Testing SERIEE's Environmnetal Protection Expenditure Account in Sweden

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1 Introduction

The objective of this paper is to test a satellite-account for economic data on environmental protection in Sweden.

The satellite account presented in this paper follows the guidelines for Environmental Protection Expenditure Account (EPEA) given in the European System for the Collection of Economic Information on the Environment (SERIEE). The account is based on statistics referring to 1991.

The quality of the basic statistics, in terms of reliability, classifications as well as coverage, has implications for interpretation of the results. In the present paper there are at least four areas that deserves attention:

Firstly, basic data is missing for several sectors, likely to have large expenditure, for example private specialised producers and government agencies. It has not been possible to impute values for these missing data.

Secondly, expenditure data on adapted and connected products are not available. We have made an estimate of the expenditure on catalytic converters, but this is most likely only a small part of the total expenditure on adapted and connected products.

Thirdly, a considerable part of the data is not broken down into environmental domains. The EPEA also consists of sub accounts for the protection of, e.g. ambient air, water, waste management. Implications are that subaccounts have not been possible to compile The national expenditure is, however, broken down in environmental domains as far as it is possible.

Finally, information on consumption of fixed capital, compensation of employees and intermediate consumption is not recorded in the Swedish surveys. Of those mentioned, consumption of fixed capital is the only one possible to estimate.

To conclude, this paper gives a description of what have been possible to do, concerning implementation of the EPEA, given the time at hand. It seems important to emphasise that this paper is only a test. The results are, of course, a function the data input, and as the data are incomplete, the results are consequently somewhat unreliable.

The paper is organised as follows: In the second section the data needed to compile an EPEA is shortly described. The second section also contains a description of the estimation methods used for missing data. Section three gives a brief overview of the data sources. The

fourth section gives a summary of some results from the test. Section five summarises the test. The tables A - C are presented in an appendix.

All economic data are expressed in million Swedish crowns (MSEK) and in current prices.

2 Data requirements

2.1 An overview of the data situation in Sweden

The EPEA consists of five tables:
- Table A shows the national expenditure on Environmental protection distributed by users/beneficiaries and by components.
- In table B the national output on environmental protection service is distributed by sectors.
- Table B1 shows the use and supply of environmental protection
- The financing of the national expenditure is presented in table C
- Table C1 provides an overview of the environmental related financial burden.

In order to compile a complete EPEA, data are required in a variety of areas. By using the existing statistics and by only estimating some of the missing data it is not possible to compile a complete EPEA.

The purpose of this section is to discuss the areas not covered by the existing statistics and possible ways of estimating missing data. Table 1 gives an overview of the missing data in difference sectors.

Table 1: Overview of the missing data in difference sectors

Sector	Missing data	Possible estimation procedure
Industry	Data on CFC is not available	Data from national accounts can be used to estimate.
	The current expenditure recorded in our survey is not broken down into compensation of employees, intermediate consumption etc.	Not possible to estimate. Output (according to table B) has to be calculated in an other way.
Specialised producers	No data	Not estimated. However, a survey referring to 1995 gives a hint of the magnitude of underestimation.
Adapted and connected products	No data	Relatively good access of data on sold new cars and of the spare part price of catalytic converters, makes it possible to estimate the environmental expenditure related to catalytic converters.
Environmental (earmarked) taxes	Data on total revenues for earmarked taxes are available.	In order to calculate the environmental related financial burden it is necessary to distribute tax expenditure on sectors (i.e. households and corporations). This has not been possible to do.
Public sector	No data on government agencies environmental expenditure is available.	An ad-hoc study referring to the budget year 1993 indicates that environmental expenditures in agencies are of considerable size. It has not been possible to transfer the data to 1991.

In the following paragraphs the missing data and attempts to estimate (where it has been possible) are described in more detail. We have concentrated our efforts in estimation to only a few areas. The choice of areas was based upon accessibility of data to make estimations from.

2.2 General difficulties with the existing data

According to the SERIEE - system (Table B) output is calculated in the following way:
Intermediate consumption (IC)
+ compensation of employees (CE)
+ consumption of fixed capital (CFC)
+ other taxes (OT)
+/- net operating surplus (NOS)
- subsidies (SUBS)
=
Output

The Swedish surveys on environmental protection expenditure only records what we call ”operational expenditure”, which includes e.g. wages and salaries, cost of input materials, fees to municipal waste water treatment. The ”operational expenditure” equals (roughly) the sum of IC, CE and OT. Consumption of fixed capital is not recorded (nor has it been calculated) in the surveys of industry.

To calculate output, we add the operational expenditure to an estimated value of consumption of fixed capital and subtract subsidies.

Only earmarked subsides to industry from central government can be found in the government budget. It is, for example, not possible to detect investment grants to environmental protection, since they are not earmarked.

The fact that the ”operational expenditure” is not possible to break down in its component has also implications when trying to calculate if the output is market or nonmarket. We have to assume that waste and waste and water services are market output, and central government and general administrations in municipalities are nonmarket output.

2.3 Specialised producers

The NACE 90 class is probably the most important class of specialised producers. Waste and waste water management are the responsibility of the municipalities in Sweden. Municipalities can contact private firms to collect waste. The survey of environmental protection expenditure in municipalities covers production of waste and waste water service.

The lack of data on private specialised producers (for Sweden mainly corporations coded in the NACE-hedings 37001, 37002, 51570 and 90002), is likely to have a large impact on the results. It has not been

possible to use industry statistics to get a figure on the output of private specialised producers in 1991.

A study of the NACE position 37001, 37002 and 51570 indicates that the total turnover in 1995 was some 8 500 MSEK. This study used both the business register and other sources of information to estimate the turnover figure. Results are presented in detail in a paper available from Statistics Sweden. Not all the 8 500 MSEK are environmental output, since the SERIEE manual takes the view that income from selling secondary material is non environmental output.

It seems not unlikely that the recycling sector has increased in size since 1991, mainly due to the political efforts in the recycling area. Even if the sector was of a lesser size in 1991, the total lack of data leads to a considerable underestimation.

2.4 Earmarked environmental taxes and pollution taxes

In order to calculate the environmental related financial burden, the environmental-related tax burden first has to be calculated. Taxes to be included are, according to the SERIEE manual, for example taxes on emissions. *Table 2* gives an overview of the taxes on emissions that existed in Sweden in 1991. No earmarked taxes existed in 1991. The revenue in table 2 causes expenditure among housholds and enterprises.

Table 2: Government revenues by emission taxes in 1991

Tax	Revenues in 1991 (MSEK)
CO2 - tax	9 108
Sulphurtax (SO2)	289
Environmental tax on domestic flights	156
SUM	9 553

We have tested to use data on energy consumption to distribute the CO2-tax, but the classification in the tax legislation and in the energy statistics was not the same. A considerable adaptation of the basic statistic on energy consumption is needed to make a distribution of the CO2-tax possible. A consequence of this is that table C1 becomes not very meaningful to compile

2.5 Adapted and connected products

According to the SERIEE-manual (§ 2026) adapted products are defined as on the one hand being less pollutant than equivalent normal products and on the other hand being more costly than equivalent normal products.

No primary statistics on adapted or connected products are available. We found it feasible to make an estimation of the extra cost related to catalytic converters installed on sold new cars.

Using the official statistics on sold new cars, it is possible to distinguish between different brands (e.g. AUDI, BMW, VOLVO etc.) and if the car is sold to a household or to a company. Data on spare part price of catalytic converters is complied by the National Board for Consumer Polices, and is also available for different brands. Thus, is it possible to estimate the extra cost for every brand, and to distribute it on households and corporations. This relatively good data leads to estimates with relatively good quality.

The prices of catalytic converters vary from brand to brand. But on an average the price is 6 500 SEK (in 1991 prices).

Households have an extra expenditure related to catalytic car converters amounting to 496 MSEK. The extra expenditure for enterprises is 593 MSEK.

It is rather common that enterprise gives employees, often senior officials or salespersons, cars. The cars can be used both for ”business” and private purposes. Households' purchase of new cars was extremely low in 1991, because of the severe recession in the Swedish economy.

2.6 Consumption of fixed capital in industry

The estimation procedure for consumption of fixed capital uses data from the national accounts.

The capital stock of environmental protection equipment can be estimated in the following way:

- We calculate gross fixed capital formation(GFCF) as a percentage of capital stock (SC) for non-environmental protection equipment, using a time series of data. (A=GFCF/SC)

- Assume the same relationship between gross fixed capital formation and capital stock for environmental protection equipment as for non-environmental protection equipment. The capital stock of

environmental protection equipment (CS-EP) can be estimated using data on gross fixed capital formation in environmental protection equipment (GFCF-EP).
(CS-EP= GFCF-EP/A)

- The next step is to calculate the relationship between consumption of fixed capital (CFC) and the capital stock (CS) for non-environmental protection equipment, using a time series of data. (B=CFC/CS)

- Finally by assuming the same ”B” in environmental protection equipment as in ”ordinary” equipment, the consumption of fixed capital in environmental protection equipment (CFC-EP) can be estimated as
CFC-EP = CS-EP*B. We use the average capital stock and the average value of B.

The rate of depreciation varies between different line of business (NACE-headings, 2-digit level), consequently the calculations are made for every line of business that occur in the survey of environmental protection expenditure.

This estimation procedure rests on assumptions, which easily can be criticised.

3 A short description of the data (existing and estimated) by sector used for the EPEA

In 1991 Statistics Sweden performed surveys of environmental protection costs by the industry (ancillary activities of manufacturing firms) and by the municipalities (local government). An analysis of the state budget (central government) was also done by the Swedish Environmental Protection Agency. The data collection was not fully adapted to the SERIEE system. Definitions of environmental protection follow the definition given in the version of the SERIEE-manual that existed at that time.
(All numbers are million Swedish crowns, MSEK)

3.1 Central government

The analysis of the 1991 government budget estimates environmental protection expenditure to 2203. Only a small amount of earmarked subsides and no investment grants could be fund.

Transfers to industry were 151. Transfers to ROW were 250. No earmarked (i.e. environmental) transfers to municipalities could be singled out. Investments amounted to 413. Final consumption of the central government was 1389.

It has not been possible to estimate consumption of fixed capital (CFC) in the central government.

The expenditure figure above does not cover some important areas of the central government, i.e. government agencies. A study made by a group of researchers in 1994 estimates the environmental protection expenditure in government agencies to some 3 600 MSEK for the budget year 1993. In the light of this survey, the figure on environmental protection expenditure in central government (2 203) is most likely an underestimation of the true value.

3.2 Local Government (municipalities)

Environmental protection expenditure in municipalities was surveyed with 1991 as the reference year. The survey covered most of the fields of activity. Activities concerning noise abatement are not included. No follow-on survey of this area has been done.

The results in brief (all numbers MSEK):

<u>The general administration in local government</u>
Operating expenditure was 921. Investments amounted to 215.
CFC (consumption of fixed capital) has not been possible to estimate.
The output is considered to be nonmarket.

<u>Waste management</u>
The operating expenditure was 3809. CFC is estimated to 271.
The expenditure is fully covered by fees paid by households and enterprises. Output is assumed to be market and amounted to 4080.
Gross fixed capital formation was 166

Households paid 3480 (basic fees) + 870 (non-deductible VAT).
Which sums up to 4350. Enterprises paid fees of 600.

<u>Wastewater management</u>
Operating expenditure was 4278. CFC was calculated by the Federation of Wastewater Facilities (Vatten- och avloppsverksföreningen) , and amounted to 1989. Investment was 2395. The costs (operating expenditure and depreciation) for wastewater management are fully covered by fees. Output is considered to be market and amount to 4278.

It is not possible to distinguish between households and enterprises in the total revenue figure.

Estimations of the use of wastewater service by sectors, using the official statistics on wastewater management, are however possible to

do. The use of this service is expressed in so called ”person equivalent”, and it is possible to obtain person equivalent for both industry and households. The variable on person equivalent for industry is afflicted with problems (such as non response in the variable), and should only be regarded as a rough estimate. The person equivalent for industry is most likely underestimated, and therefore are the payments of the enterprise sector underestimated as well.

Households are estimated to pay 3771 in fees + 943 in non-deductible VAT related to this amount. Enterprises are estimated to pay 507 in fees.

3.3 Industry

The data source on ancillary activities of manufacturing companies is a survey referring to 1991

The survey indicated that operating expenditure was 2695. CFC was estimated to 1932. Revenues from sales of non environmental products were 260.

Investments (gross capital formation) amounted to 2307.

4 Results from the test of environmental protection expenditure account (EPEA).

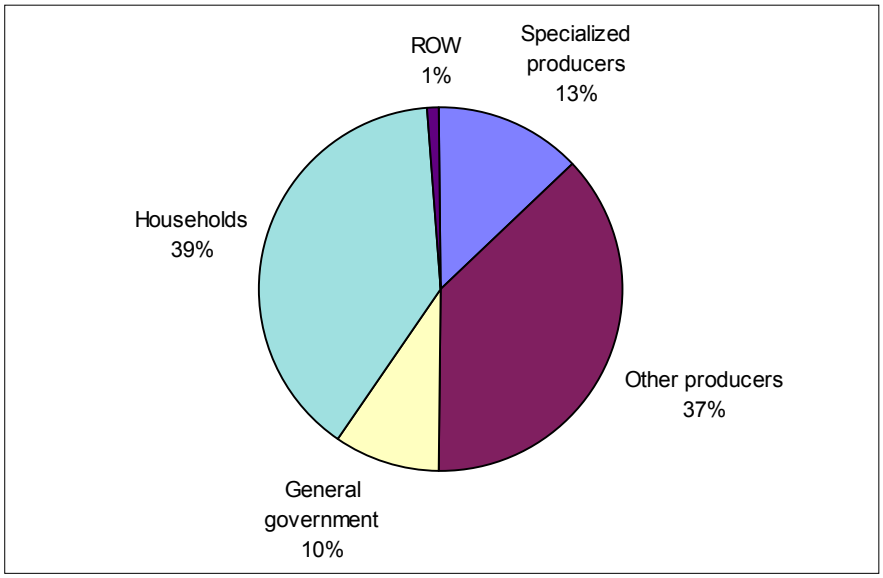
This section summarises some of the results from testing SERIEE’s environmental protection expenditure account. Table A, B, B1 and C, containing details, are presented in the appendix.

4.1 National expenditure on environmental protection

The national expenditure in environmental protection was 24203 MSEK in 1991 according to the calculations made in this paper.

The value of total expenditure must, however, be seen in the light of missing basic data for several sectors, likely to have large expenditure The total expenditure presented in *table A* is consequently an underestimation of the true value of national expenditure on environmental protection.

Graph 1: National expenditure on environmental protection by users / beneficiaries.



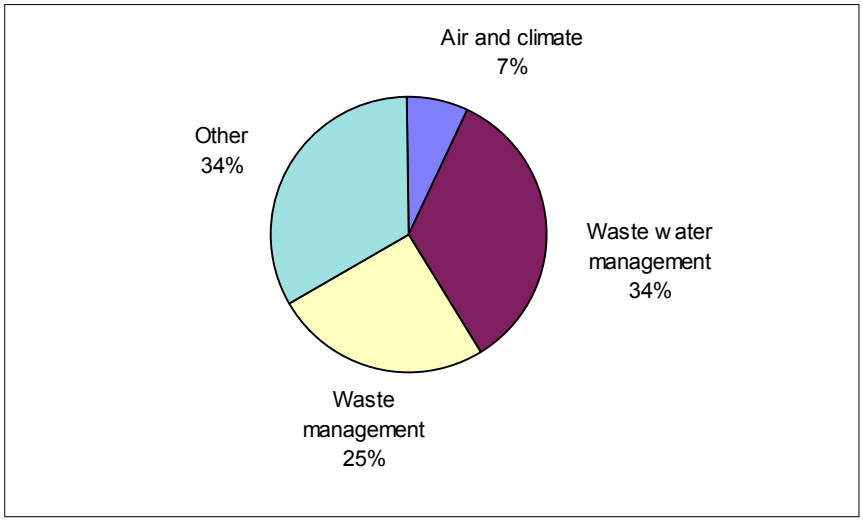
4.2 National expenditure on environmental protection broken down into environmental domain

Table 2 gives an overview of environmental protection expenditure by domain. The domain ”other” is large, a result of that much of the data is not accounted for by environmental domain. In the domain ”other most of the central governmnet expenditure cab be found and some of the adinistration in local governmnet. The largest expenditure can be found in the domain ”wastewater management”.

Table 2: National expenditure on EP distributed on environmental domain.

CEPA (1-digit level)	Domain	Total expenditure (MSEK)	Investments	Current costs
1	Air and climate	1 719	1 223	496
2	Wastewater management	8 253	3 055	5 198
3	Waste management	6 065	286	5 779
9	Other (not allocated)	8 166	1 525	6 641
	SUM	24 203	6 089	18 114

Graph 2: National expenditure on environmental protection allocated by domain.



5 Concluding remarks

The main conclusions from the test of EPEA on Swedish existing data are:

- The system provides a good tool to identify sectors with environmental protection expenditure.

- The system gives a good overall view of how the total expenditure is distributed on different sectors in the society.

- The lack of basic data has most likly lead to a considerable underestimation of the national expenditure.

- When it comes to adapted and connected products it has only been possible to estimate the extra cost for catalytic converters.

- Estimations of missing data have been successful in some areas (i.e. catalytic converters), but failed in some (e.g. the CO2-tax expenditure). Some of the estimates rest on heavy assumptions.

- To facilitate an implementation of the EPEA, the demands on basic data are very high: On the one hand, basic data from different sectors are required, on the other hand data has to be broken down in a number of ways.

Table A: National expenditure by components and by user/beneficaries

Components of national expenditure for environmental protection	Users / beneficiaries										
	Producers						General government as collective consumer		Households as actual consumers	Rest of the world	Total
	Specialized producers				Other producers (by industy)						
	CG	LG	NPISH	Other	non-specialized	non-chararteristic	CG	LG			
1. Consumption of specific products											
1.1 Final cons. of char. service							1 389	921	9 063		11 373
1.1.1 Market									9 063		9 063
1.1.2 Non market							1 389	921			2 310
1.2 Interm. cons. of char service					4 736	1 107					5 843
1.2.1 Market						1 107					1 107
1.2.2 Ancillary					4 736						4 736
1.3 Final consumption of									496		496
1.3.1 Connected products											
1.3.2 Adapted products									496		496
1.4 Intermediate consumption of											
1.4.1 connected products											
1.4.2 adapted products											
2. GCF for char. activities	413	2 776			2 307						5 496
3. GCF in specific products						593					593
3.1 In connected products											
3.2 In adapted products						593					593

3.3 In charateristic service											
4. Specific transfers											
4.1 Subsidies on production											
4.1.1 Charateristic Service											
4.1.2 Connected products											
4.1.3 Adapted products											
4.2 Other specific transfers											
4.2.1 Current						382				250	632
4.2.2 Capital											
5. Total uses of resident units											
5.1 Current					4 736	1 489	1 389	921	9 559	250	18 345
5.2 Capita	413	2 776			2 307	593					6 089
6. Financed by the rest of the world											
6.1 Current uses											
6.2 Capital uses											
7. National expenditure for environmnetal protection											
NEXP	413	2 776			7 043	2 082	1 389	921	9 559	250	24 434
7.1 Current					4 736	1 489	1 389	921	9 559	250	18 345
7.2 Capita	413	2 776			2 307	593					6 089

Table B: Production of charateristic service

Transactions	Characteristic producers						
	Specialized producers				Non specilized producers (by industy)		Total
	CG	LG	NPISH	Other	Secondary output	Ancilary output	
A. Current transactions							
1. Current uses							
1.1 Intermediate consumption							
1.1.1 charateristic service							
1.1.2 adapted and connected products							
1.2 Compensation of employees							
1.3 Consumption of fixed capital		2 260				1 932	4 192
1.4 Other taxes on production							
1.5 Less other subsidies on production						151	151
1.6 Net operating surplus							
2. Output	1 389	9 589				4 736	15 714
2.1 of W Non-environmental output		310				260	570
2.1.1. Related products							
2.1.2 Other non-environmental output		310				260	570

2.2 of W Environmnetal protection output	1 389	9 279				4 476	15 144
2.2.1 of w non- maket	1 389	921					2 310
principal	1 389	921					2 310
secondary							
2.2.2 of w market		8 358					8 358
principal		8 358					8 358
secondary							
2.2.3 of w Ancillary						4 476	4 476
2.3 Current environmental protection resorces							
2.3.1 Market output							
2.3.2 Current transfers							
B. Capital transactions							
	413	2 776				2 307	5 496
3. Gross fixed capital formation							
4. Other capital uses							
5. Investments grants recived							
6. Other capital transfers recived							
C. Financing by producers							
Labour inputs							

Table B1: Supply and use of charateristic service

Supply and use of char services	Non- market	Market	Ancillary	TOTAL
1. Use of resident units (pruchasers price)				
1.1 Intermediate consumption		1 107	4 476	5 583
1.1.1 of which specialized producers				0
1.1.2 of which other producers		1 107	4 476	5 583
1.2 Final consumption	2 310	9 063		11 373
1.3 Gross capital formation				
2. Exports				
Total use (1+2) = total supply(3+4+5+6)	2 310	10 171	4 476	15 144
3. Output	2 310	8 358	4 476	15 144
4. Imports				
5. Nondeductible VAT		1 813		1 813
6. Other taxes less subs on prod				

Table C: Financing of national expenditure for environmnetal protection

Financing units	Users / beneficiaries											
	Producers						General government as collective consumer		Households as actual consumers	Rest of the world	Total	Of which current expenditure
	Specialized producers				Other producers (by industy)							
	CG	LG	NPISH	Other	non-specialized	non-chararteristic	CG	LG				
1. General governmnet												
1.1 Central governmnet	413					151	1 389			250	2 203	1 790
1.2 Local governmnet		2 776						921			3 697	2 776
2. NPISH											0	
3. Corporations												
3.1 Specilazed producers											0	
3.2 Other producers					7 043	1 700					8 743	1 700
4. Households									9 559		9 559	9 559
											24 203	15 826
NATIONAL EXP (fr ta A)	413	2 776	0	0	7 043	1 851	1 389	921	9 559	250	24 203	18 114
5 Rest of the world												
5.1 Of which EU institutions												
Uses of residents units	413	2 776	0	0	7 043	1 851	1 389	921	9 559	250	24 203	18 114