

Monitoring greenhouse gas transfers

Focusing on transfers related to fossil fuel for monitoring Agenda 2030 and SEDA

Different types of fossil fuel transfers used in the report		
Budgetary transfers	Indirect transfers	Other support measures
<ul style="list-style-type: none">• Current transfers• Capital transfers• Taxes	<ul style="list-style-type: none">• Tax abatements• Tax credits	<ul style="list-style-type: none">• Preferential loans• Export credits• Price support

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Monitoring greenhouse gas transfers

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Preface

Sustainable Consumption and Production (SCP) is an integral part of the 2030 Agenda for Sustainable Development. Monitoring SCP will require a set of indicators that measures the shift in consumption and production patterns among them the indicator on fossil fuel subsidies. This report constitutes an initial proposal to support the monitoring of fossil fuel subsidies related targets of the SDGs, using the System of Environment and Economic Accounts (SEEA) framework which facilitates the connection of data across the environment and the economy that can effectively inform policy-making and other actions. The report also proposes further development of the monitoring of more transfers related to greenhouse gas emissions and suggests some steps for how this could be implemented in Sweden.

This report was written by Nancy Steinbach, Viveka Palm and Ariun Byambakhorloo, Statistics Sweden.

An expert sub-group of the London group on environmental accounts was also part of this project and provided excellent insight and material for the report. We are thankful for the discussions with Thorsten Kemper, Katharina Schlesag, Destatis, Germany, Kaia Oras, Statistics Estonia, Jane Harkness, Adam Tipper, Statistics New Zealand, Ysabekova Baktygul, Statistical Committee Kyrgyzstan, Gerry Brady, Clare O'Hara, CSO Ireland, Angelica Tudini Istat, Italy, Aldo Ravazzi, Gionata Castaldi, Italian Ministry of Environment, Land & Sea, Georgia Dimitropoulou Eurostat, Cindy Lecavalier, and Paola Ansietta Statistics Canada.

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Summary

The primary purpose of this pilot study is to investigate how to create a national set of data measuring a broad range of transfers from the government to economic actors or households that directly or indirectly lower the price on emitting greenhouse gas. These transfers would cover subsidies, capital transfers and other relevant measures including indirect support such as tax abatements.

In this report we call the summary of these support measures greenhouse gas transfers. The underlying statistical framework is the System of Environmental Economic Accounts (SEEA) that allows for environmentally relevant statistics to be compiled and linked to the economic statistics of the national accounts. Thus information available in the national accounts have been extracted and complemented with new data to account for tax abatements.

A secondary purpose of this pilot study is to investigate internationally comparable measurement definitions and draw on experiences from other countries, in order to build on existing data within the SEEA and using some new data be able to build a module that can be part of this statistical system.

Underlying statistical framework

The main data sources to compile and publish regular statistics in this area are the national accounts and the environmental accounts. To find a good compiling method, the data has to be named according to the conventions of these statistical frameworks. There are however many ways of naming various transfers, and different analysts and organisations use different terms. In this report there are thus different terms used when we refer to different studies or goals. In the national accounts, the concept of a subsidy is more specific than how it is used in the broader community, and needs to be complemented by other transfers such as capital transfer to cover the transfers of interest.

The government can use a wide range of economic instruments that may avertedly or inadvertently change the consumer or producer behaviour. In order to meet the data needs of the analysts, the economic instruments that are of special relevance to greenhouse gas emissions need to be identified. This pilot project has focused on identifying the transfers that could be found in the national accounts and also to consider measures that allow for analysing tax abatements. Although the tax abatements are not transfers seen and recorded in the national accounts, they are calculated by e.g. ministries of finance as a way to monitor the size of tax abatements (the ministry calculate it as 'tax expenditure' because it estimates how much of the tax that is not brought in because of differences in tax rates across e.g. fuels). There are also other international organisations, such as the OECD and the International Monetary Fund that report on tax abatements as part of their follow up on economic instruments that affect climate change.

The report investigates how to measure transfers that lower the price on emitting greenhouse gas

National accounts can provide first steps towards regular statistics and these statistics can be complemented with additional data sources from ministries or tax authorities

A statistical definition of greenhouse gas transfers

The project has investigated measurement definitions suited to capture transfers that allow for analyses of different types of supports, that is current and capital transfers as defined by the national accounts and tax abatements related to a negative impact on the climate. The focus is on data sources that allow both the various transfers, and the emissions from the industries that receive the transfers, to be followed over time.

In this report, the measurement focus is on identifying transfers on activities that lead to a direct use of fossil fuels, similar to that of producing statistics on environmental taxes¹, either direct transfers from state budget or indirect transfers such as tax abatements that lower the price on fossil fuel use. In the future, the measurement focus will need to identify other transfers that impacts greenhouse gas emissions of other kinds or through other economic instruments to provide a broader perspective.

Possibilities to use the data to monitor Agenda 2030

Data on particular fossil fuel subsidies are required to monitor Agenda 2030 goal 12 on Sustainable Consumption and Production. The proposed associated SDG Indicator is 12.C.1: Removing fossil fuel subsidies. Calculating such statistics as part of the SEEA would facilitate production of the statistics and the accompanying analysis. As SEEA already have established methods for recording greenhouse gas emissions, fossil fuel use and environmental taxes by industry it can provide good possibilities for environmental economic analyses. Terminology is complicated as subsidies are differently defined by different measuring communities, ranging from only covering direct payments to industry, to including tax abatements, and sometimes also including cost estimates for the environmental damage or including loans and other mechanisms.

The data on fossil fuel transfers are needed for monitoring Agenda 2030 and extending the data coverage to cover greenhouse gas emissions will assist the national needs for policy making

The recommendations for continued work in Sweden

In a Swedish context the work conducted and described in this report show that the further development of a national data set which enables the analysis of greenhouse gas transfers is possible.

The data set could include subsidies and investment grants payed out by the government to society related transfers for greenhouse gas emissions. The data set could also include the amount of tax abatements that companies request back related to the energy tax and carbon dioxide tax. To enhance the analysis it would be beneficial to expand and include data on e.g. energy use,

¹ A tax whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in the European System of National Accounts (ESA) as a tax. (Eurostat 2013)

greenhouse gas emissions, economic data such as value added, taxes and other variables available. The data would be disaggregated by economic activities and households. Further work on aligning the data to the SEEA is necessary as not all data are possible to present by industry yet (in Sweden the industries are classified according to [NACE](#), which is the statistical classification of economic activities used in the EU).

Recommendations on globally harmonized data

The experience gathered from the international task force that has been coupled to the work point to possibilities to use existing data. Canada, Germany, Ireland, Italy, Kyrgyzstan, New Zealand and Eurostat have participated. The number of economic instruments that can be of interest are of different types in different countries and this study includes a first attempt to find a common method to report direct transfers and to suggest some calculation and presentation forms for the indirect support in the form of tax abatements. The suggestions need not limit the scope of future assessments, e.g. through inclusion of other measures such as export credits, preferential loans etc.

Three types or areas of transfers are suggested to be part of a yearly presentation.

- 1) **Budget transfers** from the state to companies or people that are somehow linked to the use or production of fossil fuels. ²
- 2) **Indirect transfers in the form of tax abatements**
Two complementary approaches have been identified
 - Using a national tax reference to show the effect on the state budget.
 - Calculating the effective carbon price for different users and fuels.The effective carbon price in EUR/tonne emissions could be used for country comparisons, for example by reporting fuel use or emissions that fall into a number of broadly defined tax bands. That way, it would be possible to show emissions for direct payments as a negative effective carbon rate and go up to the maximum observed tax rate.
- 3) **Other implicit support measures.** Due to the complexities of accessing data and constructing comparable results, the pilot project excluded transfers such as preferential loans, export credits etc. Further methodological development is required before this can change. To make an inventory of interesting transfers and studies that concern them could be a first step.

² Subsidies are directly linked to the production prices, and investment grants are directly linked to the purchase of a fixed asset needed for production. Indirectly they can affect market price or the volume of fossil fuels used.

1 Introduction

Purpose

The primary purpose of this pilot study is to investigate how to create a national data set of greenhouse gas transfers with a focus on national monitoring, including the size of these transfers and the industries that are concerned.

To identify relevant data sets, user needs have been identified with national policy makers in mind.

Besides direct transfers, indirect transfers (tax abatements) will be investigated. This pilot study will not be able to cover data measuring other indirect transfers, such as export credits or preferential loans. However, such data needs will have to be discussed in further work.

A secondary purpose focus on investigating internationally comparable measurement definitions and drawing on experiences from other countries, in order to use data within the system of environmental economic accounts (SEEA). The pilot also has the benefit that it gives experience that can be used to develop an internationally harmonised account for fossil fuel transfers that can allow for a regular production of such statistics. From a national user analysts perspective such statistics need to provide enough detail for comparisons between transfers and their potential environmental pressure and the study will also reflect on how to accomplish these qualities in the presentation.

In order to investigate the possibilities to harmonize the methods we have asked interested statistical offices from other countries to engage in the project to be able to compare and understand the challenges of different data sources and policy environments. The countries participating are (in alphabetical order): Canada, Germany, Ireland, Italy, Kyrgyzstan, New Zealand and Eurostat, the EU statistical Office.

The importance of developing statistical methods for measuring greenhouse gas transfers

The implementation of Agenda 2030 on sustainable development is ongoing world-wide. The countries have agreed to monitor the implementation and this report will look at how the reforming of fossil fuel subsidies can be monitored by developing statistics on greenhouse gas transfers, meaning transfers that lower the cost of emitting greenhouse gases. The statistical community is moving forward in processing data for indicators to respond to the need for monitoring. Some indicators are based on existing statistics and in some cases new statistics has to be developed.

This study will develop a methodology and test it to create new statistics on greenhouse gas transfers

In the case of monitoring fossil fuel subsidies, the statistical community involved in producing and developing environmental economic accounting has a role to play. The goal of sustainable consumption and production (goal 12) specify: *Remove market distortions that encourage wasteful consumption*. The proposed associated SDG Indicator is 12.C.1 that requires the countries to quantify the amount of fossil fuel subsidies.

The UN Environment expert group on fossil fuel subsidies have prepared guidelines and a proposal for a method to calculate the indicator on behalf of the UN Environment as the custodian of the indicator at global level (UNEP et al. 2019). Their work put forward the necessary theoretical definitions of what is to be regarded as a subsidy. They also propose what type of fossil fuels should be included in the calculations, such as coal, various types of oil and petrol, gas and peat.

Target 12.c of the sustainable development goals, which Sweden has adopted along with the global community, reads “Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances”. To do this efficiently one needs to understand what transfers that could affect the goal, what are their effects, and how have they developed over time. Today there is no national coordinated data collection on this issue. But there are potentials for such activities. In this section we describe the potential actors that can be involved and why they should be.

Why is the statistical community involved?

Creating a national data set of transfers affecting greenhouse gas emissions will facilitate future evaluation and reforms. Such a data set is likely to act as a starting point for future work which underscores the importance of the data encompassing as many relevant transfers as feasible and with enough detail for analysis purposes.

Finding good measurement definitions that facilitates the comparison across countries will hopefully increase the analytic possibilities as long as enough detail is being kept in the presentations. The availability or lack of data is an important issue for this project and we anticipate that some issues will be identified for further studies.

As the UN Environment expert group has determined the definitions and type of fuels to be included in a definition of fossil fuel subsidies, why is then the statistical community of the environmental economic accountants involved?

The rationale is that in order to calculate the transfers in an internationally comparable manner, more measurement definitions are needed. The major issue concerns the calculations of tax abatements. These are frequently calculated for national uses by using country specific tax reference values, and such measurements are not ideal for global comparisons of the data.

Using existing data for more than one purpose facilitates the creation of new statistics that is cost-efficient.

Another rationale is the holistic perspective that the environmental accounts can offer. There are e.g. also greenhouse gas emissions coming from other sources than fossil fuels such as e.g. methane from agriculture. Such sources of greenhouse gas emissions are also important to quantify in terms of environmental economic instruments or lack thereof. This is, however, beyond this study's scope.

What is the environmental accounts and what does it have to do with measuring greenhouse gas transfers?

The System of Environmental-Economic Accounting helps to provide answers to common questions about the relationship between the environment and the economy by producing statistics that show the use of resources and emissions by various operators in the economy, such as industries, public authorities and households. This is referred to as a statistical framework. The framework has developed many new types of statistics since its start in the 1990-ies, e.g. greenhouse gas emissions and energy use by economic activities, environmental economic instruments such as e.g. environmental taxes and environmentally motivated subsidies. We are now interested to develop the measurements of these economic instruments and transfers further so that also tax abatements can be included, by introducing new data from the state budget or the tax authorities, but also by using already existing data on fuel use, environmental taxes and emissions by industry.

The System of Environmental-Economic Accounts (SEEA) builds on the National Accounts and provide statistics linking the economy to the environment.

The frame consists of the country's economy (production and consumption) and the contents comprise statistics that can be linked to production and consumption activities, including investments and payments from the state through the state budget. The structure of the economic statistics is provided by the international System of National Accounts (SNA or sometimes in this report ESA which is the European adaption), which measures the country's economic activity. This makes it possible to analyse possible links between, for example, economic growth and environmental impact and how the environmental economic instruments develop over time³.

International guidelines on recording statistics on subsidies and other transfers

The possibility of measuring 'Potentially environmentally damaging subsidies' (PEDS) is referred to in the standard from 2012 SEEA Central Framework (SEEA CF) (§4.147). It mentions that some definitions include implicit (or indirect) subsidies, such as preferential tax rates. The paragraph concludes that a definition of these PEDS are not included in SEEA CF. They were being

³ SNA (or ESA) reserves the term 'subsidy' to very specific situations, which may differ from other sources. In particular SNA 'subsidies' are (SNA paragraph 7.98) current unrequited payments that the government makes to enterprises on the basis of the levels of their production activities or the quantities or values of the goods or services that they produce, sell or import. SNA also records many other types of payments by the government, but under a different term (such as 'transfers'). SNA does not record the absence of a payment (such as a tax break or tax exemption). Thus, some more budget analyses and new methods are needed to also picture this in the SEEA.

discussed when the central framework was being written, but not developed enough to be considered ready for inclusion at that time. With development of new methods, we hope to be able to include them in the next revision.

Eurostat has developed a methodology and are collecting statistics on environmentally motivated subsidies. These guidelines also provides help towards the development of greenhouse gas transfers.

In 2015, Eurostat published the guidelines for *Environmental subsidies and similar transfers (ESST)*. The guidelines are mostly used for the compilation of environmentally motivated subsidies and other transfers. However, the guidelines also touches upon potentially environmentally damaging transfers. These transfers can include reductions and exemptions related to environmental taxes (such as exemptions on carbon taxes, petrol taxes and so on), ESST 2015, p. 23. The framework of the SEEA is suitable for the further development of such data, linking it to other aspects of the economy, such as energy use, economic growth and climate change.

2 Method and definitions

Measuring relevant transfers

Through the many studies available on fossil fuel subsidies the type of measures included or not are different in each study. But there is a general consensus that a “subsidy” is an economic instrument applied by governments that reduces the price of certain goods or services in one way or another.

Figure 1 shows different types of transactions available for measurement. This report will focus on the first two boxes of figure 1.

Figure 1. Different types of transfers as used in report

Budgetary transfers	Indirect transfers	Other support measures
<ul style="list-style-type: none">• Current transfers• Capital transfers• Taxes	<ul style="list-style-type: none">• Tax abatements• Tax credits	<ul style="list-style-type: none">• Preferential loans• Export credits• Price support

Different transfers from the government to households and the private sector need to be identified.

The first category above corresponds to SNA concepts, and they are valued in the same way. SNA/ESA record transactions at market values, i.e. whenever a transaction is recorded in national accounts, it is valued as the observed market value in full.

The second category above are situations in which no transfers are seen, and not recorded in national accounts, but we have an interest in them in the current context and we want to measure them and attribute them a value. Here we are extending the scope of SNA.

The third category here are situations which are recorded in SNA/ESA, but we want to disentangle their value into two components with different meaning (such as the part of a loan with purpose X and the rest of the loan), and this split is not done in SNA/ESA neither conceptually nor in estimates of the values involved.

For the **budgetary transfers** we would select: Current transfers that directly affect the level of disposable income of prices of products or of the level of savings, and that are not transfers of capital such as investments or cancellations of liability. They consist of subsidies (D3), social contributions and benefits (D6) and other current transfers (D7). Capital transfers (D9) are transfers linked to the acquisition (or disposal) of fixed assets and they can be in cash or in kind. Capital transfers include investment grants (D92) and other capital transfers (D91 and D99). More information on how the national accounts describe and delimitates transfers are available in appendix 1.

The second part of the measurement relates to **indirect transfers** such as tax abatements, tax credits etc. These are not found directly in the national accounts as there are no transfers to be recorded. Tax abatements in essence means that you do not pay – you are exempt from payment. Thus there is nothing to record. However, they can impact the direction of specific activities and allows for the status quo to be uphold.

The third part **other support measures** are focusing on supports that are harder to measure and to pinpoint statistically. E.g. preferential loans needs to be benchmarked to “normal loans” and price supports to the same or equivalent products without the support.

Measurement definition in statistical terms used in this report

This report is identifying measurement definitions to find data on transfers such as current and capital transfers as defined by the national accounts and tax abatements related to a negative impact on the climate. The focus is to look for data sources that are relevant so that the transfers and the emissions from the industries that receive the transfers can be followed over time. To begin with we start with transfers related to fossil fuels and sort the data sets that are available so that they can be used for analyses and after that widen the search for transfers on other measures related to greenhouse gas emissions.

Focusing on transfers directly targeting fossil fuels

Transfers that change the price of fossil fuel categories contributing to the emissions of greenhouse gases in the SEEA should be included. This is based on considerations to specify all fossil fuels that are part of the greenhouse gas emission calculations and that have been found to differ in tax rates. It is suggested in this report to show the following groups of fossil fuels: Petrol, Diesel, Coal, Oil, Natural gas, Peat, and possibly some specific oil categories that are used for international transports like shipping and aviation.

The measurement focus on identifying support that leads to a direct use of fossil fuels, similar to that of producing statistics on environmental taxes⁴, be it direct transfers from state budget or the indirect transfers such as tax abatements. Thus the majority of the transfers are identified this way. Once this has been achieved, other support measures that impacts greenhouse gas emissions can be identified.

The transfers related to direct budgetary flows are selected in this way. If the subsidy or investment grant can be seen to lowering the cost of production or financing the cost of buying fixed assets for production in such a way as to increase or maintain the use of fossil fuel it is captured. Consider that not the full appropriation of the government is selected but the actual subsidy (coupled to production activities) and investment grant (to buy fixed assets). If you take the whole appropriation it overestimates the value related to the

⁴ A tax whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in ESA as a tax. (Eurostat 2013)

The focus is to look for data sources that are relevant so that the transfers and the emissions from the industries that receive the transfers can be followed over time.

subsidy. Other components are for example salaries, insurance and such maintenance cost. In the case of tax abatements, if the tax abatement is applied on a tax base that is a fossil fuel, then it is selected. More details follow below in the chapter on data sources.

Expanding to other greenhouse gas transfers

Vehicle taxes and exemptions on these are examples of measures that cannot be directly linked to the fossil fuel use, but such data could be gathered for use in separate analyses. Other transfers or rules that have an indirect effect are also of importance. For some, we may be able to show the size in monetary terms but not couple it so directly to emissions. The tax deduction for travel expenses in Sweden has been studied in a separate analysis (SOU2019:36)⁵ to investigate the effects and how to redesign it so as to decrease the effect of indirectly supporting car travels.

The financial supports for farmers is another example of supports that need a separate analysis. The design of these supports has changed over time and the resulting environmental pressure or environmentally beneficial outcomes has been deemed to vary. The size of the transfers can be followed, and the other information needed will have to be assessed in future work. The financial support for farmers used to be part of the environmental subsidy statistics until it was reformed to be paid out by area rather than by production. This will also need to be covered as a special case. Since methane emissions are part of the reporting of greenhouse gases, and are not covered by climate taxes, they could in principle also be investigated in further work.

Transfers that have indirect effect to the use of fossil fuel can be investigated in further work

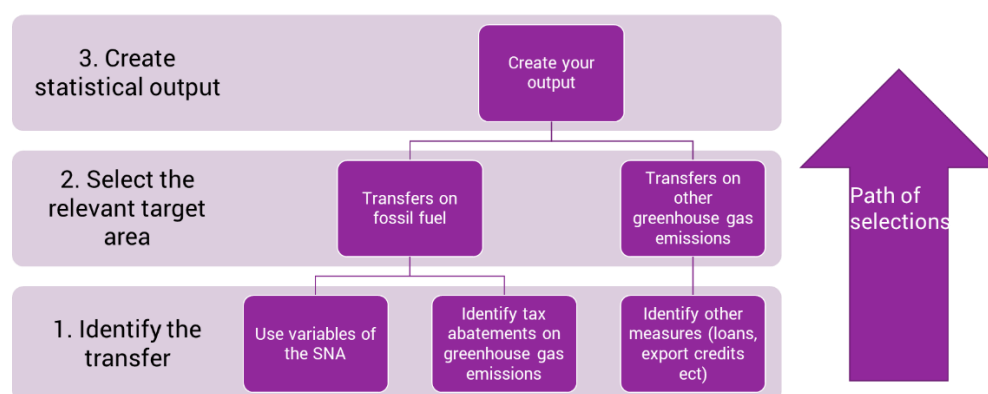
⁵ <https://www.regeringen.se/4adacc/contentassets/c5c41347278a4b839157c303514badaa/skattelattnad-for-arbetsresor-sou-201936.pdf> (In Swedish with short English summary)

Data sources on budget transfers

The statistical community can access a number of data sources and, through the statistical accounting framework available in the national accounts and the environmental-economic accounts, the data can be processed and aligned with one another. Below follows some thoughts on what can be used.

Figure 2 shows the order of the measurement paths in order to reach the resulting statistics. Thus the first stage is to identify the transfers necessary to include, i.e. the direct budgetary transfers available in the System of National Accounts (SNA), the tax abatements and other measures as described just above. The second stage require the compiler to assess each transaction in relation to the target area, i.e. on greenhouse gas emissions. The second stage of compilation is to create the statistical output.

Figure 2. Path of creating the statistics



The national accounts are “a system of accounts and balance sheets that provide a broad and integrated framework to describe an economy. For internationally comparable national accounts this system needs to be based on common concepts, definitions, classifications and accounting rules, in order to arrive at a consistent, reliable and comparable quantitative description of an economy” (Eurostat statistics explained⁶).

Statistics within the national accounts and the environmental accounts can be used as data sources for many of the greenhouse gas transfers if combined with a dedicated budget analysis, tax rules and know-how on how fossil fuels and emissions are distributed in the economy. The national accounts record transfers from government, to business and households, e.g. the subsidies and investment grants mentioned above. National accounts cannot be expected to have breakdowns of investment grants by products or economic activities. However, the environmental accounts typically have breakdowns of the fuel

⁶ https://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_an_overview

use and emissions that could be used to allocate the transfers, similarly to what is done with environmental taxes.

Table 1 provides some examples of such transfers that could potentially be included. The list is not exhaustive and the information is based on transfers available in several countries. Subsidies for coal are not used in Sweden and there are no coal industry employees.

Table 1. Examples of direct transfers to include in the statistics (subsidies and investment grants)

Subsidies for the sale of hard coal for electricity generation, for sale to the steel industry and to offset the impact of capacity adjustments
Granting of Adjustment Allowance (APG) to employees of the Coal industry
Support to airports
Support for leisure boats
Support for navigation
Support for maintenance and up-keep of roads

Data sources for tax abatements

What the national accounts does not calculate are forgone state revenues, what Figure 1 labels indirect transfers, as they are not contributing or otherwise impact the results of the budget transfers. We want to be able to also measure such indirect transfers, as a separate part of the assessment.

Therefore three steps are needed:

- 1) Identify which policy instruments by the government are tax abatements
- 2) Identify which tax abatements are related to fossil fuels
- 3) Estimate the value of the tax abatement. Because it is the absence of an action, there is no observed value or market value, which is the reference valuation method in national accounts.

Modelling tax abatements

Eurostat provides guidelines on two approaches for calculating tax abatements (ESST guidelines 2015 p.18-19):

Many countries base their tax abatements estimates on a conceptual view about 'normal' taxation. Typically, the benchmark is defined to include normal features of the tax system, whereas exemptions that are intended to address objectives other than the basic function of the tax (e.g. raising revenues, or internalising externalities) may be considered to be deviations from the benchmark. The line between what is normal and what is exemption, however, is often not a clear one.

— Some countries take a reference-law approach and identify only concessions which appear as such on the face of the law as tax abatements. Under this approach, a tax credit would likely be identified as tax abatement, whereas differential tax rates on two products within a broader category might not be.

Even when the benchmark is clear, countries may use different ways to measure the extent of the tax abatement. Each of these different ways of measuring is presented below.

— The revenue foregone method, the most straightforward method, looks at the rate of the tax concession multiplied by the tax base. For example, a reduced rate of EUR 0.25 per litre of fossil fuel for taxis from a normal fuel tax rate of EUR 0.45 per litre would yield annual tax abatements of EUR 180 million if taxi drivers consumed 900 million litres of fossil fuels a year. It is assumed the price change has no impact on the biofuel consumption.

— The revenue gain method estimates the increase in government revenues expected to be realised if the tax abatements were eliminated, thereby incorporating anticipated behavioural changes due to changes in the price ratios. Using the same example, the tax abatement under this method would be the difference between tax rates – EUR 0.20 as before – multiplied by the consumption of fossil fuel under the tax abatement regime (900 million litres) and a tax revenue change due to anticipated behavioural changes. In the given example such a behavioural change may be represented by clients that no longer take taxis and use public transport instead, assuming the cost increase due to the elimination of the tax abatement is (partly) compensated by the behaviour change of clients.

Moreover, also the different energy contents of the types of fuels can have an impact on the total consumption of fuels. Therefore, the total fuel consumption (biofuels, gas, electricity and fossil fuel) of taxi drivers may fall (under the hypothetical situation of elimination of tax abatement) below the level observed under tax abatement, leading to a lower tax abatement estimate under the revenue gain method.

Accessing data from the tax authorities

The third approach for calculating tax abatements is to access data from e.g. the tax authority. There should be documented transfers of the amounts re-funded for specific taxes at the tax authorities.

Other support measures

This pilot study will not cover data measuring export credits or preferential loans. If data can be found that will allow such data to be recorded, then that would be of interest to test in coming studies. It is to be expected that the measurements will need to be updated as the types of transfers that can be relevant will likely develop and then methods need to adapt.

Identifying and the regular monitoring of emission trading permits in monetary terms are still developing.

About emission trading permits

How should emission trading permits be reported? In some ways they can be seen as subsidies, when they are freely allocated to industries. They were introduced with a restriction that the free allocation should gradually be taken away. OECD have investigated the impact of free permit allocation in two studies, by calculating the revenue foregone⁷ and by investigating how rules and incentives can give diminished incentives for investment in clean technologies and change the average effective carbon price⁸.

For these instruments, we can only record the number of allocated permits so far. More work needs to be done to find a method to include these as statistics.

In order to create a database with statistics relevant for assessing the size and structure of greenhouse gas transfers, we will start by some of the already existing statistics from the SEEA. Many of the basic statistics that are needed should already be represented there. However, what is not yet established is to find a smart way to combine the existing information in a detailed enough way for user needs.

⁷ https://www.oecd-ilibrary.org/taxation/the-use-of-revenues-from-carbon-pricing_3cb265e4-en

⁸ https://www.oecd-ilibrary.org/taxation/permit-allocation-rules-and-investment-incentives-in-emissions-trading-systems_c3acf05e-en

3 Methodology used by international organizations

Studies from international organizations

This chapter provides a brief overview of a couple of international organisations' work on estimating the amounts of fossil fuel subsidies at country level. The chapter is intended to provide some knowledge of who is working in the field. There is no attempt to compare the methods or the levels of fossil fuel subsidies they produce.

The International Energy Agency (IEA) is producing information on direct energy subsidies paid in 44 countries that have large such transfers. The OECD have a close collaboration with the IEA and calculate fossil fuel subsidies with a range of methods such as using national tax references or calculating effective carbon rates. The World Bank calculates fossil fuels subsidies and include the revenue foregone as countries do not tax external effects. The organisations have a number of definitions on what is to be regarded as an environmentally harmful transaction. For example, *'A result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs, but in doing so, discriminates against sound environmental practices.'* (OECD 1998, 2005)⁹

Some transfers that need to be considered when implementing reforms that can decrease greenhouse gas emissions are those that directly relate to the consumption of a unit of a fuel that contributes emissions of greenhouse gases. This could for example be exemption from CO₂ and energy taxes. These can be illustrated graphically by the effective carbon rate method that OECD uses, described below (Figure 3).

Many of the international studies aims to measure a price gap, that is, defining the subsidy of every emitted unit of a CO₂ equivalent as the difference between an exogenously given reference price and the actual price paid. This approach is appealing from the perspective of comparability across countries. Other support measures, like tax rules for company cars for example, do not easily convert into a unit of energy consumption and need to be analysed in other ways. Here, the start needs to be to record the support measures that have been identified by analysts as important to follow and identify the other data that can allow for an analysis.

In any price gap analysis, a benchmark rate or reference price needs to be established. The process of picking analytically relevant benchmarks needs to be transparent. The method that OECD have used includes energy taxes, CO₂-

Several international organizations are publishing estimates of the amount of fossil fuel subsidies that nations are funding.

⁹ <https://ec.europa.eu/environment/enveco/taxation/pdf/Harmful%20Subsidies%20Report.pdf>

taxes as well as trading permits. For statistical purposes it is important to use a benchmark rate that will be at least as high as the existing effective carbon rates in the countries. Otherwise some of the economic instruments will not be included in the analytic framework.

The EU-ETS puts a price on fossil fuel consumption for the industry. However, this is distorted by the free allocation. This could potentially be registered as a direct subsidy at the moment that it is given. OECD have made studies on auctioning and free allocation, but is still ongoing work on how to measure them.

The G20 Peer-Review Process on Fossil Fuel Subsidies

The G20, a group of twenty finance ministers and central bank governors that meet regularly to discuss economic matters, have committed to a Peer Review process on fossil fuel subsidies. It has already involved China and the United States in 2016, Mexico and Germany in 2017, highlighting the diversity of methodological approaches and calculation of financial effects among experts from different countries and communities. In general, alongside the experts from the fiscal and economic, industrial and energy experts, Italy and Indonesia stressed the importance of including professionals from the environmental-climatic area to make the G20 Peer Review Report more robust and consistent with the climatic goals in which this exercise should be developed, highlighting the environmental dimension of the phenomenon. Argentina and Canada will be responsible for the next edition. Italy was invited to be part of the Peer Review team for Argentina's exercise. Netherlands has also launched a similar peer review exercise.

Italy's Peer Review has been a collective effort, led jointly by the Ministry of Environment and the Ministry of Economic Development (i.e. industry, energy & trade), and the involvement of other Ministries in charge of the main measures, in particular the Ministry of Economy & Finance. The inter-agency debate that was initiated by the publication in February 2017 of the first edition of the "Catalogue of Environmentally Harmful and Environmentally Friendly Subsidies", has contributed to improving the understanding at national level of the nature of energy taxation and its social, economic and environmental effects.

The G20 Peer Review identified 39 subsidies divided into three groups: subsidies that might be prioritized in the political agenda, FFS (fossil fuel subsidies) that deserve specific attention by the community of experts, and subsidies that should be removed in a global or international context. In the second group, for instance, are different fiscal treatment between gasoline and diesel and electricity used for urban and railway transport. The third group includes subsidies to international aviation and maritime transport (which require reforms in the frame of ICAO and IMO), together with free allowances in the EU-ETS.

OECD method on computing effective carbon rates for fuels

What is effective carbon rate?

The OECD report measures progress with carbon pricing across 42 OECD and G20 economies, using the effective carbon rate (ECR) as a measure of carbon prices¹⁰. The ECR is the sum of three components: specific taxes on fossil fuels, carbon taxes and prices of tradable emission permits. The OECD Taxing Energy Use (TEU) database, that is used for the OECD report provides information on tax rates and coverage for a total of 30 different individual users, and within these users, for emissions from 61 different fuels. Data on the coverage of each emissions trading system (ETS) is based on facilities' total emissions and not differentiated by fuel. Taxes on energy use are translated from their original units in physical or energy terms to effective tax rates in terms of the carbon content of the fuels to which they apply.

The effective carbon rate is the sum of three components: specific taxes on fossil fuels, carbon taxes and prices of tradable emission permits.

The ECR serves as a good base for calculations of the size of tax abatements, but does not in itself show the size of abatements as for that a benchmark rate (a reference price) is also required. The use of national administrative economic instruments is another aspect that hinders an effective comparison across countries, one that the OECD is well aware of through the national assessments they perform. There are some other possibilities of comparing ECRs themselves between countries, without calculating monetary tax abatements, but instead showing how much greenhouse gas is being emitted in some ranges of ECRs. This method could be a way forward for an international comparison of the structure of the greenhouse gas transfers.

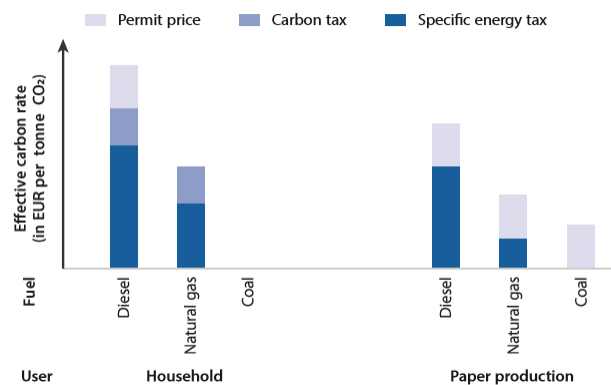
Example of effective carbon rates

By way of example, Figure 3 illustrates the three components of the effective carbon rate for two types of users (households and paper production) and three fuels (diesel, natural gas and coal). In this hypothetical example, diesel use by households is subject to all three components of the effective carbon rate, tradable emission permit prices, carbon taxes and other specific taxes on energy use. However, natural gas use by households is not subject to an emissions trading system (ETS) and hence the associated effective carbon rate does not include a tradable emission permit price component. Coal use by households is not subject to any tradable emission permit price nor to any taxes and thus the associated effective carbon rate does not include a permit price nor any tax components. Paper production, which is taken as an example of an energy-intensive industry, is subject to one or two components of the ECRs in this hypothetical example. While for coal use it is only subject to

¹⁰ The following text and illustration is adapted from OECD (2016) Effective Carbon Rates Pricing CO₂ through Taxes and Emissions Trading Systems.

tradable emission permit prices, diesel and natural gas use have an additional specific energy tax component, though at different effective rates per tonne of CO₂.

Figure 3. Illustration of composition of effective carbon rates



Source: OECD 2016

ECR illustrate tax abatements in a harmonized way

All the OECD and G20 countries included in the Taxing Energy Use database of the OECD, levy taxes on certain forms of energy use, often primarily, for the purpose of raising revenue. These taxes, most commonly excise taxes, are the most significant component of ECRs. These other specific taxes on energy use are typically levied in terms of physical units (e.g. liters, kilograms, m³), or in terms of energy content (e.g. GJ or kWh), and not by reference to the carbon content of the fuel. However, these taxes are translated into effective tax rates on the carbon content of the fuel due to the proportional relationship between these characteristics and the carbon content of each type of fuel.

Average permit prices at auctions are calculated across a year, if the data is available and the free allocation is at this stage not considered. An average is taken to smooth price fluctuations, where possible. To incorporate permit prices from emissions trading systems into ECRs, it is also necessary to estimate the coverage of the ETS, i.e. the share of emissions that are subject to an ETS permit. While tax coverage is directly determined by the users and fuels that are subject to the tax, ETS coverage is an estimate as it applies to emissions of a facility subject to an ETS and does not distinguish between fuels, and facility level data need to be matched to energy balance data. For most systems, ETS coverage is estimated by reference to verified emissions data at facility level or at aggregated facility level. Where this is not available, jurisdiction-specific information on fuel use or on permit allocation is used.

ECRs can be presented in intervals thus allowing a coverage of the entire tax range

The OECD carbon pricing gap measures the difference between actual ECRs and some benchmark rates. The report that we have studied considers two

benchmark rates¹¹: EUR 30, a low-end estimate of carbon costs today; and EUR 60, a midpoint estimate of the carbon costs in 2020 and a low-end estimate for 2030. The carbon pricing gap indicates the extent to which polluters do not pay for the damage from carbon emissions. The marginal damage caused by one tonne of CO₂ increases with the accumulation of CO₂ in the atmosphere. Accordingly, integrated assessment models show carbon prices that increase significantly in real terms over time. On the basis of such models, the High Level Commission on Carbon Pricing (2017) finds that carbon prices should amount to at least USD 40 – 80 per tonne of CO₂ by 2020 and USD 50 – 100 per tonne of CO₂ by 2030, to be able to reach the goals of the Paris Agreement. EUR 60 is the midpoint estimate of carbon costs in 2020 and a low-end estimate of carbon costs in 2030. However, it is lower than many of the observed ECRs in Sweden and in other countries. Sweden has for carbon dioxide taxes a higher tax rate than the benchmarks used in the OECD report – in 2019 over 200 euro per cubic meter for oil products and is estimated to not meet the targets of net zero emissions by 2045 (also in combination with other existing climate policy). For the statistics that we want to produce we want to be able to show the whole range of tax rates.

ECR calculations with country data

The effective carbon rate (ECR) approach as taken by the OECD has the benefit of relying on actual recorded tax payments.

With ECRs computed, there is also a possibility to take another step and look at carbon pricing gaps. Since the social cost of emitting a marginal ton of CO₂ is independent of where or how it occurred, the computation of a carbon pricing gap can be made with possible reference prices. Should we for statistical purposes use the highest observed ECR as reference price for international comparisons? It is problematic to use reference prices that are lower than the highest observed ECR, as that masks how the prices are being set, and makes international comparisons difficult. We want to be able to show the entire range of ECRs and not forget about those that are higher than a chosen reference value.

Using the OECD method and combining the reference value of 60 EURO per tonne carbon dioxide, we compared the 2015 values from OECD with the national calculations. The first test with Swedish data resulted in confusing figures as the gap did not appear to exist on a national scale. However, the reason is that OECD were not counting taxes that go above the benchmark. Thus, to compare, we need to count only the emissions that are not taxed more than 60 EURO per tonnes of CO₂.

¹¹ OECD ECR 2018 <https://www.oecd-ilibrary.org/sites/9789264305304-4-en/index.html?itemId=/content/component/9789264305304-4-en>

Table 2. OECD Effective price gap 2018 with 60 Euro per tonne CO₂

Country	Fossil OECD price gap
Sweden	34%
Canada	80%
Germany	64%
Ireland	54%
Italy	48%
New Zealand	75%

Source: OECD Effective carbon rates 2018, page 70, 57. The rate includes fossil fuels and is calculated for carbon rates below 60 Euros per tonnes.

A calculation of the situation in Sweden for the year 2015, shows the importance of knowing not only emissions, environmental tax and a reference price, but also the distribution of the taxes.

Data comes from the environmental accounts and includes taxes on fossil fuel¹² by economic activities (NACE classification) and households as well as carbon dioxide emission using the same classification. Thus the data are connected through the statistical classification of NACE. As the underlying framework of the SEEA ensures that e.g. transport emissions are allocated to the correct user industry or the user household, the analysis will show who is responsible for paying the taxes and who is emitting the carbon dioxide emissions.

Calculated in a top-down way, i.e. multiplying the emissions with 60 Euro per tonne, and following the OECD recommendation, the results show that it looks as if Sweden exceed the OECD price gap reference. Since the OECD is excluding fuels that are taxed above the reference value, those emissions that are taxed above the threshold are invisible when the price gap is calculated¹³.

If instead the results would be showing the amount of emissions (or fuels used) that have different effective carbon rates, then it would be easier to show the whole structure of the greenhouse gas transfers. Such analyses are also made by OECD and would be useful to test also for the Environmental Accounts.

On page 25 in OECD, 2018, (figure 2.3) the price levels of the emissions from fossil fuels are shown in five categories. The same report has calculated these for Sweden for year 2015 (page 64 table 3 A).

1. A price below 0 EUR per tonne of CO₂ emitted, 4%
2. Between 0-5 EUR per tonne of CO₂ emitted, 0%

¹² Eg. carbon dioxide taxes, energy tax on fossil fuels, etc.

¹³ As informed by Florens Flues, expert, Centre for Tax Policy and Administration, OECD

3. Between 5-30 EUR per tonne of CO₂ emitted, 39%

4. Between 30-60 EUR per tonne of CO₂ emitted, 1%

5. Above 60 EUR per tonne of CO₂ emitted, 56%

For 2015 and excluding biomass, there would be 4% below a price of 0 Euro/tonne, 0% emissions taxed between 0 and 5 EURO per tonne CO₂, then 39% in the band between 5-30 EURO, and 1% in the band 5 between 30 and 60 EURO per tonne emitted. Finally, 56 % of the emissions from fossil fuels are taxed above 60 EURO per tonne according to OECD.

In the project we have not had the time to calculate this with SEEA data. However, it would be a good future project to look at and also to investigate it over a number of years. Since the SEEA data on emissions would include more GHG emissions than the ones included in the OECD report that looks at emissions from fuels with a territorial boundary.

4 Transfers on greenhouse gases in a Swedish policy context

Swedish climate policy

Swedish climate policy is ambitious. In 2017, Sweden adopted a new climate policy framework¹⁴. The framework consists of a climate act, climate targets and a climate policy council. The long-term target in Sweden is to have zero net greenhouse gas emissions by 2045 at the latest. The purpose of the framework is to create a clear and coherent climate policy to ensure long term signals to the market and other actors.

Sweden adopted a new climate policy framework in 2017

The country has several policy instruments in place to decrease greenhouse gas emissions, such as a comparatively high CO₂ tax and a greenhouse gas emissions reduction obligation for petrol and diesel (Nv, 2019). However, there are also counteracting policy instruments, or exceptions, not least because of international conventions (SNF, 2018). In order to reach zero net greenhouse gases in Sweden in 2045, increased coherency through the reform of such transfers is important to work for.

The main purpose of the transfers that lower the price on greenhouse gas emissions is not to increase emissions of course. Instead, they may have been introduced in the context of other policy areas, such as social or economic policy. The aspect of some tax abatements was once necessary for acceptability when introducing new taxes or policy measures. Accordingly, the reform of the greenhouse gas subsidies and other transfers may concern the revision of policy instruments with non-climate rationales, so as to minimise their adverse effects on greenhouse gas emissions. A reform can also be based on the reassessment of the relevance of tax abatements. The common knowledge of the nature and magnitude of the greenhouse gas transfers is still insufficient for effective and efficient reform and it is not strange as it is a very diverse and technical issue to comprehend. Through this study, a first step is taken to construct a knowledge base.

A systematic way to assess economic instruments for greenhouse gas emissions

A complete and transparent data source that tracks and follows Swedish transfers on greenhouse gas emissions would facilitate future analysis on the

¹⁴ <http://www.swedishepa.se/Environmental-objectives-and-cooperation/Swedish-environmental-work/Work-areas/Climate/Climate-Act-and-Climate-policy-framework-/>

reformation of the different types of transfers such as subsidies, investment grants and tax abatements.

The data set suggested in this study constitutes a pilot for the establishment of a more comprehensive set of greenhouse gas transfers. It is anticipated that from such a data set it would be possible to conduct analysis on how greenhouse gas transfers could be restructured so that they do not have the adverse effect of incentivizing greenhouse gas emissions. The data set would provide information on the structure of the transfers and which actors are the beneficiaries. Based on this the transfers could, for example, be coupled with emission data, to see which ones give rise to substantial emissions.

A third step, that would be a work for the analysts rather than the statistical community, could be to provide a justification for each transaction and single out which of these still are deemed as necessary and relevant. A fourth step could be to single out which of the remaining transfers that could be restructured and given to an industry in a way that does not encourage greenhouse gas emission while still providing the support deemed necessary, taking into account, for example, legal frameworks. The steps above outline a systematic way to arrive at a list of greenhouse gas transfers that could either be removed or reformed.

It is important that the data set encompasses a complete compilation of greenhouse gas transfers of the economy. If the inventories of economic or administrative instruments contain instruments that can only be assessed by modelling that rely on subjective choices or expertise that lie outside of the statistical offices, that may need separate assessments. It may be the case that the transfers that are straight-forward to measure are not those that give rise to the largest emissions. For example, budgetary transfers are relatively easy to capture and measure as compared to other transfers. However, budgetary transaction might or might not be more urgent and possible to reform as compared to other types of transaction. It is important that any annual data source also lists and tracks transfers that are not easily captured, or at the very least is transparent about what is not measured to increase the likelihood of decreasing emissions in the most efficient way possible. The data base will provide a foundation to more systematically work to phase out transfers and reduce greenhouse gas emission in Sweden.

The development of the data set will also be helped by other countries that are also on their way to create a data set that encompasses all relevant transfers. That would increase the comparability of how strategies and pricing of greenhouse gases differ across countries. In particular, it would facilitate the integration of statistical data in more qualitative studies that take the complexities of comparing different countries into account.

An example of a removed greenhouse gas transaction in Sweden

Earlier surveys on potentially environmental harmful subsidies have been used as support for conducting in depth studies of the effects on removing subsidies. As an example, in the last survey^[1] in 2017 the Swedish Environmental Protection Agency identified a subsidy where the original reason for the subsidy could be obsolete. In 2018, the Swedish Environmental Protection Agency started an analysis^[2], removal of energy tax reduction for fossil fuel use in combined heat and power plants. During 2019 the Swedish government^[3] proposed the removal of the tax reduction and from 31 of august 2019 the subsidy has been removed.

Method to track and follow greenhouse gas transfers in Sweden

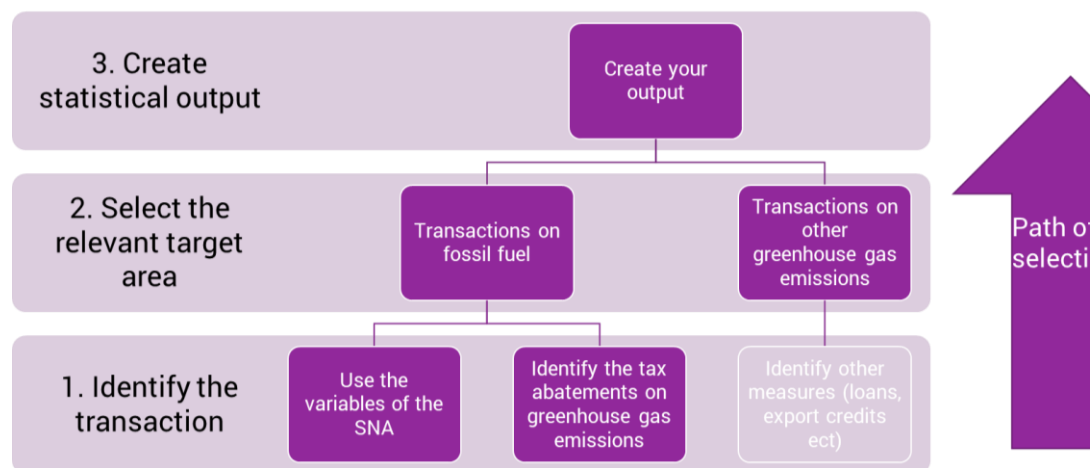
As described above there are three different kinds of groups of greenhouse gas transfers. For Sweden we have selected to investigate data sources for the budgetary transfers from the government on subsidies and investment grants that are monitored through the national accounts, and the indirect focusing on tax abatements. Figure 4 visualises the path of data process that was used in this pilot project. As described above in the chapter on methodology we chose to select a number of variables from the national accounts – i.e. subsidies and investment grants and also to investigate alternative data sources on tax abatements. In terms of defining and delimitating the scope, the first step was to identify the transfers focusing on fossil fuels and the second step to incorporate some measures related to fossil fuels but not necessarily directly applied to fossil fuels. We did not include measures related to other activities, such as export credits or loans.

^[1] Naturvårdsverket, 2017. Potentiellt miljöskadliga subventioner 2.

^[2] Naturvårdsverket, 2019. Minskad skattenedsättning av fossilt bränsle för persontransporter med inrikes sjöfart och för kraftvärmeproduktion

^[3] Finansdepartementet, 2019. Höjd energiskatt och koldioxidskatt på bränslen vid viss användning samt höjd skatt på kemikalier i viss elektronik

Figure 4. The selection criteria in the Swedish data process



The identification of transfers on fossil fuels was straight forward as they are clearly described in the government budgets and available in detail by the finance ministry as well by the Swedish tax authority.

A systematic approach was thus set-up to go through the government budget and the detailed data from the tax authority.

Direct payments from the government

The main data sources is the government budget which is available for all as open data through the Swedish National Financial Management Authority¹⁵ (ESV). In addition the government budget as described annually by the government contain information on how the appropriations are to be used. A previous study at Statistics Sweden has been used as a base of knowledge in the identification of transfers that can potentially damage the environment¹⁶

In Sweden there are few direct payments paid as subsidies and investment grants for the use of fossil fuels. But going through the budget a couple of items could be identified, such as support to rural areas. With regards to payments that are indirectly linked to the use of fossil fuels support to e.g. the operation of airports was identified.

The results and information about the subsidies and investment grants chosen are described in the chapter below on results.

Tax abatements and tax reliefs in Sweden

¹⁵ www.esv.se

¹⁶ ¹⁶ SCB report Environmental economic indicators in the Swedish state budget 1995-2006. http://share.scb.se/ov9993/data/publikationer/statistik/_publikationer/mi1301_1995i06_br_mi71br0702eng.pdf

Several types of uses of fuels are exempt from tax or has a lower tax rate. The companies may have these taxes refunded to them. These requests and the amounts are recorded with the Swedish Tax Authority and available to Statistics Sweden.

The Swedish government uses tax reliefs and tax abatements as part of their instruments to change and aid companies in Sweden. The main governmental body responsible for the taxation system is the Swedish Tax Authority.

With regards to energy and CO2 taxes some companies are completely exempt from paying these taxes and get a full refund from the tax authority, and some companies are entitled to a reduction of these taxes depending on their level of use, type of fuel and size of the company.

The tax system works such that the companies have paid the tax already when purchasing the fuels (it is embedded in the price), thus they have to ask for a refund from the tax authority. Some companies ask themselves through the annual tax declaration. Some companies can go via the storage handlers who on the company behalf ask for the refund.

What tax abatements are in place in Sweden?

A study by the Swedish Environmental Protection Agency in 2017 identified a list of tax abatements. The list is not necessarily exhaustive but can be investigated with the effective carbon rate as a tool, since they are connected to the use of fossil fuels.

A list of these tax abatements are described in table 3 below and can be included in the statistics¹⁷.

Table 3 Examples of tax abatements and tax reliefs identified in the Swedish Environmental Protection Agency report of 2017

Energy tax abatements for fuel used in international waterway transportation
Manufacture privilege for producers of energy products
Energy tax abatements for fuel used in commercial aviation
Reduced energy tax on electricity for some municipality
No energy tax on peat used for heating
Reduced energy tax on fuels used for heating within industry
Reduced energy tax on electricity within manufacturing industry and data center
Reduced carbon dioxide tax on fuels used for heating within industry outside EU-ETS and reduced carbon dioxide tax on district heating used within industry
No carbon dioxide tax on fuels used for electricity production outside EU-ETS
Reduced carbon dioxide tax on fuels used in combined heat and power plants outside EU-ETS
No carbon dioxide tax on peat as a fuel outside EU-ETS
Reduced energy tax on diesel within mining industry
Reduced carbon dioxide tax on diesel within mining industry
Free allocation of emission allowances to companies within EU-ETS
Reduced energy tax on diesel as fuel for vehicles
No energy and carbon dioxide tax on fuels used for railway
No energy and carbon dioxide tax on fuels used for domestic and international shipping
No energy and carbon dioxide tax on fuels used for domestic and international aviation

¹⁷ Naturvårdsverket, 2017. Potentiellt miljöskadliga subventioner 2.

No energy tax on natural gas and liquefied petroleum gas used as fuel for vehicles
Financial support for shipping
Financial support for shipping to Gotland
Financial support for transportation of goods
Financial support for the operation of airports
Deductions for travel expenses to work
Benefit taxation of private use of company owned cars
Reduced energy tax and carbon dioxide tax on fuels used for heating of greenhouses and within agriculture.
Reduced energy tax on electricity used for greenhouse and agriculture
Reduced carbon dioxide tax on diesel used in machinery within agriculture, forestry and aquaculture.
No energy and carbon dioxide tax on fuels used for professional fishing

Source: Swedish Environmental Protection Agency 2017

Data sources on tax abatements

There are two data sources available in Sweden on foregone tax revenues. One is a database – FRIDA¹⁸, hosted by Statistics Sweden and contain among other things data from the Swedish tax authority on company requests for tax refunds. Each tax base and the amount requested to be reimbursed is recorded in the database with a times series stretching from 2008-2017. In this project data between 2013 -2017 have been used. The list of tax abatements presented in table 3 above have been included along with a number of additional tax abatements available in the database.

The second data source is through the ministry of finance. The ministry of finance calculates the revenues foregone through a method of using a “tax norm”. This means that they apply four different tax rates on all tax abatements as specified in table 4.

Table 4. Tax norms applied by the Swedish ministry of finance when calculating tax expenditure

Tax area	2016	2019	Unit
Energy tax on electricity	32.5	34.7	Cent per kWh
Energy tax on fuel for heating	8.6	8.9	Cent per kWh
Energy tax on petrol of environmental class 1	42.9	46.1	Cent per kWh
Carbon dioxide tax	113	118	Cent per Kg

Ministry of Finance skr 2016/14:98 and skr 2018/19:98

The methodology applied by the ministry of finance

The ministry of finance provides methodological guidance on their calculations in their report Skr. 2018/19:98. Below is a free translation of their description

¹⁸ <https://www.scb.se/vara-tjanster/bestalla-mikrodata/vilka-mikrodata-finns/longitudinella-register/foretagsregister-och-individtabas-frida/>

A tax expenditure is calculated as the tax deduction multiplied by the tax base. This method of calculating tax expenditures are called the tax revenue forgone method.

The fundamental calculation for the tax expenditures are static. That means that no consideration is taken to the effect on the size of the tax base that will potentially arise through the tax rules effect on the behavior of individuals and companies.

The calculations does not take into consideration the indirect effects that can arise if a tax expenditure is stopped.

The norm for carbon dioxide taxes take its point of departure of what the tax is intended to be a price on emissions from carbon dioxide from the burning of fossil fuels.

The norm for the carbon dioxide tax is defined as a tax per ton carbon dioxide, cents/ton carbon dioxide emissions. According to the norm the tax should therefore be proportional to the carbon dioxide emissions that respective fossil fuel are producing. Implicitly the tax levels mirrors the monetary valuation of the damage that one unit of emitted carbon dioxide from fossil fuels has. The energy tax on electricity is only intended to focus on the use of electricity. Tax abatements for fuel used for electricity production is not seen as a tax expenditure.

The results from these two data sources are presented in the chapter “Results” below.

Other measures and activities, not identified in the budget

There are some transfers that are more difficult to identify in the budget. One such example is how parking space is priced in cities has been discussed but no method to calculate the part related to under-pricing has been developed as yet. Other transfers that have been discussed in the Swedish policy debate are the deductions for travel expenses to work where 90 % of the subsidies are estimated to support the travel by car with an estimated tax revenue forgone of SEK 5.5 billion¹⁹. This system has been investigated by a governmental commission that are among other things comparing the Swedish situation to a Norwegian system. Several proposals of changes are made in the investigation, e.g. to change the tax abatement to cover distance rather than cost of travel.

With regards to export credits for the construction and support of fossil fuel based investments discussions on how to measure them has been an issue in

¹⁹ <https://www.regeringen.se/4adacc/contentassets/c5c41347278a4b839157c303514badaa/skattelattnad-for-arbetsresor-sou-201936.pdf>

Sweden for some time. Recently however, the Swedish government tasked the Swedish Export Credit Agency (EKN) to investigate how the Swedish and international export finance systems will contribute to a clear change and reduced emissions of greenhouse gases. This means that they will work towards reducing the financial flows that enable fossil dependencies in the future. According to the information the EKN has promised to phase out all fossil fuel investments (i.e. towards mining, prospecting and transport of coal) by December 2020²⁰.

²⁰<https://www.ekn.se/globalassets/dokument/rapporter/ovriga-rapporter/ett-exportfinansieringssystem-som-bidrar-till-klimatomstallningen.pdf/>

5 Swedish transfers pilot

Swedish transfers identified

Both direct and indirect transfers have been identified for Sweden focusing firstly on subsidies and investment grants on fossil fuels (note that it is not the entire appropriation that has been selected) and then extending the search to those related to fossil fuel activities. In addition the results will show how much has been refunded to companies through tax abatements.

Table 5 show the areas to which the direct transfers have been given connected to the budget area communication and regional growth. Transport subsidies have been provided to regional companies for their transport costs and are increasing over the time period. The share of fossil related transfers in relation to total subsidies and investment grants in the two areas have increased between 2013 and 2018. The support for the shipping industry is one example of a new subsidy that was introduced in 2016 and has remained at the same level since, with a slight decrease between 2017 and 2018.

As there was only two expenditure areas – communication and regional growth - identified as containing fossil fuel related subsidies and investment grants the share is calculated based on the total appropriation of these two budget areas. In 2013 the share was at 0.2% and has increased to 0.4% in 2018.

Table 5 Direct subsidies and investment grants on fossil fuels and related to fossil fuels, SEK Million

Type of appropriation	2013	2017	2018
Transport funding – regional growth	360	396	428
<i>Other payments related to fossil fuels</i>			
Payment of leisure boats etc	143	188	188
Aviation services	0	8	9
Support to non-governmental airports	63	63	63
Supports for shipping	0	1 482	1 432
Road maintenance	685	1 149	1 146
Total	1 251	3 287	3 266
Share of total appropriations from budget area communication and regional growth– subsidies			
investment grants	0,19%	0,45%	0,43%

The only direct payment in the form of a subsidy and investment grant from the government identified in this study is the transport funding in rural areas. The other payments are related to the transport area such as aviation, shipping and roads.

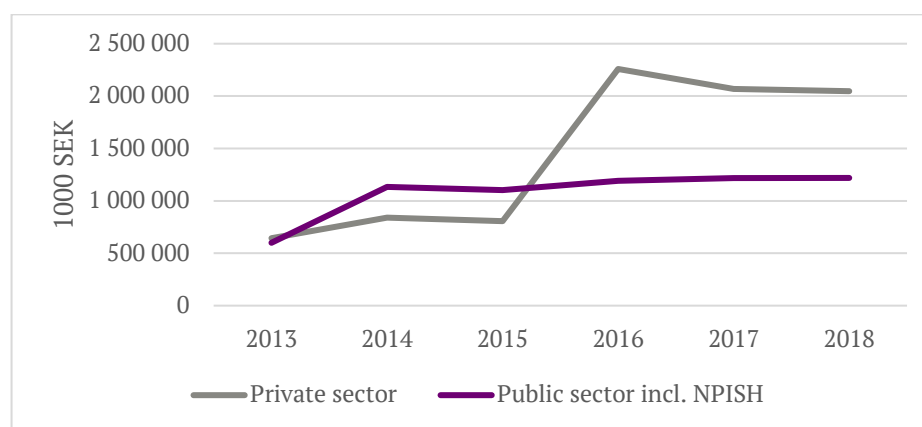
Source: ESV

The subsidies and investment grants have increased over the years for both the private and public sector between 2013 and 2018 (Figure 5). The main reason for the increase is due to the increased payment of regional transport.

The households receive payments from both the regional transport funds but also for maintenance of roads but only to a minor extent.

The majority of the funding for non-governmental airports are received by the private sector, while the public sector are mainly the receiver of funds related to the maintenance of roads. The private sector is also the main receiver of the regional transport contributions

Figure 5. Subsidies and investment grants received by sector on fossil fuels and related to fossil fuels



Source: ESV, calculations by Statistics Sweden

Note: In 2013, households received SEK 7 Million and by 2018 the amount has gone down to SEK 2.5 Million. Some funds have been provided to international agencies (SEK 193 thousand in 2013 and basically stopped by 2018).

Tax abatements – how many companies are requesting refunds?

There are only a few companies requesting tax funds out of all the companies operating in Sweden. However, a large part of the companies requesting tax refunds are doing it on behalf of others.

Table 6 shows the number of companies requesting the tax refunds. The large change in number of companies requesting refunds between 2013/2014 and again between 2016/2017 relates to the changed rules in tax abatement for the agriculture and their use of fossil fuels. There are also a number of companies asking for tax refunds for more than one activity.

Companies can either ask the tax authority directly for the refunds of taxes or have a mediator doing it on their behalf

Table 6. Number of companies requesting tax refunds

	2013	2014	2015	2016	2017
Total number of companies	32 267	4 301	4 074	4 364	28 445

Source: The database FRIDA, Statistics Sweden

Looking at the different types of tax abatements and the number of companies requesting the tax refunds a range of new tax abatements have been introduced in the recent years. This is seen in e.g. table 7 that specifies number of companies by tax abatement category, that new rules have been put in place in industrial processes, aquaculture and emission trading.

Table 7. Number of companies requesting tax refunds – by tax refund label

	2013	2014	2015	2016	2017
Petrol	36	53	53	59	61
Oil	259	308	298	302	303
Shipping	622	561	490	381	335
Aviation	310	252	222	180	165
Mining	:	305	321	314	270
Manufacturing*	:	2607	2366	2170	1983
Agriculture*	30873	10	104	603	24964
Natural gas	167	205	220	227	227

Note: Manufacturing includes exemptions related to industry processes, emission permits, and other manufacturing processes. Agriculture includes tax abatements for agriculture processes and greenhouses.

Source: FRIDA, Statistics Sweden, note that the labels in the table are not industry classified but according to naming convention of the tax authority. The notation : means that the tax abatement was not in place during this period.

Tax abatements – what are the levels of refunds actually returned?

The initial test of the data from the database FRIDA show that trade industries are receiving the largest tax abatements together with the energy industries and the transport industries. The reason that the trade industries are receiving a large part of the tax abatements relates to them being the counterpart to the tax authority, and not necessarily the user of the fuel. A method will be required to be developed in future to allocate the tax abatements to the appropriate user of the fuel.

Table 8 and 9 show how much taxes have been paid by the Swedish Tax Authority to companies on energy and carbon dioxide taxes.

A dramatic increase in the reimbursed tax abatements are seen between 2016 and 2017. A large part of this increase is up to 12 new tax abatements being implemented then for the use of several types of fuels and as noted above the tax abatements related to the agriculture. The tables does not show a large increase of tax re-imbursements in the agriculture sector so it is assumed that mediators have been asking on their behalf and thus the recorded amounts are currently seen in the trade industry in the tables. The transport industry has seen a rise of tax abatements between 2016 and 2017, due to the introduction in 2017 of a tax abatement on fuels previously taxed.

Table 8. Tax refunds on energy taxes 2013-2017, SEK Million

NACE	2013	2014	2015	2016	2017
Total	7 679	7 988	7 588	8 676	11 585
Agriculture, forestry, fishery	120	1	2	2	33
Mining and quarrying	20	0	1	1	2
Manufacturing	241	314	332	297	407
Electricity, gas	2 892	3 040	2 887	3 389	4 191
Waste, wastewater	574	369	403	409	294
Construction	38	28	55	82	91
Trade	3 183	3 673	3 650	4 074	4 444
Transport	420	169	21	141	1 931
Services	124	130	154	183	191
Unknown	69	263	82	98	2

Source: database FRIDA; SCB and the Swedish tax authority

Table 9. Tax refunds on carbon dioxide taxes 2013-2017, SEK Million

NACE	2013	2014	2015	2016	2017
Total	30 371	22 333	21 003	20 623	25 174
Agriculture, forestry, fishery	1 303	4	4	9	399
Mining and quarrying	1 441	1	1	2	223
Manufacturing	961	1 011	976	829	1 099
Electricity, gas	10 333	10 495	10 084	9 807	11 337
Waste, wastewater	2 401	1 607	1 760	1 661	1 430
Construction	949	62	63	64	100
Trade	8 133	7 805	7 504	7 436	8 157
Transport	668	256	39	173	2 122
Services	745	218	261	274	271
Unknown	3 436	874	312	368	36

Source: FRIDA; SCB and the Swedish tax authority

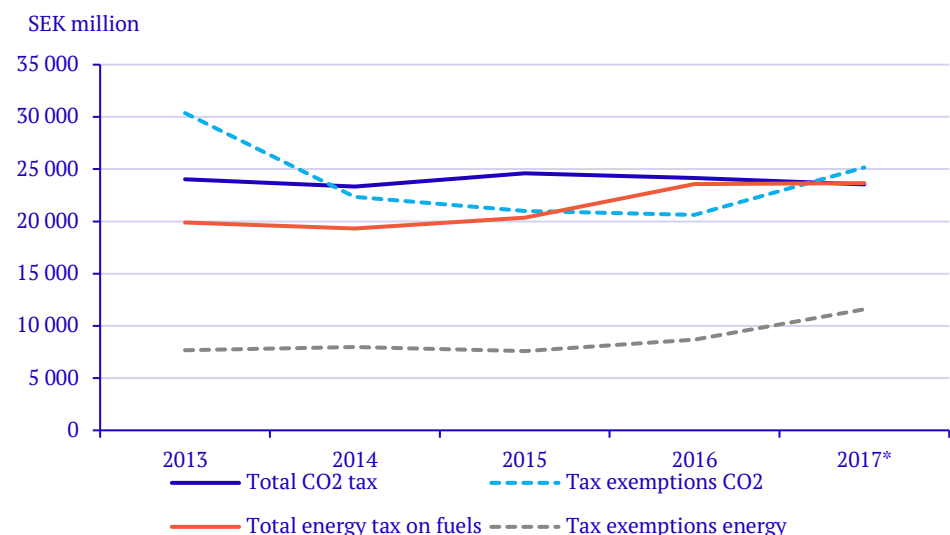
Comparing environmental taxes with the tax abatements

Official statistics on environmental tax revenues, i.e. how much tax revenues are the government receiving on e.g. taxes on fuels or carbon dioxide taxes are shown in Figure 6. These statistics are following the national accounts definitions and guidelines, thus the taxes are recorded at the time that the activity that should generate the tax, as opposed to when the taxes were paid. The data from FRIDA shows when the taxes have been paid, so the comparison over time is not identical, but still provides a picture of the levels and trends.

Figure 6 show that the tax abatements on energy is slowly rising from 2015 onwards, starting in 2013 at SEK 7.7 Billion and by 2017 the tax abatements has risen to SEK 11.5 Billion. As described above the introduction of new tax abatements has led to this increase. Besides the introduction of new tax abatements on fuels previously not tax exempt others also include the use of fuel in manufacturing related to the emission trading permits.

Looking at the tax abatements of carbon dioxide taxes, they decreased when the agriculture industry lost their tax abatements but as they were re-instated the tax abatements rose in 2017 again.

Figure 6. Tax revenues and exemptions on CO2 tax and energy tax on fuels, 2013-2017, SEK million



Source; FRIDA and environmental accounts, SCB

Tax abatements – what are the levels as described with the norm tax?

Turning to the data from the Ministry of finance, they calculate the tax revenues foregone as described above. Table 10 shows an extract of their

results of the tax expenditure. The highest relates to tax abatements on the reduced energy tax rate for diesel used in motor vehicles, all types of motor vehicles, where the prognosis estimated for 2019 was that the tax expenditure would land at SEK 9.2 Billion.

Table 10. Tax expenditure as calculated from the Ministry of Finance – an extract. SEK Billion

Tax abatements and reductions	2016	2017	2018	2019
Reduced Energy Tax Rate for Diesel used in Motor Vehicles	7.97	8.24	8.7	9.2
Energy Tax abatement for Domestic Aviation	0.82	0.86	0.9	0.94
Reduced energy tax for fuels used for heating in industry	0.63	0.63	0.63	0.63
Energy Tax abatement for Domestic Shipping	0.35	0.37	0.39	0.42
Reduced Energy Tax Rate on Diesel for the Mining Industry	0.25	0.25	0.25	0.26
Reduced carbon dioxide tax for diesel fuel in off-road vehicles and shipping within agriculture, forestry and aquaculture	0.82	0.82	0.82	0.69
Carbon tax relief for fuels used in domestic shipping	0.28	0.28	0.29	0.29
Reduced carbon dioxide tax for diesel fuel in mining	0.15	0.15	0.14	0.14
Carbon tax relief for fuels used in rail	0.02	0.02	0.02	0.02

Source: Ministry of finance 2016/17:98

Comparing data sources to select for further work and development

Statistics Sweden is fortunate to have open data sources on budget lines and tax rules to access in producing and developing new statistics. But when you have a choice what is the best data source to use? And how does cost-efficiency come into play if there is literally no extra funding for producing the statistics?

The data from the Swedish Tax Authority is not exactly the same as that of the Ministry of finance, since the Ministry publish the plan and the Tax Authority record the result. Another reason is that the sources do not use the same labels and names of the tax abatements.

Comparing data in order to evaluate what data source is possible to use in the future

However, assuming that the ministry of finance tax expenditure on energy tax for domestic aviation is the same as the Tax Authorities tax declaration on aviation the ministry concludes that the tax expenditure in 2017 was SEK 0.86 Billion while the Swedish Tax Authority paid out SEK 0.8 Billion. This appear to be close to one another. However, another example would be the tax expenditure on carbon dioxide tax for fuels used in mining. The ministry calculated the tax expenditure for 2017 to be SEK 0.15 Billion, while the Swedish Tax Authority paid out SEK 0.9 Billion.

At this point in time, the data source to use in any further data development would be to use the Swedish Tax Authority data base. This way the data quality and control and transparency of what the base data are would be ensured.

6 International outlook

Introduction

An important part of this project has been the discussion and sharing of experience with a large number of statistical offices in countries that also are interested to report on greenhouse gas transfers. We have asked in our networks and the countries that wanted to engage became part of the group. That we were able to include countries from many different parts of the world has contributed to the project.

This is a normal way of working for development of new statistics. By comparing with other countries it is easier to understand the commonalities and specificities between countries and to choose terminology and categories that can make it easier to compare and thus make good use of the statistics. Specifically for an area such as greenhouse gas emissions, the need for international cooperation and comparability is very important.

The cooperation has shown that the situation around the world is similar to that of Sweden. The policy issue is there, but for a lot of countries the use of e.g. fossil fuel subsidies are connected to social issues and therefore complicated to address.

However, the work has shown that the statistical offices are working towards identifying these types of transfers as a way of informing the government, agencies and the general public of their identity and size.

Table 11 below summarizes the knowledge assembled in this project. It provides a small insight as to what has been done until now and if there are more studies for these particular countries available and tested previously.

After table 11 follows some country specific information.

Table 11 summarize the findings on the experiences of the work done at national statistical offices

Country	Fossil fuel transfers	Allocate by industries	Challenges	Some studies available
Canada	Direct transfers both from government to industry and from government to households.	Industry allocation is currently not done.	Defining terms Allocating the transfers to industry classifications	International Institute for Sustainable Development (IISD) Environment and Climate Change Canada (ECCC)
Kyrgyzstan	Tested the OECD ECR method. Calculated carbon pricing using information on excise tax on energy products and energy balances.	Allocated to most important energy consuming sectors: agriculture, transport, industry and electricity generation, other commercial use and households.	Possible to expand the same kind of calculation for 19 different NACE economic activity groupings. Precising the SEEA conceptual improvements: geographical vs national residency criteria in using energy balances.	-
Italia	There has been previous studies in environmentally harmful subsidies where many indirect fossil fuel transfers have been identified.	Allocated to five sectors (Agr. & Fish-Energy-Transport.-Vat-Other).	Subsidies on (i) company cars, (ii) international loan guarantees, (iii) preferential VAT rates. Future iv) regional measures; v) direct transfers; vi) tariffs/charges /fees.	1st Catalogue on Environmentally Harmful & Friendly Subsidies by Ministry of Environment 2nd Catalogue (p.1-4 and 8-12 in English) G20 FFS Self-Review and Peer-Review of Italy
Ireland	Direct and indirect support is calculated separately. Time series available 2012-2016.	Industry allocation is currently not done.	Include social support measures such as household fuel allowances.	Fossil Fuel and Similar Subsidies 2012-2016
Germany	Direct and indirect transfers. Direct transfers are being phased out. A range of indirect transfers, mostly energy and electricity tax abatements.	Industry allocation is currently not done. Some transfers are possible to allocate. Some indirect transfers benefit a range of industries.	A reliable distribution needs to be developed. Uncertain about a few tax abatements/privileges are to be regarded as a subsidy of fossil fuels → Agreement on what transfers to include.	-
New Zealand	Direct and indirect transfers such as tax credits and refunds are identified. Most direct transfers are phased out already.	Industry allocation is currently not done	How/whether to include undertaxed external effects, such as emission of methane from agricultural sector.	Identifying fossil fuel subsidies in the SEEA for SDG reporting
Sweden	Direct and indirect transfers identified.	Fuel used for transportation can be allocated by NACE	Agreement on what transfers to include. How to allocate the tax abatements currently received by the trade industry to the appropriate user.	Identifying fossil fuel subsidies in the SEEA for SDG reporting

Canada

As a starting point, the main focus has been to look for data holdings of fossil fuel subsidy transfers within the Statistics Canada repository. The challenge has been not so much as to locating exactly what government department, gives what transfer, to what industry as this is all on public record. The challenge lies in quantifying transfers.

Statistics Canada's Macro Economic Accounts Division does not capture non-refundable tax credits (indirect transfers), while refundable or payable tax credits are captured. For these, a "grossing" method is applied, i.e. to keep the gross revenue but also show expenditure impact on fuel and energy aggregates. It is also important to note that indirect tax deductions and exemptions are not measured there.

Statistics Canada is looking internally to find how the Supply-Use Tables (SUTs) can help understand what data is/is not available. At this time, the conclusion is that, there is not a precise measure of direct transfers; the SUTs do not have subsidies by commodity or industry. The Public Service Sector Statistics division does capture direct transfers but what the task force would deem as a subsidy is not considered as such in the System of National Accounts. The importance of defining what subsidy is stressed as there are several definition disparities. Depending on the definition used, there may be transfers that Statistics Canada has not discovered. Further investigation is needed for the work.

Germany

The German statistical office, Destatis, define tax abatements that lower the cost of using fossil fuels as legally codified deviations from a reference excise rate on fuel consumption. The most important directly fossil fuel-related excise taxes are the electricity tax and the energy tax. Numerous exemptions exist for both taxes:

- Energy products that the respective producers use up in the production process are tax exempt ("Herstellerprivileg").
- Tax abatements exist for specific production processes in manufacturing.
- In addition to that, manufacturers face lower tax rates for the remaining electricity and energy consumption.
- Last, manufacturers are being compensated for past energy and electricity tax increases with goal of funding state pension funds ("Ökosteuer").

A couple of additional exemption schemes have been included: Tax abatements for (mainly) Diesel in agriculture, domestic commercial air traffic and domestic naval traffic.

Direct transfers

Germany has subsidized sales of hard coal for decades. These subsidies have been phased out by the end of 2018. In addition to that, since 2013, and phasing out in 2020, the German government compensates electricity-intensive industries for electricity price increases that result from the EU-ETS's coverage of electricity producers.

Transfers by the German government (million EUR)

TRANSFER	2011	2012	2013	2014	2015	2016	2017	2018
ELECTRICITY PRICE COMPENSATION	0	0	313	188	244	300	210	-
HARD COAL SUBSIDIES	1,349	1,182	1,082	1,169	1,088	1,288	1,054	1,020

Source: Destatis

German Tax abatements by fuel (million EUR), 2017

TYPE OF FUEL	2017
DIESEL	630
ELECTRICITY	3,272
GASOLINE	0
HEATING OIL	107
KEROSENE/AVIATION GASOLINE	570
LIQUID GAS	0
NATURAL GAS	749
OTHER FUELS	40

Source: Destatis

Other measures and activities

With regards to activities not directly attributable to specific fuels, additional exemptions schemes exist that lower relative prices for fossil fuels. They are listed separately because existing data do not – at this point – allow for a precise allocation of aggregate figures to specific fuels.

Fossil fuel tax abatements, not attributable to specific fuel (million EUR)

EXEMPTION	2013	2014	2015	2016	2017	2018
VALUE OF FREE EMISSION PERMITS	747	994	1,237	835	889	2,218

Tax abatements related to other environmental taxes

The Environmental Taxes accounts include additional taxes whose direct tax base are not fossil fuels, but activities that are intimately linked to the consumption of fossil fuels. In case there are legal exemption schemes they are listed below.

Tax abatements to tax bases that affect fossil fuel consumption indirectly (million EUR)

EXEMPTION	2011	2012	2013	2014	2015	2016	2017	2018
VEHICLE TAX ABATEMENT IN AGRICULTURE	60	60	260	260	260	260	260	260

Effective Carbon Rates

Germany is planning to compile average Effective Carbon Rates, based on the Air Emission Accounts and the Environmental Taxes modules of the Environmental Economic Accounts. Certain methodological and data-related production steps have yet to be completed. In Germany, energy taxes in the sense of SEEA comprise five different taxes. We have included all but the nuclear fuel elements tax, because it does not change the relative price of fossil fuels.

- Electricity tax
- Energy tax
- Contributions to the Petroleum Stockpiling Agency
- Nuclear fuel elements tax (until 2017)

- Emission permits

Ireland

Some publicly-funded supports have a negative impact on the environment. These supports come in many forms and are accordingly difficult to measure on a consistent basis across all countries. Examples of such supports include: Direct subsidies and provision of a good or service from government; Market price interventions; Tax rebates; Reduced excise rates for certain sectors of the economy; Social supports; etc. These supports can have important social and economic purposes but can be detrimental to the environment.

Alternative approaches such as refurbishment of dwellings or supporting the purchase of eco-friendly vehicles can achieve the same social purposes without having a detrimental impact on the physical environment. A research paper was published that contains estimates for 2012 to 2016 of the extent of such potentially environmentally damaging subsidies (CSO Ireland, 2019).

Italy

This work in the task force has been based on previous work done by Ministry of Environment, the catalogue of Environmentally Harmful Subsidies (EHS).

The Catalogue divides the subsidies into two main categories: direct subsidies (spending laws) and indirect subsidies (tax expenditures). Moreover, it also includes “implicit” subsidies within the indirect subsidies category. Implicit subsidies can result from standard taxation system and can promote or encourage environmentally friendly or harmful behaviour and choice of consumption (and production). Notable examples are the underpricing of the natural resources extraction (quarries or royalties) or the fiscal treatment favourable to diesel with respect to gasoline. The second, revised Catalogue assesses, for 2017, EFS equal to 15.2 billion € and EHS equal to 19.3 billion € and includes 161 subsidies, allocated to five sectors (Agr.&Fish-Energy-Transport.-Vat-Other).

Those subsidies defined “uncertain” with reference to the environmental effect deserve further analysis. For instance, there is the need for a deeper assessment of subsidies in the agricultural sector: its evaluation is very complex and requires taking into account all different opinions within the community of experts both at national and EU levels.

Kyrgyzstan

The estimations follow the methodological and classification standards of the OECD Effective Carbon Rates report (OECD ECR, 2016). Taxes on CO₂ emissions has not been set up in Kyrgyzstan and the estimates are based on the excises on energy products, according to the Tax Code: natural gas, diesel, gasoline, and fuel oil. Although not taxed, the coal, crude oil, and electricity are included in the total energy consumption as a tax base expressed in GJ. The estimated effective tax rate of CO₂ emissions of energy used does not include the electricity consumption.

The estimates are based on the energy balances, published by the National Statistical Committee of Kyrgyzstan. The applied classification follows the economic activity groupings, as recommended in the OECD ECR report.

The domestic use by type of energy products, is converted to GJ, and then expressed in CO₂ emissions, using respective conversion factors and rates.

The taxes per energy used (TEU), and respectively the TEU rates are estimated based on the excise tax rates per quantity of energy products (in GJ equivalent), applied to the volume of energy products used. The same procedure is applied for estimating the TEU rates per CO₂ emissions, however while the TEUs per GJ of energy used include the electricity consumption as a tax base, when estimating the TEU rates per CO₂ emissions of energy used the electricity consumption is excluded.

Using the exchange rate, the average TEU rate per CO₂ emissions is much below the reference threshold of 60 EUR (9 %) while converted in EUR PPS for GDP comparison the percentage reaches a level of 27 %.

New Zealand

An investigation has been done by NZ's environmental-economic accounts and national accounts teams to identify which subsidies are available and whether they can be calculated. A SEEA definition of support for fossil fuels that encompasses other forms of support while retaining consistency with the SNA is still an area for development. The SEEA approach may be able to identify the industries receiving the support as distinct from support to consumers. It is possible to extract information to produce this indicator, but given the possibilities to include various forms of support for fossil fuels and for including other greenhouse gases, agreement will be needed on what to include.

In 2017, the estimated amount of support to fossil fuels in New Zealand was \$56 million. The estimates for New Zealand include motor spirits excise duty refund from 2008–17 and tax deductions for petroleum mining expenditures from 2008–12. The OECD estimates for motor spirits excise duty refunds appear broadly consistent with those used within Stats NZ's national accounts. Other forms of support applicable to New Zealand were non-resident drilling rig and seismic ship tax abatements, reductions in royalty payments for petroleum, and exemptions of off-road vehicles from road user charges but data were not available for these items.

Emissions Trading Scheme is also in effect. However, businesses termed as emissions intensive and trade exposed are allocated units without cost. In practice this is most large emitters who are unable to pass costs onto consumers.

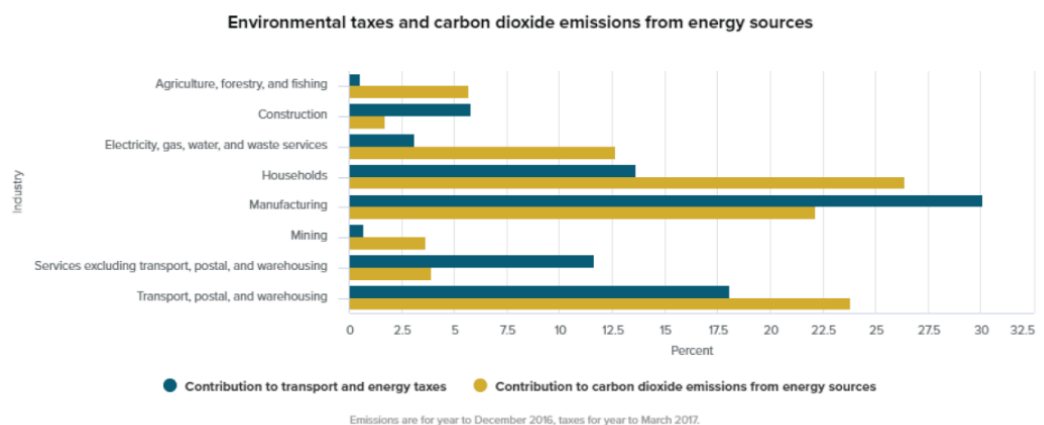
A focus on subsidies may miss other forms of assistance to wasteful or harmful consumption, or other forms of assistance (subsidies or otherwise) to other activities that exacerbate climate change. E.g. in New Zealand most emissions

come from enteric fermentation, with the resulting methane emissions accounting for over half of NZ's emissions profile. However, agriculture is excluded from the Emissions Trading Scheme.

The figure below compares environmental taxes from the environmental tax account to carbon dioxide emissions from energy sources in New Zealand. The environmental taxes included are those classified as energy and transport taxes. In this case unlike in the tables above road user charges – on vehicles over 3.5 tonnes and those using diesel are included. Emissions of methane, nitrous oxide, and fluorinated gases are excluded. In general, industries with higher carbon dioxide emissions pay higher energy and transport taxes also in relative terms except in the following cases.

- Agricultural carbon dioxide emissions are greater than its tax contribution – mobile (off road) emissions that use diesel are not subject to road user charges.
- The direct tax burden is highest for manufacturing, which has the second-highest energy emissions. However, the petroleum, chemical, polymer, and rubber product manufacturing industry pays excise taxes on behalf of consumers. As this tax is passed on at the pump, households and other industries may ultimately pay some of this tax.

Comparison of emissions of greenhouse gases and taxation. NZ.



Stats NZ

7 Discussion and conclusions

This report has investigated how to statistically measure greenhouse gas transfers in cooperation with the London group of experts on environmental accounting. A proposal has also been tested with some Swedish data sources starting with focusing on fossil fuel transfers.

There are national and global policies and initiatives combating climate change and a key aspect of changing the current use of fossil fuels relates to the price of emitting greenhouse gas or using fossil fuels. Monitoring government transfers that aid the continued use of fossil fuels can be a step towards reforms. The rationale for producing statistics, encompassing these fossil fuel transfers among others that impact climate change, assists in the knowledge and awareness of these flows.

As such the statistics can be used to track who gets what and when. Combining these data with other environmental, economic and social data on e.g. greenhouse gas emissions, energy use, employment and housing costs widen the scope and the assessment possibilities. The current report suggests using the System of Environmental-Economic Accounts (SEEA) in order to sort and arrange data in such a manner that the larger knowledgebase is possible to do.

In the report we have shown how the statistical methodology can be applied and what data are the results of this methodology. As such it is but a first step towards new data production.

The pilot in this report has focused on data that are readily accessible and identified those parts with a connection to fossil fuel use.

Developing greenhouse gas transfers in Sweden

In the Swedish chapter we tested the methodology drawn up in previous chapters with data from The Swedish National Financial Management Authority (ESV), the Swedish Tax Authority, the Ministry of Finance and Statistics Sweden. Based on the results from the tests we are proposing the development of new data sets as well as the need for further work.

There are more economic instruments in place, identified by the Swedish Environmental Protection Agency that are likely to have a substantial impact on greenhouse gas emissions that we have not included yet. Areas such as data on the monetary flows of the emission trading permits, on how to measure and estimate preferential loans and methods to assess administrative policies, have not been possible to solve during this project. But work will continue, for example is Eurostat moving forward in their work of creating a new reporting vehicle for transfers that are potentially damaging to the environment – greenhouse gas transfers being one part of that work.

Showcasing the proposed data sets

Data sets that have been discussed or used in the project concern greenhouse gas emissions in tonnes, fuel quantities in various units, money transfers either direct or indirect. Also auxiliary information like reference prices or similar that can make it possible to calculate the indirect monetary flows.

The following categories are included in the proposed data set.

1. Greenhouse gas emissions by industry (including for international transports)
2. Energy use by petrol, diesel, air fuel and boat fuel, coal, peat.
3. Energy and environmental taxes by industry
4. Direct transaction from the state budget with a direct link to fossil fuel use (to transportation sector)
5. ETS- emission rights allocation by industry (proxy)
6. List of tax abatements related to carbon and energy
7. Calculation of amounts of used fuel that lies in different ECR ranges
8. Calculation of amounts of emissions in different ECR ranges.
9. Inventory of other types of transfers that are of interest to users to have data on.

In order to move towards the SEEA framework further work on aligning data with the standardized classification of industries (in Sweden NACE), has to be done.

By collecting the information about the emissions, the types of fuel and the different type of economic instruments, we are gradually making our way to a data set that can provide a more detailed and transparent calculation of identified greenhouse gas transfers.

Further work and analysis

The study shows the possibilities to keep track of greenhouse gas transfers and correlate them with the emissions of greenhouse gases. Such statistics have the potential to be used as a basis for devolving new policy or evaluating existing policy. It can help to answer questions like:

- How have emissions changed when transfers have been removed or changed?
- Where are the largest transfers and how have the emissions historically developed correlated to these transfers?

Earlier surveys on potentially environmental harmful subsidies have been used as support for conducting in depth studies of the effects on removing

subsidies. As an example, during the last survey²¹ in 2017 the Swedish Environmental Protection Agency identified a subsidy where the original reason for the subsidy could be obsolete. In 2018 the Swedish Environmental Protection Agency started an analysis²², removal of energy tax reduction for fossil fuel use in combined heat and power plants. During 2019 the Swedish government²³ proposed the removal of the tax reduction and from 31 of august 2019 the subsidy has been removed.

Conclusions

The expert group of statistical offices has provided a lot of good country experience and has helped clarify many important issues. We are fortunate to have such a wide coverage of countries and would like to thank our colleagues in Canada, Germany, Ireland, Italy, Kyrgyzstan, New Zealand and Eurostat for sharing their knowledge and for discussions.

The SEEA and its underlying statistical system seem appropriate for calculating the carbon price in the economy. The most difficult parts of this project (or the parts that we have not looked much at before and thus need to describe) are the intricacies of recording of tax abatements and how to best describe them. Still, as is demonstrated by the studies made by institutions outside of the statistical system, such data is available.

Finding a terminology that allows for communication between users and statisticians on carbon pricing and the transfers involved is another issue that needs to be resolved. Can the word greenhouse gas transfers be used?

Three types or areas of transfers are suggested to be part of a yearly presentation.

- 1) **Budget transfers** from the state to companies or people that are somehow linked²⁴ to the use or production of fossil fuels.
- 2) **Indirect transfers in the form of tax abatements**
Two complementary approaches are available
 - Using a national tax reference show the effect on the state budget, possibly compared to use data on returned tax abatements if available nationally.
 - Calculating the effective carbon price for different users and fuels. Such a calculation could be used for country comparisons, for example by reporting fuel use or emissions that fall into a number of broadly defined tax bands. That way, it would be possible to show emissions

²¹ Naturvårdsverket, 2017. Potentiellt miljöskadliga subventioner 2.

²² Naturvårdsverket, 2019. Minskad skattenedsättning av fossilt bränsle för persontransporter med inrikes sjöfart och för kraftvärmeproduktion

²³ Finansdepartementet, 2019. Höjd energiskatt och koldioxidskatt på bränslen vid viss användning samt höjd skatt på kemikalier i viss elektronik

²⁴ , subsidies are directly linked to the production prices, and investment grants are directly linked to the purchase of a fixed asset needed for production. Indirectly they can affect market price or the volume of fossil fuels used.

for direct payments as a negative ECR and go up to the maximum observed tax rate.

- 3) **Other implicit support measures.** Due to the complexities of accessing data and constructing comparable results the pilot project excluded transfers such as preferential loans, export credits etc. Further methodological development is required before this can change. To make an inventory of interesting transfers and studies that concern them could be a first step.

A common reporting format is still a part of the work in the group where some more work is left. Industries, fuel types and what grouping of transfers to get some international comparisons and overview, even if the detailed country data would also be available.

There might also be more work to do in finding how to report the statistics in a form that is most helpful for analysts. One such identified issue is how to find measures that can cover administrative policies that put an implicit price on carbon into account.

Another outstanding issue is how to account for ETS allocation in monetary terms and to be able to show the allocation by industry.

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The following reports on environmental taxes and subsidies have been produced by the Environmental Accounts at Statistics Sweden and can be found at www.scb.se/MI1301 under Publications.

MIR2010:2 Environmentally related taxes, subsidies and emission permits (In Swedish)

MIR2008:1 Environmental economic indicators in the Swedish state budget 1995-2006 (In English)

MIR2000:3 Environmental taxes and environmentally damaging subsidies (In English)

MIR2005:21 Administrative policy tools - way to implement them in the environmental accounts. (In Swedish with parts in English).

Analysis of the Introduction of Emission Allowance Trading Schemes in Sweden (In English)

MIR2003:4 Environmental subsidies - a review of subsidies in Sweden between 1993 and 2000 (In English)

MIR2003:1 Economic effects for Sweden of Limited Carbon Dioxide Emission Trade within EU (In Swedish)

Energy taxes in the Nordic countries (In English)

Environmental taxes and environmentally damaging subsidies (In Swedish)

Public environmental protection expenditures and subsidies in Sweden (In English)

Climate change adaption expenditure - A proposal for a methodology to compile, define and classify national and EU economic information as statistics (In Swedish with parts in English)

Environmental Protection Expenditure – new data collection and additional information (In English)

Appendix 1 ESA²⁵ and SEEA definitions

This section is an extract from Eurostat [Environmental Subsidies and Similar Transfers ESST guidelines](#)

According to ESA, a transaction is an economic flow that is an interaction between institutional units by mutual agreement or an action within an institutional unit that it is useful to treat as a transaction.

ESA 2010 transactions (§ 1.66) can be of four main types: transactions in products, distributive transactions, financial transactions and other flows (e.g. acquisitions less disposals of non-produced non-financial assets). Environmental subsidies and similar transfers are distributive transactions.

Distributive transactions describe how the value added generated by production activities is distributed to labour, capital and government and how redistribution of income or wealth and saving is made. Distributive transactions comprise transactions by which the income generated in production is distributed as compensation of employees, as taxes on production and imports, subsidies and other transfers, or as property income to different institutional sectors and the rest of the world.

Among distributive transactions, the category of transfers, in particular from the general government sector, is the focus of environmental subsidies and similar transfers statistics. A transfer can be defined as a transaction in which one institutional unit provides a good, service or asset to another unit without receiving from the latter any good, service or asset in return as a direct counterpart.

This definition covers a large number of transactions between the different institutional sectors of the economy, i.e., not only to corporations but also to households as well as other government units, the rest of the world (for example international organisations or foreign governments) and NPISHs.

National accounts distinguish two types of transfers, as follows (in brackets the national accounts codification):

Current transfers directly affect the level of disposable income and are all transfers that are not transfers of capital. They consist of subsidies (D3), social contributions and benefits (D6) and other current transfers (D7).

²⁵ This appendix uses ESA, the European Systems of Accounts, which is an adaption of the global SNA, System of National Accounts, because it is based on a Eurostat handbook which follows ESA.

— Capital transfers (D9). They are transfers linked to the acquisition (or disposal) of fixed assets and they can be in cash or in kind. Capital transfers include investment grants (D92) and other capital transfers (D99).

About tax abatements

This section is an extract from Eurostat Environmental Subsidies and Similar Transfers ESST guidelines, 2015

Tax abatements²⁶ may be defined as an indirect flow of public resources achieved by reducing tax obligations with respect to a benchmark tax, rather than by a direct expenditure²⁷. By reducing the government revenue that would otherwise have been collected, tax abatements may have an impact similar to that of transfers.

Tax abatements may provide a potential taxpayer the complete relief from a tax, a tax at a reduced rate, or a tax on only a portion of the tax base and are usually not recorded in budget documents.

Tax abatements take a number of forms, all involving a certain benchmark or reference tax not actually collected: Different forms of tax abatements are:

- tax abatements: some amounts are excluded from the tax base;
- tax allowances: some amounts deducted from the benchmark to arrive at the tax base;
- tax credits: some amounts are deducted from tax liability;
- tax rate relief: a reduced rate of tax is applied to a class of taxpayer or taxable transactions;
- tax deferral: a delay in paying tax.

Accelerated depreciation allowances for tax purposes could also be seen as tax abatements. In fact a provision in the national tax code allowing businesses to allocate the costs of past expenditures on fixed assets over a shorter accounting period allows deducting faster the cost of capital than they would allow under the benchmark system. Such provisions allow for higher deductions and lower taxes in the early years of an assessment and lower deductions and higher taxes in later years.

Tax abatements, although not falling under the definition of environmental subsidies and similar transfers, can be of particular interest for environmental reasons. Tax abatements can be used as replacements for environmental subsidies or similar transfers to influence the behavior of economic actors. In some countries they can have an important role as environmental policy tool e.g. in France or the Netherlands.

²⁶ The OECD calls these tax abatements tax expenditures, but the term expenditure should be avoided in environmental accounting as there is no link to the meaning of the term 'expenditure' in national accounts.

²⁷ OECD (2010), Tax Expenditures in OECD Countries, Paris.

As tax abatements do not involve any flow from the government in cash or in kind they are not recorded in the national accounts as a transfer. However, governments sometimes prepare reports and documents on tax abatements cost to the budget. In these cases, the primary data source to gather information could be certain reports produced by for example the Ministry of Finance. Unfortunately the information in those documents is often highly aggregated and it is based on ad hoc estimations. Furthermore information on the value of a tax abatement received by particular industries or companies is usually much more difficult to obtain.

Whenever tax abatements are used to replace environmental transfers, they could be recorded as memorandum items for national purposes in the statistics on environmental subsidies and similar transfers.

The main reason for recording them is for comparability across countries.

An important issue for the measurement of environmental tax abatements is the overall taxation system. A feature of the tax system that may be considered as tax abatement in one country may not be included in another country, given differing overarching systems. For example, a reduced tax rate on a certain activity may for one country be regarded as a mechanism to compensate another penalizing feature of the tax system, whereas in another country this penalizing feature may not exist.

Several methods can be used to estimate tax abatements. Unlike direct expenditures, for which outlays can usually be readily measured, tax abatements are estimates of revenue that are foregone due to a particular feature of the tax system that reduces or postpones tax due relative to some benchmark tax system. There are a number of important measurement issues that could have an impact on the comparability of estimates of environmental tax abatements.

A key challenge in determining or assessing tax abatements is to identify the standard or benchmark tax regime against which the nature and extent of any concession is assessed. A number of different approaches to deciding on the benchmark regime are possible, and these vary among countries:

- Many countries base their tax abatements estimates on a conceptual view about ‘normal’ taxation.

Typically, the benchmark is defined to include normal features of the tax system, whereas exemptions that are intended to address objectives other than the basic function of the tax (e.g. raising revenues, or internalising externalities) may be considered to be deviations from the benchmark. The line between what is normal and what is exemption, however, is often not a clear one.

- Some countries take a reference-law approach and identify only concessions which appear as such on the face of the law as tax abatements. Under this approach, a tax credit would likely be identified as tax abatement, whereas differential tax rates on two products within a broader category might not be.

— Even in a relatively straightforward case, such as reduced VAT rates, different approaches with different results are possible. Some countries take their standard VAT rate as the baseline for measuring the revenue foregone from taxation of some goods and services at lower rates, while others regard lower rates as an intrinsic part of their VAT and would therefore report no tax expenditure. Where countries have many different rates, it may not be clear which rate should be considered the benchmark.

— An analytic approach is to look at an ‘optimal’ tax regime. This is of particular relevance when investigating tax abatements potentially damaging for the environment (e.g. related to fossil fuels), given the presence of externalities. Externalities refer in general to those costs (negative externalities) and benefits (positive externalities) of activities that affect parties who have not chosen to incur them. For example, air pollution from burning fossil fuels is a negative externality if it causes damages to the environment and the health of human beings: the costs are incurred by others than the polluter (e.g. by individuals who may suffer from respiratory diseases, by the government which needs to spend more money on public health, by forest owners who may have a lower return on their investment due to forest damage). An ‘optimal’ tax on a polluting activity would therefore be that level of tax that fully charges the costs of pollution to the polluter (internalisation). The choice of an ‘optimal’ tax as a baseline level can have significant impacts on the measurement of tax abatements.

Two methods are distinct:

1. The revenue forgone method – where it is assumed that the price change has no impact on the fuel consumption
2. The revenue gains method - estimates the increase in government revenues expected to be realised if the tax abatements were eliminated, thereby incorporating anticipated behavioural changes due to changes in the price ratios.

The different results obtained by those methods are not different estimates of the same underlying concept, but are in fact due to different variants of the concept of tax abatement.

A variant which includes indirect effects is not interchangeable with a variant that only considers direct effect. For the choice of method, the analytical purpose of measuring tax abatements plays a role as well as more practical considerations such as ease of method and availability of data.

A third method is the expenditure equivalent method. It estimates the level of funding that would be needed to meet the same outcome using a spending programme. It would estimate what amount of environmental subsidy or similar transfer would have to be paid in order to achieve a result on the relevant target variable(s) that is comparable to the result achieved by the tax abatement (i.e. in the above mentioned example to achieve the same consumption levels as observed under tax abatement).

Measures that defer payment of tax without changing the ultimate nominal tax liability are another source of valuation. A common example is accelerated depreciation allowances for capital investments. By allowing the cost of capital assets to be deducted faster than they would under the benchmark system, higher deductions result and thus lower taxes collected in the early years of the asset life and lower deductions and higher taxes in the later years.

There are two main approaches to estimating the tax expenditure associated with such measures; both provide useful information, but they are quite distinct and not directly comparable:

- The nominal cash flow approach measures the extent to which taxes in a particular year are higher or lower as a result of the accelerated allowance than they would have been in its absence. This measure is normally negative in the early years of an investment (indicating tax abatement) and positive in the later years.
- The net present value approach measures the discounted value of the time series of annual cash flow tax expenditures, normally estimated from the time at which the asset is purchased. This measure reflects the benefit provided to the taxpayer by lower tax payments in earlier years compared to higher tax payments in later years: a cash flow advantage provided today is generally worth more than the same advantage provided tomorrow reflecting inflation and inter-temporal preferences.

Due to interactions and behavioral responses, the revenue impact of eliminating multiple measures is not necessarily equal to the sum of the individual values. Great caution is therefore required in adding together estimates of multiple measures, in particular if the approach is based on the revenue gain method.

Appendix 2: Tables with comparison of excise duty and carbon tax

Excise Duty, Carbon Tax Rates, Excise Volume: Ireland 2016

Fuel	Carbon tax† (€ per 1,000 litres)	Excise duty (€ per 1,000 litres)	Total rate (€ per 1,000 litres)	Volume 2016 (Thousand litres)
Petrol	45.87	541.84	587.71	1,334,857
Auto diesel	53.30	425.72	479.02	3,330,228
Marked Gas Oil	54.92	47.36	102.28	1,044,189
Kerosene	50.73	0.00	50.73	1,049,661
Fuel Oil	61.75	14.78	76.53	55,418
LPG for transport	32.86	63.59	96.45	4,270
LPG for other purposes	32.86	0.00	32.86	263,451

†Carbon tax of €20 per tonne is applied to each fuel listed in the table

Excise Duty, Carbon Tax Rates, Excise Volume: New Zealand 2017

	(Euro per 1,000 litres - Dec 2017 rate)			
Fuel	Carbon tax ¹	Excise ^{2,3} duty Mar 2017	Total rate	Oil supply by fuel (1000s litres)
Regular and Premium Petrol	0	423.92	423.92	3,208,934
Automotive Diesel(6)	0	3.10	3.10	3,339,743
Marine Diesel	0	1.02	1.02	<i>included above</i>
LPG(1)	0	65.56	65.56	323,641
CNG(2)	0	66.19	66.19	<i>included above</i>
Methanol(3)	0	4.16	4.16	<i>not available</i>
Fuel Oil(4)	0	0.00	0.00	162,383
Aviation Gasoline	0	0.00	0.00	382,262
Jet Fuel	0	0.00	0.00	<i>not available</i>
Kerosene	0	0.00	0.00	<i>not available</i>

1. New Zealand does not have a Carbon tax

2. Although much of the taxes above are defined as excises tax by the national accounts MBIE only uses this terminology for the older pre 2008 series. Most of these taxes are ring-fenced to the national land transport management fund. Levies for Accident Compensation Corporation (ACC) are also collected at the petrol pump and are also included.

3. In New Zealand fuels taxed at source are petrol, CNG and LPG. Diesel is not taxed at source but through road user charges (RUC). RUC are payable

through purchase of a distance license which is payable in 1000km units. All vehicles over 3.5 tonnes also pay RUCs. As RUC are not payable per litre, they are not included above but they are included in the Environmental tax account.

The source for the data above is MBIE energy price and oil statistics.

Excise and Carbon Tax Rates by Country and Fuel, 2019 if not specified differently (rounded)

	<i>€ per 1,000 litres</i>						
	Petrol	Auto-diesel	Marked Gas Oil	Kerosene	Fuel Oil	LPG for transport	LPG for other purposes
IE	588	479	102	51	77	96	33
NZ 2017	424	3	n.a.	0	0	66	n.a.
IT	728	617	n.a.	337	64 (ATZ)3 1 (BTZ)	268	190 ind. use