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Title: Experiences of measuring and categorising environmental economic instruments

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Abstract

The design of local environmental policy would benefit from examples of initiatives in different countries, compiled in a harmonised way. In Sweden, the development of the System of Environmental and Economic Accounts at the statistical bureau shows examples of various ways to record environmentally related taxes and subsidies. The instruments are geared towards different areas of environmental concern. The aim of this paper is to relate the experiences of tracking and labelling the economic transfers related to such actions. Environmental statistics are often based on state of the environment reporting, but the economic statistics can also be a source of information about how the economic system affects the environmental pressure. Environmentally relevant taxes are one important part of this information that is official statistics in Sweden.

Statistics Sweden have now developed methods to identify environmentally motivated and potentially environmentally damaging subsidies/transfers as the next step towards creating a coherent information system for environmentally relevant economic instruments. The methods for identifying these transfers will be described and some of the emerging statistics presented.

The System of integrated Environmental and Economic Accounting (SEEA) is a satellite system to the National accounts and is designed to answer many of the questions about the environmental pressure from production and consumption. Legislation for providing EU statistics on SEEA has just been passed, implying that EU countries will report environmental taxes and air emissions by industry in a coherent system 2012. The cooperation between

countries to development this system has also shown many examples of different designs of environmental policy. Water policies, but also the waste treatment policies seem to be most diversified as policy areas, if you compare between countries.

There is a growing concern about how the statistical offices can provide environmental statistics for the society. Traditionally, environment statistics has not been under the development of the statistical community, but has often been the responsibility of environmental ministries or agencies. Globally, the environmental statistics today is mainly covering the physical aspects of changing the state of environment (e.g. land cover, water quality and quantity) or the discharge of pollutants or waste.

However, the close connection between environmental pressure, i.e. the use of natural resources and economic activities provides a strong argument why the statistical offices should step in and widen their range of statistics further. In particular, the use and combination of already existing economic, energy and environmental statistics can be a valuable contribution, as has been shown by the development of the system of environmental and economic accounts. By using already existing statistics for new purposes, it is also a low cost option, in the sense that it does not require new expensive surveys. The economic modules of SEEA that have been considered cover mainly the areas of environmental expenditure, environmentally related taxes, and environmentally related transfer (which is subsidies plus other related transfers). Some work has been started on how to cover emissions trading statistics and other new types of economic instruments.

Subsidies can be categorised in several ways. In relation to environment-economic assessments there are environmentally related subsidies and general subsidies. The environmentally related subsidies are divided into environmentally motivated (EM) subsidies and potentially environmentally damaging (PED) subsidies.

Introduction

There is a growing concern about how the statistical offices can provide environmental statistics for the society. Traditionally, environment statistics has not been any of the main areas for the statistical community, but has often been the responsibility of environmental ministries or agencies. Interestingly, the environmental statistics today is mainly covering the physical aspects of changing the state of environment (e.g. land cover, water quality) or the discharge of pollutants or waste.

The close connection between environmental pressure, use of natural resources and economic activities however provides a strong argument why the statistical offices should step in and widen their range of statistics further. In particular, the use and combination of already existing economic, energy and environmental statistics can be a valuable contribution, as has been

shown by the development of the system of environmental and economic accounts. By using already existing statistics for new purposes, it is also a low cost option, in the sense that it does not require new expensive surveys.

The System of integrated Environmental and Economic Accounting (SEEA) is a satellite system to the National accounts, which has been developed since the early 1990-ies (UN, 1993; UN, 2003). It is designed to answer many of the questions about the environmental pressure from production and consumption. Legislation for providing EU statistics on SEEA is now in place, for the modules of air emissions, environmentally related taxes and for material flows.

The economic statistics modules of SEEA cover mainly the areas of environmental expenditure (Eurostat, 1994), environmentally related taxes (Eurostat, 2001), and environmentally related transfer (which is subsidies plus other related transfers) (Palm and Larsson, 2007). Some work has been started on how to cover emissions trading statistics and other new types of economic instruments. This work focuses on how to obtain harmonized statistics that can be used for understanding the general trends of how economic instruments are used.

Currently there is an exchange of data between Eurostat and DG TAXUD to compile environmental taxes as part of total taxes. Data on taxes from the Member Countries' transmission to the Eurostat national accounts are delivered to DG TAXUD for further classification. Based on this data, a joint publication on taxes is annually produced for EU-27 and Norway (E.g. Eurostat, 2009). Data on environmental taxes from this publication are later on also published on the Eurostat web-site related to environmental accounts.

There is a common misconception that environmentally related taxes would be only such taxes that were motivated by an environmental purpose. In such a case, there would hardly be anything to report for most countries, as there are only a few that have used this as a regulatory instrument. However, the taxes (or subsidies) on natural resources can play a large role in determining the price for the commodities. The price of gasoline over the world varies widely, and this is mainly due to what price policy the governments have.

The need for providing an internationally comparable data set, regardless if it is transfers that are environmentally motivated (EM) or potentially environmentally damaging (PED), is very apparent. There is a need to standardize definitions that can open up for a statistical approach, leading to time series that are comparable between nations.

The major shortcoming today is the lack of internationally comparable and available data on the transfers that are driving forces for the environmental problems. The issue on subsidies is a topic that is discussed in many international organisations. The lack of common definitions and information hampers negotiations and analyses in the field. This is an area where the

SEEA is particularly well suited to bring forward some reliable definitions and comparable data.
The OECD and WTO are examples of institutions that study subsidies, and have suggested their own definitions. The expertise and knowledge of these institutions is of great value for understanding the issue and what types of analyses are conducted. These user needs should preferably be translated to a plan of data requirements for data providers to try and match. None of these organisations have regular collections of data series that can be used for new studies in the area. It is not always easy to understand the differences between the different definitions, and how it translates into different data sets. Still, we will mention some of them here, to get a flavour of what is intended to be covered by the term.

From the OECD a subsidy is defined as *'any measure that keeps prices for consumers below market levels, or for producers above market levels, or that reduces costs for consumers and producers'* (OECD, 1998).

The World Trade Organisation definition of subsidies contains three basic elements (WTO, 1994):
• a financial contribution, including direct transfers of funds (e.g. grants, loans, and equity infusion) and potential direct transfers of funds or liabilities (e.g. loan guarantees). A financial contribution also exists where government revenue that is otherwise due is forgone or not collected (e.g. fiscal incentives such as tax credits); where a government provides goods or services other than general infrastructure, or purchases goods; or where a government entrusts or directs a private body to carry out these functions;
• the financial contribution must be made by a government or any public body, including sub-national governments and public bodies such as State-owned companies;
• it must confer a benefit.

A paper presented to the London Group by Eurostat and Sweden in October 2008, presented system boundaries for a SEEA subsidy. It was a broader definition than a subsidy as in the National Accounts, including also parts highly relevant for a subsidy concept but labeled as other things in the National accounts.

There are a number of countries reporting to the OECD for the OECD/EEA database on instruments used for environmental policy and natural resources management. It is easy to access the data collected by the OECD, mainly collected from ministries of finance. The difficulty is to know the comparability of the data over time, e.g. whether it is reported as accrual data or on cash basis[1]), the completeness of the data (are all taxes included) and if the reported data can be compared with other countries. Regardless of the issues surrounding the data in the database there is information available that

[1] Accrual means that the amount of taxes paid are allocated to the year they were supposed to have been paid. Cash basis means that the taxes are recorded when they were paid in to the government. The national accounts recommend the accrual basis for the calculations.

can be a starting point for further analysis, see e.g. EEA, 2005 and EEA, 2007.

Methods

Environmentally related taxes

In 2001, the European Commission (Eurostat, DG TAXUD), the OECD, the International Energy Agency and experts on environmental accounts at national level produced a guideline on how to develop environmental taxes. The guideline includes the definition, data sources and how to use and interpret results.

The OECD/EC definition of an environmental tax.

"A tax whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment."

This definition is solely based on the physical unit of the tax. This means that motive from the legislator is disregarded. The tax bases are defined by a list (Table 1). These environmental taxes are grouped into four categories; energy, transport, pollution and resources. These groups are selected to facilitate analytical applications. The separate groups are described below.

Energy taxes
This group includes taxes on energy products used for both transport and stationary purposes. The most important energy products for transport purposes are petrol and diesel. Energy products for stationary use include fuel oils, natural gas, coal and electricity. The CO2-taxes are included under energy taxes rather than under pollution taxes. There are several reasons for this. First of all, it is often not possible to identify CO2- taxes separately in tax statistics, because they are integrated with energy taxes, e.g via differentiation of mineral oil tax rates. In addition, they are partly introduced as a substitute for other energy taxes and the revenue from these taxes is often large compared to the revenue from the pollution taxes. This means that including CO2-taxes with pollution taxes rather than energy taxes would distort international comparisons. If they are identifiable, CO2-taxes should be reported as a separate category next to energy taxes. SO2-taxes may be subject to the same problem as CO2-taxes but should be recorded under the category pollution.

Transport taxes
This group mainly includes taxes related to the ownership and use of motor vehicles. Taxes on other transport equipment (e.g. planes), and related transport services (e.g. duty on charter or scheduled flights) are also included here, when they conform to the general definition of environmental taxes. The transport taxes may be 'one-off' taxes related to imports or sales of the

equipment or recurrent taxes such as an annual road tax. Taxes on petrol, diesel and other transport fuels are included under energy taxes.

Pollution taxes
This group includes taxes on measured or estimated emission to air and water, management of solid waste and noise. An exception is the CO2-taxes, which are included under energy taxes as discussed above. SO2-taxes are included here.

Resource taxes
Under the OECD/EC definition resource taxes typically includes taxes on water abstraction, forest and some raw materials like gravel.

Taxes on oil and gas extraction are not regarded as environmentally related
Taxes on oil and gas extraction are excluded from the definition of environmental taxes, as they are levied on the economic result rather than on the physcial quantities, and therefore not directly related to the price of the resulting commodity.
Taxes on extraction of minerals and petroleum are often designed to capture the resource rent. They do not influence prices in the way that other environmental taxes, e.g. product taxes, do.

The resource rent = the value of output less all extraction costs (including a normal return to fixed capital). It represents a kind of "pure profit" from extraction.

A tax on the resource rent does not introduce a difference between the price received by the extractor and the price paid by the users in the way that a product tax does, and the market price will be affected only if supply of the product changes because of the tax on the resource rent. For petroleum and minerals where prices are determined on the world market, the effect on prices of a tax on the resource rent in a single country should be small.

Table 1. Tax bases included in the environmental tax statistics framework (Eurostat 2001)

Measured or estimated emissions to air
- Measured or estimated NO_x emissions
- SO_2 content of fossil fuels
- Other measured or estimated emissions to air

Ozone depleting substances (e.g. CFC or halon)

Measured or estimated effluents to water
- Measured or estimated effluents of oxydizeable matters (BOD, COD)
- Other measured or estimated effluents to water
- Effluent collection and treatment, fixed annual taxes

Certain non-point sources of water pollution
- Pesticides (Based on e.g. chemical content, price or volume)
- Artificial fertilisers (Based e.g. on phosphorus or nitrogen content or price)
- Manure

Waste management
- Waste management in general (e.g. collection or treatment taxes)
- Waste management, individual products (e.g. packaging, beverage containers)

Noise (e.g. aircraft take-off and landings)

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

Transport
- Motor vehicles, one-off import or sales taxes
- Registration or use of motor vehicles, recurrent (e.g. yearly) taxes

Resources
- Water abstraction
- Extraction of raw materials (except oil and gas)
- Other resources (e.g. forests)

Environmental subsidies and other transfers

There are two steps that are needed in order to identify the environmentally related subsidies and similar transfers. Firstly, the *transfer types* that are of interest needs to be identified, that is such transfers that may end up influencing the price of products or increase activities with proven negative impacts on the environment. The second step is to single out *which of these transfers* could be identified as being related to such products or services.

Transfer types

To find the transfer types, the SNA was investigated. The transfers to enterprises, as well as the transfers to governments trading organisations, to international aid and to households were of interest. It has earlier been

claimed that the SNA would not be a good source for this type of information, as the subsidy definition was seen to be narrow, only including transfers to enterprises. However, the other types of transfers are also recorded in the SNA, only under different headings.

In the SNA 93[2] subsidies are included in the primary distribution of income accounts (chapter 7, section D3). The primary allocation of income account show how primary incomes are distributed among institutional units and sectors. This account includes compensation of employees, taxes on production and on imports, subsidies, operating surplus or mixed income, and property income.

The meaning of a subsidy in the SNA is very specific, and covers transfers to enterprises. In order to get closer to what the users of environmentally related subsidy data would want, more transfers need to be added, notably investment grants and transfers to households.

When it comes to defining what a **subsidy** is, the SNA1993 states in section D.3:

§7.71 *Subsidies are current unrequited payments that government units, including non-resident government units, make **to enterprises** on the basis of the levels of their production activities or the quantities or values of the goods or services which they produce, sell or import. They are receivable by resident producers or importers. In the case of resident producers they may be designed to influence their levels of production, the prices at which their outputs are sold or the remuneration of the institutional units engaged in production.*

*§7.72. Subsidies are not payable to final consumers, and **current transfers that governments make directly to households as consumers are treated as social benefits**. Subsidies also **do not include grants** that governments may make to enterprises in order to finance their capital formation, or compensate them for damage to their capital assets, such grants being treated as capital transfers*
(…)
§7.78 Other subsidies on products.
Other subsidies on products consist of subsidies on goods or services produced as the outputs of resident enterprises that become payable as a result of the production, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation. The most common types are the following:

(a) Subsidies on products used domestically: these consist of subsidies payable to resident enterprises in respect of their outputs which are used or consumed within the economic territory;

[2] http://unstats.un.org/unsd/sna1993/toclev8.asp?L1=7&L2=4

(b) ***Losses of government trading organizations****: these consist of the losses incurred by government trading organizations whose function is to buy and sell the products of resident enterprises. When such organizations incur losses as a matter of deliberate government economic or social policy by selling at lower prices than those at which they purchased the goods,* ***the difference between the purchase and the selling prices should be treated as a subsidy****. Entries to the inventories of goods held by such organizations are valued at the purchasers' prices paid by the trading organizations and the subsidies recorded at the time the goods are sold;*

(c) Subsidies to public corporations and quasi-corporations: these consist of regular ***transfers paid to public corporations and quasi-corporations which are intended to compensate for persistent losses - i.e., negative operating surpluses - which they incur on their productive activities as a result of charging prices which are lower than their average costs of production as a matter of deliberate government economic and social policy.*** *In order to calculate the basic prices of the outputs of such enterprises, it will usually be necessary to assume a uniform ad valorem implicit rate of subsidy on those outputs determined by the size of the subsidy as a percentage of the value of sales plus subsidy.*

In discussions with researchers and national or international agencies, the terminologies for subsidies are not within the limits of the SNA-definition for subsidies. Often, investment grants are included, which in the SNA are placed elsewhere in the system compared with subsidies. Nevertheless, the importance of capturing investment grants makes it necessary to also define the same selection criteria for investment grants within the SEEA.

Investment grants D.92 §10.137
Investment grants consist of capital transfers in cash or in kind made by governments to other resident or non-resident institutional units to finance all or part of the costs of their acquiring fixed assets. The recipients are obliged to use investment grants received in cash for purposes of gross fixed capital formation, and the grants are often tied to specific investment projects, such as large construction projects. If the investment project continues over a long period of time, an investment grant in cash may be paid in instalments. Payments of instalments continue to be classified as capital transfers even though they may be recorded in a succession of different accounting periods.

The environmental component.
Now that the types of transfers have been identified it is necessary to have some criteria to be able to say what transfers can be said to be environmentally related. Over the years, these criteria have been discussed with stakeholders in order to make sure that there can be acceptance of the results.

Environmental purposes
Firstly, we look at those subsidies that are motivated by environmental purposes. In the state budget, there are budget lines that clearly belong to the environmental policy area. It can be transfers to keep or expand on nature reserves, or to maintain environmental control programs. Thus, there is a clear environmental motive behind the transfers. These are singled out.

Then it becomes more difficult. There are also budget lines that have both an environmental as well as other motives. This is for example the situation in some of the R&D that is paid for energy efficiency projects. There can be economic reasons, employment reasons, security reasons, as well as environmental reasons behind such transfers. We have chosen a number of budget lines that are explicitly stated to have a environmental motive. These are some concerning biodiversity issues to keep certain types of crops, and also some R&D that is meant to test environmental technology.

However, we have avoided adding transfers to the transportation sector. In discussions we have seen that if public transportation transfers would be regarded as a subsidy for environmental purpose, it has the same size as the rest of the transfers that have an environmental purpose. It is clear that the main purpose of public transport is to serve the public to get around, in particular those who do not drive or have access to cars, so that they can reach their work places, friends and relatives etc. Depending on the design of the public transportation system it has very varying environmental pressure.

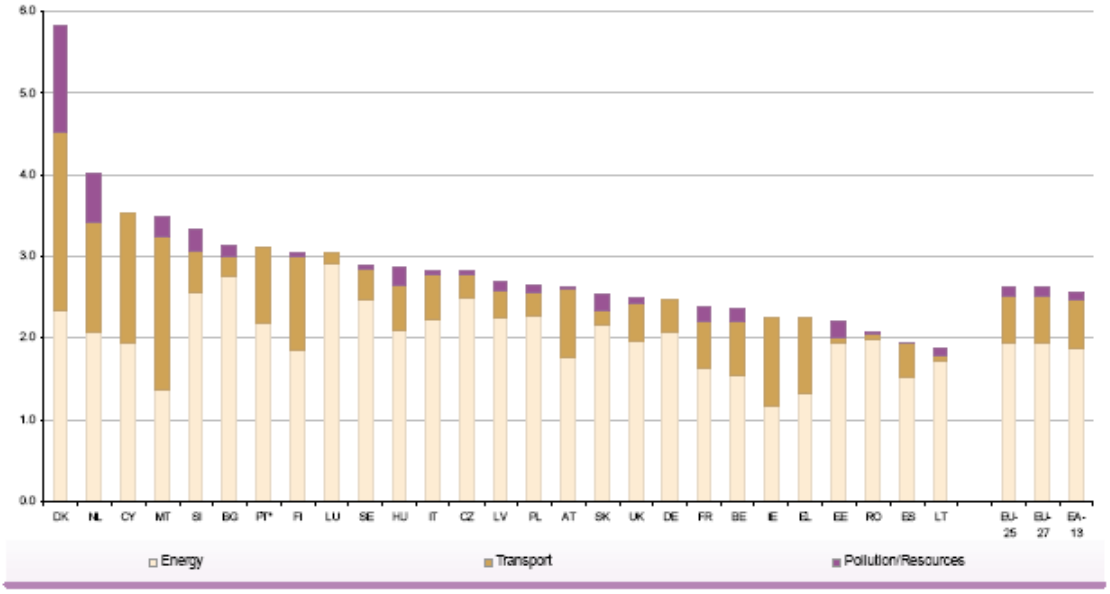
Potentially environmentally damaging transfers
There is a demand for a follow up of the amount of potentially damaging transfers. These economic instruments, that are designed for other motives, but as an indirect effect also changes the incitements for environmentally intensive activities. The criteria for potentially environmentally damaging SEEA transfers need to be set. We have proposed criteria for assessing this in an objective way, by using the environmental intensity as recorded in the SEEA. The method has been tested in a study of the environmentally related transfers from the Swedish state budget (SCB, 2008).

Results

Europe

One example of data from the EU data collection is Figure 1. It shows environmental taxes as a share of GDP for EU-27 member states and Norway. It is seen that the main contribution relate to energy and transport taxes. Only a few has one or more taxes on either pollution or resources.

Figure 1. Environmental tax revenues by Member State and type of tax 2005, in % of GDP



Note: *PT: 2004. EU-25, EU-27, EA-13: weighted average.

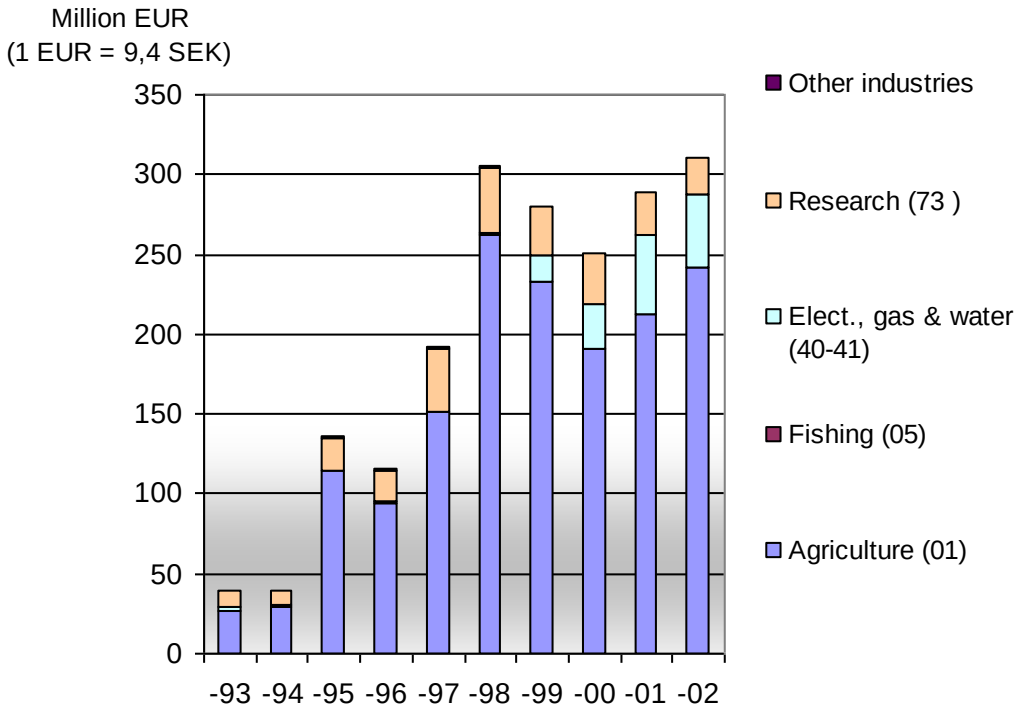
Source: Commission Services

Almost all the EU countries have energy taxation as the major component of the environmentally related taxes, and the pollution/resources part as the smallest, seen from the size of the tax. However, the effect of the tax is also dependent on how it affects the price of the commodities, and what possible alternatives there are. Therefore, also a modest pollution tax can have a major impact on what type of resources are used, if they change the relative prices. Over the world, the gasoline or coal may not be taxed, but instead subsidised, which leads to very different prices on fuels.

Comparisons of global fuel prices can be seen on the homepage for "International Fuel Prices", on behalf of the German Federal Ministry for Economic Cooperation and Development, www.gtz.de/fuelprices. There is is seen that over the world the gasoline price in US cents per litre, varied between 2 cents per litre to 190 cents per litre. As comparisons, the price for crude oil was38 cents per litre, the US retail price was 63 cents per litre and the retail price of gasoline in Luxemburg of 129 cents per litre.

In a comparative study for the Nordic countries, the CO2-tax and the CO2-emmissions by industry where compared (Balslev Pedersen et al, 2003). It could be seen that even if the countries differ in energy production methods and types of industries, the design of the CO2-tax where rather similar.

Figure 2. Environmentally motivated subsidies in Sweden, million Euros



The transfers for environmental purposes in Sweden have increased from 1993, when the measurements started. It is the agricultural sector that receives most of the transfers. A certain amount of transfers are also allocated to energy efficiency measures and to environmental research. As a proportion of the total transfers to the sectors, the environmental part is very small. When looking at the more detailed Table below, the different types of transfers are more apparent.

Total environmentally motivated direct transfers 2000-2008 in Sweden, SEK million

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	**6,604**	**7,572**	**8,050**	**6,931**	**6,445**	**9,113**	**8,529**	**7,408**	**7,815**
Resource-related subsidies:	**5,539**	**6,314**	**6,502**	**5,848**	**5,221**	**8,358**	**7,465**	**5,576**	**5,893**
Environmental supports in agriculture [2]	3,017	2,931	3,356	2,914	1,949	4,661	3,600	2,437	3,041
Environmental aid	1,282	1,500	1,448	1,415	1,616	1,715	1,955	1,947	2,035
Support for	336	332	344	403	509	868	902	331	423

liming and protecting nature									
Support to sanitation of polluted areas	19	108	414	163	448	432	603	93	77
Return of taxes on fertilizer and pesticides	-	-	61	235	251	266	64	168	-
Support for local investment programs for ecological sustainability	595	1,114	623	427	187	63	-	-	-
Environmental research	138	195	97	95	97	148	152	421	121
Support for international environmental cooperation	27	34	34	60	65	67	66	36	36
Subsidy for eco-building	-	5	15	47	28	24	15	6	0
Support for prevention of landslides etc.	30	25	29	27	25	25	25	40	29
Measures for improving the environment in the agricultural sector	13	22	26	24	14	37	37	24	20
Environmental support in the Baltic	21	6	21	-	-	-	-	-	-
Investment subsidy for an ecological restructuring	37	15	12	6	-	-	-	-	-
Subsidy for environmental marking	4	4	4	4	4	4	4	4	4
Subsidy for fish cultivation	2	3	4	9	4	8	7	18	18
Support for the environment in	-	-	-	-	-	-	-	-	31

the sea									
Other supports [3]	17	21	14	20	25	40	35	49	56
Energy-related subsidies:	**1,047**	**1,239**	**1,526**	**1,039**	**973**	**632**	**593**	**1,292**	**1,252**
Energy technology support	147	306	376	322	388	210	65	21	18
Energy research	304	263	292	248	163	166	292	330	385
Investment subsidy for renewable energy	173	222	167	54	146	-	-	-	-
Subsidy to reduce the use of energy	115	70	174	170	111	39	-	-	-
Small-scale electricity support	173	240	243	106	-	-	-	-	-
Energy efficiency measures	59	60	58	92	86	112	121	94	102
Support to windpower	-	-	-	-	67	93	103	79	104
Support related to nuclear safety	31	34	40	12	12	12	12	39	58
Measures for providing heat and power in southern Sweden	45	45	175	37	-	-	-	-	-
Support for energy investments in public facilities	-	-	-	-	-	-	-	562	394
Support for installation of energy efficient windows etc.	-	-	-	-	-	-	-	39	54
Support for	-	-	-	-	-	-	-	128	129

conversion from direct electricity heating									
Support for solar heat	-	-	-	-	-	-	-	0	8
Emission-reducing subsidies	**12**	**18**	**22**	**43**	**250**	**123**	**470**	**197**	**319**
Different supports in the climate area	12	18	21	37	171	30	10	13	42
Support for climate investments	-	-	1	6	79	93	460	185	277
Transport-related subsidies	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**343**	**352**
Transport related research	6	-	-	-	-	-	-	5	30
Trial implementation of a congestion tax	-	-	-	-	-	-	-	297	0
Eco car subsidy	-	-	-	-	-	-	-	41	322
Per cent of BNP in Sweden [4]	0.29 %	0.33 %	0.33 %	0.28 %	0.25 %	0.33 %	0.29 %	0.24 %	0.25 %

As can be seen the transfers change considerably over time. The types of transfers are therefore important to follow up and also to make note of how especially the larger ones are designed.

Conclusions

The economy is a major factor for describing what environmental pressures can be expected. The prices of fuels are of interest for environmental policy and the statistics that are produced for ordinary economic follow-up can also be used to inform environmental policy. The use of taxes and subsidies vary widely over the world.

This is an area where the statistical community can produce environmental economic statistics that can complement the traditional environmental statistics. In particular, by making a link to the economic factors that will largely affect the amount of environmental pressure. The statistical community has developed methods to measure environmental economic transfers.

As the countries in EU will now report environmental accounting data regularly, it will in time provide more information about the national initiatives for economic instruments. This will make it easier for researchers to study local varieties of economic instruments.

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