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EPE estimation method for NACE (45-96)

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26-03-2013 (Version A)

Project and report commissioned by the European Union
Project of Directorate E, Eurostat, European Commission, Grant Agreement Number 50904.2011.005-2011.299
Final report – 05-02-2013

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EPE estimation method for NACE (45-96) - A.doc
EPE estimation method for NACE (45-96).xls
Syntax – EPE estimation method for NACE (45-96).SPS
Bestanden: \\Besv1f \kenfmilieu1\Milieubeheer\Mil\Onderzoek - 2012

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Report Version A

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1 Introduction

Statistics about environmental protection expenditures (EPE) in the Netherlands started with the EPE of manufacturing in the 1980s. By legislation enterprises were forced to reduce emissions and improve their production processes and the quality of the (local) environment. Measures taken by manufacturing and the transport section brought specific environmental problems - like for example ozone depletion caused by CFCs and acid rain - under control. Over the years other EPE statistics were added. The statistic “Costs and finance of environmental management” is published every two years including expenditures of the agricultural and transport section and different government bodies. Since 1993 also the section ‘environmental specialised producers’ is added to this statistics.

With the EPE continuation program 2010-2012 financed by Eurostat other than the above mentioned sectors and industries for the Netherlands are examined. In 2010 this resulted in two reports about the building industry (part of NACE F) and the administrative burden for enterprises. In 2011 the two subjects were environmental protection expenditures in foreign countries by the Netherlands and EPE related to the home improvement by households. In 2012 - the final year of the continuation program - other sections of the economy according to the NACE - called *‘Standaard Bedrijfsindeling’* (SBI) in the Netherlands - are examined. The sections that are examined are part of the sections G-S of the NACE including storage and transportation.

In this report a general approach is given for the development of EPE data for the year 2009. By using existing data from Statistics Netherlands and AgentschapNL an estimation method is given to determine EPE for the sections (45-96) in the year 2009. This approach makes it possible to determine whether it is possible to make time series based on existing statistics. The EPE observed in the statistic ‘environmental costs of enterprises’ NACE (06-36), together with general financial and business information about enterprises, emissions and for example waste, are starting point for the approach in this research. An environmental business profile per division of the NACE is made with existing data which is used as indicator for environmental expenditures in specific sections and divisions of the NACE.

Then using a linear regression model, the EPE are determined per division (2-digit). The use of an estimation method for determining EPE is motivated by the fact that Statistics Netherlands is restricted in sending new enquiries in order to limit the administrative burden for enterprises. Without enquiry based primary observation it is not possible to differentiate EPE in specific - section related – environmental compartments. EPE data based on existing statistics means less detail and dependence on the quality and quantity of existing data. On the other hand this approach has the advantage that time series for EPE per section can be developed more easily when this data is based on available statistics.

2 Method

In this chapter the basis for determining environmental protection expenditure (EPE) data according to the NACE is given. Statistics Netherlands is depending on other methods than primary observation of enterprises with questionnaires to determine EPE for the sections (G-S). In this report the possibility to use existing data sets is examined for generating EPE data. The data sets used for this approach are given in section 2.1. The data sets together with the existing EPE statistic for enterprises (table 2.1.2 - CBS6) explained in section 2.2 forms the basis for further research. The business and environmental business profile is given in section 2.3 with relevant variables that determines the environmental profile per section and division (2-digit) of the NACE. EPE for the divisions (45-96) are estimated with (multiple) linear regression methods applied on a 2-digit level of the NACE.

2.1 Financial, business services and environmental statistics

Statistics about enterprises and financial and business services are used to determine a business profile for as many divisions of the economy as possible (2-digit). Table 2.1.1 shows the enterprises and financial and business services statistics.

Table 2.1.1: Enterprises and financial and business services statistics, business classifications: NACE, SIC, SBI

	Source	Description of data	Business classification			Publication		
			clas.	div.	digits	since	last	freq.
1	CBS1	Enterprises; by economic activity, size and legal form	NACE08	A-S	01-96	2006	2010	annually
2	CBS2	Finance of enterprises, non-financial and by activity	NACE08	A-U	01-99	2000	2010	annually
3	CBS3	Services; employement and finance per division	SIC08	B-N	01-96	2009	2010	annually
4	CBS4	Manufacturing Industry; employement and finance per division	SBI08		06-96	2009	2010	annually
5	CBS5	Investments in tangible fixed assets by companies	SBI08	B-N/ S	06-96	2009	2010	annually

Source: Statistics Netherlands

The above mentioned statistics gives general information about the financial situation of enterprises per division of the NACE on annual basis. Also other business classifications comparable with NACE are used like SIC and the Dutch SBI. All the statistics provides information for the sections (G-S) and on a 2 digit level (45-96). The statistic 'Finance of enterprises' is the only financial statistic providing time series going back to the year 2000. General information of enterprises in a section like turnover, investments, depreciation and number of employees can be confronted with variables from environment related statistics given in table 2.1.2.

Table 2.1.2: Environment related statistics, business classifications: SBI, Regkol, SIC

	Source	Description of data set	Business classification			Publication		
			clas.	div.	digits	since	last	freq.
6	CBS6	EPE: Environment costs of enterprises	SBI	B-E	06-36	2008	2009	annually
7	CBS7	SEEA: Environmental taxes and levies	SBI	A-U	10-53	1987	2010	annually
8	CBS8	SEEA: Sewerage and water pollution tax	Regkol	N/A	01-96	1987	2009	N/A
9	CBS9	Industrial waste; waste category, treatment, sectors	SBI	B-D	10-33	1994	2009	annually
10	CBS10	Non-dangerous waste Trade, Services and Government	N/A	N/A	45-96	N/A	2009	N/A
11	AgNL11	Dangerous waste	N/A	N/A	10-97	N/A	2009	N/A
12	AgNL12	Final treated waste (FTW)	N/A	N/A	10-33 / 45-96	N/A	2009	N/A
13	CBS13	SEEA: Water usage	SBI	A-U	10-36	2003	2009	annually
14	CBS14	SEEA: Energy usage	SBI	A-S	10-33 / 49-53	1990	2010	annually
15	CBS15	Natural gas and electricity delivery	SIC	F-U	x	2010	2010	N/A
16	CBS16	SEEA: Emissions	SBI	A-U	10-33 / 49-53	1990	2010	annually

Source: Statistics Netherlands, AgentschapNL (AgNL)

Statistics related to the environment can be separated in financial statistics like the environmental protection expenditures of enterprises (CBS6), environmental taxes and levies and statistics about physical quantities like water and energy usage and emissions and waste. Statistics about waste are made in association with AgentschapNL (AgNL). Statistics Netherlands is publishing the quantities of waste based on data of municipalities and enterprises. AgNL is responsible for the settlement of hazardous waste which includes information about transportation.

2.2 EPE: Environmental expenditures of enterprises NACE (06-36)

The statistic Environmental protection expenditures of enterprises NACE (06-36) is a financial statistic about expenditures resulting from environmental measures in the Netherlands. This statistic is mandatory according to Eurostat regulation. The environmental expenditures of the sections Mining and Quarrying (B), Manufacturing (C, excluded 3299.1), Electricity, Gas, Steam and Air Conditioning Supply (D) and Water supply (part of E: 36) are annually determined and based on questionnaires of Statistics Netherlands. Table 2.2 shows the main items in the statistic and total expenditures and burden.

Table 2.2: Environmental protection expenditures of enterprises (NACE 6-36) with 10 or more employees (2009)

	Main items	Subjects	mln euros
1	Environmental investments		493
2	Costs: own activities		1413
3	Transfers: paid	taxes and levies	126
4		removal of waste	330
5		outsourced activities	78
6	Received tranfers	Subsidies	450
7	Net environmental costs (2+3+4+5 -6)	Burden	1496

Source: Statistics Netherlands

The main items in the EPE statistic are: investments, costs for own activities, transfers and the net burden for enterprises. The environmental (part of) investments are reported separately from the costs for own activities. The environmental expenditures for own activities include capital costs: depreciation and interest on investments. Because of this only the costs are added (2+3+4+5). Minus the received transfers: subsidies (6) the net environmental costs (7) the burden for enterprises are determined. For the year 2009 the environmental expenditures for enterprises, part of the sections B-E of the NACE, are almost 2 bln euros. Minus the subsidies the burden is almost 1,5 bln euros.

2.3 Business and environmental business profile

The tables as mentioned in section 2.1 - are collected in the 'Summary Table Used Statistics', see annex 1 for 2-digit level. From this summary table variables are selected to determine a business and environmental business profile, see table 2.3.1 and 2.3.2. The variables that are shown are chosen for three reasons: 1/ their relevance in relation to EPE-statistics: Statline table CBS6 Environmental expenditures of enterprises NACE (06-36), 2/ the expected influence on the environmental expenditures of enterprises and 3/ the usability for preparation of data and further analysis.

General financial and business services variables per section and/ or division are given in the tables CBS1-5. Variables from these tables are used for the business profile given in table 2.3.1.

Table 2.3.1: Business profile per section according to NACE08 (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Number of enterprises	x1000	164	26	39	32	18	20	141	36	1	21	47	12	43
2	Number of enterprise groups	x1000	67	10	8	18			80	15	0	3	10	5	3
3	Net turnover	bln euro	392	50	11	46			51	40	0	2	7	6	4
4	Costs of turnover	bln euro	338	31	6	25			26	22	0	1	2	3	2
5	Other costs	bln euro	53	22	5	11			14	9	1	1	3	4	3
6	Interest charges	mln euro	4561	1400	324	2714			860	630	1	34	102	193	82
7	Inv. in tangible fixed assets	mln euro	4992	4938	795	2311		8910	1422	4066					279
8	Existing tangible fixed assets	mln euro	604	485	84	34		1118	150	229					19
9	Sold tangible fixed assets	mln euro	567	478	69	154		1912	822	1750					4

Source: Statistics Netherlands

The business profile contains variables usable for further analysis and the estimation of EPE for the divisions according to NACE (45-96). Business characteristics are not available for all sections and divisions of the economy. Only the number of enterprises (BEID's) is given for all divisions. Figures about section K: Financial institutions, L: Rental and real estate and (semi-) governmental sections (O-R) are not or only partial available.

Table 2.3.2 shows the environmental business profile with relevant - environment related - variables per section. Statistics CBS7-16 and AgNL11 and AgNL12 are describing the environmental profile of enterprises in a physical and economical way according to the sections of the NACE.

Table 2.3.2: Environmental business profile per section according to NACE08 (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Environmental tax and levies	mln euro	933	1418	198	144	189	65	291	1738	393	136	277	132	92
2	Sewerage levies	mln euro	38	12	7	8	9	2	18	9	16	14	32	4	5
3	Water pollution levies	mln euro	26	9	7	8	7	9	9	5	7	10	35	9	9
4	Total waste	1000 ton	1804	848	302	309	294	145	754	1256	389	593	1143	143	236
5	Final treated waste (FTW)	1000 ton	405	323	82	90	89	39	208	203	393	185	387	34	78
6	FTW: non-dangerous	1000 ton	359	115	79	90	87	38	203	181	374	185	376	33	77
7	FTW: dangerous	1000 ton	46	208	4	0	2	1	4	22	19	0	11	1	1
8	Drinking water usage	mln m3	23	7	4	5	5	1	11	11	10	8	19	2	3
9	Energy usage	PJ	97	408	40	23	21	6	33	46	60	28	54	26	17
10	Gas and electricity delivery *	PJ	69	27	28	13	15	17	14	7	32	22	35	15	12
11	Greenhouse gas equivalents	bln eqv	3,8	28,3	1,7	0,8	0,9	0,3	1,5	2,6	2,6	1,2	2,2	1,0	0,8

Source: Statistics Netherlands

Notice: Not all data is available for the year of analysis 2009 (* = 2010) and not all data is available as time series.

By combining variables from the business profile with variables from the environmental business profile ratios and values can be determined. In table 2.3.3 ratios and values are given derived from the variables in table 2.3.1 and 2.3.2. These figures gives an impression of the environmental profile of enterprises per section and division. Annex 2 shows the same ratios and values on a 2-digit level NACE (01-96).

Table 2.3.3: Financial and environmental profile; ratios and values per section according to NACE08 (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Costs turnover / turnover	%	86,1	62,3	53,8	54,3			51,0	53,9	60,1	48,6	33,3	61,2	52,0
2	Other costs / turnover	%	13,6	44,5	45,5	24,8			26,8	23,4	1651,2	42,8	41,9	64,4	68,9
3	Env. tax / other costs	%	1,7	6,3	3,9	1,3			2,1	18,4	54,8	13,4	9,0	3,7	3,5
4	FTW / Total waste	%	22,4	38,1	27,2	29,1	30,4	26,7	27,5	16,2	101,2	31,2	33,9	23,6	33,1
5	FTW dang. / FTW non-dang.	%	12,7	180,1	4,5	0,1	2,2	1,9	2,1	12,4	5,1	0,2	2,8	2,0	0,7
6	Gas and elec. * / energy us.	%	70,8	6,7	70,2	58,0	70,5	279,0	42,3	14,6	53,1	77,0	65,4	59,2	67,8
7	Env. tax / number of ent.	1000 €/ ent.	6	54	5	5	11	3	2	48	507	7	6	11	2
8	FTW/ number of enterprises	ton/ ent.	2	12	2	3	5	2	1	6	508	9	8	3	2
9	Water usage / number of ent.	m3/ ent.	137	279	106	157	291	71	77	310	12645	401	406	209	70
10	Energy usage / number of ent.	GJ/ ent.	591	15608	1038	724	1175	305	234	1261	77419	1352	1159	2260	396
11	Gas and elec. * / numb. of ent.	GJ/ ent.	418	1043	728	420	829	852	99	184	41139	1041	757	1337	269
12	GHG-eqv. / number of ent.	eq./ ent.	23	1082	44	24	50	13	10	73	3330	58	46	85	18

Source: Statistics Netherlands

Notice: Not all data is available for the year of analysis 2009 (* = 2010) and not all data is available as time series.

Some sections like H and O have significantly different ratios and values compared to others. Section H ‘Transport and storage’ has an extreme ratio for dangerous waste and an extreme value for energy usage and GHG-equivalents. Section O ‘Public administration and services’ has extreme values for waste, water and energy usage that is explained by the responsibility of civil authorities for these subjects.

2.4 Conclusion

The statistics and data sets from Statistics Netherlands and AgentschapNL according to the NACE classification provides a lot of information but not all sections of the economy are covered. There is a lack of financial information about the sections K, L and O, P, Q, R. Also the availability of data per section (2-digit) is limited see the ‘Summary Table Used Statistics’, annex 1. Other limitations are the availability of data as time series and the availability of data for the year of analysis 2009. The statistic ‘gas and electricity supply’ CBS15 for example is developed recently and is only published for the year 2010 and only for the sections F-U. This means data sets needs preparation for further examination.

Table 2.3.3 shows - with the average emissions per enterprise - the environmental profile per section. Different ratios and values points out that certain environmental problems are allocated to specific sections of the economy. Table and annex 2 also points out that different ratios and values can be the result of the used NACE-classification. The profile is an indicator for the environmental responsibilities within the economic chain for example related to the private sector and (semi-) public sector. Section E and section O are examples of the (semi-) public sector with particular responsibilities for the environment. The ratios and values points out that section O cannot be compared with other sectors of the economy. For the allocation of EPE it is important to determine where environmental measures are effectively taken in order to prevent double counting.

3 Preparation of data

The collected data needs preparation for analysis on a two digit level. Because almost all of the tables that are used are not completely filled with data, several methods are used to complete the data set with usable variables on a two digit level (10-96). To prepare input data for further analysis three techniques are used: linear regression, weighing and summation.

3.1 Regression

Regression is used in three cases. First a quick estimation is made of the total environmental protection expenditures (EPE) for the sections G-S, sections (45-96). Secondly input data is prepared for further analysis. And thirdly linear and multiple linear regression methods are used in chapter 4. In chapter 4 regression techniques are used per EPE-variable to estimate the main items of EPE statistics according to CBS6. In this section only a quick estimation of "EPE – own activities" and preparation of input data - the variable "other costs" - is given.

Quick estimation total EPE

With linear regression an estimation of the total environmental protection expenditures (EPE) is made. Based on the independent financial variable "net turnover" <V44> statistic CBS2 and the dependent variable "EPE - own activities" the environmental costs of enterprises are estimated. Table 3.1 shows the estimated EPE of enterprises.

Table 3.1.1: Estimation of EPE of enterprises per section according to NACE08 (2009)

Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
EPE-own activities <V130> * <V44>	mln euro	1743	238	57	227			250	202	4	14	44	40	28

Source: Statistics Netherlands

The estimated EPE for the sections G-S is 2,8 bln euro in 2009, see annex 3.1 for the EPE per section (2-digit). The sections K, L and O are excluded because the used statistics does not contain financial figures for the sections K and L. The EPE of section O "Public administration and services" is part of statistics already.

Preparation of input data

The financial variable other costs <V69> statistic CBS3 is prepared for further analysis because the assumption is that it can be used as input data to derive the variable "EPE - own activities" and the variable "transfers paid for outsourced activities". With the variable "other costs" it is possible to derive the "EPE – own activities" more exact than with the variable "net turnover". The prepared variable "other costs" is also used in the examination of the "transfers paid – for outsourced activities". The variable contains expenditures not directly related to the business process. Also environmental expenditures for levies, waste disposal and energy usage which is not directly related to the production process are part of the other business costs. The variable "other costs" is available for the sections 10-63 and 69. For the estimation of "other costs" for the sections 70-96 linear regression is used based on the independent variable "turnover". The results per section are given in table 3.1.2.

Table 3.1.2: Estimation of other costs <V69> per section according to NACE08 (2009)

Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
Other costs	bln euro	52,4	10,0	3,1	10,2			11,4	9,4	0,7	1,0	3,1	3,6	2,6

Source: Statistics Netherlands

3.2 Weighing

The table: "Enterprises; size class and legal form, 2006-2010" is used for weighing. It is the only table with data that includes all sections according to the NACE on a two digit level. By multiplication of the number of enterprises per size class CBS1 with the average number of employees per size class an estimation of the number of employees per section is given, see table 3.2.1 and per division annex 3.2.1.

Table 3.2.1: Number of enterprises and employees per section on the first of January 2009

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Total number of enterprises	x1000	164,2	26,1	38,5	31,8	17,9	19,7	141,0	36,5	0,8	20,7	46,6	11,5	42,9
2	Employees[1]	x1000	1114,9	312,0	233,3	234,0	153,1	94,6	542,1	497,9	276,8	470,8	886,2	95,0	149,2
3	Employees per enterprise	number	6,8	11,9	6,1	7,4	8,6	4,8	3,8	13,7	357,2	22,7	19,0	8,3	3,5

Source: Statistics Netherlands

[1] Estimation of number of employees based on number of enterprises per size class

The largest section in terms of number of enterprises and employees is G: Wholesale and retail trade. Section O: "Public administration and services" has the most employees per enterprise followed by other (semi-) public services in section P and Q. The variables stemming from statistics CBS: 7, 12, 13, 14, 15 are weighed because they are only partial and/ or per section available. The variables weighing is useful for are given in table 3.2.2.

Table 3.2.2: Weighted variables (2009)

	Source	Var	Subject	Unit
1	CBS7	256	Env. taxes and levies	mln euro
2	CBS12	260	Drinking water	mln m3
3	CBS13	261	Energy usage	PJ
4	CBS13	262	Gas usage	PJ
5	CBS13	263	Elektricity usage	PJ
6	CBS14	265	Gas delivery *	PJ
7	CBS14	266	Elektricity delivery *	PJ
8	CBS15	268	GHG equivalents	x mln
9	CBS15	269	Acid-equivalents	x mln
10	CBS15	271	Particulate matter eq.	x mln

Source: Statistics Netherlands

Notice: Not all data is available for the year of analysis 2009 (* = 2010) and not all data is available as time series.

The environment related variables are from statistics that present figures per section and not (or limited) on divisional level 2-digit. The weighted factors are based on the average number of employees and enterprises per size class, the figures per section are allocated per division (2-digit), see annex 3.2.2.

3.3 Summation

Summation is used to put variables together. In case of summation new variables are composed what results in more usable and comparable quantities. Also complementary variables that describes different sections of the economy are put together to get an variable for all divisions (10-96) of the NACE. Table 3.3 shows the variables that are composed by summation and composing different variables.

Table 3.3: Summation variables (2009, 2010)

	Source	Var	Subject	Unit
1	CBS2	V253	Composition other costs	mln euro
2	CBS3	V255	Sum reduced turnover	mln euro
3	CBS8	V257	Sum sewer and water pollution levies	mln euro
4	CBS9/10 + AgNL11	V258	Sum total waste	1000 ton
5	CBS14	V264	Sum gas and elektricity usage	PJ
6	CBS15	V267	Sum gas and elektricity delivery	PJ
7	CBS14/15	V272	Composition gas and elektricity usage and delivery	PJ
8	CBS5	V273	Sum investments minus outlier (section 68)	mln euro

Source: Statistics Netherlands

The sum-variables most of the times represent a (sub-) total of other variables. Also underlying operations are carried out to make summations possible like the conversion of different types of energy quantities into PJ. The variable “other costs” and the derived variable “other costs” are composed in a new variable <253> describing all sections (10-96). Variables like “gas and electricity usage” versus “gas and electricity delivery” are more comparable when they are summed up. The same with the summation of sewer and water pollution levies. The composition of figures about different segments of the economy for “gas and electricity usage” (10-39) and “gas and electricity delivery” (41-96) needs to be interpreted carefully because figures for the year 2009 and 2010 are used together. The (new) variable investments in tangible fixed assets is used to derive environmental investments. The variable is first analysed because of extreme values that can be related to specific activities per section. The investments in section 68 of the NACE shows an extreme outlier because of the core business ‘real estate activities’. Because the environmental aspect of real estate activities is examined with the reports ‘environmental expenditures in the building industry’ (2010) and ‘environmental expenditures of households, home improvement’ (2011) the expenditures related to the development of real estate are excluded.

3.4 Conclusion

Preparation of data means that the “Summary Table Used Statistics” is extended with prepared variables. With techniques that are used for preparation: linear regression, weighing and summation, 22 variables are added to the table, variables <252–273>. Variables <252-257>, <273> are financial data. The variables <258-272> are representing physical quantities per division that relates to the environmental profile of enterprises per section. In case of investments earlier research like EPE in the building industry and home improvement measures of households has been taken into account. This means that investments in real estate are left out for section L: Real Estate Activities.

The reason for using these techniques is that as many sections as possible are covered with relevant data (2-digit) which can be used for further analysis. Section O: Public administration etc. is not comparable with enterprises in the private section, see also chapter 3, is given by table 3.2.1 with an outlier for the average number of employees per enterprise. Section O will be left out in further research also to prevent double counting of environmental expenditures. In the following chapters the main items of the EPE statistic CBS6 are examined with regression methods using relevant financial and physical to the environment related variables.

4 Estimation of EPE

In this chapter the goal is to develop environmental protection expenditure (EPE) data for all remaining sections of the economy according to the NACE (45-96) based on the EPE statistic for enterprises NACE (06-36). The year of analysis is 2009. Collected data sets and prepared data with extra variables are used to examine the main items of the EPE statistic CBS6: environmental costs, transfers, investments and subsidies. In this chapter the main items of the EPE statistic are examined per item. Linear and multiple linear regression methods are applied to estimate EP expenditures for sections of the NACE (45-96), see next sections. Annex 2, 3 and 4 shows the outcome of analysis on a two digit level of the NACE (06-96). Annex 5 shows the statistical outcomes of SPSS-analysis.

The core of EPE statistics of enterprises are the environmental costs related to 'own activities' (the business process) built up from capital expenditures (depreciation and interest), current costs and other costs. Other environmental costs are paid transfers for taxes and levies, waste removal and services by third parties. The main items related to the environmental costs of enterprises are shown in table 4.

Table 4: EPE statistic of enterprises with 10 or more employees (NACE 06-36) in 2009

	Main items	Subject	mln euros	%
1	Costs: own activities		1413	73%
2	Tranfers: paid	taxes and levies	126	6%
3		removal of waste	330	17%
4		outsourced activities	78	4%
5	Total costs		1947	100%

Source: Statistics Netherlands

The EPE statistic includes capital costs in terms of depreciation and interest (costs: own activities) and are determined over a longer period of time related to investments. Investments itself are based on yearly expenditures and primary observation by annual reporting of enterprises. The items investments and subsidies are not mentioned in table 4 because they are not directly related to the environmental costs enterprises make. Determining if investments are environmental investments is arbitrary and based on definitions about the sort of investments and payback time. The variable environmental investments <V129> is therefore not used for the estimation of capital costs. Data about subsidies - variable <V149> - are provided by registers of AgentschapNL.

4.1 Environmental costs: own activities

In 2009 almost three-quarter of the total environmental costs (73%) of enterprises in the industry NACE (06-36) are costs related to the business process called 'own activities'. The costs related to the business process are built up from the underlying variables (subtotal variables) as given in table 4.1.1 see also CBS6.

Table 4.1.1: Environmental costs: own activities NACE (06-36) in 2009

	Main items	Subject	mln euros	%	%
1	Capital costs:	Depreciation	553	39%	28%
2		Interest	209	15%	11%
3	Current costs		431	30%	22%
4	Other costs		221	16%	11%
5	Subtotal: Costs: own activities		1414	100%	73%
6	Total costs		1947	x	100%

Source: Statistics Netherlands

The 'capital costs: own activities' (depreciation and interest) is with 54% of the subtotal environmental costs and 39% of all environmental expenditures the biggest item for enterprises NACE (06-36). The financial statistics CBS2 provides variables like: tangible fixed assets <V28>, depreciation <V46> and interest <V50> which are used as independent variables in linear and multiple regressions to estimate the environmental part of the capital costs: depreciation <V132> and interest <V133> for sections of the NACE (45-96). Analysis points out that the best estimation of environment related capital costs: depreciation <V132> and interest <V133> is made with the independent variables: tangible fixed assets <V28> and depreciation <V46>. Table 4.1.2 shows the estimation of the 'total capital costs' and 'depreciation' with multiple linear regression and the 'interest' with linear regression per section.

Table 4.1.2: Estimation environment related capital costs (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Depreciation <V132> * <V28> <V46>	mln euro	313	193	38	178			59	88		3	11	20	9
2	Interest <V133> * <V28>	mln euro	77	84	16	31			27	28		3	8	14	8
3	Total capital costs	mln euro	390	277	55	209			86	116		6	20	33	18

Source: Statistics Netherlands

The second biggest post after the capital costs are the current costs <V134> which is 30% of the subtotal environmental costs and 22% of all environmental expenditures of enterprises. The correlation of different variables like costs of energy use <V70>, other costs <V253>, waste disposal <V258>, weighed ghg-equivalents <V268>, energy use/ delivery <V272> and investments <V273> with the current costs are compared and used for regression. The variable investments <V273> is finally used to estimate the 'current costs' with linear regression. The other costs <V135> are 16% of the subtotal environmental costs and 11% of all environmental expenditures. The same variables as with the current costs are used. Waste disposal <V258> and investments <V273> are used for multiple linear regression. The estimation of the environment related current costs and other costs are shown in table 4.1.3.

Table 4.1.3: Estimation environment related current and other costs (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Current costs <V134> * <V273>	mln euro	165	169	28	90			53	147		1	3	3	12
2	Other costs <V135> * <V258> <V273>	mln euro	82	76	13	32			23	60		9	18	-2	5
3	Total current and other costs	mln euro	247	246	41	121			76	208		10	21	1	17

Source: Statistics Netherlands

With the estimation of all subjects of the 'environmental costs: own activities', like: depreciation <V132>, interest <V133>, current costs <V134> and other costs <V135> the biggest part of the environmental expenditures of enterprises are estimated. Table 4.1.4 shows the results of table 4.1.2 and 4.1.3 and the total environmental costs in 2009.

Table 4.1.4: Total estimation environmental costs: own activities (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Capital costs: depreciation	mln euro	313	193	38	178			59	88		3	11	20	9
2	Capital costs: interest	mln euro	77	84	16	31			27	28		3	8	14	8
3	Current costs	mln euro	165	169	28	90			53	147		1	3	3	12
4	Other costs	mln euro	82	76	13	32			23	60		9	18	-2	5
5	Total costs	mln euro	637	523	95	330			162	324		16	40	35	35

Source: Statistics Netherlands

Section G: Wholesale and retail trade; repair of motor vehicles and motorcycles and section H: Transportation and storage have the most environmental costs related to their own activities.

4.2 Environmental costs: transfers

In 2009 more than a quarter of the environmental expenditures (27%) of enterprises in the industry NACE (06-36) is related to transfers. Transfers consists of three main items: expenditures for taxes and levies, waste disposal and other outsourced activities like research and coordination. Table 4.2.1 shows the expenditures with the underlying variables.

Table 4.2.1: Environmental costs: tranfers (NACE 6-36) (2009)

	Main items	Subject	mln euros	%	%
1	Taxes and levies:	Water pollution tax	89	17%	5%
2		Sewer tax	20	4%	1%
3		Other taxes and levies	17	3%	1%
4	Waste disposal:	Dangerous waste	116	22%	6%
5		Non-dangerous waste	214	40%	11%
6	Outsourced activities:	Research	26	5%	1%
7		Coordination	19	4%	1%
8		Other activities	33	6%	2%
9	Subtotal: Transfers		534	100%	27%
10	Total costs		1947	x	100%

Source: Statistics Netherlands

Transfers in case of 'waste disposal' are with 62% of the subtotal transfers and 17% of all environmental expenditures the biggest transfer item. Important to mention is that treatment of waste is changing under pressure of rising prices of raw materials. Because of this not the quantities of general (non-) dangerous waste streams are used for estimation of expenditures in this research but only the 'final treated waste' streams. Final treated waste means the quantities of waste that are dumped on the dumping ground, into water or burned. On average about 20% of total waste streams of enterprises is final treated NACE (10-96). The variables that are used are from AgentschapNL AgNL12, two variables: non-dangerous final treated waste <V204> and dangerous final treated waste <V205>. Table 4.2.2 shows the estimation of expenditures of enterprises for the final treatment of dangerous and non-dangerous waste.

Table 4.2.2: Transfers: Estimation of costs related to final waste treatment (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Dangerous waste treatment <V142> * <V205>	mln euro	9	35	2	5			7	8		1	4	3	3
2	Non-dangerous waste treatment <V143> * <V204>	mln euro	50	28	15	28			44	39		24	52	16	18
3	Total costs final waste treatment	mln euro	60	64	17	33			51	47		25	57	19	21

Source: Statistics Netherlands, AgentschapNL

In general the expenditures for non-dangerous waste streams are higher than the expenditures for dangerous waste streams. An exception is section H: Transportation and storage.

Taxes and levies are with 24% the second biggest transfer related expenditures and 6% of all environmental expenditures of enterprises NACE (06-36). The water pollution tax and sewer tax are the majority of tax related expenditures. Table 4.2.3 shows the estimation of the total expenditures for taxes and levies based on the summation of water pollution and sewer taxes.

Table 4.2.3: Transfers: Estimation of costs related to taxes and levies (2009)

Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
Taxes and levies <V136> * <V257>	mln euro	63	24	15	20		12	31	18	23	24	66	15	15

Source: Statistics Netherlands

With the estimation of the most important subjects of the 'environmental costs: transfers', like: final treated dangerous waste <V204>, non-dangerous waste <V205> and taxes and levies <V136> the remaining part of the environmental expenditures of enterprises are estimated. Table 4.2.4 shows the results of table 4.2.2 and 4.2.3 and the total environmental transfers in 2009.

Table 4.2.4: Estimation total environmental costs: transfers (2009)

	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Dangerous waste treatment	mln euro	9	35	2	5			7	8		1	4	3	3
2	Non-dangerous waste treatment	mln euro	50	28	15	28			44	39		24	52	16	18
3	Taxes and levies	mln euro	63	24	15	20			31	18		24	66	15	15
4	Total environmental costs: transfers	mln euro	123	88	32	54			82	65		49	122	34	36

Source: Statistics Netherlands

Table 4.2.4 does not show expenditures for outsourced activities like: research and coordination. For enterprises in the industry NACE (06-36) outsourced activities are about 4% of total environmental expenditures. Outsourced environmental activities are depending on the section and kind of activities and are left out because of this.

4.3 Investments

One of the items in the EPE statistic of enterprises in the industry NACE (06-36) are the investments. Investments are used in the EPE statistic of enterprises to determine capital costs. In this research the relation between investments and capital costs is decoupled. The reason is that the EPE (06-36) publication on Statline only provides one figure for investments. This means that there is no distinction between the sort of investment (construction or process) and the related payback time and costs. Like in the EPE statistic CBS6 the variable environmental investments <V129> is treated as a solitary variable. In the analysis the correlation between the environmental investments and general investments CBS5, variables <V118-V128> and <V273> is examined. Also energy <V272> and ghg-equivalents <V268> are analysed because of the contemporary emphasis on the reduction of ghg- emissions and the investments to reduce this kind of emissions. Analysis points out that the estimation of environmental investments can be made with different sets of variables. Almost all of the estimations leads to an overestimation of the environmental investments of enterprises in the industry NACE (06-36). Table 4.3 shows the estimation made with multiple linear regression and the variables: ground, way and water work <V121> and ghg-equivalents <V268>.

Table 4.3: Estimation of environmental investments (2009)

Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
Investments <V129> * <V121> <V268>	**mln euro**	29	170	14	135			34	38		7	17	20	15

Source: Statistics Netherlands

With this method the overestimation of environmental investments of enterprises in the industry NACE (06-36) is 40% (526 over 375 mln euro). Further research is necessary to improve the estimation of environmental investments for the sections G-S.

4.4 Subsidies

In 2009 the subsidies related to the industry NACE (06-36) amount to 450 mln euros, see the variable received transfers <V149> statistic CBS6. Subsidies are associated with costs enterprises make related to their own activities. In general environmental subsidies are meant to improve the business process of enterprises for example to cope with new legislation. The sum of environmental subsidies, variable <V149> is over 30% of the variable costs: own activities <V130>. In financial statistics CBS3 subsidies are included under the subject operating returns and the variable other revenues <V65>. The problem with the variable 'other revenues' is that subsidies are only a (small) part of the revenues. Big differences occurs between revenues per section and also between the variables <V65> and <V149> for the enterprises in the sections of the NACE (06-36). The applied regression method does not provide useful data.

Subsidies in the industry are stemming from registers of AgentschapNL. As agency of the Ministry of Economic Affairs AgentschapNL is responsible for the subsidization of environmental programmes enterprises can apply for. The stimulation policies pertaining to the environmental protection expenditures taken into account by Statistics Netherlands are: 1/ the Energy Investment Deduction (EIA), 2/ Environmental quality of the Electricity Production (MEP), 3/ Subsidy for Environment & Technology (SMT), 4/ Mia & Vamil (MV) and 5/ CO_2- reduction. Table 4.4 shows subsidies from environmental policies on a national level: EIA, MEP, SMT, MV and CO_2- reduction distributed to enterprises according to NACE from 1993 per compartment for the sections (45-95) in 2009.

Table 4.4: Subsidies EIA, MEP, SMT, MV and CO_2-reduction per compartment in 2009 (euros)

	NACE 1993	water	air	soil	waste	noice	total
1	45	5.049	1.560.861	76.642	5.696	172.664	1.753.842
2	60-62	50.066	3.935.439	24.208	54.994	401.321	4.466.028
3	63-64	0	2.870.158	0	2.772	0	2.872.931
4	90	0	28.676.943	12.448	834.596	92.160	29.616.147
5	95	0	0	0	0	0	0
6	Rest	261.865	40.497.872	5.541	177.771	189.378	41.132.427
7	Total	316.980	77.541.273	118.839	1.075.829	855.523	79.841.375

Source: Statistics Netherlands

In 2009 a total amount of almost 80 mln euros of environmental subsidies is assignable to the remaining sections (45-90) from which 41 mln (51% of 79,8 mln) is not assignable to a specific section. Over 77 mln euros (97% of 79,8 mln) is related to the compartment air, which means related to measures to reduce emissions, for example energy- and CO_2-reduction. For this research and the sections of the NACE (2-digits) the register with subsidies of AgentschapNL is not directly useful. Only the sections 45, 60-62, 63-64, 90, 95 and a (big) rest category is given according to NACE 1993.

4.5 Conclusion

Estimation of environmental protection expenditures for NACE (45-96) is based on the extended data set "Summary table Used Statistics". Although this data set contains 273 financial and physical variables only a few variables are used to estimate environmental expenditures. About 40 variables were used for analysis. Finally, for the main items of the EPE, 12 independent variables are used for 9 dependent EPE variables in linear regression. Table 4.5.1 shows the variables used for regression with the variables from the EPE statistic of enterprises in the industry NACE (06-36).

Table 4.5.1: Variables and data sets used for regression

	Var	Independent	Unit	Data set	EPE - var	Stat	Table in report	Unit
1	V28	Tangible fixed assets	mln euro	CBS2	V132, 133	CBS6	4.1.2	mln euro
2	V46	Depreciation	mln euro	CBS2	V132	CBS6	4.1.2	mln euro
3	V65	Operating returns: other revenues	mln euro	CBS3	V149	CBS6	x	mln euro
4	V121	Groundworks and civil engineering	mln euro	CBS5	V129	CBS6	4.3	mln euro
5	V203	Final treated waste (FTW): total	1000 ton	AgNL12	V135	CBS6	4.1.3	mln euro
6	V204	Final treated waste (FTW): non-dangerous	1000 ton	AgNL12	V143	CBS6	4.2.2	mln euro
7	V205	Final treated waste (FTW): dangerous	1000 ton	AgNL12	V142	CBS6	4.2.2	mln euro
8	V253	Regression Other costs	mln euro	UITK	V135	CBS6	4.1.3	mln euro
9	V257	SUM Sewer and water pollution levies	mln euro	UITK	V136	CBS6	4.2.3	mln euro
10	V258	SUM Waste disposal	1000 ton	UITK	V135	CBS6	4.1.3	mln euro
11	V268	Weighed Green house gas equivalents	eqv x mln	UITK	V129	CBS6	4.3	mln euro
12	V273	SUM Investments - outlier	mln euro	UITK	V134, 135	CBS6	4.1.3	mln euro

Source: Statistics Netherlands

The core of EPE-statistics is the environmental costs related to 'own activities' and of 'transfers'. The estimation of environmental investments and subsidies is left out the table below. Table 4.5.2 shows the total estimated environmental costs per section in 2009.

Table 4.5.2: Estimation total environmental costs (2009)

	Var	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V132	Own activities: Depreciation	mln euro	313	193	38	178			59	88		3	11	20	9
2	V133	Own activities: Interest	mln euro	77	84	16	31			27	28		3	8	14	8
3	V134	Own activities: Current costs	mln euro	165	169	28	90			53	147		1	3	3	12
4	V135	Own activities: Other costs	mln euro	82	76	13	32			23	60		9	18	-2	5
5	V142	Transfers: Dangerous FTW	mln euro	9	35	2	5			7	8		1	4	3	3
6	V143	Transfers: Non-dangerous FTW	mln euro	50	28	15	28			44	39		24	52	16	18
7	V136	Transfers: Taxes and levies	mln euro	63	24	15	20			31	18		24	66	15	15
8	V130 *	Total environmental costs	mln euro	760	611	128	384			244	389		65	163	69	71

Source: Statistics Netherlands

* Sum of estimated expenditures: own activities and transfers

In total the environmental costs are estimated to 2,9 bln euros for enterprises in sections G – S. Three quarter of EPE is related to 'own activities'. Most of the costs are indirectly related to investments (depreciation and interest), about 1,2 bln (40% of 2,9 bln). The current costs and other costs are almost 1 bln euros (over 30%). Transfers are good for a quarter of the EPE of enterprises. Almost 400 mln euros is related to final waste treatment, which is about 14% of total environmental expenditures of enterprises in section G-S. Taxes and levies are 292 mln euros (10%). Outsourced activities like research and coordination are not examined, they represent about 4% of the EPE - NACE (06-36). Notice that the mentioned percentages are an average for sections G-S. Per section and section the mentioned ratios vary.

5 Time series

One of the goals of the approach as given in this report is to make time series. Existing statistics and registers are useful for this goal. Initially the goal of Statistics Netherlands was to produce time series for the NACE (45-96) from the year 2000. Looking at available statistics and their time series this is not possible for all main items of EPE statistics. Also important to mention is, that the dependent EPE variables stem from the EPE statistic 'Environment costs of enterprises' CBS6 according to NACE 2008, which is only available since 2008. For longer time series of EPE of enterprises NACE 1993 must be used. The variables that are used for regression in chapter 4 stem from statistics given in table 5 and the estimation of EPE for the year 2009.

Table 5: Time series; used variables and statistics

	Var	Subject	Used variables and statistics							
			Sum table		Business classification			Publication		
			Var	stat	clas.	div.	digits	since	last	freq.
1	V132	Own activities: Depreciation	V28	CBS2	NACE08	A-U	01-99	2000	2010	annually
2			V46	CBS2	NACE08	A-U	01-100	2000	2010	annually
3	V133	Own activities: Interest	V28	CBS2	NACE08	A-U	01-99	2000	2010	annually
4	V134	Own activities: Current costs	V273	CBS5	SBI08	B-N/ S	06-96	2009	2010	annually
5	V135	Own activities: Other costs	V258	CBS9	SBI	B-D	10-33	1994	2009	annually
6			V258	CBS10	N/A	N/A	45-96	N/A	2009	N/A
7			V258	AgNL11	N/A	N/A	10-97	N/A	2009	N/A
8			V273	CBS5	SBI08	B-N/ S	06-96	2009	2010	annually
9	V142	Transfers: Dangerous waste treatment	V205	AgNL12	N/A	N/A	10-97	N/A	2009	N/A
10	V143	Transfers: Non-dangerous waste treatment	V204	AgNL12	N/A	N/A	10-33 / 45-96	N/A	2009	N/A
11	V136	Transfers: Taxes and levies	V257	CBS8	Regkol	N/A	01-96	1987	2009	N/A
13	V129	Investments	V121	CBS5	SBI08	B-N/ S	06-96	2009	2010	annually
14			V268	CBS16	SBI	A-U	10-33 / 49-53	1990	2010	annually
15	V149	Subsidies	V65	CBS3	SIC08	B-N	01-96	2009	2010	annually

Source: Statistics Netherlands

Statistics CBS2, CBS8, CBS9 and CBS16 are available for over more than 10 years. All the other statistics and above mentioned variables are not available for that period of time. With these statistics it is possible to estimate EPE regarding to depreciation <V132> (about 30% of total EPE; sections G-S), interest <V133> (10%) and taxes and levies <V136> (also 10%). The variable other costs <V135> cannot be determined for the sections (45-96) because the independent variable <V258> is not only built up from CBS9 but also from CBS10 and AgNL11 which do not provide information over a longer period of time. The three variables that can be estimated (depreciation, interest and taxes and levies) over a longer period of time are good for 50% of EPE of enterprises.

The other 50% of environmental expenditures of enterprises regarding to e.g. current costs <V134> and other costs <V135> needs to be determined in another way. For example, by using other variables from statistic CBS2 in order to produce time series. Further research has to point out if time series can be based on other variables. If CBS2 is usable for the variables <V134> and <V135> the EPE regarding to environmental costs: own activities of enterprises NACE (45-96) can be estimated on yearly basis. For costs related to the transfers: final dangerous waste treatment <V142> and final non-dangerous waste treatment <V143> Statistics Netherlands is depending on AgentschapNL.

6 Conclusion

In the final year of the EPE continuation program 2010-2012 sections of the NACE (45-96) – part of the sections G-S – are examined. Together with the agricultural section A, the industry (B-E) and the building industry F the new sections covers all of the NACE except section K, L, T and U.

This report gives a general approach for the development of EPE data on section level. Characteristic for the approach in this report is first of all that financial and physical data are combined and secondly that with this data a business profile and environmental business profile is made which is used for further analysis. Because of practical reasons the outcome in the report is given per section. In the annex all sections of the NACE regarding to the used data sets and the outcome of analysis are given on a 2-digit level. In this research three steps are taken and explained per section: 2/ collecting relevant data, 3/ preparation of data and 4/ estimation of EPE for the year 2009.

Collecting relevant data, section 2, shows that there are several limitations regarding to developing EPE data with existing data sets. There is a lack of financial information about sections of the NACE: K, L and O, P, Q, R. Annex 1 'Summary Table Used Statistics' shows that not all data is available on a 2-digit level and not all data is available for the year of analysis 2009. Sections K and L are left out further analysis because of the lack of information. The collected tables and ratios and values also shows that there are shared responsibilities regarding to environmental measures. The private and (semi-) public section is represented in the NACE which means the allocation of expenditures needs to be considered carefully to prevent double counting. Section O 'Public administration and services' is left out further analysis because of allocation and double counting.

Preparation of data, section 3: because some of the used data sets does not provide data on section level 2-digit the "Summary Table Used Statistics" is extended with 22 variables <252-273> that does present figures on a 2-digit level. Therefore three techniques are used: linear regression, weighing and summation. Annex 2 shows the outcome of linear regression on 2-digit level. Data sets that provides information per section are weighted to get figures on 2-digit level. Annex 3 shows the number of enterprises and employees per section that is used for weighing. Also the weighted variables are given. Summation is used to compose different data sets and variables. Annex 4 shows the variables that are composed or summed up. The variable investments <V273> for example is corrected for the investments in section L: Real Estate Activities. Investments in this section are in majority expenditures that are related to other sections of the NACE like the building industry or households and therefore allocated differently.

Estimation of EPE for NACE (45-96) and time series, section 4 and section 5, are the actual results of the analysis. From 273 collected variables 40 are used in analysis. The main items of EPE of enterprises in the industry CBS6 are used for regression together with prepared variables. Table 4.5.2 shows the outcome of the examination for the main items of the EPE statistic. Environmental costs: own activities (good for 75% of EPE) and transfers (25%) are determined for the year 2009. Environmental investments are determined in section 4.3 but not given in the conclusion because further research is necessary. Subsidies are also not given because of the limitation of available figures on section level and regarding to allocation.

The SPSS outcome of analysis is given in annex 5. The quality of the values for R-square and t-coefficients varies depending on the variables that are used for regression. For the variables 'taxes and levies' <V136> and 'final treated waste' <V204>, <V205> the outcomes are sufficient. Outcomes for variables with t-values < 3 should be reconsidered and further analysed before used for statistical purposes.

Table 6 shows the sub-total of EPE – variables V132, V133, V136 – that is suitable for an estimation of EPE over a longer period of time. Also the sub-total of EPE that is not good for time series is shown (summation variables: V134, V135, V142, V143).

Table 6: Estimation total environmental costs, good (and not good) for time series (2009)

	Var	Subject	Unit	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	V132	Own activities: Depreciation	mln euro	313	193	38	178			59	88		3	11	20	9
2	V133	Own activities: Interest	mln euro	77	84	16	31			27	28		3	8	14	8
3	V136	Transfers: Taxes and levies	mln euro	63	24	15	20			31	18		24	66	15	15
4	N/A	Sub-total good for timeseries	mln euro	453	301	69	229			117	134		30	85	48	33
5	N/A	Sub-total not good for timeseries	mln euro	307	309	58	155			127	255		35	77	21	38
6	N/A	Total estimated environmental costs	mln euro	760	611	128	384			244	389		65	163	69	71
7	N/A	% of sub-total good for timeseries	mln euro	60%	49%	54%	60%			48%	34%		46%	52%	70%	47%

Source: Statistics Netherlands

The percentage of EPE that can be estimated over a longer period of time varies from 34% till 70% per section. So in order to develop time series there are two conclusions: 1/ not all items of EPE statistics can be estimated with the used data sets (and variables) because they are not available over a longer period of time, including the existing EPE of enterprises CBS6 itself and 2/ the method to construct time series needs to be considered. The environmental share related to these variables in manufacturing industries is likely higher than in other sections of the economy. Therefore, the part of EPE that can be estimated: depreciation <V132> and interest <V133> has to be interpreted as an upper limit. One of the possibilities to improve the analysis is to use data that is available for more divisions of the NACE (12,14,15, 19,27,29,36) but not used in analysis because of secrecy.

To improve the estimation of EPE related to 'own activities' and 'capital costs' the estimation of investments needs to be improved. In calculations expenditures related to the real estate activities of division 68 are excluded for example. Outliers related to a specific kind of investments, like wind turbines (division 35), should be left out the regression. Also the environmental expenditures the building industry is accountable for needs to be deducted from the environmental part of investments (construction) in divisions (45-96) of the NACE. With these improvements the estimation of investments can be improved and the environmental share of depreciation and interest can be derived. Another part of EPE 'own activities' are the current costs. Variables that can be used to improve the estimation of the current costs are the variables related to personnel expenses which should be examined further on.

With data sets that are used in this report it is not possible to estimate net environmental costs per section. The conclusion is that it is not possible to estimate net environmental costs without good insight in subsidies. Subsidies as mentioned in chapter 4.4 are a subset of a greater set of subsidies and transfers as pointed out in earlier research carried out by Statistics Netherlands (Graveland et al., 2011). Also the estimation of investments are left out in the conclusion. Not only practical improvements of data sets, as pointed out above, are necessary. There are also technical reasons why existing data related to investments CBS5 needs to be examined further on. For example the distinction between the sort of investment (construction or process) and the related payback time and costs according to the used EPE definitions in statistic CBS6 needs to be examined.

Because of the expected relation between environmental investments and subsidies further research is necessary. Not only the understanding of the relation between investments and subsidies will be improved also the net environmental costs can be estimated if subsidies per section are available.

References

CBS1 Bedrijven; naar grootte en rechtsvorm (SBI 2008)
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=80232ned&D1=a&D2=a&D3=3&HDR=T%2cG2&STB=G1&VW=T

CBS2 Financiën van alle ondernemingen; niet-financiële sector naar activiteit
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=80263ned&D1=a&D2=a&D3=9&HDR=T&STB=G1%2cG2&VW=T

CBS3 Bedrijfsleven; arbeids- en financiële gegevens, per branche, SBI 2008
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81156ned&D1=0-10%2c19-21&D2=0%2c2%2c5%2c125%2c128%2c136%2c153%2c160%2c184%2c212%2c232%2c242%2c266%2c282&D3=l&VW=T

CBS4 Industrie; arbeids- en financiele gegevens, per branche, SBI2008
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81166NED&D1=a&D2=0%2c2%2c20%2c22%2c24%2c2627%2c29%2c34%2c38%2c43%2c45%2c56%2c58%2c63%2c69%2c73%2c82%2c87%2c92%2c102%2c106%2c110%2c112%2c116&D3=l&VW=T

CBS5 Investeringen in materiële vaste activa; SBI2008
http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=81352ned&D1=a&D2=2-6,8-10,12-14,16,18-19,21-25,28-29,31-33,35-36,38-51,54,56-57,59,61-63,66-71,73,75-78,80-83,85,87-90,92-103&D3=0&HDR=G1&STB=G2,T&VW=T

CBS6 Milieukosten en -investeringen; bedrijven met >10 werknemers, SBI 2008
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81233NED&D1=a&D2=a&D3=0&D4=l&VW=T

CBS7 Milieubelastingen en milieuheffingen; opbrengst naar betalingsplichtige
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81383ned&D1=a&D2=a&D3=22&HDR=T&STB=G2%2cG1&VW=T

CBS8 Milieurekeningen, Rioolrecht en MVO: Revisiereeks_1987-2009.xls, zie tevens email Isabel van Geloof dd.10092012 (voorlopige cijfers voor 2009)

CBS9 Bedrijfsafval; afvalsoort, verwerking, bedrijfstak (SBI 2008)

CBS10 Afvalstoffen HDO 2-digit: Bestand Afval2009-HDO.xls

AgNL11 AgentschapNL, gevaarlijk afval per SBI: Bestand 2012-08-14_(Koppert).xls

AgNL12 AgentschapNL, eindverwerkt afval - 2009, bestand: 2012-08-14 Milieukosten_(Koppert).xls

CBS13 Milieurekeningen; watergebruik
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81398NED&D1=a&D2=a&D3=l&VW=T

CBS14 Milieurekeningen; netto energieverbruik
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81410NED&D1=a&D2=a&D3=19&VW=T

CBS15 Aardgas- en elektriciteitsleveringen; openbaar net aan bedrijven
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81606NED&D1=a&D2=0-1%2c5%2c7-8%2c10-11%2c14-15%2c18-20%2c22-24&D3=l&VW=T

CBS16 Milieurekeningen; emissies naar lucht, herkomst en bestemming
http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLNL&PA=81395NED&D1=a&D2=a&D3=19&VW=T

Graveland, C., B. Edens & W. Tebbens, 2011. Report on Environmental subsidies and transfers. Statistics Netherlands, The Hague.

Annex 1, 2-4, see Excel-sheets.

Annex 5, outcomes analysis SPSS

1/ Environmental investments (V129), report table 4.3 (p.18)

Correlations

		V129	V121	V268
V129	Pearson Correlation	1	,943**	,942**
	Sig. (2-tailed)		,000	,000
	N	21	19	21
V121	Pearson Correlation	,943**	1	,492**
	Sig. (2-tailed)	,000		,000
	N	19	63	63
V268	Pearson Correlation	,942**	,492**	1
	Sig. (2-tailed)	,000	,000	
	N	21	63	80

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,945[a]	,893	,879	16,759

a. Predictors: (Constant), V268, V121

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4,515	6,024		,750	,464
	V121	,148	,153	,519	,968	,348
	V268	,002	,002	,429	,799	,436

a. Dependent Variable: V129

2/ Estimation of environmental costs (V130), report table 3.1.1 (p.10)

Correlations

		V130	V44
V130	Pearson Correlation	1	,830**
	Sig. (2-tailed)		,000
	N	21	21
V44	Pearson Correlation	,830**	1
	Sig. (2-tailed)	,000	
	N	21	75

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,830[a]	,689	,673	42,775

a. Predictors: (Constant), V44

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	6,050	11,856		,510	,616
	V44	,004	,001	,830	6,488	,000

a. Dependent Variable: V130

2a/ Environmental costs (own activities): capital costs (investments), Depreciation (V132) + interest (V133), report table 4.1.2 (p.15)

2a1/ Depreciation (V132),

Correlations

		V132	V28	V46
V132	Pearson Correlation	1	,884**	,911**
	Sig. (2-tailed)		,000	,000
	N	21	21	21
V28	Pearson Correlation	,884**	1	,765**
	Sig. (2-tailed)	,000		,000
	N	21	75	75
V46	Pearson Correlation	,911**	,765**	1
	Sig. (2-tailed)	,000	,000	
	N	21	75	75

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,926[a]	,858	,842	12,125

a. Predictors: (Constant), V46, V28

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,652	3,876		-,168	,868
	V28	,002	,001	,360	1,889	,075
	V46	,037	,012	,593	3,113	,006

a. Dependent Variable: V132

2a2/ Interest (V133),

Correlations

		V133	V28
V133	Pearson Correlation	1	,939**
	Sig. (2-tailed)		,000
	N	21	21
V28	Pearson Correlation	,939**	1
	Sig. (2-tailed)	,000	
	N	21	75

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,939[a]	,882	,876	4,451

a. Predictors: (Constant), V28

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1,890	1,098		1,721	,101
	V28	,002	,000	,939	11,939	,000

a. Dependent Variable: V133

2b/ Environmental costs (own activities): current (V134) + other costs (V135), report table 4.1.3 (p.15)

2b1/ Current costs (V134),

Correlations

		V134	V273
V134	Pearson Correlation	1	,790**
	Sig. (2-tailed)		,000
	N	21	19
V273	Pearson Correlation	,790**	1
	Sig. (2-tailed)	,000	
	N	19	63

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,790[a]	,624	,602	14,671

a. Predictors: (Constant), V273

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,866	4,385		,198	,846
	V273	,037	,007	,790	5,311	,000

a. Dependent Variable: V134

2b2/ Other costs (V135),

Correlations

		V135	V258	V273
V135	Pearson Correlation	1	,510*	,845**
	Sig. (2-tailed)		,031	,000
	N	21	18	19
V258	Pearson Correlation	,510*	1	,226
	Sig. (2-tailed)	,031		,107
	N	18	69	52
V273	Pearson Correlation	,845**	,226	1
	Sig. (2-tailed)	,000	,107	
	N	19	52	63

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,953[a]	,908	,894	4,350

a. Predictors: (Constant), V273, V258

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-3,473	1,534		-2,264	,041
	V258	-,002	,001	-,229	-2,027	,064
	V273	,039	,004	1,092	9,651	,000

a. Dependent Variable: V135

2c/ Payed transfers: Taxes and Levies (V136), report table 4.2.3 (p.17)

Correlations

		V136	V257
V136	Pearson Correlation	1	,987**
	Sig. (2-tailed)		,000
	N	21	21
V257	Pearson Correlation	,987**	1
	Sig. (2-tailed)	,000	
	N	21	80

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,987[a]	,974	,973	1,975

a. Predictors: (Constant), V257

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	,744	,459		1,619	,122
	V257	,956	,036	,987	26,867	,000

a. Dependent Variable: V136

2d/ Payed transfers: Waste disposal (Final Waste Treatment): Dangerous FWT (V142) + Non-dangerous FWT (V143), report table 4.2.3 (p.17)

2d1/ Dangerous FWT (V142)

Correlations

		V142	V205
V142	Pearson Correlation	1	,996**
	Sig. (2-tailed)		,000
	N	21	18
V205	Pearson Correlation	,996**	1
	Sig. (2-tailed)	,000	
	N	18	67

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,996[a]	,992	,992	1,117

a. Predictors: (Constant), V205

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,850	,276		3,086	,007
	V205	,149	,003	,996	45,766	,000

a. Dependent Variable: V142

2d2/ Non-dangerous FWT (V143)

Correlations

		V143	V204
V143	Pearson Correlation	1	,968**
	Sig. (2-tailed)		,000
	N	21	18
V204	Pearson Correlation	,968**	1
	Sig. (2-tailed)	,000	
	N	18	67

**. Correlation is significant at the 0.01 level

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,968[a]	,936	,932	2,820

a. Predictors: (Constant), V204

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3,005	,798		3,763	,002
	V204	,115	,008	,968	15,316	,000

a. Dependent Variable: V143