



D6.4 Taxes and Subsidies

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Compiling and Refining Environmental and Economic Accounts

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About CREEA

The main goal of CREEA is to refine and elaborate economic and environmental accounting principles as discussed in the London Group and consolidated in the future SEEA 2012, to test them in practical data gathering, to troubleshoot and refine approaches, and show added value of having such harmonized data available via case studies. This will be done in priority areas mentioned in the call, i.e. waste and resources, water, forest and climate change / Kyoto accounting. In this, the project will include work and experiences from major previous projects focused on developing harmonized data sets for integrated economic and environmental accounting (most notably EXIOPOL, FORWAST and a series of EUROSTAT projects in Environmental Accounting). Most data gathered in CREEA will be consolidated in the form of Environmentally Extended Supply and Use tables (EE SUT) and update and expand the EXIOPOL database. In this way, CREEA will produce a global Multi-Regional EE SUT with a unique detail of 130 sectors and products, 30 emissions, 80 resources, and 43 countries plus a rest of world. A unique contribution of CREEA is that also SUT in physical terms will be created. Partners are:

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Executive Summary

This deliverable aims at identifying the climate related parts of the environmental taxes, environmentally motivated subsidies and if possible the environmental goods and service sector (EGSS). The current situation with mitigation and adaption expenditures is also discussed. These climate related parts of the environmental monetary accounts are then used to investigate the possibility of forming a link with the emission accounts. The emission accounts include data on emissions and emission intensities, both on industry level. Preferably data on an EU level should be used to form this link but the available data on the whole of EU is found not to have sufficient detail. The estimations are grouped in such ways that made it difficult to sort out the climate related parts. Instead a country example, Sweden, is used.

Regarding the environmental taxes, the most apparent link was found to be that between the CO₂ tax and CO₂ emissions. This can provide interesting insight about how the tax is distributed across sectors and industries compared to how CO₂ emissions are distributed. For example households in Sweden pay 40 percent of the total amount of CO₂ tax yet only stand for around 20 percent of CO₂ emissions. If data on the emission permit trading was available with NACE industry categorisation this would increase the use of this link, since both of these economic instruments are active in the climate area within many of the EU countries.

The link formed with the environmental motivated subsidies, the EGSS and emission intensities was not as straightforward. In the case of the subsidies the NACE categorisation needs to be developed further. Subsidies are distributed completely within one NACE category on a one-for-one basis. The confidentiality with the EGSS data in Sweden made it difficult to provide enough detail in the NACE categories for the analysis to be useful. Only five groups can be formed for the entire business sector. There are large differences within each group in emission intensities. For example the Manufacturing industries (one group) include some industries that have some of the largest emission intensities in Sweden yet others are well below the national average.

Another issue for both the environmental motivated subsidies and the EGSS is that it would be useful to know what type of research, education, consultancy etc. that is done within those respective NACE categories (environmental domains for the EGSS). For example the largest receiver of climate related subsidies in Sweden is the NACE category for research and development. This research might be related to (and become useful for) several other industries in turn and it would therefore be helpful to know further on what type of research is done.

Despite this, forming a link between climate related monetary accounts and emission accounts is clearly not an impossibility. A link between these two areas of environmental accounts can provide valuable insights on economic instruments and their effects on emission levels, as well as giving a better understanding of the incentive structures within industries.

1 Introduction

1.1 Purpose of deliverable 6.4

The main task of this deliverable is to identify and study the most climate related environmental taxes and subsidies as such, and to analyse ways to link them to the emissions accounts. National studies will be taken as a basis and the data situation on a general EU level will be assessed. A general EU method needs to be developed in order to get to a harmonised EU account, especially concerning the subsidies.

The work will be focussed on those parts of the taxes, subsidies and EGSS that have a direct relation to the climate issue. These parts have not been identified as a subset before. This will make it possible to deepen the analyses and the linkages to the emissions accounts. On the adaptation and mitigation expenditure side, the data situation is such that it is unlikely that analysis can be performed. More work on the testing the classification is needed by countries before the area can be included in analysis work.

1.2 System of Environmental-Economic Accounts

Environmental accounts have been developed in connection and as a satellite system to the framework of the System of National Accounts (SNA) since the early 1990's. The SNA is an international set of standards, concepts and definitions about the statistics measuring the economy, the European System of Accounts (ESA) being the European version of SNA.

On the global level, the effort has focused on developing the environmental accounts, or the System of Environmental-Economic Accounts Central Framework (SEEA CF) as a satellite system to the SNA. In February 2012 the SEEA CF was adopted as an international statistical standard by the United Nations Statistical Commission. The SEEA CF, as with the SNA contains the internationally agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistic and accounts. The added value and strength of the SEEA CF, being the link to the environment and its relationship with the economy.

In Europe, statisticians and researchers have had the focus of the development of data on physical flows, such as air emission accounts, material flow accounts and sub-soil assets. Simultaneously developments have been achieved in the monetary environmental economics through statistics on environmental taxes, environmental protection expenditures and the environmental goods and services sector. In more recent years the data has matured enough for extended studies investigating these physical and financial flows together as well as observing the impact of climate change emissions through consumption behaviours or the structural changes of a country's economy.

1.3 Layout of deliverable 6.4

After this introduction chapter, a chapter is devoted to each of the subjects Environmental Taxes, Environmental Subsidies, Environmental Goods and Service Sector and last Mitigation and Adaption Expenditures. Each chapter presents existing methods

where such exists and data sources. The final chapter discusses the linkages with emission data.

2 Environmental taxes

Environmental economic instruments are used as a tool for policy makers to influence decisions made while producing or consuming goods and services towards better environmental performances. As the severity of our environmental impact becomes more known, locally, nationally and globally, the use of these instruments have gained more attention and credit. One of the most common environmental economic instruments used by policy makers to reduce environmental impact are environmental taxes. Other types of environmental economic instruments are subsidies, fees and charges and other control measures. Implementing environmental taxes increases the relative price on activities and products that are harmful to the environment. Statistically, within the EU, Eurostat collects yearly data from the European Statistical System (ESS)¹ on environmental taxes. Following below is a description on the methods and data sources regarding environmental taxes in Europe, and a discussion on the climate relation of these taxes are described at the end of this chapter.

2.1 Definition and concept

A key issue when compiling harmonized international data is agreeing on a definition to use as a base for the compilation. Regarding environmental taxes, two things need to be addressed. What is a tax? And what taxes are considered environmental?

Through the co-operation between organisations such as the UN, the OECD, Eurostat, national statistical offices and researchers an agreed methodology, including a definition capturing environmental taxes was developed. The resulting definition has been formulated in the regulation 691/2011 which concerns the obligation for EU Member States to collect data on environmental taxes. It is also a part of the UN SEEA CF 2012.

'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 ESA95 as a tax.'

The last part of the definition deals with the first question, what is a tax? It references to the ESA manual from 1995. This is the manual used to compile the National Accounts. The most known indicator of the National Accounts is the Gross Domestic Product (GDP). In effect this means that if it is considered to be a tax within the National Accounts, it is a tax that can be further evaluated as environmental or not. ESA defines a tax as:

'compulsory, unrequited payments, in cash or in kind, made by institutional units to government units'

Using the same definition greatly simplifies harmonization between countries and data collection. It is important to note that the definition used for National Accounts might

¹ It is a partnership between the Community statistical authority, which is the Commission (Eurostat), and the national statistical institutes (NSIs) and other national authorities responsible in each Member State for the development, production and dissemination of European statistics. This Partnership also includes the EEA and EFTA countries (Eurostat:

http://epp.eurostat.ec.europa.eu/portal/page/portal/ess_eurostat/introduction)

differ from the legal definition of a tax within each country. The purpose of the definition is solely to be able to compile harmonized statistics between countries.

From the ESA definition above the difference between a tax and a fee is made clearer with the term '*unrequited payments*'. This means that the payment (the tax) does not render a service or good given in return that is equal to the payment. This in practice means that the name of the economic instrument is irrelevant for the statistical compilation.

The second question was how to discern which of all these taxes within the National Accounts should be defined as environmental. The above mentioned definition for an environmental tax makes a connection between the tax and its tax base. If that tax base (or a proxy of it) is proven to be environmentally harmful then the tax is considered environmental.

To simplify this Eurostat has compiled a list of tax bases that the member nations have agreed upon to have a negative impact on the environment. This list is divided into four categories, Energy, Transport, Pollution and Resources. In annex 1 the full list is presented.

Some taxes are excluded from the possibility of being considered as environmental. Neither the name of the payment nor the purpose may be used in determining the specific tax as environmental. The criteria is the physical base on which the tax is collected that leads the statistical categorization. As such e.g. land taxes and taxes that should be treated as rents on sub-soil assets are not included in the statistics on environmental taxes, due to the base on which the tax is applied. Resource rents are normally applied on the profit of the sales of the natural resource, not the resource itself. Value Added taxes are also excluded, but for different reasons. For a complete description of the exclusion of these taxes, view the Eurostat statistical guide for environmental taxes (Eurostat, 2001).

2.2 Data sources

Data on environmental taxes are compiled annually in most of the ESS members. Environmental tax statistics is one of three modules that is part of the EU Regulation for environmental accounts². The others are material flow accounts and air emission accounts. Data availability is therefore good compared to many other aspects of environmental statistics.

When data are compiled by the national statistics agencies the main source is the National Accounts data on different taxes. The primary data in turn is mainly provided by the national tax authorities.

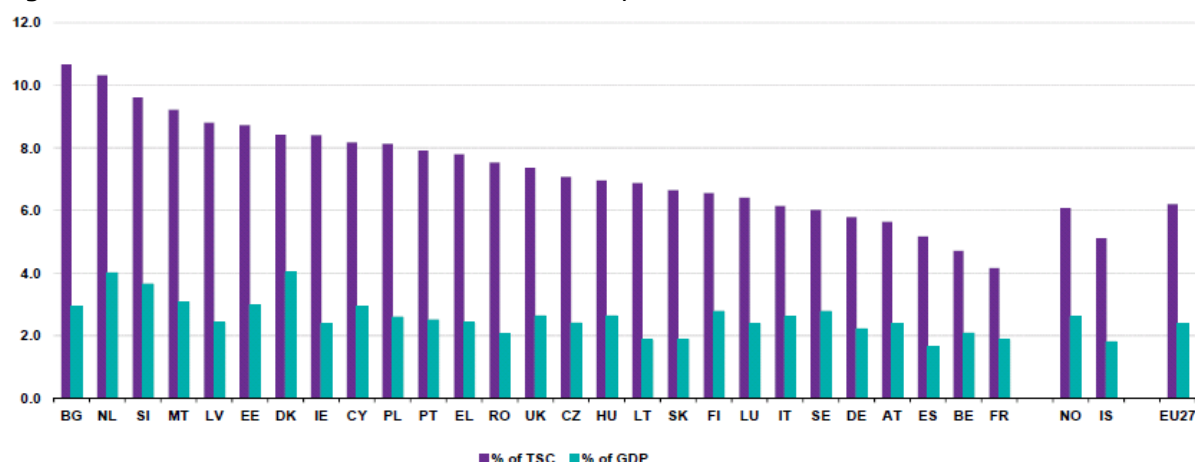
Typical indicators derived from this type statistics are environmental taxes as percentage of GDP and as a percentage of Total Taxes and Social Contributions (TSC).

² Regulation No 691/2011 on European Environmental Economic Accounts

In Europe, Eurostat collect statistics from the ESS community on environmental taxes by industry (NACE rev.2) on an annual basis³. Data are available from 1995 and onwards. Data from 2008 are in accordance with NACE rev 2, which means that there is a break in the times series as earlier data are available in NACE rev 1.1.

The trends of the environmental taxes in Europe are summarized in the yearly publication of Statistics in Focus on environmental taxes⁴. Figure 1 below shows the total environmental taxes in each of the ESS countries in relation to their respective TSC and GDP. The average for the EU 27 is that the environmental taxes are around 6 percent of TSC and 2 percent of GDP.

Figure 1: Environmental taxes in % of TSC and GDP, 2010

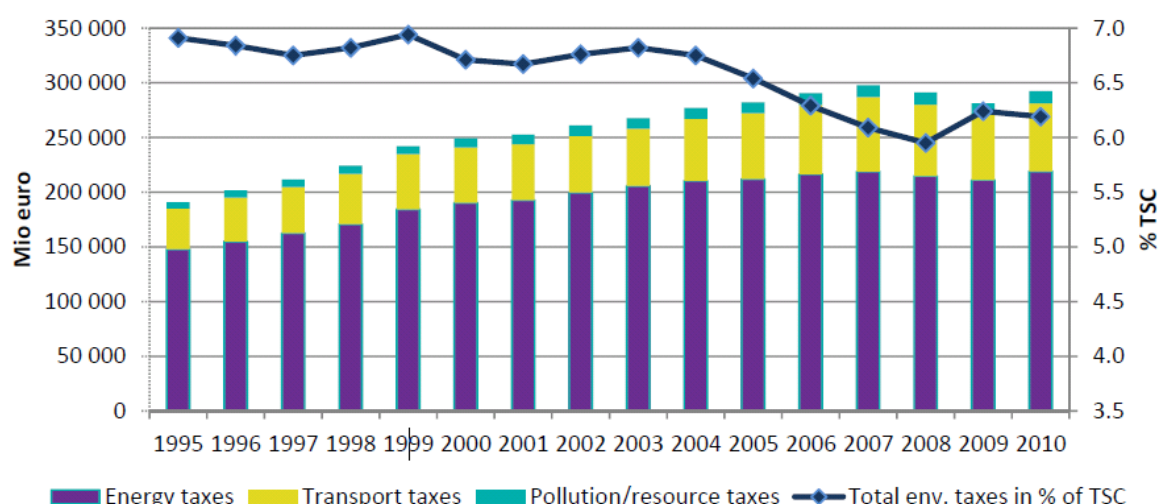


Source: Statistics in focus on environmental taxes, Eurostat, 2012.

Figure 2 shows the development of the environmental taxes over time together with the distribution of the different categories of taxes. Even though the sum of taxes (in millions of Euros) has gone up since 1995, their relative size of TSC has gone down. It is also visible that the Energy taxes are the largest tax category, followed by transport taxes. The sum of taxes from Pollution and Resources are small in comparison to the other categories.

Figure 2: Development of environmental taxes 1995 – 2010 in the EU 27.

⁴ For 2010 taxes, the Statistics in Focus is available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-12-053/EN/KS-SF-12-053-EN.PDF



Source: Statistics in focus on environmental taxes, Eurostat, 2012.

2.3 Climate related taxes?

Not all types of environmental taxes are associated with the climate. It is also important to reflect on what is intended by the term "climate"? In the broad meaning of climate, taxes on car sales or road transportation are related because they steer people away from using high emission forms of transportation. But as cars today might be driven on fuels with less impact on the climate a more strict interpretation might be to only include the taxes on the substances causing the change of climate, for example a tax on CO₂ emissions from fossil fuels.

Regarding the different categories of environmental taxes that Eurostat publishes data on (Energy, Transport, Resource and Pollution), Energy and Transport can be considered to have a relation to climate issues. This is because they include taxes on vehicles, fossil fuels etc. while the Resource and Pollution categories include taxes on waste, extraction of minerals etc. But this is a simplification, for example Energy also includes taxes on nuclear power which does not have the same relation to climate issues. Therefore it is considered that these categories are too general to provide an adequate link to the emission accounts. Data on the individual taxes provide a better basis for this link and they are not provided on a European level yet⁵. A case study of Sweden will be used instead to give an example of how such a link may be formed. The tax on CO₂ placed on fuels provides the closest connection with climate related emissions and will therefore be used as an example described in chapter 6.

⁵ Although the OECD publish individual taxes through their environmental economic database it cannot be verified that the taxes listed are complete or follows the accrual principles (time of payment) of the National Accounts.

3 Environmental subsidies

Unlike environmental taxes, which are already an established area of statistics, statistics on environmentally related subsidies and similar transfers, are still in its early stages. An environmentally related subsidy can take many forms which makes it of highest importance to define, first of all, the meaning of a subsidy in itself. Then, after defined what a subsidy is and which transfers that are included, it is necessary to define what an *environmental* subsidy is. An environmentally *related* subsidy can be either beneficial or damaging to the environment.

Subsidies and similar transfers, including also investment grants and social transfers in kind, are another type of economic instrument. It is commonly used by governments to assist or otherwise influence social or economic behaviours. The issue receives attention when governments assist certain economic activities, as the assistance can distort the competitiveness of business.

This chapter will focus on environmentally motivated subsidies but the starting point is the broader term; environmentally related subsidies which also includes, besides the motivated, the potentially environmentally damaging subsidies.

3.1 Ongoing work

A statistical guide on environmental subsidies and similar transfers is being drafted by Eurostat, in co-operation with national statistical offices and will be referred to below as ongoing work since its date of publishing at the moment is unknown. The statistical guideline will provide a step-by-step procedure for compiling data on environmental subsidies and similar transfers.

There are also other organisations, like the OECD and WTO, as well as researchers that are involved in measuring and analyzing subsidies and similar transfers. However the statistics from these organisations is not always consistent with other statistics or comparable among countries and this has made the need for standardized statistics apparent.

There are several countries in the EU that have some experience with statistics on environmentally related subsidies and similar transfers, however the level of experience is varied. Sweden has developed statistics on environmentally motivated subsidies since 2005 and publishes it on yearly basis on the internet⁶. Sweden has also carried out several projects regarding potentially damaging subsidies. The Netherlands statistical office (CBS) has conducted work on environmentally motivated subsidies and tax credits (as an example of damaging subsidies) and has included it in their annual report on Environmental Accounts since 2009⁷. In Denmark, data on environmental subsidies are provided yearly in the environmental accounts and time series on environmental

⁶ http://www.scb.se/Pages/ProductTables_38186.aspx

⁷ Se annual report for 2011: <http://www.cbs.nl/NR/rdonlyres/3F5F2C12-CB59-4C59-AE1A-FD46AF6D4DAD/0/2011c174pub.pdf>

subsidies are available on their webpage⁸. Norway has conducted a study on environmentally motivated transfers for Eurostat in the past⁹. In Germany, the Central Government has been reporting yearly in detail on the size and extent of environmental subsidies and similar transfers (among others coal subsidies) since the 1960-ies. Concerning environmentally harmful subsidies, the European Commission has published a number of studies in the past years¹⁰.

3.2 Definition and concept

The precise definition and scope of a subsidy, as well as an environmentally motivated subsidy (EMS) and a potentially environmentally damaging subsidy (PEDS), has been debated for a long time in the statistical community and constituted one of the revision items of the SEEA¹¹. International recommendations are used as much as possible in the ongoing work by Eurostat. Defining a subsidy and what is included as environmentally related subsidies have been one of the major tasks of the current task force at Eurostat. In the upcoming statistical guide, a subsidy is defined as well as an environmentally motivated subsidy.

The figure below gives an overview to the different parts in the broader term environmentally related subsidy. Two of the most used types of environmentally related subsidies today are environmentally motivated subsidies (EMS) and potentially environmentally damaging subsidies (PEDS). Both of these can include different parts depending on the chosen scope of analysis. A common use in the statistical area is to account for direct subsidies (paid from the government budget). But by broadening the concept it is possible to also include subsidies given , indirectly , for example by allowing companies to pay a lower tax rate than the given tax rate (so called tax credits, or exemptions).

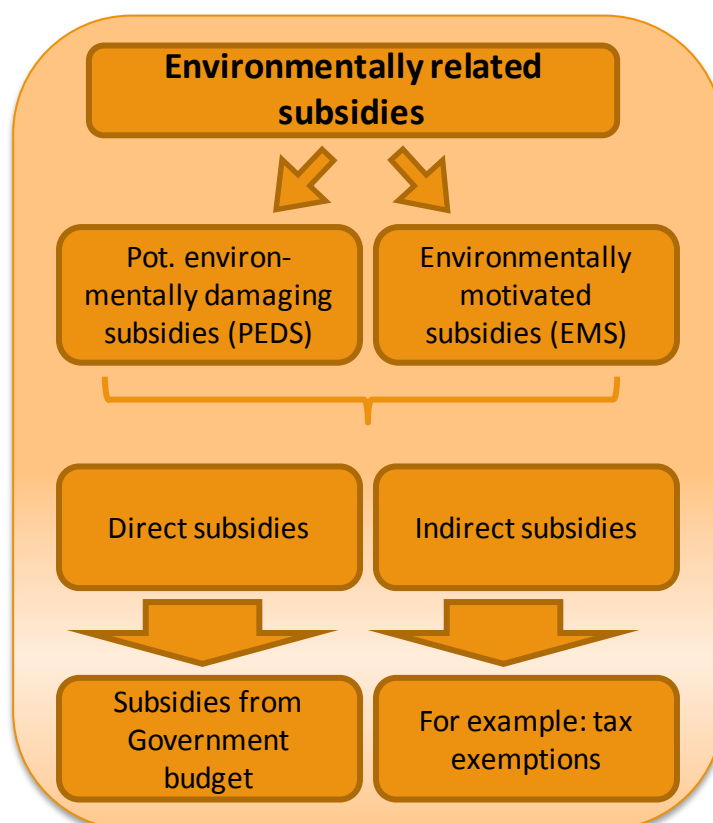
Figure 3: Context of environmentally related subsidies from an environmental account point of view

⁸ <http://www.statbank.dk/mreg4t> Denmark have kept the definition of a subsidy as used in the National Accounts in previous work which does not make the results comparable to for example the result presented in Sweden and the Netherlands.

⁹ http://www.ssb.no/english/subjects/01/90/doc_201115_en/doc_201115_en.pdf

¹⁰ <http://ec.europa.eu/environment/enveco/taxation/index.htm>

¹¹ <http://unstats.un.org/unsd/envaccounting/seearev/>



The figure makes it apparent of the importance to define the chosen environmentally related subsidy in a transparent way in order to avoid misunderstandings as well to make it possible to compare the statistics between different countries.

3.2.1 Definition subsidy and environmentally motivated subsidy

International organisations, such as the OECD, FAO and WTO, tend to take a different view of subsidies based on their diverse interests. This makes studies performed by these organisations very difficult to compare.

The SEEA does not provide any in-depth assistance, but the work done in Europe provides some. The scope of a subsidy is broader than the term subsidy as used in the ESA where the definition of a subsidy includes a restriction to mainly include transfers for enterprises as beneficiaries in the subsidy term. To cover all payments from the government other transfers also need to be covered. Therefore the term "*subsidies and similar transfers*" is used to clarify that also other types of transfers, besides only to enterprises, are included in the definition of a subsidy, such as investment grants and social transfers in kind. Below follows a full lists:

A subsidy and similar transfers;

- Include the following transfers in the National Accounts; subsidies (D3), social contributions and benefits (D6), other current transfers (D7) and capital transfers (D9).
- Includes transfers to producers/enterprises, individuals, organisations, non-profit-making associations, municipalities, county councils, EU-countries and international activities

An environmentally motivated subsidy and similar transfers;

- Is a subsidy that is intended to support (as its main purpose) activities which protect the environment (environmental protection) or reduce the use and extraction of natural resources (resource management).
- Is classified as a subsidy or a similar transfer in National Accounts.
- Is a payment directly paid from the Government.

An environmentally motivated subsidy and similar transfers are therefore motivation-based, meaning that it is the underlying motive of the amount paid out that determines whether a subsidy is beneficial or not. The actual effect is not analyzed, due to the complexity of the task. To simplify, the term environmentally motivated subsidy will hereafter be used meaning also similar transfers.

3.3 Data sources and methods

There are many different methods for collecting the data and the upcoming statistical guide on environmental subsidies and similar transfers by Eurostat will describe two primary ways. Both of these are still in their early stages but the experience is growing for every year.

The two (main) approaches for compiling an account for environmentally related subsidies, are in short the following;

- Using data in the *National Accounts* (if such data makes it possible to see the specific type of subsidy behind the transfer)
- Using the result of *Government budget* (where information of each subsidy is to be found as budget lines)

However, it has been shown that a common way to find statistics on environmentally related subsidies is to combine the two in a way such as the National Accounts data is the main source of data but with the help of finding relevant information about the different budget lines in the Government budget. The budget has been necessary for compilers in many countries in order to determine if a subsidy is "environmental" or not. By using this third approach, the *combination-approach* the comparability with the National Accounts is kept.

3.3.1 Examples of data collection

At the moment there are only two countries that, on regular basis, calculate and publish statistics on environmentally related subsidies (based on the wider definition of a *subsidy and similar transfers*). These methods will shortly be described below as examples of two different ways to collect data. Besides the two countries the OECD gathers some data on environmental subsidies in its database which will be described shortly first.

The OECD and the European Environment Agency have information about environmentally motivated subsidies. This information can be found in the OECD/EEA database on instruments used for environmental policy and natural resources

management¹². In the database it is possible to find information about, besides environmentally motivated subsidies, also environmentally related taxes, fees and charges, tradable permit systems, deposit refund systems and voluntary approaches used in environmental policy. It is possible to look at the data in the database from different aspects; by country, by environmental domain or by instrument. For environmentally motivated subsidies, there is no given definition or handbook describing exactly what to include and this has an effect on the result. Different countries include different subsidies and therefore the result is difficult to compare between countries. An effect of the upcoming handbook on environmentally related subsidies by Eurostat will be that those European countries who will compile statistics on environmentally motivated subsidies within the environmental accounts will also be able to publish good quality data in the OECD/EEA database.

Sweden

In Sweden, the data collection is based on the transfers in the National Accounts. It is important to use the primary data and not only the data processed by the National Accounts, since it is important to get access to all the details in the input data in order to be able to discern the environmental motivation. The transfers from the government are derived from the outcome of the Government budgets and it is possible to learn more about the different budget lines therein. For each budget line a decision whether it is environmentally motivated or not needs to be taken. For some payments, only a share of the transfer is environmentally motivated, where different methods to calculate shares are developed based on the different subsidies. One example is the environmentally motivated subsidies in the Rural Development Programme which needs to be separated from the other (without environmental motive) supports paid out from this programme. The subsidies (and similar transfers) also need to be distributed to industries (NACE), this is done plainly by deciding which industry is the main receiver of each subsidy, some larger ones are divided on several industries. Data on the environmentally motivated subsidies in Sweden are provided in Annex II.

The Netherlands

In the Netherlands it is not possible to directly obtain environmentally motivated subsidies from the National Accounts, contrary to the environmental taxes, as no subdivision for the subsidies is made (based on the broader definition subsidy and similar transfers). The method in the Netherlands has therefore been based on obtaining data on environmental subsidies from additional data sources like registers. This gives a very good distribution on NACE for the subsidies since each subsidy payment then has a correlation to the receiver of the subsidy. However the correlation to the National Accounts is lost in the process and it is not possible to see if a transfer is for example a current or capital transfer.

3.4 Climate related subsidies?

Many of the environmentally related subsidies have a connection to the climate and it is possible to extract the subsidies related to climate by either their names or by their environmental domain.

¹² <http://www2.oecd.org/ecoinst/queries/> Information can be found about instruments used in environmental policy in OECD member countries, OECD accession countries, EEA member countries and countries otherwise co-operating with EEA, not being members of OECD.

At the moment, in Sweden, similar domains as for environmental taxes are used to classify environmentally motivated subsidies¹³. These groups are energy-related, resource-related, emission-reducing, transport-related and environmentally related aid. In the three groups named energy-related, emission-reducing and transport-related the main subsidies are clearly related to the climate area. Examples of environmentally motivated subsidies found in the group called "energy-related" are different supports promoting renewable energy, new technologies and more efficient use of energy. The largest subsidy in the group energy-related is subsidies for energy research which are paid out with the overall goal to fulfill given goals in the areas of energy and climate. Examples in the group emission-reducing are; subsidies for climate investments in Sweden and subsidies for international climate-related work such as developing the tradable permit system for CO₂ and participating in work related to the Clean Development Mechanism (CDM). In the transport-related group the subsidy for the eco-cars is found together with subsidies for environmentally motivated transport research.

¹³ In the future a different classification will be used as well, distributing the subsidies in more detailed sub-groups describing better if the purpose of the subsidy is for environmental protection (CEPA) or resource management (CREMA).

4 Environmental Goods and Service Sector (EGSS)

In addition to environmental economic instruments the SEEA also covers aspects of businesses. The need to better understand the green/eco sector within the economy has prompted the development of statistics on what has now been defined as the Environmental goods and service sector (EGSS). In section 4.1 below, the methods for providing data on the EGSS is briefly explained, followed by section 4.2 on available data sources.

4.1 Definition and concept

Early pilot studies were made during the late 1990s in Sweden, Portugal, the Netherlands and France to develop methods to estimate the scope of the environmental goods and service sector. The OECD and Eurostat have published several reports. Most current is The Environmental Goods and Service Sector, (2009), a handbook by Eurostat including definitions, variables, data sources, case studies and discussions. The definition of the EGSS in that report is,

'The environmental goods and services sector consists of a heterogeneous set of producers of technologies, goods and services that:

Measure, control, restore, prevent, treat, minimise, research and sensitise environmental damages to air, water and soil as well as problems related to waste, noise, biodiversity and landscapes. This includes 'cleaner' technologies, goods and services that prevent or minimise pollution.

Measure, control, restore, prevent, minimise, research and sensitise resource depletion. This results mainly in resource-efficient technologies, goods and services that minimise the use of natural resources.'

Thus the definition has two main parts, the first concerning general environmental protection and the second part involves resource management issues. Together they form the basis for understanding what the EGSS is. Some delimitation from this definition is necessary for measurement to be possible. Only goods and services produced with mainly environmental purpose is included in the environmental sector. For example electronic distribution of documents means less transports and lesser resource use. On the other hand it is a service that has not been provided primarily with environmental purpose and is therefore not included in the EGSS. Another delimitation is that only producers of the final environmental good or service is included in the EGSS. Because of this input goods that can be used for other than environmental purposes are not included. Neither is the distribution of those goods and services.

There is currently no cohesion between the ESS on how the actual data collection is designed and this can affect the coverage of industries and businesses measured. Countries like Sweden and the Netherlands use a registry based approach, this means that no data collection is then required. Others, like Germany use a survey directed to

the goods and service producers. Austria uses among other things estimations based on the results of the environmental protection expenditure survey.

4.2 Data sources

In the latest voluntary data collection, by Eurostat in 2011, 12 countries provided data on the EGSS. This data can be found in the Eurostat database¹⁴. The collection included data on NACE categories and environmental domain for the following variables; production value, added value, exports and employment in the EGSS. Austria and France were also able to provide data on product types.

As mentioned previously, because of the different methods for data collection used by the countries involved it is difficult to compare but also to give a complete list of data sources. For a clearer view an example is used below in the case of data collection in Sweden.

Sweden uses a registry based approach for collecting data on the EGSS. All data are supplied without the use of traditional questionnaires in which companies are asked various questions. Establishment level data are provided by the business registry, data on employment by labour statistics, exports from the trade statistics. Production, added value and exports are only available on company level, some approximation is therefore required to divide company level data on the establishments. Because the employment data are available on establishments, this can be used as a foundation for the approximation. If every employee is assumed to provide an equal share to the production of the company, the production of each establishment is in line with the number of employees it has. This is a crude measure but it is deemed necessary to be able to report data on regional level within Sweden. Without it a disproportionately large amount of production would be placed in Stockholm where many head offices are located. It is also an improvement from simply dividing the production/added value/exports by the number of establishments within the company.

Another important issue is the production of environmental goods and services embedded within companies that are otherwise not considered to be a part of the EGSS. By definition this should be included and for many companies it is not a negligible amount. An environmental share is therefore approximated for each company. Some companies have an environmental share of 100 percent and therefore all of the production is included in the EGSS, this is the case for example with companies specialized in waste collection and water treatment. For other companies evaluations need to be made based on information gathering from financial statements, webpages etc.

A summary view of the environmental sector in Sweden between 2003 and 2011 is shown in table 1 below. The turnover in the sector has increased by around 90 million SEK since 2003 (roughly 10 million EUR). At the same time the number of establishments has grown by 3000 as well as 8000 more employees in the sector.

Table 1: Overview of the EGSS in Sweden 2003-2011

¹⁴ <http://epp.eurostat.ec.europa.eu/portal/page/portal/environment/data/database>

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Establishments	12 000	12 009	12 922	13 205	13 864	14 275	14 665	15 383	15 148
Turnover (million SEK)	146 564	153 760	173 531	194 757	207 792	243 155	216 395	233 829	241 492
Export (million SEK)	22 984	24 688	28 726	30 780	35 443	38 049	39 600	36 752	38 942
Employed, total	60 851	63 921	66 262	66 766	69 632	70 543	68 972	68 759	n.a.

Source: Statistics Sweden, http://www.scb.se/Pages/TableAndChart_206294.aspx

4.3 Climate related EGSS?

The EGSS has a set of environmental domains that the estimations are presented within. Table 2 below shows the environmental domains in Sweden and the establishments, turnover, exports and employees distributed among them. Some domains are possible to consider to be climate related, for example Renewable energy and Heat/energy saving. But there is no category specifically dedicated toward climate. The domain Environmental consultant probably includes consultants working with climate related issues but there is no way to sort these out from the other types of environmental consultants. The same applies to the domain Education, research and monitoring. EGSS involved in climate related work seems to be a cross section across several environmental domains.

Table 2: The EGSS in Sweden by environmental domain in 2010

Environmental area	No. of establishments	Turnover (million SEK)	Export (million SEK)	Employed women	Employed men	Total employed
Air pollution control	112	2 743	1 464	292	771	1 063
Wastewater management	917	12 996	4 241	1 149	5 270	6 418
Waste management	2 678	32 185	2 625	2 952	13 029	15 981
Soil and groundwater	399	2 254	518	302	1 018	1 320
Noise and vibration	41	236	47	24	123	147
Environmental consultants	1 664	8 195	1 727	2 309	4 103	6 412
Education, research and monitoring	274	1 327	--	3 350	2 509	5 859
Recycled materials	1 800	30 782	9 143	1 076	5 588	6 664
Renewable energy	2 712	115 277	11 171	2 769	10 251	13 019
Heat/energy saving	924	12 109	5 035	989	4 448	5 437
Sustainable agricult./fishery	3 556	6 823	308	1 054	3 459	4 513
Sustainable forestry	112	7 604	83	168	646	814
Other resource man. (incl. eco-tourism)	194	1 298	--	558	555	1 112
TOTAL	15 383	233 829	36 752	16 990	51 769	68 759

Source: Statistics Sweden, http://www.scb.se/Pages/TableAndChart_257462.aspx

5 Statistics on mitigation and adaptation expenditures in a SEEA context

International, national and local efforts to introduce measures reducing greenhouse gases are progressing and receiving attention as it moves ahead.

Statistically, these measures are monitored through e.g. physical information on the various gases, energy uses or waste generated. The SEEA Central Framework sets out the framework that can be used to analyse and visualise the various impacts of this information on the economy as well as parts of the environment. However, the SEEA CF has until now not broached the topic of specific monetary statistics on either the financial flows related to the mitigation measures implemented nor the financial flows related to the adaptation measures developed.

Basically, measures to reduce emissions occurring in the first place that adds to the accumulation of greenhouse gases in the atmosphere are in literature called mitigation. Measures to protect ourselves, our community and our environment from the unavoidable impact of the climate change already noticed are called adaptation.

5.1 Ongoing work

Globally, the work on compiling statistics on climate change mitigation and adaptation is still in its infancy and different approaches are applied.

In Australia for example, in 2012 the Australian Bureau of Statistics published works covering both areas. Their approach was to look at climate change mitigation from a holistic viewpoint discussing pressures of air emissions, carbon binding and the use of taxes as an economic instrument (ABS 2012). On the other hand The European Commission, DG CLIMA contracted in 2010 work to be undertaken to develop and propose methods to collect new statistics on expenditure for climate change adaptation done by governments (SCB 2012).

Statistics Netherlands performed a study examining how statistics on expenditure made by general government could be collected and disseminated (CBS 2012). The study basically tested the method as proposed through DG CLIMA's study with regards to adaptation expenditures with some further development and proposed their own methodology for capturing mitigation expenditures.

5.2 Definition and concept

The need to establish definitions in a statistical context is important for two reasons: firstly, it is necessary to select definitions based on language that allow the compiler to apply a considerable amount of flexibility in accounting for a wide range of variables, and secondly, particular definitions need to be agreed to by the relevant decision makers and project developers in order to help develop a consistent approach as part of both statistical data compilation. The situation with statistics measuring expenditure on

mitigation and adaptation requires definitions for statistical purposes to be constructed, acknowledged and tested on a global level.

5.2.1 Mitigation

Measuring green house gas emissions are well established through the reporting to the Kyoto Protocol. However, there are no methods defining the area of statistics on expenditure for mitigation activities. The UNFCCC define the broader area as “any anthropogenic interventions that can either reduce the sources of greenhouse gas (GHG) emissions (abatement) or enhance their sinks (sequestration).”

The CBS (2012) study use that very definition and they have to interpret and further build on it for statistical compilations. They concluded that the measures can effect emissions directly through e.g. technologies that reduces emissions to arise in the first place or through regulatory activities. The second type of measure would affect emissions indirectly through e.g. the substitution of energy sources. With regards to sinks two types were distinguished; natural or man-made sinks.

Under the circumstance that statistics on mitigation expenditure would be compiled under the framework of the SEEA CF, it would mean that expenditure that has occurred would be captured. Considering the CBS approach, certain mitigation activities would never be captured. This would for instance be the case of using natural sinks to store GHG emissions. If the natural sinks does not cause or create any additional outlays in financial terms there would be no expenditure recorded. On the other hand statistics measuring e.g. expenditure on technological changes already exist and would fit the potential new statistics.

5.2.2 Adaptation

The situation within statistics related to expenditure on adaptation measures are very much the same as for mitigation expenditures. There is no established statistical definition on how to delimitate the area. However, there was an evaluation of existing definitions from the IPCC, the World Bank, the OECD and the EEA in the context of producing statistics through the DG Clima study (SCB, 2011). The conclusion of that evaluation was the better fit of the IPCC definition as “adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities associated with climate change.” This definition was also used in the CBS study (2012).

5.3 Potential data sources

Parallel to experiences compiling monetary environmental economic statistics monetary climate change statistics would be a sub-set of traditional economic statistics and information.

Table 3 below presents a first outline of existing statistics that has the potential to be used for future work on monetary adaptation or mitigation statistics. The listed areas of interest captures climate change measures through their general coverage. However, the data are not readily available for extraction from published works. It is highly likely that

medium to large development would be required to alter existing data at the micro-level (data collection stage). Questionnaires would need to be re-designed or databases altered to facilitate an extraction solely focusing on climate change.

Table 3: Potential statistics capturing mitigation or adaptation expenditures

Type of statistics	Relevance	Variables
Environmental protection expenditure statistics	Capture technology advancements and environmental related management	Investments, current expenditure
Environmental taxes	Capture regulatory actions	Tax revenues and taxes paid
Environmental goods and services	Capture a sector of the economy that produces environmental goods and services	E.g. Turnover, number of employees
Environmental subsidies and similar transfer statistics	Would capture government assistance both national and international assistance	Subsidies, investment grants, social transfers in kind
Research and development statistics	Captures expenditure on research and development	R&D expenditures
Household expenditure survey	Captures expenditure made by households	Various information could be used.
OECD data, UNFCCC data, other research databases	Capture various pieces of information on international aid, projects and education exchanges relevant to the field.	

5.4 Future discussions developing the statistics

Creating new statistics on expenditure on mitigation and adaptation will require the development of a whole new area of statistics. Statistical rules, guidelines and historic experience would facilitate the work, but there would nonetheless be complex issues to solve.

Definitions and classifications would need to be developed. A start has already been seen by Statistics Sweden and Statistics Netherlands but more are required. The proposed definitions on mitigation and adaptation will require some further thoughts on how they should be applied and where delimitations are needed. This is particularly relevant when the two topics would most likely be presented side-by-side. There is a risk that the

measures might, in some circumstances be considered both mitigating and adapting as for example with some regulatory activities. It could also be the case that existing statistics, or back ground information are not detailed enough to split climate change activities into the two components. The experience in Europe compiling statistics on investments and current expenditure for environmental protection would most likely be a good source of knowledge when furthering this work.

Another issue to resolve would be what kind of expenditure statistics are of interest. Investments, current expenditure, subsidies, R&D and so on are all of interest, but the field is open to be debated further.

As with most statistics the compilation of various indicators would also be a topic. The benefit of applying conditions of the SEEA to the work would enable a fair and appropriate link to other physical data, most importantly climate change emissions. But it might also be of interest to develop certain productivity indicators or ensure that the data can be used in various models available for impact assessments.

6 Linkages with Emission Data

A subset of areas within the environmental accounts with possible connections to the climate issue has been explained briefly in chapters 2 to 5 above. This chapter will further develop these possible connections into a link where comparisons can be made between the climate related monetary parts of environmental accounts with the emission accounts.

6.1 What can be linked?

In the previous chapters environmental taxes, environmental subsidies, the EGSS and adaption and mitigation expenditures has been presented with the intent of finding components solely concerning the climate.

Choosing subsets of each that has some connection to the climate is possible in all areas (except adaption and mitigation) which have been mentioned in the previous chapters. A point of discussion is how narrowly to view what climate related is. A pragmatic approach is to use those areas that have the most direct connection between monetary side and emissions. If no such can be found then a more broad meaning of the term climate can be used to form a base for comparison with emissions.

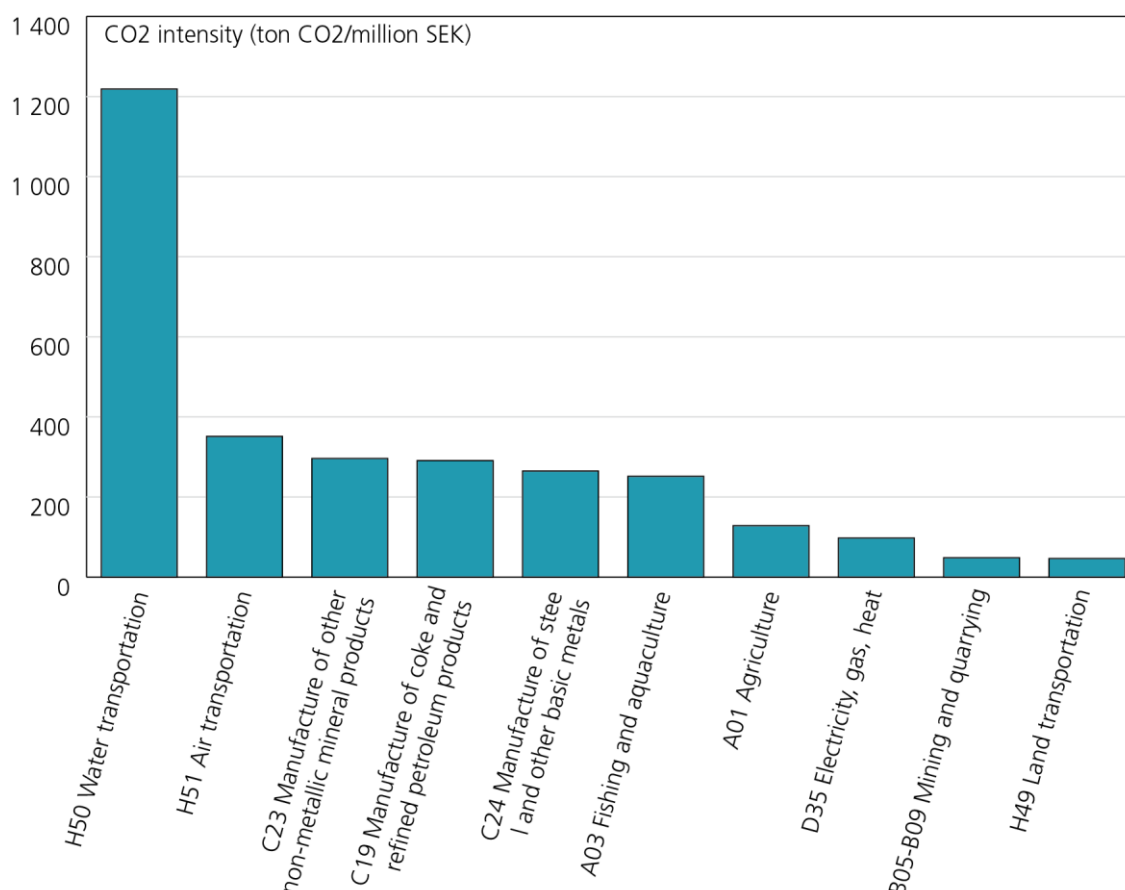
Another aspect to consider is if there exists a possibility for industry classification. The opportunities of the analysis are more extensive if it is possible to link with other economic data. NACE codes are available for the environmental taxes, environmental subsidies and the EGSS.

The tests developed in this chapter builds on the Swedish data and experience. With regards to EGSS, statistical confidentiality restricts the breakdown of detailed levels of information, only broad categories can be used. The statistics on environmental subsidies are disseminated by industry (NACE) as is environmental taxes.

Requiring both a close connection with the climate issue and industry classification, a good starting point is to use the environmental taxes to form a link with emissions. Specifically the tax regarding CO₂ which can be linked to CO₂ emissions by industry.

The emission accounts also include emission intensities by industry. The emission intensity is a measure of the amount of emissions in relation to the added value produced in the industry. It is therefore seen as an estimation on the amount of emissions needed to produce, which varies across industries. The emission intensities of the 10 most intensive industries in Sweden are shown in figure 4 below. Transportation on water is by a large margin the most emission intensive industry, every million SEK of added value requires roughly 1 200 tons of CO₂ emissions.

Figure 4: Top 10 emission intensive industries in Sweden 2009



Source: Statistics Sweden

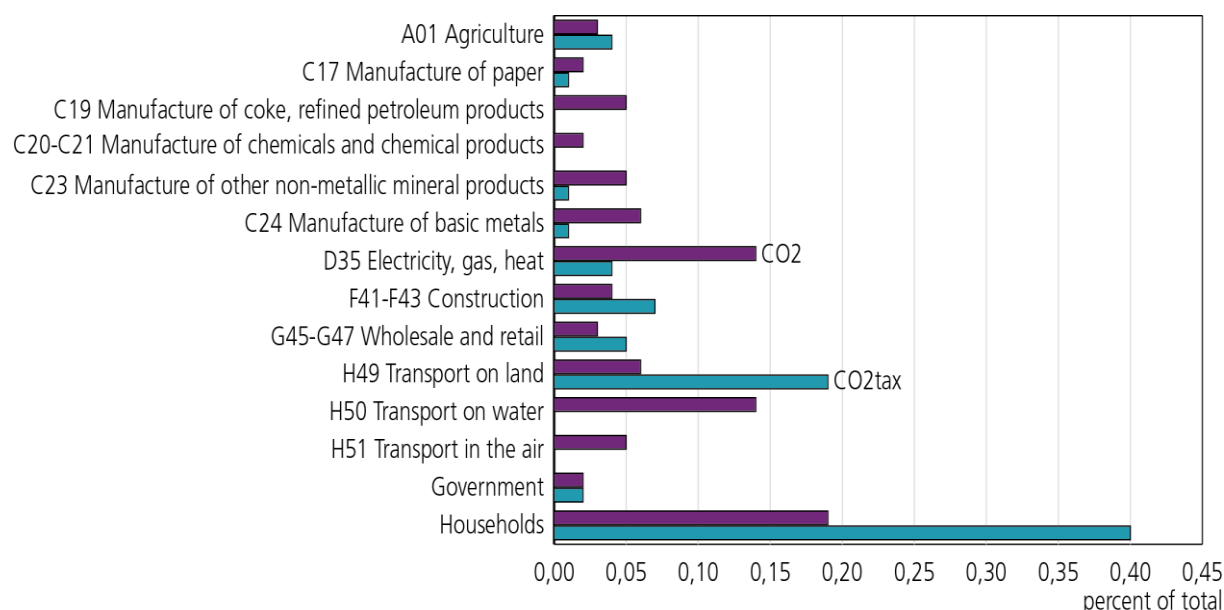
These intensities might be interesting to compare to the climate related subsidies. They could provide some insight into whether the most emission intensive industries are also large receivers of subsidies intended to improve the environment, or more specifically the climate.

Since the EGSS in Sweden has a broad industry classification and it is difficult to tie the environmental domains to the climate issue, it is complicated to form a close link to the emission accounts. Although it will be attempted to make a connection with the emission intensities to possibly provide some insight of the size of the EGSS within the emission intensive industries, since the EGSS by definition is a cross section of the entire business sector.

6.2 Linking climate related financial and emission accounts

In the previous section 6.1 a starting point was considered linking the CO2 taxes with CO2 emissions. By putting the tax and emissions of each industry in relation to the total emission and total taxes a percentage is formed that can be easily compared between industries. To clarify with an example data from 2009 in Sweden is used. Only industries and sectors with above one million ton CO2 emissions have been included. The result of this is shown in figure 5 below.

Figure 5: Industry comparison on relative levels of CO2 taxes and CO2 emissions in Sweden, 2009



Source: Statistics Sweden

The comparison shows that there is a difference between the level of tax and emission in some industries and sectors. The households account for slightly less than 20 percent of all emissions yet pay almost 40 percent of total taxes. On the other hand many of the manufacturing and energy producing industries pay relatively less than is emitted. The transport industries differ amongst themselves, land transports pay more while transports on water or through air pay no CO2 tax at all.

Care should however be taken before any conclusions are drawn. The EU Emission Trading Scheme is not taken into consideration here, and it is another important economic instrument implemented in the climate area. Some of the industries are also included in the trading scheme, e.g. the energy producers, therefore the figure above does not give a full picture of the incentive structure. However the emission permits have so far been allocated freely in Sweden.

Another possible link is between the climate related subsidies and the emission intensities. In section 3.4 the environmental subsidies involving energy, emission-reducing and transport were mentioned as climate related. Selecting only these and distributing them on the NACE codes of the the receivers of these chosen subsidies will provide table 4 below.

Table 4: Climate related subsidies and emission intensities by industry

Industry	Climate related subsidy (million SEK)	CO2 intensity (ton CO2/million SEK)
C29 Motor vehicles, trailers	282	9
D35 Electricity, heat and gas	164	97
L68 Real estate activities	160	1
M71 Architectural and engineering	38	3
M72 Research and development	501	3

Source: Statistics Sweden

In a second column the emission intensities of the respective industries have been attached. Out of the top 10 emission intensive industries, showed in figure 4 above, only

the energy producing (D35) is also a receiver of subsidies related to the climate. The other receiving industries have relatively low emission intensities. It is important to note that the largest receiver of climate related subsidies, R&D (M72), is an activity that can be beneficial to any other industry depending on the type of research done.

Lastly, a similar link was suggested with the EGSS. Because of confidentiality the industry aggregates are presented in only five groups. The same is done for the emission intensities resulting in table 5 below.

Table 5: Emission intensities and the EGSS in Sweden 2009

NACE group	Turnover (million SEK)	Export (million SEK)	Employees	CO2 intensity (ton CO2/ million SEK)
A01–A03 Agriculture/forestry/fishing	10 347	174	3 231	59
B05–C33 Mining/Manufacturing	42 395	24 078	13 779	33
D35 Energyproduction	71 687	1 658	5 257	97
E36–E39 Water/Waste/ Sewerage/Recycling	29 597	3 866	12 083	16
F41–U99 Services	60 504	9 755	23 422	13

Source: Statistics Sweden

While table 5 includes all industries of the business sector the aggregation is so broad that it is difficult to draw any conclusions from the comparison with the emission intensities. The mining/manufacturing category has an emission intensity of 33 ton per million SEK. Yet some industries within this group have above 200 tons, while others e.g. the production of electronic equipment is around 1 ton of CO2 emissions per one million SEK in added value. The same goes for the service industry that includes transports as well as consultancy services.

6.3 Conclusions and further development

The purpose of this report was to analyze mainly climate related environmental taxes and subsidies, but also the EGSS, with the aim of making a link with the emission accounts. If possible this link should be formed with data on EU level.

EU level data was not found to a satisfying degree at the level of detail necessary. The only area that has a regular data collection on that level is the environmental taxes and these are only published in the Eurostat database by main category of tax type (Energy, Transport, Resource and Pollution). These can include other taxes as well as the climate related ones and there is no way of knowing their relative size within each group. Many countries within the EU have a specific CO2 tax and in the Eurostat data collection this tax is sorted separately. It should therefore be possible to provide specific data on the CO2 tax for each member state. Another solution would be to ensure that the OECD database on environmental economic instruments were in line with the rules of national accounts and were appropriately documented. That way the two data sources could be used in connection with one another. Even though this might be provided it is still not sure as to what level of industry breakdown the countries can provide. This is a necessity since both parts of the emission accounts (emission levels and emission intensities) are compiled in NACE categories.

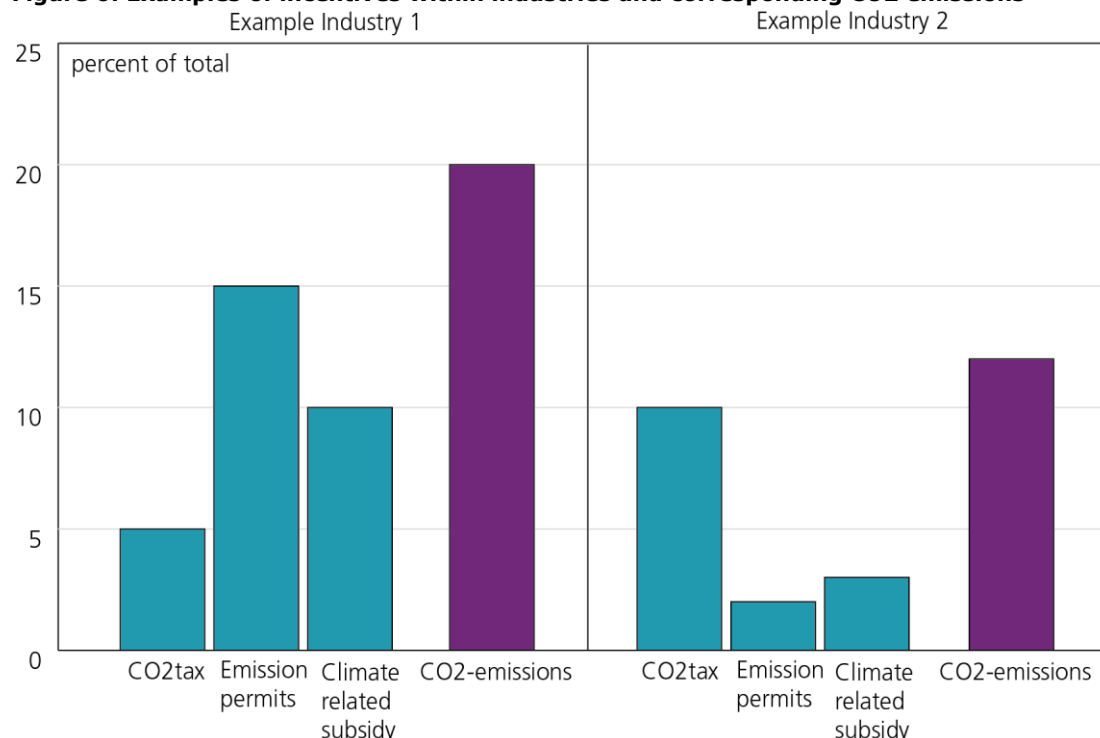
Using Sweden as a country example the most straightforward link was formed between the CO₂ tax and the CO₂ emissions. This link can provide a base for further analysis e.g. also linking the EU ETS data if that can become available on industry level¹⁵.

The links formed between the emission intensities, environmentally motivated subsidies and the EGSS were more complicated to analyse. The NACE categories of the EGSS are broad because of confidentiality issues. It is possible that another country might provide a better example but very few countries in the EU produce data on EGSS. The methodology of providing a NACE breakdown of environmental subsidies is not fully developed yet that makes the subsidies appear to be more focused on certain industries than they might actually be.

Another issue for both the EGSS and the environmental subsidies is that it would be very useful to have further knowledge about what type of research, education, consultancy etc. that is involved within the NACE categories (and the environmental domains of the EGSS).

Despite this, forming a link between climate related monetary accounts and emission accounts is clearly not an impossibility. A link between these two areas of environmental accounts can provide valuable insights on economic instruments and their effects on emission levels, as well as giving a better understanding of the incentive structures within industries. In figure 6 an example is given on what type of data could be produced regularly (yearly) given that some of the issues mentioned above are solved.

Figure 6: Examples of incentives within industries and corresponding CO₂ emissions



¹⁵ For a further discussion on the possibilities of combining the EU ETS data with environmental accounts, view the report from CREEA task 6.3.

Figure 6 shows the future possibility of being able to analyze several economic instruments at once together with the substance variable (in this case CO₂ emissions). Comparisons can then be made between several industries. In the example in figure 6 example industry one is more involved in the EU ETS than example industry two, yet this industry pays relatively more in CO₂ taxes. The comparison can be made in monetary amounts if the substance variable is left out of the figure.

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Annex I: List of environmental tax bases

Table 1: List of environmental tax bases¹⁶

Energy products (including fuel for transport)

- Energy products for transport purposes
- Unleaded petrol
- Leaded petrol
- Diesel
- Other energy products for transport purposes (e.g. LPG or natural gas)
- Energy products for stationary purposes
- Light fuel oil
- Heavy fuel oil
- Natural gas
- Coal
- Coke
- Biofuels
- Electricity consumption and production
- District heat consumption and production
- Other energy products for stationary use

Transport (excluding fuel for transport)

- Motor vehicles import or sale (one off taxes)
- Registration or use of motor vehicles, recurrent (e.g. yearly taxes)
- Road use (e.g. motorway taxes)
- Congestion charges and city tolls (if taxes in National Accounts)
- Other means of transport (ships, airplanes etc.)
- Flights and flight tickets

Pollution

- Measured or estimated emissions to air
- Measured or estimated NOx emissions
- SO2 content of fossil fuels
- Measured or estimated Sulphur emissions
- Other measured or estimated emissions to air
- Ozone depleting substances (e.g. CFCs or halons)
- Measured or estimated effluents to water
- Measured or estimated effluents of oxydisable matter (BOD, COD)
- Other measured or estimated effluents to water
- Effluent collection and treatment, fixed annual taxes
- Non-point sources of water pollution
- Pesticides (based on e.g. chemical content, price or volume)
- Artificial fertilisers (based on e.g. phosphorus or nitrogen content or price)
- Manure

¹⁶ This is a copy of the list as of 2012. Tax bases might be added or removed over time. For an accurate list view the Eurostat statistical guide for environmental taxes which is updated ongoing.

- Waste management
- Collection, treatment or disposal
- Individual products (e.g. packaging, beverage containers, batteries, tyres)
- Noise (e.g. aircraft take-off and landings)

Resources

- Water abstraction
- Harvesting of biological resources (e.g. timber, hunted and fished species)
- Extraction of raw materials (e.g. minerals, but excluding oil and gas)
- Landscape changes and cutting of trees

ANNEX II Environmentally motivated subsidies in Sweden

Total environmentally motivated direct subsidies (million SEK)	2000	2011
Total	5 781	8 206
Resource-related subsidies:	3 635	3 723
Environmental supports in agriculture [1]	2 427	2 518
Support for liming and protecting the nature [2]	336	309
Support to sanitation of polluted areas	19	208
Environmental research	138	171
Support for local investment programs	595	-
Return of taxes on fertilizer and pesticides	-	133
Support for the environment in the sea	-	138
Support for sustainable cities	-	129
Subsidy for eco-building	-	-
Support for environmental marking	4	4
Subsidy to preserve the fish	2	2
Support for international environmental cooperation	27	48
Investment subsidy for an ecological restructuring	37	-
Measures for improving the environment in the agricultural sector	13	12
Support for improved environment in Baltic sea	21	-
Other (environmental goals, supervision etc)	17	51
Energy-related subsidies:	1 047	1 672
Investment subsidy to reduce the use of energy	115	-
Investment subsidy for renewable energy	173	-
Energy research	304	772
Support for international environmental cooperation [3]	0	19
Support for more efficient use of energy	59	107
Support for energy investments in public facilities	-	0
Support for energy technology/energy efficiency	147	378
Support for installation of energy efficient windows etc.	-	0
Support for conversion from direct electricity heating	-	210
Support related to nuclear safety (international) [4]	25	53
Support related to nuclear safety	6	6
Small-scale electricity support	173	-
Support for solar heat [5]	-	20
Support to windpower	-	107
Measures for providing heat and power in southern Sweden	45	-
Emission-reducing subsidies:	12	-27
Different supports in the climate area	12	73
Support for climate investments [6]	-	-101
Transport-related subsidies:	6	18
Transport related research	6	18
Trial implementation of a congestion tax	-	0
Eco car subsidy [7]	-	-
Environmentally related aid:	1 081	2 820
Environmental aid [8]	1 081	2 820
Percent of GDP in Sweden[9]	0,26%	0,23%

Fotnootes

1) Mainly environmental supports in agriculture, such as for example conservation of biodiversity in the farmed landscape and environmentally friendly agriculture. About half is paid by EU. Only refer to the environmental supports in the Rural Development Programme but there are also other support in the programme with an environmental motive. Not the actual payment is presented but a periodised result based on statistics from the the Swedish Board of Agriculture.

2) The budget line/lines behind this subsidy has changed name over the years. For 2011 the budget lines included are Protection of valuable nature and Support for valuable nature.

3) The amount for fees to international organisations and for international cooperation is possible to separate from the subsidy Energy research from 2011, since it is now paid out from a separate budget line.

4) Years without data is due to a change in methodology. The source of data (Result of the government budget) is more detailed from 2007 making it possible to separate a budget line into more than one purpose. International nuclear safety support was before 2007 included in the subsidy called International environmental cooperation.

5) Support for solar cells is also integrated in the subsidy post above called Support for energy technology/energy efficiency regarding the years 2009-2011.

6) The budget line ended in 2010. The amount in 2011 shows repayments from municipalities (among others) which did not fulfill their commitment.

7) The eco car subsidy ended in 2010 and has been replaced by a so called super eco car subsidy from 2012.

8) The amount has been revised. Included now is only what is paid out from SIDA (the share themselves say is primarily environmentally motivated) and from the budget line called Bistandsverksamhet/aid activities. There are environmentally motivated aid paid out also from other budget lines as well as from other authorities which future projects could look closer at if such a more complete picture is to be seen.

9) GDP at market price, current prices.

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