



Climate-related taxes
– Who pays?

RIR 2012:1



SWEDISH NATIONAL
AUDIT OFFICE

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RiR 2012:1

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TO THE RIKSDAG

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We hereby deliver, in accordance with Section 9 of the Act (2002:1022) on auditing of state activities, etc., the following performance audit report:

Climate-related taxes – Who pays?

The Swedish National Audit Office has audited the application of climate-related taxes, which are important policy instruments for achieving the climate objectives set by the Riksdag. The audit results are presented in this performance audit report.

Representatives for the Ministry of Finance, the Ministry of the Environment, the Ministry of Enterprise, Energy and Communication, the National Institute of Economic Research, the Swedish Environmental Protection Agency, the Swedish Tax Agency, the Swedish Energy Agency and Statistics Sweden have had the opportunity to check the accuracy of factual content and otherwise submit views on the draft of the final report.

The report contains conclusions addressed to the Government and the agencies concerned as well as recommendations addressed to the Government.

Auditor General *Claes Norgren* has had the right of decision in this matter. Audit Director *Fredrik Engström* was responsible for the presentation of the report. Senior Auditor *Madeleine Nyman* and programme manager *Lena Björck* assisted in producing the final version of the report.

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Summary

The Swedish National Audit Office (Swedish NAO) has audited the application of climate-related taxes, primarily those on energy and carbon dioxide. These are important policy instruments for achieving the climate and energy policy objectives set by the Riksdag. Cost-effectiveness and the polluter pays principle are cornerstones in the structuring of climate-related taxes.

The Swedish NAO's overall conclusions are that climate-related taxes lead to distribution effects, both between households and trade and industry, between different types of households, between the trading and the non-trading sectors and between various trade and industry sectors. The polluter pays principle is one of the Riksdag's points of reference for tax policy, but it is not applied to its full extent. There are major differences with respect to how much different polluters pay for emissions. Climate-related taxes and the EU Emissions Trading System are not the same type of policy instrument, but in practice their combined effect has been to increase these differences. According to the Government, there may be reasons for deviating from the polluter pays principle if there is a risk of carbon leakage, that is, that production will be placed in countries with no, or with lower, emissions expenditures. But the Government has not analysed or reported the amounts different trade and industry sectors have paid for emissions. The analyses and reporting provided by the Government and agencies do not provide a comprehensive and clear picture of the expenditures for and the effects of climate-related taxes. This means that agencies, the Government and the Riksdag do not have a basis for assessing whether climate-related taxes in combination with other policy instruments are cost-effective and to what extent they are compatible with the polluter pays principle. Furthermore, there is also no basis for assessing the risk of carbon leakage with respect to various Swedish trade and industry sectors and sub-sectors. Reductions made to climate-related taxes run the risk of reduced cost-effectiveness, and it is therefore necessary to have a basis for assessing whether any claims for compensation are reasonable.

Audit background

Reasons: Climate-related taxes – primarily those on energy and carbon dioxide – are financially the most significant policy instrument in Swedish climate policy. The complexity of the system means that it is difficult to discern how much different types of polluters have to pay for their emissions. The polluter pays principle shall, following the intentions of the Riksdag, be fundamental to climate-related taxes, but the principle is not always adhered to. The Riksdag has called for a clearer reporting of the costs and effects of various climate-related measures.

Purpose: The purpose of the audit is to assess whether agency and Government reporting of household and trade and industry expenditure for climate-related taxes is transparent and surveyable. This is the kind of reporting that is necessary in order to provide a decision basis for policy instruments. With a view to assessing the need for reporting, the purpose is also to examine whether there are significant differences in the distribution of expenditure for climate-related taxes between households and trade and industry, between various trade and industry sectors, between companies within and outside the trading sector (that is, companies within or outside the EU Emissions Trading System) and between various household types.

What we have audited: The audit covers the application of climate-related taxes, primarily those on energy and carbon dioxide. The audit includes the question of whether Government and agency reporting of the expenditure for and effects of climate-related taxes is transparent and surveyable. In order to assess the need for reporting, we have examined whether there are significant differences in the distribution of expenditure for climate-related taxes. Overall trade and industry expenditure for climate-related taxes and allowances in the EU Emissions Trading System is also included.

Audit results

The audit has reached the following conclusions and findings:

Expenditure for climate-related taxes is unevenly distributed

Trade and industry generates approximately four fifths of carbon dioxide emissions, but households have to pay almost half of the climate-related taxes. Companies within the trading sector have lower expenditure for climate-related taxes than companies outside the trading sector.

In the long term, the tax restructuring being carried out for the years 2010–2015 will have little impact on the economy as a whole. In addition, this restructuring has only a marginal effect on emissions, and so the possibilities of achieving the climate objective are only marginally influenced.

The tax restructuring leads to companies within the trading sector having an even lower expenditure for climate-related taxes. One reason for this is that companies within the trading sector are assumed to have expenditure for emission allowances. At the same time, companies outside the trading sector have greater expenditure.

The polluter pays principle is not always applied to trade and industry. The expenditure of trade and industry for climate-related taxes constitutes a small part of the total costs of trade and industry/companies. Expenditure for energy and carbon dioxide taxes was approximately 4 per cent of the companies' total costs in 2009. Furthermore, the costs of many companies for climate-related taxes are in practice approximately 25 per cent lower than their payments to the central government because climate-related taxes are deductible in the companies' income tax assessment.

EU Member States have the national discretion to decide that up to 10 per cent of the emission allowances in the second period of the Emissions Trading System (2008–2012) shall be auctioned. Auctioning is considered by, inter alia, the National Institute of Economic Research and the OECD to be a better allocation method than free allocation, and the Government believes that auctioning helps to achieve compliance with the polluter pays principle. Sweden has, in contrast to six other Member States, chosen not to auction any allowances.

Both the EU Emissions Trading System and the carbon dioxide tax mean that there is a price on carbon dioxide emissions, but companies in the trading sector have in practice paid very little, in some cases nothing, for emissions. This is due to reductions in and exemptions from climate-related taxes. This is also due to Swedish companies having obtained a completely free allocation of allowances and that the availability of emission allowances has been favourable because the cap has been high in relation to actual emissions. The total emissions in the EU Emissions Trading System can only be changed if the cap for the total emissions in the trading system is changed.

In addition, every year from the start of the Emissions Trading System in 2005, the trading sector in Sweden has been allocated far more emission allowances than it has required. In this way, some installations and trade and industry sectors may have received considerable income without having had to reduce emissions or to take action to reduce emissions. To date, the surplus of allowances that have been allocated free of charge to Swedish companies has constituted a redistribution which can be estimated to a value of approximately SEK 1.8 billion. However, if allowances are sold, a taxable revenue is generated which may reduce the value of this surplus.

The tax restructuring for the period 2010–2015 alone means that trade and industry is estimated to have increased expenditure for climate-related taxes corresponding to approximately SEK 0.3 billion per annum. Companies within the trading sector are expected to have an overall reduction in expenditure for climate-related taxes. The non-trading sector is estimated to have increased expenditure.

Households pay a large portion of the climate-related taxes. In 2008, households accounted for approximately 19 per cent of carbon dioxide emissions, but paid nearly half of the climate-related taxes. The household type ‘cohabiting without children’ has the highest expenditure for climate-related taxes per consuming unit. These households also account for the highest carbon dioxide emissions. The households paid climate-related taxes averaging SEK 2700 per tonne of emissions from car travel and oil heating in 2007.

The households’ total expenditure for the energy and carbon dioxide tax on fuels and motor fuels and on vehicle tax is expected to increase by the equivalent of SEK 1.8 billion per annum as a result of the tax restructuring for the period 2010–2015. There is no appreciable effect on the proportional distribution between different types of households.

The restructuring of the carbon dioxide tax has increased its cost-effectiveness. According to the analysis carried out by the National Institute of Economic Research for the Swedish NAO, the part of the tax restructuring for the period 2010–2015 that relates to carbon dioxide tax has increased the cost-effectiveness of the carbon dioxide tax in relation to the national climate objective. This is the case because the altered carbon dioxide tax can bring about a certain reduction in emissions in the non-trading sector at a lower economic cost, in the form of reduced GDP, compared with the achievement of the same emissions reduction with the previous structure of the carbon dioxide tax.

Government and agency reporting does not provide a comprehensive picture of the costs and effects of climate-related taxes

Inadequate analyses lead to insufficient reporting. Government reporting to the Riksdag on household and trade and industry costs for emissions is unclear and incomplete.

In relation to the climate-related taxes, the Government has not presented a comprehensive, clear picture of the distribution of costs between trade and industry and households or within trade and industry. With regard to distribution effects, there are however some limited surveys of climate-related taxes in Checkpoints 2004 and 2008.

Neither has the Government reported any comprehensive picture of how the costs of trade and industry are affected by the Emissions Trading System. The accumulated surplus has corresponded to 1.4 million tonnes of carbon dioxide emissions and may be calculated to have been worth SEK 1.8 billion for the years 2005–2010. In spite of this significant redistribution, the Government has not reported the size or value of the surplus.

The lack of reporting of expenditure and costs for climate-related taxes and emission allowances also entails that the Government has not reported the overall effect of these.

The Government has not designated any agency or ministry to be responsible for the comprehensive reporting of costs and effects of the climate-related taxes, the Emissions Trading System or the interaction between these policy instruments in relation to emissions. One reason for the lack of a coherent picture seems to be that no one has overall responsibility for its reporting. The conducted analyses do not provide a comprehensive picture.

Fragmentary analysis and reporting of the effects of the tax restructuring. No survey has been carried out concerning the distribution of expenditures for climate-related taxes between households and trade and industry, between various trade and industry sectors and between various household types brought about by the tax restructuring for the period 2010–2015. The agencies have surveyed the effects of climate-related taxes in certain respects, but there is no overall compilation and analysis.

Government reporting focuses on the 2020 target

The management of climate policy through climate-related taxes is in practice relatively short-term. The Government focus is on the 2020 target. The Government has not specified the trajectory of how the long-term vision for the year 2050 is to be fulfilled. However, the Government has commissioned the Swedish Environmental Protection Agency to produce a roadmap for a Sweden without net emissions of greenhouse gases by 2050. The Government has also appointed a special consultative group for dialogue on the Government's objective of a Sweden without net emissions in 2050.

In the present situation, it is not possible to monitor the actual contribution of the climate-related taxes to the milestone target in 2020. Follow-up of the milestone target is further complicated by the fact that the Environmental Protection Agency's reporting of emissions from the non-trading sector is difficult to follow in parts. Furthermore, the general equilibrium model EMEC of the National Institute of Economic Research is inadequate for analysis of the distribution effects of the Emissions Trading System, partly because the trade and industry sectors in the model are not broken down by trading and non-trading sector. In order to guarantee the ability of Checkpoint 2015 to provide a clear picture of the expenditures for emissions in relation to these emissions, the Government needs to ensure that there are clear and comprehensive analyses of the costs of trade and industry and households for climate-related taxes. An analysis of the costs and income of trade and industry with respect to emission allowances is also necessary. An analysis of this kind would also improve the bases for negotiations and the structure of forthcoming periods of the trading system.

Recommendations to the Government

The Swedish NAO makes the following recommendations to the Government in order to achieve a better analysis and reporting. Ultimately, these recommendations are intended to produce good bases for making decisions that will lead to the long-term achievement of the climate objective at a reasonable cost. Good bases for decision-making are also necessary in order to assess whether climate-related taxes in combination with other policy instruments fulfil the polluter pays principle and to assess the risk of carbon leakage.

- The Government should report comprehensively on how great the polluters' costs for climate-related taxes and emission allowances are in relation to the volume of emissions. Reporting should encompass trade and industry and households, different types of household, various trade and industry sectors and the trading and the non-trading sectors. Such reporting is important in order to determine an appropriate structure and scope for various Swedish policy instruments so that the climate objective can be achieved at a reasonable cost. It is also important in order, for example, to assess whether claims for compensation from various groups are well founded and whether there is a risk of carbon leakage. In addition, bases are necessary for negotiations on the structure of the EU Emissions Trading System in forthcoming trading periods.
- The Government should guarantee that the agencies provide information to the Government to facilitate such reporting.
- The Government should designate a clear responsibility for the coordination of continuous data collection, analyses and comprehensive reporting of the costs for and effects of the climate-related taxes, the Emissions Trading System and the interaction between these policy instruments in relation to the development of emissions. This is necessary because the analyses that are currently conducted are fragmentary and do not provide the overall picture which would be needed to make well-founded decisions in order to make the climate-related measures more effective. Coordination responsibility should be designated as soon as possible so that the work on specifying and assembling the necessary statistical basis and relevant analysis tools is secured in good time for the in-depth reporting in Checkpoint 2015.

1 Audit background and focus

1.1 Audit background and reasons

The average temperature of the Earth is rising. Climate change and its threat to societies is global. The emissions of greenhouse gases from human activities are considered to be a significant cause of this rise in average temperature.

Climate-related taxes – primarily those on energy and carbon dioxide – are financially the most significant policy instrument in Swedish climate policy. These taxes are also of great fiscal importance. Climate-related taxes amount to a total of approximately SEK 80 billion per annum.¹ Many environmental economic researchers maintain that climate-related taxes are, in addition to the trade in emission allowances, a cost-effective policy instrument that should be refined in order to avoid a duplication of policy instruments. The system of energy and carbon dioxide taxes has often been criticised because it is complicated and unsurveyable with a large number of exemptions and reductions. The complexity means that it is difficult to identify the size of the total tax burden and the taxation's distribution effects. In this context, the term 'distribution effects' refers primarily to changes in costs and income between trade and industry and households, and between various trade and industry sectors.² The structure also entails a risk that the taxation is not applied in a cost-effective manner in order to achieve the climate objectives.

The polluter pays principle is fundamental in environmental and climate policy, but it is not always adhered to in the case of the climate-related taxes.³ Many changes will risk producing a lack of long-term planning. A long-term approach is needed in order to give companies and the general public a sufficient planning horizon to make rational choices. It is also needed to bring about the changes that are necessary if the objective of limited climate impact is to be achieved. In order to obtain adequate bases for decision-making, the Riksdag

¹ Income from energy, carbon dioxide and vehicle taxes according to Principles for calculations for 2012.

² Distribution effects may also relate to differences between various countries, for example.

³ There is no definition of the polluter pays principle, and there are differences of opinion as to how far-reaching the principle is. One example is whether the principle applies to costs which correspond to the theoretically optimal pollution level in terms of economics.

has also called for clearer reporting of the costs and effects of various climate-related measures.

In order to provide good bases for making decisions on changes to climate-related taxes and other climate policy instruments, comprehensive analyses of emissions and distribution effects will need to be conducted, for example of who has to pay in order to reduce emissions.

In spring 2011, the Swedish NAO carried out a prestudy of climate-related taxes. During the prestudy, several indications of problems in the central government initiatives emerged. These included the fact that the Government has not presented any overall analysis or assessment of how the costs for climate-related taxes are distributed between households and trade and industry or between different parts of trade and industry. The Government has also failed to observe or present the combined effects of climate-related taxes and the EU Emissions Trading System to the Riksdag.

The audit has been carried out within the framework of the Swedish NAO's audit strategy, Sustainable development – Climate. The audit strategy's overall objective is to examine whether the central government applies its policy instruments to reduce the greenhouse gas emissions in accordance with the objectives set and at a reasonable cost.

1.2 Purpose and audit questions

The purpose of the audit is to assess whether agency and Government reporting of household and trade and industry expenditure for climate-related taxes is transparent and surveyable. This is the kind of reporting that is necessary in order to provide a decision basis for policy instruments. With a view to assessing the need for reporting, the purpose is also to examine whether there are significant differences in the distribution of expenditure for climate-related taxes between households and trade and industry, between various trade and industry sectors, between companies within and outside the trading sector and between various household types.

The audit proceeds from the following audit questions:

- Are there significant distribution effects, that is, differences in how much different polluters have to pay for their emissions?
- Do Government and agencies report the substantial distribution effects that may exist?
- Does the Government provide sufficient information to the Riksdag on measures and effects in relation to binding and optional objectives with different time horizons?

The foundation of the audit's points of departure includes the Riksdag's decisions on Government Bills relating to climate and energy and the Riksdag's guidelines for tax policy. One point of departure is that the climate-related taxes shall contribute to cost-effective reductions in emissions, partly with reference to the competitiveness of trade and industry. Furthermore, the taxes shall be coordinated with other policy instruments – such as trade in emission allowances. The polluter pays principle shall apply. Significant distribution effects of climate-related taxes in combination with other policy instruments need to be surveyed and analysed in order to assess the need for the reporting and accounting of such effects.

1.3 Audit scope

1.3.1 *Central government initiatives in the area*

Energy tax, carbon dioxide tax and vehicle tax are designated in this report as *climate-related taxes*, because they are important policy instruments for the achievement of the climate objectives. Energy tax is a collective term for excise duties on a number of fuels and on electrical power. In connection with the tax reform of 1990/91, carbon dioxide tax and sulphur tax on fuels as components of energy taxation were introduced. The purpose of carbon dioxide tax is to reduce carbon dioxide emissions. The primary purpose of energy tax is to generate tax revenues and to contribute to the more efficient use of energy. In practice, it is difficult to distinguish between the effects resulting from the energy tax and those resulting from carbon dioxide tax, since both affect the price.

Vehicle tax has been designed with regard to, inter alia, reasons of central government finances and to aspects of environment and traffic safety. In order to increase the effect of vehicle tax as an environmental instrument, a carbon dioxide component to vehicle taxation was introduced in 2006 for new private cars.

The EU Emissions Trading System is not a direct central government initiative, but a significant policy instrument for reducing carbon dioxide emissions from installations in the EU. Both the carbon dioxide tax and the allowances put a price on carbon dioxide emissions. Trade and industry expenditure for allowances in the EU Emissions Trading System is also taken into account in the audit.

1.3.2 Responsible agencies and ministries

Issues of climate-related taxes, emissions and emission allowances fall under the remit of several different ministries. These departments have several responsible agencies under their supervision. The table below provides an overview of these actors along with their tasks in this area.

Ministries	Ministry of Finance The Ministry's remit covers tax, customs and enforcement. Responsible for directing the Swedish Tax Agency, Statistics Sweden and the National Institute of Economic Research.	Ministry of the Environment The Ministry's remit covers climate policy. Responsible for directing the Swedish Environmental Protection Agency.	Ministry of Enterprise, Energy and Communications The Ministry's remit covers enterprise policy, energy policy and transport policy. Responsible for directing the Swedish Energy Agency.
Agencies	The Swedish Tax Agency Responsible for the collection of, inter alia, taxes and social security contributions.	The Swedish Environmental Protection Agency Responsible for the official Swedish emissions statistics and for the reporting of Swedish emissions to the UN and the EU.	The Swedish Energy Agency Responsible for the Swedish Emissions Trading Registry (SUS), where the allowances of Swedish, and other, installations in the EU Emissions Trading System are handled.
	Statistics Sweden Responsible for Sweden's environmental accounts. Runs the micro-simulation model FASIT and the FRIDA database.		
	The National Institute of Economic Research Commissioned by the Government to produce an annual report on the economic aspects of environmental policy. Runs EMEC, a general equilibrium model.		

1.3.3 Limitations

The audit focuses primarily on the energy and carbon dioxide taxes, which are important policy instruments for achieving the climate and energy policy objectives set by the Riksdag. Vehicle tax is taken into account in certain respects by the audit, for example in the case of the effects of the energy and carbon dioxide taxes on households in combination with the effects of the vehicle tax. For trade and industry, the climate-related taxes' interaction with income tax with respect to income tax assessment deductibility is also taken into account. The EU Emissions Trading System (ETS) is not audited as such. On the other hand, we do examine the coordination of Swedish climate-related taxes with the trading system and the combined effects of these policy instruments. Significant aspects in this respect are the reporting of income and expenditure as well as emissions within and outside the trading system.

The audit also includes the Government's management and follow-up of the climate-related taxes.

The following areas are not covered by the audit, even though they have some bearing on the costs of trade and industry and households for emissions:

- company car taxation, inter alia, with regard to green cars
- deductions for travel to and from work
- congestion charge
- road charges for heavy goods vehicles
- tax on the thermal power output of nuclear power reactors and increased property tax for an electricity generation unit which consists of a tax assessment unit with a hydroelectric power station compared with other electricity generation units
- electricity certificates/quotas.

1.4 Assessment criteria

The following statements and criteria summarise the points of departure for the Swedish NAO's assessments:

Are there significant distribution effects, that is, differences in how much different polluters have to pay for their emissions?

The point of departure for the Swedish NAO is that comprehensive analyses of emissions and distribution effects, for example of who has to pay in order to reduce emissions, are important bases for decision-making. If the Government and agencies do not produce such information, the implementation of an effective climate policy risks becoming more difficult through, for example,

claims for compensation from various groups. There will then be no basis for assessing whether the claims are well founded, and decision-makers will have difficulties in determining which policy instruments can be applied (and to what extent) without serious unwanted side effects. These side effects may include the deterioration of Sweden's competitiveness or that certain groups of society have to bear an unreasonably heavy burden in order to reduce emissions.

The Swedish NAO also proceeds from Government statements in various contexts on the importance of a cost-effective climate policy. Cost-effectiveness is promoted, for example, by companies encountering the same carbon dioxide price within and outside the Emissions Trading System.⁴

The following decisions and statements by the Riksdag form the basis of the Swedish NAO's assessments:

- The Riksdag's environmental objective Reduced Climate Impact and its interim target for the year 2012 and milestone target for the year 2020.⁵
- The Riksdag's decisions/committees' reports on Government Bills relating to energy and climate as well as the Government Bill on certain excise duty issues in view of the budget bill for 2010.⁶
- The Riksdag's guidelines for tax policy in the form of, inter alia, the following points of reference:⁷
 - The tax regulations shall create good conditions for investments in Sweden.
 - Tax policy shall be designed in order to secure the objectives of a general and equitably distributed welfare and higher employment.
 - In the environmental area, the taxes shall be coordinated with other policy instruments, such as trade in allowances – so that the environmental direction becomes effective in terms of the economy.
 - The polluter pays principle shall apply.⁸

⁴ Govt. Bill 2009/10:41 p. 119 f.

⁵ Committee Report 2008/09:MJU28, Riksdag Written Communication 2008/09:300.

⁶ Committee Report 2008/09:MJU28, Riksdag Written Communication 2008/09:300, Committee Report 2008/09:NU25, Riksdag Written Communication 2008/09:301, Committee Report 2009/10:SkU21, Riksdag Written Communication 2009/10:122.

⁷ Govt. Bill 2007/08:100 section 5,3, Committee Report 2007/08:FiU20, Riksdag Written Communication 2007/08:259–260. Compare 2011/12:SkU17 p. 12.

⁸ The *Polluter Pays Principle* is also an established principle of EU law, international environmental conventions and the general rules of consideration in the Swedish Environmental Code. See J. Ebbesson, *Miljö rätt* ('*Environmental Law*'), 2nd edition, p. 153.

Do Government and agencies report the substantial distribution effects that may exist? Does the Government provide sufficient information to the Riksdag on measures and effects in relation to binding and optional objectives with different time horizons?

The point of departure for the Swedish NAO is that a reporting of the distribution of the costs of the climate-related taxes for different polluters is an important prerequisite for being able to assess the reasonableness of claims for compensation from various groups. In this context, distribution refers to that between households and trade and industry, between various trade and industry sectors, between installations within and outside the trading sector and between various household types. Claims for compensation may arise, for example, as a result of changes to the tax legislation or to the trading system that are related to climate policy. Such reporting is also an important basis for being able to assess whether the polluter pays principle is being fulfilled. The point of departure for the Swedish NAO is also that the Riksdag's statements on improved reporting places demands for an appropriate follow-up, analysis and reporting from agencies and the Government. The purpose of improved reporting is to provide a good basis for well-founded decisions on combinations of measures which take into account, inter alia, cost-effectiveness and the polluter pays principle. This will enhance the possibility of achieving the climate objective at a reasonable cost in the long term.

The following decisions by the Riksdag and the position of the (Parliamentary) Committee on Agriculture and the Environment form the basis of the Swedish NAO's assessments:

- The Riksdag has called for better follow-up and reporting by the Government with regard to climate-related matters. In the budget reports for the years 2009–2011, the (Parliamentary) Committee on Agriculture and the Environment has stated the following, inter alia, which the Riksdag has approved:
 - It is important that the Government undertakes continuous follow-up and evaluation of the measures carried out in the climate area as well as presents reports and analyses of the results obtained to the Riksdag. The reporting of results should have a clearer focus on the results and effects of the action taken. The Government should develop relevant indicators which, in an integrated way, can contribute to the assessment of how the various initiatives affect the climate. It is then important to be able to monitor the development of the various indicators over the years, for example in the form of tables.⁹

⁹ Committee Report 2008/09:MJU1, Riksdag Written Communication 2008/09:103.

- The majority of the initiatives which the central government takes in order to achieve climate-related objectives is made within the framework of other areas of expenditure. It would be necessary to have both a coherent reporting of the most important central government initiatives for each area and a report of the result of the initiatives.¹⁰
- It would be an advantage if the Government's reporting also included the trend which can be observed until 2050 – that is, whether the emissions are expected to decline to the desired extent.¹¹
- In its budget report for 2012, the (Parliamentary) Committee on Agriculture and the Environment has submitted the following: In order to achieve sound finances and to be economical with common resources, the combination of measures implemented should be that which will achieve the desired objective at the lowest possible cost in the long term, that is, the most cost-effective combination of measures. According to the Committee, it is very important that economic effectiveness is taken into account in the design of climate policy.¹²

Presented below are the principal objectives of UN climate policy as well as the climate and energy policies of the EU and Sweden, which constitute the foundation of the Swedish NAO's points of departure in the audit (in Appendix 1, we present these objectives and references to them in more detail):

- The parties to the UN Climate Convention have agreed that the global average temperature shall not be allowed to increase by more than two degrees Celsius compared with pre-industrial levels.
- For the EU's part, the European Parliament and the Council have stated that by 2050, global greenhouse gas emissions should have been reduced by at least 50 per cent compared with 1990 levels.
- EU's climate objective by the year 2020 is currently the reduction of emissions by at least 20 per cent.
- The overall objective of EU energy policy is that the share of renewable energy in final energy consumption shall increase to 20 per cent and energy efficiency shall increase by 20 per cent by the year 2020. For the transport sector, an objective of at least 10 per cent renewable energy by 2020 is applicable.
- For Sweden, the share of renewable energy in final energy consumption shall be 49 per cent in the year 2020.

¹⁰ Committee Report 2009/10:MJU1, Riksdag Written Communication 2009/10:129.

¹¹ Committee Report 2010/11:MJU1, Riksdag Written Communication 2010/11:119.

¹² Committee Report 2011/12:MJU1, Riksdag Written Communication 2011/12:99.

- Reduced Climate Impact is one of the 16 environmental objectives decided by the Riksdag. The objective has an interim target and a milestone target. The interim target is applicable for the period 2008–2012 and means that the Swedish emissions of greenhouse gases on average during the period 2008–2012 shall be at least four per cent lower than emissions in 1990. The milestone target for 2020 means that emissions from the non-trading sector shall be 40 per cent lower than emissions in the year 1990. In this way, the greenhouse gas emissions in 2020 shall be approximately 20 million tonnes lower in relation to the 1990 levels.
- The energy policy objectives for 2020 decided by the Riksdag mean the following:
 - The share of renewable energy in 2020 shall be at least 50 per cent of the total energy consumption.
 - The share of renewable energy in the transport sector in the same year shall be at least 10 per cent.
 - Energy consumption shall be 20 per cent more efficient by the year 2020.

1.5 Method

The audit has been carried out with the help of several methods. A review of governing and follow-up documents from the Government and agencies, supplemented with interviews, has been a fundamental element. This has mainly been used to answer the audit questions about the Government's accounting and reporting.

In order to answer the audit question of whether there are significant distribution effects, the Swedish NAO commissioned processing in the following models (more detailed descriptions are found in the report's appendices):

Calculations of the consequences of tax changes in the long term

EMEC¹³ is the computable general equilibrium (CGE) model of the National Institute of Economic Research for environmental economic analyses. EMEC displays adjustments throughout the economy with a 10–15-year perspective from an “original situation”, which is altered through, for example, tax changes to a situation where the economy has once again reached equilibrium.

¹³ EMEC stands for Environmental Medium term EConomic model.

The National Institute of Economic Research has, by commission of the Swedish NAO, used EMEC to calculate the economic impact of the majority of the changes to the climate-related taxes that the Riksdag decided on in 2009.¹⁴ The National Institute of Economic Research has made calculations of the development of the economy, with and without the tax changes. The results are reported for the years 2007–2020 and 2007–2030.

Calculations of distribution effects among household types

FASIT is Statistics Sweden's (SCB) distributional analysis system for income and transfers. FASIT can be used to calculate distribution effects among household groups of, for example, changes in the tax system.

Statistics Sweden has, by commission of the Swedish NAO, used FASIT to calculate the households' costs for energy and carbon dioxide taxes as well as the vehicle tax. The changes in climate-related taxes that the Riksdag decided on in 2009 have also been analysed. The calculations relate to six different types of households.

Calculations of expenditure for energy and carbon dioxide taxes in various trade and industry sectors

FRIDA is Statistics Sweden's Firm Register and Individual Database. The database consists of a number of anonymised databases which include companies of various forms (sole trader, trading partnership, limited company, economic association). One part of FRIDA reflects the energy consumption by fuel and company within the majority of trade and industry sectors.¹⁵ It also reflects all companies that operate as suppliers of electricity, gas, heating and cooling. This part of FRIDA is called for 'Energy FRIDA'.

The Swedish NAO has commissioned Statistics Sweden to produce data from Energy FRIDA on industrial energy consumption and based on this data, estimate the expenditure for energy and carbon dioxide taxes in various trade and industry sectors. In some respects, the estimates take volume changes into account.

Calculations of revenues from energy and carbon dioxide taxes

FRISIM is a newly developed simulation model for FRIDA. The purpose of FRISIM is to simulate the fiscal outcome after changes in tax rates, changes in

¹⁴ Govt. Bill 2009/10:41, Committee Report 2009/10:SkU21, Riksdag Written Communication 2009/10:122.

¹⁵ The trade and industry sectors do not, for example, cover agriculture and forestry, fishing and waste collection.

the regulations and the expected development of energy consumption. It is also possible to use the underlying material of excise duties and refunds to monitor the inflow of energy and carbon dioxide taxes to the central government. FRISIM includes all companies that either submit an excise duty return for energy and carbon dioxide tax or apply for refunds (for example agricultural and forestry companies) for energy and carbon dioxide tax.

Statistics Sweden has, by commission of the Swedish NAO, calculated the inflow of tax revenues to the central government for energy and carbon dioxide based on the Riksdag's decision in 2009 regarding the tax restructuring for the period 2010–2015. In some respects, the estimates take volume changes into account.

The Swedish National Audit Office's supplementary calculations

The Swedish NAO has supplemented the processing carried out by the National Institute of Economic Research and Statistics Sweden with its own calculations. As a further basis for these calculations, data from Thomson Reuters Point Carbon on the prices of emission allowances is included.¹⁶

The various sources that the Swedish NAO has had processed have different limitations and definitions in part. Therefore, it is important not to make direct comparisons between different sections in this report.

1.6 Instructions for readers

The chapters of the report are set out as follows: Chapter 2, which is an introduction to the Swedish National Audit Office's analyses in Chapter 3, reports in part new information about, inter alia, the emissions of greenhouse gases. The chapter also contains a description of the climate-related taxes and the policy instruments of the EU. The overall question in Chapter 3 is who in practice pays tax and pays for emission allowances in order to reduce the greenhouse gas emissions. The chapter contains calculations and reporting of the expenditures and the effects (in the form of an effect on emissions) of climate-related taxes. The chapter answers the first audit question of whether there are significant distribution effects. Chapter 4 treats Government and agency reporting of expenditures/costs and emissions and answers the second and the third audit questions regarding accounting and reporting. Chapter 5 presents the Swedish National Audit Office's conclusions and recommendations.

¹⁶ The prices relate to EUA allowances (Emission Unit Allowance) within the EU Emissions Trading System.

1.7 Key terms and concepts

The following is a description of certain terms and concepts used in this report:

Trading period	Periods for the EU Emissions Trading System. The first period was a trial period relating to the years 2005–2007. At present, the second trading period (2008–2012) is in progress. The third trading period starts in 2013 and will end in 2020.
The trading sector	Installations in companies within industrial and energy production which are part of the EU Emissions Trading System.
Points of reference for tax policy	The Riksdag's guidelines for tax policy include a number of points of reference and requirements. The purpose of the points of reference is that tax policy shall support the overall objectives of economic policy.
The non-trading sector	Those activities which are not part of the trading sector, such as housing, transport, services, agriculture and forestry.
Industrial and energy sectors	This expression is used as a collective term for industrial sectors and the trade and industry sector which supplies electricity, gas, heating and cooling.
Climate-related taxes	This expression is used in this report as a collective term for energy, carbon dioxide and vehicle taxes. The reason is that they influence the consumption of energy products and vehicles, inter alia, to reduce the greenhouse gas emissions.
Carbon leakage	As a result of higher expenditure for carbon dioxide emissions, production is placed in countries without or with lower emissions expenditures, so that in practice global emissions are not reduced.
Consuming unit	This expression denotes a weighting system that takes the composition of the household into account. Not all expenditures in a household increase in proportion to the number of persons in a household. With the help of consuming units, truer and fairer comparisons are made of the expenditures between individuals in different household types.
Costs	This expression is used in this report to describe how much different polluters actually pay for their emissions, that is, the net amount after deductions upon income tax assessment, inter alia, have been taken into account.
Greenhouse gases	This expression is used as a collective term for the greenhouse gases carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, fluorocarbons and hydrofluorocarbons.

2 Reporting of emissions and policy instruments

This chapter describes the development of greenhouse gas emissions in relation to the environmental objective Reduced Climate Impact. The development is described for both the trading and the non-trading sectors. Furthermore, the chapter provides a description of the emissions of carbon dioxide by trade and industry and by households as well as the basic features of the climate-related taxes and the EU Emissions Trading System. The presentation is a compilation that includes partly new information. The overall picture given by several of the compilations presented in the chapter has been lacking until now. The compilations are based on processing that the Swedish NAO has obtained from various sources. The Riksdag has called for a coherent reporting of the most important central government initiatives in the climate area and has announced that the Government should develop relevant indicators which can contribute in an integrated way to the assessment of how the various initiatives affect the climate. The Swedish NAO describes Government and agency analyses and reporting in Chapter 4.

2.1 Emissions and emissions projections

This section describes the development of the Swedish emissions of greenhouse gases in the trading and the non-trading sectors. It also describes the total emissions.

The Swedish emissions of greenhouse gases amounted to approximately 60 million tonnes of carbon dioxide equivalents in 2009.¹⁷ Of these, 42 million tonnes (excluding aviation) were emissions outside the trading sector and 18

¹⁷ *The emissions statistics* are reported excluding emissions from Land Use, Land-Use Change and Forestry (LULUCF) and international transport, see the Swedish Environmental Protection Agency, *National Inventory Report 2011, Sweden*, p. 15. *The Swedish emissions statistics* report emissions in Sweden. The emissions statistics do not include emissions from the production of goods in other countries for import to Sweden. However, emissions from the production of goods in Sweden for export to other countries are included. See the Swedish Environmental Protection Agency website 09-12-2011. *Carbon dioxide equivalents* is a joint unit of measurement for greenhouse gas emissions (CO₂e) and states the quantity of a greenhouse gas expressed in terms of the amount of carbon dioxide that has the same impact on the climate; the impact, for example, of 1 kg of methane corresponds to the climate impact of 21 kg of carbon dioxide, see the Swedish Environmental Protection Agency website 23-11-2011.

million tonnes (including aviation) were emissions within the trading sector.¹⁸ In total, the emissions have decreased by 7.6 million tonnes since 2005. If the emissions keep in step with the Swedish Environmental Protection Agency's projections, the interim target for the years 2008–2012 will be achieved by a good margin. See Figure 2.1.¹⁹

At present, it is too early to assess whether Sweden will achieve the milestone target for emissions reductions in the non-trading sector by the year 2020 using the policy instruments that have been decided. One reason is that the scope of the non-trading sector changes on a regular basis, due to installations entering or being removed from the trading sector. In addition, aviation will be included in the trading sector from the year 2012. Furthermore, additional sectors and substances will be included in the trading sector from the year 2013.²⁰ The Swedish Environmental Protection Agency's most recent projection for emissions in the non-trading sector is 39.8 million tonnes (excluding aviation) in the year 2020. This can be compared with the 2020 milestone target, which for the corresponding demarcation of that sector is 30.7 million tonnes. One third of the milestone target can be achieved with the help of emission credits from other countries, corresponding to approximately 6.8 million emission credits.²¹ Emissions within the non-trading sector should therefore be no greater than approximately 37.5 million tonnes in order for to achieve the 2020 milestone target, provided that the target is interpreted as a lasting outcome in 2020. The Government has however not established how the milestone target is to be interpreted.²² If the Swedish Environmental Protection Agency's most recent projection of 39.8 million tonnes is borne out, and the current scope of the non-trading sector stays the same, emissions in the year 2020 will exceed the milestone target by 2.3 million tonnes.

¹⁸ The trading sector includes installations within industrial and energy production. Activities such as transport and housing are not covered by the trading system.

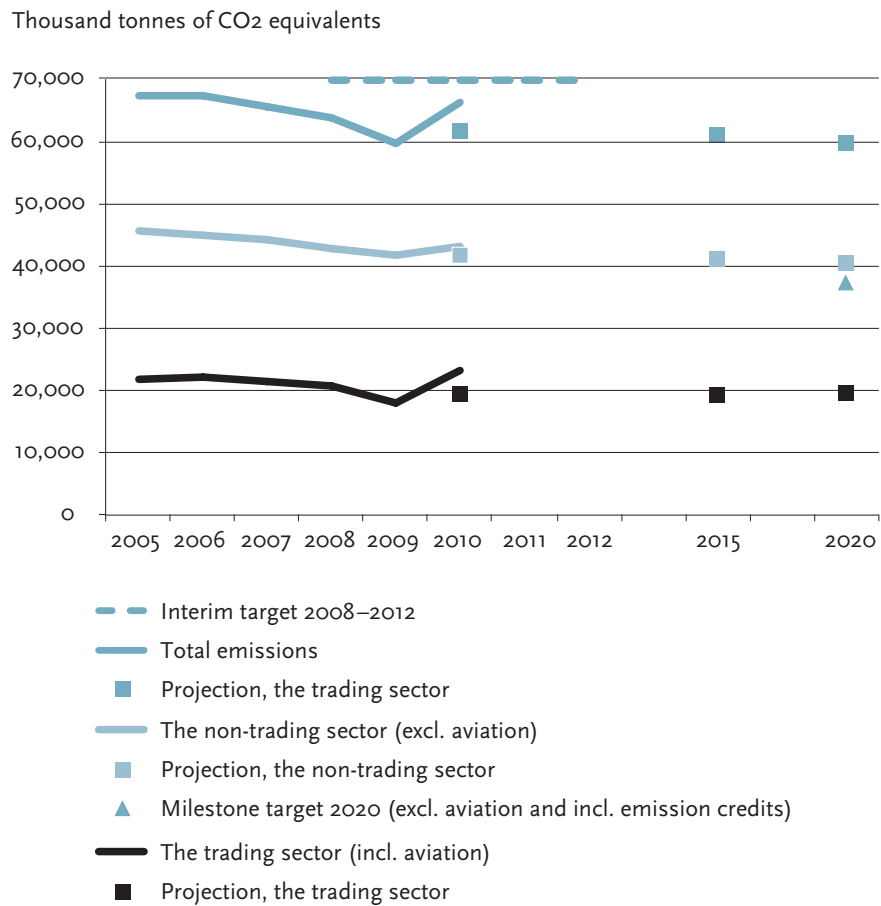
¹⁹ The interim target is applicable for the period 2008–2012 and means that the Swedish emissions of greenhouse gases on average during the period 2008–2012 shall be at least four per cent lower than emissions in 1990.

²⁰ One problem is that there is great uncertainty in determining emissions in the year 1990 from activities that are not covered by the emissions trading system since the trading system only started in 2005. Another problem is that the milestone target does not indicate how follow-up is to be performed when activities and gases are transferred from the non-trading sector to the trading sector or vice versa. The Swedish Environmental Protection Agency has in its agency annual report of the environmental objectives for 2011 proposed a follow-up method. See e-mail from the Swedish Environmental Protection Agency 24-11-2011.

²¹ In Govt. Bill 2008/09:162 p. 60, the Government states that the emission credits correspond to approximately 6.7 million tonnes. The figure of 6.8 million emission credits is based on the Swedish Environmental Protection Agency's latest report (March 2011) to the EU.

²² RiR 2011:8 *Efforts abroad to mitigate climate change – the Central Government's acquisitions of CDM and JI credits*. The Swedish Energy Agency has proposed an interpretation of the milestone target with the year 2013 as the start year, which would lead to the milestone target being applicable for the period 2013–2020. The Swedish Energy Agency's report ER 2011:09 *The Swedish climate objective for 2020 – contributions from international efforts*.

Figure 2.1 Emissions of greenhouse gases in Sweden 2005–2010, projections for 2010, 2015 and 2020 as well as the interim target for 2008–2012 and the milestone target for 2020



Note: Aviation is included in the trading sector in the diagram above. The milestone target for the year 2020 includes emission credits from climate initiatives in other countries amounting to 6.8 million tonnes, which corresponds to one third of the reductions in emissions between 1990 and 2020 for the non-trading sector. The projections for the years 2010, 2015 and 2020 in the figure and the milestone target for 2020 are based on the Swedish Environmental Protection Agency's latest report (March 2011) to the EU. The actual emissions (continuous lines) and the interim target for the years 2008–2012 are based on the Swedish Environmental Protection Agency's calculations as of the end of December 2011.

Source: The Swedish National Audit Office's processing of data from the Swedish Environmental Protection Agency.

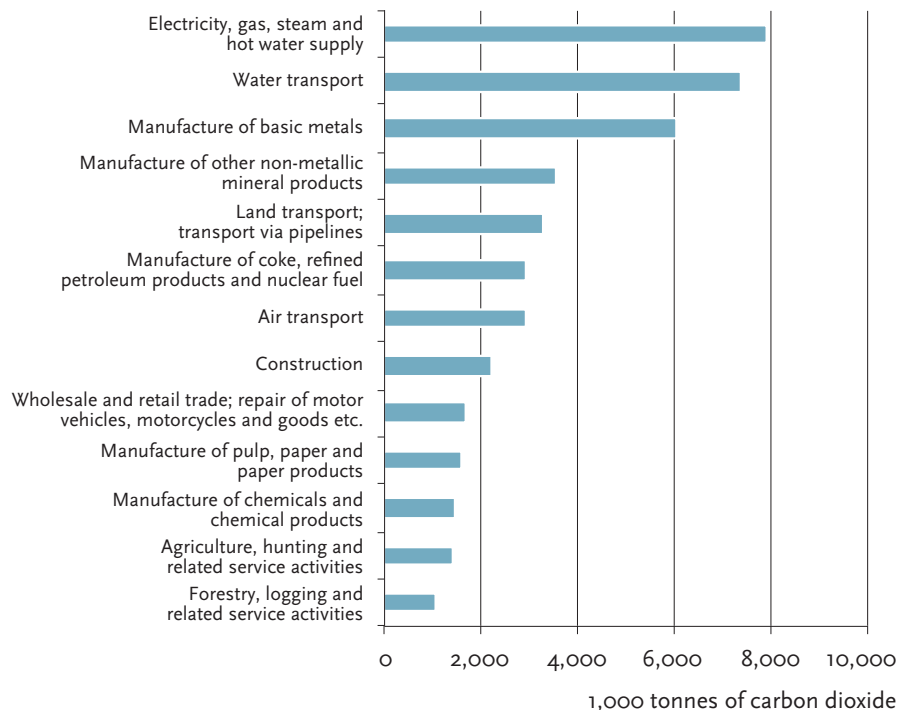
Trade and industry emissions of carbon dioxide

The total emissions of trade and industry for the year 2008 amounted to 48.6 million tonnes of carbon dioxide. The total emissions from private consumption, non-profit institutions serving households and public sector consumption amounted to 11.7 million tonnes.²³

Emissions display significant differences between various trade and industry sectors. This is shown in Figure 2.2 below, which presents the trade and industry sectors with the greatest emissions in 2008. The electricity, gas, steam and hot water supply sector had the highest emissions. Other trade and industry sectors with high emissions were water transport and the manufacture of basic metals. Water transport is the sector which has the highest carbon dioxide emissions in relation to added value (approximately 0.7 kg per SEK of added value). For the electricity, gas, steam and hot water supply sector and the manufacture of basic metals, the corresponding proportions were approximately 0.1 and approximately SEK 0.2 kg per SEK of added value, respectively.

²³ The Swedish National Audit Office's processing of data from Statistics Sweden's environmental accounts. The environmental accounts also include emissions from mobile sources and from bunkers.

Figure 2.2 Trade and industry sectors with carbon dioxide emissions over 1 million tonnes in 2008²⁴



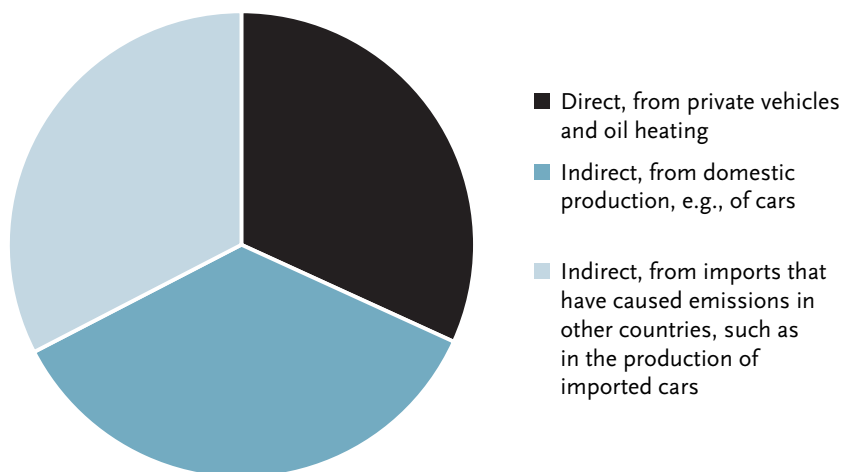
Source: The Swedish National Audit Office's processing of data from Statistics Sweden's environmental accounts.

Households' carbon dioxide emissions

Households' emissions can be divided into three categories: direct and indirect from domestic production and indirect from imports. Households' direct emissions of carbon dioxide, primarily from private vehicles and oil heating, constitute only a part of the emissions caused by households. In addition to the direct emissions, households also cause emissions through their consumption of goods and services and the production of these. The indirect emissions can occur both through the consumption of domestically produced and imported goods and services.²⁵ See Figure 2.3. Other parts of this report only present direct emissions from households.

²⁴ According to the Swedish Standard Industrial Classification 2002 (SNI 2002).

²⁵ The Swedish NAO does not take a position on how emissions in other countries should be dealt with.

Figure 2.3 Households' direct and indirect emissions of carbon dioxide in 2006²⁶

Source: The Swedish National Audit Office's processing of data from Statistics Sweden's environmental accounts.

2.2 Climate-related taxes and the Emissions Trading System

This section describes the basic features of the climate-related taxes and the EU Emissions Trading System. The section also describes the development of income from environmentally related taxes and energy taxes within the EU as well as the current reform of the EU's Energy Taxation Directive. The section ends with a description of the EU Emissions Trading System, including the Member States which have chosen to auction allowances.

2.2.1 Climate-related taxes in Sweden

Central government revenue from energy and carbon dioxide taxes is estimated to amount to approximately SEK 68 billion for the year 2012. The revenue from vehicle tax is estimated to amount to just under SEK 12 billion in 2012.²⁷ The Government has estimated that tax expenditures (which reduce central government income) in the form of reductions in energy and carbon dioxide taxes will amount to just over SEK 52 billion in 2012.²⁸

²⁶ Direct emissions are estimated carbon dioxide emissions for the quantity of fuels we use to run our vehicles or heat our homes. Indirect emissions are emissions which take place in the production of the products included in private consumption. The Swedish National Audit Office's processing of data from Statistics Sweden's environmental accounts.

²⁷ Principles for calculations for 2012.

²⁸ Written Communication 2010/11:108. This corresponds to approximately SEK 39 billion after the companies' income tax assessment.

In accordance with the Riksdag's guidelines for tax policy, the tax regulations shall create good conditions for investments in Sweden. The objectives of a general and equitably distributed welfare and higher employment shall be secured. The tax regulations shall also contribute to the capturing of negative environmental and public health aspects in the price formation in various markets by internalising negative external effects as effectively as possible. In the environmental area, the taxes shall be coordinated with other policy instruments so that the environmental direction becomes effective in terms of the economy. The polluter pays principle shall apply.²⁹

The Government has also emphasised, in several bills, the importance of the polluter pays principle in the form of carbon dioxide tax or emission allowances, for example. In the bill on the restructuring of the climate-related taxes for the period 2010–2015, the Government stresses, inter alia, that emission allowances, carbon dioxide tax and energy tax shall play a prominent role in achieving the objectives of climate and energy policy. This is because the policy instruments have good potential to be efficacious and cost-effective. Provided that the allowances are auctioned as opposed to being allocated free of charge, a system of emission allowances helps to achieve compliance with the polluter pays principle. The equivalent applies for the carbon dioxide tax, according to the Government. If taxes are used as policy instruments, this will, in the majority of cases, mean a reduction in the need to pay grants towards the achievement of the objectives, which is expected to lead to greater effectiveness in terms of the economy. In the case of subsidisation, it is also true that compliance with the polluter pays principle is not achieved.³⁰

There can be different reasons for taxes, including fiscal or resource control reasons. The fiscal reasons are to collect enough taxes to finance central government expenditures. An important long-term precondition is then that the tax base (that upon which the tax is levied) is stable. Taxes that control resources, for example the carbon dioxide tax, are intended to influence the behaviour of consumers and companies by adjusting the price of a commodity to the "right" level. If the tax fulfils its purpose of controlling a resource, the environmental problems diminish, but depending on price sensitivity, the tax revenues may also be reduced in the longer term.³¹

²⁹ Govt. Bill 2007/08:100 section 5.3, Committee Report 2007/08:FiU20, Riksdag Written Communication 2007/08:259–260.

³⁰ Govt. Bill 2009/10:41 p. 1, 115 f., 130 and Govt. Bill 2008/09:100 p. 56.

³¹ See, for example, Brännlund, R. *The tax system's options and tasks within environmental policy*, Yearbook For Nordic Tax Research (2009), p. 191 f. Compare Sterner, T. (2003), *Policy Instruments for Environmental and Natural Resource Management*, p. 174 f.

Historically, the energy tax has been primarily fiscal in nature, but it has gradually assumed a purpose more to do with resource control. In connection with the tax reform of 1990/91, carbon dioxide tax and sulphur tax on fuels as components of energy taxation were introduced. In 1993, energy taxation was reformed again. Among other things, the manufacturing industry was exempted from energy tax on fuels and electricity. Furthermore, the previous system of individual tax reductions at company level was replaced to a large extent by a reduced carbon dioxide tax for the entire manufacturing industry.³²

The purpose of the energy tax has, as mentioned above, become increasingly one of resource control in order to achieve the objectives relating to the share of renewable energy and to the more efficient use of energy at the lowest possible economic cost.³³

Carbon dioxide tax is levied for emissions of fossil carbon dioxide. The principle is that the carbon dioxide tax should be neutral between different fossil fuels and essentially comprehensive. This is so that each kilogram of carbon dioxide shall cost the same to emit, independent of fuel and how that fuel is used. However, deviations from this principle may be justified if the risk of what is known as carbon leakage arises.³⁴

Historically, there have been several different reasons for vehicle taxation; its provisions have been affected by fiscal reasons, environmental considerations and aspects of traffic safety. From the 1950s to the end of the 1990s, there was also a sales tax on motor vehicles. Its original purpose was to limit the rapid development of motoring. The structure of the tax was later adapted to promote vehicles with superior environmental performance. The differing amounts of the vehicle tax are due, inter alia, to the vehicle type, vehicle weight and type of motor fuel. In 2006, a new principle for vehicle taxation was introduced by taking into account the vehicle's type of motor fuel and carbon dioxide emissions. The carbon dioxide component is applicable for newer private cars. The component is lower if the vehicle runs on alternative motor fuels than if the vehicle runs on petrol and diesel. The purpose of the new principle is to increase the effect of the tax as an environmental instrument.³⁵

³² The Swedish Tax Agency, *Tax Statistical Yearbook of Sweden 2010*, p. 140.

³³ Govt. Bill 2009/10:41 p. 119 f., Committee Report 2009/10:SkU21 p. 9 f., Riksdag Written Communication 2009/10:122.

³⁴ Ibid.

³⁵ The Swedish Tax Agency, *Tax Statistical Yearbook of Sweden 2010*, p. 153 f.

In 2009, the Riksdag decided on a number of changes of climate-related taxes, primarily for energy, carbon dioxide and vehicle taxes. These tax changes, together with other financial policy instruments, shall yield a total reduction in greenhouse gas emissions of 2 million tonnes by 2020. In Appendix 2, we set out these changes in more detail.

The Government's assessment in the budget bill for 2011 was that the carbon dioxide tax does not need to be increased during the term of office beyond decisions already taken and normal inflation adjustment. The Riksdag shared this assessment.³⁶

2.2.2 *Climate-related taxes in the EU Member States and in the Nordic countries*

All the EU Member States, as well as countries such as Norway and Iceland have a tax on energy³⁷; five Member States (Slovenia, Finland, Sweden, Denmark and Ireland) also have a specific carbon dioxide tax on various fuels and motor fuels. Norway has a carbon dioxide taxation which is similar to that in Sweden.³⁸

The figure below presents the development of the proportion of revenues from environmentally related taxes and energy taxes in relation to the total tax revenues in the EU27³⁹ from 1998 to 2009. At the beginning of the period, Sweden had a significantly lower proportion of revenues from environmentally related taxes in relation to the total tax revenues compared with the EU27. In recent years, Sweden has moved closer to the EU27 average. Please note that taxes other than energy and carbon dioxide taxes are also included in the term environmentally related taxes. In addition, it should be noted that the revenues from Swedish environmentally related taxes in relation to GDP were somewhat higher than the average in the EU27 (2.8 per cent compared with 2.4 per cent) in 2009.

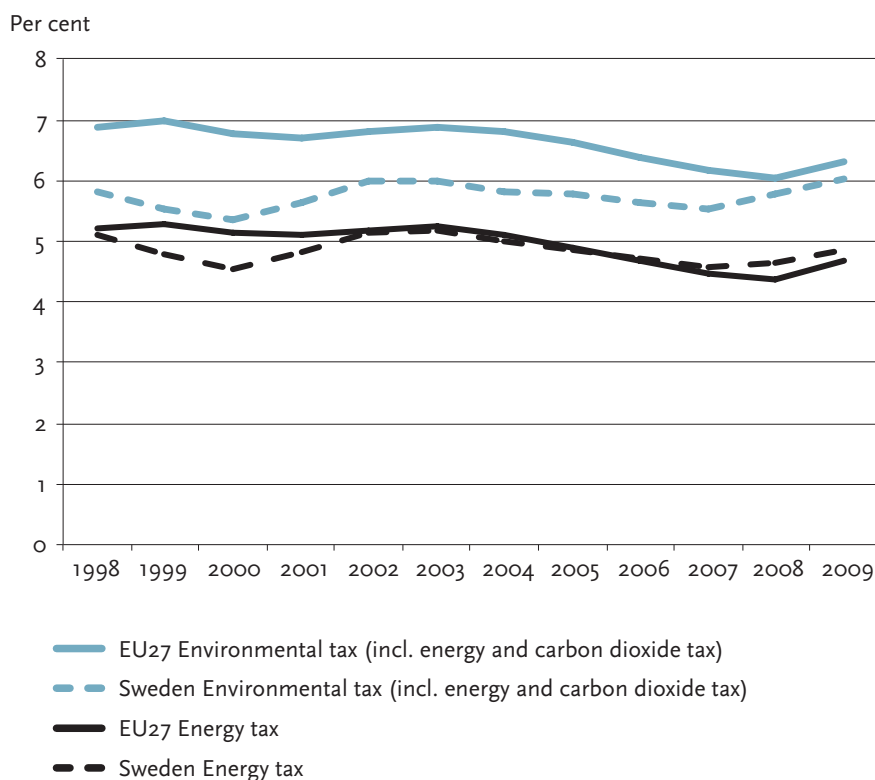
³⁶ Govt. Bill 2010/11:1, Committee Report 2010/11:FiU1, statement 2010/11:SkU1y.

³⁷ See, for example, European Commission, Taxation and Customs Union, 01 July 2011, *Taxation trends in the European Union – Data for the EU Member States, Iceland and Norway*, p. 351.

³⁸ These countries had a carbon dioxide tax (separately or as part of energy taxes) on different types of fuels and motor fuels on 1 July 2011. See European Commission, Directorate-General for Taxation and Customs Union, Indirect Taxation and Tax administration, Environment and other indirect taxes, ref 1033 July 2011, *Excise Duty Tables, Part II – Energy products and Electricity*, see link http://ec.europa.eu/taxation_customs/index_en.htm#. See the Swedish Environmental Protection Agency and the Swedish Energy Agency, *Checkpoint 2008 Interim report 2*, p. 27 concerning Norway's carbon dioxide taxation.

³⁹ Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom.

Figure 2.4 Development of environmentally related tax revenues and energy tax revenues⁴⁰ 1998–2009, the EU27 and Sweden, as a percentage of total tax revenues



Source: *The Swedish National Audit Office's processing of data from Eurostat.*

The European taxes on motor fuels have, according to some analysts, had greater effects on consumption compared to countries with lower motor fuel taxes, for example, the United States.⁴¹

⁴⁰ The environmentally related tax revenues include tax on transport, energy, environmental pollutants and natural resources, that is, here both energy and carbon dioxide taxes are encompassed by the term.

⁴¹ See, for example, Sterner, T. (2007), *Gasoline Taxes a useful instrument for climate policy*, Energy Policy, vol. 35, Issue 6, pp. 3194–3202.

2.2.3 *The Energy Taxation Directive is to be revised*

Certain parts of the tax legislation are governed by EU legislation, for example, the Energy Taxation Directive. The Commission has identified several deficiencies in the Energy Taxation Directive and has therefore submitted a proposal for changes. In its present form, the Energy Taxation Directive⁴² states, inter alia, minimum levels for the taxation of energy products used as motor fuel, heating fuel and for electrical power. These minimum levels for certain energy products are generally applied to the volume of the energy product consumed and not to the product's energy content. According to the Commission, this leads to the inefficient use of energy and distortions within the EU's internal market. The design of the minimum levels also creates incentives which are contrary to the EU's energy and climate change objectives in that they also promote, inter alia, the use of coal as a heating fuel. In the case of motor fuels, the Directive favours diesel over petrol because diesel has a higher energy content. According to the Commission, today's minimum levels also lead to discrimination against renewable forms of energy.⁴³

In spring 2011, the Commission proposed that the current Energy Tax Directive shall be amended. The proposal has the following main objectives:⁴⁴

- It shall ensure a uniform treatment of energy sources in the Energy Taxation Directive in order to provide energy consumers with a level playing field independent of energy source.
- It shall help provide an adapted framework for the taxation of renewable sources of energy.
- It shall help to provide a framework for the application of carbon dioxide tax as a complement to the price signal on carbon dioxide created by the EU Emissions Trading System without any overlap between these policy instruments arising. The Commission proposes, inter alia, an explicit distinction between energy taxes which are specifically linked to carbon dioxide emissions from the consumption of energy products (carbon dioxide related taxes) and energy taxes which are based on the products' energy content (general tax on energy consumption). Carbon dioxide tax

⁴² Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity, OJ L 283, 31.10.2003, p. 51.

⁴³ Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee, *Smarter energy taxation for the EU: proposal for a revision of the Energy Taxation Directive*, COM (2011) 168 final p. 2 f.

⁴⁴ European Commission, COM (2011) 169 final, of 13 April 2011, *Proposal for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity*, p. 12 f. The Government Offices, Factual Memorandum 2010/11:FPM113, *Overhaul of the Energy Taxation Directive*, 18-05-2011, p. 12 f. The amended Directive is proposed to enter into force on 1 January 2013; the Commission proposes, however, substantial transitional periods with regard to certain provisions. The proposal will be dealt with by the Council and the Parliament in autumn 2011 and spring 2012, see the European Parliament's website 23-11-2011.

shall not be charged on emissions from installations which are part of the EU Emissions Trading System.

EU legislation also contains other directives which are of importance for achieving the objectives of reduced greenhouse gas emissions and of increased energy efficiency, for example, the Fuel Quality Directive and the Renewable Energy Directive.⁴⁵

2.2.4 *The EU Emissions Trading System undergoes continuous change*

The EU Emissions Trading System (ETS) is a policy instrument for the reduction of greenhouse gas emissions. ETS is the first major trading system for greenhouse gases in the world. It was launched in January 2005. Trade in emission allowances already existed before that date, however.⁴⁶ Today, all incineration plants with a power output of more than 20 MW must participate in the trading system.⁴⁷

Within the EU, emission allowances have been allocated to each Member State for the period 2008–2012 in accordance with a specific burden-sharing agreement. A certain quantity of a Member State's total number of allowances is allocated during each trading period to installations that cause emissions. An emission allowance (EUA) gives the installation the right to emit 1 tonne of carbon dioxide equivalents. Installations that are part of the trading system may emit greenhouse gases if the installations surrender allowances corresponding to the actual emissions to the respective Member State's competent authority. If the installation has a deficit of allowances in relation to its emissions, the installation can buy more on the market. If the installation has a surplus of allowances, the installation can sell them.⁴⁸

A large number of trade and industry sectors receive, in accordance with EU law, a free allocation of allowances. The reason for this is that these sectors run the risk of what is known as carbon leakage, that is, the emissions would increase in countries outside the EU where industry is not covered by comparable carbon dioxide constraints. The Commission has decided on a list

⁴⁵ Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC, OJ L 140, 5.6.2009, pp. 88–113 and Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

⁴⁶ See, for example, Figures A and B in Appendix 3.

⁴⁷ The Swedish Environmental Protection Agency website 09-11-2011.

⁴⁸ Cf. Govt. Bill 2008/09:162 p. 77 f.

of a large number of industry sectors and sub-sectors considered to run the risk of carbon leakage.⁴⁹ An increase in emissions through carbon leakage may be due to existing companies moving abroad or on future expansion taking place in countries outside the EU.

For the trading period 2008–2012, at least 90 per cent of the allowances shall be allocated free of charge.⁵⁰ The remaining portion can be sold, for example, by the allowances being auctioned by each Member State. The National Institute of Economic Research considers that auctioning should be the fundamental principle instead of free allocation. According to that agency, auctioning may, inter alia, increase the economic effectiveness, improve the companies' incentives to reduce emissions and reduce the transaction costs of allocation. According to the OECD, auctioning also has other benefits, such as the avoidance of arbitrary and unexpected redistributions, that lobbying is afforded less scope and that existing and new installations are treated equally.⁵¹ According to the Government, a system of emission allowances helps to achieve compliance with the polluter pays principle, provided that the allowances are auctioned instead of being allocated free of charge.⁵² Within the EU, six Member States have informed the Commission that they auction (or will be auctioning) allowances,⁵³ see Table 2.1 below. Sweden has elected to allocate all allowances free of charge during the period 2008–2012.⁵⁴

⁴⁹ See Commission Decision 2010/2 EU of 24 December 2009 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, preamble 2.

⁵⁰ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, Art. 10. At least 95 per cent of the allowances were allocated free of charge in the first trading period 2005–2007.

⁵¹ See the National Institute of Economic Research, Occasional Study No. 25, *The challenges of climate policy during the term of office*, with references, p. 9, OECD, Environment Directorate, Centre for Tax Policy and Administration, *Environmentally Related Taxes and Tradable Permit Systems in Practice*, 11 June 2008, p. 20 f. and 29 as well as OECD, Environment Directorate, Centre for Tax Policy and Administration, *Joint Meetings of Tax and Environment Experts, Interactions between emission trading systems and other overlapping policy instruments*, 8 June 2011, p. 11 note 27.

⁵² Govt. Bill 2009/10:41 p. 115.

⁵³ European Commission, the Directorate-General for Climate Action, website 10-11-2011.

⁵⁴ The Swedish Environmental Protection Agency website 09-11-2011.

Table 2.1 EU Member States which do not allocate all emission allowances free of charge, but auction a portion of the allowances, average share and number of allowances which are auctioned annually

Member State	Average share of auctioned allowances annually during the trading period 2008–2012	Average number of allowances which shall be auctioned annually*
Germany	9 %	40 million
United Kingdom	7 %	17 million
The Netherlands	3.7 %	3.2 million
Hungary	2 %	2.7 million
Austria	1.3 %	0.4 million
Ireland	0.5 %	0.6 million

* 1 allowance corresponds to a reduction of 1 tonne of carbon dioxide equivalents.

Source: European Commission, the Directorate-General for Climate Action.

Plans for the trading period 2013–2020

Decisions have been made regarding significant changes to the Emissions Trading System's third trading period during 2013–2020. Nonetheless, there is work to be done in preparation for the third trading period, and preparations are still in progress within the EU. What is new is that a common cap for the Member States' emissions is being introduced instead of national allocation plans. The Commission will decide on the level of the cap, which is calculated based on the total number of allowances allocated during the trading period 2008–2012.

Auctioning will be applied for a significant proportion of the allowances. However, industry and the heating sector will be able to have allowances allocated free of charge.⁵⁵ Free allocation will be based on benchmarks. From 2013, the scope of the trading system will be expanded to a number of new sectors, including the production of organic basic chemicals, the production

⁵⁵ There are plans for all allowances to be auctioned in the future. E-mail from the Swedish Energy Agency 05-12-2011.

of non-ferrous metals and aluminium production. In addition, the greenhouse gases nitrous oxide and perfluorocarbons will be included for specific sectors.⁵⁶

Emission allowances are assets in business activities

In Sweden, emission allowances for installations in the trading system will, for tax purposes, be treated as stock items in business activities. For allowances allocated free of charge, a taxable revenue arises in the business activity only when the allowances are sold.⁵⁷

⁵⁶ The benchmarks are based on predefined “product benchmarks”. They are being designed in accordance with the 10 per cent most carbon dioxide efficient installations in each sector within the EU. Sectors that are exposed to what is known as carbon leakage, in which the trading system is expected to lead to the risk of activities and emissions being moved to countries with less stringent requirements, can receive an allocation of up to 100 per cent of the benchmark in question. Sectors that are not considered to be exposed to carbon leakage will receive an allocation of 80 per cent of the benchmark in 2013, with a subsequent annual decrease resulting in 30 per cent of the benchmark in 2020. The Swedish Environmental Protection Agency has produced a proposal for the preliminary allocation per installation for the trading period. The Swedish Environmental Protection Agency website as of 21 November and 12 December 2011 and 30 January 2012.

⁵⁷ The Swedish Tax Agency, Guide for the taxation of income and wealth in the 2011 tax assessment, p. 360 f. and p. 506. The emission allowances obtained through allocation shall be treated as stock items in business activities, see Chapter 17, Section 22b of the Income Tax Act (1999:1229), abbreviated IL. Allowances allocated free of charge constitute what are known as government contributions, which the recipient shall enter as a taxable revenue, compare Chapter 29, Section 2, IL. The recipient shall also enter the value of the allowances (=the stock items) as SEK 0 since government contributions shall not be included in the valuation of the stock (Chapter 29, Section 7, IL). All of this means that taxation only really takes place when allowances are sold. According to the Government, this solution means that operators can match the consumption of allowances against emissions made, which would seem to give a correct material result. The Government maintains that it is true that an emission allowance may represent an asset value, but that by analogy with what is true for electricity certificates, the taxation of issued allowances should take place only upon a possible sale. The Riksdag concurred with the Government's assessment, see Govt. Bill 2004/05:33, Committee Report 2004/05:SkU16, Riksdag Written Communication 2004/05:133.

3 Who pays for the emissions?

This chapter describes distribution effects, that is, who pays for emissions through climate-related taxes and emission allowances. We also shed light upon effects of the restructuring of the climate-related taxes for the period 2010–2015. The analyses relate to expenditures both for trade and industry and for households. The Swedish NAO has compiled and analysed existing statistics from the various agencies and also commissioned calculations in various models. The results of the calculations are, for the most part, completely new information which has not previously been presented. The analyses answer the audit question: *Are there significant distribution effects, that is, differences in how much different polluters have to pay for their emissions?*

The chapter begins with a general description of the distribution of carbon dioxide emissions as well as energy and carbon dioxide taxes between trade and industry and households. In the subsequent section, changes in policy instruments over time are described. Then follows a section with descriptions of the expenditures of trade and industry and households for climate-related taxes. Thereafter, effects of the tax restructuring for the period 2010–2015 are presented. The chapter concludes with important findings.

3.1 Distribution of carbon dioxide emissions and climate-related taxes

This section provides an overview of how large a proportion of the climate-related taxes which trade and industry and households pay respectively in relation to their carbon dioxide emissions.

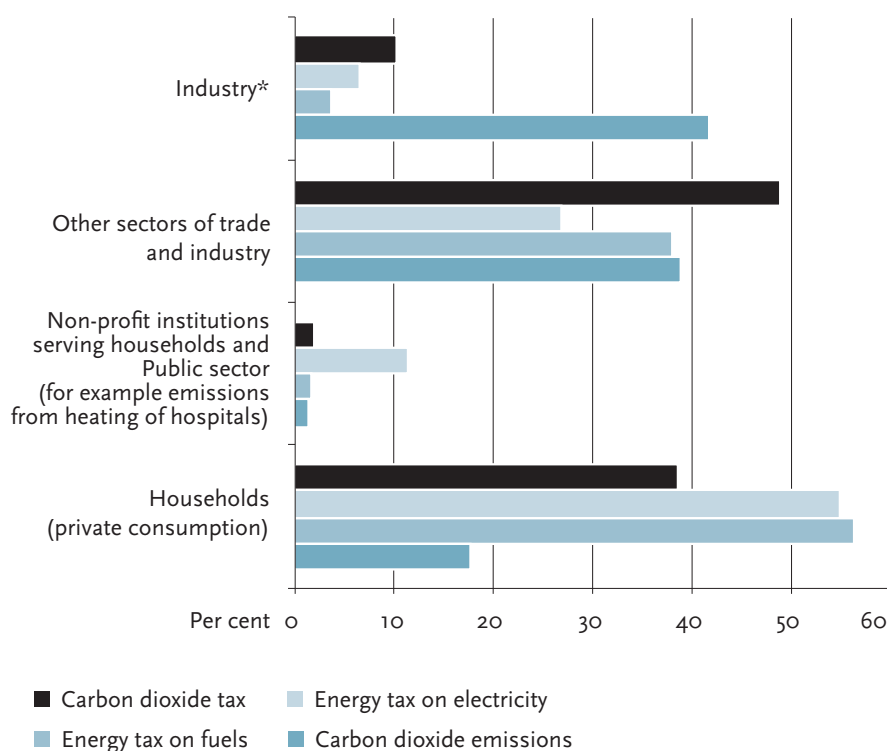
The purpose of the energy tax has historically been fiscal but has gradually become increasingly one of resource control.⁵⁸ The purpose of the carbon dioxide tax is to steer a course towards reducing carbon dioxide emissions. In other words, it exists for the purpose of resource control since the tax is intended to influence behaviour through costs being charged ultimately to consumers. For example, an installation producing a steam and hot water supply pays, inter alia, carbon dioxide tax. The cost for the tax is normally passed on to the consumer of the steam and hot water supply. This report

⁵⁸ Govt. Bill 2009/10:41 p. 115 f.

describes “the way there”, that is, how the expenditures are distributed between, for example, trade and industry and households.

Trade and industry causes the greatest carbon dioxide emissions. Of the total carbon dioxide emissions, trade and industry caused approximately 81 per cent. Households and non-profit institutions serving households and public sector consumption caused approximately 19 per cent, but paid almost half of the climate-related taxes. See Figure 3.1 below.⁵⁹

Figure 3.1 Proportion of carbon dioxide emissions and proportion of carbon dioxide tax and energy tax divided between households (private consumption) and trade and industry in 2008⁶⁰



* Industry includes manufacturing industry, recycling industry and electricity, gas and water supply (SNI 15–39 + 40–41). See Appendix 7.

Source: The Swedish National Audit Office’s processing of data from Statistics Sweden’s environmental accounts.

⁵⁹ Statistics Sweden’s environmental accounts, data and analysis pages, 15-11-2011. It should be noted that large parts of trade and industry are part of the trading sector and are covered by the emissions trading system. The expression “climate-related taxes” in this calculation does not include energy tax on electricity.

⁶⁰ According to the Swedish Standard Industrial Classification 2002 (SNI 2002).

3.2 Changes in policy instruments are balanced against each other

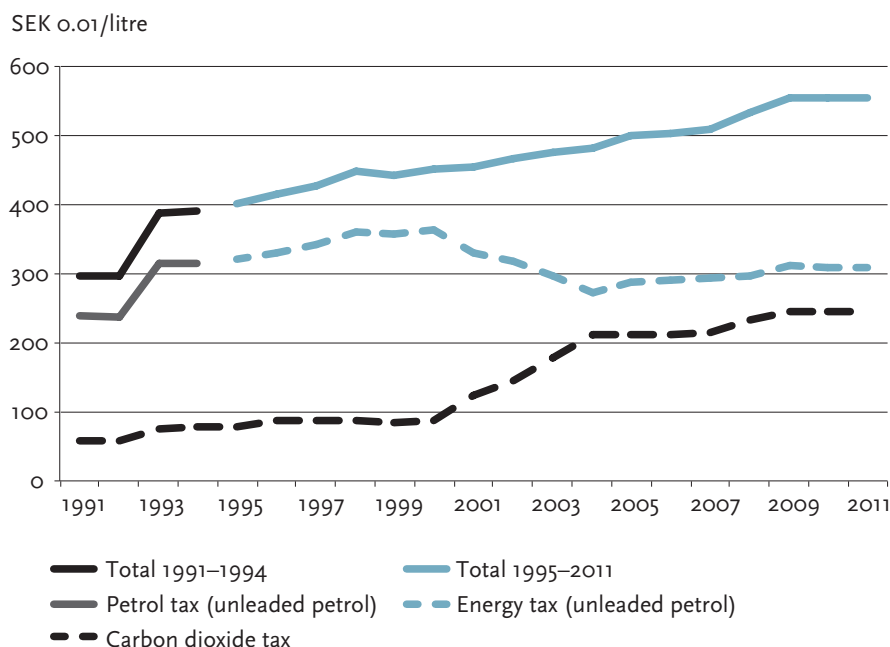
This section describes how the various reductions in and exemptions from the carbon dioxide tax mean that it is, in practice, much lower than the tax rate indicates. It also describes various examples of how the tightening of various policy instruments is offset by, or that proposals have been presented about, alleviations in other policy instruments. One purpose of the reductions and the alleviations may have been to compensate various trade and industry sectors for higher costs.

Due to a number of reductions and exemptions, the tax on carbon dioxide in practice is less than the tax rate indicates. The formal carbon dioxide tax is generally equivalent to SEK 1050 per tonne of carbon dioxide for the year 2011.⁶¹ However, the implicit (average actually levied) tax is considerably lower. Between 2003 and 2009, the implicit tax varied between SEK 422 and SEK 551 per tonne of carbon dioxide.⁶²

Historically, the tightening of certain policy instruments has been compensated for by alleviations in others. One example is that previous increases in the carbon dioxide tax on unleaded petrol until mid-2003 were offset by reductions in the energy tax. By taxes largely offsetting each other, the effect of increases in fuel prices and in turn on the carbon dioxide emissions has not been as great as it would otherwise have been. See Figure 3.2 below.

⁶¹ See Appendix 2.

⁶² The Swedish NAO's processing according to the principles for calculations for carbon dioxide tax for these years compared to Sweden's total emissions of carbon dioxide for the corresponding years.

Figure 3.2 Energy and carbon dioxide taxes, SEK 0.01/litre of unleaded petrol, 1991–2011

Source: The Swedish National Audit Office's processing of data from the Swedish Tax Agency.

Another example is that heavy traffic is fully compensated for the initial increase in 2011 of the energy tax on diesel (one of the steps in the restructuring of the energy and carbon dioxide taxes in 2010–2015). The compensation is achieved through a reduction in the vehicle tax for heavy traffic. The Government's assessment is that there is no reason to further compensate heavy traffic for the forthcoming increase in the energy tax on diesel in 2013.⁶³

A further example is the Government's proposal in 2005 to abolish the carbon dioxide tax for the trading sector in order to compensate industry for emission allowances expenditure in addition to the objective of avoiding a duplication of policy instruments.⁶⁴

The energy-intensive basic industries in Sweden are largely competing on an internationally competitive market. Analyses show that the trading system, including the effect on electricity prices, means that the competitiveness of energy-intensive companies deteriorates in proportion to the situation with only energy taxation that

⁶³ See Govt. Bill 2009/10:41 p. 157.

⁶⁴ Govt. Bill 2005/06:1 p. 139. The proposal to abolish the carbon dioxide tax for the trading sector was not implemented in this year, however, compare Committee Report 2005/06:FiU1 p. 160, but only through the Riksdag's decision in 2009 on Govt. Bill 2009/10:41. It should be noted that so far Sweden has allocated emission allowances free of charge to most trade and industry sectors in the trading sector. Existing installations in the trade and industry sector supplying electricity, gas and heating have had to buy their allowances on the market.

has existed until now. Decisions on production levels for individual installations are independent of how the allocation of emission allowances takes place. At the margin, emission allowances therefore mean a cost increase corresponding to the market price of the allowance. Abolishing the carbon dioxide tax is key to this industry's future competitiveness as it can partly compensate for the cost increase that the trade in allowances leads to.

3.3 Trade and industry emissions and expenditures for these

This section presents the result of the Swedish NAO's investigation of how much trade and industry in general and the industrial and energy sectors in particular pay in climate-related taxes and, where applicable, for emission allowances. The quantity of allocated emission allowances in relation to emissions and the value of the surplus of allowances are also presented.

The calculations are based on results from various models. The years and populations investigated in the models differ to some extent. In addition, the long-term calculations carried out by the National Institute of Economic Research are based on older basic data than the calculations for trade and industry carried out by Statistics Sweden.⁶⁵ Therefore, direct comparisons between the different sections which are based on results from different models should be made with caution.

3.3.1 Expenditures for climate-related taxes are a small part of the total costs of trade and industry

There are currently no comprehensive statistics on the total expenditures for climate-related taxes in various trade and industry sectors within and outside the trading sector.⁶⁶ Such comprehensive information is essential to be able to analyse the consequences of climate-related taxes and the trading system on emissions and expenditures to reduce emissions in these sectors. Our analyses to estimate the expenditures for climate-related taxes are based partly on the total expenditure of trade and industry for energy and carbon dioxide taxes and partly on industrial energy consumption.⁶⁷

⁶⁵ The National Institute of Economic Research has used EMEC, and Statistics Sweden has used Energy FRIDA and FRISIM, see Appendices 4 and 6.

⁶⁶ The trading sector includes installations within industrial and energy production. Activities such as transport and housing are not covered by the trading system.

⁶⁷ Statistics Sweden's models FRISIM and Energy FRIDA have been used for these analyses.

The total expenditure of trade and industry for energy and carbon dioxide taxes

Total central government revenue from energy and carbon dioxide taxes amounted to approximately SEK 66 billion for the year 2009.⁶⁸ The expenditure of trade and industry for climate-related taxes constitutes a small part of the total costs of trade and industry/companies.⁶⁹ The situation is similar to that described in the Swedish Long-Term Survey 2003.⁷⁰

Expenditure for energy and carbon dioxide taxes was approximately 4 per cent of the companies' total costs in 2009.⁷¹ For companies within the trading sector, the proportion was approximately 3 per cent, and for companies outside the trading sector, approximately 5 per cent.⁷²

Industry expenditure for energy and carbon dioxide taxes

The industrial and energy sectors' expenditures for energy and carbon dioxide taxes according to the 2009 energy consumption are estimated to amount to a total of SEK 2.3 billion for the group of industrial and energy companies with more than nine employees.⁷³ The total added value was SEK 546 billion in the same year.⁷⁴ The expenditures for energy taxes in this calculation include energy tax on electricity. The emissions from the corresponding energy consumption are estimated to amount to 16.7 million tonnes of carbon dioxide.⁷⁵

⁶⁸ Ministry of Finance, Principles for calculations for 2012.

⁶⁹ This is evidenced by the Swedish National Audit Office's processing of Statistics Sweden's calculations in FRISIM. Appendix 6 presents the companies included in FRISIM. The term "total costs" for the companies relates to costs including personnel costs stated by the companies in the standardised accounting statements (SRU data) found in FRIDA.

⁷⁰ "With regard to excise duties on energy, they are, however, of little financial importance as industry has a series of special rules that exempt it from most of the excise duties on energy", see Appendix 11 to the Swedish Long-Term Survey in 2003, *Distribution effects for environmental policy*, p. 137.

⁷¹ According to the Swedish National Audit Office's processing of Statistics Sweden's calculations in the micro-simulation model FRISIM. This includes companies that either submit an excise duty return for energy and carbon dioxide tax or apply for refunds of energy and carbon dioxide tax. The number of companies is approximately 40,000. The calculation of the companies' profits is based on SRU data (which is attached to the companies' income tax returns) on revenues, income, expenditures and costs.

⁷² In 2009, the expenditures for energy and carbon dioxide taxes within the trading sector consisted of 44 per cent for carbon dioxide tax and 56 per cent for energy taxes. In the non-trading sector, the corresponding proportions were 37 and 63 per cent.

⁷³ According to the calculations in the Energy FRIDA database. Energy FRIDA includes approximately 6,200 companies with workplaces operating in the industrial sectors and in the supply of electricity, gas, heating and cooling. See Appendix 6 for a description of Energy FRIDA.

⁷⁴ According to the calculations in the Energy FRIDA database. The added value is represented here by revenue minus costs (excluding personnel costs), which is largely the same thing as the added value without regard to depreciation and write-down.

⁷⁵ This cannot be compared with industry's carbon dioxide emissions according to the 2008 environmental accounts (SNI 2002), which was at that time approximately 26 million tonnes. One explanation for the difference is that the environmental accounts also include emissions from mobile sources and from bunkers.

The industrial and energy sectors' expenditures for energy and carbon dioxide taxes are in many cases low in relation to the sectors' added value. The 'manufacture of basic metals' was the sector that had the highest proportion of expenditure for energy and carbon dioxide taxes in relation to added value (3.9 per cent). The lowest proportion was the sector 'manufacture of computer, electronic and optical products' (0.004 per cent). The low proportion is due to the sector not using as much fossil energy.

See Table 3.1 below.

Table 3.1 Expenditures for energy and carbon dioxide taxes by industrial and energy sector as well as the expenditures' proportion of added value**, SEK million and per cent in 2009⁷⁶

Sector*	Expenditures for energy and carbon dioxide taxes	Added value**	Expenditures' proportion of added value (per cent)
Manufacture of food products	128	27,121	0.5
Manufacture of beverages	16	4,187	0.4
Manufacture of tobacco products	0	5,181	0.0
Manufacture of textiles	7	1,820	0.4
Manufacture of wearing apparel	0	615	0.0
Manufacture of leather and related products	0	213	0.1
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	141	17,344	0.8
Manufacture of paper and paper products	215	35,409	0.6
Printing and reproduction of recorded media	2	7,004	0.0
Manufacture of coke and refined petroleum products	18	1,918	0.9
Manufacture of chemicals and chemical products	65	20,260	0.3
Manufacture of basic pharmaceutical products and pharmaceutical preparations	6	50,777	0.0

cont.

⁷⁶ The reported expenditures for energy and carbon dioxide taxes relate to gross effects. Therefore, they do not take into account the fact that the expenditures are deductible in the companies' income tax assessment.

cont.

Sector*	Expenditures for energy and carbon dioxide taxes	Added value**	Expenditures' proportion of added value (per cent)
Manufacture of rubber and plastic products	20	10,493	0.2
Manufacture of other non-metallic mineral products	181	11,771	1.5
Manufacture of basic metals	567	14,595	3.9
Manufacture of fabricated metal products, except machinery and equipment	51	29,381	0.2
Manufacture of computer, electronic and optical products	2	41,089	0.0
Manufacture of electrical equipment	8	17,281	0.0
Manufacture of machinery and equipment n.e.c.	31	34,169	0.1
Manufacture of motor vehicles, trailers and semi-trailers	32	87,173	0.0
Manufacture of other transport equipment	3	9,935	0.0
Manufacture of furniture	10	5,994	0.2
Other manufacturing	4	7,192	0.0
Repair and installation of machinery and equipment	16	11,365	0.1
Electricity, gas, steam and air conditioning supply	426	39,265	1.1
Total industry and electricity, gas, steam and air conditioning supply	1,950	491,551	0.4
Other workplaces within industry that belong to companies classified in another sector	360	53,952	0.7
Total	2,310	545,503	0.4

* According to the Swedish Standard Industrial Classification 2007 (SNI 2007). The workplaces in the sector 'mining of coal and lignite' are included along with 'mining of metal ores' and 'other mining and quarrying' (SNI 2007). These workplaces have primarily been attributed to other industrial and energy sectors.

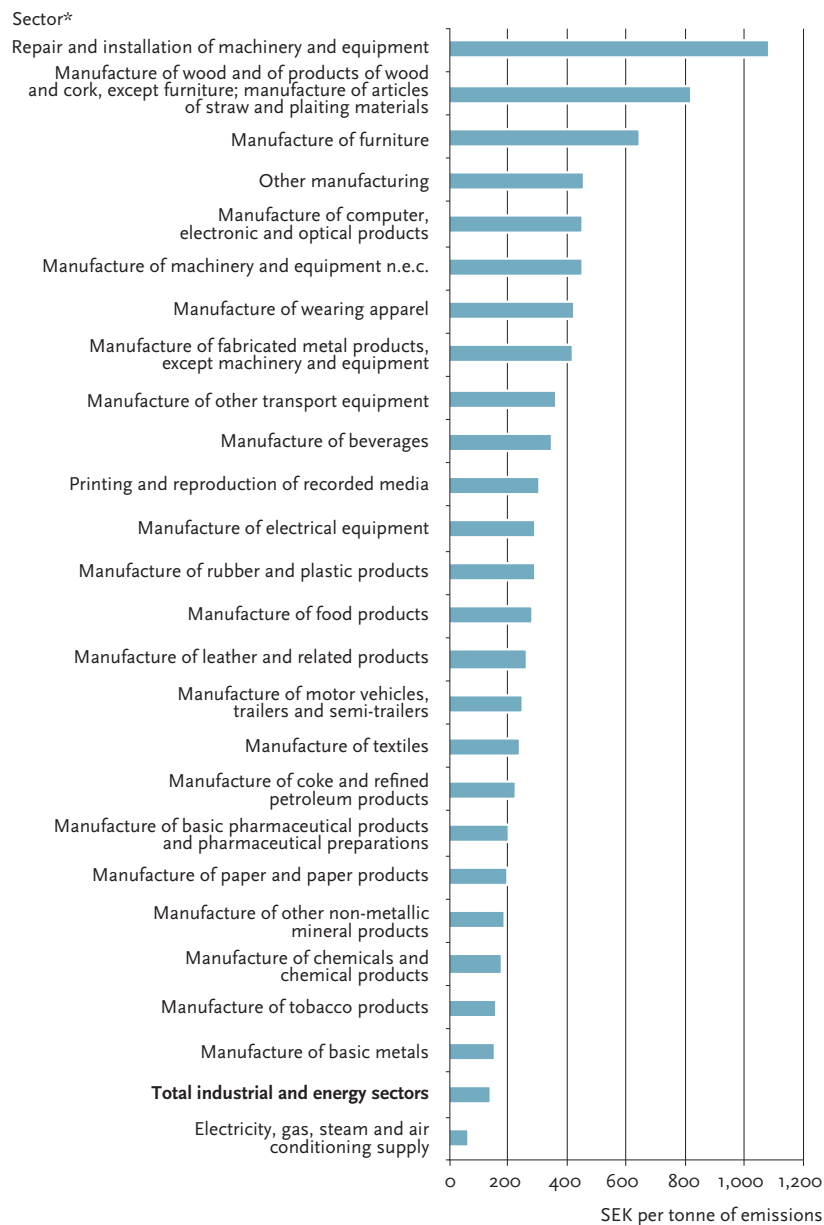
** Added value is represented here by revenue minus costs (excluding personnel costs), which is largely the same thing as added value without regard to depreciation and write-down.

Source: The Swedish National Audit Office's processing of data from Statistics Sweden's calculations in the Energy FRIDA database.

Industry expenditures for climate-related taxes in relation to emissions

There are great differences in how much various trade and industry sectors have to pay for their emissions. With regard to the industrial and energy sectors' expenditures for climate-related taxes in relation to their emissions, it was the sector 'repair and installation of machinery and equipment' which had the highest expenditures, SEK 1080 per tonne, see Figure 3.3. The sector with the lowest expenditures for energy and carbon dioxide taxes in relation to its emissions was 'supply of electricity, gas and steam' at SEK 70 per tonne. In total, expenditures for energy and carbon dioxide taxes in relation to the sector's emissions were, on average, SEK 140 per tonne. This may be compared with the households' expenditures for the corresponding taxes, which amounted to SEK 2800 per tonne, see Section 3.4.1.

Figure 3.3 Average expenditures for energy and carbon dioxide taxes per tonne of emissions in various industrial and energy sectors, SEK per tonne in 2009⁷⁷



* The workplaces in the sector 'mining of coal and lignite' are included along with 'mining of metal ores' and 'other mining and quarrying' (SNI 2007). These workplaces have primarily been attributed to other industrial and energy sectors.

Source: The Swedish National Audit Office's processing of data from Statistics Sweden's calculations in the Energy FRIDA database.

⁷⁷ According to the Swedish Standard Industrial Classification 2007 (SNI 2007). The reported expenditures for energy and carbon dioxide taxes relate to gross effects. Therefore, they do not take into account the fact that the expenditures are deductible in the companies' income tax assessment.

Trade and industry costs for climate-related taxes are often lower in practice

Many companies have in practice approximately 25 per cent lower costs for climate-related taxes than they pay the central government. This is because the climate-related taxes are deductible in the companies' income tax assessment; they may be deducted as costs from business income.⁷⁸

Of the industrial and energy sectors' energy consumption, 99 per cent is attributable to limited companies.⁷⁹ Since the expenditures for climate-related taxes on that consumption are deductible in the companies' income tax assessment, the actual costs of the industrial and energy sectors for energy and carbon dioxide taxes amounted to approximately SEK 1.7 billion. This magnitude is comparable to the industrial and energy sectors' personnel costs, which amounted to SEK 280 billion. An increase in personnel costs by, for example, 1 per cent, results in increased costs of approximately SEK 2.8 billion.⁸⁰

The fact that the climate-related taxes are deductible in the companies' income tax assessment means in principle the following for those companies which are limited companies:

1. If a company has paid SEK 100 in energy tax, the company's actual cost for energy tax is SEK 73.70 because the energy tax of SEK 100 reduces the company's income tax by SEK 26.30 (technically, the company deducts the SEK 100 paid for energy tax in the income tax assessment at a tax rate of 26.3 per cent, which means that the energy tax of SEK 100 is "worth" SEK 26.30 in the income tax assessment).
2. Some companies, however, have tax deficits. A deficit arising in the tax assessment may, if it cannot be offset against a profit, be rolled over to tax assessments in future years in order to be offset against possible future surpluses.⁸¹ Some companies do not have the chance to exploit the deductions because the companies are liquidated or enter into bankruptcy. All this implies that it is reasonable to allow for a lower tax rate than 26.3 per cent. One assessment is that the deductions in the limited companies' income tax assessment are worth 25.5 per cent.⁸²

⁷⁸ Energy tax, carbon dioxide tax and vehicle tax are known as special taxes, which shall be deducted in the income tax assessment, see Chapter 16, Section 17 of the Income Tax Act (1999:1229), IL. The tax rate for the business income of legal persons is 26.3 per cent, see Chapter 65, Section 10, IL.

⁷⁹ According to the companies included in the Energy FRIDA database.

⁸⁰ The added value is represented here by revenue minus costs (excluding personnel costs).

⁸¹ See, for example, the Swedish Tax Agency, *Tax Statistical Yearbook of Sweden 2010*, p. 9.

⁸² E-mail from the Swedish Tax Agency 07-09-2011.

3. In the cases where we describe the limited companies' actual costs for climate-related taxes, we assume that the deductions are worth 25.5 per cent, as discussed above. The costs can alternatively be estimated from a value lower than 25.5 per cent, for example, 22 per cent. When we make estimations using the lower value, we state this specifically.⁸³

For sole traders and for natural persons who are owners in trading partnerships, the tax effect is more difficult to calculate. This is because their tax burden is not in proportion to the extent of the incomes.⁸⁴

The effects of climate-related taxes being deductible in the income tax assessment can, in whole or in part, disappear for those companies that are not liable to VAT. Then the VAT becomes a cost in the same manner as for households. Both the energy and carbon dioxide taxes are included in the taxable basis for VAT. It is difficult to single out any trade and industry sectors which are entirely non-liable to VAT, even if the following areas are generally included in this group:⁸⁵

⁸³ It should be noted that the tax rates used are based on assessments. There are other assessments of the value of the deductions for climate-related taxes. The Ministry of Finance's calculations of the public financial effects of tax changes are designed primarily to capture the effects of tax changes on the public finances. The net public financial effect is intended to demonstrate the effect on the net financial transactions in a given year. The Ministry's calculation for companies is as follows: Tax changes for diesel oil, for example, which is used in agriculture and forestry, tax on the thermal power output of nuclear power reactors, tax on pesticides are only assumed to affect business income. The net effect for these is calculated to be 73.7 per cent of the gross (net effect = gross effect * (1-0.263), where 0.263 indicates tax on company profits). For industry and haulage companies, it is assumed that the gross tax change affects wage costs, profits and the product price. In view of the assumption that costs are passed on, the net amount is calculated as a proportion of the gross. In the calculations for the Climate Bill, the net effect was approximately 85 per cent of the gross effect in the year of its entering into force. See e-mail from the Ministry of Finance 22-11-2011.

⁸⁴ E-mail from the Swedish Tax Agency 07-09-2011. How great a tax effect the deduction has depends on the level of contributions (which are levied at varying percentages) and the marginal tax for income tax. At the margin, the tax effect can vary from approximately 30 to 75 per cent. The lowest margin is for those who do not pay any contributions and only municipal tax. The higher margin is for those who pay full social security contributions, municipal income tax and central government income tax at 25 per cent.

⁸⁵ E-mail from the Swedish Tax Agency 13-09-2011, compare Chapter 3 of Value-Added Tax Act (1994:200). When it comes to real estate, there is an opportunity to voluntarily register for VAT. However, this is not possible in terms of rental housing. A housing company (which mainly leases housing) may, however, register for VAT for the leasing of the company's commercial premises. Then there is partial tax liability, which means that the company is permitted to make deductions for a portion of the paid (input) VAT. Partial tax liability is also often the case for other companies operating in tax-free areas. For example, this is the case for insurance companies, which in addition to tax-free insurance services, may also have services that are liable to tax. A dentist may, in addition to tax-free treatments, perform services that are liable to tax or sell taxable goods. Apart from it being difficult to single out all the trade and industry sectors covered by tax-free turnover, it is difficult to assess the extent of (partially) taxable activities within these sectors.

- real estate
- health, dental and social care
- education
- banking and insurance.

Most companies are, however, liable to VAT. For these, VAT does not constitute a cost because the companies deduct the input VAT (on their supplier invoices) from the output VAT (on their customer invoices).

3.3.2 *The trading and non-trading sectors' emissions*

Hitherto, the EU Emissions Trading System covers three periods. The first period was a trial period and ran during the years 2005–2007. The second trading period runs during the years 2008–2012. During the second trading period, a number of installations have joined the trading system. Towards the end of the second trading period (in 2012), aviation will also become part of the trading system. In both the first and the second trading periods, trade covers carbon dioxide emissions. The third trading period will run during the years 2013–2020, when more greenhouse gases will also be covered by trading.

The table below provides an overview of the emissions of carbon dioxide and other greenhouse gases during the years 2005–2009. In total, carbon dioxide emissions constituted 78–79 per cent of the total emissions of greenhouse gases. The trading system in turn covers approximately 30 per cent of the total greenhouse gas emissions in Sweden.

Table 3.2 Emissions of greenhouse gases and carbon dioxide, millions of tonnes of carbon dioxide equivalents, 2005–2010⁸⁶

	2005	2006	2007	2008	2009	2010
EMISSIONS OF GREENHOUSE GASES						
The non-trading sector (excl. aviation)	45.7	45.1	44.3	42.9	41.7	43.1
The trading sector (incl. aviation)	21.7	22.2	21.3	20.7	18.0	23.1
Total emissions	67.4	67.3	65.6	63.6	59.7	66.2
OF WHICH EMISSIONS OF CARBON DIOXIDE						
The non-trading sector (excl. aviation)	31.6	31.0	30.7	29.4	28.7	29.8
Aviation	0.7	0.6	0.6	0.6	0.5	0.5
The trading sector (excl. aviation)	21.1	21.6	20.7	20.1	17.5	22.7
Total carbon dioxide emissions	53.3	53.2	52.0	50.1	46.7	52.9

Source: The Swedish National Audit Office's processing of data from the Swedish Environmental Protection Agency.

Greenhouse gas emissions from the trading sector in 2009 were the lowest since the start of the trading system in 2005. According to the Swedish Environmental Protection Agency survey of emissions in 2009, this is due primarily to the financial crisis and the recession at that time.⁸⁷

⁸⁶ The emissions of the trading sector (2005–2007) have been converted according to the sectors that are part of the trading sector during the second trading period (2008–2012).

⁸⁷ Swedish Environmental Protection Agency press release, 17-05-2010.

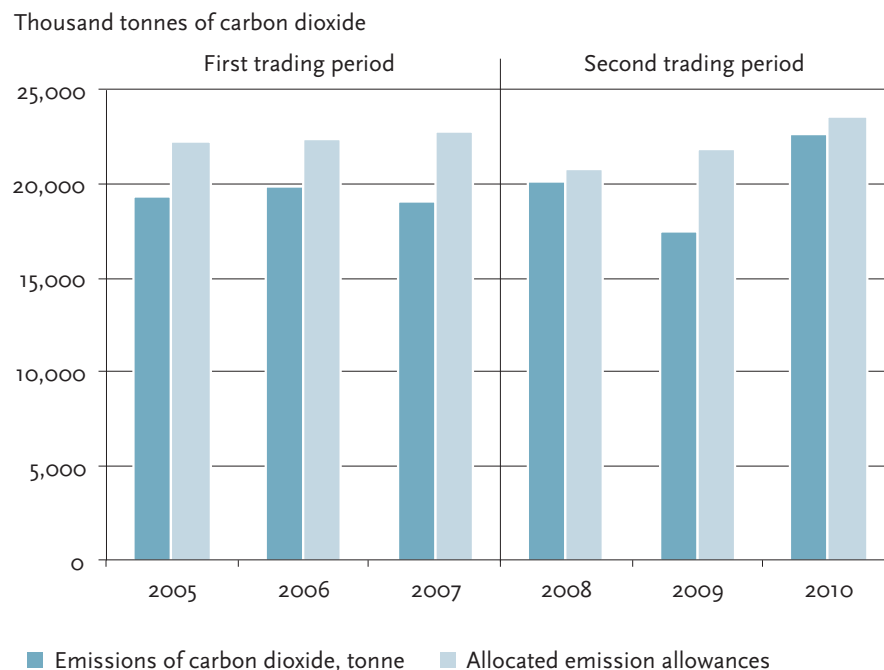
3.3.3 *The trading sector's expenditures for emission allowances*

On aggregate, installations in the trading sector are each year allocated a surplus of emission allowances compared with the emissions that these plants have caused. Companies in certain trade and industry sectors have, however, had to purchase allowances. The expenditures for allowances within the trading sector have been low for most installations because the allocation of allowances has been higher than the emissions, see Figure 3.4. Also within the EU Emissions Trading System as a whole, there is an accumulated surplus of emission allowances as a result of the actual emissions during the years 2008–2010 having amounted to considerably less than the agreed cap.⁸⁸

The allocation and the emissions of the first and second trading periods should be compared with caution because the scope of the trading sector has varied between the periods. Moreover, it was not permitted to save unused emission allowances from the first trading period and use them in the second trading period. The emission allowance price fell at the end of 2007. The fact that the allowances could not be transferred to the next period and that the availability of allowances was greater than the demand may have contributed to this.

⁸⁸ Within the EU Emissions Trading System, there is a fixed quantity of emission allowances, that is, an agreed cap on emissions. For the 2008–2012 trading period, the cap is set at the sum of the Member States' national allocation plans, after approval by the Commission. Emissions within the trading system for the period 2008–2010 were much lower than the cap, see European Commission, DG Climate Action, News 17 May 2011, "*EU ETS emissions increased in 2010 but remain well below pre-crisis level*". See also European Commission, DG Climate Action, *Verified Emissions for 2008–2009–2010 and allocations 2008–2009–2010* (15 April 2011).

Figure 3.4 Allocated emission allowances and carbon dioxide emissions for the trading sector in Sweden 2005–2010



Source: The Swedish National Audit Office's processing of data from the Swedish Environmental Protection Agency and the Swedish Energy Agency.

Prices of emission allowances

The market price of emission allowances within the EU Emissions Trading System has fluctuated since trading was introduced in 2005. For example, the price at the beginning of the current trading period (2008–2012) was approximately EUR 25 per tonne/allowance. Then the price fell rapidly to EUR 10 per tonne in early 2009. Since then, the price remained around EUR 15 per tonne until October 2011 when the price again fell to approximately EUR 10. In Appendix 3, we describe the price development of allowances in more detail.

The market expects the price of emission allowances within the trading system to rise relatively constantly during the period until 2020. Until the year 2019, the market expects a price of less than EUR 15 per tonne.⁸⁹

⁸⁹ Information on the closing prices per 20-12-2011 from Thomson Reuters Point Carbon, see Figure C in Appendix 3.

In the budget bill for 2012, the Government reports projected revenues for the forthcoming auctioning of emission allowances in the third trading period of 2013–2020.⁹⁰ As a basis for the projection, the Government has estimated a price of allowances equivalent to EUR 15 per tonne during the period 2013–2015, which is a somewhat higher price than expected by the market. The assumptions concerning the price of allowances in the Government's projection have been made by the Swedish Energy Agency.⁹¹ For the calculations in the EMEC model that the Swedish NAO commissioned the National Institute of Economic Research to do, the Swedish Energy Agency has assumed the price of allowances to be EUR 16 per tonne for the years 2020 and 2030. In surveys the Swedish Energy Agency has been involved in at the Nordic level (see Section 4.3.1), EUR 25 per tonne has been assumed as the price of allowances for the same period.

The consequence of the assumptions of a high future price of emission allowances is that the result yields relatively high costs for the trading sector. This may in turn contribute to claims for compensation from companies and trade and industry sectors.⁹²

Expenditures for emission allowances within different trade and industry sectors

In most industrial sectors, the installations have had a surplus of emission allowances. The total value of the surplus is estimated to be just over SEK 900 million for both the first trading period and thus far in the second trading period. See Tables 3.3. and 3.4. The total surplus for the two trading periods can thus be estimated to have been worth just over SEK 1.8 billion. It should be noted, however, that in the cases where companies sell their allocated allowances, the remuneration shall be subject to tax, see Section 2.2.4. Such taxation may reduce the value of the surplus.

⁹⁰ Govt. Bill 2011/12:1 p. 31.

⁹¹ Interview at the Ministry of Finance 27-10-2011.

⁹² An example of discussions on compensation to companies within the trading sector are the consultations conducted by the Commission in spring 2011. These discussed the enabling of Member States to provide energy-intensive companies with central government subsidies as compensation for increased costs as a result of higher electricity prices through the trading system. See the link http://ec.europa.eu/competition/consultations/2011_questionnaire_emissions_trading/index_en.html.

Table 3.3 Surplus/deficit of emission allowances by trade and industry sector and the value of emission allowances, 2005–2007 (the first trading period)

Trade and industry sector (SNI 2007)	2005		2006		2007		Total 2005–2007	
	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)
Mining of metal ores	108	0	-724	0	-38,515	0	-39,131	0
Manufacture of food products	102,592	17	134,706	22	140,068	1	377,366	40
Manufacture of beverages	9,590	2	9,397	2	9,041	0	28,028	3
Manufacture of textiles	6,870	1	15,264	2	15,264	0	37,398	4
Manufacture of wood and of products of wood	-22,895	-4	-20,337	-3	-53,495	0	-96,727	-8
Manufacture of paper and paper products	682,489	115	684,175	112	1,201,224	8	2,567,888	235
Refineries	572,581	97	85,034	14	285,191	2	942,806	112
Manufacture of chemicals and chemical products	106,624	18	210,055	34	137,645	1	454,324	53
Manufacture of basic pharmaceutical products and pharmaceutical preparations	5,711	1	7,126	1	20,665	0	33,502	2
Manufacture of other non-metallic mineral products	300,169	51	175,119	29	293,695	2	768,983	81
Manufacture of basic metals*	888,806	150	1,074,634	175	920,990	6	2,884,430	332
Manufacture of motor vehicles	2,774	0	12,059	2	31,556	0	46,389	3
Electricity, gas, steam and air conditioning supply*	220,789	37	159,771	26	799,021	5	1,179,581	69
Human health activities	5,224	1	7,929	1	10,456	0	23,609	2
Other personal service activities	-1,085	0	1,023	0	1,023	0	961	0
Total surplus/deficit	2,880,347	486	2,555,231	417	3,773,830	25	9,209,408	929

* When calculating the surplus/deficit of allowances, the Swedish National Audit Office has started out from the official reporting of the Swedish Environmental Protection Agency. The reporting includes emissions from Lulekraft AB in the 'manufacture of basic metals' sector because fuel and allowances derive from SSAB Luleå.

Source: The Swedish National Audit Office's processing of data from the Swedish Environmental Protection Agency, Thomson Reuters Point Carbon and the Riksbank.

Table 3.4 Surplus/deficit of emission allowances by trade and industry sector and the value of emission allowances, 2008–2010 (the second trading period)

Trade and industry sector (SNI 2007)	2008		2009		2010*		Total 2008–2010*	
	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)	Surplus/deficit (tonne)	Value (SEK million)
Mining of metal ores	-35,347	-8	143,362	20	-44,021	-6	63,994	7
Manufacture of food products	127,106	27	77,495	11			204,601	38
Manufacture of beverages	8,117	2	8,741	1			16,858	3
Manufacture of textiles	0	0	0	0			0	0
Manufacture of wood and of products of wood	-85,564	-18	-66,339	-9			-151,903	-28
Manufacture of paper and paper products	954,436	205	1,216,796	173	1,066,030	147	3,237,262	525
Refineries	168,064	36	247,021	35	228,510	32	643,595	103
Manufacture of chemicals and chemical products	494,170	106	588,097	83			1,082,267	190
Manufacture of basic pharmaceutical products and pharmaceutical preparations	17,530	4	9	0			17,539	4
Manufacture of other non-metallic mineral products	334,390	72	872,812	124	631,098	87	1,838,300	283
Manufacture of basic metals**	1,135,385	244	3,886,593	552	1,659,524	229	6,681,502	1,025
Manufacture of motor vehicles	92,070	20	33,992	5			126,062	25
Electricity, gas, steam and air conditioning supply**	-2,478,070	-534	-2,624,204	-372	-2,666,536	-368	-7,768,810	-1,274
Human health activities	1,235	0	-4,833	-1			-3,598	0
Other personal service activities	832	0	832	0			1,664	0
Total surplus/deficit	734,353	158	4,380,374	622	874,605	121	5,989,332	901

* Data by trade and industry sector in 2010 is not directly comparable with previous years because they are not broken down in the same way as each other. That which is intended for energy purposes is instead included in the supply of electricity, gas, heating and cooling.

** When calculating the surplus/deficit of emission allowances, the Swedish National Audit Office has started out from the official reporting of the Swedish Environmental Protection Agency. The reporting includes emissions from Lulekraft AB in the 'manufacture of basic metals' sector because fuel and allowances derive from SSAB Luleå.

Source: The Swedish National Audit Office's processing of data from the Swedish Environmental Protection Agency, Thomson Reuters Point Carbon and the Riksbank.

One example is the ‘manufacture of basic metals’ sector. For that trade and industry sector, the allocation of emission allowances has been higher than the actual emissions, which has resulted in a surplus. In 2009, the companies received a surplus of allowances equivalent to a value of approximately SEK 552 million. This can be compared with that sector’s expenditures for energy and carbon dioxide taxes. In 2009, the expenditure for these taxes were approximately SEK 567 million, see Table 3.1.⁹³ All companies operating in the manufacture of basic metals are limited companies, meaning that the actual cost for energy and carbon dioxide taxes are lower, approximately SEK 423 million.⁹⁴

Another example is installations in the trade and industry sector ‘manufacture of paper and paper products’. In 2009, the surplus of emission allowances that have been allocated free of charge corresponded to a value of approximately SEK 173 million. This can be compared with the expenditures for energy and carbon dioxide taxes, which in 2009 amounted to approximately SEK 160 million after deductions in the income tax assessment.

Existing installations in the trade and industry sector supplying electricity, gas and heating have not received a free allocation of emission allowances. They have, therefore, been forced to purchase emission allowances. During the years 2008–2010, these installations had to purchase allowances corresponding to approximately 7.8 million tonnes of emissions, equivalent to an estimated expenditure of approximately SEK 1.3 billion. Installations within the trade and industry sectors ‘manufacture of wood and of products of wood’ and ‘mining of metal ores’ have also had to purchase allowances during both the first and second trading periods because the allocation of allowances has been lower than their emissions. See Tables 3.3. and 3.4.⁹⁵

The emission allowances indirectly affect the price of electricity since the electricity price is determined by the cost of producing electricity at the margin in the energy system. The cost includes the price of both carbon and emission allowances.⁹⁶ A higher electricity price affects, for example, electricity-intensive industry and households. The energy tax rate for electricity consumed in the

⁹³ According to our calculations in Statistics Sweden’s Energy FRIDA database. The reported values do not take into account the fact that the expenditures are deductible in the companies’ income tax assessment.

⁹⁴ Here we have assessed that the companies’ deductions are worth 25,5 per cent. If the companies’ deductions are instead worth 22 per cent, the actual cost is SEK 443 million.

⁹⁵ Statistics Sweden has attributed the Swedish Environmental Protection Agency’s reporting of emissions by trade and industry sector according to the Swedish Standard Industrial Classification 2007 (SNI 2007). Also emissions from uses other than the primary processes for various trade and industry sectors are included in the reporting. A case in point is emissions attributable to waste heat in the manufacture of basic metals.

⁹⁶ The Swedish Energy Agency Report ER 2005:35, *The price development of electricity, allowances and the international fuel markets*, pp. 7, 43 and 52.

manufacturing process in industrial activities or in commercial greenhouse cultivation is, however, SEK 0.005 per kilowatt hour, instead of the normal tax rate of SEK 0.283 per kilowatt hour for the year 2011.⁹⁷

3.3.4 *Some companies do not have to pay for their emissions*

Approximately 10 per cent of the total carbon dioxide emissions in Sweden are completely exempted from the carbon dioxide tax. This part of the emissions comes from rail operations (railway and tram), domestic aviation, domestic maritime traffic, crude fuels consumed in installations that have a lower capacity than the limit for inclusion in the EU Emissions Trading System, and from waste incineration. According to the Government, the reason for not imposing tax on the carbon dioxide emissions from this group is a combination of reasons relating to the economy and EU law. Aviation will be part of the EU Emissions Trading System as of 2012. As of 2013, waste incineration will also, for the most part, be included in the trading system.⁹⁸

Companies that do not have to pay carbon dioxide tax or are not part of the Emissions Trading System do not need to pay at all for the carbon dioxide emissions from production. In addition to rail operations and maritime traffic, this relates to smaller companies that use fuel as raw material⁹⁹ in production. The Swedish energy and carbon dioxide taxes relate to fuel used as motor fuel or for heating. Therefore, installations that use fuel for a purpose other than as motor fuel or heating fuel are not encompassed by either energy or carbon dioxide tax. For those installations that are too small to be covered by the capacity limits of the Emissions Trading System, the companies also do not have to pay for carbon dioxide emissions through emission allowances.¹⁰⁰ The Government stated in 2009 that an analysis should be performed of the requirements for extending the carbon dioxide tax to include fuels consumed in smaller installations that are not covered by the trading system.¹⁰¹ At the present time, no such analysis work is being undertaken. The question is, however, addressed in the Commission's proposal for an amended Energy Tax Directive, see Section 2.2.3, and negotiations on this proposal are being held between the Member States.¹⁰²

⁹⁷ In a number of municipalities in northern and central Sweden, the normal tax rate is SEK 0.187 per kilowatt hour. See Chapter 11, Sections 3 and 4 of the Act (1994:1776) on Excise Duties on Energy and the Swedish Tax Agency, *Revised tax rates for fuels and electricity as of 1 January 2011*.

⁹⁸ Written Communication 2010/11:108 p. 17 f.

⁹⁹ Emissions from mobile sources caused by the trade and industry sector, through transport, for example, include the costs of carbon dioxide tax in the fuel price.

¹⁰⁰ Compare Govt. Bill 2009/10:41 p. 142, Written Communication 2009/10:195 p. 16.

¹⁰¹ Govt. Bill 2009/10:41 p. 143.

¹⁰² E-mail from the Ministry of Finance 15-11-2011, compare European Commission, COM (2011) 169 final, *Proposal for a Council Directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity*, p. 20.

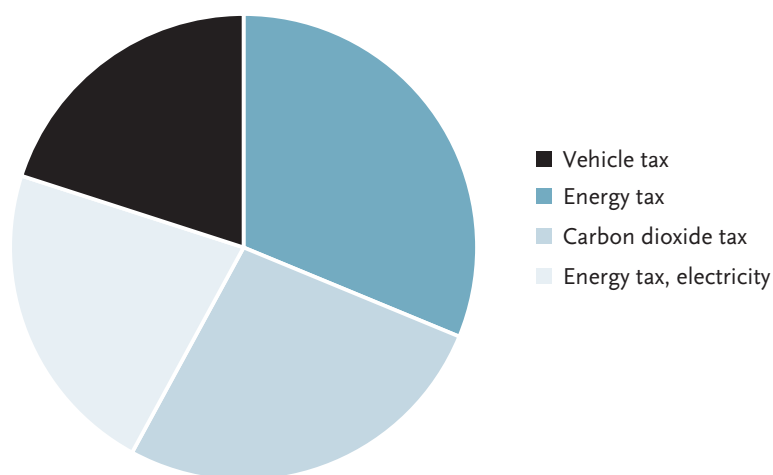
3.4 Household expenditures for emissions

This section primarily describes the result of the Swedish NAO's investigation of the expenditures of households for carbon dioxide emissions. The expenditures relate to energy and carbon dioxide taxes. The section begins with results from the Swedish NAO's processing of expenditures for various household types. This is followed by a background description of the most significant factors behind the effects of climate-related taxes on household expenditure. The section concludes with some fictitious examples of various household types.

3.4.1 Energy and carbon dioxide taxes are the predominant climate-related taxes

The households' total expenditure for energy, carbon dioxide and vehicle taxes amounted to SEK 38.9 billion in 2007, according to the Swedish NAO's calculations.¹⁰³ The bulk of the expenditure consisted of energy and carbon dioxide taxes, see Figure 3.5.

Figure 3.5 Percentage distribution of household expenditures for climate-related taxes in 2007¹⁰⁴



Source: The Swedish National Audit Office's processing of Statistics Sweden's calculations in the micro-simulation model FASIT.

¹⁰³ The data is calculated in Statistics Sweden's FASIT module for indirect taxes. The expenditures for carbon dioxide and energy taxes are in relatively good agreement with the data in the environmental accounts.

¹⁰⁴ There is also expenditure for emission allowances, but this has not been possible to calculate. In addition, there is the cost of electricity certificates. The households' total expenditure for electricity certificates amounts to approximately SEK 1.4 billion for the year 2007.

The household type ‘cohabiting without children’ had the highest expenditure for climate-related taxes per consuming unit on average in 2007, see Table 3.5. These households also had the highest carbon dioxide emissions per consuming unit. Single women with and without children had the lowest expenditure for emissions per consuming unit and also caused the lowest carbon dioxide emissions from private vehicles and oil heating. Single women also had the lowest disposable income per consuming unit.¹⁰⁵

Table 3.5 Average household expenditure for climate-related taxes¹⁰⁶ (SEK) and carbon dioxide emissions (kg) in 2007 per consuming unit

Household type	Carbon dioxide tax	Energy tax excl. electricity	Vehicle tax	Total carbon dioxide, energy and vehicle taxes (excl. electricity)	Emissions from private vehicles and oil heating	Energy tax on electricity
Single women	600	700	400	1,800	700	800
Single men	1,300	1,500	1,000	3,800	1,400	900
Cohabiting without children	2,100	2,400	1,600	6,000	2,200	1,700
Cohabiting with children 0–19 years	1,700	2,000	1,200	4,900	1,800	1,300
Single women with children	800	1,000	600	2,300	800	800
Single men with children	1,400	1,700	1,200	4,300	1,500	1,500
Total, all household types	1,500	1,700	1,100	4,300	1,600	1,200

Source: The Swedish National Audit Office’s processing of Statistics Sweden’s calculations in the micro-simulation model FASIT.

¹⁰⁵ These calculations do not include VAT on the energy and carbon dioxide taxes.

¹⁰⁶ Expenditures for energy tax on electricity are to some extent attributed to energy from renewable sources, such as hydropower. Unfortunately, it is not possible to distinguish which electricity comes from renewable sources. This means that a large proportion of the expenditures for electricity tax is not related to carbon dioxide emissions.

The Swedish NAO has also compared the size of the various household types' expenditures for energy and carbon dioxide taxes on fuels and motor fuels and for vehicle tax in relation to the size of their average carbon dioxide emissions from private vehicles and oil heating. Overall, the expenditures for climate-related taxes amount to SEK 2700–2800 per tonne of carbon dioxide emissions for all household types.

For the households in total, the expenditures for energy and carbon dioxide taxes amount to approximately SEK 2800 per tonne.¹⁰⁷

3.4.2 *Effects are dependent on consumption patterns and price sensitivity*

The effects of the climate-related taxes on household expenditure are dependent primarily on the households' consumption patterns and price sensitivity.¹⁰⁸ The environmental economic research reports differing results in terms of how different types of households and income groups are affected by increases in climate-related taxes. There are studies that conclude that the influence of the carbon dioxide tax on the households depends on where in the country the households are. The effect of the carbon dioxide tax on consumption is then highest for households in rural areas and smaller towns.¹⁰⁹ As regards the effects on various income groups, different studies arrive at differing results. According to some studies, increased carbon dioxide tax has the greatest effect on consumption in households with low income; they are affected more by an increased carbon dioxide tax. The tax is then regressive.¹¹⁰ Other studies report that the tax on motor fuels, for which carbon dioxide tax is a significant component, is largely neutral between income groups or even progressive. If a tax is progressive, it has a greater effect on the consumption of households with a high income than of households with a low income.¹¹¹ One reason may be that low-income households often have no car and live in less space than high-income households.

¹⁰⁷ The amount stated relates to expenditures for energy tax on fuels, motor fuels and electricity and for carbon dioxide tax but not for vehicle tax.

¹⁰⁸ Swedish Government Official Report 2003:60 p. 262.

¹⁰⁹ For example, Kriström et al in the Swedish Long-Term Survey 2003, Appendix 11, p. 88 f., Brännlund in Swedish Government Official Report 2003:60 p. 260 f., and the National Institute of Economic Research Occasional Study No. 18, 2008, p. 60 f., the Swedish Institute for Transport and Communications Analysis, Report 2008:11, p. 12 f.

¹¹⁰ For example, Kriström et al in the Swedish Long-Term Survey 2003, Appendix 11, p. 88 f., Brännlund in Swedish Government Official Report 2003:60 p. 260 f. and the Swedish Institute for Transport and Communications Analysis, Report 2008:11, p. 12 f.

¹¹¹ Ahola, Carlsson and Sterner in Economic Debate 2009:2 and the National Institute of Economic Research Occasional Study No. 18, 2008, p. 60 f.

3.4.3 Examples of consequences for various households

This section describes some different fictitious households based on their direct carbon dioxide emissions from private vehicles and oil heating and their costs for energy, carbon dioxide and vehicle taxes.¹¹² The households also pay VAT at 25 per cent on the energy and carbon dioxide taxes (but not on the vehicle tax), something which is not included in the descriptions.

Hans and Elisabeth, both 37, have three children. The family lives in an oil-heated 1960s house and has two cars: a small car that is a few years old and a new fuel-efficient diesel sedan. Hans and Elisabeth take turns to drive the small car to and from work. One of them uses the other car to pick up the children from day-care and for driving them to and from hockey and football training. The family pays SEK 12,300 in energy and carbon dioxide taxes and SEK 3000 in vehicle tax each year. The carbon dioxide emissions from driving and oil heating in the five-person household are just over 4 tonnes each year.

Kristina, 25, and Olle, 29, are both single. Neither of them has children. Olle has a much higher income than Kristina. Olle also accounts for twice as much carbon dioxide emissions (1.4 tonnes) each year compared to Kristina (0.7 tonnes). Olle has a fairly new car that he uses both to and from work, and for various trips. Every year, Olle pays SEK 3700 in energy and carbon dioxide taxes and SEK 1000 in vehicle tax. Kristina has a small car that she seldom uses because she travels to work by public transport. She pays SEK 2200 in energy and carbon dioxide taxes and SEK 400 in vehicle tax each year.

Maria and Eric are both in their 30s. They cohabit in a co-operative apartment. They have a new petrol-driven large car that Maria uses to and from work. They also use the car frequently at weekends to travel to various recreational activities (both near and far away). The carbon dioxide emissions from Maria and Eric's household amount to just over 3 tonnes each year. For those emissions, Maria and Erik together pay SEK 9600 in energy and carbon dioxide taxes and SEK 2500 in vehicle tax each year.

¹¹² The examples are based on average expenditures for energy tax (here including energy tax on electricity), carbon dioxide tax and vehicle tax, income and emissions per household in 2007. The data is based on processing of the calculations in FASIT that Statistics Sweden performed on behalf of the Swedish NAO and on Statistics Sweden's income distribution survey for the years 1991–2009. As the examples present data by household, they are not directly comparable with the data that we report in Table 3,5 because that table reports data by consuming unit.

3.5 Effects of the tax restructuring 2010–2015

In this section, the Swedish NAO reports the effects of the restructuring of the climate-related taxes for the period 2010–2015. The analyses help to answer the first audit question of whether there are significant distribution effects as a result of the restructuring.

First, we describe long-term effects of the restructuring of the climate-related taxes for the years 2010–2015. Then we describe effects on central government finances, followed by effects of the restructuring on industry and households. The reporting of the long-term effects is based on processing that the Swedish NAO commissioned the National Institute of Economic Research to carry out in that agency's general equilibrium model, EMEC.¹¹³ The reporting of the effects on central government finances and the effects on industry and households are based on processing that the Swedish NAO commissioned Statistics Sweden to carry out in that agency's FRIDA database and micro-simulation model FASIT. Note that such processing in EMEC cannot be compared with the processing in FRIDA and FASIT.

Appendix 2 provides an overview of the changes in the restructuring of the climate-related taxes for the period 2010–2015.

3.5.1 Small long-term effects of the tax restructuring

The restructuring of the climate-related taxes has only a marginal effect on emissions, and thereby the chances of achieving the climate objective are also marginally affected. According to the processing that the National Institute of Economic Research conducted on behalf of the Swedish NAO, the tax restructuring for the period 2010–2015 also did not have any appreciable effect on the economy as a whole in the long term. The carbon dioxide emissions are projected to decline to a somewhat greater extent as a result of the tax restructuring than would have been the case without restructuring. The decided restructuring of the climate-related taxes does not entail any major general tax increases. Below we describe long-term effects on trade and industry and households.

Small long-term effects for trade and industry

The assessment of the National Institute of Economic Research is that the distribution (calculated as added value) among different trade and industry sectors in the non-trading sector will be affected to some extent by the tax

¹¹³ EMEC is an abbreviation of "Environmental Medium term Economic model". EMEC displays adjustments throughout the economy with a 10–15-year perspective from an "original situation", through, for example, tax changes to a situation where the economy has once again reached equilibrium. See also Appendix 4.

restructuring for the period 2010–2015.¹¹⁴ However, the effects in the long term are small. The trade and industry sectors that are adversely affected, that is, those gaining a lower added value in the long term because of the restructuring, are mining and quarrying, manufacturing n.e.c. and agriculture, forestry and fishing. The manufacture of basic metals is expected, however, to gain a somewhat higher added value in the long term as a result of the restructuring. A higher or lower added value as a result of the tax restructuring may be due to increased or decreased tax costs but also to indirect effects.¹¹⁵

The tax restructuring for the period 2010–2015 is assessed by the National Institute of Economic Research to help to reduce the carbon dioxide emissions by 2020 and 2030 to a somewhat higher extent than would have been the case without the restructuring. The non-trading sector accounts for the emissions reductions, while the trading sector increases its emissions as a result of the tax restructuring. Note that this applies to the effects of the tax restructuring for the period 2010–2015 and not the total emissions reductions. The tax restructuring is assessed as having the greatest effect in the form of reduced emissions in the trade and industry sectors, manufacturing n.e.c., mining and quarrying, agriculture, forestry and fishing.

The National Institute of Economic Research has also examined how the changes in the carbon dioxide tax affect the cost-effectiveness of the tax. According to the National Institute of Economic Research, the changes in the carbon dioxide tax have increased the cost-effectiveness of the tax. This is the case because the altered carbon dioxide tax can bring about a certain reduction in emissions in the non-trading sector at a lower economic cost, in the form of reduced GDP, compared with the achievement of the same emissions reduction with the previous structure of the carbon dioxide tax.

¹¹⁴ The EMEC model does not contain data on individual installations. Therefore, all production in these sectors is attributed to the trading sector. The trade and industry sectors in the model, that are not part of the trading sector, are 'non-metallic mineral products', 'pulp and paper', 'publishing and printing', 'chemicals excluding pharmaceuticals', 'rubber and plastics', 'basic metals', 'other metals excluding non-ferrous metals', 'metals', 'other machinery and equipment', 'office machinery and computers', 'electrical appliances', 'communication equipment', 'measuring instruments', 'motor vehicles', 'other transport equipment', 'other manufacturing', 'petroleum and nuclear fuel', 'electricity, gas, steam and hot water', 'water purification' and 'aviation'. See Appendix 4 for a detailed description of EMEC.

¹¹⁵ E-mail from the National Institute of Economic Research 08-12-2011. Indirect effects may occur, for instance, due to changes in demand for the trade and industry sector's products as a result of lower production in other trade and industry sectors. A change in demand can occur when companies and households switch to relatively cheaper goods if what is known as the relative price increases or if the companies and households which express a demand for the goods of the trade and industry sector have a lower income and therefore reduce their demand for all inputs/ consumer goods, including the goods produced by the trade and industry sector in question.

Small long-term effects for households

Households (private consumption), according to the National Institute of Economic Research, will not be affected to any great extent by the tax restructuring. Neither will the distribution among the various household groups in the model be appreciably affected in the long term.¹¹⁶ This is because the energy tax increases relate to forms of energy that the households do not consume to any great extent (coal, natural gas and LPG). The raised energy tax on diesel does, however, affect the households directly, but the effects are small and affect the households' total consumption very little in the long term.¹¹⁷ Neither do any greater increases in carbon dioxide tax affect the households. Therefore the tax restructuring does not lead to any major effects on the carbon dioxide emissions of households.

3.5.2 *The effects on central government finances of climate-related taxes and emission allowances*

The energy taxes are increasing and the carbon dioxide taxes are decreasing as a result of the tax restructuring for the period 2010–2015, according to the Swedish NAO's calculations, see Table 3.6 below.¹¹⁸ Overall, the revenues from energy tax on fuels and motor fuels and from carbon dioxide tax are projected to decrease by SEK 1.4 billion. The expenditures are expected to decrease for companies within the trading sector and to increase for companies outside the trading sector.

For the companies in the trading sector, the expenditures for energy tax on fuels and motor fuels and for carbon dioxide tax are projected to decrease by SEK 5.6 billion between 2009 and 2015.¹¹⁹ This is primarily because most companies within the trading sector do not have to pay carbon dioxide tax as of the year 2011.¹²⁰ The carbon dioxide tax for companies within the trading sector is projected to decrease by SEK 6.5 billion (from SEK 7.2 to 0.7 billion).¹²¹

¹¹⁶ The household groups in the EMEC model are individuals on low incomes and individuals on high incomes in rural areas, medium-sized cities and metropolitan areas.

¹¹⁷ The calculations have not taken into account, however, changes in the vehicle tax, see Appendix 4.

¹¹⁸ The calculations relate to the gross effects of the climate-related taxes. Here, the calculations do not take into account indirect effects such as the deductibility of the climate-related taxes in the companies' income tax assessment.

¹¹⁹ These calculations are based on companies that are liable to tax. Therefore, there may be a certain displacement between the trading and non-trading sectors if trade in fuels takes place between these two sectors.

¹²⁰ For the trade and industry sectors combined heat and power (CHP) and heating, the carbon dioxide tax was not abolished through the tax restructuring. Instead, the tax was decreased from 15 to 7 per cent of the general level of carbon dioxide tax for the CHP sector. For the heating sector, the tax rate remains at 94 per cent of the general level of carbon dioxide tax.

¹²¹ For companies in the simulation model FRISIM as a result of the tax restructuring for the period 2010–2015.

In the non-trading sector, the companies are expected to have increased expenditures for energy tax on fuels and motor fuels and for carbon dioxide tax by SEK 4.2 billion during the same period.

Table 3.6 Effects in SEK billion of the tax restructuring between 2009 and 2015 on the total expenditure of trade and industry for energy tax on fuels and motor fuels and for carbon dioxide tax (2009 volumes)¹²²

	Energy tax on fuels and motor fuels	Carbon dioxide tax	Total
The trading sector	0.9	-6.5	-5.6
The non-trading sector	2.4	1.8	4.2
Total	3.4	-4.7	-1.4

Source: The Swedish National Audit Office's processing of Statistics Sweden's calculations in the simulation model FRISIM.

If the projections of energy consumption until the year 2013 are also taken into account, the total revenues from energy tax on fuels and motor fuels and from carbon dioxide tax are expected to increase by SEK 0.3 billion, see Table 3.7. For companies within the trading sector, the expenditures for energy tax on fuels and motor fuels and for carbon dioxide tax are expected to decrease by SEK 5.4 billion. The expenditures for companies outside the trading sector are projected to increase further, by a total of SEK 5.7 billion.

Table 3.7 Effects in SEK billion of the tax restructuring between 2009 and 2015 on the total expenditure of trade and industry for energy tax on fuels and motor fuels and for carbon dioxide tax (2013 volumes)¹²³

	Energy tax on fuels and motor fuels	Carbon dioxide tax	Total
The trading sector	1.5	-6.9	-5.4
The non-trading sector	3.4	2.3	5.7
Total	4.9	-4.5	0.3

Source: The Swedish National Audit Office's processing of Statistics Sweden's calculations in the simulation model FRISIM.

¹²² The reported expenditures for energy and carbon dioxide taxes relate to gross effects. Therefore, they do not take into account the fact that the expenditures are deductible in the companies' income tax assessment.

¹²³ The reported expenditures for energy and carbon dioxide taxes relate to gross effects. Therefore, they do not take into account the fact that the expenditures are deductible in the companies' income tax assessment.

3.5.3 Industry's expenditures for climate-related tax is changing

The tax restructuring for the period 2010–2015 is estimated to bring about a total decrease in the expenditures of the industrial and energy sectors for energy and carbon dioxide taxes, if the projection for energy consumption for the year 2013 is taken into account. Overall, the industrial and energy sectors are expected to reduce their expenditures for energy and carbon dioxide taxes by approximately SEK 248 million.

For individual industrial and energy sectors, the tax restructuring is expected to have the following effects on the expenditures for climate-related taxes, if the projection for energy consumption is taken into account: The trade and industry sectors of the manufacture of basic metals, the supply of electricity, gas, heating and cooling, the manufacture of other non-metallic mineral products and the manufacture of chemicals and chemical products will have reduced expenditures. Other trade and industry sectors will have increased expenditures. See Table 3.8 below, which shows the total increase or decrease in calculated expenditures for the industrial and energy sectors as a result of the tax restructuring for the period 2010–2015. For the 2009 volumes, the expenditures are specified for energy tax and carbon dioxide tax.¹²⁴ For the 2013 volumes, the expenditures are not specified for energy tax and carbon dioxide tax. Before the tax restructuring, the industrial sectors were among those that were fully exempted from energy tax on fuels.

Table 3.8 Effects of the tax restructuring 2010–2015 on the industrial and energy sectors (based on the 2009 and the 2013 energy consumption)¹²⁵

Industrial and energy sectors* (SNI 2007)	Differences in expenditures, SEK million			
	2009 volumes		2013 volumes	
	Energy tax	Carbon dioxide tax	Total	Total
Manufacture of food products	71	0	71	71
Manufacture of beverages	9	4	13	19
Manufacture of tobacco products	0	0	0	0
Manufacture of textiles	5	4	9	7
Manufacture of wearing apparel	0	0	0	0
Manufacture of leather and related products	0	0	0	1

cont.

¹²⁴ In 2009, the energy volumes were greatly affected by the financial crisis.

¹²⁵ The reported expenditures for energy and carbon dioxide taxes relate to gross effects. Therefore, they do not take into account the fact that the expenditures are deductible in the companies' income tax assessment. The 2013 energy consumption is based on the Swedish Energy Agency's projection, which in part includes behavioural changes.

cont.

Industrial and energy sectors* (SNI 2007)	Differences in expenditures, SEK million			
	2009 volumes			2013 volumes
	Energy tax	Carbon dioxide tax	Total	Total
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	30	4	34	90
Manufacture of paper and paper products	225	-150	75	9
Printing and reproduction of recorded media	1	1	2	2
Manufacture of coke and refined petroleum products	19	9	28	11
Manufacture of chemicals and chemical products	51	-31	19	-4
Manufacture of basic pharmaceutical products and pharmaceutical preparations	6	0	6	7
Manufacture of rubber and plastic products	11	7	18	19
Manufacture of other non-metallic mineral products	123	-129	-6	-36
Manufacture of basic metals	319	-472	-153	-374
Manufacture of fabricated metal products, except machinery and equipment	20	13	33	42
Manufacture of computer, electronic and optical products	1	0	1	2
Manufacture of electrical equipment	5	-1	4	6
Manufacture of machinery and equipment n.e.c.	11	7	18	27
Manufacture of motor vehicles, trailers and semi-trailers	19	-10	9	13
Manufacture of other transport equipment	1	1	2	4
Manufacture of furniture	2	1	4	6
Other manufacturing	1	1	2	3
Repair and installation of machinery and equipment	3	1	4	11
Electricity, gas, steam and air conditioning supply	379	-410	-31	-183
Total	1,311	-1,148	163	-248

* Refers to the industrial and energy sectors SNI 10–35. See Table H, Appendix 6, for complete classifications of industrial and energy sectors. The workplaces in the sector 'mining of coal and lignite' are included along with 'mining of metal ores' and 'other mining and quarrying' (SNI 2007). These workplaces have primarily been attributed to other industrial and energy sectors.

Source: The Swedish National Audit Office's processing of data from Statistics Sweden's calculations in the Energy FRIDA database.

3.5.4 *Household expenditures and emissions are increasing*

The calculations of the effects on households of the tax restructuring for the period 2010–2015 that the Swedish NAO has made in this section produce an outcome using the 2007 consumption patterns. These calculations are, in other words, static.¹²⁶ The purpose of the carbon dioxide tax is to influence consumption patterns, but to examine this, the data on household finances would need to be updated.

Household expenditures for climate and electricity taxes are increasing

The households' expenditures for energy tax and carbon dioxide tax on fuels and motor fuels and on vehicle tax are expected to increase by SEK 1.8 billion as a result of the tax restructuring for the period 2010–2015.¹²⁷ The greatest portion of the increase relates to energy tax and carbon dioxide tax on heating fuel and motor fuels. The households' heating fuel and motor fuels are expected to consist of 85 per cent petrol, 11 per cent diesel and 4 per cent oil for the year 2012.¹²⁸ The expenditures for vehicle tax are expected to remain largely unchanged.¹²⁹ If energy tax on electricity is also included, the households' expenditures are estimated to increase by SEK 2.9 billion.

The tax restructuring has no appreciable effect on the proportional distribution between different households.

¹²⁶ However, the calculations of the long-term effects of the tax restructuring on households in Section 3.5.1 that have been made in the National Institute of Economic Research EMEC model take into account the fact that the households switch to relatively cheaper consumer goods if what is known as the relative price increases.

¹²⁷ According to our calculations in Statistics Sweden's module for indirect taxation in FASIT. In the model, the values for 2012 have been calculated using the tax rates before the tax restructuring in 2009 and with the tax rates in 2015. Energy tax on electricity is not part of the tax restructuring and has therefore not been included.

¹²⁸ E-mail from Statistics Sweden 23-01-2012.

¹²⁹ It should be noted that the calculation of the households' expenditures for vehicle tax is based on car ownership in 2007. The proportion of cars with lower carbon dioxide emissions has increased since then, which would affect the result of a calculation based on car ownership, for example, in 2011.

Household carbon dioxide emissions are increasing

The households' carbon dioxide emissions from private vehicles and oil heating are estimated to increase by approximately 265,000 tonnes between 2007 and 2012 according to the Swedish NAO's calculations.¹³⁰ This will take place even though the emissions per consuming unit are decreasing somewhat between 2007 and 2012. One explanation for the emissions still increasing is that the population is expected to increase between these years. If the households' consumption patterns are affected by the tax restructuring, their total emissions may instead decrease.

3.6 Important findings

The Swedish National Audit Office's overall findings are that the polluter pays principle is not applied to its full extent. There are great differences in how much different polluters have to pay. The tax restructuring for the period 2010–2015 has a marginal effect on the emissions and the climate objective and on the economy as a whole.

- According to the Swedish NAO's calculations, the households pay approximately SEK 2800 in energy and carbon dioxide taxes per tonne¹³¹, and the industrial and energy sectors pay on average approximately SEK 140 per tonne of carbon dioxide.
- The expenditure of trade and industry for climate-related taxes constitutes a small part of the total costs of trade and industry/companies. Expenditure for energy and carbon dioxide taxes was approximately 4 per cent of the companies' total costs in 2009. Furthermore, the costs of many companies for climate-related taxes are in practice approximately 25 per cent lower than their payments to the central government because climate-related taxes are deductible in the companies' income tax assessment.
- Given the value of free allocation and the surplus of emission allowances as well as reductions and exemptions with respect to the climate-related taxes, the companies in the trading sector have paid very little, sometimes nothing, for emissions. Certain installations and trade and industry sectors may have received considerable income without having had to reduce emissions or to take action to reduce emissions.

¹³⁰ According to Statistics Sweden's indirect excise duty module for the micro-simulation model FASIT.

¹³¹ The amount stated relates to expenditures for energy tax on fuels, motor fuels and electricity and for carbon dioxide tax but not for vehicle tax.

- In the long term, the tax restructuring for the period 2010–2015 will have marginal effects on the economy as a whole and on emissions.
- The portion of the tax restructuring for the period 2010–2015 that relates to carbon dioxide tax has increased the cost-effectiveness of the carbon dioxide tax. This is the case because the altered carbon dioxide tax can bring about a certain reduction in emissions at a lower economic cost, in the form of reduced GDP, compared with the achievement of the same emissions reduction with the previous structure of the carbon dioxide tax.
- Companies within the trading sector gain an overall reduction of the expenditures for energy tax on fuels and motor fuels and for carbon dioxide tax. The non-trading sector has increased expenditures for climate-related taxes. In total, the expenditures of trade and industry are expected to increase by SEK 0.3 billion as a result of the tax restructuring for the period 2010–2015.
- The tax restructuring for the period 2010–2015 is estimated to bring about a total decrease in the expenditures of the industrial and energy sectors for energy and carbon dioxide taxes, if the projection for energy consumption for the year 2013 is taken into account.
- The total expenditures of the households for climate-related taxes are expected to increase by SEK 1.8 billion as a result of the tax restructuring for the period 2010–2015. There is no appreciable effect on the proportional distribution between different households.

4 Government and agency reporting of costs and emissions

This chapter presents the Swedish National Audit Office's findings on Government and agency analyses and reporting with respect to expenditures and costs for greenhouse gas emissions, especially carbon dioxide.

As reported in Chapter 3, there are distribution effects, that is, differences in expenditures between households and trade and industry, between different household types and between different trade and industry sectors. There are also significant deviations from the Riksdag's fundamental principles in terms of the effects of climate-related taxes and of the Emissions Trading System.

Since the beginning of the 2000s, certain surveys have been carried out within environmental economic research, Government Official Reports and official statistics of the distribution effects and other effects of environmental taxes. The surveys have primarily covered the distribution between different types of households, but certain effects on trade and industry have also been analysed.¹³²

There is, however, no comprehensive survey of the costs of trade and industry for climate-related taxes and emission allowances in relation to the emissions. Neither has the overall distribution of expenditures for climate-related taxes and emission allowances between trade and industry sectors been reported. The distribution of costs for climate-related taxes between households and trade and industry as a result of the tax restructuring for the period 2010–2015 has also not been presented.

¹³² See, for example, the Swedish Long-Term Survey 2003, Appendix 11 and the Swedish Long-Term Survey 2008, Statistics Sweden, environmental accounts report 2010:2, *Environmentally related taxes, subsidies and allowances*, as well as Swedish Government Official Report 2003:38.

4.1 The Government's analyses and reporting of effects

This section describes the Government's analyses and reporting of the effects of climate-related taxes. To begin with, the analyses of the Ministries concerned are reported. Then follows a description of the Government's reporting with respect to public financial effects as well as effects on trade and industry and households. The Swedish NAO's audit relates partly to the Government's reporting of the effects of the restructuring for the period 2010–2015 and partly to the Government's continuous reporting of the effects of climate-related taxes as well as the cumulative effects of climate-related taxes and other policy instruments.

4.1.1 The Ministries' analyses vary in focus

The Ministry of Finance

The Ministry of Finance has above all a public financial perspective in its calculations and analyses of tax effects. This means that the Ministry's focus is on how much money the central government receives from the taxes. Also the effect of tax changes on the achievement of objectives is central to the Ministry, as are the economic impact of, and administrative costs for, regulation changes.

In addition, the Ministry gives priority to calculations of the distribution of costs and income between different income groups. Then the Ministry uses above all Statistics Sweden's FASIT model. FASIT's module for indirect taxes was used for the green tax shift in 2001–2006. The module for indirect taxes was last updated by the Government Offices in 2007. The Government Offices have also used the module later, but without updating the basic data in the module.

About two years ago, the Ministry of Finance produced a brief internal memorandum about the distribution effects of a proposed carbon dioxide tax increase between different household types and between regions.¹³³ The Ministry has not estimated the distribution of climate policy costs between, for example, households and trade and industry, or between different trade and industry sectors or company types in trade and industry. However, the Ministry of Finance has, together with the Ministry of Enterprise, Energy and Communications and the Parliamentary Research Service, commissioned Statistics Sweden to develop an initial simulation model for FRIDA. The model – called FRISIM – deals with climate-related taxes, and may for example be used to simulate the fiscal outcome following changes in tax rates, regulation changes and the projected development of energy consumption.

¹³³ Ministry of Finance, internal memorandum, 07-04-2010.

The Ministry of Enterprise, Energy and Communications

Questions about the implications for industry of climate-related taxes and the EU Emissions Trading System fall within the remit of the Ministry of Enterprise, Energy and Communications. The Ministry of Enterprise, Energy and Communication's analysis department has carried out a brief survey of the consequences that an amended energy and carbon dioxide taxation would have on industry. The work resulted in a supporting memorandum to the ministry memorandum Ds 2009:24. The Ministry of Enterprise, Energy and Communication has subsequently not carried out any surveys of climate-related taxes. Nor have the costs of trade and industry for climate-related taxes and emission allowances been analysed.¹³⁴

The Ministry of the Environment

The Ministry of the Environment has primary responsibility within the Government Offices for the Emissions Trading System. The Ministry has not reported what the surplus of allocated emission allowances may be worth or made any projections of the price of emission allowances. The Ministry participated in the working party which prepared the bases for the ministry memorandum Ds 2009:24. The memorandum was a treatment of the tax restructuring for the period 2010–2015. The Ministry does not carry out its own analyses of the distribution effects and other effects of climate-related taxes. With regard to assessments of the achievement of objectives, the Government has, besides the forthcoming Checkpoint 2015, commissioned the Swedish Environmental Protection Agency to produce a roadmap for a Sweden without net emissions of greenhouse gases by 2050.¹³⁵ The Government has also appointed a special consultative group for dialogue on the Government's objective of a Sweden without net emissions in 2050.¹³⁶

¹³⁴ Interviews at the Ministry of Enterprise, Energy and Communication on 15-09-2011 and 27-10-2011.

¹³⁵ Interview at the Ministry of the Environment 03-11-2011 and Government decision on 21 July 2011, M2011/2426/K1. A first interim report will be submitted on 31 January 2012. The commission shall have its final presentation on 1 December 2012. Checkpoint 2015 shall analyse the development in relation to the objectives and the state of knowledge. The checkpoint does not include fundamental policy orientation but may lead to adjustments of policy instruments and other instruments. See Govt. Bill 2008/09:162 p. 2.

¹³⁶ Government press release on 15 November 2011.

4.1.2 *Difficult to interpret reporting of public financial effects as well as of the expenditures of trade and industry and households for emissions*

This section addresses the Government's reporting to the Riksdag of the effects and costs of the tax restructuring for the period 2010–2015. The audit focuses on the reporting of the Climate Bill, the bill on the tax restructuring and the budget bill for 2010. The reporting of the Ministry of Finance's memorandum that preceded the bill on the tax restructuring is also considered.¹³⁷

The tax restructuring for the period 2010–2015, together with other financial policy instruments, shall contribute to the achievement of the milestone target for the year 2020. In order for the target to be achieved at the lowest possible economic cost, all emissions sources need, according to the Government, to encounter the same cost for emissions in the form of a common level of tax. However, if there is a risk of carbon leakage, there could, according to the Government, be justification for certain sectors that are exposed to foreign competition to be imposed with a lower tax. The Government also believes that the use of taxes ensures compliance with the polluter pays principle. According to the Government, it is difficult to identify the tax level that will achieve the set environmental objective. The Government has therefore introduced a checkpoint in 2015, partly to see if corrections of the climate-related taxes are needed with respect to how the sources of emissions actually perform.¹³⁸ To achieve the target, emission credits can also be used.

Climate effects

In the Climate Bill, the Government presents a table of the size of emissions reductions that the various measures of the tax restructuring for the period 2010–2015 are expected to contribute. The Government supplements this presentation in the bill on the tax restructuring with short text descriptions in the section "Environmental Effects". The Government emphasises that there are obvious difficulties in accurately stating the reduction of emissions as a result of the various tax changes.¹³⁹

Public financial effects

The Government's descriptions of public financial effects and effects on trade and industry of the tax restructuring for the period 2010–2015 are not conclusive and may therefore be difficult to interpret. Even though it is the

¹³⁷ Govt. Bill 2009/10:41, Govt. Bill 2009/10:1 volume 1, Govt. Bill 2008/09:162 and ministry memorandum Ds 2009:24.

¹³⁸ Govt. Bill 2008/09:162 p. 228.

¹³⁹ Ibid p. 237 f. and Govt. Bill 2009/10:41 p. 187 f.

same calculations that underlie the reporting of the public financial effects of the tax restructuring for the period 2010–2015 in the Government’s various preparatory works, the reporting of these effects differ between the preparatory works. In the bill on the tax restructuring, the Government refers to the 2010 budget bill concerning the reporting of the public financial effects.¹⁴⁰ The reporting differs in part from the reporting of the Climate Bill with respect to division, years and certain amounts.¹⁴¹

Regarding the effects on trade and industry, the reporting does not always adhere to the Ministry of Finance’s principles for calculations.¹⁴² The consequences of the Government’s descriptions of the tax restructuring being difficult to interpret are that the Riksdag has not gained a clear overall picture of the effects of the tax restructuring.

Economic impact

The Government’s analysis of the tax restructuring’s economic impact is described briefly in the Climate Bill and the bill on the tax restructuring for the period 2010–2015. The Government also refers to analyses by the National Institute of Economic Research, the Swedish Environmental Protection Agency and the Swedish Energy Agency. The Government emphasises that the analyses are uncertain.¹⁴³

With regard to the risk of carbon leakage, the Government states in the bill on the tax restructuring for the period 2010–2015, with reference to the National Institute of Economic Research, that the energy-intensive industry is essentially part of the Emissions Trading System and is therefore not affected by the decrease in the reductions. It is therefore the assessment of the Government that the risk of carbon leakage is less today than before the energy-intensive industry was part of the trading system.¹⁴⁴ In the Climate Bill, the Government comments on an analysis in Checkpoint 2008 of the consequences of abolishing the reduction of the carbon dioxide tax for the non-trading sector. According to the Government, it is difficult to assess the extent of carbon leakage, as this depends on several factors. Such factors may, according to the

¹⁴⁰ Govt. Bill 2009/10:41 p. 191.

¹⁴¹ Govt. Bill 2009/10:1 p. 188 f. and p. 192 and Govt. Bill 2009/10:41 p. 237 f.

¹⁴² Ministry of Finance, *Principles for calculations ('Beräkningskonventioner') for 2011*, p. 23 and 29 f. According to the Ministry, the principles for calculations may be regarded as a manual for how various types of public financial effects of regulation changes for taxes and contributions are to be calculated and how the calculations should be reported. The principles for calculations use the concepts of gross effect, indirect effect, net effect and lasting effect for different public financial effects of a measure concerning taxes or contributions.

¹⁴³ Govt. Bill 2008/09:162 p. 229 f. and Govt. Bill 2009/10:41 p. 191 f.

¹⁴⁴ *Ibid.* and the National Institute of Economic Research Occasional Study No. 18 June 2008 *Economic Assessment of the Climate Committee's Action Plan for Swedish Climate Policy*.

Government, be the extent to which producers in other countries are imposed with equivalent regulation in order to achieve their own national emissions targets.¹⁴⁵ The National Institute of Economic Research maintained in 2011 that analyses show that the risk of carbon leakage is often exaggerated since carbon dioxide taxation is just one of several factors for companies to consider when making decisions on location.¹⁴⁶ The Swedish NAO's processing shows that the expenditures for energy and carbon dioxide taxes of the industrial and energy sectors in many cases are low in relation to the total added value of the trade and industry sectors, see Section 3.3.1.

4.1.3 *Inadequate reporting of how the costs for climate-related taxes are distributed among different parts of trade and industry*

The Government has not presented a comprehensive picture to the Riksdag of the distribution of the costs for climate-related taxes among different trade and industry sectors.

Neither does the Government give any coherent description of the effects of the tax restructuring for the period 2010–2015 for the various trade and industry sectors. For those trade and industry sectors where the costs are reported, the Government does this in different bills. For example, the reporting of costs for certain trade and industry sectors is divided between the Climate Bill and the bill on the tax restructuring.¹⁴⁷ One trade and industry sector that is reported is the paper industry. According to the Government, the restructuring entails that the total tax cost is expected to be reduced by 0.5 per cent of the added value. For combined heat and power (CHP) and heating plants, for example, the Government assessment is that the effects will be relatively small compared to the previous taxation.¹⁴⁸

¹⁴⁵ Govt. Bill 2008/09:162 p. 232. The analysis in Checkpoint 2008 was performed by the consultancy firm ÅF, which indicates that it is the smaller companies that are affected most by a completely abolished reduction of the carbon dioxide tax since they are attributed with limited opportunities to make the necessary investments to switch fuels in their processes.

¹⁴⁶ National Institute of Economic Research Occasional Study No. 25 March 2011 *The challenges of climate policy during the term of office* p. 11, with reference to Barker, T. et al. (2007): *Carbon leakage from unilateral environmental tax reforms in Europe, 1995–2005*, Energy Policy, vol. 35, 2007 and the OECD *The economics of climate change mitigation: Policies and options for global action beyond 2012*, OECD, Paris, 2009.

¹⁴⁷ Govt. Bill 2008/09:162 sections 12.4.1–3 compared with Govt. Bill 2009/10:41 sections 6.4–6.9.

¹⁴⁸ Govt. Bill 2009/10:41 p. 139. As a basis for the information, the Government has used the information in an internal memorandum from the Ministry of Enterprise, Energy and Communications: *Consequences for industry upon amended energy and carbon dioxide taxes*, dated 05-11-2008. In the Bill, the Government proposes, inter alia, that the carbon dioxide tax be abolished for heating fuels consumed in installations within the EU Emissions Trading System. At the same time, the Government proposes that energy tax equivalent to the EU minimum tax level for light fuel oil be introduced for installations within the trading system. The Government states that a large part of the Swedish energy-intensive industry is covered by the trading system.

However, the ministry memorandum that preceded the Bill on the Climate tax restructuring for the period 2010–2015, and which was accordingly not reported to the Riksdag, presents, inter alia, an analysis of the costs of tax proposals for two different typical companies.¹⁴⁹ According to the background material to the calculations, the tax cost for the non-trading sector will increase by a factor of two to three. For the industrial companies within the trading sector, the taxation will not increase by more than 0.3 per cent within any branch of trade and industry.¹⁵⁰ These calculations disregard, however, the fact that the companies' expenditures for climate-related taxes are deductible in the income tax assessment.¹⁵¹ The consequence of this is that the Government has overestimated the cost increases or cost reductions for the reported trade and industry sectors.

According to the Swedish NAO's calculations, the trade and industry sector 'manufacture of paper and paper products'¹⁵² will have *increased* costs of approximately 0.21 per cent of the added value, which including the right to deduction means a cost increase of approximately 0.16 per cent of the added value. The proportion 0.21 per cent may be compared with the Government's information in the bill on the effects of the tax restructuring. The Government stated that the total tax cost is expected to be *reduced* by 0.5 per cent of the added value. Taking into account the Swedish Energy Agency's projection for energy consumption in 2013, the trade and industry sector will, according to the Swedish NAO's calculations have increased costs equivalent to 0.02 per cent of the added value.¹⁵³

¹⁴⁹ Ministry memorandum Ds 2009:24 *More effective taxes in the climate and energy area* p. 150 and p. 162. In the former case, the analysis relates to the effects of increased carbon dioxide tax on heating fuels, etc. within the activities of agriculture, forestry and aquaculture as well as industries not covered by the EU Emissions Trading System. The typical company is a machinery manufacturing workshop with 26 employees. The introduction of energy tax on fossil fuels is also included in the estimation for the typical company. In the latter case, the estimation refers to the introduction of carbon dioxide tax on fossil fuels in certain industrial processes outside the trading system (installations that have a lower capacity than certain limits are not covered by the trading system). The typical company is a small foundry company with 26 employees.

¹⁵⁰ The Ministry of Enterprise, Energy and Communication, internal memorandum 05-11-2008, *Consequences for industry upon amended energy and carbon dioxide taxes*.

¹⁵¹ Interview at the Ministry of Enterprise, Energy and Communication 15-09-2011.

¹⁵² According to the Swedish Standard Industrial Classification 2007 (SNI 2007).

¹⁵³ See Table 3.8 compared with Table 3.1 for the trade and industry sector 'manufacture of paper and paper products'. The proportion 0.02 per cent refers to the net effect, that is, when account has been taken of deductions in the companies' income tax assessment.

There is, however, a calculation in the ministry memorandum which estimates the net effect of the tax restructuring for the period 2010–2015. The calculation reports the following increased tax costs for industry in the non-trading sector, transport using heavy goods vehicles, agriculture and forestry.¹⁵⁴

- Industry in the non-trading sector + SEK 750 million
- Heavy goods vehicles transport + SEK 70 million
- Agriculture + SEK 435 million
- Forestry + SEK 210 million

According to the Swedish NAO's calculations of industry's expenditures for energy and carbon dioxide taxes as a result of the tax restructuring for the period 2010–2015, industry expenditures in the non-trading sector will increase by approximately SEK 400 million.¹⁵⁵ A probable cause of the difference may be different methods of calculation.

4.1.4 *Distribution effects of climate-related taxes are not reported in budget bills and Spring Fiscal Policy Bills*

The Government's reporting of distribution effects in budget bills and Spring Fiscal Policy Bills focuses on the effects of the Government's overall policy on households and on differences between women and men. In a special appendix to the distribution policy statements, the Government reports the bases used for the calculations. Statistics Sweden's FASIT model and Statistics Sweden's survey of household finances are important bases for the calculations. With respect to the regulation changes that the Government takes into account in the calculations, changes in the climate-related taxes are not included.¹⁵⁶

4.1.5 *The combined effects of taxes and other policy instruments have not been surveyed*

The Government has not surveyed the combined effects and distribution of expenditures for energy and carbon dioxide taxes and other taxes that influence the climate and energy objectives. It is intended that such surveys should be carried out afterwards, for the purposes of Checkpoint 2015.¹⁵⁷

¹⁵⁴ Ministry memorandum Ds 2009:24 Table 8:3. The tax costs are reported in the memorandum in relation to net sales in 2015. The amounts refer to net effects, that is, consideration has been given to the deductibility of the climate-related taxes in the companies' income tax assessment.

¹⁵⁵ The Swedish National Audit Office's processing of Statistics Sweden's calculations in Energy FRIDA. The amount refers to the net effect, that is, account has been taken of deductions in the companies' income tax assessment.

¹⁵⁶ The Swedish National Audit Office's review of the distribution policy statements in budget bills and Spring Fiscal Policy Bills from 2003 to 2012.

¹⁵⁷ Interview at the Ministry of Enterprise, Energy and Communication 15-09-2011.

The Government has not reported any assessment of the trading sector's anticipated expenditures and revenues from the buying and selling of emission allowances. Neither does the Government report any assessment of the value of the emission allowances allocated to the trading sector free of charge or the value of the surplus. However, the Government has reported expected revenues to the central government from the auctioning of emission allowances from 2012.¹⁵⁸ These revenues are included in the central government's other income reforms and are not reported separately. As described in Chapter 2.2.4., the trading sector will be extended as of the year 2012, initially with aviation, and subsequently with a number of other sectors.

4.2 Government reporting in relation to the objectives

This section audits the Government's reporting to the Riksdag in relation to the objectives.

The Government has not reported any follow-up of the climate-related taxes' contribution to the milestone target in 2020. The Government stressed, however, in the budget bill for 2011 that the analysis work continues to receive high priority in the Government Offices. The purpose, in good time for 2020, is to have well-balanced financial policy instruments that can be used if necessary. According to the Government, this is especially urgent if, within the framework of Checkpoint 2015, it is assessed that further measures are required to achieve the set targets by 2020.¹⁵⁹ Any continuous follow-up before this is not assessed as relevant because a comprehensive follow-up will be done in Checkpoint 2015.¹⁶⁰

As stated in Section 2.2.1, it was the Government's assessment in the budget bill for 2011 that the carbon dioxide tax does not need to be increased during the term of office beyond decisions already taken and normal inflation adjustment. The Riksdag shared this assessment.¹⁶¹

¹⁵⁸ Govt. Bill 2011/12:1 p. 31.

¹⁵⁹ Govt. Bill 2010/11:1 p. 143.

¹⁶⁰ Interviews at the Ministry of Finance, Ministry of the Environment and Ministry of Enterprise, Energy and Communication.

¹⁶¹ Govt. Bill 2010/11:1, Committee Report 2010/11:FiU1, statement 2010/11:SkU1y.

The Government has not reported the rate of increase or decrease of emissions in relation to the vision for the year 2050.¹⁶² Neither has the Government made any calculations of the climate-related taxes' contribution to the achievement of that objective.¹⁶³ The Government has, however, commissioned the Swedish Environmental Protection Agency to produce bases for a roadmap for a Sweden without climate emissions by 2050.¹⁶⁴

4.3 Agency analyses and reporting of effects

In this section, the Swedish NAO audits agency analyses and reporting of how the expenditures for climate-related taxes, emission allowances and emissions are distributed.

Several agencies provide various information to the Government and to each other. The information concerns, inter alia, energy consumption as a basis for emissions calculations, paid climate-related taxes and projections about public financial developments. This represents a long chain of information that needs to be coordinated in time to enable a comprehensive picture of, inter alia, costs and distribution effects in relation to emissions.

4.3.1 *Effects of climate-related taxes and emission allowances have been surveyed in some respects, but there is no comprehensive compilation and analysis*

The National Institute of Economic Research

The National Institute of Economic Research has carried out processing in the EMEC model for several climate-policy reports in the past decade. However, the Agency has not analysed or surveyed the distribution and burden of the tax costs in detail. The fundamental prerequisites for such analyses or surveys have been entered into EMEC, but the National Institute of Economic Research has not made a compilation of “who pays” climate-related taxes. However, the National Institute of Economic Research has analysed the economic impact of energy and carbon dioxide taxes. Every two years, the National Institute of Economic Research carries out processing in the EMEC model for the Swedish Energy Agency as a basis for the Swedish Energy Agency's energy projections. In 2010, the National Institute of Economic Research carried out an assignment for the Expert Group for Environmental Studies and also used EMEC in the

¹⁶² Committee Report 2010/11:MJU1 and interviews at the Ministry of the Environment and the Swedish Environmental Protection Agency.

¹⁶³ Interviews at the Ministry of Finance on 21-05-2011 and 27-10-2011.

¹⁶⁴ Government decision on 21 July 2011, M2011/2426/KI.

agency's projection "The Swedish Economy".¹⁶⁵ The Swedish Agency for Public Management recommended in a Government commission in the same year that the National Institute of Economic Research should continue to develop models for economic analyses.¹⁶⁶

It is possible to some extent to use EMEC to analyse the distribution effects caused by the Emissions Trading System. One limitation, however, is that EMEC counts all production in trade and industry sectors that have installations in the Emissions Trading System as being part of the trading sector, although some production in those trade and industry sectors is part of the non-trading sector. A further limitation lies in EMEC's manner of treating the free allocation of emission allowances. The model assumes according to national economic theory that the allowance that has been allocated free of charge has an alternative value that corresponds to the market price and that the company takes that price into account in its strategic decisions, even if the allowance has been allocated free of charge.¹⁶⁷

In 2011, the Government commissioned the National Institute of Economic Research, in consultation with the Swedish Environmental Protection Agency, to produce an annual report on the economic aspects of environmental policy, including short and long-term effects of economic policy on the Riksdag's environmental objectives, and on an otherwise environmentally sustainable development. The first report shall be submitted to the Government no later than 31 December 2012. In addition, a scientific advisory council will be established at the National Institute of Economic Research. The council shall assist the agency in matters of methods and relevant models with regard to the agency's environmental economic activities and the long and short-term effects of economic policy on the Riksdag's environmental objectives and on an otherwise environmentally sustainable development.¹⁶⁸ The appropriation to the National Institute of Economic Research is being increased by SEK 1.1 million as of 2012 on account of its new duties. The plan requires the appropriation to be increased by a further SEK 1.9 million as of 2013.¹⁶⁹

¹⁶⁵ Report to the Expert Group for Environmental Studies 2010:4, *The objective of energy efficiency measures makes climate policy more expensive*.

¹⁶⁶ The Swedish Agency for Public Management, 2009:3, *Environmental economic work at the National Institute of Economic Research, Statistics Sweden and the Swedish Environmental Protection Agency*, p. 73.

¹⁶⁷ E-mail from the National Institute of Economic Research 06-12-2011.

¹⁶⁸ See the appropriation directions for the National Institute of Economic Research in 2011 (05-05-2011) and Section 4a of the Ordinance (2007:759) with Instructions for the National Institute of Economic Research.

¹⁶⁹ Govt. Bill 2011/12:1 Part 2 p. 77 f.

The Swedish Environmental Protection Agency

The Swedish Environmental Protection Agency monitors and evaluates the environmental effects of the policy instruments for which the agency is responsible. The agency presents the follow-up regarding the environmental objective *Reduced Climate Impact* (and regarding its interim target and milestone target) in the reporting on environmental objectives. The Swedish Environmental Protection Agency has not made any major evaluations of the distribution effects of the climate-related taxes. However, the reports of the Swedish Environmental Protection Agency and the Swedish Energy Agency in Checkpoints 2004 and 2008 include limited sections on the distribution effects of climate-related taxes. The sections are based on information prepared by various consultancy firms on behalf of the agencies.¹⁷⁰

The Swedish Energy Agency

The Swedish Energy Agency has carried out some limited surveys of the distribution effects of various environmental taxes, but not on a continuous basis. One example is the surveys in the checkpoints (see above with regard to the Swedish Environmental Protection Agency). The agency's follow-up focuses on the objectives of energy efficiency and renewable energy. In those contexts, the Swedish Energy Agency takes into account changes in tax levels. The emphasis, however, is not on surveying the distribution of expenditures for climate-related taxes. Another important responsibility is to produce energy projections for the short and long term. The projections are used, inter alia, by the Ministry of Finance, Statistics Sweden and the National Institute of Economic Research in their projections and simulations.¹⁷¹

On a Nordic level, model experiments of the Nordic energy systems have been reported in the context of the Nordic Energy Perspective, a research project chaired by the Swedish Energy Agency.¹⁷² The model experiments include various policy instruments, such as energy and carbon dioxide taxes, the Swedish electricity certificate system and subsidies in the other

¹⁷⁰ Interview at the Swedish Environmental Protection Agency 27-05-2011, the Swedish Environmental Protection Agency and the Swedish Energy Agency, Checkpoint 2004 Part 4, p.47 f. and Checkpoint 2008 Interim Report 2 p. 27, 47 and 137.

¹⁷¹ Telephone interview with representatives of the Swedish Energy Agency 01-06-2011. The energy projections are based on assessments by the Swedish Energy Agency's experts in each sector and are partly based on historical relationships and assumed conditions. To some extent, the Swedish Energy Agency takes into account behavioural changes resulting from the climate-related taxes (primarily energy and carbon dioxide taxes) in the energy projections. E-mail from the Swedish Energy Agency 16-12-2011.

¹⁷² Other members include the Nordic Council of Ministers, Svenska Kraftnät (Swedish national grid), Swedenergy, the Confederation of Swedish Enterprise, the Finnish Ministry for Trade and Industry, representatives of the Finnish forestry and pulp industry, Energy Norway, Statkraft and the Danish Energy Association.

Nordic countries. The price of emission allowances for the trading sector is included as an assumption in the model experiments at EUR 25 per tonne.¹⁷³ Assumptions of the price are of great importance in assessing the various actors' expenditures for the reduction of emissions. A high price results in the companies' expenditures being high. In Chapter 3 and in Appendix 3 of this performance audit report, we describe the prices of allowances adopted by the market (closing prices from Thomson Reuters Point Carbon) and by other actors. These prices have usually been well below EUR 25 per tonne.

Statistics Sweden

Statistics Sweden is responsible for the micro-simulation model FASIT and the FRIDA database with the simulation model FRISIM. FASIT can be used to assess the distribution effects between household types of, for example, various tax changes. FRISIM can be used to assess fiscal effects on central government finances of various tax changes. FRIDA can, for example, be used to analyse the effects of various tax changes on trade and industry. Statistics Sweden has not itself planned to initiate any publications in these areas. Data on the climate-related taxes has been included in Statistics Sweden's environmental accounts since the year 2000 and is published annually. Statistics Sweden reports data on environmental taxes, to which the climate-related taxes belong, to the EU. The National Institute of Economic Research uses data from the environmental accounts in the EMEC model. The agency has not performed any calculations of the costs for electricity certificates or emission allowances.¹⁷⁴

4.3.2 *The reporting of emissions is partly hard to follow*

The Swedish Environmental Protection Agency is responsible for the Swedish emissions reporting to the EU and the UN. It is also responsible for coordinating the national work of Swedish climate reporting and maintaining the reporting system. In addition, the Swedish Environmental Protection Agency shall annually compile a basis for reporting to the Government.¹⁷⁵

It is difficult to follow the emissions from the non-trading sector in the Swedish Environmental Protection Agency reports. The Swedish Environmental Protection Agency's follow-up of the emissions from the non-trading sector towards the milestone target in 2020 is reported on the website Environmental

¹⁷³ Nordic Energy Perspectives 2010, *Towards a Sustainable Energy System*, p. 23. The price EUR 25 per tonne for allowances is exogenously given in the reference scenario and is also part of the model experiment's various policy scenarios.

¹⁷⁴ Interview at Statistics Sweden 23-05-2011.

¹⁷⁵ Section 4 of the Ordinance (2009:1476) with Instructions for the Swedish Environmental Protection Agency and Section 2 of the Ordinance (2005:626) concerning Climate Reporting.

Objectives Portal¹⁷⁶ but not in connection with the other follow-up of the environmental objective *Reduced Climate Impact*. However, it is reported in a separate document in another part of the website.¹⁷⁷ In 2010, the Swedish Environmental Protection Agency did, nonetheless, publish a separate follow-up of the consequences for Sweden due to the EU's possible tightening of its climate objective from minus 20 per cent to minus 30 per cent. In the follow-up, the Swedish Environmental Protection Agency also reports the consequences for the non-trading sector.¹⁷⁸

Moreover, uncertainties in the Swedish Environmental Protection Agency reports result in uncertainty as to the actual emission level that is applicable to the milestone target for 2020 and therefore the achievement of the objective. In connection with the publication of data on greenhouse gas emissions, the Swedish Environmental Protection Agency is also revising the emissions, including those for the base year 1990, as part of the reporting on the achievement of the interim target for the years 2008–2012. However, the agency is not at the same time revising the division between the trading and the non-trading sectors for the base year 1990. One example is the Swedish Environmental Protection Agency's publication of data on emissions in December 2011.¹⁷⁹ A current distribution would be needed in order to also determine the emission levels in the milestone target for 2020 and thus the development of the emissions in relation to that target.

There are also some uncertainties concerning the Swedish Environmental Protection Agency's emissions data in relation to the allocation for the trading sector.¹⁸⁰ There are discrepancies in the total level in the agency's reporting of allocated emission allowances for the years 2005, 2006 and 2009. The differences are due to the Swedish Environmental Protection Agency not having updated certain data on new participants in the Emissions Trading System.¹⁸¹

¹⁷⁶ The Environmental Objectives Portal is the official website for the reporting and follow-up of the Swedish environmental objectives.

¹⁷⁷ The last follow-up was carried out in March 2011, see the Swedish Environmental Protection Agency report 6420, *The Environmental Objectives on a New Basis*.

¹⁷⁸ The Swedish Environmental Protection Agency Report 6384, *Consequences of the EU tightening its climate objective from –20 to –30 per cent*, p. 72 f.

¹⁷⁹ E-mail from the Swedish Environmental Protection Agency 13-01-2012.

¹⁸⁰ The Swedish Environmental Protection Agency publishes data on emissions and the allocation of allowances on its website and reports data to the EU on the trading sector's emissions.

¹⁸¹ E-mail from the Swedish Environmental Protection Agency 26-08-2011.

4.4 Important findings

The Swedish NAO's findings relate to the lack of reporting. Comprehensive and clear reporting is needed to assess whether current and future measures are sufficient to achieve the climate objective and whether the expenditures of various polluters are reasonable.

- Overall trade and industry expenditure for climate-related taxes and emission allowances in relation to the emissions has not been analysed by the Government and agencies. Neither has the overall distribution of expenditures for climate-related taxes and emission allowances between trade and industry sectors been reported.
- No survey has been carried out concerning the distribution of expenditures for climate-related taxes between households and trade and industry that will be brought about by the tax restructuring for the period 2010–2015.
- No ministry has overall responsibility for analysing and reporting the effects of climate-related taxes and emission allowances in relation to emissions.
- The Government's reporting to the Riksdag of public financial effects as well as of the costs of trade and industry and households for emissions is unclear and incomplete. A comprehensive and clear reporting would be needed for overall and coherent analyses of emissions and of who has to pay in order to reduce the emissions. The Government and the Riksdag need such bases in order to make well-founded decisions on combinations of measures which take into account, inter alia, cost-effectiveness, the polluter pays principle and the possible risk of carbon leakage.
- The Government has not reported any coherent overview of the distribution of costs for climate-related taxes in general or the effects of the tax restructuring for the period 2010–2015 for various trade and industry sectors.
- The Government has not presented a comprehensive picture of the Emissions Trading System's effects on trade and industry. Such a picture would be necessary as bases of, for example, negotiations and decisions on the structure of forthcoming trading periods and for assessing whether any claims for compensation are reasonable.
- The combined effects of the energy and carbon dioxide taxes in combination with other taxes that influence the climate and energy objectives have not been surveyed. It is intended by the Government that such surveys should be carried out afterwards, for the purposes of Checkpoint 2015.

- The agencies have surveyed the effects of climate-related taxes in certain respects, but the bases of the analyses are fragmentary and do not enable an overall compilation and analysis.
- The National Institute of Economic Research has not analysed or surveyed the distribution/burden of climate-related taxes in detail. The fundamental prerequisites for such analyses or surveys have been entered into EMEC, but the National Institute of Economic Research has not made a compilation of “who pays” climate-related taxes. EMEC has several limitations with respect to the analysis of the distribution effects caused by the Emissions Trading System.
- The Swedish Environmental Protection Agency’s reporting of emissions from the non-trading sector is partly difficult to follow.

5 The Swedish National Audit Office's conclusions and recommendations

The Swedish National Audit Office (Swedish NAO) has audited the application of climate-related taxes, primarily those on energy and carbon dioxide. These are important policy instruments for achieving the climate and energy policy objectives set by the Riksdag. Cost-effectiveness and the polluter pays principle are cornerstones in the structuring of climate-related taxes.

The Swedish NAO's overall conclusions are that climate-related taxes lead to distribution effects, both between households and trade and industry, between different types of households, between the trading and the non-trading sectors and between various trade and industry sectors. The polluter pays principle is one of the Riksdag's points of reference for tax policy, but it is not applied to its full extent. There are major differences with respect to how much different polluters pay for emissions. Climate-related taxes and the EU Emissions Trading System are not the same type of policy instrument, but in practice their combined effect has been to increase these differences. According to the Government, there may be reasons for deviating from the polluter pays principle if there is a risk of carbon leakage, that is, that production will be placed in countries with no, or with lower, emissions expenditures. But the Government has not analysed or reported the amounts different trade and industry sectors have paid for emissions. The analyses and reporting provided by the Government and agencies do not provide a comprehensive and clear picture of the expenditures for and the effects of climate-related taxes. This means that agencies, the Government and the Riksdag do not have a basis for assessing whether climate-related taxes in combination with other policy instruments are cost-effective and to what extent they are compatible with the polluter pays principle. Furthermore, there is also no basis for assessing the risk of carbon leakage with respect to various Swedish trade and industry sectors and sub-sectors. Reductions made to climate-related taxes run the risk of reduced cost-effectiveness, and it is therefore necessary to have a basis for assessing whether any claims for compensation are reasonable.

5.1 Expenditure for climate-related taxes is unevenly distributed

Trade and industry generates approximately four fifths of carbon dioxide emissions, but households have to pay almost half of the climate-related taxes. Companies within the trading sector have lower expenditure for climate-related taxes than companies outside the trading sector.

In the long term, the tax restructuring for the period 2010–2015 will have little impact on the economy as a whole. In addition, this restructuring has only a marginal effect on emissions, and so the possibilities of achieving the climate objective are only marginally influenced.

The tax restructuring for the period 2010–2015 leads to companies within the trading sector having an even lower expenditure for climate-related taxes. One reason for this is that companies within the trading sector are assumed to have expenditure for emission allowances. At the same time, companies outside the trading sector have greater expenditure.

5.1.1 *“The polluter pays principle” is not always applied to industry*

The expenditure of trade and industry for climate-related taxes constitutes a small part of the total costs of trade and industry/companies. Expenditure for energy and carbon dioxide taxes was approximately 4 per cent of the companies’ total costs in 2009. Furthermore, the costs of many companies for climate-related taxes are in practice approximately 25 per cent lower than their payments to the central government because climate-related taxes are deductible in the companies’ income tax assessment.

EU Member States have the national discretion to decide that up to 10 per cent of the emission allowances in the second period of the Emissions Trading System (2008–2012) shall be auctioned. Auctioning is considered by, inter alia, the National Institute of Economic Research and the OECD to be a better allocation method than free allocation, and the Government believes that auctioning helps to achieve compliance with the polluter pays principle. Sweden has, in contrast to six other Member States, chosen not to auction any allowances.

Both the EU Emissions Trading System and the carbon dioxide tax mean that there is a price on carbon dioxide emissions, but companies in the trading sector have in practice paid very little, in some cases nothing, for emissions. This is due to reductions in and exemptions from climate-related taxes. This is also due to Swedish companies having obtained a completely free allocation of allowances and that the availability of emission allowances has been favourable

because the cap¹⁸² has been high in relation to actual emissions. The total emissions in the EU Emissions Trading System can only be changed if the cap for the total emissions in the trading system is changed.

In addition, every year from the start of the Emissions Trading System in 2005, the trading sector in Sweden has been allocated far more emission allowances than it has required. In this way, some installations and trade and industry sectors may have received considerable income without having had to reduce emissions or to take action to reduce emissions. To date, the surplus of allowances that have been allocated free of charge to Swedish companies has constituted a redistribution which can be estimated to a value of approximately SEK 1.8 billion. However, if allowances are sold, a taxable revenue is generated which may reduce the value of this surplus.

The tax restructuring for the period 2010–2015 alone means that trade and industry is estimated to have increased expenditure for climate-related taxes corresponding to approximately SEK 0.3 billion per annum. Companies within the trading sector are expected to have an overall reduction in expenditure for climate-related taxes. The non-trading sector is estimated to have increased expenditure.

5.1.2 *Households pay a large portion of the climate-related taxes*

Households gave rise to approximately 19 per cent of carbon dioxide emissions, but paid nearly half of the climate-related taxes in 2008. The household type ‘cohabiting without children’ has the highest expenditure for climate-related taxes per consuming unit. These households also have the highest carbon dioxide emissions per consuming unit. The households paid climate-related taxes averaging SEK 2700 per tonne of emissions from car travel and oil heating in 2007.¹⁸³

The households’ total expenditure for the energy and carbon dioxide tax on fuels and motor fuels and on vehicle tax is expected to increase by the equivalent of SEK 1.8 billion per annum as a result of the tax restructuring for the period 2010–2015. There is no appreciable effect on the proportional distribution between different types of households.

¹⁸² See Section 3.3.3. Based on Sweden’s allocation plan, Sweden has received a certain quantity of allowances that can be allocated completely free of charge or, to a certain extent, auctioned (10 per cent for the trading period 2008–2012).

¹⁸³ The amount stated relates to expenditures for energy tax on fuels and motor fuels, carbon dioxide tax and vehicle tax. If the vehicle tax is not included but the energy tax on electricity is included, the households’ expenditures amounted to SEK 2800 per tonne in 2007.

5.1.3 *The restructuring of the carbon dioxide tax has increased its cost-effectiveness*

According to analysis by the National Institute of Economic Research, the portion of the tax restructuring for the period 2010–2015 that relates to carbon dioxide tax has increased the cost-effectiveness of the carbon dioxide tax in relation to the national climate objective. This is the case because the altered carbon dioxide tax can bring about a certain reduction in emissions in the non-trading sector at a lower economic cost, in the form of reduced GDP, compared with the achievement of the same emissions reduction with the previous structure of the carbon dioxide tax.

5.2 **Government and agency reporting does not provide a comprehensive picture of the costs and effects of climate-related taxes**

The Riksdag has called for better follow-up and reporting by the Government with regard to climate-related matters. It is then important that the Government undertakes continuous follow-up and evaluation of the results obtained and that the reporting has a clearer focus on results and effects of the measures carried out. A coherent reporting is needed of the most important central government initiatives for the climate policy areas and a report of the result. According to the Riksdag, it would also be an advantage if the Government's reporting also considered whether the emissions are expected to be reduced to the desired extent by 2050.

According to the Swedish NAO, comprehensive analyses of emissions and of who has to pay in order to reduce emissions are important bases in order for the Riksdag to make well-founded decisions on combinations of measures which take into account, inter alia, cost-effectiveness, the polluter pays principle and the possible risk of carbon leakage. The Government and agencies need to produce such information in order, for example, to assess the relevance of claims for compensation from various groups. Otherwise the implementation of a cost-effective climate policy will be made more difficult since different reductions and alleviations risk reducing cost-effectiveness. When there is no basis to assess whether the claims are well founded, decision-makers will have difficulties in determining which policy instruments can be applied without serious unwanted side effects. It will also be difficult to assess how the policy instruments should be designed in order to achieve the desired emissions reduction. One example is the tax level that should be applied in order to reduce emissions in a cost-effective manner in the long term.

The availability of emission allowances has been favourable because the cap in the EU Emissions Trading System has been high in relation to actual emissions. When the allocation of allowances is greater than the actual emissions, the price of allowances decreases. This increases the differences in the cost (price) for emissions between the trading and the non-trading sectors, which also runs the risk of reducing the overall cost-effectiveness of the climate-related measures.

5.2.1 *Inadequate analyses lead to insufficient reporting*

Government reporting to the Riksdag on household and trade and industry costs for emissions is unclear and incomplete.

In relation to the climate-related taxes, the Government has not presented a comprehensive, clear picture of the distribution of costs between trade and industry and households or within trade and industry. With regard to distribution effects, there are however some limited surveys of climate-related taxes in Checkpoints 2004 and 2008.

Neither has the Government reported any comprehensive picture of how the costs of trade and industry are affected by the Emissions Trading System. The accumulated surplus has corresponded to 1.4 million tonnes of carbon dioxide emissions and may be calculated to have been worth SEK 1.8 billion for the years 2005–2010. In spite of this significant redistribution, the Government has not reported the size or value of the surplus.

The lack of reporting of expenditure and costs for climate-related taxes and emission allowances also entails that the Government has not reported the overall effect of these.

The Government has not designated any agency or ministry to be responsible for the comprehensive reporting of costs and effects of the climate-related taxes, the Emissions Trading System or the interaction between these policy instruments in relation to emissions. One reason for the lack of a coherent picture seems to be that no one has overall responsibility for its reporting. The Ministry of Finance is responsible for reporting revenues from the climate-related taxes, while the Ministry of the Environment is responsible for reporting the Swedish emissions. The Ministry of Enterprise, Energy and Communication is responsible for analysing the consequences for trade and industry. Also at agency level, there is a division of responsibility with respect to the analysis and reporting of costs and emissions. No agency has overall responsibility. Therefore the analyses performed do not provide a comprehensive picture.

5.2.2 *Fragmentary analysis and reporting of the effects of the tax restructuring*

No survey has been carried out concerning the distribution of expenditures for climate-related taxes between households and trade and industry, between various trade and industry sectors and between various household types brought about by the tax restructuring for the period 2010–2015.

The agencies have surveyed the effects of climate-related taxes in certain respects, but there is no overall compilation and analysis.

5.3 **Government reporting focuses on the 2020 target**

The management of climate policy through climate-related taxes is in practice relatively short-term. The Government focus is on the 2020 target. The Government has not specified the trajectory of how the long-term vision for the year 2050 is to be fulfilled. However, the Government has commissioned the Swedish Environmental Protection Agency to produce a roadmap for a Sweden without net emissions of greenhouse gases by 2050. The Government has also appointed a special consultative group for dialogue on the Government's objective of a Sweden without net emissions in 2050.

The Swedish NAO has found that the combined effects of the climate-related taxes have not been surveyed. In the present situation, it is therefore not possible to monitor the actual contribution of the climate-related taxes to the milestone target in 2020. Follow-up of the milestone target is further complicated by the fact that the Environmental Protection Agency's reporting of emissions from the non-trading sector is difficult to follow in parts. Furthermore, the general equilibrium model EMEC of the National Institute of Economic Research is inadequate for analysis of the distribution effects of the Emissions Trading System, partly because the trade and industry sectors in the model are not broken down by trading and non-trading sector. The Government's intention is that analyses and reporting of the climate-related taxes' costs and effects on emissions shall be carried out afterwards, in conjunction with Checkpoint 2015.

In order to guarantee the ability of Checkpoint 2015 to provide a clear picture of the expenditures for emissions in relation to these emissions, the Government needs to ensure that there are clear and comprehensive analyses of the costs of trade and industry and households for climate-related taxes. An analysis of the costs and income of trade and industry with respect to emission allowances is also necessary. An analysis of this kind would also improve the bases for negotiations and the structure of forthcoming periods of the Emissions Trading system.

5.4 Recommendations to the Government

The Swedish NAO makes the following recommendations to the Government in order to achieve a better analysis and reporting. Ultimately, these recommendations are intended to produce good bases for making decisions that will lead to the long-term achievement of the climate objective at a reasonable cost. Good bases for decision-making are also necessary in order to assess whether climate-related taxes in combination with other policy instruments fulfil the polluter pays principle and to assess the risk of carbon leakage.

- The Government should report comprehensively on how great the polluters' costs for climate-related taxes and emission allowances are in relation to the volume of emissions. Reporting should encompass trade and industry and households, different types of household, various trade and industry sectors and the trading and the non-trading sectors. Such reporting is important in order to determine an appropriate structure and scope for various Swedish policy instruments so that the climate objective can be achieved at a reasonable cost. It is also important in order, for example, to assess whether claims for compensation from various groups are well founded and whether there is a risk of carbon leakage. In addition, bases are necessary for negotiations on the structure of the EU Emissions Trading System in forthcoming trading periods.
- The Government should guarantee that the agencies provide information to the Government to facilitate such reporting.
- The Government should designate a clear responsibility for the coordination of continuous data collection, analyses and comprehensive reporting of the costs for and effects of the climate-related taxes, the Emissions Trading System and the interaction between these policy instruments in relation to the development of emissions. This is necessary because the analyses that are currently conducted are fragmentary and do not provide the overall picture which would be needed to make well-founded decisions in order to make the climate-related measures more effective. Coordination responsibility should be designated as soon as possible so that the work on specifying and assembling the necessary statistical basis and relevant analysis tools is secured in good time for the in-depth reporting in Checkpoint 2015.

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Appendix 1 Climate and energy policy objectives

UN objectives

The United Nations Framework Convention on Climate Change, also known as the Climate Convention, provides the framework for international climate policy. Its ultimate objective is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. At the meeting in Cancùn in December 2010, the parties to the Climate Convention acknowledged that the global average temperature shall not be allowed to increase by more than two degrees Celsius compared with pre-industrial levels.¹⁸⁴ At the meeting in Durban in December 2011, the parties agreed to establish a second commitment period under the Kyoto Protocol for the period 2013–2017 or 2013–2020. The final determination of the parties' commitments was, however, deferred until the next meeting of the parties in Qatar in 2012. Only thereafter can the amendments to the Protocol be ratified.¹⁸⁵

EU objectives

The UN Climate Convention was adopted in 1994 on behalf of the EC through a decision of the Council. In order to achieve the Climate Convention's objective of stabilising greenhouse gas emissions, the Council adopted the following overall objectives for European climate policy: The global average temperature shall not be allowed to increase by more than two degrees Celsius compared with pre-industrial levels. The overall objective has been confirmed by the Council on several occasions. In 2007, the European Parliament and the Council stated that by 2050, global

¹⁸⁴ Sweden adopted the Climate Convention in 1993, see SÖ 1993:13. The two-degree objective was recognised in United Nations, Conference of the Parties Report of the Conference of the Parties on its sixteenth session, held in Cancùn from 29 November to 10 December 2010 Addendum Part Two: Action taken by the Conference of the Parties at its sixteenth session, 15 March 2011, FCCC/CP/2010/7/Add.1.

¹⁸⁵ Swedish Government website on 13-12-2011.

greenhouse gas emissions shall have been reduced by at least 50 per cent compared with 1990 levels.¹⁸⁶ EU's climate objective by the year 2020 is currently the reduction of emissions by at least 20 per cent.¹⁸⁷ For the transport sector, an objective of at least 10 per cent renewable energy by 2020 is applicable.¹⁸⁸

Energy policy within the EU rests on the pillars of sustainability, competitiveness and security of supply.¹⁸⁹ The overall objective of EU energy policy is that the share of renewable energy in final energy consumption shall increase to 20 per cent and energy efficiency shall increase by 20 per cent by the year 2020.¹⁹⁰ The objective regarding the share of energy from renewable sources has been further clarified by a specific burden-sharing agreement for the various EU Member States. For Sweden, burden sharing entails that the share of renewable energy in final energy consumption shall be 49 per cent in the year 2020.¹⁹¹

For bio motor fuel consumption, the objective is that at least 10 per cent of each Member State's consumption of petrol and diesel in the transport sector should be made up of bio motor fuels no later than 2020, which shall be introduced in a cost-effective manner.¹⁹²

¹⁸⁶ On the basis of the second assessment report of the Intergovernmental Panel on Climate Change (IPCC), the EU Council of Ministers confirmed in 1996 that it believes that the global average temperature should not be more than two degrees Celsius above pre-industrial levels, see Minutes of the 1939th Council Meeting, Luxembourg, 25 June 1996. Compare Communication from the Commission COM (2005) 35 final p.3. At the Council Meeting in March 2007, a firm commitment was made to, by 2020, reducing the total EC greenhouse gas emissions by at least 20 per cent compared with 1990 levels and by 30 per cent provided that other industrialised countries commit to reducing their emissions to a similar extent and that the economically more advanced developing countries contribute in a manner that is proportionate to their responsibility and capability. By 2050, global greenhouse gas emissions should have been reduced by at least 50 per cent compared with 1990 levels. See preamble 2 and 3 to Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. The Government states in Bill 2008/09:162 p. 23 that the EU's two-degree objective has been reiterated on several occasions in the conclusions of both the Environment Council and the European Council as the point of departure for long-term EU climate strategy.

¹⁸⁷ Govt. Bill 2008/09:162 p. 56.

¹⁸⁸ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (the Renewable Energy Directive).

¹⁸⁹ Cf. Govt. Bill 2008/09:163 p. 10.

¹⁹⁰ The objective was adopted at the Council Meeting in March 2007, see Govt. Bill 2008/09:163 p. 18.

¹⁹¹ Article 3 and appendix 1 A Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

¹⁹² The objective was adopted at the Council Meeting in March 2007. See preamble 9 Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009.

Swedish objectives

Reduced Climate Impact is one of the 16 national environmental objectives decided by the Riksdag.¹⁹³ The objective has an interim target and a milestone target. The interim target is applicable for the period 2008–2012 and means that the Swedish emissions of greenhouse gases on average during the period 2008–2012 shall be at least four per cent lower than emissions in 1990.

The Riksdag decided in 2009 that the interim target would remain in place and that a milestone target would be introduced. The milestone target means that emissions from the non-trading sector shall be 40 per cent lower than emissions in the year 1990. In this way, the greenhouse gas emissions in 2020 shall be approximately 20 million tonnes lower in relation to the 1990 levels in accordance with the decision by the Riksdag. Of that decrease, one third will take place through investments in other countries or through what are known as flexible mechanisms, such as CDM (Clean Development Mechanisms).¹⁹⁴ The trading sector is not static because some installations join the trading system and some installations leave. In addition, the trading system will be extended to further sectors and greenhouse gases. Since the trading sector is not static, the milestone target for the non-trading sector is also affected.

The environmental objective *A Good Built Environment* is related to the area of energy. According to the objective, the total energy consumption per heated unit area, residential and commercial, shall be reduced by 20 per cent by 2020 and 50 per cent by 2050 compared with 1995. By 2020, the dependence on fossil fuels for energy consumption in the building development sector shall be broken, while the share of renewable energy is increasing continuously.¹⁹⁵

¹⁹³ Reduced Climate Impact has a temperature target, which means that the increase in the global average temperature is limited to a maximum of two degrees Celsius compared with pre-industrial levels. There is also a concentration target which means that Swedish climate policy is designed so that it contributes to the long-term stabilisation of greenhouse gas concentrations in the atmosphere at a level no higher than 400 parts per million of carbon dioxide equivalents. Sweden shall work internationally so that global efforts are focused on this goal. The ability to fulfil the environmental objective is crucially dependent on international cooperation and efforts in all countries. See Govt. Bill 1997/98:145, Committee Report 1998/99:MJU6, Riksdag Written Communication 1998/99:183; Govt. Bill 2008/09:162, Committee Report 2008/09:MJU28, Riksdag Written Communication 2008/09:30. The latest formulation of the meaning is contained in Govt. Bill 2009/10:155, Committee Report 2009/10:MJU25, Riksdag Written Communication 2009/10:377.

¹⁹⁴ Govt. Bill 2008/09:163, Committee Report 2008/09:MJU28, Riksdag Written Communication 2008/09:30.

¹⁹⁵ Govt. Bill 2005/06:145, Committee Report 2005/06:BoU9, Riksdag Written Communication 2005/06:365.

In 2009, the Riksdag also decided on energy policy objectives for 2020. The objectives mean that:

- the share of renewable energy in 2020 shall be at least 50 per cent of the total energy consumption
- the share of renewable energy in the transport sector in the same year shall be at least 10 per cent
- energy consumption shall be 20 per cent more efficient by the year 2020.

In connection with the climate and energy bills of 2009, the Government presented the following *vision*: “In 2050, Sweden will have a sustainable and resource-efficient energy supply and no net emissions of greenhouse gases in the atmosphere.”¹⁹⁶ The Government reiterates the vision in, for example, the 2011 Spring Fiscal Policy Bill.¹⁹⁷

¹⁹⁶ Govt. Bill 2008/09:163 p. 12.

¹⁹⁷ Govt. Bill 2010/11:100 p. 58.

Appendix 2 Tax rates 2009–2015

Primarily a summary of the Riksdag's decision in 2009 on changes to tax rates for energy, carbon dioxide and vehicles for the period 2010–2015:¹⁹⁸

- The general carbon dioxide tax level is SEK 1.05 per kilogram of carbon dioxide in 2010.¹⁹⁹
- Carbon dioxide and energy taxes on *motor fuels*:
 - Petrol: Tax rates change based on the consumer price index.
 - Diesel: Incremental increase of the energy tax besides indexation, from SEK 1.33 per litre in 2010, by SEK 0.20 in 2011 and a further SEK 0.20 in 2013. The carbon dioxide tax is unchanged, corresponding to SEK 3.013 per litre. The transport sector is fully compensated for the initial increase of the energy tax in 2011 through a restructuring of the vehicle tax for heavy goods vehicles.
 - Natural gas and LPG: Increase of the carbon dioxide tax (energy tax remaining at SEK 0) for natural gas from SEK 0.62 per kilogram to SEK 1.05 per kilogram of carbon dioxide.²⁰⁰
 - Bio motor fuels (ethanol, biogas, etc.) remain exempt from tax. For bio motor fuels other than biogas, tax alleviations are granted through exemption decisions by the Government. During 2011, a cap has applied to the tax exemption for low-admixture bio motor fuels.
 - Motor fuels etc. in the agriculture and forestry industries:
 - The refunds of carbon dioxide tax on diesel in work machinery are reduced gradually from SEK 2.38 per litre in 2010 to SEK 0.90 per litre in 2015.²⁰¹ In connection with this change, the tax on commercial fertilisers was abolished on 1 January 2010.

¹⁹⁸ Govt. Bill 2008/09:162 Chapter 8, Ministry memorandum Ds 2009:24, Govt. Bill 2009/10:41, Committee Report 2009/10:SkU21, Riksdag Written Communication 2009/10:122.

¹⁹⁹ The general carbon dioxide tax level was also SEK 1.05 per kilogram of carbon dioxide for 2009. The annual adjustment of tax rates according to the consumer price index meant that for the year 2010, the tax was lowered from SEK 1.05 to SEK 1.04 per kilogram of carbon dioxide. At the same time, the tax was increased by SEK 0.01 to SEK 1.05 per kilogram of carbon dioxide in order to finance the abolition of the waste incineration tax. See Govt. Bill 2009/10:41 p. 127 f.

²⁰⁰ In 2011, the tax is increased to the equivalent of SEK 0.735 and in 2013 the tax is increased to the equivalent of SEK 0.84 per kilogram of carbon dioxide.

²⁰¹ In 2011, there is a decrease to SEK 2.10 per litre and in 2013 there is a decrease to SEK 1.70 per litre diesel.

- Carbon dioxide and energy taxes on *fuels for heating*:
 - The general carbon dioxide tax level of SEK 1.05 per kilogram of carbon dioxide is levied on households and service companies.
 - For agriculture, forestry and for industry *outside* the trading system, the carbon dioxide tax is increased in two steps from 21 per cent of the general tax level in 2010 (equivalent to approximately SEK 0.22 per kilogram) to 60 per cent of the general tax level in 2015 (equivalent to approximately SEK 0.63 per kilogram). On 1 January 2011, the previous zero rate of energy tax for these sectors was replaced with an energy tax, proportional to the energy content, of SEK 0.024 per kWh.
 - Changes for companies/installations *within* the trading system:
 - On 1 January 2011, the carbon dioxide tax was abolished for industrial installations. For combined heat and power (CHP) installations, the carbon dioxide tax was reduced from approximately SEK 0.16 to approximately SEK 0.07 per kilogram of carbon dioxide. Other heating installations retain their carbon dioxide taxation at approximately SEK 0.99 per kilogram.
 - For industry, heat production and CHP heat production, an energy tax, proportional to the energy content, of SEK 0.024 per kWh (equivalent to the Energy Taxation Directive’s minimum level) was introduced on 1 January 2011. For other heat production, there applies since that date a uniform energy tax rate of SEK 0.08 per kWh (which previously varied between SEK 0.01 and SEK 0.08).
 - The amendments entail, at least for the year 2011, no real change in the tax levied on CHP companies; it is in principle the same in 2011 as in 2009 and 2010.²⁰²
 - Peat will continue to be exempt from both energy and carbon dioxide taxes.
 - Biofuels for heating, such as wood, chips and vegetable oils, are exempt from both energy and carbon dioxide taxes. Crude tall oil is taxed, however, with an energy tax corresponding to the total level of energy and carbon dioxide taxes for low-tax oil.
- Energy and carbon dioxide taxes also continue not to be imposed on fuel for the generation of electrical power. Tax on electrical power is instead imposed on the end user (no changes as a result of the tax restructuring).

²⁰² Govt. Bill 2009/10:41 p. 139.

- Vehicle tax is adjusted in several respects in conjunction with the restructuring of the energy and carbon dioxide taxation:
 - Vehicle tax for newer cars is divided into a carbon dioxide component and a basic amount. The carbon dioxide component is increased in 2011 from SEK 15 to SEK 20 for each gram of carbon dioxide that a car emits per kilometre.
 - Vehicle tax for older cars continues to be based on their weight.
 - For diesel-driven private cars, the vehicle tax is adjusted downwards in view of the increases in energy tax on diesel oil.
 - The vehicle tax on heavy goods vehicles and buses is reduced to the EU's minimum level in order to compensate heavy traffic for the initial increase of the diesel tax in 2011.
 - Light goods vehicles, buses and camper vans taken into service as of 1 January 2011 are incorporated into the carbon dioxide related system for vehicle tax.
 - New private cars with carbon dioxide emissions of 120 gram per kilometre or less are exempted from vehicle tax for five years. The Government announces in the 2011 Spring Fiscal Policy Bill for that the requirements for tax exemption will be tightened.²⁰³

The following tables present the restructuring in more detail, based on the preparatory works to the Riksdag's decision on the tax restructuring for the period 2010–2015. Some of the amounts stated may differ from amounts in the legislative texts. This is because certain amounts are specified with other units in the preparatory works than in the final wording of the legislation. The tables also do not present amendments of tax rates based on changes in general price trends.²⁰⁴

²⁰³ Govt. Bill 2010/11:100 p. 59.

²⁰⁴ Govt. Bill 2009/10:41 p. 122 f. and Committee Report 2009/10:SkU21 p. 9 f.

The restructuring of the energy and carbon dioxide taxation decided in 2009

Table A Taxation of heating fuels from 2009 to 2015²⁰⁵

FOSSIL FUELS (FUEL OIL, COAL, NATURAL GAS, LPG, ETC.)					
		Outside the EU ETS		Within the EU ETS	
		Households and services	Industry, agriculture, forestry and aquaculture	Industry and CHP heat production	Other heat production
2009–2010	CO ₂ tax	SEK 1.05/kg	SEK 1.05/kg x 21%	SEK 1.05/kg x 15%	SEK 1.05/kg x 94%
	Energy tax	SEK 0.01–0.08/kWh	SEK 0.00/kWh	SEK 0.00/kWh	SEK 0.01–0.08/kWh
2011	CO ₂ tax	SEK 1.05/kg	SEK 1.05/kg x 30%	SEK 0.00/kg (industry) SEK 1.05/kg x 7% (CHP)	SEK 1.05/kg x 94%
	Energy tax	SEK 0.08/kWh	SEK 0.024/kWh	SEK 0.024/kWh	SEK 0.08/kWh
2015	CO ₂ tax	SEK 1.05/kg	SEK 1.05/kg x 60%	SEK 0.00/kg (industry) SEK 1.05/kg x 7% (CHP)	SEK 1.05/kg x 94%
	Energy tax	SEK 0.08/kWh	SEK 0.024/kWh	SEK 0.024/kWh	SEK 0.08/kWh
BIOFUELS (VEGETABLE AND ANIMAL OILS AND FATS, BIOGAS, ETC.)					
2009–2015	CO ₂ tax	SEK 0.00/kg	SEK 0.00/kg	SEK 0.00/kg	SEK 0.00/kg
	Energy tax	SEK 0.00/kWh	SEK 0.00/kWh	SEK 0.00/kWh	SEK 0.00/kWh

²⁰⁵ Some of the amounts stated may differ from amounts in the legislative texts. This is because certain amounts are specified with other units in the preparatory works than in the final wording of the legislation. The table also does not present amendments of tax rates based on changes in general price trends.

Table B Motor fuel taxation from 2009 to 2015²⁰⁶

FOSSIL FUELS (PETROL, DIESEL, NATURAL GAS, LPG)					
		Petrol and diesel	Diesel in work machinery within the agriculture and forestry industries etc.	Diesel in certain industrial mining activities	Natural gas and LPG
2009–2010	CO ₂ tax	SEK 1.05/kg	Refund SEK 2.38/l	SEK 1.05/kg x 21%	Natural gas: SEK 1.05/kg x 59% LPG: SEK 1.05/kg x 52%
	Energy tax	Petrol: SEK 0.34/kWh (SEK 3.08/l) Diesel: SEK 0.13/kWh (SEK 1.33/l)	SEK 0.13/kWh (SEK 1.33/l)	SEK 0.00/kWh	SEK 0.00/kWh
2011	CO ₂ tax	SEK 1.05/kg	Refund SEK 2.10/l	SEK 1.05/kg x 30%	SEK 1.05/kg x 70%
	Energy tax	Petrol: SEK 0.34/kWh (SEK 3.08/l) Diesel: SEK 0.15/kWh (SEK 1.53/l)	SEK 0.15/kWh (SEK 1.53/l)	SEK 0.024/kWh	SEK 0.00/kWh
2013	CO ₂ tax	SEK 1.05/kg	Refund SEK 1.70/l	SEK 1.05/kg x 30%	SEK 1.05/kg x 80%
	Energy tax	Petrol: SEK 0.34/kWh (SEK 3.08/l) Diesel: SEK 0.17/kWh (SEK 1.73/l)	SEK 0.17/kWh (SEK 1.73/l)	SEK 0.024/kWh	SEK 0.00/kWh
2015	CO ₂ tax	SEK 1.05/kg	Refund SEK 0.90/l	SEK 1.05/kg x 60%	SEK 1.05/kg
	Energy tax	Petrol: SEK 0.34/kWh (SEK 3.08/l) Diesel: SEK 0.17/kWh (SEK 1.73/l)	SEK 0.17/kWh (SEK 1.73/l)	SEK 0.024/kWh	SEK 0.00/kWh
BIOFUELS (ETHANOL, BIOGAS, FAME)					
2009–2015	CO ₂ tax	SEK 0.00/kg	SEK 0.00/kg	SEK 0.00/kg	SEK 0.00/kg
	Energy tax	SEK 0.00/kWh	SEK 0.00/kWh	SEK 0.00/kWh	SEK 0.00/kWh

FAME (fatty acid methyl esters) is produced from vegetable or animal oils, such as rape-seed oil, for admixture into vehicle fuels.

Ethanol used as a low admixture in petrol is exempt from tax for admixture up to 6.5 per cent by volume.

Biofuels used as a low admixture in diesel oil tax are exempt from tax for admixture up to 5 per cent by volume.

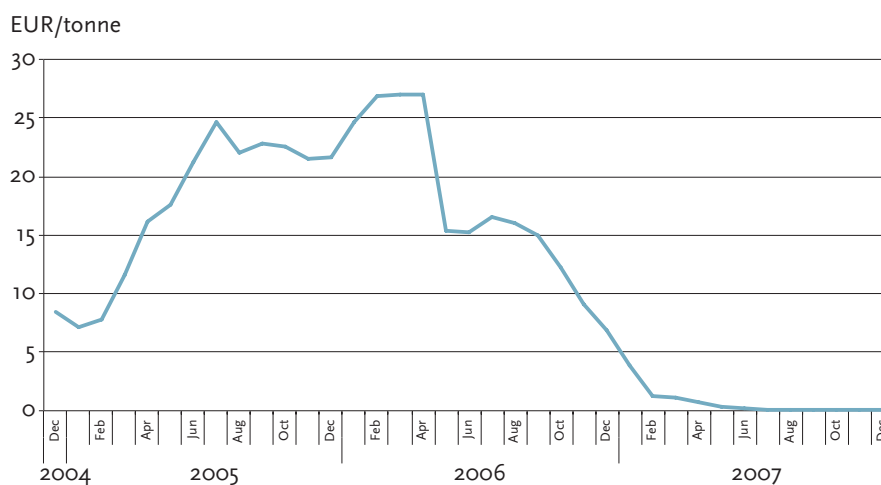
²⁰⁶ Some of the amounts stated may differ from amounts in the legislative texts. This is because certain amounts are specified with other units in the preparatory works than in the final wording of the legislation. The table also does not present amendments of tax rates based on changes in general price trends.

Appendix 3 Prices of emission allowances in the EU Emissions Trading System

The development of the price of emission allowances within the trading system

The prices of emission allowances (EUA) within the trading system rose initially when the market for emission allowances was started in early 2005. In April 2006, the price of allowances during the first period was at its highest EUR 27 per tonne. Then the price fell sharply almost down to zero at the end of 2007. One cause may be that the allocation, and hence also the availability, of allowances was great and that the allowances could not be carried over to the next period.²⁰⁷ See Figure A below.

Figure A Price of emission allowances (EUA) within the EU Emissions Trading System (the first trading period)

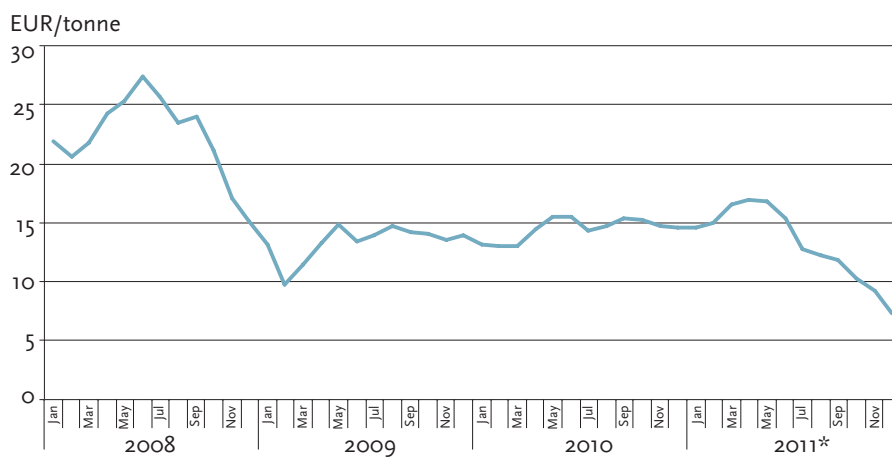


Source: Thomson Reuters Point Carbon.

During the second trading period, the price of emission allowances rose initially, but then dropped to EUR 10 per tonne in early 2009. Subsequently, the prices have been at around EUR 15 per tonne until October 2011 when the price fell once more. See Figure B below.

²⁰⁷ The first trading period 2005–2007 was a trial period, which was one of the reasons that the emission allowances could not be saved.

Figure B Price of emission allowances (EUA) within the EU Emissions Trading System (the second trading period)



* Allowance prices for December 2011 are calculated until 20 December 2011.

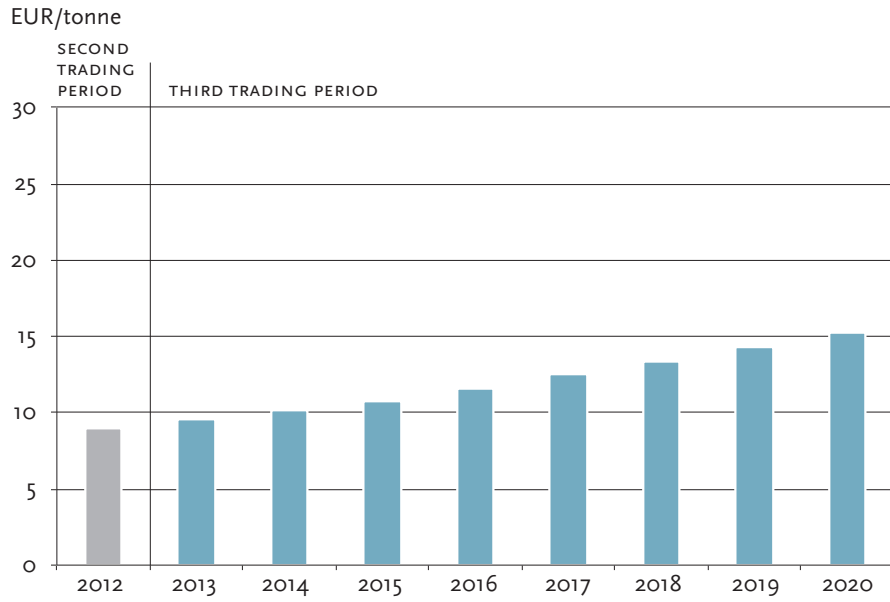
Source: Thomson Reuters Point Carbon.

Projections for future prices of emission allowances

One method of estimating the emission allowance prices in the future is to start from the market’s closing prices for emission allowances in forthcoming periods.²⁰⁸ Such an estimate shows that the price of emission allowances within the trading system will rise relatively constantly until the year 2020. In mid-December 2011, the market expected a price of less than EUR 15 per tonne until the year 2019. See Figure C below.

²⁰⁸ The figure shows the closing prices on 20-12-2011 for emission allowances that are valid for forthcoming periods (maturities); EUA DEC2012, EUA DEC2013 and so on until EUA DEC2020.

Figure C Projection based on market closing prices for the years 2012–2020



Source: Thomson Reuters Point Carbon.

Appendix 4 The general equilibrium model EMEC of the National Institute of Economic Research

The general equilibrium model EMEC²⁰⁹ of the National Institute of Economic Research is used to assess the economic impact of environmental and climate-related taxes and regulations on the entire Swedish economy. The model has been developed continuously over the past ten years. The model compares an “original situation”, where the economy is in equilibrium, with a future situation where the economy has once again reached equilibrium. A key assumption in the model is that there is perfect competition in all markets. In the reference scenario used in the EMEC calculations carried out by the National Institute of Economic Research on behalf of the Swedish NAO in this report, the model displays the situations of equilibrium in 2020 and 2030 with basic data from national accounts and environmental accounts for the year 2006.

EMEC shows the distribution between six different types of households²¹⁰ and 26 different trade and industry sectors and the public sector. Companies, households and the public sector demand 33 different goods and services to be used as inputs in production or for investments and private consumption. The composite goods are made from imported goods and domestically produced goods that can also be exported. Trade and industry and the public sector also use labour, fixed capital, transport and energy as input factors in the production of goods and services. The activity of trade and industry and household consumption has an environmental impact. The model primarily takes into account various types of combustion that cause emissions of carbon dioxide, sulphur dioxide, nitrogen oxides and particles, but also production processes that contribute to air emissions. The actors’ decisions are influenced by the tax system and by the trade in emission allowances.

The financial actors in the model react to prices, including taxes, through the companies switching to relatively cheaper production factors and through the households switching to relatively cheaper consumer goods if the relative price increases. The model’s long-term nature means that market actors have time to adapt fully to the price changes that take place when the economy moves towards a new equilibrium. This is presumed to be an acceptable assumption for a 10–20-year perspective. How great these adaptations will be for a given price change depends

²⁰⁹ EMEC stands for Environmental Medium term EConomic model.

²¹⁰ Individuals on low and high incomes residing in rural areas, medium-sized cities and metropolitan areas.

on the actors' sensitivity to price changes. The actors' price sensitivity is a matter of judgment based on a variety of empirical bases. To some extent, the companies have the opportunity to pass on taxes further down the chain.

The strength of economic growth is controlled in the model by the supply of production factors such as labour and capital and of technological development as measured by labour productivity. The supply of labour, the price of capital and the development of labour productivity are given exogenously, that is, based on assumptions made outside the model.

The level of carbon dioxide tax is given or determined endogenously, that is, in the model, so that a given emission target is reached. The model's emission coefficients are constant throughout the simulation period. They are determined by the ratio between the base year's emissions and the value of the input which generate the same emissions. Emission data is taken from Statistics Sweden's environmental accounts, and the value of inputs from national accounts.

Technological development is given exogenously and is included as energy efficiency coefficients, which to some extent are calibrated to the Swedish Energy Agency's long-term projection. Fuel changes take place in the model when the relative prices between different types of fuel change due to such factors as taxes or increases in world market prices.

EMEC's handling of emission allowances within the EU Emissions Trading System

It is possible to some extent to use EMEC to analyse the distribution effects caused by the Emissions Trading System.

The trade in emission allowances includes installations in the basic metals industry, refineries, pulp and paper, non-metallic mineral products, the metal industry, air transport and within electricity and heat production.²¹¹ See also Table C below. The model lacks, however, data on individual installations, despite not all installations/companies being part of the trading sector. Therefore, all production in these sectors is attributed to the trading sector. The model assumes that in 2030, 70 per cent of the emission allowances are auctioned within the EU ETS and that 88 per cent of these revenues revert to the Member States. The model assumes that Sweden receives 1 per cent of these (Sweden's emissions within the EU ETS amounted to approximately 1 per cent in 2005). However, these revenues are so small that they do not affect the Swedish economy at the macro level.

²¹¹ Note that the trade and industry sector 'mining' (SNI2002) is included in the non-trading sector in EMEC calculations, which differ from other calculations where that trade and industry sector is included. FRISIM and Energy FRIDA also include workplaces from 'mining of coal and lignite' along with the 'mining of metal ores' and 'other mining and quarrying' (SNI 2007).

The free allocation of emission allowances means that the company gains an asset that does not require any service in return. This asset has an alternative value that corresponds to the price of the emission allowance. The company can either use the emission allowance in its production or sell it on the market at the allowance price that is applicable there. According to national economic theory, this means that the company takes into account the value of the emission allowance and alters the input mix as if the company actually paid an allowance price for each unit of fossil fuel it uses in its production. In the short term, it is in practice unlikely that the companies act and alter the input mix as a result of the emission allowance price. It is therefore important that results from the model's scenarios are evaluated from a longer perspective.

As the model assumes perfect competition, that is, that production takes place so that the price of the produced good becomes just as high as the marginal cost of production, an extra asset, such as an emission allowance that is added to the company, will go directly to the capital owners.

Table C Classification of trade and industry sectors within and outside the trading sector

SNI 2002	Trade and industry sector in EMEC
THE NON-TRADING SECTOR	
01	Agriculture
05	Fishery
02	Forestry
10–14	Mining
15–20	Other industries
244	Drug industries
45	Construction
601	Rail road transports
602 excluding 6024	Road passenger transports
6024	Road goods transports
61	Sea transports
63–64	Supporting and auxiliary transport activities; activities of travel agencies
50–55, (65–67), 71–74, 80–85, 90–95	Wholesale and retail trade, hotels, restaurants, financial intermediation and insurances, real estate, renting and business activities, education, health, public administration and defence, other service activities
70	Real estate activities

cont.

cont.

SNI 2002	Trade and industry sector in EMEC
THE TRADING SECTOR	
26	Mineral products
21–22	Manufacture of pulp, paper and paper products; publishing and printing
24 excluding 24.4, 25	Manufacture of chemicals and chemical products excluding drug industries, manufacture of rubber and plastic products
271–3	Iron and steel industries
274–5	Non-iron metal industries
28–36	Metal, machinery and equipment n.e.c., office machinery, computers, electrical machinery, radio, television and communication equipment and apparatus, precision and optical instruments, motor vehicles, other transport equipment, manufacturing n.e.c.
23	Petroleum and nuclear fuel
401–403 as well as 410 and 90001	Electricity, gas and water supply
62	Air transports

Basis for the calculations

In order to calculate what the effects of the tax restructuring for the period 2010–2015 will be the long term, the National Institute of Economic Research is devising a reference scenario and an alternative scenario in the model. The reference scenario and the alternative scenario are both future scenarios with the same assumptions about energy price conditions, balance of resources and employment, see Tables D and E. The difference between the scenarios is changes as a result of the tax restructuring for the period 2010–2015.

Table D Energy price conditions (prices 2007)

	Real prices (excl. tax)			Annual percentage change		
	2007	2020	2030	2007–2020	2007–2030	2020–2030
Emission allowance (EUR/tonne)	16	16	16			
Crude oil (USD/barrel)	72.7	98.0	112.7	2.3	1.9	1.4
Coal ^a (USD/tonne)	85.9	102.1	107.3	1.3	1.0	0.5
Natural gas ^a (USD/Mbtu)	8.6	11.9	13.7	2.5	2.1	1.5
Chips, SEK/MWh	158.0	225.0	240.0	2.8	1.8	0.6
Electricity (SEK 0.01/kWh) ^b	40.7	46.4	48.5	1.0	0.8	0.4
Steam and hot water (SEK 0.01/kWh)	33.1	25.6	24.5	-2.0	-1.3	-0.4

^a Excluding taxes and emission allowances.

^b Excluding electricity certificates.

Table E Balance of resources and employment in the reference scenario. Annual percentage change

	Employment ¹	GDP	Private consumption	Public sector consumption	Investments	Export	Import
2007–2010 REF	0.3	-0.5	0.7	1.6	-3.7	-0.6	0.2
2010–2020 REF	0.4	2.4	2.9	0.7	5.2	5.0	5.9
2020–2030 REF	0.0	1.9	2.6	0.7	1.9	3.3	3.5
2007–2020 REF	0.4	1.7	2.4	0.9	3.0	3.7	4.6
2007–2030 REF	0.2	1.8	2.5	0.8	2.5	3.5	4.1

¹ Number of hours worked.

In the alternative scenario, the tax changes decided by the Riksdag in 2009 have been introduced.²¹² Due to the EMEC model's overall macro-economic nature, however, not all tax changes are described in the alternative scenario. See the following list of changes included or not included in the alternative scenario.

The following changes have been introduced into the alternative scenario:

Carbon dioxide tax:

- The general carbon dioxide tax is increased by SEK 0.01 per kilogram. Following the increase of SEK 0.01 per kilogram of carbon dioxide and the annual adjustment in accordance with the projected consumer price index, the general carbon dioxide tax amounts to SEK 1.05 per kilogram of carbon dioxide in 2010. For the subsequent period, the carbon dioxide tax is indexed to the model's calculated consumer price index.
- The carbon dioxide tax on fuels for heating and the operation of stationary engines within industry outside the Emissions Trading System as well as activities in agriculture, forestry and aquaculture increased from 21 per cent to 60 per cent of the general carbon dioxide tax level. (An initial step, to 30 per cent, was taken in 2011.) Corresponding increases are also made for diesel oil consumed in certain industrial mining activities.
- The refund of the carbon dioxide tax of SEK 2.38 per litre on diesel oil in agricultural and forestry machines is reduced to SEK 2.10 in 2011, SEK 1.70 in 2013 and SEK 0.90 in 2015.
- The carbon dioxide tax is abolished for fuels consumed in industrial installations covered by the EU Emissions Trading System. The carbon dioxide tax on fuels used in CHP installations within the trading system is reduced to 7 per cent of the general carbon dioxide tax level.

Energy tax:

- The energy tax on fossil heating fuels is restructured according to the fuel's energy content. The point of departure for the restructuring is the energy tax rate for fuel oil which, with the 2009 tax rate of SEK 797 per m³, is equivalent to SEK 0.08 per kWh. Expressed in terms of volume and weight units, the new tax rates for 2011 are estimated to amount to SEK 797 per m³ of heating oil, SEK 1024 per 1000 kg of LPG, SEK 880 per 1000 m³ of natural gas and SEK 625 per 1000 kg of coal and coke.
- The energy tax on diesel oil is increased, besides the conventional annual index conversion, in two stages by a total of SEK 0.40 per litre. (A first increase of SEK 0.20 per litre took place on 1 January 2011 and a second increase of SEK 0.20 per litre takes place on 1 January 2013.)

²¹² Committee Report 2009/10:SkU21, Govt. Bill 2009/10:41, Ministry memorandum Ds 2009:24.

- Energy tax is introduced on fossil fuels for heating and the operation of stationary engines in sectors where the energy tax today is zero, that is, in industry, within the activities of agriculture, forestry and aquaculture as well as for CHP heat production. For these sectors, the energy tax level is then 30 per cent of the general energy tax level which, with the 2009 tax rates, is equivalent to SEK 0.024 per kWh. A corresponding energy tax is also introduced for diesel oil consumed in certain industrial mining activities.
- A further assumption made in the model is that industry in the long term will no longer be able to participate in the Programme for Improving Energy Efficiency (PFE), but will pay energy tax for the consumption of electricity corresponding to SEK 0.005 per kWh.

The following changes have not been possible to include in the EMEC calculations:²¹³

- Revised definition of the term combined heat and power (CHP), which means that in order to grant carbon dioxide and energy tax alleviations, it is a requirement, as of 2011, to have an electricity efficiency of at least 15 per cent instead of, as previously, at least 5 per cent and less than 15 per cent.
- Phasing out of the 0.8-per cent rule in two stages: increase to 1.2 per cent from 2011 and abolition from 2015.
- Increase of the carbon dioxide tax on natural gas and LPG when used as motor fuels: incrementally from (regarding natural gas) 59 to 70 per cent in 2011 and 80 per cent in 2013 to 100 per cent of the general carbon dioxide tax level in 2015.
- Vehicle tax (all changes).

²¹³ E-mail from the National Institute of Economic Research 28-06-2011.

Appendix 5 Statistics Sweden’s distributional analysis system for income and transfers (FASIT)

Statistics Sweden’s FASIT model is a distributional analysis system for income and transfers. FASIT is used, inter alia, by the Ministry of Finance to calculate the distribution effects between household types of, for example, changes in the tax system. Statistics Sweden has devised a special module for FASIT for indirect taxation, which we describe in detail below. The data basis consists of the HEK survey (Household Finances) and STAR (Statistical Analysis Register) as well as part of the individual database LINDA.²¹⁴

FASIT and its module for indirect taxes

FASIT’s module for indirect taxes was last used in 2007 on behalf of the Government Offices to simulate the effects of energy and vehicle taxes. FASIT is a static model; it does not show changes in behaviour (with the exception of its module for labour supply). The basis for the module consists of data from the HEK survey in 2007 and the Swedish Road Traffic Registry.

The Swedish NAO has commissioned Statistics Sweden to perform calculations of the households’ expenditures for energy, carbon dioxide tax and vehicle tax (with tax rates before and after the tax restructuring for the period 2010–2015). In addition, we have had Statistics Sweden calculate household emissions from private vehicles and oil heating for the years 2007 and 2012.

Basis for the calculations

The assumptions that have been used for the various calculations are presented in the tables below. The tables show the tax rates and conversion factors used in the calculations of expenditures for energy, carbon dioxide and vehicle taxes as well as in the calculation of carbon dioxide emissions.

²¹⁴ LINDA is a sample-based longitudinal individual database for researchers.

Table F Tax rates etc. in the calculations

	2007	2012_2009 ¹	2012	2012_2013 ²	2012_2015 ³
ENERGY AND CARBON DIOXIDE TAXES, SEK					
Electricity tax, kWh	0.265	0.282	0.29	0.296	0.318
Electricity tax northern Sweden, kWh	0.204	0.186	0.192	0.195	0.21
Energy tax petrol, litre	2.9	3.08	3.14	3.13	3.25
Carbon dioxide tax petrol, litre	2.16	2.44	2.51	2.5	2.6
Energy tax diesel, litre	1.057	1.332	1.566	1.762	1.833
Carbon dioxide tax diesel, litre	2.663	3.007	3.1	3.093	3.218
Energy tax oil, m ³	750	797	819	817	850
Carbon dioxide tax oil, m ³	2,663	3,007	3,100	3,093	3,218
VEHICLE TAX, SEK					
<i>Vehicle year up to and including 2005</i>					
Petrol					
– weight, basic amount	720	720	741	741	
– weight, amount for additional 100 kg	183	183	188	188	
Diesel					
– weight, basic amount	2,187	2,187	2,098	2,098	
– weight, amount for additional 100 kg	554	554	531	531	
Alternative motor fuels					
– weight, basic amount	2,187	2,187	2,098	2,098	
– weight, amount for additional 100 kg	554	554	531	531	

cont.

cont.

	2007	2012_2009 ¹	2012	2012_2013 ²	2012_2015 ³
VEHICLE TAX, SEK					
<i>Vehicle year from and including 2006 or environmental class 2005</i>					
Petrol					
– basic amount	360	360	360	360	
– reduction factor for CO ₂ emissions	100	100	120	120	
– coefficient for CO ₂ emissions	15	15	20	20	
Diesel					
– basic amount	360	360	360	360	
– reduction factor for CO ₂ emissions	100	100	120	120	
– coefficient for CO ₂ emissions	15	15	20	20	
– coefficient environmental + fuel charge for CO ₂	3.5	3.5	2.55	2.4	
– environmental charge	–	–	500	500	
Alternative motor fuels					
– basic amount	360	360	360	360	
– reduction factor for CO ₂ emissions	100	100	120	120	
– coefficient for CO ₂ emissions	10	10	10	10	

¹ 2012_2009 states tax rates for 2009 according to the model's volumes for 2012.

² 2012_2013 states tax rates for 2013 according to the model's volumes for 2012.

³ 2012_2015 states tax rates for 2015 according to the model's volumes for 2012.

Table G Conversion factors in the calculation of carbon dioxide emissions, kilogram

Petrol, litre	2.36
Diesel, litre	2.54
Oil, m ³	2,659.993

In addition, the model has changed assumptions about the number of people employed, the number of unemployed, the number in labour market programmes, the number on sickness benefit, population changes etc. However, there is no projection of quantities between the years, that is, the model keeps the household consumption of electricity, petrol, etc. constant over time. In other words, the difference in electricity consumption and carbon dioxide emissions between 2007 and 2012 is explained solely by weight changes.

Appendix 6 Statistics Sweden’s Firm Register and Individual Database (FRIDA)

In autumn 1997, Statistics Sweden (SCB) was commissioned by the Ministry of Finance to develop a companies database. The result of the work culminated in a micro-based Firm Register and Individual Database (FRIDA). The database consists of a number of anonymised databases for companies of various forms, such as sole trader, trading partnership, limited company, economic association. The information in the databases relates to the income years 1995–2009. FRIDA 2009 consists of approximately 334,000 limited companies, approximately 75,000 trading partnerships, approximately 16,000 economic associations (including housing co-operatives) and approximately 740,000 sole traders. FRIDA is used, inter alia, by the Ministry of Finance as a basis for the principles for calculations.

The Swedish NAO has commissioned Statistics Sweden to produce data from FRIDA based on industrial energy consumption. That part of FRIDA is here called Energy FRIDA. The Swedish NAO has also commissioned Statistics Sweden to perform calculations based on the new simulation model FRISIM (developed during 2011) to calculate energy and carbon dioxide taxes.²¹⁵

Statistics Sweden has taken information from the Swedish Environmental Protection Agency about which companies are part of the trading sector. These have then been matched against the companies found in FRIDA and FRISIM.

Energy FRIDA

Energy FRIDA mirrors energy consumption by fuel and company within the industrial sectors SNI 05–33 (SNI 2007)²¹⁶ for companies that have one or more workplaces with more than nine employees. It also reflects all companies within SNI 35: electricity, gas, steam and air conditioning supply (SNI 2007). The energy volumes are taken from the surveys Industrial energy consumption and Annual energy statistics (electricity,

²¹⁵ The model has been developed on behalf of the Ministry of Finance, the Ministry of Enterprise, Energy and Communications and the Parliamentary Research Service.

²¹⁶ Swedish Standard Industrial Classification 2007 (SNI 2007). Previously applicable was the Standard Industrial Classification 2002 (SNI 2002).

gas, steam and hot water supply), which are exhaustive investigations of producers of electricity and heat. The surveys have been carried out at the workplace and installation level, and they are carried out by Statistics Sweden on behalf of the Swedish Energy Agency.

FRIDA has aggregated the data on the lower level to the company level so that the data on energy consumption can be matched with FRIDA's other data. This means that other trade and industry sectors that have workplaces with industrial energy consumption are also included in the calculations. In the processing for the Swedish NAO, emissions have then been calculated based on reported energy volumes using emission factors from the Swedish Environmental Protection Agency. Expenditures for taxes have been calculated according to the tax rates for the years 2009 and 2015. Account has also been taken of the reductions that are found in the regulations. It should be noted that not all that pay energy and carbon dioxide taxes, nor refunds, are included. This means that the results are not fully comparable with the results in FRISIM, where all those liable to excise duty are included.

In addition to emissions and expenditures for energy and carbon dioxide taxes, revenues, costs (excluding personnel costs) and personnel costs have been produced for the companies in Energy FRIDA. This has been done by using SRU data (standardised accounting statements) that is contained in FRIDA. SRU data does not cover information for municipalities and county councils, which means that there is not full consistency between the populations. In total, the population in Energy FRIDA encompasses 6257 companies in 2009. SRU data is available for 6168 of these companies, that is, for 99 per cent of the companies. For the industrial and energy sectors, there is data for all companies' revenues and costs, provided that the company has submitted an income tax return for the relevant year.

FRISIM

The purpose of FRISIM is to simulate the fiscal outcome after changes in tax rates, changes in the regulations and the expected development of energy consumption. It is also possible to use the underlying material of excise duties and refunds to monitor the inflow of energy and carbon dioxide taxes to the central government. FRISIM includes all companies that either submit an excise duty return for energy and carbon dioxide tax or apply for refunds of energy and carbon dioxide tax. The companies that are liable to tax are not always the same companies that consume the energy, that is, those that account for the emissions and in practice pay tax.

In total, the population encompasses 40,435 companies in 2009. All trade and industry sectors can occur, since their inclusion in FRISIM only needs the companies to have one activity that falls within the regulations for being a warehousekeeper or for

being entitled to refunds. The trade and industry sectors SNI 01–03 (SNI 2007) are a large group, which can be explained by these trade and industry sectors representing agriculture and forestry, which have many opportunities to apply for a refund. SNI 35 (SNI 2007) contains the major energy companies. SNI 46 (SNI 2007) is also a large group including oil trading companies.

Table H Trade and industry sectors included in the FRIDA database

SNI 2007	Designation
01	Crop and animal production, hunting and related service activities
02	Forestry and logging
03	Fishing and aquaculture
05	Mining of coal and lignite
06	Extraction of crude petroleum and natural gas
07	Mining of metal ores
08	Other mining and quarrying
09	Mining support service activities
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products

cont.

cont.

SNI 2007	Designation
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
36	Water collection, treatment and supply
37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
39	Remediation activities and other waste management services
41	Construction of buildings
42	Civil engineering
43	Specialised construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
53	Postal and courier activities
55	Accommodation
56	Food and beverage service activities
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
61	Telecommunications
62	Computer programming, consultancy and related activities

cont.

cont.

SNI 2007	Designation
63	Information service activities
64	Financial service activities, except insurance and pension funding
66	Activities auxiliary to financial services and insurance activities
68	Real estate activities
69	Legal and accounting activities
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator and other reservation service and related activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
84	Public administration and defence; compulsory social security
85	Education
86	Human health activities
87	Residential care activities
88	Social work activities without accommodation
90	Creative, arts and entertainment activities
91	Libraries, archives, museums and other cultural activities
93	Sports activities and amusement and recreation activities
94	Activities of membership organisations
95	Repair of computers and personal and household goods
96	Other personal service activities

Appendix 7 Other methods (emissions and allocation)

The Swedish NAO has used various sources to report the emissions of carbon dioxide and greenhouse gases by trade and industry and by households. The various sources we have used and for what purpose are as follows:

- SCB’s environmental accounts, data and analysis pages and environmental accounts’ simulation tools for household emissions. The environmental accounts are classified according to the Swedish Standard Industrial Classification 2002 (SNI 2002). Data has been used to examine differences in emissions between trade and industry and households as well as to illustrate the households’ direct and indirect emissions.
- The Swedish Environmental Protection Agency’s emissions data for installations within the trading sector. This information has been classified on behalf of the Swedish NAO according to the Swedish Standard Industrial Classification 2007 (SNI 2007) by Statistics Sweden. Data has been used to calculate surpluses or deficits of emission allowances and the value of these, see the section below.
- The Swedish Environmental Protection Agency’s most recently published data on emissions within and outside the trading sector according to the Swedish Environmental Protection Agency’s reporting for 2010. Data has been used by the Swedish NAO to report greenhouse gas emissions within and outside the trading sector in relation to the milestone target in 2020.
- The Swedish Energy Agency’s allocation of emission allowances by installation published on the Swedish Environmental Protection Agency website. Data has been used by the Swedish NAO to calculate surpluses or deficits of emission allowances and the value of these, see the section below.

Statistics Sweden’s classification of emissions and allocation according to SNI 2007

Statistics Sweden has, on behalf of the Swedish NAO, attributed the Swedish Environmental Protection Agency’s reporting of emissions by trade and industry sector according to the Swedish Standard Industrial Classification 2007 (SNI 2007). Also emissions from uses other than the primary processes for various trade and industry sectors are included in the reporting for the years 2005–2009. A case in point is emissions attributable to waste heat in the manufacture of basic metals. In 2010, combustion emissions from electricity and steam and hot water supply as well as installations within chemicals, food products, metals, paper, textiles, wood products, workshops and hospitals are included within the trade and industry sector ‘electricity, gas, steam and air conditioning supply’.²¹⁷

Statistics Sweden’s environmental accounts – classification of manufacturing according to SNI 2002

Section 3.1, Figure 3.1 uses, inter alia, the term ‘manufacturing’. This encompasses the following trade and industry sectors (according to SNI 2002):

- manufacture of food products, beverages and tobacco
- manufacture of textiles and textile products, manufacture of leather and leather products
- manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- manufacture of pulp, paper and paper products
- publishing, printing and reproduction of recorded media
- manufacture of coke, refined petroleum products and nuclear fuel
- manufacture of chemicals and chemical products
- manufacture of rubber and plastic products
- manufacture of other non-metallic mineral products
- manufacture of basic metals
- manufacture of fabricated metal products, except machinery and equipment
- manufacture of machinery and equipment n.e.c.
- manufacture of office machinery and computers
- manufacture of electrical machinery and apparatus n.e.c.
- manufacture of radio, television and communication equipment and apparatus, manufacture of medical, precision and optical instruments, watches and clocks
- manufacture of transport equipment, manufacturing n.e.c.

²¹⁷ Swedish Environmental Protection Agency memorandum 13-05-2011, *Emissions within the trading system 2010*.

The Swedish NAO's calculation of the value of surpluses or deficits of emission allowances

When calculating the surplus or deficit of emission allowances, the Swedish NAO has started out from the official reporting of the Swedish Environmental Protection Agency. The reporting includes emissions from Lulekraft AB in the 'manufacture of basic metals' sector because fuel and allowances derive from SSAB Luleå.²¹⁸

The Swedish NAO has calculated the value of the surplus or deficit of emission allowances by multiplying the number of allowances by an annual average allowance price. The annual average is calculated on the basis of daily price data from Thomson Reuters Point Carbon for emission allowances (EUA) within the Emissions Trading system.²¹⁹ Then the value has been converted from EUR to SEK using the Riksbank's annual average exchange rates.

²¹⁸ Swedish Environmental Protection Agency memorandum 13-05-2011, *Emissions within the trading system 2010*.

²¹⁹ Emission allowances valid for the current year; EUA DEC2005, EUA DEC2006 and so on until EUA DEC2010. The monthly average has been weighted with the number of observations (daily quotations each month) in order to calculate the annual average. For the month of December in each trading period, an average of EUA DEC for following years in the same trading period has also been factored in, as recommended by Thomson Reuters Point Carbon on 01-11-2011.

For more information about the Swedish National Audit Office, please refer to our website: www.riksrevisionen.se

The Swedish National Audit Office has audited the application of climate-related taxes, primarily those on energy and carbon dioxide. These are important policy instruments for achieving the climate objectives set by the Riksdag. Climate-related taxes shall be cost-effective and be based on the polluter pays principle.

The audit focuses on whether the reporting to the Riksdag of the costs of trade and industry and households and of the effects of the climate-related taxes is clear and surveyable as well as on whether there are great differences in how much different polluters have to pay.

The audit demonstrates that there are great differences between various polluters' expenditures for climate-related taxes and emission allowances in the EU Emissions Trading System. The systems have, in practice, led to increases in these differences.

The Government and agencies lack a comprehensive and clear picture with which they can assess whether climate-related taxes in combination with other policy instruments are cost-effective and to what extent they are compatible with the polluter pays principle. The Swedish National Audit Office recommends the Government to designate a coordination responsibility and to improve the bases for decision-making that are submitted to the Riksdag.

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