in certain mining industry.

For these sectors, the energy tax is 30% (Konjunkturinstitutet, 2012). Table 47 shows the development of energy and CO₂ taxes during 2010–2013.

³² With the exceptions of LPG, coal-based fuels and petroleum coke, which are taxed by weight.

Table 47 Energy and CO₂ tax rates for different energy sources 2010–2013

	Tax	2010	2011	2012	2013
Light oil fuel SEK (EUR)/litre	Energy	0.79 (0.08)	0.8 (0.09)	0.82 (0.09)	0.82 (0.09)
	CO ₂	3.01 (0.32)	3.02 (0.33)	3.1 (0.36)	3.09 (0.36)
	<i>Total</i>	<i>3.8 (0.4)</i>	<i>3.81 (0.42)</i>	<i>3.92 (0.45)</i>	<i>3.91 (0.45)</i>
Heavy fuel oil (MK1) SEK (EUR)/litre	Energy	1.32 (0.14)	1.52 (0.17)	1.57 (0.18)	1.76 (0.2)
	CO ₂	3.01 (0.32)	3.02 (0.33)	3.1 (0.36)	3.09 (0.36)
	<i>Total</i>	<i>4.34 (0.45)</i>	<i>4.54 (0.5)</i>	<i>4.67 (0.54)</i>	<i>4.86 (0.56)</i>
Heavy fuel oil (MK2) SEK (EUR)/litre	Energy	1.58 (0.17)	1.79 (0.2)	1.84 (0.21)	2.03 (0.24)
	CO ₂	3.01 (0.32)	3.02 (0.33)	3.1 (0.36)	3.09 (0.36)
	<i>Total</i>	<i>4.6 (0.48)</i>	<i>4.8 (0.53)</i>	<i>4.94 (0.57)</i>	<i>5.12 (0.6)</i>
Heavy fuel oil (MK3) SEK (EUR)/litre	Energy	1.72 (0.18)	1.92 (0.21)	1.98 (0.23)	2.17 (0.25)
	CO ₂	3.01 (0.32)	3.02 (0.33)	3.1 (0.36)	3.09 (0.36)
	<i>Total</i>	<i>4.74 (0.5)</i>	<i>4.94 (0.55)</i>	<i>5.08 (0.58)</i>	<i>5.27 (0.61)</i>
Natural gas for transportation SEK (EUR)/litre	Energy	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	CO ₂	1.35 (0.14)	1.58 (0.18)	1.62 (0.19)	1.85 (0.22)
	<i>Total</i>	<i>1.35 (0.14)</i>	<i>1.58 (0.18)</i>	<i>1.62 (0.19)</i>	<i>1.85 (0.22)</i>
Natural gas for other use SEK (EUR)/litre	Energy	0.26 (0.03)	0.88 (0.1)	0.9 (0.1)	0.9 (0.1)
	CO ₂	2.26 (0.24)	2.26 (0.25)	2.32 (0.27)	2.32 (0.27)
	<i>Total</i>	<i>2.51 (0.26)</i>	<i>3.14 (0.35)</i>	<i>3.23 (0.37)</i>	<i>3.22 (0.37)</i>
LPG for transportation SEK (EUR)/kilo	Energy	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	CO ₂	1.67 (0.18)	2.22 (0.25)	2.28 (0.26)	2.6 (0.3)
	<i>Total</i>	<i>1.67 (0.18)</i>	<i>2.22 (0.25)</i>	<i>2.28 (0.26)</i>	<i>2.6 (0.3)</i>
LPG for other use SEK (EUR)/kilo	Energy	0.16 (0.02)	1.02 (0.11)	1.05 (0.12)	1.05 (0.12)
	CO ₂	3.17 (0.33)	3.17 (0.35)	3.26 (0.37)	3.25 (0.38)
	<i>Total</i>	<i>3.33 (0.35)</i>	<i>4.2 (0.46)</i>	<i>4.31 (0.5)</i>	<i>4.3 (0.5)</i>
Coal SEK (EUR)/kilo	Energy	0.34 (0.04)	0.61 (0.07)	0.62 (0.07)	0.62 (0.07)
	CO ₂	2.62 (0.27)	2.63 (0.29)	2.7 (0.31)	2.69 (0.31)
	<i>Total</i>	<i>2.96 (0.31)</i>	<i>3.23 (0.36)</i>	<i>3.32 (0.38)</i>	<i>3.31 (0.38)</i>

Note: CO₂ taxes are only applicable to non-EU ETS industry. Industry within the EU ETS does not pay a carbon tax.

Source: Skatteverket (2013).

The following tax exemptions exist for the tax on fuels:

Table 48 Energy and CO₂ tax exemptions 2013

Purpose	Non-exempt fuels	Degree of exemption from	
		Energy tax	CO ₂ tax
Use for purposes other than as motor fuel or for heating or in processes where the fuel is essentially used as motor fuel or for heating	-	100%	100%
Use in metallurgic processes	Fuels except for coal-based fuels and petroleum coke	100%	100%
Use in trains or other rail transportation, ships and some boats when not for private use	Petrol, high-taxed oils	100%	100%
Use in aircraft when not for private use	Kerosene	100%	100%
Use for the manufacture of energy products or other products for which the manufacturer is liable to tax	High-taxed oil	100%	100%
Use in the manufacture of taxable electric power, subject to certain limitations	High-taxed oil	100%	100%
Use for purposes other than operation of motor vehicles in a manufacturing process in industrial operations covered by EU ETS	Petrol, raw tall oil, high-taxed oils	70%	100%
Use for purposes other than operation of motor vehicles in a manufacturing process in industrial operations <i>not</i> covered by EU ETS	Petrol, raw tall oil, high-taxed oils	70% (2009: 100%)	70% (2009: 79%)
Use for purposes other than operation of motor vehicles in professional agriculture, forestry or aquaculture	Petrol, raw tall oil, high-taxed oils	70%	70%
Use in manufacturing processes in mining operations for operation of motor vehicles other than automobiles, trucks and buses	Fuels except for high-taxed oils	86% (2009: 100%)	70% (2009: 79%)
Use for the manufacture of minerals other than metals, such as cement, limestone	High-taxed oil, raw tall oil	100%	100%
Use for production of combined heat and power in facilities covered by EU ETS	High-taxed oil, raw tall oil	70% (2009: 100%)	100%
Use for other heat production in facilities covered by EU ETS	High-taxed oil, raw tall oil	-	6%

Note: High-taxed fuels are heating oil, diesel fuel oil, paraffin etc. without added marking agents and producing at least 85% distillate by volume at 350 °C.

Source: Act (1994:1776) on Energy Tax, chapter 6a 1§ (*Lag om skatt på energi*).

The energy tax on diesel was raised in two stages in 2011 and 2013, by a total of SEK 0.4 (EUR 0.05) per litre, in order to approach the tax on petrol. However, the energy tax on gasoline is still higher than that on diesel, see Table 49. The relatively low tax rates have probably contributed to the sharp increase in the number of diesel cars in recent years (Konjunkturinstitutet, 2012).

Table 49 Energy tax and carbon dioxide tax on transportation fuels 2010–2013

Tax		2010	2011	2012	2013
Petrol (MK 1) SEK (EUR)/litre	Energy	3.06 (0.32)	3.06 (0.34)	3.14 (0.36)	3.13 (0.36)
	CO ₂	2.44 (0.26)	2.44 (0.27)	2.51 (0.29)	2.5 (0.29)
	<i>Total</i>	<i>5.5 (0.58)</i>	<i>5.5 (0.61)</i>	<i>5.65 (0.65)</i>	<i>5.63 (0.65)</i>
Petrol (acrylate) SEK (EUR)/litre	Energy	1.37 (0.14)	1.37 (0.15)	1.41 (0.16)	1.4 (0.16)
	CO ₂	2.44 (0.26)	2.44 (0.27)	2.51 (0.29)	2.5 (0.29)
	<i>Total</i>	<i>3.81 (0.4)</i>	<i>3.81 (0.42)</i>	<i>3.92 (0.45)</i>	<i>3.9 (0.45)</i>
Petrol (MK 2) SEK (EUR)/litre	Energy	3.09 (0.32)	3.09 (0.34)	3.17 (0.36)	3.16 (0.37)
	CO ₂	2.44 (0.26)	2.44 (0.27)	2.51 (0.29)	2.5 (0.29)
	<i>Total</i>	<i>5.53 (0.58)</i>	<i>5.53 (0.61)</i>	<i>5.68 (0.65)</i>	<i>5.66 (0.66)</i>
Diesel (MK 1) SEK (EUR)/litre	Energy	1.32 (0.14)	1.52 (0.17)	1.57 (0.18)	1.76 (0.2)
	CO ₂	3.01 (0.32)	3.02 (0.33)	3.1 (0.36)	3.09 (0.36)
	<i>Total</i>	<i>4.34 (0.45)</i>	<i>4.54 (0.5)</i>	<i>4.67 (0.54)</i>	<i>4.86 (0.56)</i>

Source: Skatteverket (2013).

Sweden allows full exemption from energy tax for the use of renewable energy sources in vehicles. This exemption is however up for debate, see Box 4.

Box 4 Energy taxation of biofuels

Sweden promotes efficient fuel use and the use of renewable energy sources in passenger cars. Flexible fuel vehicles and efficient technologies, including electric vehicles and plug-in hybrids, and the use of biogas, ethanol, hydrogenated vegetable oils (HVO) and biodiesel are encouraged through a number of tax incentives. High blends, for example E85, ED95 and biodiesel (100% FAME) are subject to full energy tax exemption. As a result, Sweden has one of the highest shares of renewable energy in transport of the European Member States, with 5.4% in 2009. (Ethanol and biodiesel accounted for the majority of the fuel used).

However, taxation of biofuels is discussed both in Europe and in Sweden. In the Swedish 2013 Budget Bill the Government proposed to introduce an energy tax on biofuels used for low-blend purposes, at a level that does not discourage the use of such blends in the market. The motivation is that the energy efficiency target includes both fossil and bio-based energy use. For the energy tax to be a cost-effective instrument in achieving the energy-efficiency target, it should be proportional to the energy content of all fuels and any use. This is a condition not met by the system today, as just over a quarter of energy use in Sweden (about 100 TWh of a total of 380 TWh in 2008) is not taxed at all with energy tax. This especially concerns district heating and biofuels.

Source: Konjunkturinstitutet (2012) & NCM (2009).

Electrical power consumption tax

The energy tax on consumption of electrical power was introduced in June 1951 and includes electrical power consumed in Sweden. For electricity use in industry, both within and outside the EU ETS, the energy tax is in line with EU minimum requirements (0.5 öre/kWh). For the rest of the economy and households, the tax on electricity is much higher, see Table 50.

Table 50 Electricity tax 2010–2013, öre (eurocent) per kWh

	2010	2011	2012	2013
Electricity tax, general	28.0 (2.94)	28.3 (3.13)	29.0 (3.33)	29.3 (3.4)
Electricity tax, general reduced	18.5 (1.94)	18.7 (2.07)	19.2 (2.21)	19.4 (2.25)
Electricity tax, industry	0.5 (0.06)	0.5 (0.06)	0.5 (0.06)	0.5 (0.06)

Note: The reduced electricity tax rate applies to users in a number of Northern municipalities. These are: Norrbotten, Västerbotten and Jämtland regions – all municipalities; Västernorrland region – Sollefteå, Ånge and Örnsköldsvik municipalities; Gävleborg region – Ljusdal Municipality; Dalarna region – Malung, Mora, Orsa and Älvdalen municipalities and; Värmland region – Torsby Municipality. Source: Skatteverket (2013).

Figure 3 shows the sum of carbon dioxide and energy tax (converted to öre per kWh) per energy use. As can be seen from the figures, energy taxation varies widely between energy types and between users.

Figure 3 Sum of energy and carbon tax

Note: The figure summarises how the excise tax on energy is distributed among energy types and economic agents. The line shows the sum of the energy tax and the carbon tax (converted to öre per kWh). Energy use is based on the environmental accounts in 2008. Note the broken scale on the horizontal axis. Tax refers to 2015, based on the agreed rates and without compensation for participation in the Programme for Energy Efficiency (PFE). The tax is excluding VAT. The points mark divisions: industry within and outside the EU ETS; fuels based on oil, coal and gas; fuels in agriculture, households and industry; electricity in households and businesses outside the industry. Source: Konjunkturinstitutet (2012).

6.1.3 Other energy and air pollution taxes

Sulphur dioxide tax

Since the introduction of the sulphur tax in 1991, the tax rate has remained constant at SEK 30 (EUR 3.5) per kg sulphur for solid fuels and SEK 27 (EUR 3.1) per kg for each thousandth of sulphur content by weight in oils (Skatteverket, 2013).³³

The Swedish sulphur dioxide tax was introduced with the objective of shifting oil consumption towards low-sulphur oil. It is only levied on the fuel categories with the highest sulphur content: heavy fuel oil, coal and peat. Oil with less than 0.05% sulphur content is exempt from the tax, and the tax is capped at a maximum tax rate equivalent to 0.2% sulphur

³³ Fuels used for manufacturing lime, stone and cement, and in soda boilers in the pulp and paper industry are wholly exempt from the sulphur tax. Diesel and heating oils used for shipping, trams and railways, and aviation fuel are also exempt from the tax. It is possible to receive a refund of the tax if sulphur emissions are limited by treatment or if the sulphur is to some extent fixed (NCM, 2009).

content. For coal, the sulphur tax is based on the weight of the sulphur in the fuel. The environmental classes of fuel oil are:

- MK 1:³⁴ <0.001% sulphur by weight.
- MK 2: <0.005% sulphur by weight.
- MK 3: <0.02% sulphur by weight.

Nitrogen oxides charge

Sweden introduced a charge on nitrogen oxide emissions in energy production at stationary combustion facilities in 1992 (Law 1990:613). The charge was last changed on 1st January 2008, when it was raised to SEK 50 (EUR 5.8) per kg (Government Bill 2007/08:153). The NO_x charge is a complement to emission limits set in operating permits. The main aim of the charge is to combat acidification and reduce emissions beyond the emission limits.

As of 1997, the charge covers combustion plants generating more than 25 GWh/year. A further criterion for liability to the charge is that the energy produced is used to heat buildings, to generate electricity or in industrial processes. The initial charge introduced in 1992 was SEK 40 (EUR 4.7) per kilo of nitrogen oxides emitted.

Almost all proceeds from the tax are paid back to the plants based on the amount of energy utilised.³⁵ This means that plants with low emissions compared to energy production are net receivers of funds, while plants with high emissions in relation to energy production are net payers.

Thermal power output tax

Sweden also has a separate tax on thermal power output of nuclear power reactors (Act 2000:466). The tax was raised in two steps in 2006 and 2008, from SEK 5,514 (EUR 641) per megawatt and month to SEK 10,200 (EUR 1,185), and to SEK 12,648 (EUR 1,470). The rate has not changed since (NCM 2009, & Skatteverket, 2013).

6.1.4 CO₂ emissions trading system

As required, Sweden has set out the total quantity of CO₂ emission allowances, and the quantity allocated for each installation covered by the

³⁴ MK = Miljöklass, English translation = Environmental Classification.

³⁵ Net of administrative charges.

EU ETS, in a National Allocation Plan. This has been done for the first (2005–07), second (2008–12), and third (2013–20) trading periods. In the first period, Sweden allocated emission allowances to electricity and district heating producers based on their historical emissions, and to energy-intensive industries based on projected emissions.

In the second period, Sweden allocated 19.8 million emission allowances on average per year. A reserve for new entrants was set at 13.1 Mt of CO₂ for the entire period. Operators exceeding the allocation have to purchase allowances from others, reduce their emissions or use credits from international carbon offsets.³⁶

In the third trading period, 30.2 million emission allowances have been allocated freely to 636 industry installations in Sweden, with 22 new installations after 2013. For 2020, 24 million free emission allowances are allocated.

Seventeen airline operators who applied for allowances in Sweden in accordance with EU regulations have been allocated emission allowances. In 2012, the aviation sector was allocated the equivalent of 97% of the sector's average emissions per year from 2004 to 2006. For the period 2012 to 2020, the number of allowances will be reduced from 97% to 95% of the average emissions in 2004–06.

6.1.5 *Energy and climate-related subsidies and green certificates*

In the Swedish accounts, environmental subsidies are grouped into five categories: resource-related subsidies, energy-related subsidies, emission-reducing subsidies, transport-related subsidies, and environmentally-related aid.³⁷ Energy-related and emission-reducing subsidies are described below. Together, these two groups are allocated almost 17% of total environmental subsidies in 2012, which makes it the third largest group after resource-related subsidies and environmentally-related aid.

Subsidies

Table 51 lists the energy- and climate-related subsidies available in Sweden in 2013, and the amount of support paid out from 2010 to 2012.

³⁶ The use of flexible mechanisms by EU Member States under the Kyoto Protocol is restricted by the European Commission to up to 10% of the total national allocation.

³⁷ Environmentally related aid ("miljörelaterat bistånd") is mainly paid to projects outside Sweden.

Table 51 Environmentally motivated subsidies for climate and energy (excluding administrative expenses)*

Energy- and climate-related subsidies	Support from 2010 to 2012, SEK (EUR) million
Energy research	2,059 (237)
Support for international environmental cooperation	40 (5)
Support for more efficient use of energy	325 (37)
Support for energy technology/energy efficiency	1,168 (134)
Support for conversion from direct electricity heating	334 (38) (discont.)
Support related to nuclear safety (international)	180 (21)
Support related to nuclear safety	19 (2)
Support for solar heat	46 (5) (discont.)
Support for wind power	254 (29)
Various support in the climate area	385 (44)
Support for climate investments**	-34 (-4)
Total	4,776 (549)

Note: *) The subsidies listed are those under the categories *energy-related subsidies* and *emission-reducing subsidies* in the Swedish environmental accounts. Other energy- and climate-related subsidies, such as support for sustainable cities and grants for environmental cars, which fall under other categories (resource-related and transport-related subsidies, respectively) are described in the relevant chapters of this report.

**) The budget line ended in 2010. The amount in 2012 shows repayments from municipalities (among others) who did not fulfil their commitment.

Source: Statistics Sweden (SCB) and the Swedish National Financial Management Authority (ESV).

Energy research

Sweden established an Energy Research Programme as early as 1975. The focus of the programme has developed over the years, and is now mainly targeted towards renewable energy, energy efficiency, and decreasing the impact of the energy sector on the climate and the environment. The programme includes activities in research, development, demonstration, innovation and commercialisation. The overall responsibility for the programme rests with the Swedish Energy Agency (Government Offices of Sweden, 2012).

Support for energy technology/energy efficiency

Subsidies for energy technology are used to stimulate the proliferation of certain energy technologies (biogas, other renewable gases, solar cells etc.) that are not yet commercially competitive, but are expected to have positive effects on the climate. Subsidies for installation of photovoltaic systems have largely been granted to individuals for the installation of solar electricity in houses. The maximum market launch grant is 25% of certain specified costs (Konjunkturinstitutet, 2012).

In the budget proposal for 2014, the Swedish Government pledged SEK 700 million (EUR 78.5 million) to putting in place a green investment fund targeting energy and environmental technology firms.

Other activities aim to strengthen regional and local climate and energy initiatives, support green procurement by the public sector, and

procure energy-efficient technology. For example, all municipalities in Sweden offer energy and climate advice to households and companies. Their role is to give free advice on energy efficiency as well as Government grants in the field of energy, heating systems, bioenergy and more (Government Offices of Sweden, 2012).

Energy efficiency in companies and business is promoted in a number of ways, for example by demonstration projects, network activities, seminars and information. In 2010 a programme was introduced for reducing energy consumption in small and medium sized companies. Through the programme, companies can apply for an “energy review cheque,” which is a subsidy for performing an energy review.

Since 2010, Swedish municipalities and county councils can seek support from the Swedish Energy Agency to work strategically with energy efficiency in their own operations. In 2012, 282 municipalities and 20 counties used this option.

Support for wind power

Support for wind power consists of two grants: planning support for wind energy (Boverket, 2013), and support for market introduction of wind power (see section on green certificates below).³⁸ The purpose of the planning scheme is to support municipalities, county councils, and local and regional cooperation bodies in planning initiatives for wind power and in facilitating wind power development. The aim of support for market introduction of wind power is to subsidise production that would otherwise be unprofitable, with the expectation that production costs will be reduced over time and thus generate profits in the future.

Different forms of support in the climate area

To complement the use of carbon tax in reducing greenhouse gas emission, other measures such as research are used.³⁹ With a focus on improving the risk assessment, the Swedish Geotechnical Institute has for example been tasked with developing a database on landslide risks and flooding, and the National Land Survey has set up an altitude database. The Swedish Planning and Building Act has been reviewed to include climate change adaptation into spatial planning. Planning for potential environ-

³⁸ Swedish translation: “Planeringsstöd för vindkraft med mera” and “Stöd för marknadsintroduktion av vindkraft”.

³⁹ The county administrative boards coordinate activities in this area.

mental effects affecting the transport system is coordinated among the various transport agencies (Government Offices of Sweden, 2012).

Discontinued support

- Subsidies for installation of solar heating were discontinued in December 2011.
- Support for conversion from direct electricity heating was discontinued in 2010.
- The voluntary Programme for Improved Energy Efficiency (PFE), which offered industry zero-rated electricity tax, was discontinued in 2012. The provisions of the programme still apply to companies signed up by 2012, which means that most programme participants will finish PFE in 2014, and that the last reporting companies will finish in 2017 (Government Offices of Sweden, 2012).

Green certificates

The green electricity certificate system is a form of market-based support for the expansion of electricity production based on renewable energy sources and peat. It is the main support scheme for renewable electricity production in Sweden. The electricity certificate market had a turnover of SEK 3.7 billion (EUR 430 million) in 2011, which is four times as much as the total budgetary climate and energy subsidies in the same year (Swedish Energy Agency, 2012). The electricity certificate market is described in Box 2.

Box 2 The Swedish green electricity certificate market

All electricity suppliers, and certain electricity users, are required to purchase certificates corresponding to a certain proportion (quota) of their electricity sales per year. Producers of electricity are allocated one certificate unit for each MWh of electricity that they produce from renewable energy sources or from peat. Certificates are traded on an open market. The sizes of quota obligations are adjusted from year to year, thus generating an increasing demand for certificates. In turn, this increases the incentive to produce more electricity from energy sources approved for production of certificate-entitled electricity. By selling their certificates, the producers of electricity from renewable sources can receive additional revenue to complement their sale of electricity. The certificate system thus encourages the expansion of production from renewable energy sources.

Source: Swedish Energy Agency (2012).

In 2010 the Swedish Parliament decided on a higher target for the green certificate system, and on an extension of the scheme until 2035. The current target will increase the production of renewable and peat-based electricity by 25 TWh by 2020 compared to 2002 levels.

Since 1st January 2012, the Swedish certificate system has been expanded to create a common Swedish-Norwegian market for electricity certificates. This means that certificates issued in Norway can be used for the fulfilment of the quota obligation according to Swedish law on electricity certificates and vice versa. The target for the common system is to increase electricity production based on renewable energy sources in Sweden and Norway by 26.4 TWh from 2012 to 2020. The joint system is the first example of cooperation mechanisms under the EU Renewables Directive (Government Offices of Sweden, 2012).

Figure 4 shows the total number of certificates issued in Sweden from 2003 to 2011. Biomass-based electricity has been issued the largest share of green electricity certificates, followed by wind and small-scale hydro power. Wind power is increasing rapidly from production of 1 TWh in 2006 to production of over 6 TWh in 2011 (Government Offices of Sweden, 2012).

Figure 4 Number of certificates issued by energy source

Source: Ekonomifakta (2013).

6.2 Water

6.2.1 *Water pollution from ships*

Sweden has a water pollution charge introduced in 1984 related to oil spills as a part of the Measures to Combat Water Pollution from Ships Act (1980:424). The size of the water pollution charge is fixed to take account of the extent of the discharge and the gross tonnage of the vessel, and is intended to be preventative rather than to compensate for oil damage or fund measures preventing damage caused by oil (Swedish Transport Agency, 2010).

6.2.2 *Local water preservation grant, LOVA*

In August 2009, an initiative for local water preservation measures, the Local Water Preservation Grant,⁴⁰ LOVA, was introduced. The aim of the grant is to develop local measures to improve the marine environment, primarily by reducing nutrients in oceans. Since 1st July 2011, LOVA grants have been funded by the Marine and Aquatic Environment Grant,⁴¹ which aims to improve, preserve and protect marine and aquatic environments. LOVA grants focus on reducing amounts of phosphorus and nitrogen in the Baltic Sea and the Kattegat and the Skagerrak (Swedish Agency for Marine and Water Management, 2011). Municipalities and non-profit organisations can apply for LOVA grants in order to:

- develop plans for measures aimed at reducing the amount of nitrogen and phosphorus in the Baltic Sea and the Kattegat and the Skagerrak
- install equipment to deal with sewage from recreational boats
- install equipment for washing boats
- implement monitoring and evaluation of the above.

A total of 202 projects were granted funding in 2012 totalling SEK 76,600 (EUR 8,800) (Swedish Agency for Marine and Water Management (2013).

⁴⁰ Swedish translation: "Lokalt vattenvårdsbidrag".

⁴¹ Swedish translation: "Havs- och vattenmiljöanslaget".

6.2.3 User charges for water supply and wastewater services

Swedish municipalities levy a charge for water supply and wastewater treatment combined in the "VA-avgift".⁴² The charge is formally levied to protect the groundwater.

The charge is applicable to both industry and households, and consists of a fixed part and a part which varies according to water consumption. Charges vary considerably according to municipality, due to e.g. population density (i.e. the length of pipeline required per capita), use of groundwater versus surface water, etc. In 2013, annual charges for domestic water and wastewater services in different municipalities ranged from SEK 2,964 (SEK 2,370 in 2008) (EUR 345, EUR 276 in 2008) to 10,668 (SEK 8,031 in 2008) (EUR 1,241, EUR 994 in 2008) per year for a detached house.⁴³ For an apartment in a block of 15 flats, fees for water supply and wastewater services ranged from SEK 1,488 (SEK 1,322 in 2008) (EUR 173, EUR 154 in 2008) to SEK 7,284 (SEK 5,917 in 2008) (EUR 847, EUR 688 in 2008) (The Swedish Water & Wastewater Association, 2013).⁴⁴

Where the character of industrial wastewater differs from that of normal wastewater, industrial users can be charged additional wastewater charges. The fees are then calculated as a function of sewage loads. No charge applies for agricultural use as every landowner has a right to use the groundwater resources below their property.

6.2.4 A certificate system for nitrogen discharge in the Baltic Sea

The Swedish Environmental Protection Agency has, on behalf of the Government, proposed an economic incentive to reduce the discharge of nitrogen from wastewater treatment plants into the Baltic Sea. The background is the political agreement in the Baltic Sea Action Plan (BSAP). The Government has distributed Sweden's commitment to reduce the eutrophication emissions into the Baltic Sea between industries that contribute to eutrophication; mainly agricultural, wastewater treatment plants and industry. As these reductions will be costly, the

⁴² Regulated in *Lag (2006:412) om allmänna vattentjänster*.

⁴³ Based on a consumption of 150 m³ per year.

⁴⁴ Based on an average consumption of 133 m³ per year.

Swedish Environmental Protection Agency has suggested a system of tradable certificates, so that emission reductions can be achieved at the lowest cost possible. However, no final decision has been made and the system will most likely be operational in 2016 at the earliest (The Swedish Water & Wastewater Association, 2012).

6.3 Waste

To limit the environmental effects of waste treatment and augment resource efficiency, there are a number of economic and administrative instruments. The economic instruments include taxes and charges, as well as tax reliefs and subsidies.

6.3.1 *Landfill tax*

In 2000, a tax on landfill waste was introduced, in order to minimise landfill waste and promote material recycling, along with energy recovery (NCM, 2006). Initially, the tax rate was SEK 250 (EUR 30) per tonne, but has since been raised at several stages. The rate today is set at SEK 435 (EUR 51) per tonne (Avfall Sverige 2013).⁴⁵

A ban on the disposal of sorted burnable (2002) and organic waste (2005) has also been introduced to further promote material recycling and energy recovery (Avfall Sverige, 2013).⁴⁶

6.3.2 *Incineration tax*

In 2003, the Swedish Ministry of Finance initiated an investigation of a potential tax on the incineration of waste. Two methods were under consideration: a tax per tonne of waste incinerated and a tax which varies according to carbon content per tonne for household waste. The purpose was to increase recycling, reduce carbon emissions and increase cogeneration. Whether electricity certificates should be issued for incineration of waste was also under consideration (NCM, 2006).

⁴⁵ The waste depot is liable for the tax.

⁴⁶ In Sweden, there are no laws governing households' responsibility to sort and deal with hazardous waste, but most municipalities have included this in their administrative agreements. It is the municipality that has the responsibility for collecting hazardous waste.

On 1st July 2006, Sweden introduced an incineration tax on waste which settled on the second option. The tax also accounted for how much electricity was produced at the waste plant. The tax was SEK 487 (EUR 57) per tonne of waste for plants without electricity production, and decreased gradually with electricity production (NCM, 2009). However, the tax was removed in September 2010, and waste intended for incineration is now exempted from tax. The tax was removed since it was shown to have an insignificant steering effect, and only led to unnecessary transportation of household waste. The tax cut was financed by the general carbon tax increase of 1 öre (0.1 eurocent) per kg of carbon dioxide (Swedish Ministry of Finance, 2009).

6.3.3 Producer responsibility

Producer responsibility means that producers, importers and retailers of certain goods are obliged to provide collection, recovery and information for consumers for all goods sold. Producer responsibility is implemented in Swedish legislation with regard to eight product groups: *packaging, waste paper, tyres, electrical and electronic products, batteries, vehicles, pharmaceuticals, and radioactive products and orphan radiation sources* (Swedish Environmental Protection Agency, 2012).⁴⁷

Packaging and waste paper

Glass: Around 93% of glass packaging in Sweden is recycled. Producers of packaging glass pay for the number of packages and their different fill volume, with a separate charge on glass packaging for cosmetics and pharmaceuticals. All of these packaging fees are managed by and paid to Swedish Glass Recycling (Svensk Glasåtervinning AB).

⁴⁷ Producer responsibility can be seen as an administrative instrument rather than an economic one. Producers are made responsible for collecting packaging, but are not given economic incentives to do so. The charges levied on for example glass, paper and plastics are not intended to reduce the volume of or increase recycling of the packaging, or to increase the use of more environmentally friendly alternatives, but rather to cover the costs for producers to collect them. A possible exception is when charges are levied based on weight, as these charges are passed on to consumers and producers are probably interested in keeping prices low for their products. Deposit-refund systems are also an exception, as they provide a direct economic incentive for consumers to return the container with a deposit. However, in line with previous reports, packaging charges are included in this section.

Table 52 Glass packaging charges in 2013, öre (eurocent)

Use of packaging	Fill volume	Fee, öre (eurocent)
General	Up to 250 ml	7 (0.81)
	251–500 ml	16 (1.86)
	501–699 ml	20 (2.32)
	From 700 ml	30 (3.49)
Cosmetics	Up to 50 ml	2 (0.23)
	From 51 ml	7 (0.81)
Pharmaceuticals	51–250 ml	7 (0.81)
	251–500 ml	16 (1.86)
	501–699 ml	20 (2.32)
	From 700 ml	30 (3.49)

Source: Swedish Environmental Protection Agency (2012b).

Plastic, corrugated cardboard, paper and cartons, metal and waste paper: Industry and trade have established a waste management company, the Packaging and Newspaper Collection Service (Förpacknings- och Tidningsinsamlingen AB, FTI), to manage the different types of waste. FTI administers the packaging charges for these companies with regard to plastic, corrugated cardboard, paper and cartons, metal packaging and waste paper. Swedish Glass Recycling takes care of its own financing, but is included in FTI through a contractual cooperation.

The annual fee for all affiliated FTI companies is SEK 1,500 (EUR 174.00) per calendar year. Companies whose packaging fees are below SEK 8,500 (EUR 988.00) per year (including the annual fee) may get a fixed flat rate instead of a charge based on actual waste volumes. The fixed rate is divided into three levels: SEK 2,000, SEK 4,000 or SEK 8,500 (EUR 232.60, EUR 465.00 or EUR 988.00) per year (as of 1st January 2011).

Producers, importers and retailers of packaging or packed goods whose packaging fees are above SEK 8,500 (EUR 988.00) pay fees based on the weight and use of the packaging. The charges are passed on to consumers for the waste management companies to be self-financing. A list of charges is presented in Table 53.

Table 53 Packaging charges, SEK (EUR) per kilo

Material		From October/ November 2009	From April 2011	From April 2013
Households	Paper	-	0.95 (0.11)	1.08 (0.13)
	Plastic	1.25 (0.13)	1.71 (0.19)	1.71 (0.20)
	Aluminium	-	2.32 (0.26)	2.32 (0.27)
	Steel plate	2.25 (0.24)	2.79 (0.31)	2.86 (0.33)
Commercial	Paper	0.02 (0.00)	0.03 (0.00)	0.03 (0.00)
	Plastic	-	0.1 (0.01)	0.1 (0.01)
	Aluminium	-	0.77 (0.09)	0.01 (0.00)
	Steel plate	2.52 (0.26)	0.93 (0.10)	0.23 (0.03)
	Steel band and wire	0.42 (0.04)	0.42 (0.05)	0.4 (0.05)
	Top of Form. Steel drums	0.06 (0.01)	0.06 (0.01)	0.04 (0.00)
	Bottom of Form	-	0.86 (0.10)	0.98 (0.11)
Service	Paper	-	0.86 (0.10)	0.98 (0.11)
	Plastic	1.13 (0.12)	1.55 (0.17)	1.55 (0.18)
	Aluminium	-	2.17 (0.24)	2.17 (0.25)

Note: As a new fee structure was implemented from 1 April 2011, some product groups are not applicable before this date. For example, the category paper was previously divided into the two categories cartons/paper and corrugated cardboard, of which the fee for the latter varied according to product and use.

Source: Swedish Environmental Protection Agency (2012a).

In 2012, a suggestion for transferring responsibility for packaging from producers to municipalities was made in a Swedish Government official report (SOU 2012:56). However, as per October 2013, no legislative change has been made.

Disposable beverage containers: Legislation introduced in 2005 requires that all disposable beverage containers sold in Sweden must be included in an approved deposit refund system, with some exemptions.⁴⁸ Returpack is responsible for non-refillable aluminium cans and PET bottles.

Deposit rates for aluminium cans and PET bottles have remained relatively stable over the period 2010 to 2013, with one minor change. On 15th September 2010, the deposit for aluminium cans was raised from 50 öre to SEK 1 (EUR 0.12) (including VAT). The deposit for small and large PET bottles is SEK 1 and SEK 2 (EUR 0.12 and EUR 0.23), respectively (website of Returpack).

⁴⁸ Products containing at least 50% juice and dairy products are exempt.

Table 54 Deposit refunds for non-refillable cans and PET bottles, SEK (EUR) per item

Container	1984	2005	2010	2011	2012	2013
Aluminium cans (for recycling)	0.25 (0.03)	0.5 (0.05)	1 (0.12)	1 (0.12)	1 (0.12)	1 (0.12)
PET – small (for recycling)		1 (0.12)	1 (0.12)	1 (0.12)	1 (0.12)	1 (0.12)
PET – medium (for recycling)		2 (0.23)	2 (0.23)	2 (0.23)	2 (0.23)	2 (0.23)

Source: Website of Returpack and NMR (2009).

Tyres

Tyres are covered by a producer responsibility, which mean that anyone who professionally manufactures, imports or sells tyres and those who manufacture, import or sell vehicles and equipment other than cars fitted with new tyres should be affiliated with Svensk Däckåtervinning AB, SDAB (the Swedish Tyre Recycling Organisation), which organises the collection and recycling of old tyres. Tyre workshops are also covered by the producer responsibility, and are therefore obliged to accept scrap tyres.⁴⁹ A private person who wants to get rid of their waste tyres can therefore submit them to a tyre workshop that will accept them free of charge.

As the collection system for tyres is transport-intensive, and as the costs of transportation and fuel have risen, SDAB increased the recycling rates for workshops to the current levels in 2007. The rates are listed in Table 55.

Table 55 Charges per tyre, SEK (EUR)

Category of tyre	2003/2004	From July 2007
Category I	13 (1.4)	16 (1.7)
Category I R	8 (0.9)	10 (1.1)
Category II A	350 (38.4)	425 (45.9)
Category II B	800 (87.7)	1,000 (108.1)
Category III	80 (8.8)	100 (10.8)

Source: NCM (2009) and website of the Swedish Tyre Recycling Organisation.

Electrical and Electronic Equipment (WEEE)

In Sweden, a single national producer responsibility organisation, El-Kretsen, exists to fulfil the collection and treatment obligation of producers. El-Kretsen is owned jointly by 20 business associations and has agreements with 1,300 affiliated companies for electrical/electronic product recycling, and with 700 for battery recycling. Membership dues for affiliated companies comprise a fixed entry fee, an annual membership fee, and a fee based on product type and the subscribing company's

⁴⁹ According to the Directive concerning Manufacturers' Liability for Used Car Tyres (1994:1236).

market share. Through these dues, El-Kretsen facilitates the collection (from El-Kretsen collection points) and treatment of household and commercial electronic waste.

The Swedish El-Kretsen scheme has contributed greatly to Sweden's performance in terms of electronic waste collection (16 kg per capita and 63% of total WEEE placed on the market), recovery (92% of WEEE collected per capita) and reuse/recycling (84% of WEEE collected per capita) of WEEE. These performances have already put Sweden ahead of the majority of the 2020 targets set in the recast WEEE Directive (European Commission (DG ENV), 2012).

Batteries

Economic instruments targeting batteries are intended to reduce the spread of the dangerous substances present in batteries. Environmental charges on batteries have been imposed in Sweden since 1987 to cover society's costs for collecting, sorting, transporting and recycling batteries. Previously the charge covered lead, mercury and cadmium batteries; the charge currently only applies to nickel-cadmium batteries.⁵⁰ Revenues from the environmental charge can be used to compensate municipalities or producers that bear the costs of collecting, sorting, transporting and recycling (website of the Swedish Environmental Protection Agency, 2013).

The collection of batteries in Sweden is currently regulated through the Battery Regulation of 1st January 2009 (2008:834). The regulation includes all types of batteries, contains provisions on producer responsibility and stipulates that all batteries should be recycled. It also contains stronger requirements for the labelling of batteries than previous regulations.

Producers are required to report to the Environmental Protection Agency through "EE- och Batteriregistret" (a register of electrical and electronic products and batteries) before selling to the Swedish market. Producers should annually report the number of batteries introduced to the Swedish market (volumes sold in kilos), collected and recovered quantities of batteries in kilos and how the producer fulfils the requirements of the Battery Regulation. Failure to report in time carries an en-

⁵⁰ Producers of nickel-cadmium batteries shall pay a charge of SEK 300/kilo that the producer releases to the market.

vironmental penalty of SEK 10,000 (EUR 1,162.80) to be paid to the Environmental Protection Agency.⁵¹

End-of-life vehicles (ELVs)

Until June 2007, Sweden had a deposit-refund system for ELVs, where car owners were given SEK 4,000 (EUR 465.1) per ELV when returning it. The system was then abandoned in accordance with the EU directive for ELVs which was introduced in Swedish legislation by Regulation 2007:185. Currently, vehicles with a gross weight of less than 3.5 tonnes are covered by producer responsibility, which means that producers finance scrapping. Heavier vehicles are outside this system, as market-based mechanisms are considered sufficient to deal with them.⁵² The reason is that spare parts for these vehicles have a high second-hand value. A large number of used heavy vehicles are also exported to countries in Eastern Europe and developing countries.

6.4 Transport

When the Swedish Parliament set targets for renewable energy and energy efficiency in 2009, it was decided that consumption should reach a 50% share of energy from renewable sources by 2020 and a 10% share of renewable energy specifically in the transport sector. Its long-term ambition is that Sweden should have a fossil fuel independent vehicle fleet. In order to achieve the short- and long-term goals, environmentally-friendly cars are heavily promoted, along with public transport.

6.4.1 The road network

Annual tax on vehicles

Sweden levies an annual vehicle tax on cars, trucks, buses, motorcycles, tractors (tax class I), motorised equipment and certain heavy-duty off-road vehicles and trailers if they are, or should be, entered in the vehicles register and have not been taken off the road (Tax Authority 2013). The tax is levied for the vehicle to be used on public roads.

⁵¹ Attachment 1, point 8.2.1 SFS 2008:842.

⁵² Government Bill 1995/96:174.

The annual tax on vehicles can vary between SEK 0–6,000 (EUR 0–698). Taxes on cars of model year 2006 and newer, and cars qualifying for environmental class 2005 (electric and hybrid), are determined by the car's emissions of carbon dioxide. Tax on other cars depends on a number of factors such as the fuel they use and their weight (Heavier vehicles are taxed more heavily.). Tax on petrol cars averages around SEK 2,500 (EUR 291) a year.⁵³ There are several exemptions from the vehicle tax:

Box 3 Vehicle tax exemptions

Vintage vehicles are exempted from the vehicle tax. Motorcycles, and buses, trucks and cars that are not used in professional service, which are thirty years or older are counted as vintage vehicles. Other vehicles exempted from the tax are:

- Cars, light buses and light trucks that are taxed under the Act (2006:228) on Special Vehicle Tax.
- Tractors, machinery and heavy off-road vehicles belonging to tax category II according to §17 of the Road Tax Act.
- Trailers towed by heavy off-road vehicles belonging to tax class II or taxed according to §19 of the Road Tax Act.
- Semi-trailers with a weight over 3 tonnes if towed by cars that can be powered by diesel or tractors designed to be used within ports and terminal areas.
- Trailers with a maximum weight of 750 kg.

In 2013, several changes were made to the annual tax on vehicles. In brief, these are:

- most vehicles are subject to a higher rate of vehicle tax
- most diesel vehicles are subject to a lower rate of vehicle tax
- the rules for the five-year tax exemption for vehicles with certain environmental characteristics change.

The vehicle tax consists of two parts:

- A base fee of SEK 360 (EUR 42) per year. The fee has remained unchanged since 2009.

⁵³ From <http://bilforsakring-jamfor.nu/vad-kostar-det-att-aga-en-bil/>. Specific tax rates can be found at <http://www.skatteverket.se/privat/skatter/biltrafik/fordonsskatt>

- A CO₂ component of SEK 20 (EUR 2.3) per gram on vehicles emitting over 117 grams of CO₂/kilometre calculated based on normal driving conditions (Skatteverket, 2013). The corresponding figures for 2009 were SEK 15 (EUR 1.4) per gram on vehicles emitting over 100 grams of CO₂/kilometre, which implies an increase in the vehicle tax. For cars that can use alternative fuels, the component is SEK 10 (EUR 1.2) per gram (the same as 2009).⁵⁴

For diesel cars, the sum of the base fee and the CO₂ component should be multiplied by an environmental and fuel factor of 2.3 (3.3 in 2009). An environmental supplement is also added of SEK 500 (EUR 58) for cars that became taxable for the first time before the end of 2007, and SEK 250 (EUR 29) for cars that became taxable for the first time after the end of 2007. A deduction on the vehicle tax is allowed in sparsely populated areas.

Cars, campers, light trucks and light buses that meet specific environmental demands and are put into service for the first time are exempt from vehicle tax for the first five years from the time the vehicle was introduced. This “environmental car” exemption was introduced in January 2010. The purpose is to encourage more people to buy vehicles that are fuel-efficient or run on renewable fuel. The exemption is explained further in section 6.4.4.

Road charges

Road charges in Sweden are levied for financing the construction of new roads. However, the charges also have a steering effect and may be used e.g. to restrict traffic in certain areas or on certain routes.

Since 1st February 1998, all domestic and foreign heavy goods vehicles (HGV) above 12 tonnes driving on Swedish roads are levied with a road charge as set out under the Eurovignette Directive (99/62/EC). The road charge for Swedish-registered trucks covers the entire road network and is payable annually.⁵⁵ Charges depend on the exhaust class of the vehicle (Euro 0, 1, or 2), and how many axles the vehicle has.

⁵⁴ Alternative fuels refer to ethanol, E85, natural gas or bio gas.

⁵⁵ The fee does not apply for trucks if they are registered in the Traffic Registry as a model 30 years old or older, and if it is not used in commercial traffic. Nor does the fee apply for vehicles belonging to the armed forces, the police, the state or a municipality, or if the vehicle is intended to be used for emergency services. Trucks used as road maintenance vehicles are also exempt from paying the charge.

In September 2011, the European Council adopted the revised “Eurovignette directive”. A specific provision of the directive allows Member States to cooperate for the purpose of introducing a common system of electronic charges, or vignettes. In this respect, Belgium, Denmark, Luxembourg, the Netherlands and Sweden have a common system of user charges for heavy goods vehicles above 12 tonnes.⁵⁶ In Sweden, the charge is payable for using motorways and certain trunk roads (“Europe Roads”) that are not motorways. Charges depend, in addition to exhaust class and number of axles on the vehicle, on how long the driver intends to use the road. Payment can be made for a day, week, month or year at some fuel stations and forwarding agents. Table 56 displays the charges and changes since 2009.

Table 56 Road Charges in SEK (EUR) 2010–2013

Number of axles	Exhaust class	Annual road charge SEK (EUR)			
		2010	2011	2012	2013
Two or three	Euro 0	9,337 (979)	8,849 (980)	8,849 (1,017)	8,134 (945)
Two or three	Euro 1	8,267 (867)	7,835 (868)	7,835 (900)	7,202 (837)
Two or three	Euro 2 or cleaner	7,295 (765)	6,913 (766)	6,913 (794)	6,354 (738)
Four or more	Euro 0	15,076 (1,581)	14,288 (1,582)	14,288 (1,642)	13,133 (1,526)
Four or more	Euro 1	13,617 (1,428)	12,905 (1,429)	12,905 (1,483)	11,862 (1,378)
Four or more	Euro 2 or cleaner	12,158 (1,275)	11,522 (1,276)	11,522 (1,324)	10,591 (1,231)

Source: Skatteverket (2012) and Skatteverket (2013).

Table 57 displays the road charges for foreign vehicles in 2013.

Table 57 Road charges for foreign vehicles in SEK (EUR) 2013

Number of axles	Two or three	Two or three	Two or three	Four or more	Four or more	Four or more
Exhaust class	Euro 0	Euro 1	Euro 2	Euro 0	Euro 1	Euro 2
1 day	67 (8)	67 (8)	67 (8)	67 (8)	67 (8)	67 (8)
1 week	220 (26)	194 (23)	169 (20)	347 (40)	313 (36)	279 (32)
1 month	813 (94)	720 (84)	635 (74)	1,313 (153)	1,186 (138)	1,059 (123)
1 year	8,134 (945)	7,202 (837)	6,354 (738)	13,133 (1526)	11,862 (1378)	10,591 (1231)

Source: Skatteverket (2012) and Skatteverket (2013).

⁵⁶ European Commission (2013a).

Congestion taxes

Stockholm was the first Swedish city to introduce congestion taxes permanently in 2007, in order to reduce congestion on the roads and streets in and around central Stockholm, and to reduce emissions of pollutants that are harmful to health and the environment. The tax also has a fiscal purpose since most of the revenues are intended for investment in public transport (Swedish Environmental Protection Agency, 2007).

Gothenburg was the second Swedish city to introduce a congestion tax on 1st January 2013. The tax is intended to contribute to environmental benefits and better accessibility in inner city traffic, and to finance parts of the planned improvements in public transport, railways and roads (Swedish Transport Agency, 2011).⁵⁷

Box 4 How does the congestion tax in Stockholm work?

Different taxes are levied at different hours of the day and are governed by law in Act 2004:629 and Regulation 2004:987. Tax is not levied on Saturdays, holidays, the day before holidays or during the month of July. Some vehicles are exempt from the congestion charge, such as emergency vehicles, buses with a total weight of at least 14 tonnes, diplomatic registered vehicles, motorcycles, foreign registered vehicles and military vehicles. The amount ranges from SEK 20 during peak hours to SEK 10 during off-peak hours, and a maximum value is set at SEK 60 per day and vehicle. These rates have remained unchanged since the tax was introduced in 2006, but in early 2014 the Government proposed raising the rates to between SEK 15 and SEK 35. Until 31st July 2012, some environmentally friendly cars were exempt from congestion charges in Stockholm. This exemption does not apply anymore, and since 1st August 2012 all environmentally friendly cars pay congestion tax.

Congestion tax expenses can be deducted from people's declaration for income tax payments, thus potentially reducing some of the impact of the tax on people's driving behaviour.

⁵⁷ SEK 14 billion out of SEK 34 billion until 2025.

6.4.2 Shipping

Shipping causes emissions of sulphur, nitrogen oxides, carbon dioxide and particles that affect human health and contribute to acidification and eutrophication of land and water.

Currently, there are no direct charges for emissions in shipping. Instead, differentiated shipping lane charges are used as instruments to reduce emissions.⁵⁸ Ships that only use bunker oil with low sulphur content⁵⁹ are given a discount on shipping lane charges, along with ships with equipment installed to reduce emissions of nitrogen oxides.

Also, approximately 40% of Swedish ports implement environmental differentiation in their port fees, to reduce emissions of sulphur and nitrogen oxides. As differentiation of port fees is a voluntary measure, the 30 ports that have chosen to introduce this incentive have different regulation designs (Trafikverket, 2012).

6.4.3 Aviation

Exhaust gas-related landing charges were introduced at Swedish state-owned airports in 1998. To encourage the use of aircraft with better environmental qualities, Sweden has a system of environmentally differentiated starting fees at state-owned airports. The charges are levied on both domestic and international flights, and are largely dependent on the volume of nitrogen oxides emitted by individual aircraft. These charges are meant to internalise the social costs of NO_x emissions from aviation. This component only exists in Sweden and Switzerland (Trafikverket, 2012).

From 2012, aviation is covered within the EU ETS. An allowance gives the owner the right to emit one tonne of carbon dioxide. In Sweden, scheduled and charter services are affected by this, with an exception for airplanes over 5,700 kg. The majority of the allowances for airlines are free, but any residual needs to be purchased. For the trading period 1st January 2012 to 31 December 2012, 85% of the airlines'

⁵⁸ Generally, shipping regulations are adopted internationally, mainly within the framework of the International Maritime Organisation (IMO), but also within the EU. The possibilities for separate, national regulations are small.

⁵⁹ Not exceeding 0.5% by weight.

allowances were distributed for free, and for the period 1st January 2013 to 31 December 2020, the corresponding figure is 82%. Of the remaining allowances, 15% will be auctioned off for each period. During the period 2013–2020, 3% will be set aside in a special reserve for new entrants and fast-growing airlines.

6.4.4 Grants and subsidies

As mentioned briefly in section 6.4.1, since January 2010 cars, campers, light trucks and light buses that meet specific environmental requirements and are put into service for the first time are exempt from vehicle tax for the first five years from the time the vehicle was introduced. Until 2013, the criterion for an environmental classification was that the car should emit less than 120 g of CO₂ per kilometre, regardless of its size. Vehicles equipped with technology for operating entirely or partially on electricity, alcohol or gas, as well as fuel-efficient petrol and diesel cars, could also receive the grant. However, in the Government's 2013 budget proposal a new definition was implemented, where the allowed emission levels are determined by vehicle weight. Lighter cars have lower limits, and heavier cars higher. Cars that run on biofuels will have special rules for some time. These cars can emit no more than 150 grams of carbon dioxide per kilometre. The differentiation reflects the fact that the carbon emissions from these cars are of renewable origin. At the same time, the Government has signalled that the more generous emission allowances for alternative fuel vehicles are to be removed eventually, without setting a date for the time of removal.

From the start of January 2014, it is expected only ten per cent of new cars will meet these new rules. The Government also estimates it will make the requirements even more stringent until 2020, in line with new EU rules. According to these rules, CO₂ limits for new passenger cars may not exceed 130 g of CO₂ per km from 2015 onwards⁶⁰ and 95 g of CO₂ per km by 2020. For new vans, equivalent figures are 175 g of CO₂ in 2017 and 147 g of CO₂ in 2020.⁶¹

⁶⁰ Regulation (EC) No 443/2009.

⁶¹ Regulation (EU) 510/2011.

Super environmentally-friendly car grant⁶²

The Government decided on 22 December 2011 to introduce a “super environmentally-friendly car grant.” The purpose of the grant is to stimulate the market introduction of the most environmentally friendly cars. The grant is available between 2012 and 2014, and differs in size depending on whether it is granted to a person or an organisation. For a person the grant is SEK 40,000 (EUR 4,651). For an organisation, the grant is 35% of the price difference between the super environmentally-friendly car and the closest comparable car, up to a maximum of SEK 40,000 (EUR 4,651).

The following grants and subsidies can be mentioned:

- *Public transport is subsidised* by around 50%, to make it more competitive and to achieve the aims of Swedish transport policy, including the environmental target (Trafikverket, 2012). Subsidies vary on an annual basis and depend on the profitability of the transport.
- *Transport grants* are offered to companies in certain industries in the four northernmost counties in Sweden (Trafikverket, 2012). These are obtainable for road, rail and lake transport. The grants are intended to compensate for some of the cost disadvantages of industry in northern Sweden, and stimulate value-added production.

6.5 Agriculture and natural resources

In Sweden, as in many other industrialised countries, agriculture is one of the sectors receiving a great deal of subsidies. The fishery sector also receives significant support. Other resource-related subsidies include measures such as ecolabelling of products, fish preservation and support for sustainable cities. The purpose of the latter is to support the development of urban environments that help reduce greenhouse gas emissions.

⁶² Swedish translation: “Supermiljöbilspremie”.

Resource-related environmentally motivated subsidies	Support from 2010 to 2012 SEK (EUR) million
Environmental support in agriculture*	7,414 (861)
Support for liming and protecting the natural environment	957 (111)
Support for sanitation of polluted areas	469 (55)
Environmental research	504 (59)
Support for local investment programmes	-
Return of taxes on fertiliser and pesticides	289 (34)
Support for the marine environment	428 (50)
Support for sustainable cities	233 (27)
Subsidy for eco-building	-
Support for environmental marking	13 (2)
Subsidy to preserve the fish	20 (2)
Support for international environmental cooperation	133 (15)
Investment subsidy for ecological restructuring	-
Measures for improving the environment in the agricultural sector	35 (4)
Support for improved environment in the Baltic sea	-
Other (environmental goals, supervision etc.)	150 (17)
<i>Total</i>	<i>10,645 (1,237)</i>

Note: *) Mainly environmental support in agriculture, such as conservation of biodiversity in the farmed landscape and environmentally friendly agriculture. About half is paid by the EU. Only refers to the environmental support in the Rural Development Programme, but there are also other environmental support measures in the programme. Periodised results based on statistics from the Swedish Board of Agriculture are presented.

Source: Statistics Sweden (SCB) and the Swedish National Financial Management Authority (ESV).

6.5.1 Agriculture

The agricultural support to Swedish farmers is extensive and has a great influence on the environmental impact of agriculture. The Swedish rural programme⁶³ includes support for rural development, environmental improvements and support for improved competition strength in agriculture, gardening, ecology and cultivation. The programme includes SEK 35 billion (EUR 4 billion), i.e. SEK 5 billion (EUR 581 million) annually (NCM, 2009). A new period for the programme starts in 2014 and continues until 2020. This may lead to changes to the support available today.

Sweden has also seen its fertiliser tax abolished as of 1st January 2010.⁶⁴ The tax was introduced on nitrogen (N) and phosphorous (P) along with a price regulation charge in 1984. The aim of the tax abolition was to increase the competitiveness of Swedish agriculture (Statskontoret, 2010).

⁶³ Swedish translation: "Det nya svenska landsbygdsprogrammet". Duration from 2007 to 2013, financed by the EU and the Swedish Government.

⁶⁴ In accordance with the Act (2009:1499) on the Repeal of the Act (1984:409) on Tax on Fertilisers

Another tax relevant to agriculture, the pesticide tax, is currently SEK 30 (EUR 3.5) per kg of active substance, which is the same level as in 2009. The purpose of the tax is to reduce the use of pesticides and thereby the health and environmental risks. The tax is intended to fund certain activities, such as advisory services, research and development on ways of reducing pesticide use. The tax was initially introduced in 1984 (Act 1984:410).

Finally, as previously mentioned, following the 2009 taxation reform, agriculture along with forestry and fisheries saw the introduction of a 30% energy tax and an increase in the CO₂ tax to 30% from 2011 onwards (60% as of 2015). This represents a significant change, with a focus on steering away from environmentally harmful activities.

6.5.2 *Forestry*

Forest-owners can receive a range of subsidies in order to create incentives to maintain forests, thereby promoting biological diversity and maintaining forests with important cultural heritage. Payments are granted for the costs incurred by thinning and removing deadwood, for example. Most of the schemes are only applicable to broad-leaved deciduous forests.

6.5.3 *Fishery*

Fisheries in all EU Member States are directly subject to the Common Fisheries Policy of the EU. Total allowable catches are set every year for most stocks and every two years for deep sea species by the European Commission.

The fishing industry in Sweden receives a number of subsidies. All seafaring, including fishing vessels, is exempt from energy and CO₂ taxes. This has led to a more fuel-intensive fishing fleet and trawling being promoted above less environmentally friendly methods of fishing, such as nets and traps (Swedish Environmental Protection Agency, 2012).

Part II:
Environmentally Harmful Subsidies in
the Nordic Countries

7. What are environmental harmful subsidies and how can they be identified and categorised?

7.1 Introduction

Subsidies for certain goods and activities are common in all Nordic countries, and are used to remove market deficiencies or to support disadvantaged parts of society. They can be useful and powerful tools in promoting growth and employment, as well as resource-saving technologies that are not yet competitive in the market. However, some of these subsidies, aimed at correcting market failure or as part of redistribution policy, may lead to negative consequences for the environment. Subsidies that harm the environment, or *environmentally harmful subsidies (EHS)*, have recently been researched by several important institutions and organisations at EU and OECD levels.

The EU, along with others, has a long-standing commitment to removing or phasing out EHS (Withana *et al.*, 2012), as they put strain on fiscal budgets and add to global greenhouse gas emissions. IEA estimates that subsidies to fossil fuel consumption alone are approximately 1% of global GDP, and that a phase-out of these subsidies would reduce global carbon emissions by about 6% (NCM, 2011).

While the obvious solution to the problem is to remove subsidies that harm the environment, this may not be easily achieved. The Nordic countries have far-reaching environmental policies, which implies a high level of environmental awareness, and that the occurrence of EHS may not be obvious. Consequently, reforming EHS involves more than identifying direct budget subsidies and removing them. Indirect support, lack of environmental taxes, selective exemptions from governmental standards, preferential market access and price support represent different types of off-budget subsidies with principally the same effects as direct subsidies, but with a more discreet appearance.

What is more, reforming EHS may not be uncontroversial, as the subsidies may align with other policies, such as support for regional development or domestic production. An example is reduced energy taxes in rural areas, which aims to support rural development, but entails a reduced steering effect of the economic instrument.

7.1.1 Purpose and scope

Given the abovementioned difficulties, in order to remove or phase out EHS, a natural place to start is to find some common traits that characterise an EHS. In order to do so, we create a *framework for identifying what can be considered an environmentally harmful subsidy*, based on previous work by the Nordic Council of Ministers, the European Commission, the OECD and others. The developed method can be used in future work to identify environmentally harmful subsidies.

As the current study takes a Nordic perspective, we create a framework applicable to environmental policy in the Nordic countries. This implies that the findings from some studies, which focus on EHS globally, will have to be adapted to a Nordic setting.

We also take the analysis one step further by creating a method for classifying environmentally harmful subsidies according to the *political possibility of reform*. We focus on two key dimensions:

- The fiscal budget impact of reforming an environmentally harmful subsidy.
- The environmental impact of reforming an environmentally harmful subsidy.

These dimensions are the focal point, as the political possibility of reforming an EHS is largely determined by its effect on the fiscal budget and on the environment. The greater the positive environmental effect of removing or phasing out an EHS, the easier it is to motivate its reform. Correspondingly, the larger the fiscal gain from a reform proposal, the larger the economic incentive for the reform. Other aspects that may be important for the possibilities for reforming a particular environmentally harmful subsidy, such as effects on competitiveness and the underlying political agenda, and EU legislation, will only be addressed summarily due to the limited time frame and budget of the study. These aspects will be discussed to an extent depending on their importance in the different case studies we perform.

The methodology can enable further work for identifying and classifying a larger set of environmentally harmful subsidies in the Nordic countries. With a more comprehensive list it would be possible for decision-makers to pinpoint which specific instruments may be reformed with relative ease, and for which instruments there are substantial barriers to reform.

7.1.2 A four step method

To create this framework we, *firstly*, find a suitable and relevant way of defining environmentally harmful subsidies. The definition serves as a basis for the subsequent analysis.

Secondly, we create an overall method for identifying potentially environmentally harmful budgetary elements, based on criteria set up in the literature. The far-reaching environmental policies in the Nordic countries are taken into account.

Thirdly, we create a method for classifying environmentally harmful subsidies according to political feasibility of reform. The greater the positive environmental effect, and the less negative impact on the fiscal budget of reform, the easier it is to politically motivate reform. These dimensions are the focal point in the developed framework.

Fourthly, we perform case studies of some of the identified elements in the Nordic fiscal budgets that can be viewed as environmentally harmful subsidies. The cases are selected using the developed methodology for defining and identifying EHS, and classified according to possibility for reform. It is out of the scope of the study to calculate other effects than fiscal and environmental, but we complement the assessment by discussing other possible barriers and drivers, such as the macroeconomic effects, or EU legislation of reforming the environmentally harmful subsidy.

In the calculations of fiscal effects of EHS reform, we do not take into consideration what the potential savings are spent on. If, for example the gains go to environmental activities, the environmental impact of EHS reform can be even larger than calculated. However, an analysis of the potential use of the savings is beyond the scope of the study.

7.2 Defining environmentally harmful subsidies

Our starting point for identifying potential EHS is a practical definition of what an environmentally harmful subsidy is.

We first undertake a review of the literature on how subsidies in general, and environmentally harmful subsidies in particular, have been defined in different contexts. We then compare the different versions and settle on a definition suitable for the Nordic perspective of the study, and the fiscal impact of reform approach.

7.2.1 *The definition of a subsidy*

There is currently no universally accepted definition of a subsidy by all who use the term – national account statisticians, trade negotiators, environmental economists and the general public. The concept of a subsidy has also evolved significantly over time and varies in scope. The narrowest and perhaps most commonly used definition of a subsidy is a direct cash payment by a government to a producer or consumer. But this is just one way in which governments can stimulate the production or use of a particular product or service. Broader definitions attempt to capture other types of government interventions that affect prices or costs, either directly or indirectly, such as tax exemptions or market price support.

OECD (2010b) describes how the notion of a subsidy spans from a direct government payment, to include various policy-related transfers, along with any foregone revenues. Figure 5 shows this span.

Figure 5 The definition of a subsidy

Source: Adapted from OECD (2010b).

Several international organisations, including the OECD, the WTO, the EU, the IEA, the World Bank, the IMF and Global Subsidy Initiative, have their own definitions of a subsidy (OECD, 2012). The definitions used by the WTO, the OECD and the EU are described below.

WTO definition of a subsidy

The definition of a subsidy from the WTO is one of the most widely used, and the only one that is legally binding for the WTO Member States. It is also the starting point for many of the sectoral definitions used in practice.

Figure 6 Simplified illustration of the definition of a subsidy in the WTO Agreement on Subsidies and Countervailing Measures

Note: “Income or price support” can for example mean schemes that cause domestic prices to be fixed above the world price level.

Source: Adapted from OECD (2005).

The WTO definition is reasonably comprehensive and includes direct transfers of funds, fiscal incentives and the provision of goods and services other than general infrastructure. However, the definition is mainly used in international trade law and, as such, may be unduly technical or administrative to serve the purpose of this study.

OECD definition of a subsidy

Many economists today agree that it would be better to speak of *support* (or *transfers*) rather than subsidies, as support also covers a wider range of transfers of public resources (including those for goods and services for which markets are missing) (OECD, 2012). The view is adapted by the OECD (2005), which defines a subsidy as the result of “a government action that confers advantage on consumers or producers, in order to supplement their income or lower their costs.” A more recent definition by the OECD (2010b, p. 7) defines a subsidy as “any unrequited financial

assistance provided by a government.” The following mechanisms for financial assistance are specified (OECD, 2012):

- Direct transfer of funds
- Tax revenue forgone (tax expenditure)
- Other government revenue forgone (provision of goods and services below market value)
- Transfer of the risk to government
- Induced transfers (income or price support)

IEEP definition of a subsidy

A recent report by Withana *et al.* (2012) for the European Commission divides subsidies into *on-budget* and *off-budget* subsidies, defined as follows:

On-budget subsidies are payments that appear on national balance sheets as government expenditure and include cash transfers paid directly to producers, consumers and other related bodies. They also include low interest or reduced-rate loans administered by governments or directly by banks with state interest rate subsidy.

Off-budget subsidies are transfers that typically do not appear on national accounts as government expenditure. Such transfers include tax exemptions, credits, deferrals, rebates and other forms of preferential tax treatment. Additionally, they may include market access consent and access to natural resources.

The division by Withana *et al.* (2012) is in line with the WTO and the OECD definitions in that it excludes non-internalised externalities.

For the purpose of the study, we use the definition of a subsidy adopted by the OECD (2010b), i.e. a subsidy as “any unrequited financial assistance provided by a government.” This since the definition is practical, widely used, and encompasses many types of financial assistance. We also use the IEEP division of on- and off-budget subsidies.

The definition of an environmentally harmful subsidy

What constitutes an environmentally harmful subsidy seems to vary, to a certain degree, depending on the role of the institution investigating the topic. Different institutions also change their definitions over time as new knowledge and new commitments to phase out environmentally harmful subsidies arise. Table 58 summarises some of the definitions used of an EHS and the development in definition over time.

Table 58 Definitions of environmentally harmful subsidies in the literature

Institution	Year	Definition
OECD	1996 (p. 12)	Economic and fiscal measures that have both clear budget impacts and negative side-effects on environmental quality.
OECD	1998 (p. 32)	A subsidy can be defined as “environmentally-harmful” if it encourages more environmental damage to take place than what would occur without the subsidy.
OECD	2005 (p. 33)	A subsidy is harmful to the environment if it leads to higher levels of waste and emissions, including those in the earlier stages of production and consumption, than what would be the case without the support measure.
Danish Environmental Assessment Institute (DØRS)	2005 (p. 4)	An environmentally harmful subsidy increases production or use of a product/substance with environmentally harmful effects.
IEEP <i>et al.</i>	2007 (p. iv)	A result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs, but in doing so, discriminates against sound environmental practices.
Valsecchi <i>et al.</i> (IEEP)	2009 (p. 16)	All other things being equal, the [environmentally harmful] subsidy increases the levels of output/use of a natural resource and therefore increases the level of waste, pollution and natural exploitation to those connected.
Nordic Council of Ministers	2011 (p. 27)	Environmentally harmful subsidies are inefficient subsidies causing (substantial) negative environmental effects. Inefficient subsidies are subsidies other than those that efficiently correct for positive externalities or efficiently correct for distributional issues. For practical purposes inefficient subsidies can be categorised in three main groups: A. Subsidies to negative environmental externalities. B. Exemptions from taxation of negative environmental externalities. C. Other inefficient subsidies.

Source: See table.

The *subsidy* element, or the support element, in some of the definitions has evolved over time. For example, the OECD did not even use the term subsidy in its definition from 1996; instead the term “economic and fiscal measures that have clear budget impacts” is used. The support element in the OECD definition of environmentally harmful subsidies has gradually changed over time, from a wide definition towards a narrower one. The recent definition of a subsidy by the OECD (2010b) as “any unrequited financial assistance provided by a government” is frequently used in defining EHS. A rather broad definition of a subsidy is used by the IEEP *et al.* (2007), where the “result of a government action” that has negative environmental effects counts as an EHS. The TemaNord report by the Nordic Council of Ministers from 2011 uses the term *inefficient subsidies*, which are defined as subsidies other than those that efficiently correct for positive externalities or efficiently correct for distributional

issues. Many studies use definitions of a subsidy from the WTO or the OECD, and focus on the environmental aspect of defining EHS.

As can be seen from Table 58, some rather broad definitions of what constitutes “environmental harm” are applied in certain EHS definitions. For example, an action that “discriminates against sound environmental practices,” as stated in the IEEP *et al.* definition from 2007, implies a wide range. The same goes for the NCM definition (2011), which concludes that subsidies causing substantial negative environmental effects should be defined as EHS. Conversely, the most current OECD definition from 2005 limits an EHS to a subsidy that “leads to higher levels of waste and emissions,” which is a fairly narrow scope. The modification in OECD definitions over time reflects a change from a wider description towards a more concrete EHS description, with a clearer and more operative purpose. This is evident from the reformulation from “if it encourages more environmental damage” (definition from 1998) to “if it leads to higher levels of waste and emissions” (definition from 2005). Furthermore, by also including production and consumption in earlier stages, the issue of how the product life-cycle impacts upon the environment is addressed, indicating that not only product end use and consumption are of relevance.

Another aspect differentiating EHS definitions is whether they contain a specification of a *counterfactual* situation or not. For example, the OECD definitions from 1998 and 2005 both contain a relevant counterfactual situation, which is the state in which the subsidy, or support measure, is not in place. “A subsidy is harmful to the environment if it leads to higher levels of waste and emissions, [...] than what would be the case without the support measure” (OECD, 2005). The presence of a counterfactual situation enables an assessment of the extent of the environmental damage caused by the EHS. This since the current situation with the EHS in place can be compared to another possible situation, without the EHS in place. The lack of this element in the definition of an EHS raises the question of what the present situation should be benchmarked against. This is the case in, for example, the definition of an EHS as a subsidy causing “negative environmental effects” (NCM, 2011), where a counterfactual situation (no negative effects, fewer negative effects etc.) would have to be assumed.

The commonly used OECD definition of an EHS from 2005 suits our purposes, as it contains a clear fiscal element, a specific environmental component and a counterfactual situation. Substituting the OECD (2010b) definition of a subsidy for the OECD (2005) definition of an EHS, a practical definition of EHS is:

“Any unrequited financial assistance provided by a government is harmful to the environment if it leads to higher levels of waste and emissions, including those in the earlier stages of production and consumption, than what would be the case without the support measure.”

7.3 Methods for identifying potential environmentally harmful budgetary elements

With a definition of an EHS in place, the next step is to investigate how EHS are generally identified, in order to build a suitable methodology for identifying environmentally harmful subsidies in the Nordic countries.

We again review the literature; this time on how environmentally harmful subsidies have previously been identified. Several institutions have developed identification and assessment tools, which serve different purposes and vary in their level of detail and depth of analysis.

Early on, the OECD (OECD, 1998) developed a rudimentary “quick scan” that would allow for selecting those subsidies that were more likely than others to have adverse environmental effects, while having little effect on their stated objectives (notably, employment and income). The OECD has since elaborated and turned its focus increasingly towards environmental effects.

The OECD Quick Scan model shows, among other things, that there is not necessarily a direct link between the volume of financial support and the nature of the subsidy and the environmental impact. This is since the environmental impact depends not just on the subsidy but also on other conditions, such as other environmental policies (in the model, these environmental policies are called “environmental filters”).

Despite its name, the Quick Scan is rather demanding in data and analytical efforts required. For simply identifying potential EHS, rather than assessing and quantifying them, other methods may be more appropriate. For example, several institutions have developed various checklists, or *decision trees*,⁶⁵ for identifying environmentally harmful subsidies. The main ones used to shape the discussion on EHS by various institutions are *the OECD Checklist*, *the World Bank Checklist*, and *the OECD*

⁶⁵ Decision trees are decision support tools that use a tree-like graph or model of decisions and their possible consequences. In a decision tree, each answer triggers a certain chain of consequences until a final decision is reached.

Integrated Assessment Model (OECD, 2012). Additionally, national checklists have been developed, e.g. by the Swedish EPA.⁶⁶

OECD Checklist

The OECD Checklist enables governments to assess whether a subsidy is harmful to the environment (OECD, 2012). It serves two main purposes:

- Specifying conditions under which subsidy removal could have significant beneficial environmental effects.
- Ranking EHS by their environmental impact in order to support governments in making the choice of EHS that need to be eliminated first (For a discussion on how to rank environmental impacts, see Pieters, 2002.).

The steps in the checklist are described in Figure 7.

⁶⁶ See Swedish Environmental Protection Agency (2013), "Kartläggning av potentiellt miljöskadliga subventioner – En handledning".

Figure 7 OECD Checklist procedure

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Source: OECD (2012).

The procedure starts with a subsidy description. Then a number of enquiries should be investigated, where each answer triggers a certain chain of consequences until a final decision is reached. For example, the second step after subsidy description is to investigate if existing policies (called policy filters in the Checklist) are effective in mitigating the environmental impact caused by the subsidy. If the answer is yes, then the subsidy is not likely to be an EHS.⁶⁷

The Checklist basically provides a qualitative analysis. It is beyond its scope to e.g. estimate the effects of EHS removal on other sectors, social

⁶⁷ Subsequent steps include investigating if more benign alternatives to subsidy exist, assessing whether the subsidy leads to higher levels of environmental damage, and assessing whether the subsidised sector is exposed to significant market power of suppliers or consumers. If suppliers or customers or both wield much market power, the outcomes of removing any type of subsidy will be hard to predict.

impacts. Rather, the framework can provide reference for a more detailed analysis. A negative aspect of the tool is that it relies on the idea that decision-makers already have access to the relevant data and information in order to assess each linkage that it contains. This is not always the case in practice.

The Checklist does not include an analysis of social impacts or the implications of subsidy removal in social terms. The model also excludes considerations of political economy of subsidies (such as lobbying of interest groups, leadership and communication). In order to address these concerns, the OECD has developed a more detailed approach, which integrates the social, economic and environmental dimensions of subsidy removal. These aspects are reflected in the *Integrated Assessment Framework*.

Integrated Assessment Framework

The Integrated Assessment Framework (OECD, 2005) is the most recent of the OECD tools (OECD, 2012). The aims of the integrated assessment are to:

- highlight the costs and benefits, winners and losers, intended and unintended effects of a subsidy in the environmental, economic and social spheres
- provide information that is understandable to the general public.

The last aim is applied since the OECD states that broader communication is considered essential for successful reform. The integrated assessment may be problematic from a methodological point of view because it involves comparing different types of effects, such as environmental impacts with social impacts.

The framework consists of four steps, of which the first, “Screening”, is needed for identification purposes (Figure 8). The subsequent steps are used to make further assessments of the environmental benefits of EHS removal, and to analyse reform options.

Figure 8 Integrated Assessment decision-tree approach

Source: OECD (2012).

The framework is intended to be broad enough to be applied to subsidies of any type (excluding uncompensated externalities), and includes a checklist of information that policy-makers need to gather in order to make an informed assessment of the impacts of EHS removal in environmental, social and economic terms. It therefore goes beyond the purpose of this chapter, which is merely to specify ways to *identify* possible EHS.

The OECD Integrated Assessment Framework is widely used and seems to be effective as an initial screening tool (OECD, 2012). Valsecchi *et al.* (2009) have employed the OECD Integrated Assessment Framework for assessing the environmental effects of the following subsidies: VAT reduction for domestic energy consumption in the UK, fuel tax exemptions for biofuels in Germany, nuclear energy decommissioning subsidies in Germany, fuel taxes for diesel relative to petrol in Austria, company car taxation in the Netherlands and irrigation water subsidies in Spain. One of the conclusions is that the OECD Integrated Assessment Framework complements the other tools developed by the OECD (such as the OECD Checklist).

World Bank Checklist

The World Bank Checklist model is specifically designed to identify and assess wasteful energy subsidies. The stepwise approach allows for a transparent assessment and decision-making process. However, like other similar models such as the OECD Quick Scan, the World Bank Checklist is very data intensive and time-consuming, and requires major analytical efforts (such as the use of cost-effectiveness and cost-benefit analyses for each individual subsidy scheme).

Figure 9 World Bank decision tree

Source: OECD (2012).

The process follows, like both previous models, a flowchart model where each answer triggers a response. For example, the first step involves a cost benefit analysis where the efficiency of energy subsidies in reaching their intended objectives is investigated. If the net benefits are positive, and impact on consumption is limited, cost effectiveness analysis of *alternative* policy tools should be investigated to see if the objectives can be fulfilled more cost efficiently. The subsidy should only be kept in its current form if the conclusion is negative. The World Bank Checklist, like the OECD Integrated Assessment Framework, goes beyond the scope of this chapter, which is to specify ways to identify possible EHS.

Finally, national checklists have been developed, e.g. as mentioned by the Swedish EPA. They follow the same structure as the international ones, with a screening/identification phase and steps for further investigation and removal of EHS.

Withana *et al.* (2012) makes an attempt to identify the key types of environmental harmful subsidies in the EU across a number of sectors and environmental issues, including subsidies from non-action. It is the most comprehensive list of environmentally harmful subsidies across EU Member States currently available. Table 59 shows some of the subsidies listed in Withana *et al.* (2012), using the division of on-budget and off-budget subsidies previously discussed. The listed subsidies are highly relevant, as they are among the types of economic instruments used in Nordic policy. However, the list is not exhaustive and the original source is not very specific on the question to what countries each subsidy applies.

Table 59 Potential environmentally harmful subsidies relevant for the Nordic countries, per sector

	On-budget subsidies	Off-budget subsidies
Energy and air pollution	Potential direct transfer of funds, covering liabilities of nuclear plants (e.g. FI)	Energy tax reductions for the manufacturing, agriculture and forestry sectors. Preferential treatment of biofuels production (almost all MS). Feed-in tariff for electricity generated by cogeneration (e.g. FI). Over allocation of free ETS allowances (EU-wide).
Water pollution		Exemption from water tax (e.g. DK)
Waste		GHG emissions from landfill and incineration not in ETS (all MS) Incomplete producer responsibility for WEEE (e.g. DK, FI). Absence of (differentiated) municipal waste collection fees (e.g. SE, DK)
Transport	Provision of free parking (e.g. DK, SE)	VAT exemption for international flights (all MS). Regulated access to the taxi market supporting private rather than public transport (e.g. DK). Absence of km based road tolling (e.g. FI)
Agriculture natural resources	Aid for competitiveness of agriculture under CAP Rural development Regulation (all MS). Provision of roads (all MS). Financial aid for firms in difficulty – “De minimis” aid (all MS). Subsidies for modernisation of the fishing fleet (e.g. DK, SE, FI). Provision of port infrastructure (most MS). Subsidies to improve forestry on peat lands (e.g. FI, SE – all reformed)	Reduced fuel excise duty for diesel used in agricultural machinery (e.g. FI and SE). Impacts of palm oil production (for food and fuel) for EU imports in third countries (all MS). Reduced excise tax on fuel for ships (most MS). Non-internalisation of externalities arising from damage to ecosystems from bottom-trawling and dredging (all MS). Reduced VAT rate for food (most MS except e.g. DK). Third country impacts from EU food imports (all MS). Cheap food in public canteens (most MS). Tax exemptions and rebates to promote silviculture investments (e.g. FI). Indirect subsidy to raw materials extraction/import (e.g. DK).

Source: Withana *et al.* (2012).

Many of the subsidies listed in Table 59 are also identified in reports that cover a single Nordic country, e.g. Hyyrynen (2013), who analyses tax exemptions within the energy, traffic, agriculture and forestry sectors of Finland. Given that extensive work has been done on identifying potential EHS, among others Withana *et al.* (2012), this report relies on the existing studies and the lists produced by them, and chooses three cases from those lists for more detailed analysis.

7.4 Classifying environmentally harmful subsidies according to facility of reform

Facility of reform of a particular environmentally harmful subsidy can be seen to a large degree as determined by the effects of the reform *on the fiscal budget* and *on the environment*. The greater the positive environmental effect of reforming an environmentally harmful subsidy, the easier it is to motivate its reformation. At the same time, the larger the fiscal gain from a reform proposal, the larger the economic incentive for going forward with a reform proposal.

In this section we create quantitative measures for both the fiscal budgetary impact, and the environmental impact of a reform. By combining the impacts it is possible to single out which environmentally harmful subsidies could be reformed to generate positive effects in both areas. Reform of environmentally harmful subsidies with significant positive effects for both the public finances and the environment can be considered “low-hanging fruits”.

However, if such environmentally harmful subsidies are identified, a follow up question is why they have not been reformed already. Here the framework will not give the whole picture since the focus is on the fiscal budget and the environment. It is out of the scope of the study to calculate other effects, but we complement the quantitative assessment in subsequent case studies with a discussion of possible other barriers and drivers such as the macroeconomic effects, distributional effects etc. of reforming the environmentally harmful subsidy.

7.4.1 *Measuring the environmental impact of reforming an environmentally harmful subsidy*

Relying on the OECD (2005) definition, the environmental impact of an environmentally harmful subsidy can be defined as the increase in environmental damage attributable to the subsidy or, put in another

the way, the decrease in environmental damage attributable to the removal of the subsidy.

As noted in OECD (2005), all economic activities have a potential impact on the environment. These impacts are either accentuated or attenuated by policies put in place by governments. Measuring the increase in environmental damage attributable to a subsidy is difficult because there is no direct link between the nature and size of the subsidy and the environmental impact.

The OECD (1998, 2005) suggests a three linkage model shown in Figure 10 for assessing the environmental impact of a support measure. The first linkage shows the extent to which the support measure increases output in the economy. The second linkage shows how the increase in output affects emissions and resource use. The increase in actual levels of emissions and resource use depends on how much of the increase is “filtered out” by environmental policies. The third linkage is a dose-response relationship that describes the assimilative capacity of the environment. It shows the extent to which the increase in emissions, or resource use, causes actual environmental damage.

Copenhagen
Economics

Figure 10 Links between a support measure and environmental damage

Source: Reproduced from OECD (2005).

Conditionality of the subsidy: What are the likely responses of the previously subsidised industries in terms of production volumes and rates of exploitation of natural resources? The answer to this question depends on the size and conditionality of the subsidy as well as the distribution of market power.

4

Relying on three linkages suggested by the OECD and shown in Figure 10, the analysis in this report relies on analysing the following three linkages:

- Effect of the identified subsidy on output, both in terms of the level and the composition, and the composition of the inputs used to produce the output.
- Effect of the change in inputs and output on emissions.
- Effect of the change in emissions on environmental damage (or environmental degradation).

To compare and evaluate the effects of a subsidy removal, monetary values are attributed to the environmental effects, as is standard in e.g. cost-benefit analyses. Due to the inherent uncertainty in putting monetary values on non-monetary effects, conservative estimates are generally used. We also go as far as possible in finding the most credible references for the values used in each case study. It is, however, important to stress that the outcomes are uncertain.

There are also large differences in the level of uncertainty between the linkages, e.g. while there may be little uncertainty attached to the effect of an output increase on emission (second linkage), there may be large uncertainties attached to the effect of the increased emissions on the environment (third linkage).

7.4.2 *Measuring the fiscal impact of reforming an environmentally harmful subsidy*

Advanced economic tools exist which help explain the effects of subsidies on the environment, economy and welfare at the global level and within groups of countries. However, as the current study is limited to the fiscal impact of reforming an environmentally harmful subsidy, measuring such effects with the use of for example computerised general equilibrium (CGE) models is outside the scope of this study. This implies that only static effects of subsidy removal will be captured and not potential dynamic effects, such as economic impacts from changes in prices and subsequent effects for production and consumption decisions.

The fiscal or budgetary impacts of subsidy removal include:

- direct budgetary impacts (e.g. discontinued transfers from state budget to producers)

- indirect budgetary impact (e.g. revenue that was previously forgone that will start being generated)
- potential budgetary impacts (e.g. when the government stops taking risks related to certain activities undertaken by individual producers).

To quantify these effects, the OECD (2005) suggests the methodologies listed in Table 60.

Table 60 Overview of quantification methodologies, suggested by OECD

Methodology and description	Strengths	Weaknesses
Programme-aggregation: Quantifies financial transfers associated with various government programmes. Aggregates programmes into overall level of support.	Captures transfers whether or not they affect end-market prices. Can capture intermediation value (which is higher than the direct cost) of government lending and insurance	Does not address questions of ultimate incidence of pricing distortions. Sensitive to decisions regarding inclusion of programmes. Requires programme-level data.
Price-gap: Evaluates positive or negative “gaps” between the domestic price and the world price. Also known as Market Price Support.	Can be estimated with relatively little data. Useful for multi-country studies. Good indicator of pricing and trade distortions.	Sensitive to assumptions regarding “free market” and transport prices. Understates full value of support by ignoring transfers that do not affect end-market prices.
Resource rent: Estimates the difference between the full economic rent and the price paid for exploiting a natural resource.	Relevant for natural resource sectors such as forest and water.	Data intensive. Sensitive to assumptions.
Marginal social cost: Estimates the difference between the marginal social cost (that internalises all externalities) and the price paid.	Most comprehensive approach. Used for transport.	Data intensive. Requires a significant amount of modelling. Sensitive to assumptions and has a wide range of uncertainty.
Producer/consumer support estimate: Systematic method to aggregate budgetary transfers and consumer transfers (through market price support calculation) to specific industries.	Integrates budgetary transfers with market price support into holistic measurement of support. Distinguishes between support to producers and consumers.	Data intensive. Currently calculated for agriculture and coal production, but not for other sectors.

Source: Reproduced from OECD (2005).

The methods are suitable for different purposes, depending on what type of subsidy is investigated. Quantification efforts have mainly focused on on-budget subsidies, as the quantification of off-budget subsidies is complex, and in some cases impossible. Given the difficulties, there are often significant variations in the estimates produced given the different methods and definitions used across sectors and countries and by different organisations and analysts.

The revenue-foregone method is the standard approach applied by most OECD countries, and thus deserves special emphasis here. It is basically builds on the programme-aggregation method as described in Table 60. Box 5 outlines the revenue-foregone method.

Box 5 The revenue-foregone method

The revenue-foregone method relies on identifying differences in tax rates, e.g. the difference between standard VAT and reduced VAT, and calculating the foregone revenues based on this difference and the total value of the subsidised activity. The following figure shows this in a simple model of demand and supply. The standard tax rate is t_1 , and the reduced tax is t_2 . Reducing the tax rate from t_1 to t_2 , increases consumption from q_1 to q_2 , reduces the price faced by consumers from p_{s1} to p_{s2} , and increases the price faced by producers from p_{1s} to p_{2s} . The revenue-foregone method shows that the subsidy is equal to $A+B+C+D$.

A weakness of the revenue-foregone method is that it assumes that consumers and producers do not change their behaviour in response to tax changes, i.e. that q is unchanged. In the simple framework here, this assumption does not hold. The true subsidy is $A+C-E$, as a result of the increase in consumption from q_1 to q_2 .

Source: Valsecchi *et al.* (2009).

When calculating the fiscal effect in the case studies we generally use the revenue-foregone method, with some alterations where suitable. What alterations are needed depend on the circumstances of the case. A guiding principle is that the calculations should be relatively simple, for them to be reproducible in other cases. As previously mentioned, we do not

take into account the use of potential savings, as such an analysis is beyond the scope of the report.

It should also be noted that we do not assess whether the current taxes, subsidies or exemptions are socially optimal. I.e., the level from which the effect of a subsidy removal is calculated is not evaluated.

8. Case studies of environmentally harmful subsidies in the Nordic countries

Three cases of environmentally harmful subsidies were chosen for a more detailed analysis. Three criteria were employed in the choice of cases. First, each case should be relevant to more than one Nordic country. Second, the cases should include both on-budget and off-budget subsidies. Third, the cases should cover more than one sector. The selected cases are:

- Lower energy tax on diesel used in transport compared to petrol.
- EU direct payments to farmers.
- Overallocation of allowances in the EU Emissions Trading Scheme.

Together these cases cover the above mentioned aspects: 1 and 3 are off-budget subsidies while the EU direct payments subsidy constitutes an on-budget subsidy (at EU level). 1 is prevalent in all countries but Iceland, 2 in all Nordic countries but Iceland and Norway, and 3 in all Nordic countries. Sectors covered are transport and agriculture.

8.1 Case 1: Lower energy tax on diesel used in transport compared to petrol as an environmentally harmful subsidy

8.1.1 General description

Many EU Member States tax diesel fuel⁶⁸ at lower rates than petrol. Figure 11 shows the difference between excise duty on petrol and diesel in the EU, Iceland and Norway. The only country with equalised excise duty rates of fuels is the United Kingdom.

Figure 11 Difference between excise duty on unleaded petrol and diesel per litre in the EU, Norway and Iceland, 2013

Source: Europe's Energy Portal and respective country chapters for the Nordic countries.

Diesel has traditionally been subsidised for its use in industry and for commercial and public transport. The lower tax on diesel fuel is thus an instrument intended to favour commercial and public road transport (Valsecchi *et al.*, 2009). With the commitment in the OECD as well as in the Nordic countries to phase out subsidies to fossil fuels, the lower tax on diesel is not motivated for environmental reasons.⁶⁹

In order to offset the lower costs of diesel relative to petrol, diesel-powered cars are generally subject to a higher vehicle road tax. Cars

⁶⁸ Refers to petroleum diesel throughout this section, as opposed to biodiesel.

⁶⁹ See e.g. OECD on the phase-out of fossil fuel subsidies at <http://www.oecd.org/ctp/fossilfuelsubsidies.htm>

with diesel engines are nevertheless becoming increasingly attractive in the Nordic countries.

Figure 12 Road sector diesel fuel consumption in the Nordic countries (% of total road sector energy consumption)

Source: World Bank, World Development Indicators.

Though the increase in diesel car popularity in the Nordic countries is likely due to other factors than diesel tax rates – like the efficiency of diesel engines – the sharp increase indicates that the higher vehicle road tax does not adequately offset the lower energy tax on diesel fuel. The system also encourages those who drive *further per year* to get a diesel car, as fixed costs are higher and variable costs lower, compared to driving an equally energy-saving petrol car. Likewise, it encourages car owners who drive *little per year* to buy a petrol car.

Why is this a possible EHS?

Coming back to the definition of an EHS as specified in section 0, the subsidy element, or the “unrequited financial assistance” is to be seen as an off-budget subsidy. This is confirmed by the fact that the lower tax on diesel is reported as tax expenditure in the Nordic national budgets (see the fiscal impact section for more information).

Whether a subsidy is environmentally harmful according to the EHS definition is based on “if it leads to higher levels of waste and emissions, including those in the earlier stages of production and consumption, than what would be the case without the support measure.” This deserves some qualification, as the link to increased levels of waste and emissions is perhaps not obvious at first sight.

Firstly, removing the subsidy would likely reduce diesel fuel demand to some extent, as a higher tax would increase the price of diesel. An increased price will also mean that consumers might switch to using other types of transportation. If diesel is less harmful to the environment than petrol, it may be motivated to stop consumers from switching from diesel to petrol, and the different tax rates could be motivated. But as diesel is not an environmentally preferable fuel to petrol from a life-cycle perspective (Valsecchi *et al.*, 2009), this is not a valid environmental reason.

Secondly, if the tax rate for diesel were to increase, passengers would likely also switch to other transport modes than petrol cars, such as petrol, biofuels, public transport etc., especially in the long run. If the rate on diesel and petrol are the same per energy *content*, passengers are no more likely to switch to petrol cars than they are to stay with their diesel car.⁷⁰ A subsidy removal will therefore at least serve to create a more level competitive playing field between the two fuels. This could help increase the market opportunities for other types of fuels and other types of transportation (e.g. plug-in vehicles, public transport) (Valsecchi *et al.*, 2009).

What is the counterfactual scenario?

The counterfactual situation in the diesel case, i.e. the state in which the subsidy is not in place, is the case of an equalised tax rate between petrol and diesel. This is the case against which the assessment of the environmental damage and fiscal impact is benchmarked.

As mentioned above, in order to offset the lower costs of diesel relative to petrol, diesel-powered cars are generally subject to a higher vehicle road tax. This shows how complicated EHS removal in the Nordic countries can be, as there are effects from different policy measures enhancing or counteracting each other. Harmonising diesel and petrol tax rates per litre would imply an abolishment of the yearly paid tax, which could affect driving habits and thereby the effect of subsidy removal. However, commercial transport may deduct the yearly paid tax from pre-tax income, which means that they would be more affected by a subsidy removal than non-commercial transport (for Finland, see Government of Finland, 2007). The final effect depends on many factors, such as the share of diesel used by commercial and non-commercial

⁷⁰ Whether they will switch to a more environmentally friendly option depends on the *level* of tax on the two fossil fuels, compared to the price of choosing a more environmentally friendly mode of transportation.

transport in the Nordic countries. We do not account for all such effects in this case study as we mainly want to exemplify how the effect of an EHS removal could be calculated.

Why is the subsidy investigated?

There have been a number of studies on this topic, and attempts to amend the policy have been made by the European Commission. Diesel tax subsidies are also frequently mentioned as environmentally harmful subsidies by environmental groups (Valsecchi *et al.*, 2009). The subsidy exists in all the Nordic countries except Iceland,⁷¹ and data availability is also good compared with other subsidies.

Tax rates: Taxes on diesel and petrol in the Nordic countries generally consist of a CO₂ charge and an energy charge. As evident from Table 61, significant variation can be found in the excise rate between petrol and diesel in the Nordic countries, particularly in Denmark, Finland and Norway.

Table 61 Excise duties per litre of unleaded petrol and diesel in the Nordic countries 2012, eurocent

	Unleaded petrol			Diesel			Difference
	CO ₂	Energy	Total	CO ₂	Energy	Total	
Denmark	5	54	59	6	38	44	15 (34%)
Finland	12	50	63	13	31	44	18 (42%)
Iceland	2	39*	41	3	49*	51	-10 (-20%)
Norway	12	63	75	8	49	58	18 (32%)
Sweden	29	36	65	36	18	54	11 (20%)

Note: *) Consists of general tax and road tax. Due to rounding, total figures may not add up.

Source: Respective country chapters.

Finland, Denmark, Norway and Sweden apply approximately equivalent tax rates on petrol. Norway charges the highest taxes, both for diesel and for petrol. The recent tax reform in Sweden, intending to equalise fuel taxes per energy content, brought diesel and petrol rates closer.

⁷¹ The analysis is not relevant for Iceland, since the tax on petrol is lower than for diesel. Whether this implies subsidy for petrol relative to diesel can be debated. If the goal is to equalise tax rates over energy content in fuels – which is an expressed strategy at EU and national levels – diesel *should* be taxed slightly higher than petrol per litre, as the per-litre energy content in diesel is higher than in petrol (IEEP, 2009). The question then becomes at which rate the tax is equal between energy content in fuels. As diesel has around 10% more energy content per litre than petrol (petrol: 34.7 MJ per litre, diesel: 37.9 MJ per litre, see <http://withouthotair.blogspot.dk/2008/11/petrol-diesel-miles-per-gallon-litres.html>), the 10% difference in excise duties in Iceland (see Table 61) seems reasonable. Iceland is thus not further included in the analysis.

Finland and Norway have the largest difference between the tax rate for petrol and diesel. The gap in Finland remains even with a recent increase in diesel tax of three eurocent, as the petrol tax was increased by almost the same amount.

8.1.2 *Environmental impacts*

Transport causes negative environmental impacts and the costs associated with these impacts are called the external costs or environmental costs. Without policy intervention, these external costs are not taken into account when for example motorists make a decision on the vehicle types they prefer to use. Air pollution, noise and impacts on climate change are typical external effects of motoring on the environment. The costs caused by air pollutants consist of health costs, building/material damages, crop losses and costs of further damage to the ecosystem. For example, the Finnish Transport Agency (2012) has calculated that the environmental costs of airborne pollutants from road transport were EUR 695 million in 2007. The environmental costs vary according to different factors like where the vehicle is used (e.g. in urban or inter-urban areas), how old the used vehicle is (technology improvements) and which type of fuel it uses (CE Delft, 2008).

The Finnish Transport Agency (2012) has also evaluated the environmental costs caused by diesel-powered vehicles and petrol cars with and without catalytic converters in 2007 in Finland. In the evaluation, the environmental costs consist of the health costs of the fine particulates, impacts on climate change and the impact of air pollutants on the ozone layer, which have negative effects on human health, crops and forests.

Table 62 Environmental cost (eurocent/vkm) of road transport in 2007 in Finland

Vehicle	Costs eurocent/vkm
Petrol passenger car, without catalytic converter	0.77
Petrol passenger car with catalytic converter	0.58
Diesel passenger car	1.38
Petrol van, without catalytic converter	1.03
Petrol van, with catalytic converter	0.85
Diesel van	1.98

Note: Vkm stands for vehicle kilometres. The costs are based on the average emissions of the Finnish vehicle fleet in 2007.

Source: Finnish Transport Agency (2012).

Similar results are provided by CE Delft (2008), in the Handbook on estimation of external costs in the transport sector, commissioned by European Commission DG TREN. The handbook divides environmental

costs of diesel-powered vehicles and petrol cars into two different categories: urban and interurban. The environmental costs per vehicle kilometre in Table 62 and Table 63 consist of costs of the air pollutants, impacts on climate change and upstream and downstream processes.⁷²

Table 63 Environmental cost of the different passenger cars

Vehicle	Costs eurocent/vkm
Petrol passenger car, urban	1.81
Diesel passenger car, urban	2.66
Petrol passenger car, interurban	1.18
Diesel passenger car, interurban	1.72

Source: CE Delft (2008).

In both evaluations, the environmental cost per kilometre is higher for diesel-powered cars than petrol cars. The costs from the air pollution of the diesel-powered vehicles in particular are clearly higher than for petrol cars. The greatest costs of air pollutants are caused by fine particulates and nitrogen oxides. Also, the costs of the upstream and downstream processes seem to be higher in the case of diesel-powered vehicles. Whereas the cost caused by the impacts on climate change are higher in the case of petrol cars. The difference in the costs per vehicle kilometre of these two estimates can be partly explained by the inclusion of the upstream and downstream processes in the CE Delft evaluation.

Based on these two estimates, it is clear that diesel-powered vehicles have a greater environmental cost per vehicle kilometre than petrol cars (More recent data, once it becomes available, may show a different gap.). So it can be deduced that the lower taxes on diesel fuels have harmful effects on the environment. As mentioned above, the sharp increase in the popularity of diesel cars indicates that the higher vehicle road tax does not adequately offset the lower energy tax on diesel fuel.

Assessing the environmental impact of the lower tax rate on diesel is difficult because it requires establishing the counterfactual, which is the number of diesel-powered vehicles and the number of kilometres driven per year using diesel-powered vehicles with equal tax treatment for petrol and diesel. If the tax rate on diesel were brought up to the same level as that of petrol, based on energy and CO₂ content, the price of diesel would increase by between 8 and 16% in the Nordic countries (see Table 64).

⁷² Upstream and downstream processes means indirect effects due to the production of energy, vehicles and transport infrastructure, which cause additional external costs.

Estimates of long-run price elasticity of demand for diesel fuel vary between sources. Dargay (2008) as described in Konjunkturinstitutet (2012) finds long-run price elasticity for diesel to be -0.32, based on data from 1972–2006 in Sweden, while Sterner (2006) finds it to be -0.8.⁷³ Using these values as a lower and upper bound, an increase in the tax rate on diesel would lower long-term demand by between 2.6% (Sweden) and 5% (Finland) with low estimates, and by between 2.5% (Sweden) and 12.6% (Finland) with high estimates.

We assume that the economic value of the environmental impact can be calculated using the environmental costs given in Table 63. In the table, the cost of 2.66 eurocent per driven kilometre is the upper bound for the environmental cost. Using this value, reducing the number of kilometres driven by diesel cars by harmonising the tax rates gives the environmental impact seen in Table 64.

Table 64 Environmental impact of a tax harmonisation between diesel and petrol

	Change in diesel price	Change in driven distance per year (bn km)	Yearly environmental impact (EUR million)
Denmark	11%	-0.9 to 2.3	24.7 to 61.8
Finland	16%	-1.2 to -2.9	31.2 to 77.9
Norway	11%	-0.8 to -2.0	21.2 to 53.1
Sweden	8%	-0.5 to -1.1	12.0 to 29.9
<i>Total</i>	-	-3.3 to -8.4	89.1 to 222.7

Note: Lower bound is calculated based on estimated long-run price elasticity for diesel of -0.32, and upper bound on -0.8.

Source: Copenhagen Economics based on data from the World Bank, national statistics agencies, Sterner (2006), CE Delft (2008), Konjunkturinstitutet (2012).

8.1.3 Fiscal impacts

A lower tax rate on diesel fuel is an off-budget subsidy, and can be seen as foregone tax revenue. There are several different ways of calculating the foregone tax revenue due to EHS, as outlined in Section 7.4.1.

The OECD calculates the fiscal impact of the EHS by referencing to a benchmark tax treatment in each country. Some countries, like Sweden and Finland, use the energy rate tax for unleaded petrol as a standard benchmark when calculating tax expenditure in e.g. budget proposals. This is also the benchmark used by the OECD when calculating tax ex-

⁷³ While some of this is transferred to using petrol vehicles instead of diesel vehicles, Eltony (1993, cited in Sterner, 2006) has found that 75% of the price elasticity of demand for fuel can be attributed to less driving.

penditure for lower tax on diesel (OECD, 2012). Norway, however, uses a slightly different method where the basis for calculating foregone revenue is the difference between taxes on petrol and diesel measured per MJ of theoretical energy content.⁷⁴ Consequently, the estimates below may not be completely comparable.

Nevertheless, annual subsidies to diesel vehicles amount to a total EUR 3 billion in foregone tax revenue in the Nordic countries except Iceland. The largest share accrues to Sweden, where foregone revenues due to reduced energy-tax rate on diesel used in transport amounts to EUR 980 million.

Table 65 Foregone revenue in the Nordic countries except Iceland due to lower tax rate on diesel compared to petrol, 2012

	Yearly foregone revenue (EUR million)	Share of total tax expenditure
Denmark	720	14%
Finland	970	7%
Norway	370	2%
Sweden	980	4%
Total	3,040	5%

Note: Finnish values from 2011, and Danish from 2010. The term *tax expenditure* refers to provisions in the tax code that give favourable tax treatment for an activity or a group of taxpayers. Tax expenditures may take a number of forms like exemptions, allowances, credits, preferential rates, deferral rules etc. They are, in effect, policy instruments of government to promote specific social or economic policies and thus are closely related to direct spending programmes. Figures for tax expenditure from 2009.

Source: Calculations based on OECD (2012), national budgets and Jacobsen *et al.* (2010).

Altogether, foregone revenue from lower tax on diesel represents five% of total tax expenditure in the Nordic countries, i.e., tax deductions, exclusions, exemptions etc. The share is largest for Denmark, due to the fact that total tax expenditure in the country is much lower than in the other Nordic countries (EUR 5 billion vs. EUR 13 billion in Finland with the second lowest expenditure).

The revenue-foregone method used by the OECD does not take into account that consumers and producers change their behaviour in response to tax changes. As diesel is subsidised relative to the benchmark

⁷⁴ Which relative tax rates are preferable in the diesel case can be debated. As previously mentioned, given the different energy content in the two types of energy, equalised tax levels between petrol and diesel per litre may not necessarily be optimal. Rather, the tax should be higher for diesel. The reason for equalising tax rates between diesel and petrol may be political. Diesel car owners bought their vehicles with the expectation of benefiting from lower fuel taxes. Industry will demand time to adjust production to new input prices. Hence, a gradual increase in diesel tax may be an option for those calling for removing the diesel subsidy.

level, demand is higher than it would be in the absence of the subsidy. An increase in tax rates for diesel would lower this demand, thereby reducing tax revenue. At the same time, the higher tax rate will increase revenue, as more tax is collected per litre.

We have calculated the net effect of these counteracting factors, and the results are shown in Table 66. Using a lower bound elasticity of -0.32 and an upper bound of -0.8 as described in section 8.1.2, the fiscal impact of removing the diesel subsidy could be between EUR 1.1 billion and EUR 1.5 billion, taking into account changed behaviour in response to the tax increase.

Table 66 Fiscal impact due to tax harmonisation

	Change in diesel consumption	Yearly fiscal impact, EUR million
Denmark	-4 to -9%	342 to 451
Finland	-5 to -13%	257 to 368
Norway	-4 to -9%	294 to 411
Sweden	-3 to -6%	173 to 238
<i>Total</i>		<i>1,067 to 1,468</i>

Source: Copenhagen Economics based on data from the World Bank, national statistics agencies, Sterner (2006), CE Delft (2008).

8.1.4 Political feasibility of EHS reform

The maximum fiscal potential of reforming the diesel EHS in the Nordic countries is EUR 3 billion, calculated solely on current tax expenditure and no dynamic effects. Calculated based on behavioural changes, the fiscal impact is at the most half of that, see Table 67.

Table 67 Summary of fiscal and environmental impact due to tax harmonisation

	Yearly environmental impact (EUR million)	Yearly fiscal impact (EUR million), calculated without behavioural changes	Yearly fiscal impact (EUR million), calculated with behavioural changes
Denmark	24.7 to 61.8	720	342 to 451
Finland	31.2 to 77.9	970	257 to 368
Norway	21.2 to 53.1	370	294 to 411
Sweden	12.0 to 29.9	980	173 to 238
<i>Total</i>	<i>89.1 to 222.7</i>	<i>3,040</i>	<i>1,067 to 1,468</i>

Source: Previous sections.

The environmental impact of a subsidy removal is small relative to the fiscal impact; only between EUR 89 and 222 million in monetary terms. The fiscal impact is at least five times larger than the environmental impact. This means that the gains of a tax harmonisation to a larger degree are on the fiscal side compared to the environmental side. A proposed

reform of the subsidy cast in the terms of protecting the environment may be criticised as a reform intended only to improve the fiscal balances.

Other impacts

A subsidy removal is also expected to have effects in other areas, in addition to fiscal and environmental impacts. An affected area is the competitiveness of the transport sector, which is reduced relative to countries still subsidising diesel. Prices of goods that are transported by diesel-fuelled vehicles may then increase, given that the higher cost of fuel is passed on to the customer. If this is the case it has a negative effect on consumers' welfare. There would also be a general effect of the increased taxation on the economy. The extent of the effect depends on what the proceeds are used for. Another area which could be affected is public transport, which is largely based on diesel fuel. A subsidy removal could lead to the introduction of other forms of subsidies in this sector.

The elimination of the subsidy may reduce diesel imports, but could increase "fuel tourism" where drivers in high-tax countries cross the border to lower-tax countries to fuel their vehicles. This issue applies especially to pan-European transport by trucks.⁷⁵ This issue should be seen in the wider EU context of an effort to gradually phase out the petrol/diesel differentiation

The diesel subsidy benefits producers of the fuel, owners of private diesel-fuelled vehicles, and firms producing diesel technology.

Example of subsidy reform

Reform of the diesel subsidy has been carried out in the UK and in the Netherlands. In the UK, the Government has equalised taxes on non-commercial petrol and diesel, thus eliminating the subsidy for diesel for non-commercial purposes.⁷⁶ In the Netherlands, the Government slowly increased the excise duty on diesel while keeping petrol rates unchanged, thus lessening the size of the subsidy. This was in order to signal future diesel fuel cost increases to consumers. To the authors' knowledge, there have not yet been any studies assessing the reforms.

⁷⁵ Truck drivers who seek out Europe's cheapest diesel are known as "fuel tourists". A study by the European Commission found that fuel tourism costs Germany an estimated EUR 1.9 billion in lost tax on diesel. See <http://www.ft.com/cms/s/0/d9f81c82-bddf-11db-bd86-0000779e2340.html#axzz2sM02hSla>

⁷⁶ Note again that due to the differing energy content of the fuels, a case could be made that per-litre equality actually still favours diesel fuel relative to petrol.

Reform process

The European Commission intends to gradually phase out diesel subsidies to non-commercial vehicles in order to remove the bias against petrol (IEEP, 2009). A stepwise harmonisation of diesel and petrol excises may therefore also be advisable in the Nordic countries. If the subsidy were to be phased out, the price of diesel would increase slowly and make it possible to achieve a more gradual transition to greater fuel efficiencies, other types of fuels (i.e. electric vehicles), and other modes of transport.

As mentioned at the beginning of the case study, the annual tax on diesel cars, which is currently higher than for petrol to compensate for the lower per litre tax, would also have to be phased out in order to completely equalise tax rates on diesel and petrol cars.

8.2 Case 2: EU direct payments to farmers as an environmentally harmful subsidy

8.2.1 General description

The direct payments are the backbone of the EU Common Agricultural Policy (CAP), with a yearly budget of EUR 40.5 billion in 2012 (European Commission, 2011b). Direct payments are granted directly to farmers under a number of support schemes. The direct payments are only relevant for the Member States Sweden, Finland and Denmark. Studying the direct payments is of special interest in the Nordic context because Sweden and Finland have comparably unfavourable natural conditions for agricultural production.

There are two schools of thought as to what the function of the direct payments is (European Commission, 2011a). One says that the direct payments are income support. The other says that the direct payments are the compensation for the public goods provided by the farmers. The public goods include, among others, food security. The arguments for the subsidies are usually equity concerns, self-support and rural development (NCM, 2011).

As it is a direct transfer of funds, direct payments to farmers fall into the category of on-budget subsidies in the classification of on-budget vs. off-budget subsidies.

The direct payments have seen many changes over the years. They were introduced in 1992 as coupled payments that were linked either to area or to the number of animals. The objective of the direct payments at

the time of introduction was to compensate farmers for cuts in price support (European Commission, 2011a).

In 2003, direct payments were decoupled from production decisions. Currently, the direct payments are based on past production decisions and past support receipts (European Commission, 2011a). To be eligible for direct payments, land must be kept in good agricultural condition. In the absence of the payments, some of the land will be converted to other use. The analysis here relies on Balkhausen *et al.* (2006), who find that if (decoupled) direct payments are abolished, 8 to 11% of the agricultural area falls idle.

Why are direct payments a possible EHS?

Studying the EU direct payments is interesting because they make up a large share of the EU budget and because in the absence of them some farms (especially small ones) would be driven out of business. The direct payments constitute an EHS if the reduction in agricultural activity from fewer farms leads to reduced environmental impact. Because part of the direct payments is linked to environmental protection plans, here only a 10% reduction of the direct payments is considered. The assessment of environmental impact from reduced support to agriculture in the Nordic countries is complicated. There are many ways in which income support may affect production decisions, and many links through which production decisions can affect the environment. Hence, the purpose of this exercise is not to give an exact estimate of environmental impacts from removing agricultural support, but rather to display the use of the framework and the reasoning in prioritising reform of EHS.

What is the counterfactual scenario?

The counterfactual situation for the EHS case is assumed to be a 10% reduction of the direct payments. 10% is chosen to illustrate the effects of a small reduction of the direct payments. We only take into account the EU subsidy in this example and do not consider any other national support schemes. Furthermore, as some of the subsidies are earmarked for other purposes such as environmental protection, we assume that such subsidies will still be in place even after the reduction.

Whether this is the correct counterfactual can be debated. The Danish Environmental Assessment Institute, DØRS, (2005) finds that about two-thirds of direct farm subsidies are estimated to be perverse, meaning that they are harmful to the environment as well as to economic development in society. This finding implies that two-thirds of direct support should actually be removed. However, any changes to the agricultural

direct support scheme will be politically sensitive. Thus, a conservative – more realistic – approach seems reasonable when estimating the potential of reforming agricultural support.

8.2.2 *Environmental impacts*

The analysis of the environmental impacts relies on the assumption that lowering the direct payments will reduce agricultural activity. With less activity, the environmental harm will also be smaller. Thus, in the current situation, the direct payments leads to a higher activity in the agricultural sector, and more environmental damage, as illustrated in Figure 13. The figure shows the three linkages that the assessment of the environmental impact relies on.

Figure 13 *Environmental impact of direct payments to farmers*

8.2.3 *Linkage 1: Effect of the subsidy on the level and the composition of output and the use of inputs*

Assessing the first linkage is difficult, because the level of production in the agricultural sector is dependent on several factors, of which the level and distribution of EU direct payments are two. Given that the direct payments make up a very large share of the agricultural income in the EU, removing them completely would most likely drive many small and mid-size farmers out of business, due to the strong international competition.

Between 2007 and 2009, the direct payments constituted 29% of agricultural factor income for the average EU farmer (31% in EU-15 and 19% in EU-12) (European Commission, 2011a). Agricultural factor income is defined as the income generated by farming activities which is used to remunerate production factors that are rented and production factors owned by farms (European Commission, 2011a). The shares vary significantly between Sweden (50%), Finland (30%) and Denmark (70%).

The estimation of the reduction of agriculture production as a result of the reduction of the direct payments relies on the estimate by

Balkhausen *et al.* (2006). Balkhausen *et al.* analyse the effect of the reduction of direct payments on land use and production in Germany, France, the Netherlands and Poland. That the estimate is based on these countries and not on Sweden, Finland and Norway adds uncertainty to the results.

The finding by Balkhausen *et al.* is that as a result of a total abolishment of direct payments, 8 to 11% of the agricultural area falls idle. Balkhausen *et al.* take into consideration that the payments are decoupled.

Here, it is assumed that the effect is linear with respect to the reduction in the payments. Thus, a 10% reduction leads to a 1% reduction in production. Further, it is assumed that there is a one to one correspondence between output and emissions, i.e. a 1% reduction in output is matched by a 1% reduction in emissions. This is a simplification.

8.2.4 Linkage 2: Effect of the change in inputs and outputs on emissions or resource use

The main environmental impacts from agriculture in the Nordic context are eutrophication and global warming. Eutrophication is caused by the leaching of phosphorous and nitrogen from arable land to rivers, lakes and the sea, while global warming is caused by greenhouse gases that originate from the decomposition of organic matter in the soil, the digestion of bovines and the decomposition of manure (Walls, 2006). Nitrous oxide from fertiliser use also causes global warming.

In addition to eutrophication and global warming, agriculture has other environmental impacts. These include, among others, the use of water for irrigation and soil degradation (Walls, 2006). The other environmental impacts also include changes in biodiversity. Here, only eutrophication and global warming are considered.

The share of the phosphorous and nitrogen load attributable to agriculture and the share of the greenhouse gas emissions attributable to agriculture are known relatively well in Sweden, Finland and Denmark.

Sweden

In 2009, the total human caused phosphorus load from non-point and point sources to waterways was 4,580 tonnes, of which 21% was attributable to agriculture. In the same year, the total human caused nitrogen load to waterways was 118,500 tonnes, of which 29% was attributable to agriculture (SMED, 2011).

In 2010, the total greenhouse gas emissions from Sweden were 66.2 million tCO₂e (Statistics Sweden, 2012). Of this, approximately 10 million tCO₂e was attributable to agriculture. The share of CO₂ emissions attribut-

able to agriculture is in the range of 2%, whereas the share of methane attributable to agriculture is 60% and the share of N₂O emissions is 70%. Approximately 10% originated from consumption of fossil fuels.

Finland

Agriculture is the main cause of eutrophication in Finland. In 2008, the total human caused phosphorus load to waterways was 4,105 tonnes, of which 55% was attributable to agriculture. In the same year, the total human caused nitrogen load to waterways was 73,917 tonnes, of which 65% was attributable to agriculture (Hyytiäinen & Ollikainen, 2012).

Of the total greenhouse gas emissions that originated from Finland in 2010, 14.5 million tCO₂e (7%) was attributable to agriculture. Of this, 7.1 million tCO₂e originated from land use changes, 5.9 million tCO₂e was direct emissions and 1.5 million tCO₂e was caused by the use of fossil fuels (Hyyrynen, 2012).

Denmark

In connection with evaluations of the water environment plans (*vandmiljøplan*) adopted in Denmark, evaluations of load factors for nitrogen are made at regular intervals. At the time of the last evaluation, in 2007, the load factor was 160,800 tonnes of nitrogen. The target for 2015 is 141,000 tonnes (De Økonomiske Råd, 2010). The gross nutrient balance of phosphorus in agriculture was 6,650 tonnes in 2009 (Eurostat).

Total greenhouse gas emissions from agriculture amounted to 9.6 million tonnes of CO₂ equivalents in 2009, or 16% of total emissions. Of these emissions, 4.1 million tonnes are from methane emissions associated with the raising of cattle and pigs and 5.6 million tonnes from nitrous oxide emission from agricultural fields, mainly due to the use of livestock manure and synthetic fertilisers (Danish National Environmental Research Institute, 2011).

8.2.5 Linkage 3: Effect of increase in emissions or resource use on environmental degradation

Many models exist for assessing the biological impact of an additional tonne of phosphorous or nitrogen on the Baltic Sea. However, assessing the economic value of the reduced biological impact is hard.

In 2007 prices, Gren (2008) puts the value at EUR 12–24 per kilogram of avoided nitrogen and EUR 265–500 per kilogram of avoided phosphorous for the Baltic Sea.

For comparison, Table 67 shows the results of a study of the willingness-to-pay for a Baltic Sea undisturbed by excessive inputs of nutrients

during a period of 20 years. It shows an annual total of willingness to pay of EUR 5,000 million per year. As noted by Söderqvist & Hasselström (2008), the willingness-to-pay may be interpreted as the cost of taking no action. Similar results are provided by Agrifood Research Finland MTT (2012) in a study which estimates total benefits of reducing the eutrophication. The study shows that the annual willingness to pay lies between EUR 3,000–4,000 million per year (Ahtiainen *et al.*, 2012).

Table 68 Annual total willingness-to-pay for a Baltic Sea undisturbed by excessive inputs of nutrients during a period of 20 years

Country	EUR million in 2005 prices
Denmark	920
Estonia	60
Finland	610
Germany	530
Latvia	60
Lithuania	80
Poland	930
Russia	180
Sweden	1,460
Total	4,830

Source: Söderqvist & Hasselström (2008).

Analogously, there are many models for assessing the impacts of greenhouse gas emissions. Early models, e.g. Fankhauser (1994) put the damage cost of emitting a tonne of CO₂ equivalent at USD 20 (in 1995 terms). A study published by European Commission (1998) estimates that the marginal damage of CO₂ emission lies between USD 16–46 (in 1990 terms) per tonne. A more recent estimate by Hope (2013) puts the damage cost at USD 106.

Tables 68 and 69 show the value of the environmental effects of reducing the direct payments by 10%. This relies on the assumption stated above; that a 10% reduction in direct payments reduces production and emissions by 1%.

Table 69 Lower estimate of environmental impact on subsidy reform, EUR million

Country	Phosphorus	Nitrogen	CO ₂	Total
Sweden	2.5	4.1	1.5	8.2
Finland	6.0	5.8	2.2	13.9
Denmark	17.6	19.3	1.4	38.4
Total	26.2	29.2	5.1	60.5

Source: Own calculations based on emissions statistics per country (presented above), estimates of environmental damages per effluent (presented above), and estimate of agricultural production decrease by Balkhausen *et al.* (2006).

Table 70 Upper estimate of environmental impact on subsidy reform, EUR million

Country	Phosphorus	Nitrogen	CO ₂	Total
Sweden	4.8	8.2	8.0	21.1
Finland	11.3	11.5	11.6	34.4
Denmark	33.3	38.6	7.7	79.5
Total	49.3	58.4	27.3	135.0

Source: Own calculations based on emissions statistics per country (presented above), estimates of environmental damages per effluent (presented above), and estimate of agricultural production decrease by Balkhausen *et al.* (2006).

The tables show that total environmental impacts for Sweden, Finland and Denmark would be between EUR 61 and 135 million per year. The difference between the lower and upper estimates stems from the uncertainty of the per unit damages of phosphorous, nitrogen and CO₂.

8.2.6 Fiscal impact

The agricultural support is an on-budget subsidy. Direct payments to agriculture in the EU amounted to EUR 40.5 billion in 2012, of which 5.4% was paid out in the Nordic countries. The majority was paid out to Denmark.

A reduction of the direct support by 10% would imply a decrease of between EUR 54 and 94 million for the different countries.

Table 71 Fiscal impact due to reduced agricultural support, EUR million

	Fiscal impact, EUR million
Denmark	94
Finland	54
Sweden	70
Total	218

Note: Based on 2011 year figures.

Source: European Commission (2011a).

Thus, the fiscal potential of removing ten per cent of agricultural income support in the Nordic countries is roughly EUR 218 million. A removal would bring budgetary benefits, but not directly to the Nordic countries as the support is paid out from the EU budget. It would indirectly benefit the countries, lower fees, redirected to better use etc.

8.2.7 Political feasibility of EHS reform

The maximum fiscal potential of reforming the EHS in the Nordic countries is approximately EUR 220 million. The environmental potential is between EUR 61 and 135 million per year. However, it may take a long time for environmental outcomes to manifest themselves. In the short term the reduction of agricultural support may also lead some producers to exploit environmentally sensitive land to recuperate income loss, which would offset the positive environmental effect. Nor is reforming the EU direct payment scheme necessarily something that individual Member States can decide. Rather, action has to be taken at EU level, and apply to all countries part of CAP.

It is important to remember that the assessment of environmental impact from reduced support to agriculture in the Nordic countries is complicated. The framework can at best give a rough estimate, on which further work can build. Nor is the purpose of this exercise to give an exact estimate of environmental impacts from removing agricultural support, but to display the use of the framework and assess relative impacts of EHS removal.

Other impacts

While a complete or partial removal of the agricultural subsidy would bring substantial environmental and fiscal gains, other factors may counteract the reform.

Lack of political will to undertake reform of environmentally harmful subsidies is linked to the strength of special interests and the role of rent-seeking in gaining and retaining subsidies. For a politically sensitive area such as agricultural support, this is likely the main obstacle to reform. Distribution issues will also most likely arise between the current land owners (who have paid a high price) and future owners (who will pay a lower price for the land).

A subsidy reduction in the expenditure for direct agriculture support could also potentially benefit developing countries. This since subsidising primary industries is generally considered to impose costs to developing countries by distorting trade (NCM, 2011). A removal of agriculture support can reduce such a distortion, if the relative prices rise in the EU, as this would mean increased exports to the EU from developing countries.

Farmers in the Nordic countries depend heavily on the direct support measures. Denmark and Sweden were among the countries with the most direct support to agriculture as a share of income: far above the EU average of 33% for EU farmers in 2009 (see Figure 14). Finland received less direct income, but receives in *total* the most support to agriculture

in the EU (European Commission 2011a). This is a clear barrier to reform, as farmers and associated organisations generally can be expected to protest a subsidy removal.

Figure 14 Share of direct payments in agricultural factor income (avg. 2007–2009)

Source: Adapted from European Commission (2011a).

Example of subsidy reform

An often-cited example of a subsidy reform is the case of New Zealand phasing out of subsidies to agriculture and irrigation during the 1980s. The reform included abolishing minimum price schemes and tax concessions, land development loans, fertiliser and irrigation subsidies, etc. (NCM, 2011). The adjustment process took several years, and was aided by transitional assistance to farmers.

By some reports the reform was successful, with improvements in economic and environmental indicators for the agriculture sector. NCM (2011) reports overall positive environmental impacts, with reduced phosphate leaching; erosion control improved by a reduction in the national sheep flock, improved water quality, and reduced methane emissions.

Other reports show poor performance of environmental indicators of New Zealand after the reform. The OECD (2008) found that the nutrient balance, i.e. the difference between total nutrients entering the agricultural system and the quantity leaving the system, increased between 1990/92 and 2000/02. For nitrogen and phosphorous, the gross balanced increased by 41 and 128% respectively. For phosphorous, this is the largest increase among the OECD countries, and the third largest for nitrogen.

8.3 Case 3: Overallocation of allowances in the EU Emissions Trading Scheme as an environmentally harmful subsidy

8.3.1 *General description*

The EU Emissions Trading Scheme (EU ETS) – the main EU policy tool for fighting climate change – was launched in 2005. The current on-going Phase 3 runs from 2013 to 2020. The scheme covers 28 EU Member States, Iceland, Liechtenstein and Norway (European Commission, 2013). The rules are defined in the EU ETS Directive, and as such the rules are the same for all participating countries.

The activities covered by the EU ETS are commonly referred to as the EU ETS sector, while the activities not included in the EU ETS are commonly referred to as the non-EU ETS sector. For the EU ETS sector, the EU ETS is the primary instrument for regulating greenhouse gas emissions. For the non-EU ETS sector, regulation is based on a range of market and non-market based instruments, among others, CO₂ taxes. The market based instruments are described in Part 1 of this report.

Due to the economic recession, demand for emissions allowances has been much smaller than the supply, which is fixed. While the total allocation over Phase 3 (2013–2020) of the EU ETS is fixed, the yearly allocation decreases along a linear trend. The demand has reduced not only because of the recession but also because of policy crowding from mechanisms for the promotion of renewable energy sources and because of the import of offsets from the Clean Development Mechanism.

As a result, a significant surplus of the emission allowances has accumulated. The most recent information, provided by European Commission, shows that by the end of 2012, the cumulative surplus had grown close to 2 billion allowances. At the end of 2020 the oversupply is expected to be around 2.2 billion allowances (European Commission, 2012). For comparison, verified emissions in 2012 were 1.87 billion tCO₂ (based on the European Union Transaction Log).

As a consequence of the oversupply, the price for EU emissions allowances (EUA) has decreased dramatically. During the first half of 2008, the price for forward contracts with delivery in December 2008 varied in the range of EUR 20–35. In March 2014, the price of forward contracts with delivery in December 2014 was in the range of EUR 6–7, while the price of forward contracts with delivery in December 2020 was in the range of EUR 9–10.

To address the current market imbalance, the Commission has identified six alternatives for structural measures for the EU ETS (European Commission, 2014d). However, implementing any of the proposed measures will be politically difficult and it is likely that the current oversupply situation will continue beyond phase 3. It will lead to a situation whereby the prices of the EUAs will stay depressed. As a short-term measure, the European Commission will postpone the auction of 0.9 billion allowances until 2019–2020 (European Commission, 2012a). However, the backloading will not reduce the overall number of allowances for Phase 3.

How can overallocation of emissions allowances be considered an EHS?

Relying on the definition that an EHS is “any unrequited financial assistance provided by a government” that leads to higher levels emissions than in the absence of the support measure, the overallocation of EUAs can be viewed as an environmentally harmful subsidy because it lowers the price of emitting CO₂ for installations within the EU ETS well below the social costs of CO₂ emissions. For comparison, in Sweden, fossil fuels consumed within the non-EU ETS sector are subject to a CO₂ tax. For coal, the CO₂ tax is 3.31 SEK (0.28 EUR) per kilo (2013), which is roughly equivalent to 100 EUR per tonne of CO₂ (for more details see Part 1). Fuels consumed within the EU ETS sector are exempted from the CO₂.

The rationale is that emissions during Phase 3 are larger than what they would be if emitters were to face a price equal to the social cost of CO₂ emissions. Emissions over Phase 3 may change because in the current economic situation, the cap for Phase 3 is not binding (in economic terms). That the cap is not binding means that even if the EUA price were to be zero, there would be a surplus of allowances at the end of 2020.

Under current rules, any surplus accumulated by the end of 2020 is transferred to Phase 4. For emissions over all phases of the EU ETS to change, part of this “hot air” must be retired. One way to retire part of the surplus is to deposit it (or a part of it) into a reserve. Depending on the rules, the reserve may act as a permanent set-aside. Another is to tighten the linear adjustment factor. With a large surplus, tightening the linear adjustment factor will have less effect on the price than without a large surplus, and thus may be easier to reach political consensus on.

What is the counterfactual scenario?

The counterfactual is that emitters in the EU ETS sector face a CO₂ price that is equal to the social costs of CO₂ emissions. The social costs account for the damage of global warming caused by increased atmospheric CO₂

concentrations. The social costs of CO₂ emissions have been chosen as the counterfactual because many activities within the non-EU ETS sector face a CO₂ price that is equal to or higher than the social costs of CO₂ emissions.

Here, the assumption is that the social cost is EUR 30 per tCO₂e. EUR 30 was the price expectation for Phase 3 of the EU ETS at the time when the Climate Package was approved and the cap was fixed for Phase 3 in 2008 (Clo, 2013). The span of estimates of the social costs CO₂ emissions is large. An early estimate by Fankhauser (1994) puts the costs at USD 20 per tCO₂ (in 1995 terms). A more recent estimate by Hope (2013) puts the costs at USD 106 per tCO₂. The absolute size of the costs is not important. What is important is that EUA price for Phase 3 is well below the estimates.

The low CO₂ price for the EU ETS sector can be viewed as a form of tax exemption. As such, it falls into the category of off-budget subsidies in the classification of on-budget vs. off-budget subsidies. The cap is a political decision, while the price is determined by the market.

8.3.2 *Environmental impacts*

The environmental impact is assessed using the three-link model suggested by OECD.

8.3.3 *Linkage 1: Effect of the subsidy on the level and the composition of output and the use of inputs*

The lower the CO₂ price, the higher the emissions, in both absolute and per unit terms. Emissions per unit of output may increase for a number of reasons. One possibility in the generation of electricity is switching from natural gas to coal. The use of coal in power generation is more CO₂ intensive than natural gas. A reduction in the CO₂ price makes coal as an intermediate input more competitive, all other things being equal.

A comparison made by Schuermans (2013) shows that in 2012, a carbon price of EUR 35.67 per tonne would have made natural gas and coal equally competitive. Since the carbon price was significantly below that, coal was much more competitive in 2012.⁷⁷ This comparison may,

⁷⁷ Schuermans' (2013) comparison is based on comparing the clean spark spread with clean dark spread. The clean spark spread shows the net revenue of generating electricity from natural gas. It is defined as the price of electricity less the gas cost and less the cost of the emissions allowances. The clean dark spread shows the same for coal.

to some extent, explain why coal consumption in Europe has seen a steady increase during the last three years in Europe, from 707 million tonnes in 2010 to 762 million tonnes in 2011 and 784 million tonnes in 2012 (Schuermans, 2013).

8.3.4 Linkage 2: Effect of the change in inputs and outputs on emissions or resource use

Table 72 shows the cost of CO₂ abatement measures of stationary sources in the EU in 2020. The results can be used to assess the magnitude of the increase in emissions that can be attributed to a CO₂ price of less than EUR 10 relative to a CO₂ price of EUR 30.

With a CO₂ price less than EUR 10, none of the measures in Table 72 will be implemented. With a CO₂ price of EUR 30, the range of measures that would be implemented would reduce emissions by 176 million tCO₂ per year.

With less emission during Phase 3 of the EU ETS there would be an even larger surplus that is transferred over to Phase 4. For total emissions to reduce part of this “hot air” must be retired, e.g. by tightening the linear adjustment factor.

Table 72 CO₂ abatement measures of stationary sources in the EU in 2020 with unit costs of less than 50 EUR per tCO₂

	Cost in EUR per tCO ₂	Potential in MtCO ₂ per year	Cumulative potential in MtCO ₂ per year
Industrial energy efficiency	10	65	65
Nuclear instead of coal	16	62	127
Switch existing coal to gas (tranche 1)	20	0	127
Hydro	20	7	134
Build integrated gasification combined cycle (IGCC) instead of ultra-supercritical coal	20	42	176
Build new gas instead of lignite	31	125	301
Switch existing coal to gas (tranche 2)	40	220	521
Onshore wind	47	15	536
Electricity end use efficiency (tranche 1)	35	36	572

Source: Blyth & Bunn (2011), Table A1.

The increase in CO₂ emissions attributable to the low CO₂ price includes not just the increase in emissions due to short-term substitution from less carbon-intensive production to more-carbon-intensive, but also the costs from a locking in into carbon-intensive production capacity (see e.g. Sartor, 2012). The risk is that, in the face of low carbon prices in the short-to-medium term, companies will continue to invest in carbon-intensive production. Reverting to less carbon intensive production may become very costly in the long-term.

8.3.5 *Linkage 3: Effect of increase in emissions or resource use on environmental degradation*

Table 73 shows the environmental impact of the increase in emissions attributable to a EUA price that is below the social costs of CO₂ emissions. The total environmental impact is EUR 5.3 billion per year for the EU. It equals 176 million tCO₂ per year multiplied by the assumed social costs of CO₂ emissions.

Assuming that the environmental impact is proportional to emissions, the last column of Table 73 shows the environmental impact per Nordic country.

Table 73 Environmental impact of increasing the EUA price to equal the social costs of CO₂ emissions

	Share of total EU ETS sector emissions in 2012	Environmental impact per year, EUR million
Denmark	1.0%	51.4
Finland	1.6%	83.4
Iceland	0.0%	0.0
Norway	1.0%	52.6
Sweden	1.0%	51.4
<i>Total</i>	<i>4.5%</i>	<i>238.8</i>

Note: Verified EU ETS sector emissions in 2012 and environmental damage assuming that environmental damage is proportional to emissions.

Source: European Union Transaction Log (EUTL).

8.3.6 *Fiscal impacts*

It is estimated that during Phase 3, 48% of the emission allowances will be auctioned (European Commission, 2014e). This means a total of over 8 billion allowances during the period for the whole of the EU ETS. The share of auctioned allowances will rise each year. For the manufacturing industry the share is 20% in 2013, with an increase of up to 70% by 2020. For the power generation sector, all allowances will be auctioned during the third phase (European Commission, 2014e).

For the Nordic countries, based on CDC Climate Research (2013), the expected annual auction volumes during Phase 3 are:

- Denmark: 12 million allowances.
- Finland: 16 million allowances.
- Sweden: 8.5 million allowances.
- Norway: 9.8 million allowances (preliminary estimate based on the number of allowances auctioned in 2012).
- Iceland: 0.4 million allowances (preliminary estimate for the first years of the Phase 3 of the EU ETS, based on information from the Icelandic Ministry of Finance).

The size of the fiscal impact of a higher EUA price is estimated by multiplying they estimated auctioned volume with difference between the current forward prices for Phase 3 and the assumed social cost of CO₂ emissions. Fiscal impacts are calculated as the price difference (EUR 30–EUR 8) multiplied by the auction volume.

Table 74 Fiscal impact of increasing the EUA price to equal the social costs of CO₂ emissions

Country	Average auction volume in million EUA	Assumed social costs of CO ₂ emissions in EUR	Average of forward prices for Phase 3 of the EU ETS in EUR	Fiscal impact in million EUR
Denmark	12	30	8	264
Finland	16	30	8	352
Sweden	8.5	30	8	187
Norway	9.8	30	8	216
Iceland	0.4	30	8	9
<i>Total</i>	<i>46.7</i>			<i>1,027</i>

Source: Calculations based on CDC Climate Research (2013), the source for the information for Iceland is the Icelandic Ministry of Finance.

Table 74 shows that the size of the total fiscal effect is in the range of EUR 1 billion per year.

8.3.7 Political feasibility of EHS reform

Increasing the CO₂ price for the EU ETS sector would undeniably bring both environmental and fiscal benefits. The main environmental impact would stem from avoiding investment in carbon-intensive capital goods. A lock-in in carbon intensive capital goods makes decarbonisation later on much more difficult and expensive.

While the European Commission has announced a goal of reducing greenhouse gas emissions by 40% until 2030 relative to the 1990 level, the prospects for a higher EUA price are poor. This is because neither the backloading proposal nor the new Market stability mechanism, suggested by the European Commission, includes a permanent set-aside of EUAs (European Commission, 2014a, 2014b). The linear reduction factor that adjusts the overall cap, will possibly be tightened for Phase 4 of the EU ETS, which runs from 2021 onwards (European Commission, 2014c). However, once tightened, it will take many years for the market to absorb the current surplus.

Reform process

The Nordic countries cannot unilaterally change the rules that govern the EU ETS, which ultimately determine the CO₂ price for the EU ETS sector. Any changes to the rules must take place through the political and legislative processes of the EU.

The UK has introduced a unilateral carbon tax on top of the EUA price for the EU ETS sector (Ares, 2013). The UK charges electricity generators the difference between the EUA price and a carbon floor price, which is set unilaterally by the UK Government. Currently, the UK carbon floor is set two years in advance. Thus, the tax reacts with significant delay to changes in the EUA price. The revenue (in the range of EUR 1.2–2.7 billion per year between 2013 and 2018) is retained by the UK treasury.

8.4 Summary of EHS cases

8.4.1 Assessment of the political possibilities to reform EHS

The case studies attempt to identify some fiscal elements or subsidies that can be considered environmentally harmful. Building on the framework developed in chapter 7, we assess the fiscal and environmental impacts of reform of the identified EHS: two aspects which largely determine the political possibility for reform. The greater the relative positive environmental effect of reforming an environmentally harmful subsidy, the easier it is to motivate political action. At the same time, the less negative impact on the fiscal budget, the larger the economic incentive for going forward with a reform proposal.

We have strived to create a quantitative measure in both dimensions, which are comparable between different environmentally harmful subsidies. This enables us to rank or group subsidies, according to which would

be most beneficial to reform or remove. It should be noted that quantification and assessment of non-monetary effect is inherently uncertain. In addition, it is not possible put an economic value on all environmental impacts. Where possible, we have used lower and upper bounds, but the calculations should still be interpreted as rough indications.

The aim of this exercise is to set the scene for further and more in-depth work, where more EHS can be classified according to the framework. Thus, a more extensive priority list for political action can be developed. Such a list enables policy makers to decide and document which subsidies should be considered for reform or studied further, and which should *not* be considered for reform or studied further. Efforts should be focused to where they have the largest impact.

Effects on the fiscal budget and the environment of removal of the three chosen EHS cases, and their ranking based on total effects, are presented in Table 75. The estimates of the environmental impacts contain large uncertainties because of the uncertainties on assessing the three linkages that the analyses of the environmental impacts rely on.

Table 75 Overview of fiscal and environmental impact of removing three identified EHS

EHS	Environmental impact	Fiscal impact	Environmental/ Fiscal impact
Lower energy tax on diesel used in transport compared to petrol	EUR 89–223 m	EUR 1–3 bn	0.07–0.22
EU direct payments to farmers	EUR 61–135 m	EUR 218 m	0.28–0.62
Overallocation of allowances in the EU Emissions Trading Scheme	EUR 240 m	EUR 1 bn	0.24

Source: Sections 8.1, 8.2 and 8.3.

By combining the impacts on the environment and the fiscal budget, it is possible to single out which environmentally harmful subsidies could be reformed to generate positive effects in both areas. According to the table, the agricultural case has the lowest environmental impact and fiscal impact. The diesel case has a slightly higher environmental impact, and the ETS overallocation case has the largest upper bound potential for environmental effect. Although this indicates that the ETS case should be the most eligible for reform, it is also perhaps the most sweeping one, which could hamper its potential for reform. A reform of the EU ETS has already been suggested by the European Commission (2014c). The European Commission suggests a tighter linear adjustment factor (from 2021) and the creation of a market stability mechanism.

An important aspect to consider in this framework is the size of the fiscal impact in relation to the environmental impact. Harmonising die-

sel tax with petrol tax in the Nordic countries would for example yield five times larger fiscal impact than environmental, or conversely, the environmental impact would only be 7–22% of the fiscal impact. The smaller this share, the larger the risk that a reform proposal would be criticised for being more of a fiscal reform than an environmental one. This share can be used to evaluate the potential risks of proposing a reform, and thus also the likelihood of the reform passing parliamentary process. The EU direct payments case seems to have the highest share, which means this obtains most environmental impact per fiscal impact.

A caveat in the analysis is why some environmentally harmful subsidies, if their removal would bring positive effects, have not been reformed already. Here the framework does not give the whole picture since the focus is on the fiscal budget and the environment. As discussed in the previous sections, other barriers to reform may exist that hold back development.

8.4.2 Other impacts of EHS reform

In practice, environmental and fiscal concerns are weighed against other economic interests and potential effects of environmentally harmful subsidy reform. For example, a removal of the diesel subsidy could reduce competitiveness of domestic industry, compared to countries which still subsidise diesel. The same goes for agriculture, where Nordic farmers would see greatly reduced viability in their business, since up to half of their income stems from direct support. Special interests also play a role here: those who would lose from a reform (farmers, transport businesses, carbon emitting industries etc.) can be expected to engage in rent-seeking in retaining the subsidies. An example from the UK demonstrates the difficulty in removing this particular subsidy: there have been several protests by the trucking industry against the cost of diesel (IEEP, 2009).

Consumer welfare may be affected by a subsidy removal, if prices of good and/or services increase. A removal of the income support in agriculture may spill-over onto consumers in the form of higher prices on agricultural products. Prices of goods that are transported by diesel-fuelled vehicles may increase, given that the higher cost of fuel is passed onto the customer. A higher price on carbon emissions can increase prices from industries that emit large amounts of carbon and reduce their international competitiveness.

Other areas in which a subsidy removal may have effects are regional policy, social policy, employment and trade. Finally, the current study has only taken into account static effects of a subsidy removal, and in the

case of diesel, some dynamic effects. Other potential dynamic effects, such as economic impacts from changes in prices and subsequent effects for production and consumption decisions are likely to occur. These should be investigated further.

8.4.3 *Next step and recommendations*

In the process of phasing out of environmentally harmful subsidies, those which are found to have the largest negative environmental and fiscal impact should be prioritised. Further investigation of a removal of these subsidies should be carried out, mainly of dynamic impacts, i.e. changes in prices and effects on production and consumption. Effects for consumer welfare, regional policy, employment etc. should be thoroughly analysed.

Conversely, subsidies that cause relatively *little* negative effects should not be prioritised in further work in phasing out environmentally harmful subsidies. Rather, efforts should be focused on reform of the subsidies that have the largest impact.

References

8.5 References PART I

Introduction/Summary and cross-country comparison

- Aatola P., Marjamaa E., Ollikainen M. and Ollikka, K. (2013): *Euroopan unionin päästöoikeuskauppa ja ilmastopolitiikka*. Kansantaloudellinen aikakauskirja 3/2013.
- EU Oplysningen (2013): *What is the environmental guarantee (environmental derogation)?* http://www.eu-oplysningen.dk/euo_en/spsv/all/94/
- European Commission (2012): *The state of the European carbon market in 2012*. http://ec.europa.eu/clima/policies/ets/reform/docs/com_2012_652_en.pdf
- European Commission (2013a): *Living well, within the limits of our planet*. Proposal for a general Union Environment Action Programme.
- European Commission (2013b): *The EU Emissions Trading System (EU ETS) Fact Sheet*.
- European Commission (2013c): *The EU climate and energy package*. http://ec.europa.eu/clima/policies/roadmap/index_en.htm
- European Commission (2013d): *Proposal for a new EU Environment Action Programme to 2020*. <http://ec.europa.eu/environment/newprg/intro.htm>
- European Voice (2013): *Commission proposes to adjust aviation emission rules*.
- Fankhauser, S. (1994): *The social costs of greenhouse gas emissions: An expected value approach*. The Energy Journal 15, No. 2, pp. 157–184.
- Hope, C. (2013): *Critical issues for the calculation of the social cost of CO₂: why the estimates from PAGE09 are higher than those from PAGE2002*. Climatic Change, Vol. 117(3), pp. 531–543.
- Konjunkturinstitutet (2012): *Miljö ekonomi och politik*.
- Nordic Council of Ministers, NCM (2002): *The use of economic instruments in Nordic environmental policy 1999–2001*. TemaNord 2002:581.
- Nordic Council of Ministers, NCM (2006): *The use of economic instruments in Nordic and Baltic environmental policy 2001–2005*. TemaNord 2006:525.
- Nordic Council of Ministers, NCM (2009): *The use of economic instruments in Nordic environmental policy 2006–2009*. TemaNord 2009:578.
- OECD/EEA (2013): *OECD/EEA database on environmentally related taxes*. <http://www2.oecd.org/ecoinst/queries/>

References Denmark

- CDC Climate Research (2013): *Auction revenues in EU ETS Phase 3: a new public resource*.
- Danish Energy Agency (2008): *Kort og Godt om CO₂-kvoter*. http://www.ens.dk/graphics/Energipolitik/dansk_energipolitik/CO2_kvoter/publ/kortoggodt_kvoter_dec08.pdf
- Danish Energy Authorities (1999): *Elreformen*. http://www.ens.dk/graphics/Energipolitik/dansk_energipolitik/politiske_aftaler3marts1999_elreformen.pdf
- Danish Government (2009): *Forårspakke 2.0*.

Danish Government (2013): *Danmark uden affald*.

Danish Ministry of Taxation (2012a): *Svovlafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/233.html

Danish Ministry of Taxation (2012b): *CFC-afgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/184.html

Danish Ministry of Taxation (2012c): *Foderfosfatafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/2961.html

Danish Ministry of Taxation (2013a): *Kulafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/215.html

Danish Ministry of Taxation (2013b): *Mineralolieafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/222.html

Danish Ministry of Taxation (2013c): *Gasafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/210.html

Danish Ministry of Taxation (2013d): *CO₂-afgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/216.html

Danish Ministry of Taxation (2013e): *Elafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/206.html

Danish Ministry of Taxation (2013f): *Kvælstofoxidaftgiftsloven (NO_x)*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/8187.html

Danish Ministry of Taxation (2013g): *Vandafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/239.html

Danish Ministry of Taxation (2013h): *Spildevandsafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/229.html

Danish Ministry of Taxation (2013i): *Emballageafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/207.html

Danish Ministry of Taxation (2013j): *Brændstofforbrugsafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/183.html

Danish Ministry of Taxation (2013j): *Kvælstofafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/217.html

Danish Ministry of Taxation (2013k): *Pvc-afgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/227.html

Danish Ministry of Taxation (2013l): *Vægtafgiftsloven*.

Danish Ministry of Taxation (2013m): *Bekæmpelsesmiddelafgiftsloven*.
http://www.skm.dk/skatteomraadet/talogstatistik/satser_og_beloeb/182.html

Dansk Returssystem (2013): *Pantsatser*.
<http://www.dansk-returssystem.dk/content/dk/pantsystemet/pantsatser>

De Økonomiske Råd (2012): *Økonomi og miljø 2012*.

De Økonomiske Råd (2013): *Økonomi og miljø 2013*.

EU Oplysningen (2013): *What is the environmental guarantee (environmental derogation)?* http://www.eu-oplysningen.dk/euo_en/spsv/all/94/

European Commission (2013): *CFP reform – Transferable Fishing Concessions*.
http://ec.europa.eu/fisheries/reform/docs/tfc_en.pdf

IEA (2012): *Energy policies of IEA countries Denmark 2011*.

OECD (2010): *Danish Tax Reform of 2010*.

OECD (2012): *OECD economic surveys: Denmark 2012*. OECD Publishing.

Puljefiskeri.dk (2013): <http://www.puljefiskeri.dk>

Retsinformation (2009): *Bekendtgørelse af lov om jordbrugets anvendelse af gødning og om plantedække*. <https://www.retsinformation.dk/Forms/R0710.aspx?id=8459>

Retsinformation (2013): *Bekendtgørelse af lov om afgift af affald og råstoffer (affalds- og råstofafgiftsloven)*. <https://www.retsinformation.dk/Forms/R0710.aspx?id=133844#B1>

Skatteministeriet (2013): *Overblik over skatte- og afgiftselementer i Vækstplan DK*.

References Finland

- Association of Finnish Local and Regional Authorities (2012): *Uusi jätelaki*. <http://www.kunnat.net/fi/asiantuntijapalvelut/tyty/jatehuolto/jatelakiuudistus/Sivut/default.aspx>
- Customs Authority (2010): *Energy Taxation*. http://www.tulli.fi/fi/suomen_tulli/julkaisut_ja_esitteet/THT/tht_arkisto/THT_2010/tiedotteet_2010/21901010/index.html?bc=425
- Customs Authority (2013a): *Energy Taxation*. http://www.tulli.fi/en/finnish_customs/publications/excise_tax/excise_taxation/021.pdf
- EC Directive 2009/28: *Euroopan Parlament in Ja Neuvoston Direktiivi 2009/28/EY*.
- Energy Market Authority, (2013): *Summary of the production subsidy scheme*. http://www.emvi.fi/files/Feed_in_tariff_summary_6_2013.pdf
- Energy Market Authority, (2013b): *Päästötiedot*. <http://www.energiamarkkinavirasto.fi/alasivu.asp?gid=250&languageid=246>
- Finavia OYJ (2012), *Terms of service 2012 – General terms of airport and air navigation services for air carriers and other aircraft operators including air traffic charges*.
- Finlex (152/2010): *Hallituksen esitys Eduskunnalle laiksi uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta*.
- Finnish Car Recycling Ltd (2013): *Recycling legislation*. <http://www.autokierratys.fi/Kuluttajille/Artikkeli.aspx?julkaisuID=7445>
- Finnish Energy Industries, (2012): *Uusiutuvat energialähteet, edistyminen vs. tavoitteet vuoteen 2020 – Energiateollisuuden näkökulma*.
- Finnish Tire Recycling Ltd (2013): *Recycling fees*. <http://www.rengaskierratys.com/en/recycling-fees>
- Finnish transport safety agency (2013): *Structure and amount of tax*. http://www.trafi.fi/en/road/taxation/vehicle_tax/structure_and_amount_of_tax
- Finnish water forum (2013): *Management of Water Supply Services in Finland*.
- Government resolution (2008): *Government resolution on Forest Biodiversity Programme for Southern Finland 2008–2016 (METSÖ)*.
- Hyrynen M.(2013): Ministry of the Environment: *Ympäristön kannalta haitalliset tuet*. <http://www.ym.fi/download/noname/%7BB3E047CC-DD7A-4897-BA56-513FBDC50C5F%7D/40297>
- International Emissions Trading Association (2013): *Norway. The World's Carbon Markets: A Case Study Guide to Emissions Trading*.
- Ministry of Finance (2010): *Hallituksen esitys Eduskunnalle energiaverotusta koskevan lainsäädännön muuttamisesta*. http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/03_muut_asiakirjat/20100702Lausun/20100701_HE-energiaverotus_LUONNOS_lausunolle.pdf
- Ministry of Finance (2011a): *Reworking transport and energy taxation in Finland 2008–2011*. <http://www.scp-knowledge.eu/sites/default/files/Parkonnen%202011%20Reworking%20Transport%20and%20energy%20taxation%20in%20Finland%202008-2011.pdf>
- Ministry of Finance (2012): *Autoverolain muutos voimaan*. http://www.vm.fi/vm/fi/03_tiedotteet_ja_puheet/01_tiedotteet/20120326Autove/name.jsp

Ministry of the employment and the economy (2012):
http://www.tem.fi/files/32194/Tyo-ja_elinkeinoministerion_paatospdf

Ministry of the Environment (2013): *Waste charges and taxes*.
http://www.environment.fi/en-US/Consumption_and_production/Waste_and_waste_management/Waste_charges_and_taxes

Ministry of the Environment (2013b): *Tuottaja vastuu*.
<http://www ymparisto.fi/tuottajavastuu>

Ministry of the Environment (2013c): [http://www.ym.fi/fi-FI/Ymparisto/Uudet_asetukset_juomapakkausten_kerayspa\(17027\)](http://www.ym.fi/fi-FI/Ymparisto/Uudet_asetukset_juomapakkausten_kerayspa(17027))

PALPA (2013): *Juomapakkausten kierrättäminen*. <http://pantilliset.fi/kierrattaminen>

RES Legal (2013): *Legal sources on renewable energy*. <http://www.res-legal.eu/search-by-country/finland/single/s/res-e/t/promotion/aid/subsidy-energy-aid/lastp/127/>

TEM (2013): *Energituki*.

TUKES (2013): *Waste Electrical and Electronic Equipment*. <http://www.tukes.fi/en/Branches/Electricity-and-lifts/Electrical-equipment/Requirements-for-electrical-equipment/Waste-Electrical-and-Electronic-Equipment/>

VATT (2011): *Verotuet Suomessa 2009–2012*.

Veroainmaksajain keskusliitto (2012): *Autovero Suomessa*.
<http://www.veroainmaksajat.fi/omatveroasiat/autot/autovero>

References Iceland

Althingistidindi (2009–2013): *Parliamentary records*.

Endurvinnslan hf. (Recycling Ltd.) (2013): *Deposit System*.
<http://endurvinnslan.is/english/> (30.10.2013)

Environment Agency (2013): <http://www.ust.is/einstaklingar/haf-og-vatn/stjorn-vatnamala/> (30.10.2013)

Financial Management Authority (2012): *Treasury accounts for 2012*.

Iceland Forestry Service/Thröstur Eysteinnsson (2013): *Forestry in a Treeless Land (4th edition)*. http://www.skogur.is/media/ymislegt/Treeless-land_netutgafa.pdf

Icelandic Fisheries, Information centre of the Icelandic Ministry of Fisheries and Agriculture (2013): *Individual transferable quotas*.
<http://www.fisheries.is/management/fisheries-management/individual-transferable-quotas/> (30.10.2013)

Ministry for the Environment and Natural Resources (2007): *Iceland's Climate Change Strategy*. http://eng.umhverfisraduneyti.is/media/PDF_skrar/Stefnumorkun_i_loftslagsmalum_enlokagerd.pdf

Ministry for the Environment and Natural Resources (2010): *Aðgerðaaætlun í loftslagsmálum* (Climate Change Action Plan).

Ministry for the Environment and Natural Resources (2013): *Emissions of greenhouse gases in Iceland from 1990 to 2011*. National Inventory Report 2013, Submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

Ministry of Industries and Innovation (2011): *Orkustefna fyrir Ísland* (Energy Plan for Iceland). <http://www.atvinnuvegaraduneyti.is/media/frettir2/Orkustefna-fyrir-Island.pdf>

Ministry of Industries and Innovation (2013): *The Icelandic National Renewable Energy Action Plan for the promotion of the use of energy from renewable sources in accordance with Directive 2009/28/EC and the Commission Decision of 30 June 2009 on a template for the national renewable energy action plans.*

OECD (2012): *Agriculture: Support to agriculture at historic lows, says OECD.*
<http://www.oecd.org/newsroom/agriculturesupporttoagricultureathistoriclowssaysoecd.htm>(30.10.2013)

Soil Conservation Service of Iceland (2013): *Bændur græða landið.*
<http://www.land.is/vidhfangsefni/baendur-graedha-landidh-bgl> (4.12.2013).

Stjornartidindi (2009–2013): Publication of laws, regulations etc.

References Norway

Government tax proposals 2010–2013 (St. prp. nr. 1 Skatte-, avgifts- og tollvedtak).

IEA (2011): *Energy policies of IEA countries Norway 2011.*

International Emissions Trading Association (2013): *Norway. The World's Carbon Markets: A Case Study Guide to Emissions Trading.*

Ministry of Finance (2013): *National Budget 2013: A Summary.*

Norwegian Government (2012): *Ambitious Norwegian white paper on climate efforts.*
<http://www.regjeringen.no/en/archive/Stoltenbergs-2nd-Government/Office-of-the-Prime-Minister/Nyheter-og-pressemedlinger/pressemedlinger/2012/ambitious-norwegian-white-paper-on-clima.html?id=679419>

Norwegian Water Resources and Energy Directorate (2013): *Elsertifikater.*
<http://www.nve.no/no/kraftmarked/elsertifikater/>

NOU (2007): *En vurdering av særavgiftene.* NOU 2007:8.

OECD (2011): *OECD environmental performance reviews: Norway 2011.* OECD Publishing.

OECD (2012): *OECD economic surveys: Norway 2012.* OECD Publishing.

References Sweden

Act (1994:1776) on energy tax, chapter 6a 1§ *Lag om skatt på energi.*

Avfall Sverige (2013): *Svensk avfallshantering 2013.*

Boverket (2013): *Planeringsinsatser för vindkraft.*
<http://www.boverket.se/Planera/planeringsfragor/Vindkraft/Planering-vind/>

Ekonomifakta (2013):
<http://www.ekonomifakta.se/sv/Fakta/Energi/Styrmedel/Elcertifikat/>

EU Upplýsningen (2013): *EU-länderna samarbetar kring miljöfrågor.*
<http://www.eu-upplysningen.se/Om-EU/Vad-EU-gor/Miljopolitik-i-EU/>

European Commission (DG ENV) (2012): *Use of Economic Instruments and Waste Management Performances.* Final Report 10 April 2012 Contract ENV.G.4/FRA/2008/0112

European Commission (2013): *Road Infrastructure Charging – Heavy Goods Vehicles.*
http://ec.europa.eu/transport/modes/road_charging/charging_hgv_en.htm

Government Bill (2009): *Svenska miljömål – för ett effektivare miljöarbete.* Prop. 2009/10:155.

Government Offices of Sweden (2012): <http://www.government.se/sb/d/16022/a/187772>

International Energy Agency (2013): *Energy Policies of IEA Countries, Sweden 2013 Review – Excerpt, The framework: energy policy and climate change.*

Konjunkturinstitutet (2012): *Miljö ekonomi och politik.*

Statistics Sweden (SCB) (2010): *Miljörelaterade skatter, subventioner och utsläppsrätter*. Statistics Sweden (SCB) and Swedish National Financial Management Authority (ESV).

Swedish Agency for Marine and Water Management (2011): *LOVA – Lokala vattenvårdsprojekt*. <https://www.havochvatten.se/insatser-och-skydd/havs--och-vattenmiljoanslag/lova.html>

Swedish Agency for Marine and Water Management (2013): *Utvärdering av projektverksamheten av havs- och vattenmiljöanslaget 2007–2012*.

Swedish Environmental Protection Agency (2012a): *Från avfallshantering till resurshushållning – Sveriges avfallsplan 2012–2017*. Rapport 6502.

Swedish Environmental Protection Agency (2012b): *Avfall i Sverige 2010*. Rapport 6520.

Swedish Environmental Protection Agency (2012c): *Underlag till en färdplan för ett Sverige utan klimatutsläpp 2050*. Rapport 6537.

Swedish Environmental Protection Agency (2013a): *Batterifonden*. <http://eeb.naturvardsverket.se/producentansvarforbatterier/Batterifonden/>

Swedish Environmental Protection Agency (2013b): *Miljökvalitetsmålen*. <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Sveriges-miljomal/Miljokvalitetsmalen/>

Swedish Government (1996): *Government Bill 1995/96:174*. (http://www.riksdagen.se/sv/Dokument-Lagar/Forslag/Propositioner-och-skrivelser/Producentansvar-for-uttjanta-b_GJ03174/?text=true) Attachment 1, point 8.2.1 SFS 2008:842.

Swedish Government (2007): *Government Bill 2007/08:153*.

Swedish Ministry of Finance (2009): *Nya miljöbilar befrias från fordonsskatt*. 2009-03-09. <http://www.regeringen.se/sb/d/11401/a/122076>

Swedish National Financial Management Authority (ESV) (2013): *Utfallet för statens budget – del av ESV:s underlag för årsredovisning för staten 2012*.

Swedish Tax Authority (2010, 2011, 2012, 2013a): *Ändrade skattesatser på bränslen och el fr.o.m. 1 januari 2010*. <http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/energiskatter.4.18e1b10334ebe8bc8000843.html>

Swedish Tax Authority (2013b): *Handledning för punktskatter 2013*. SKV 504 utgåva 16.

Swedish Transport Agency (2010): *Transportstyrelsens allmänna föreskrifter och allmänna råd om åtgärder mot förorening från fartyg*. http://www.transportstyrelsen.se/tsfs/TSFS%202010_96.pdf

Swedish Transport Agency (2011): *Nu har vi börjat gräva*. <http://www.transportstyrelsen.se/sv/Vag/Trangselskatt/Driftsinformation1/Nu-har-vi-borjat-grava/2011-04-15-Nu-har-vi-borjat-grava/>

The electricity certificate system (2012): <http://webbshop.cm.se/System/TemplateView.aspx?p=Energimyndigheten&view=default&id=806d7f0a547f45f9b499f6749fcc14fa>

The Swedish Water & Wastewater Association (2012): *Information om certifikatsystem för kväveutsläpp till havet*. 2012-10-29.

The Swedish Water & Wastewater Association (2013): *Taxestatistik*. <http://www.svensktvatten.se/Vattentjanster/Management/VASS/Taxa/>

Trafikverket (2012): *Styrmedel för ett effektivare transportsystem*. Underlagsrapport 2012:106.

8.6 References PART II

- Ahtiainen *et al.* (2012): *Benefits of meeting the Baltic Sea nutrient reduction targets – Combining ecological modeling and contingent valuation in the nine littoral states.* MTT Discussion papers 1/2012.
- Ares, E. (2013): *Carbon Price Floor.* Standard notes SN0592. House of Commons Library. UK Parliament.
- Balkhausen, O. and Banse, M. (2006): *European agriculture without direct payments – A partial equilibrium analysis.* Studies on the Agricultural and Food Sector in Central and Eastern Europe, Vol. 33, pp. 294–308.
- Blyth, W. and Bunn, D. (2011): *Coevolution of policy, market and technical price risks in the EU ETS.* Energy Policy, vol. 39(8), pp. 4578–4593.
- CDC Climate Research (2013): *Auction revenues in EU ETS Phase 3: a new public resource.*
- CE Delft (2008): *Handbook on estimation of external costs in the transport sector.* Internalisation Measures and Policies for All external Cost of Transport (IMPACT) Version 1.1. Report commissioned by European Commission DG TREN.
http://ec.europa.eu/transport/themes/sustainable/doc/2008_costs_handbook.pdf
- Clo S. (2013): *Policy options to improve the effectiveness of the EU emissions trading system: A multi-criteria analysis.*
- Danish Environmental Assessment Institute, DØRS (2005): *Environmentally Harmful Subsidies – Linkages between subsidies, the environment and the economy.* Reference no.: 2002-2208-001.
- Danish National Environmental Research Institute (2011): *Danish emission inventory for agriculture. Inventories 1985–2009.* <http://www2.dmu.dk/pub/fr810.pdf>
- Ellis J. (2010): *The effects of fossil-fuel subsidy reform – A review of modelling and empirical studies.*
- Ernkrans, M. (2012): *Miljöskadliga subventioner.* Motion till riksdagen 2012/13:Sk268.
- European Commission (1998): *Externalities of Energy – Vol.8 Global warming.*
- European Commission (2011a): *The future of CAP direct payments.* Agricultural Policy Perspectives Briefs, Brief no 2.
- European Commission (2011b): *EU Budget 2012.*
- European Commission (2012): *The state of the European carbon market in 2012.* http://ec.europa.eu/clima/policies/ets/reform/docs/com_2012_652_en.pdf
- European Commission (2013): *The EU Emissions Trading System (EU ETS) Fact Sheet.*
- European Commission (2014a): *Climate Action: Structural reform of the European carbon market.* http://ec.europa.eu/clima/policies/ets/reform/index_en.htm
- European Commission (2014b): Press release, *Questions and answers on the proposed market stability reserve for the EU emissions trading system.* European Commission – MEMO/14/39, 22/01/2014.
- European Commission (2014c): Press release, *Questions and answers on 2030 framework on climate and energy.* European Commission – MEMO/14/40, 22/01/2014.
- European Commission (2014d): *Climate Action: Structural reform of the European carbon market.* http://ec.europa.eu/clima/policies/ets/reform/index_en.htm
- European Commission (2014e): *Climate Action: Auctioning.* http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm

- Fankhauser, S. (1994): *The social costs of greenhouse gas emissions: An expected value approach*. The Energy Journal 15, no. 2, 157–184.
- Federal Environment Agency Germany (2010): *Environmentally Harmful subsidies in Germany*.
- Financial Times (2013): *EU planning duty rise to limit “fuel tourism”*.
<http://www.ft.com/cms/s/0/d9f81c82-bddf-11db-bd86-0000779e2340.html#axzz2sMO2hSlA>
- Finnish Transport Agency (2012): *Liikenneviraston tutkimuksia ja selvityksiä*. 23/2012, Liikenteen päästökustannukset.
- Government of Finland (2007): *Hallituksen esitys Eduskunnalle laiksi ajoneuvoverolain muuttamisesta*. HE 146/2007.
- Gren, I. (2008): *Costs and benefits from nutrient reductions to the Baltic Sea*. Report 5877. Swedish Environmental Protection Agency.
<http://www.naturvardsverket.se/Documents/publikationer/978-91-620-5877-7.pdf>
- Hope, C (2013): *Critical issues for the calculation of the social cost of CO2: why the estimates from PAGE09 are higher than those from PAGE2002*. Climatic Change, vol. 117(3), pp. 531–543.
- Hyrynen, M. (2013): *Ympäristön kannalta haitalliset tuet*. Ympäristöministeriön raportteja 13/2013.
- Hyttiäinen, K. & Ollikainen, M. (eds.). (2012): *Taloudellinen näkökulma Itämeren suojelemaan*. Ympäristöministeriön raportteja 12/2012.
- IEEP et al. (2007): *Reforming environmentally harmful subsidies*. Final report to the European Commission’s DG Environment, March 2007.
- Jacobsen, M.R., Gebauer, A., Mellbye, K., Pukander, F., Kari, S., Olsen, S., Lindvall, L. (2010): *Tax Expenditures in the Nordic Countries*. A report from a Nordic working group, presented at the Nordic Tax Economist meeting in Oslo, June 2009.
http://www.skm.dk/public/dokumenter/Tal45/Skatter_og Afgifter86/Tax_Expenditures_in_the_Nordic_Countries.pdf
- Jasch C. (2003): *The use of environmental management accounting (EMA) for identifying environmental costs*.
- Konjunkturinstitutet (2012): *Miljö ekonomi och politik*.
- Nordic Council of Ministers (2011): *Reforming environmentally harmful subsidies. How to counteract distributional impacts*. TemaNord 2011:551.
- OECD (1996): *Subsidies and Environment: Exploring the Linkages*. Organisation for Economic Co-operation and Development, Paris.
- OECD (1998): *Improving the Environment through Reducing Subsidies. Part 1: Summary and Policy Conclusions*.
- OECD (2005): *Environmentally harmful subsidies, challenges for reform*.
- OECD (2006): *Subsidy Reform and Sustainable Development Economic, Environmental and Social Aspects*.
- OECD (2007): *Subsidy reform and sustainable Development Studies, Political Economy Aspects*.
- OECD (2008): *Environmental Performance of Agriculture at a Glance*.
- OECD (2009): *Making reform happen in environmental policy*.
- OECD (2010a): *Making Reforms Happen Lessons from OECD Countries*.
- OECD (2010b): *Measuring Support to Energy — Version 1.0*. Background paper to the joint report by IEA, OPEC, OECD and World Bank on Analysis of the Scope of Energy Subsidies and Suggestions for the G-20 Initiative.
- OECD (2010c): *Phasing Out Energy Subsidies in Indonesia*.

- OECD (2012): *Overview of key methods used to identify and quantify environmentally harmful subsidies with a focus on the energy sector.*
- Pieters, J. (2002): *What makes a subsidy environmentally harmful: Developing a checklist based on the conditionality of subsidies.* OECD Workshop on Environmentally Harmful Subsidies, 7–8 November 2002, OECD, Paris.
- Sartor, O. (2012): *The EU ETS carbon price: to intervene or not to intervene.* CDC Climate Research. Climate Brief no 12. http://www.cdcclimat.com/IMG/pdf/12-02_climate_brief_12_-_the_eu_ets_carbon_price_-_to_intervene_or_not_to_intervene.pdf
- Schuermans Y. (2013): *The future of coal in Europe. Energy Outlook.* <http://energy.sia-partners.com/20130724/the-future-of-coal-in-europe/>
- SMED (2011): *Beräkning av kväve- och fosforbelastning på vatten och hav för uppföljning av miljökvalitetsmålet "Ingen övergödning".*
- Statistikmyndigheten (2010): *Effekter på priset för handelsgödsel när skatten på kväve i handelsgödsel avskaffas – en delrapport.* <http://www.statistikmyndigheten.se/upload/publikationer/2010/2010108.pdf>
- Statistics Sweden (2000): *Environmental taxes and environmentally harmful subsidies.*
- Statistics Sweden (2012): *Hållbarhet i svenskt jordbruk 2012.*
- Stern, T. (2006): *Survey of Transport Fuel Demand Elasticities.* <http://www.naturvardsverket.se/Documents/publikationer/620-5586-0.pdf>
- Stockholms- och Uppsala Läns Luftvårdsförbund (2008): *Utsläpps- och hälsokonsekvenser i Stockholms län vid en övergång till Europadiesel.* (http://www.itm.su.se/documents/publications/Preem_rapport.pdf) LVF 2007:38.
- Swedish Environmental Protection Agency (2012): *Potentiellt miljöskadliga subventioner.*
- Swedish Environmental Protection Agency (2013): *Kartläggning av potentiellt miljöskadliga subventioner – En handledning.*
- Söderqvist, T. and Hasselström, L. (2008): *The economic value of ecosystem services provided by the Baltic Sea and Skagerrak – Existing information and gaps of knowledge.* Report 5874. Swedish Environmental Protection Agency.
- Trafikmyndigheten Göteborgs stad (2002): *Miljöledning av transporter.* <http://www2.trafikmyndigheten.goteborg.se/resourcelibrary/miljoledning.pdf>
- Valsecchi C., ten Brink P., Bassi S., Withana S., Lewis M., Best A., Oosterhuis F., Dias Soares C., Rogers-Ganter H., Kaphengst T. (2009): *Environmentally Harmful Subsidies: Identification and Assessment, Final report for the European Commission's DG Environment.* November 2009.
- Walls, M. (2006): *Agriculture and environment.* SCAR Foresight Group.
- Watkins P., Downing, T., Handley, C. and Butterfield R. (2005): *The Impacts and Costs of Climate Change.*
- Withana, S., ten Brink, P., Franckx, L., Hirschnitz-Garbers, M., Mayeres, I., Oosterhuis, F., and Porsch, L. (2012): *Study supporting the phasing out of environmentally harmful subsidies.* A report by the Institute for European Environmental Policy (IEEP), Institute for Environmental Studies – Vrije Universiteit (IVM), Ecologic Institute and Vision on Technology (VITO) for the European Commission – DG Environment. Final Report. Brussels. 2012.
- World Bank, World Development Indicators, data for road sector fuel consumption in the Nordic countries, collected from <http://data.worldbank.org/indicator/IS.ROD.DESL.PC>

Sammanfattning

Abstrakt

Den här rapporten innehåller två delar. Del 1 presenterar en översikt av användningen av ekonomiska styrmedel i de nordiska länderna, och förändringar som har skett under perioden 2010–2013. Del 2 innehåller ett ramverk för att undersöka vilka faktorer, eller instrument, i offentliga budgetar som kan anses miljöfarliga (eller klassificeras som miljöskadliga subventioner). Del 2 innehåller också tre fallstudier av sådana potentiellt skadliga subventioner.

Miljöskattereform, antagande av handlingsplanerna för förnybar energi och införande av EU:s system för handel med utsläppsrätter på Island är några av de stora förändringar av ekonomiska styrmedel som används inom miljöpolitiken i de nordiska länderna. Sen Islands inträde är EU ETS det primära ekonomiska instrumentet för att minska utsläppen av växthusgaser i alla nordiska länder. Instrument som används för att nå andra miljömål, till exempel minskning av avfall och bevarande av haven, har varit relativt oförändrade sedan 2009, eller utsatts för små förändringar.

Tre miljöskadliga subventioner har analyserats och klassats utifrån de skatte- och miljömässiga konsekvenserna av en reform: 1) lägre energiskatt på diesel som används i transportsektorn jämfört med bensin, 2) EU:s direktstöd till bönder, och 3) överallokering av utsläppsrätter inom EU:s system för handel med utsläppsrätter.

Bakgrund

Vart tredje till fjärde år publicerar Nordiska ministerrådets arbetsgrupp för miljö och ekonomi en översikt av användningen av ekonomiska styrmedel i miljöpolitiken i de nordiska länderna. Den här rapporten är en del av den serien.

Den första delen av rapporten beskriver användningen och förändringar av *ekonomiska styrmedel* i miljöpolitiken i de fem nordiska länderna, med fokus på perioden 2010–2013. Ekonomiska styrmedel korregerar marknadsmisslyckanden, såsom negativa externaliteter, genom att

justera priset på varor och tjänster så att de återspeglar samtliga kostnader och fördelar med att producera och konsumera dem. De nordiska länderna var tidiga med att använda ekonomiska styrmedel, främst skatter, och har idag ett relativt komplext regleringssystem format av en mängd faktorer. Del 1 av rapporten ämnar bidra till den samlade informationen om miljöinstrument i Norden.

Den andra delen av rapporten undersöker, i linje med tidigare rapporter, en tematisk fråga. I rapporten för 2010–2013 läggs särskilt fokus på miljöskadliga subventioner. Vi skapar ett ramverk för att undersöka vilka instrument eller element i statsbudgetar som kan anses vara miljöfarliga. Med hjälp av ramverket bedömer vi de politiska möjligheterna att reformera tre olika miljöskadliga subventioner genom att analysera dem utifrån två viktiga dimensioner:

- De finanspolitiska budgetkonsekvenserna av att reformera/eliminera miljöskadliga subventioner.
- Miljöpåverkan av att reformera/eliminera miljöskadliga subventioner.

De tre miljöskadliga subventioner som analyserats är 1) lägre energiskatt på diesel som används i transportsektorn jämfört med bensin, 2) EU:s direktstöd till bönder, och 3) överallokering av utsläppsrätter inom EU:s system för handel med utsläppsrätter.

Slutsatser och rekommendationer

Största förändringarna har skett inom områdena energi och klimat

De nordiska ländernas nationella miljömål är i många avseenden mer långtgående än de mål som satts på EU-nivå. Ekonomiska instrument inom energi- och klimatpolitiken är särskilt progressiva, och har sedan 2009 reviderats för att stärka dess miljöstyrningseffekt. Förutom av skattemässiga skäl, har energiskatter i de nordiska länderna syftet att främja användningen av miljövänliga bilar, förbättra energibesparingar, minska utsläppen av växthusgaser och öka användningen av inhemska energiresurser.

Förändringar i EU:s ETS-system, såsom inledningen av fas III och inkludering av luftfarten, har påverkat alla de nordiska länderna. Island har märkt störst effekt, eftersom landet gick med i EU ETS under 2012. I och med Islands inträde är EU ETS det primära ekonomiska instrumentet för att minska utsläppen av växthusgaser i alla nordiska länder. In-

strument som används för att nå andra miljömål, som exempelvis minskning av avfall och skydd av marina miljöer, har varit relativt oförändrade sedan 2009, eller förändrats marginellt.

Skattereform i Danmark

Under 2009 infördes en skattereform i Danmark, som innehöll flera förändringar på miljöområdet och som generellt gjorde miljöskadlig verksamhet dyrare. De flesta skattesatserna på fossila bränslen har ökat sedan 2009, och energiskatten på naturgas har ökat med över 30 procent under de senaste fyra åren.

Andra förändringar är införandet av en extra avgift för användning av vatten och hantering av avloppsvatten. För avfall har en skatt på förbränning tagits bort för att ersättas av en avgift på energiinnehåll, och en skatt på behandling av farligt avfall har införts. Dessutom kommer en viktbaserad förpackningsskatt tas bort den 1 januari 2014. På transportområdet har utformningen av både registreringsavgiften och punktskatten på fordon förändrats för att skapa incitament för bränsleeffektiva bilar. Beskattning av bekämpningsmedel har radikalt förändrats under 2013, från att vara värdebaserad, till att baseras på miljö- och hälsoegenskaper hos produkterna.

Feed-in tariffer infördes i Finland år 2011

Som ett resultat av en energiskattereform i Finland år 2011 är energiskatterna nu baserade på bränslens energiinnehåll, koldioxidutsläpp och lokala utsläpp (partiklar). Det har lett till högre skatter på kol, naturgas och en del andra bränslen. Dessutom har biobränsle gynnats av reformen, då det relativa priset på biobränsle har sjunkit i jämförelse med priset på fossila bränslen. För att stödja produktion av förnybar energi infördes feed-in tariffer år 2011.

Andra ekonomiska styrmedel har också reviderats och implementerats för att stärka miljöstyrningen. Till exempel har registreringsavgiften och den årliga fordonsskatten ändras så att bilar med lägre CO₂-utsläpp får lägre skatt. Dessutom har en avfallsskatt, som är ett av de viktigaste styrmedlen för avfallshantering i Finland, ökat flera gånger sedan 2009.

Island inkluderades i EU:s system för handel med utsläppsrätter

Det har skett en märkbar förändring på Island under de senaste åren mot ökad användning av ekonomiska styrmedel inom vissa områden av miljölagstiftningen, särskilt energi- och klimatpolitik. Ett flertal lagändringar på klimat- och energiområdet har skett sedan 2009. De viktigaste förändringarna är införandet av EU:s system för handel med utsläppsrätter, som introducerades på Island för första gången 2012, en ny kol-

dioxidskatt på fossila bränslen och nya (eller långvariga) skatterabatter för icke-fossila bränslen och bilar som använder förnybar energi. En ny skatt på energiförsäljning infördes under 2009, för att reducera budgetunderskottet efter den ekonomiska nedgången under 2008. Punktskatter på bränslen för transportändamål har också ökat markant under 2009 av samma skäl.

En viktig förändring gjordes inom transportsektorn 2011, då punktskatter och skatter på fordon kopplades till CO₂-utsläpp i stället för cylindervolym och vikt. Förändringar i andra sektorer har varit små.

Få förändringar i Norge

Förändringar i energi- och klimatbeskattning i Norge sedan 2009 inkluderar höjningar av grundskatten på mineralolja, CO₂-skatten på naturgas och gasol, och CO₂-skatten på petroleumverksamhet på den internationella marknaden. Den senare fördubblades nästan under 2013. Fiskeindustrin, som tidigare varit skattebefriad, möter från och med 2013 krav att betala (en reducerad) CO₂-skatt på mineralolja.

Från och med 1 januari 2012 infördes i Norge ett elcertifikatsystem för förnybar energi. Systemet innebär elproducenter kan få ett certifikat för varje producerad megawattimme (MWh) förnybar el. Den som är kvotpliktig enligt lagen om elcertifikat (främst återförsäljare av el) måste köpa en viss andel elcertifikat i förhållande till sin elförsäljning eller elanvändning. Certifikaten handlas på en marknad som har integrerats med den svenska marknaden. Ytterligare förändringar inkluderar en utökning av väganvändningsskatten på bränsle för att täcka användningen av biodiesel som drivmedel.

Under 2010 togs skatten på avfallsförbränning bort i Danmark och deponiskatten reformerades. Förutom ett förbud mot att placera nedbrytbara material i deponier, har deponiskatten sänkts med nästan 40 procent för avfall som placeras i deponi. Under 2012 lades en skatt på NO_x-utsläpp till fordonsregistreringsavgiften.

Energiskatt på skogsbruk, fiske och jordbruksverksamhet i Sverige

Nya ambitiösa energi- och klimatmål antogs i Sverige 2009. Efter reformen introducerades en energiskatt och en ökning av CO₂-skatten för industrier utanför EU ETS, inklusive skogsbruk, fiske och jordbruk. Reformen minskade också antalet undantag för inhemsk industri. Sverige har dessutom sedan 2009 tagit ett initiativ för lokala åtgärder för vattenbevarande.

På avfallsområdet har den svenska skatten på avfallsförbränning tagits bort och panten för aluminiumburkar höjts under 2010. Inom transportsektorn har flera förändringar gjorts under 2013 av den årliga skatten på fordon, och de flesta fordon har nu en högre skattesats. En su-

permiljöbilspremie infördes också under 2013, för att främja personbilar med mycket låga utsläpp av växthusgaser. Dessutom införde Göteborg, som den andra staden i Sverige, en trängselskatt från och med den 1 januari 2013.

Potentiellt miljöskadliga subventioner är studerade av ett flertal aktörer

Miljöfarliga subventioner (EHS) har nyligen undersökts av flera viktiga institutioner och organisationer på EU-och OECD-nivå. EU, tillsammans med andra, har sedan länge ett åtagande om att avskaffa eller avveckla EHS, eftersom subventionerna innebär påfrestningar på offentliga budgetar och ökar de globala växthusgasutsläppen. Två aspekter som till stor del avgör den politiska möjligheten för EHS-reformer är de skatte- och miljömässiga konsekvenserna av att fasa ut sådana subventioner. Genom att kombinera effekterna på miljön och de offentliga budgetarna är det möjligt att peka ut vilka miljöskadliga subventioner som kan reformeras för att generera positiva effekter i båda områdena, och på så sätt vara politiskt möjliga att reformera.

Kvantitativa åtgärder kan användas för att klassificera EHS

Vi har utvecklat en metod och försökt skapa kvantitativa mått för både skattekonsekvenserna och de miljömässiga konsekvenserna av EHS-reform, som är jämförbara mellan olika subventioner. Det ger oss möjlighet att rangordna eller gruppera subventionerna utefter vilka som är mest fördelaktiga att reformera eller ta bort. Syftet är att skapa förutsättningar för ytterligare och mer djupgående arbete, där fler EHS kan klassificeras enligt med ramverket. Därmed kan en mer omfattande prioriteringslista för politiska åtgärder utvecklas.

Subventioner med mest negativa miljö- och skattekonsekvenser bör reformeras först

En omfattande lista av konsekvenserna av att reformera enskilda EHS möjliggör för beslutsfattare att bestämma och dokumentera de subventioner som bör övervägas för reformer eller studeras ytterligare. Insatserna bör riktas dit där de har störst effekt. Vi har applicerat vårt ramverk i tre fallstudier, för att belysa dess användning och för att visa hur olika EHS kan klassificeras. Fallstudierna är följande:

- Lägre energiskatt på diesel som används i transportsektorn jämfört med bensen.
- EU: s direktstöd till jordbrukare.
- Överallokering av utsläppsrätter inom EU: s system för handel med utsläppsrätter.

Tabellen visar de beräknade effekterna för miljön och offentlig budget, samt en kvot med de båda måtten.

Skatte- och miljömässig effekt av att reformera identifierade EHS

EHS	Miljömässig effekt	Skattemässig effekt	Miljömässig/ Skattemässig effekt
Lägre energiskatt på diesel som används i transportsektorn jämfört med bensen	89 – 223 mn €	1–3 mdr €	0.07 – 0.22
EU:s direktstöd till jordbrukare	61 – 135 mn €	218 mn €	0.28 – 0.62
Överallokering av utsläppsrätter inom EU:s system för handel med utsläppsrätter	240 mn €	1 mdr €	0.24

Not: Kvantifiering av icke-monetära (miljömässiga) effekter är i sig osäkert. Det går är heller inte att sätta ett ekonomiskt värde på alla miljöeffekter. Där det är möjligt har vi använt ett lägre och ett högre värde, men beräkningarna ska ändå tolkas som grova indikationer.

Källa: Del 2.

Enligt tabellen har direktstödet till jordbrukare den minsta miljö- och skattemässiga effekten. Energiskatten på diesel har något större miljöeffekt och överallokeringen av utsläppsrätter har det största övre värdet för potentiell miljöeffekt. Även om detta indikera att utsläppsrätterna är bäst lämpade för reformering innebär det kanske också den mest drastiska åtgärden, vilket skulle kunna hämma dess potential för reform.

En aspekt att beakta i det här sammanhanget är storleken på den skattemässiga effekten i förhållande till miljöeffekten. En reform med stor relativ skatteeffekt kan kritiseras för att drivas mer av skattemässiga motiv än av miljömässiga. EU:s direktstöd till jordbrukare verkar ha den största relativa andelen miljöeffekt, vilket innebär att den ger den största miljöeffekten per skatteeffekt.

Andra effekter av EHS-reformer behöver studeras

I praktiken vägs miljö- och finanspolitiska frågor mot andra ekonomiska intressen och andra potentiella effekter av miljöskadliga subventioner. Borttagandet av en subvention kan minska den inhemska industrins konkurrenskraft, påverka sysselsättningen eller minska konsumenternas välfärd. Dessutom kan det finnas argument för att bevara subventioner med effekter som är svåra att kvantifiera i ekonomiska termer,

som exempelvis livsmedelssäkerhet som en effekt av jordbrukssubventioner. Sådana aspekter behöver analyseras ytterligare innan reformer föreslås. Dynamiska effekter som till exempel ekonomiska effekter av förändringar i priser och efterföljande effekter i produktions- och konsumtionsbeslut kommer troligen att uppstå. De effekterna bör undersökas ytterligare. Den nuvarande studien tar hänsyn till vissa dynamiska effekter, men främst statiska effekter av borttagandet av subventioner.

En viktig dimension av att reformera en subvention är i vilken grad ett enskilt nordiskt land, eller de nordiska länderna tillsammans, kan påverka den. Det finns till exempel inte mycket manövreringsutrymme inom ramen för EU:s system för handel med utsläppsrätter. De nordiska länderna kan dock, till och med inom ramen för EU:s system, enskilt eller tillsammans, följa Storbritanniens exempel och sätta ett minimipris för koldioxid för anläggningar som omfattas av EU:s system för handel med utsläppsrätter.

The Use of Economic Instruments

The Working Group on Environment and Economy of the Nordic Council of Ministers publishes regular reports on the use of economic instruments in Nordic environmental policy. This report is part of that series and has two parts.

Part 1 presents an overview of the use of economic instruments in Nordic environmental policy, with a focus on policy changes over the period 2010–2013. Part 2 develops a framework for assessing the political possibilities of reforming environmentally harmful subsidies, and applies this framework to three cases relevant in the Nordic context.

The report was prepared by Copenhagen Economics, GreenStream and Environice. The authors of the report are Hrafnhildur Bragadóttir, Carl von Utfall Danielsson, Roland Magnusson, Sampo Seppänen, Amanda Stefansdotter and David Sundén.

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