Quality Report

for statistics on generation of waste and recovery and disposal of waste in Sweden, 2008

According to EU Regulation on Waste Statistics 2008

Part I Description of the data

1 QR_WASTE_SE_2008_0

2 Identification

Country: *Sweden*
Reference year: *2008*
Description of data set(s) delivered
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4 Parties involved/sources used

The Swedish Environmental Protection Agency (EPA) is responsible for reporting to the Commission according to the Waste Statistic Regulation and other waste related regulations, and for producing and publishing the official national statistics on waste according to the Swedish Ordinance on Official Statistics. The Swedish EPA has a framework agreement with the SMED consortium (Swedish Environmental Emission Data) for the provision of services regarding data collection, statistics production and the development of methodology for waste statistics production. The waste statistics with accompanying documentation have been produced by SMED. There have also been a large number of other organisations and authorities involved in the production of the statistics.

In preparation for the current reporting, the work has been organised as in Figure 1 and Table 1.

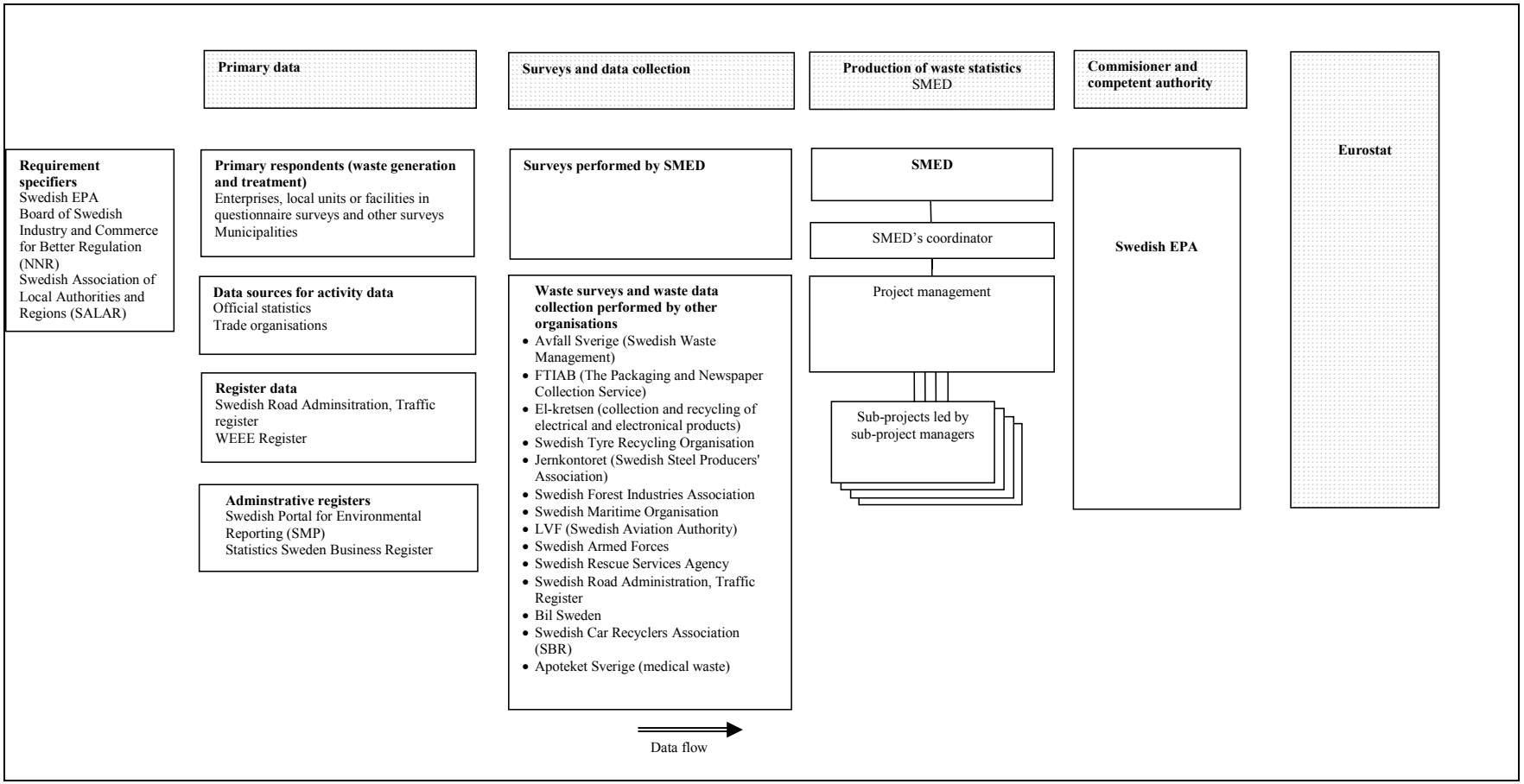

Figure 1. Organisation of the work and institutions involved

Table 1: Institutions involved and distribution of tasks

Name of institution	Description of key responsibilities
Swedish Environmental Protection Agency	Responsible for producing, publishing and reporting national waste statistics. Responsible for the Swedish Portal for Environmental Reporting (SMP). The register covers all activities that has permission to environmentally hazardous activities according to the Environmental Code and is updated continuously by the county administrations. At the portal yearly environmental reports from facilities are available.
SMED consortium	SMED means "Swedish Environmental Emissions Data", which is a collaborative consortium involving the four organisations IVL Swedish Environmental Research Institute, Statistics Sweden, Swedish University of Agricultural Sciences and Swedish Meteorological and Hydrological Institute. The waste statistics with accompanying documentation have been produced by SMED at the request of Swedish Environmental protection Agency.
Other primary data collectors:	Organisations, enterprises, agencies, etc. has made own inquiries or surveys from their members. SMED has collected data from them and compiled the data to reporting format
Avfall Sverige (Swedish Waste Management)	Swedish Waste Management is a stakeholder and trade association in the field of waste management and recycling. They make yearly surveys of household waste generation and treatment through inquiries to municipalities. Also domestic hazardous waste is included in their survey.
FTIAB (The Packaging and Newspaper Collection Service)	FTIAB is an industrial organisation responsible for producer's responsibility for newspapers and packaging material. They collect and publish data about collection and recycling of newsprint.
El-Kretsen	El-Kretsen is responsible organisation for collection and recycling of electric end electronic products. They collect and publish data about collection of WEEE
Swedish Tyre Recycling Association	Swedish Tyre Recycling Association is a producer's responsibility organisation responsible for collection and recycling of tires. They collect and publish data about collection and treatment of scrap tyres.
Jernkontoret (Swedish Steel Producer's Association)	Swedish Steel Producer's Association is a trade organisation that organises the major steel mills. They make a yearly survey on waste generation from its members.
Skogsindustrierna (Swedish Forest Industries Federation)	Swedish Forest Industries Association is a trade organisation that organises the major pulp and paper mills. They make a yearly survey on waste generation and treatment from its members
SBR (Sweden Car Recycler's Association)	Sweden Car Recycler's Association is a trade organisation for car recyclers. They make a yearly survey of waste from their members.
Swedish Maritime Administration	Swedish Maritime Administration has provided data about waste from harbors.
LFV (Swedish Aviation Authority)	LFV has provided data from airports.
Swedish Armed Forces	Swedish Armed Forces has provided data about waste from the Armed Forces facilities.
Swedish Civil Coutingencies Agency	Swedish Civil Coutingencies Agency has provided data about waste from rescue organisations.
Board of Swedish Industry and Commerce for Better Regulation (NNR) Swedish Association of Local Authorities and Regions	Specification of requirements for inquiries, e.g. recommendation of scope and layout of inquiries.

For the reporting according to the waste statistics regulation, a quality system has been developed covering the areas of responsibility for SMED[1] and the Swedish EPA[2]. This ensures the possibility to repeat and trace the work carried out.

[1] Manual for SMED's Quality System for waste reporting according to WStatR, 10 April 2006
[2] Swedish Environmental Protection Agency Quality Manual for reporting of waste statistics according to EU Regulation No 2150/2002

5 General description of methods

Data set 1: Waste generation by waste category (EWC-STAT) and economic activities (NACE)

2.5.1 GENERAL DESCRIPTION OF METHODOLOGY – WASTE GENERATION

Several methods have combined to capture data. When selecting methods, the starting-point has been to prioritise good quality of statistics for flows of **hazardous** waste and **large** flows of waste that have been associated with environmental or resource problems. Another starting point has been to reduce the burden of respondents.

In Table 2 an overview of the methodologies used is given. It should be pointed out that there are usually several methods used to get the data in a cell (e.g. a waste type in a certain NACE sector). For example an inquiry can be the main method, but model calculations are used for small enterprises (less than 10 or 20 employees). Some NACE sectors may also consist of several sub sectors, in each of a special method has been used for a sub sector and another method for another sub sector. The methods indicated in the table is the major method used (which covers the majority of the surveyed waste quantity).

Table 2: Description of main methods for determining waste generation

		Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20
		NACE	01 - 02	03	04 - 09	10 - 12	13 - 15	16	17 – 18	19	20 – 22	23	24 – 25	26 - 30	31 – 33	35	36, 39	37	38	41 – 43	G – U, excl. 46.77	46.77	
01.1*	Spent solvents	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
01.2	Acid, alkaline or saline wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
01.2*	Acid, alkaline or saline wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
01.3*	Used oils	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
01.4	Spent chemical catalysts	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
01.4*	Spent chemical catalysts	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
02	Chemical preparation wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
02*	Chemical preparation wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
03.1	Chemical deposits and residues	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
03.1*	Chemical deposits and residues	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
03.2	Industrial effluent sludges¤	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
03.2*	Industrial effluent sludges¤	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
05	Health care and biological wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]

		Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20
		NACE	01 - 02	03	04 - 09	10 - 12	13 - 15	16	17 – 18	19	20 – 22	23	24 – 25	26 - 30	31 – 33	35	36, 39	37	38	41 – 43	G – U, excl. 46.77	46.77	
05*	Health care and biological wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
06	Metallic wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
06*	Metallic wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
07.1	Glass wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
07.1*	Glass wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
07.2	Paper and cardboard wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	E	A	E	D	C[5]	E	D	C[8]
07.3	Rubber wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
07.4	Plastic wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
07.5	Wood wastes	Non-H	A	A	C[0]	B	B	A	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
07.5*	Wood wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
07.6	Textile wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
07.7*	PCB-containing wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
08	Discarded equipment	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
08*	Discarded equipment	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
08.1	Discarded vehicles	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
08.1*	Discarded vehicles	H	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

		Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20
		NACE	01 - 02	03	04 - 09	10 - 12	13 - 15	16	17 – 18	19	20 – 22	23	24 – 25	26 - 30	31 – 33	35	36, 39	37	38	41 – 43	G – U, excl. 46.77	46.77	
08.41	Batteries and accumulators	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
08.41*	Batteries and accumulators	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
09 excl. 09.11 and 09.3	Animal and vegetal wastes (excluding 09.11 and 09.3)	Non-H	A	A	C[0]	A	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	E	D	C[8]
09.11	Animal waste of food preparation and products	Non-H	A	A	C[0]	A	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
09.3	Animal faeces, urine and manure	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
10.1	Household and similar wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	E	A	E	D	C[5]	C[7]	D	C[8]
10.2	Mixed and undifferentiated materials	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
10.2*	Mixed and undifferentiated materials	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
10.3	Sorting residues	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
10.3*	Sorting residues	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
11 (excl. 11.3)	Common sludges¤	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	I	D	C[5]	C[7]	D	C[8]
11.3	Dredging spoils	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]

		Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20
		NACE	01 - 02	03	04 - 09	10 - 12	13 - 15	16	17 – 18	19	20 – 22	23	24 – 25	26 - 30	31 – 33	35	36, 39	37	38	41 – 43	G – U, excl. 46.77	46.77	
12.1 +12.2 +12.3 +12.5	Mineral wastes (excl. Contaminated soils and polluted dredging spoils)	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[7]	D	C[8]
12.1* +12.2 * +12.3 * +12.5 *	Mineral wastes (excl. Contam-inated soils and polluted dred-ging spoils)	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	C[5]	C[6]	D	C[8]
12.4	Combustion wastes	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	A	A	E	D	C[5]	C[7]	D	C[8]
12.4*	Combustion wastes	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	A	A	E	D	C[5]	C[6]	D	C[8]
12.6*	Contaminated soils and polluted dredging spoils	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	B[1]	A	E	D	I	C[6]	D	C[8]
13	Solidified, stabilised and vitrified waste	Non-H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	A	A	E	D	C[5]	C[7]	D	C[8]
13*	Solidified, stabilised and vitrified waste	H	A	A	C[0]	B	B	B	C[1]	C[2]	C	A	C[3]	C	B	A	A	E	D	C[5]	C[6]	D	C[8]

Notation

A	Reuse of data from WStatR2008 (reference year 2006)
A[1]	Reuse of data from WStatR2008 (reference year 2006) with calculation/waste factors in some sub sectors
B	Reuse of data from WStatR2006 (reference year 2004)
B[1]	Reuse of data from WStatR2006 (reference year 2004) and WStatR2008 (reference year 2006) for some sub sectors
C	Sample survey, where environmental reports were used as main data source. For "respondents" without practicable environmental report, data from WStatR 2008 were reused.

C^0	Total survey on NACE 07 (Mining of metal ores), Other sectors in NACE 04-09 are reused
C^1	Sample survey: For members of Swedish Forest Industries Association from a survey by Swedish Forest Industries Association was used.
C^2	Sample survey: Data from the ten biggest facilities were taken from environmental reports. Data from other facilities were reused from WStatR2006
C^3	Sample survey: For members in Swedish Steel Producer's Association from a survey by Swedish Steel Producer's Association was used.
C^4	Survey: Total survey for waste incineration plants (including combustion plants), and model calculation for other waste from combustion.
C^5	Survey to transporters. Waste generators in construction sector were identified by organisation registration number.
C^6	Survey to transporters. Waste generators in service sector were identified by organisation registration number
C^7	Survey to major public enterprises, authorities, agencies, etc.
C^8	Data from Swedish Waste Management and The Packaging and Newspaper Collection Service and other producer's responsibility enterprises.
D	Total survey, where environmental reports were used as a main data source. For "respondents" without practicable environmental report, data from WStatR 2008 were reused.
E	Waste factors
G	Administrative sources
I	Data from other international reporting

Data has been collected using classifications according to WStatR requirements, see Table 3.

Table 3: Description of classifications used

	Name of classification(s) used	Description of the classification(s) (in particular compatibility with WStatR requirements)
Economic activities	NACE Rev.2	
Waste types	EWC-Stat and List of waste	Remark: often the respondents report waste types (mostly non-hazardous waste) in their own classification system or in common terms (e.g. rest waste, combustible waste and similar). In general these have been easy to transpose to EWC-Stat.
Recovery and treatment operations	Treatment according to WStatR	In the data collection regarding recovery was divided into Biological treatment (composting and anaerobic digestion) and other recovery.

2.5.2 DETERMINATION OF WASTE GENERATION BY (SAMPLE) SURVEY

Surveys in Mining and quarrying and Manufacture sectors

The Mining and quarrying and Manufacture sectors cover 11 different items in total in the reporting of waste generation in accordance with the Waste Statistics Regulation. Several different methods have been applied this time to produce waste data.

Data from earlier surveys (WStatR2008 or WStatR2006) was reused for some sectors, with small amounts of waste, especially small amounts of hazardous waste.

The Business Register was used as base for the sampling. Local unit has been used as statistical unit. A local unit can have several different activities, one main activity and several secondary activities. The entire local unit have been classified by its main activity. Local unit is used because in most cases the entire local unit has a common waste management and local unit is equivalent to facility registered as environmental hazardous activities. Those facilities have to make a yearly environmental report which usually contains waste data.

Several data sources were used in the survey:

1. The main data source has been environmental reports from facilities that are registered as environmentally hazardous activities according to the Environmental Code. These reports were available as PDF-files at the website Swedish Portal for Environmental Reporting (SMP).
2. The Swedish Forest Industry makes a yearly survey among their members (a little more than 50 member enterprises) in the pulp- and paper industry (NACE 17). Results from their inquiry were used for units included in their survey. Their inquiry was coordinated with requirements in advance.
3. The Swedish Steel Producer's Association (Jernkontoret) makes an annual or biannual waste survey to their member (about 20 members) in the metal industry (NACE 24-25). Results from their inquiry were used for the

industry units that were included in their survey. Their inquiry was coordinated with requirements in advance.

4. When no data for a unit was available according to the above methods, data from WStatR2008 (reference year 2006) were reused. In some cases this implies that also data from WStatR2006 (reference year 2004) was used.

Table 4: Waste generation in the economy – sample survey

Description of the sample survey		Item 3 (NACE 4-9; only NACE 7 surveyed)	Item 7 (NACE 17-18; only NACE 17 was surveyed)						Item 8 (NACE 19)						Item 9 (NACE 20-22, excl. 20.4)						Item 11 (NACE 24-25)						
		Facility	Local units / Business Register						Local units / Business Register						Local units / Business Register						Local units / Business Register						
			20-49	50-99	100 - 199	200 - 499	500 +	*	10-49	50-99	100 - 199	200 - 499	500 +	***	10-19	20-49	50-99	100 - 199	200 - 499	500 +	10-19	20-49	50-99	100 - 199	200 - 499	500 +	**)
1	Number of statistical units per strata and item according to the available register(s)	17	37	18	20	14	2	48	6	3	0	4	2	11	239	219	100	75	31	10		631	206	74	37	6	19
2	Number of statistical units selected for sample survey and questionnaires sent out	17	6	6	20	14	2	48	-	-	-	-	-	11	37	44	44	75	31	10		93	68	74	37	6	19
3	Number of non-responses (No answers, non-usable answers; non identifiable units)	0	If not found 2008 by environmental reports, data from 2006 was reused						If not found 2008 by environmental reports, data from 2006 was reused						If not found 2008 by environmental reports, data from 2006 was reused						If not found 2008 by environmental reports, data from 2006 was reused						
a	Number of responses from environmental reports	16	46						8						89						82						
b	Number of reused responses from WStatR2008	1	2						3						152						196						
c	Number of responses through trade organisation	-						48																			19
4	Part of 3: Number of incorrect register data (Non existing statistical units, non identifiable units)	-																									
5	Number of statistical units used for the calculation of the totals	17	6	6	20	14	2	48						11	37	44	44	75	31	10		93	68	74	37	6	19
6	Enumeration factor	1	6	3	1	1	1	1						1	6	5	2,5	1	1	1		6	3	1	1	1	1

*) From Swedish Forest Industries

**) From Swedish Steel Producer's Association

***) Environmental Reports from 12 major facilities (according to waste amount in WStatR2006)

Description of the sample survey		Item 12 (NACE 26-30) Local units / Business Register						Item 16 (NACE 38) Facility / Register of environmentally hazardous activities		Item 19 (NACE 46.77) Facility / Register of environmentally hazardous activities
		10-19	20-49	50-99	100-199	200-499	500+	NACE 38.1-38.2	NACE 38.3	
1	Number of statistical units per strata and item according to the available register(s)		512	240	152	105	55	516	337	409 ##)
2	Number of statistical units selected for sample survey and questionnaires sent out		77	79	152	105	55	516	78 #)	78 #)
3	Number of non-responses (No answers, non-usable answers; non identifiable units)	If not found 2008 by environmental reports, data from 2006 was reused.								
a	Number of responses from environmental reports	120						418	64	66
b	Number of reused responses from WStatR2008	348						25	0	0
4	Part of 3: Number of incorrect register data (Non existing statistical units, non identifiable units)							73		
5	Number of statistical units used for the calculation of the totals		77	79	152	105	55			
6	Enumeration factor		6	3	1	1	1	1	Employed according to Business register / Employed in surveyed facilities	Employed according to Business register / Employed in surveyed facilities

#) Facilities handling more than 10 000 tons/year

##) Excluding 46.771 Wholesale of scrap cars

Surveys in NACE 38 Waste management and 46.77 Wholesale of waste and scrap
The waste generation in sectors NACE 38 and NACE 46.77 has been estimated in a coordinated survey according to the following:

1. NACE 38 excluding 38.3 was investigated in a total survey, including all waste treatment facilities that were registered as hazardous activities. The data source was
   a. Environmental reports were used as primary source. The environmental reports were available as PDF-files through the Swedish Portal for Environmental Reporting (SMP).
   b. Data from WStatR2008 (reference year 2006) was reused for units that did not have relevant waste data in the environmental reports.

   No adjustment due to non-response (that is if no environmental report was available) was made, because it was judged that the non-responding facilities did not have any real activity in 2008.

2. Materials recovery (NACE 38.3) and Wholesale of waste and scrap (NACE 46.77) excl. car dismantling have been examined in a combined survey. When reviewing activities in NACE 38.3 and NACE 46.77 (excl. car dismantling) in the Business Register, it was discovered that the classifications of very similar activities in practice could be classified as both NACE 38.3 and NACE 46.77 and that the classification in many cases could be seen as arbitrary. Facilities that handle more than 10 000 tonnes/year have to make an annual environmental report. Data from environmental report was used and proportional adjustment according to number of employees was made.
   A list of facilities was extracted from SMP, also a list of local units were extracted from the Business Register. Car recyclers and dismantlers were identified and excluded from this survey. The facilities (in 38.3 and 46.77 together) with useful environmental reports covered approximately 50 % of all employees. From the survey a waste factor was obtained for each type of waste, expressed in kg/employee. The projected waste factor was multiplied by the total number of employees, metallic and non-metallic actors taken separately, in NACE 38.3 and 46.77. The data on the total number of employees in each segment respectively were obtained from the Business Register.

2.5.3 DETERMINATION OF WASTE GENERATION IN THE ECONOMY ON BASIS OF INFORMATION ON WASTE COLLECTION

Waste generation in NACE 41 – 43 Construction
Waste generation in NACE 41-43 Construction has been surveyed in an inquiry to a sample of waste transporters.

The construction sector in Sweden has 65 500 enterprises. There are seven major groups of companies, consisting of 430 subsidiary enterprises. The seven

major groups (430 enterprises) have a turn-over that corresponds to 30 % of the total turn-over in the construction sector.

These seven groups of enterprises also engage a few waste management companies. 90 % of the waste is managed by four major waste transporters. Thus, these four waste transporters were estimated to carry out 27 % of all waste transports in the construction sector. These transporting companies have data about each waste transport stored in their respectively administrative system: organisation registration number of the waste generator, type of waste (mostly according to their own classification system; except hazardous waste that usually is classified in List of Waste), amount of waste (in tonnes or kg), date for transport, etc.

The method chosen to get data about waste generation was to extract data about all waste transports carried out for all 430 enterprises.

The seven major groups were contacted and the organisation registration numbers (VAT number) for all their subsidiary enterprises (430 enterprises) were received. The list of organisation registration numbers (in digital form) was handed over to the four waste transporters, who linked and matched these organisation registration numbers with their own administrative system. With this method, all transports of waste for the seven major groups were identified. All four transporters delivered a list with the total amount of each waste type that has been transported from the seven major groups of enterprises. These data were converted to tonnes and EWC-Stat and proportional extrapolation was made with a enumeration factor 3,7 (= 1/90% * 1/30%).

However, the seven major groups that were studied is not representative for the whole sector. For example, demolition and civil engineering is underrepresented in the surveyed sample. The result was therefore compared with other methods:

- Waste factors, based on Swedish conditions and developed by the Ecocycle Council (Byggbranchens kretsloppsråd).
- Comparing with data from 2006, when waste amounts from one region i Sweden was used to make a proportional adjustment to the whole country based on the regional construction activity index.

The final figures used for the reporting is a syntheses of all three methods.

Generation of hazardous waste in the service sector

Data about generation of hazardous waste in the service sector (NACE G-U, excl. 46.77) was collected by asking hazardous waste transporters. Initially about eight transporters were asked to participate, but only four of them responded.

An extract from their administrative systems was requested. The initial request was to get organisation registration number, waste type (preferably List of Waste) and waste amount in kg for every waste generator in their administrative system. Depending on their IT systems different information were retrieved from different companies:

- Two of the transporters gave organisation registration numbers, amount and waste type according to the request. These lists comprised of all transports regarding all NACE sectors.
- One transporter gave only the name of the companies (all sectors).
- One transporter gave the result in NACE code and EWC-Stat for the service sector ("ready-to-use format")

These data were linked and matched with the Business Register to identify NACE sector. Most of the organisation registration numbers or the names could be linked to a NACE Sector, but in a number of cases manual judgement to get the NACE sector had to be made.

The waste data from businesses in the service sector was picked out. A proportional adjustment was made by multiplying the surveyed waste with a factor based on the turn-over. From Statistics Sweden the total turnover 2007 of hazardous waste management in the old NACE sector 9002 were retrieved. Information was also retrieved about the individual turn-over of each of the four responding transport companies. The total turnover for hazardous waste transports was estimated to 6 315 million SEK, and the four transporting companies had a turnover of 2 156 million SEK in hazardous waste management sector. That made an enumeration factor of 2,929.

2.5.4 DETERMINATION OF WASTE GENERATION IN THE ECONOMY ON THE BASIS OF ADMINISTRATIVE SOURCES

End-of-Life-Vehicle Wastes

Statistics Sweden and the Swedish Agency for Transport Policy Analysis publish statistics about registration of passenger cars and lorries. Private cars, lorries including tow cars, buses, trailers, semi-trailers, caravans, motor-bikes, mopeds class 1, tractors, snow mobiles are shown in the register. Also the organisation registration number (VAT number) of the owner is registered as well as the service weight of each vehicle.

A search in the register was made to pick out all vehicles, including organisation registration number of the owner and service weight that were deregistered during 2008. It was assumed that the main reason for deregistering is that the deregistered cars have been handed over to an authorised car dismantling facility[3]. There may be some or exceptional reasons for deregistering, e.g. export of private car, or sole use of the car on private property, but we have judged that can be negligible.

The organisation registration number was linked and matched with the Business Register. In this manner the weight of deregistered vehicles for each NACE Sector was obtained.

[3] It should be mentioned that occasional deregistration is not included.

These data was compared to amounts obtained in the surveys. The surveys contained data about discarding cars and other vehicles only in a few cases, probably due to that old cars usually are not managed by the waste management departments in an industry.

WEEE and batteries
The Electric and Electronic Product-and Battery Register (EE- and Battery Register) is operated by the Swedish EPA. 2008 was the first year of full operation. This register contains data about:

- All enterprises that sells electric and electronic products or batteries.
- Data about sold quantities of EE and batteries
- Data about collected and treated quantities of EE waste and battery waste

The sector where the waste is generated is not reported.

For the household sector we have assumed that the EWC-Stat category 08 Discarded equipment consists of mainly electric and electronic devices. In these cases information from the register have be taken to make a judgement of how much of the waste is from the household sector. For the household sector the corresponding data from the producer's responsibility organisation El-Kretsen was used. We have made the judgement that the data from El-Kretsen is more reliable than the data from EE- and Battery Register.

2.5.5 DETERMINATION OF WASTE GENERATION IN THE ECONOMY ON THE BASIS OF OTHER METHODS

The use of waste factors, models and other methods are described in

Table 5: Waste generation in the economy on the basis of models or other

Description of the models		
Animal and vegetable waste from trade		
1	Scope of the model (waste types and economic sectors covered)	09 Animal and vegetal wastes from the trade sector, including restaurants, fast-food restaurants and institutional kitchens and one factor for returns from shops.
2	Basic data for the estimations (production figures etc.)	The factors has been obtained from a study financed and published by Avfall Sverige (Swedish Waste Management) (Avfall Sverige Report 2006:7) The number of employees in different sub sectors is obtained from Statistics Sweden. The following waste factors have been used (all figures refers to generation of EWC-Stat 09 Animal and vegetal wastes. Waste from supermarkets: 1200 kg/employee Waste from shops: 1600 kg/employee Waste from restaurants: 4500 kg/employee (of which 1500 kg is fat from fat separators) Waste from fast-food restaurants: 2500 kg/employee (of which 1500 kg is fat from fat separators) Waste from catering: 1900 kg/employee (of which 500 kg is fat from fat separators)
3	Description of the model and the factors applied	see 2.
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	The factors are based on data from 2005-2006.
Office paper		
1	Scope of the model (waste types and economic sectors covered)	We have assumed that office paper is the major paper waste (07.2 Paper and cardboard wastes) in some sectors. The factor was obtained by taken the total amount of collected office paper and divide it with the number of "office employees".
2	Basic data for the estimations (production figures etc.)	The total amount of office paper is obtained from the trade organisation. The number of "office employees" is obtained from Statistics Sweden. The waste factor derived for 2008 its 0,1568 kg/office employee
3	Description of the model and the factors applied	From the statistics a number of "office employees" in different sectors was obtained to calculate the amount of office paper in each sectors or sub sectors where no other data on paper and cardboard waste was available.
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	This factor is updated every year.
Waste from car dismantling		
1	Scope of the model (waste types and economic sectors covered)	This model handles waste generated in dismantling of cars. Many facilities within NACE 38.3 and NACE 46.77 which carry out car dismantling are members of the Swedish Car Recyclers Association (SBR). Every year, the SBR carries out a questionnaire survey among its members, producing data on the number of scrapping certificates issued and on the quantity of waste generated for a number of selected waste types. We have had access to SBR's questionnaire. The figures have

<table>
<tr><td></td><td></td><td>instead been used to develop waste factors for each type of waste respectively.</td></tr>
<tr><td>2</td><td>Basic data for the estimations (production figures etc.)</td><td>The Swedish Road Administration compiles data on the total number of scrapping certificates issued in Sweden each year. Using simple multiplication of the waste factors and the number of issued scrapping certificates from the Road Administration, it is possible to obtain estimates of total waste quantities in tonnes for each type of waste. The waste factors used are according to the following table.
<table>
<tr><th>EWC-Stat</th><th>Waste type</th><th>Waste factor
kg per dis-mantled car</th><th>Relative error
%</th></tr>
<tr><td>01.1 H</td><td>Solvent wastes</td><td>0,02</td><td>100</td></tr>
<tr><td>01.3 H</td><td>Used oils</td><td>5,6</td><td>5</td></tr>
<tr><td>01.4 non-H</td><td>Spent chemical catalysts</td><td>3,3</td><td>80</td></tr>
<tr><td>02 H</td><td>Chemical preparation wastes</td><td>1,5</td><td>15</td></tr>
<tr><td>06. non-H</td><td>Metal wastes</td><td>49,5</td><td>25</td></tr>
<tr><td>07.1 non-H</td><td>Glass wastes</td><td>12,2</td><td>15</td></tr>
<tr><td>07.3 non-H</td><td>Rubber wastes</td><td>22,2</td><td>50</td></tr>
<tr><td>07.4 non-H</td><td>Plastic wastes</td><td>0,0</td><td>60</td></tr>
<tr><td>08.1 non-H</td><td>Discarded vehicles</td><td>874,5</td><td>2</td></tr>
<tr><td>08.41 H</td><td>Batteries and accumulator wastes</td><td>14,1</td><td>10</td></tr>
<tr><td>08. H</td><td>Discarded equipment, hazardous</td><td>0,5</td><td>5</td></tr>
<tr><td>08. non-H</td><td>Discarded equipment, non-hazardous</td><td>0,3</td><td>80</td></tr>
<tr><td>10.2 non-H</td><td>Mixed and undifferentiated materials</td><td>4,4</td><td>30</td></tr>
</table>
The relative error is based on how the waste factor has varied between different years 2003-2006</td></tr>
<tr><td>3</td><td>Description of the model and the factors applied</td><td>Processing of the questionnaire data began with the waste-types being converted to EWC-Stat codes by combining a number of variables (waste-types). The quantities of each waste-type were added together. Each waste factor was obtained by dividing the total quantities for each waste type by the number of scrapping certificates issued.</td></tr>
<tr><td>4</td><td>Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)</td><td>We have used factors based on dismantling figures from several years. It is to expect that the factors will be developed over time.</td></tr>
<tr><td colspan="3">Reuse of data for generation of ash and slag from combustion</td></tr>
<tr><td>1</td><td>Scope of the model (waste types and economic sectors covered)</td><td>This model concerns 12.4 Waste from combustion from NACE 35.</td></tr>
<tr><td>2</td><td>Basic data for the estimation of changes caused by changes in the fuel mix</td><td>Figures about use of different fuels is published by Statistics Sweden and by the Swedish Energy Agency.
Ash content for different fuels are given in literature as for example kg ash per kg of fuel. In addition, ash and slag from incinerators contains flue gas cleaning residues, sand from fluid beds etc.
Estimated specific production of ashes and slag for the main fuels used are listed in the following table</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Generated amount of ash and slag
weight-% per tonne wet fuel</th><th>Non-Hazardous</th><th>Hazardous</th></tr>
<tr><td>Heating Gas Oil</td><td></td><td>0,00%</td></tr>
<tr><td>Fuel oil</td><td></td><td>0,03%</td></tr>
<tr><td>Tall pitch oil</td><td>0,35%</td><td></td></tr>
<tr><td>Coal</td><td>6,5%</td><td></td></tr>
<tr><td>Natural Gas</td><td>0,0%</td><td></td></tr>
<tr><td>Peat</td><td>6,0%</td><td></td></tr>
<tr><td>Wood</td><td>2,7%</td><td></td></tr>
<tr><td>Municipal solid waste</td><td>20,0%</td><td>5,0%</td></tr>
<tr><td>Pellets, briquettes and wood powder</td><td>1,0%</td><td></td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Description of the model and the factors applied</td><td>In WStatR2008 (reference year 2006) the amount of ash and slag was obtained by a survey to all energy enterprises.
We based our estimate of the WStatR2008 figures, and used the specific ash productions on the changes in fuel use from 2006 to 2008
.</td></tr>
<tr><td>4</td><td>Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)</td><td>The straight use of the factors from the literature is not recommended, as mentioned above. As far as there are moderate changes in the fuel use, incineration plants and technique used this method may be acceptable for one or two more reportings, but then the base year (2006) should be updated.</td></tr>
</table>

Household waste from business		
1	Scope of the model (waste types and economic sectors covered)	This model concerns "10.1 Household wastes" generated in business. This factor can be used in all sectors, when there is no other data source for this waste (the surveys does usually cover the household waste).
2	Basic data for the estimations (production figures etc.)	The factor is 100 kg per employee. The number of employees is obtained from Statistics Sweden.
3	Description of the model and the factors applied	In the earlier reporting's (WStatR2006 and WStatR2008) a special analysis from enterprises (or rather local units) was made that has reported the household waste in the inquiries. The result showed that it was 100 kg/employee (+/- 10 %)
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	This factor is expected to develop. Improved source separation and waste prevention programs may change the amounts. Also changes in legislation concerning the definition of household waste from business may affect the factor. In Sweden there is a recent change in the legislation that household waste from business no longer will be regulated by the municipalities' responsibility.
Data from public companies, public agencies etc		
5	Scope for the OTHER information sources (waste types and economic sectors covered)	1. In the service sector data from several different public enterprises, authorities and agencies have been used, for example: Swedish Maritime Administration LVF (Swedish Aviation Authority) Swedish Armed Forces Swedish Rescue Services Agency They make their own surveys to cover their own needs. Usually they cover all kind of wastes from their sphere of interest. 2. Data about discarded vehicles in all sectors, see Section 5.1.4 above.
6	Description of the other information source which is not fitting to the type of information sources mentioned above	

Reuse of data from WStatR 2008 and WStatR2006		
5	Scope for the OTHER information sources (waste types and economic sectors covered)	Data from earlier surveys (WStatR2008 or WStatR2006) have been reused for some sectors, which have shown to have only small amounts of waste, especially small amounts of hazardous waste. These sectors are: 01-02 Agriculture, hunting and Forestry 03 Fishing 05, 06, 08, 09 Mining and quarrying (note: NACE 07 was surveyed) 10-12 Food, beverages, tobacco 13-15 textiles, wearing apparel, leather 16 Manufacture of wood (wood bi-products was classified as waste in the earlier surveys, but in this reporting it is excluded) 31-33 Manufacture of furniture, other manufacture, repair 35 Several sub sectors have been reused. Other sub sectors have been adjusted (e.g. according to quantity produced, number of facilities in service). Waste from combustion from waste incineration has been surveyed, see section 5.1.2. 36 + 38 Water supply, remediation and other waste management services These sectors and sub sectors have very small amounts of waste according to earlier surveys. It is to expect that the waste quantities have been changed in these sectors, but these changes has a very small impact on the total flow of each waste type.
6	Description of the other information source which is not fitting to the type of information sources mentioned above	Not applicable

2.5.6 DETERMINATION OF WASTE GENERATED BY HOUSEHOLDS

The data about waste generation from households (see Table 6 below) is retrieved from different trade organisations and producer's responsibility organisations that make own surveys of the wastes they handle.

Table 6: Determination methods for waste generated by households

1	**Indirect determination via waste collection**	
1.1	Description of reporting unit applied (waste collectors, municipalities)	The data about waste generation from households is retrieved from different trade organisations and producer's responsibility. These organisation make their own inquiries: Avfall Sverige collects data from all municipalities about household waste (including household waste from business) generation and treatment. Avfall Sverige also collects data of collected household waste from household (inquiry to the municipalities) The Packaging and Newspaper Collection Service are obliged to report data to Swedish EPA about collection and treatment of paper packages, plastic packages, glass packages, metal packages and newsprint. The Swedish Tyre recovery Association is obliged to report to Swedish EPA the amount of tyres collected and treated. El-Kretsen (producer's responsibility organisation for WEEE) report collected and treated amounts of WEEE. Remark: we have assumed that 08 Discarded equipment from household mainly consists of WEEE. The national cooperation of Swedish pharmacies collects data about medical wastes.
1.2	Description of the reporting system (regular survey on waste collectors, utilisation of administrative sources)	Data is retrieved from the sources above and experts.
1.3	Waste types covered	EWC stat codes: 01.1; 01.2; 01.3; 02; 06; 07.1; 07.2; 07.5; 08.41; 10.2
1.4	Survey characteristics (1.4a – 1.4d)	
	a) Total no. of collectors /municipalities (population size)	Not relevant
	b) No. of collectors/municipalities selected for survey	Not relevant
	c) No. of responses used for the calculation of the totals	Not relevant
	d) Factor for weighting	Not relevant
1.5	Method applied for the differentiation between the sources household and commercial activities	In all waste types also commercial waste is included. We have made a judgement from case to case of the amount from households. Discussions have been held with each data source.
1.6	Percentages of waste from commercial activities by waste types	Different for each type of EWC stat code.

2	Indirect determination via waste treatment	
2.1	Specification of waste treatment facilities selected	Not relevant.
2.2	Waste types covered	Not relevant
2.3	Method applied for the differentiation between the sources household and commercial activities	Not relevant
2.4	Percentages of waste from commercial activities by waste types	Not relevant

100 % of the population is served by municipal waste collection.

Data sets 2 - 5: Waste treatment

2.5.7 GENERAL DESCRIPTION OF METHODOLOGY FOR DATA COLLECTION ABOUT WASTE TREATMENT

Waste treatment in all sectors except NACE 35 (energy sector) has been estimated in a coordinated survey according to the following sections.

Waste incineration in NACE 35 facilites was determined as follows:

- Quantity of household waste incinerated, secondary waste generated, number of facilities and incineration capacity was determined within the waste treatment survey.

Quantity of other wastes incinerated is described in section 5.11

2.5.8 IDENTIFICATION OF RELEVANT TREATMENT FACILITIES

The registers used for identification of waste treatment plant are presented in Table 7. It is the register of environmental hazardous activities that has been the base register. The other registers have been used to check the completeness.

Table 7: Registers used for identification of waste treatment operations

Identification of register(s) used	Responsible institution or organisation	Description of register
Environmental hazardous activities.	Swedish EPA and the county administrations.	The register covers all activities that has permission to environmental hazardous activities (according to the Environmental Code). The register is obtained through SMP The Swedish Portal for Environmental Reporting. It is updated continuously by the county administrations.
Register of organisations with obligation to pay waste tax.	Swedish Tax Agency	It covers all organisations that have waste facilities with obligation to pay waste tax according to the Waste Tax Ordinance, in practise all landfills. The register is updated yearly.
Register of organisations with obligation to pay energy tax for incineration of household waste.	Swedish Tax Agency	It covers all organisations that have waste facilities with obligation to pay energy tax for incineration of household according to the Energy Ordinance, in practise all landfills. The register is updated yearly, but will be closed in 2010.
Avfall Sverige (Waste Management Sweden)	Avfall Sverige (Waste Management Sweden) is a trade organisation where municipalities, municipality-owned waste companies and private waste companies are members	The register covers all waste facilities that incinerate, compost, digest or landfill household waste. It is updated yearly through a survey to the municipalities. The register is voluntary.
Business Register	Statistics Sweden	All types of legal forms with some kind of economical activity are included in Statistics Sweden's Business Register. Earlier surveys have shown that waste treatment facilities, especially facilities run by municipalities, often can´t be identified as waste treatment facilities from the register. (the municipal waste treatment plants are often incorporated in other municipal activities and difficult to identify).
WStatR2006 and WStatR2008	SMED	The databases from the earlier surveys contain the treatment plants that have been identified in the earlier surveys.

The treatment plants were identified by their activity code in the register of environmental hazardous waste activities. Both primary codes and secondary codes were assessed. All activities with incineration, landfilling and biological treatment of more than 50 tonnes/year are in the register.

Some types of waste is legally incinerated in facilities without waste incineration permits. These facilities cannot be identified by there activity code and are therefore not included.

From the registers above 1256 facilities with permission or licence to treat waste were identified. Pre-treatment plants and sorting plants were included in this figure.

2.5.9 DATA COLLECTION ON TREATED QUANTITIES

The data on treated quantities were collected as follows:

1. We used the environmental reports as primary source. The environmental reports were available digitally through the Swedish Portal for Environmental Reporting (SMP). The content in the environmental report is regulated by a decree from the Swedish EPA. The decree states that the environmental report shall contain "production data".

2. If the environmental report was not available, or if it contained no usable data about treatment, data from WStatR2008 (reference year 2006) was reused (we reused data for 25 facilities). For incineration of household waste in NACE 35 facilities data from Avfall Sverige (Waste Management Sweden) was used for 15 of the 27 facilities, resulting in 100% response rate.

Data from more than 80 % of the facilities were obtained. No adjustment due to non-response (that is if no environmental report was available) was made, since it was judged that the non-responding facilities did not have any real activity of interest in 2008.

When evaluating the environmental reports, the information was first transferred onto a paper form, which was reviewed before it was put into the database. The following information was extracted from the environmental reports:

- Treatment method (according to WStatR; plus pre-treatment and sorting; the treatment 4 Other recovery was divided into composting, anaerobic digestion and other recovery).
- Waste type (both EWC-Stat and List of Waste entries) and quantity treated.
- Waste generated at treatment plant (used for the waste generation survey), except for the NACE 35 incineration facilities.
- Capacity of plant for each treatment. When the capacity or the permitted treatment quantity was not given in the environmental report, a model calculation was used, assuming that the facility worked close to the upper capacity or permission, see next Section. For the NACE 35 incineration facilities the capacity was estimated from the activity code when data was not given in the environmental report.
- All facilities were identified with a code giving the location on NUTS3 level.

The amounts of treated waste and the capacity was then summarised. The number of plants in each NUTS 2 region was also counted.

2.5.10 DATA COLLECTION ON CAPACITY OF TREATMENT FACILITIES

Data on capacity were collected from the environmental reports parallel with the data collection on waste treatment, see above.

In first hand, capacities for recovery and disposal means licensed capacity for waste treatment. When the licenses capacity is not applicable, the "technical capacity" for treatment facilities should be identified and used for reporting.

The environmental report shall contain information about given permits and production data. However, the permits are usually expressed in terms that are difficult to convert to WStatR terms:

- Landfill capacity is often given as height of landfill, area of landfill, permission to landfill the waste that has been generated (for industrial landfills), allowed landfilling per year, etc.
- Some integrated plants with several treatment methods (e.g. landfilling, composting and sorting) sometimes have a permission to manage a certain amount of waste per year, without any specification on the separate treatment methods.
- A lot of the material recovery occurs in the manufacturing industry which handles both virgin raw materials and secondary raw materials (waste).
- For energy facilities, maximum quantity of supplied fuel in energy units (for example MW or MWh/year) is often used, which is not relevant to describe the annual incineration of waste at the facility. Defining capacity for the incineration of waste in an unambiguous and relevant way is a problem in the energy sector. Many qualities of wood waste are, when used as fuel, equivalent to other wood fuels. Because incineration is almost exclusively carried out to produce district heating and, to a certain extent, electricity, the maximum fuel consumption of a facility is not a relevant measurement of annual waste incineration capacity. Annual fuel consumption is instead determined by the need for heat production.

When relevant capacity data have been missing, the following principles to calculate the capacity have been employed:

- For landfilling, it was assumed that “the average landfill” has a licence for 5 more years. Often, but not always, the permit or licence is granted for 10 years, after which time a new assessment is required. The capacity has then been calculated as the volume of five annual quantities of landfilled waste.

- For other treatment methods, it was assumed that the permitted capacity is approximately the same as the treated quantity, i.e. that the facilities receive close to the maximum quantity of waste allowed. This method was not used for the NACE 35 incineration facilities.

The capacity and number of facilities in different regions have been retrieved automatically from the database.

2.5.11 QUANTITY OF WASTE INCINERATED IN THE NACE 35 FACILITIES

Data on quantities incinerated was reused from WStatR2008 (reference year 2006) for all types of waste except household waste. Some data have been changed and the reasons are given below.

03.1, hazardous Chemical residues:

Tall pitch oil used as fuel is now classified as by-product and not waste. In WStatR 2008 all chemical residues incinerated consisted of tall pitch oil.

07.5, non-hazardous Wood waste:

Wood spills from saw mills as well as pulp and paper industry are now classified as by-products and not waste. The remaining quantity of wood waste has been estimated.

The incineration of wood waste has increased substantially between 2006 and 2008. Data on incineration of RT-chips from Svensk Fjärrvärme (Swedish District Heating Association) was used to estimate a more accurate value for 2008.

09 Animal and vegetal wastes (excluding 09.11 and 09.3)

Logging residues and other wood fuels from forestry is now classified as by-product and not waste. The remaining quantity of waste has been estimated.

2.5.12 DEFINITIONS AND INTERPRETATIONS OF IMPORTANCE FOR THE STATISTICS

In the survey, a broad interpretation of the concept of waste according to the EU waste directive (2008/98/EC) and to the judgments of the European Court of Justice has been applied.

By-products of wood and felling residues from forestry have been regarded as by-products and not waste. Also some metal scrap has been classified as by-product, when the quality has been well specified and it has been sold directly by the manufacturing industry to a metal work.

Generated quantities of waste may have been counted twice in the event of a waste firstly being generated as one type of waste and during treatment becoming another type of waste. For example, when waste is sorted in different facilities, new waste is generated from the old waste. This may, for example, be mixed industrial waste or bulky waste from households which is sorted into different recoverable materials, combustible waste and landfill residue. Another example is end-of-use vehicles (hazardous waste), which when dismantled generate end-of-use vehicles (non-hazardous waste). The new fractions generated during sorting are classified as generated waste.

In connection with recovery, a waste has been classified as waste until it has become a new product or part of a new construction, etc.

Water-containing waste has normally not been classified as waste if it has undergone a treatment process at the site of generation. One example is leachate from landfill sites (classified as EWC-Stat 03.2) which is treated before being released into sewers or into recipient surface water. Other sewage-related waste has also been classified in this way.

Recovery is, as stated above, when the waste has become a new product or part of a new construction, etc. Recovery preparations, e.g. sorting, fragmentation, evaporation, dewatering, etc., in the recovery statistics have not been included. This interpretation ensures that recovery is not reported twice, since one particular waste flow is only reported once in the statistics on the recovery of waste.

In Accordance with the Waste Statistics Regulation, waste recycled internally (internal recycling is when the waste is material recycled in the same facility where it has been generated) is not reported, either as generated waste or as recovered waste.

Incineration of municipal waste and most industrial facilities and waste fuels used in the energy sector are classified as R1, Use as fuel. These facilities have been primarily built to produce energy and not to dispose of waste. It is estimated that these facilities will comply with the "R1 energy efficiency requirement" in Annex II in the waste directive.

Waste from mining is included in the survey of the Mining and quarrying sector (NACE C). Some of the waste from mining is used in various ways to restore the mining pits (terracing, landscaping and such like). This has been classified as Landfilling D1.

6. Foreseen Changes

The strategy for improvement in how to produce waste statistics:

- The burden of respondents shall be as low as possible. This means that environmental reports and other administrative sources will be primary data sources, and direct inquiries will be used in sectors/for enterprises that don't have to make environmental reports.
- Resources will be allocated to waste flows that are of certain interest. For example hazardous waste and wastes that is of concern for the environment or for the natural resources.
- In sectors and sub-sectors with low amounts of waste full surveys will be conducted when needed.
- The production of statistics will consider the national need of waste statistics.

The waste directive (2008/98/EC) will be implemented in the Swedish legislation at latest in December 2010.

The implementation of the waste directive may lead to a change of the definition of household waste from business, which may lead to changes in the collecting of data.

Part II: Report on quality attributes

This report on quality attributes includes descriptions of the quality of the statistics, according to the guidelines from Eurostat. Important aspects are the relevance of the statistics, their accuracy and precision, accessibility and clarity, comparability, coherence and the burden on respondents.

1. Relevance

Relevance (validity) refers in general to whether you measure what you intend to measure. Relevance refers here also to how the statistics are used on a national level and how complete the produced statistics are (using the requirements in the waste statistics regulation as a starting point).

Apart from the reporting obligation to the EU in accordance with the waste statistics regulation, statistics on waste generation and recovery and disposal of waste are needed in Sweden for the follow-up and development of environmental policies, the 16 environmental quality objectives and action plans.

The existing waste statistics are considered to be useful for both the follow-up and the development of action plans in this field, even if follow-up indicators and other uses based on the statistics need to be developed.

There are many different users of waste statistics - citizens, politicians, municipal, regional and national authorities, central government offices, industry, researchers, etc.

The datasets in the reporting are complete. The value zero (0) has been reported in some cases, based on expert assessments that the quantity of waste of a certain category is close to zero.

2. Accuracy

presents the key aggregates reported. The presented coefficients of variation show how uncertainty estimates for these key aggregates have been done. Coefficients of variation for the sample surveys as well as estimates of uncertainties in other methods and systematic errors are included.

Uncertainties have been produced for all surveys, and an assessment of the certainty of the figure for each piece of data has been made. Appendix 2 Accuracy in all sectors presents discussion on errors and uncertainties in different sectors and how coefficients of variation have been estimated.

Table 8. Totals and coefficients of variation for the key aggregates in 2008.

Country: Sweden Reference year: 2008		Total hazardous waste (key aggregates),	Total non-hazardous waste (key aggregates)	Coefficient of variation hazardous waste	Coefficient of variation non-hazardous waste
		Tonnes	*Tonnes*	*%*	*%*
Generation of waste					
1	**Households**	348 748	4 044 254	3	4
2	**Enterprises**	1 714 641	80 060 947	7	1
Recovery and disposal of waste					
1	**Incineration with energy recovery R1**	100 154	8 311 096	6	3
2	**Incineration as a means of disposal D10**	86 805	375	11	4
3	**Recovery R2-R11**	424 997	9 392 662	19	6
4	**Landfilling D1, D3, D4, D5, D12 Land treatment and release to water D2, D6, D7**	384 266	62 651 749	9	5

UNCERTAINTY IN THE SURVEYS

In cases where data on the generation of waste and on the recovery and disposal of waste have been produced from surveys (questionnaire or environmental reports as the data source), statistical uncertainty (coefficients of variation) is created when extrapolations are carried out. This concerns surveys of waste in Mining and quarrying and Manufacture. The variance is calculated according to the formula:

$$\hat{V}(\hat{t}_z) = \sum_{h=1}^{H} \frac{N_h^2}{m_h}\left(1-\frac{m_h}{N_h}\right)\frac{1}{m_h-1}\left[\sum_{k=1}^{m_h} z_{hk}^2 - \frac{\left(\sum_{k=1}^{m_h} z_{hk}\right)^2}{m_h}\right]$$

where, $\hat{t}$ = *point estimate*

H = *number of strata*

N_h = *population in stratum h*

m_h = *total responses in stratum h*

r_h = *number of elements in stratum h*

y_k =*k-te variable value in stratum h*

The estimate's mean error is then calculated using $SE(\hat{t}) = \sqrt{\hat{V}(\hat{t})}$ after which the relative mean error or coefficient of variation are calculated using $rmf = \frac{SE(\hat{t})}{\hat{t}}$ The variance coefficients have then been given in per cent.

UNCERTAINTY IN DATA FROM OTHER SOURCES

In cases where sources other than questionnaire surveys with sampling form the basis of the inventory, uncertainty estimates are based on subjective assessments. An uncertainty assessment has been made for every figure produced, by assessing within which interval the true value lies with 95% probability. In sample questionnaire surveys, where the standard deviation and variation coefficient can be calculated, the true value is assumed, with 95% probability, to lie at the most 2 standard deviations over or under the statistical value that has been estimated. When an equivalent uncertainty interval was set up using other survey methods, a fictive standard deviation was obtained so that a fictive variation coefficient could be calculated that could be compared to the variation coefficient developed from the sample questionnaire survey.

We have used the following grounds for assessment when assessing uncertainty.

When assessing uncertainty, the uncertainties for total **hazardous waste and total non-hazardous waste** should in principle be considered as independent of the individual types of waste. Individual types of waste can often give major uncertainties in questionnaire surveys, due to uncertainties in classification, whilst their combined total is more certain.

For sectors where everything were not covered (e.g. Services (NACE G-U, uncertainty is put on what has been developed and then the under coverage is described under the relevant heading in the Quality report.

Distorted distributions can be approached in two ways; an assessment must be made for each individual case:

- Adjust the point estimate so that it lies between the most likely highest and lowest value respectively. This is mainly done if the interval is credible but the actual estimate is more uncertain.
- Adjust the uncertainty interval. For example, if the uncertainty is deemed to be -20% to +50%, ±35% is specified. This is done if to keep the point estimate is requested.

The uncertainty for the entire sector or a group of waste-types can be lower than the uncertainty per waste-type since the quantity can be certain but uncertainties in the classification mean that individual waste-types can be uncertain.

Model for 95% confidence interval for **qualified, substantiated expert assessment:**

- ±30% equivalent to the variation coefficient 15% in more complicated cases (heterogeneous sectors with many types of waste, e.g. Construction)
- ±20% equivalent to the variation coefficient 10% in simpler cases (homogenous sectors with few or straightforward types of waste)

Hazardous waste from transporters: For hazardous waste data, taken from transporters, the confidence interval has been set to ±40%, i.e. variation coefficient ±20%.

Model for 95% confidence interval for **figures reused from last time**: It is reasonable to assume that the waste quantity can change by 2% per year. That will be 4% in 2 years, in other words the confidence interval increases by 4% on two years, i.e. the variation coefficient increases by 2% in two years.

Model for 95% confidence interval for **figures projected from last time**: Here, the odd factor is used for the projection itself which should reflect the change in the sector. If it is reasonable to assume that the projection factor really does reflect waste generation, the same variation coefficient as last time can be used. If it is uncertain how certain the projection factor is, or if data is projected for more than two years, the confidence interval should be increased by 1-2% for each two-year period.

Model for 95% confidence interval for **industry expert guess work**: ± 50-60% equivalent variation coefficient 25-30%.

Model for 95% confidence interval for **"expert guess work":**
± 100% equivalent variation coefficient 50%.

Waste factors: When the factor is actually developed for other purposes (e.g. for waste planning or just to exemplify magnitudes), difficulties arise. If no other information is forthcoming, the uncertainty for a waste factor should be confidence interval = ±50% to 100% equivalent variation coefficient 25% - 50%. The value can be greater or less depending on what other information is forthcoming.

Waste factors for household waste (100 kg/worker): confidence interval ± 20%, variation coefficient 10%.

Waste factor for office paper waste: the quantity data are reasonable reliable, but the number of office workers is less certain. A confidence interval of ±50% was assumed, equivalent variation coefficient 25%.

Waste factor for degradable waste from shops, restaurants, institutional kitchens (in NACE G-Q). Waste factors from Avfall Sverige have been used. Similarly, the confidence interval was set to ±50%, equivalent variation coefficient 25%.

Questionnaire surveys - sampling: When data is extracted from the working database and extrapolated for sampling (extrapolation is also carried out for non-response), a variation coefficient is also obtained. In WStatR2006, this variation coefficient was used as it was. In WStatR2008 and WSTatR2010, the uncertainty has been considered as a preliminary gross uncertainty that can be adapted by the sub-project. For example, this may be needed where the background data are made up of environmental reports, data on recovery from trade organisations, reused data from last time, etc.

Questionnaire surveys – total population:
An ideal questionnaire survey with a 100% response rate will give a variation coefficient = 0. In addition, there may be processing errors, incorrect classifications, incorrect responses, incorrect inputting of data, etc., which mean that the values in the database are associated with some uncertainty. Likely errors

must be assessed from case to case. Neither is the response rate in a real survey equal to 100%, without any non-response. Uncertainty assessments are made on the figures produced, the non-response is dealt with in the quality report.

Environmental reports as a data source: The content of an environmental report should in most cases be assumed to be true. It is known that incorrect and contradictory data can occur, but they can in general be considered reliable. A processing error does occur, however, when the content is converted to WStatR format, e.g. convert types of waste to EWC-Stat or interpret different waste treatment methods. This applies in particular when waste codes are not stated or when treatment is poorly specified. Likely errors must be assessed from case to case. It can be reasonable to assume that the uncertainty (confidence interval) is ±10 % for environmental report compilations.

Surveys from trade organisations and public enterprises (Swedish Forest Industries Federation, Jernkontoret, Swedish Maritime Administration, etc.). The sector organisations have contributed in different ways

- In NACE 17 – 18 and NACE 24 - 25, we have obtained data from the Swedish Forest Industries Association and Jernkontoret on individual mills/works, and they have been considering as questionnaire responses in the survey, see above.
- In NACE G-U, the Swedish Maritime Administration did its own questionnaire survey to Swedish ports and we received the results in one cluster. They should then be more compared to a qualified expert assessment and afforded a little more uncertainty (e.g. ± 20% confidence interval).
- The sector organisations' survey request data on different wastes that are common in each sector respectively and they use their own terminology, i.e. in accordance neither with the list of waste in the waste regulation nor with EWC-Stat. Some of the sector organisations have therefore used terminology which is not unequivocally compatible with EWC-Stat. This leads to classification error for the types of waste in question, which should in such cases be added to the previous uncertainty for the waste-types, but not for the total amount.

LIST OF UNCERTAINTIES IN KEY AGGREGATES

It has been assumed that the different sub-sectors are independent of one another when they are summed to the key aggregate. The standard formula for propagation errors can thus been applied:

$$U_{total} = \frac{\sqrt{(U_1 * x_1)^2 + (U_2 * x_2)^2 + \ldots + (U_n * x_n)^2}}{x_1 + x_2 + \ldots + x_n}$$

Where:

U_{total} is the percentage uncertainty for the total waste quantity

x_i is the incoming waste quantity

U_i is the percentage uncertainty for waste quantity x_i

WET AND DRY QUANTITIES

Inventories of some types of waste (mostly sludge and dredging spoils) have been performed using both dry and wet quantities, whilst other types are just total quantities (which are the same as wet quantities). The key aggregates have been summarised using the dry weight of industrial effluents, common sludge and dredging spoils.

In Appendix 2 the generation and treatment of sludge expressed as both wet and dry quantity is presented.

3. Timeliness and punctuality

A general time schedule for the reporting according to the EU waste statistics regulation is shown in Table 9.

Table 9. Time schedule for reporting waste statistics

Activity	Start	Completed
Planning, preparations and supplementary method developments	1 April 2009	31 May 2009
Data collection and processing	15 May 2009	15 February 2010
Compilation of statistics	2 January 2010	1 March 2010
Compilation of checking documentation	2 January 2010	1 March 2010
Drafting of Quality Report	1 March 2010	1 May 2010
Final checking of statistics and documentation	1 March 2008	30 April 2010
Data processing (checks of accuracy, completeness etc.)	15 Jan. 2010	15 April 2010
National independent controls and approval for reporting	1 May 2010	30 June 2010
Drafting of national statistical report	1 April 2010	30 August 2008
Supplementary work, follow-up, archiving	30 April 2010	30 September 2010
Delivery of statistics and quality report to Eurostat		30 June 2010
National publication of statistical report		30 September 2010

4. Accessibility and clarity

Statistics on waste generation and recovery and disposal of waste and the current quality report are planned to be published on the website of the Swedish Environmental Protection Agency[4] at the end of June 2010, when reporting to Eurostat is complete. A statistical report will be published in September 2010, in which the numerical material will be presented and discussed.

The intention for this quality report is to be a resource for more advanced statistical users in order to increase clarity regarding methods and checking procedures, for example.

The statistics have been collected according to the Official Statistics Act and the Public Access to Information and Secrecy Act. Environmental reports are accessible to the public. In order to reduce the amount of confidential data in the final statistical tables, respondents have been asked on the questionnaires whether they are willing to relinquish their right to confidentiality. Some critical respondents have also been contacted and asked if the figures can be published.

[4] www.naturvardsverket.se

5. Comparability

COVERAGE AND PRECISION

The regulatory framework and guidelines from Eurostat have been followed as far as possible. All surveys have been carried out to achieve 100% coverage of waste quantities. This should guarantee that the statistics are comparable with corresponding statistics from other member states. However, the following areas should be highlighted as somewhat problematic concerning comparability:

- The concept *household waste* contains, apart from waste generated by households, both in practice and legally, similar waste from shops, offices and other business. The majority of waste flows, such as bag and dustbin waste, packaging waste, electronic scrap, etc. contain both waste generated by households and waste from different operations. For every waste flow included in household waste (according to EWC-Stat), an assessment has been made by industry experts of how much originates from households and how much from other operations.

- The distinctions between waste and by-products have had a considerable effect on the statistics and hence on comparability with other countries.

- Local unit, establishment, facility, station or equivalent has mostly been used as survey objects. A local unit, facility, station or equivalent can have several different activities, one main activity and several secondary activities. In this case the entire local unit, facility, station or equivalent has been classified by its main activity. For example, coking plants can be found at steelworks. Independent coking plants should be classified as NACE 19 and steelworks as NACE 24. In our survey, coking plants at steelworks have been classified as belonging to NACE 24, and the waste generated there has been allocated to NACE 24.

Resources and efforts have consciously been evenly distributed to ensure that, as far as possible, the same care has been taken with all the sub-surveys. Some industries have, for natural reasons, been harder to survey than others, resulting in some differences in the precision of the final results.

REGIONAL COMPARABILITY OF WASTE TREATMENT

Validation of data regarding treatment of waste

Data on waste treatment facilities have as far as possible been checked against other administrative data and other sources (e.g. Avfall Sverige (Waste Management Sweden), the tax authority, trade organisations and WStatR2006 and WStatR2008).

Statistical units
The objects have been different in different sub-surveys. Those used include local unit, facility, enterprise and sector.

Mobile waste treatment
For the generation of waste and the recovery and disposal of waste, mobile equipment has been reported where it has been used. Capacity data have, however, been reported in the home town. Only very few mobile operations have been found in the survey, so the locations of these facilities is not considered to have any significant impact on the total reported quantities of waste or treatment capacities.

COMPARABILITY OVER TIME
The current survey is basically comparable to the survey carried out prior to the previous reporting. There are though two major exceptions that give relatively large changes between WStatR2008 and WStatR 2010:

1. The new NACE revision has changed some reporting items.
2. Some materials, especially wood residues from saw mills, felling residues from forestry and excaveted soils from construction, were classified as waste in WStatR2008, but has been classified as by-product and –non-waste in the current reporting.
3. Some survey methods have been changed, especially for waste treatment, which may influence the results.

Changes in key aggregates for 2008 when compared to 2006 are shown in Table 10 and are explained below.

Table 10: Changes in key aggregates for 2008 when compared to 2006

Country: Sweden **Reference year: Changes 2008 compared to 2006**		**Total hazardous waste (key aggregates)**	**Total non-hazardous waste (key aggregates)**
		%	%
Generation of waste			
1	Households	-29%	5%
2	Enterprises	-21%	-27%
Recovery and disposal of waste			
1	Incineration with energy recovery R1	-52%	-55%
2	Incineration as a means of disposal D10	-16%	-69%
3	Recovery R2-R11	25%	-64%
4	Landfilling D1, D3, D4, D5, D12 Land treatment and release to water D2, D6, D7	2%	-6%

The results so far have shown that there are relatively large uncertainties associated with the results produced. This means that even if the results are comparable, it can be difficult to interpret the differences. The differences can, in some cases, reflect statistical uncertainties and, in other cases, be due to actual changes.
The difference for generated waste from Households is mainly due to that discarded vehicles (hazardous waste) are partly excluded from Households and are allocated to other sectors in WStatR2010. For non-hazardous waste there is an increase of plastic waste due to that more plastics are collected separately and there is a small decrease of Glass, due to a decreased consumption of beverages in glass bottles.

For Enterprises the decreased waste amounts for hazardous waste is due to a new methodology for data collection and that different data sources have been used in the different submissions. The exclusion of by-products has resulted in decreased non-hazardous waste amounts and finally the amounts of sludges have been summarized based on dry weights which decreases both hazardous and non-hazardous waste amounts.

Waste for Incineration with energy recovery has decreased in WstatR2010 due to that by-products are not included (for example tall oil, wood from sawmills and felling residues from forestry).

Incineration as means of disposal has mainly decreased due to the close down of one facility and due to that sludge has been summarized based on dry weights in WStatR2010.

Recovery has higher amounts of hazardous waste due to that more waste streams have been included in the survey, especially for oil waste, and is hence not due to a real increase in waste amounts. The high decrease of non-hazardous waste is due to that large amounts of excavated soils from construction are not included (this year excavated soils are not included in neither generation nor treatment).

WStatR 2012
Results from the next survey (which will be reported in 2012 and refers to generation of waste and waste treatment during 2010) will be possible to compare with this year's survey. There are some foreseen changes that have been discussed in Part I Section 6 that depends on the new waste directive and on planned changes in WStatR.

6. Coherence

The Swedish official statistics on generated and treated waste quantities are planned to be based on the same statistical information (same surveys, scope and limitations of statistics) as the statistics that are to be reported to Eurostat.

7. Burden on respondents

An evaluation has been made of burden on the respondents. Table 11 shows the total time different actors have spend on producing the statistics. The time for Swedish Environmental protection Agency is not included, neither is the time for their consultants (the SMED consortium). Since existing environmental reports and data from trade organisations, that was produced anyhow, have been used, the total burden is very low.

Table 11. Burden on respondents

Survey / Source	Type and total number of respondents	Actual no. of respondents	Estimated time per respondent (hours)	Total time required for response (hours)	Measures taken to minimise the burden
Transporters (Construction sector)	4	4	25	100	
Transporters (hazardous waste in Service sector)	8	4	25	100	
Trade organisation, public enterprises	15	15	8	120	
Total				**320**	

Appendix1. Accuracy in all sectors

Sampling errors
Sampling errors occur when only a selection of the local units/facilities/enterprises that are included in the group in question is surveyed. The error is due to the degree of variation in the data and can be controlled by choosing the right sample design.

In the sample surveys the sampling errors is assessed by the coefficients of variation.

Non-sampling errors

Coverage errors

Population
To compile data adapted to the waste statistics ordinance, different methods have this time been used for different sectors, as described in Part I. In the surveys for waste generation reaching 100 % coverage have been strived for :

- In sample survey model calculations for small local units (less than 10 or 20 employees) based on data from 2004, see Sweden's Quality Report from WStatR2006[5].
- When using waste factors activity data that covers the whole sector, have been used when applicable (for example turn-over, number of employees).
- When using other kind of methods (e.g. sample survey to transporters, or surveying only major enterprises as in NACE 46.77) proportional adjustment to reach 100 % coverage have been made. The adjustment factor has been assessed by for example number of employees or turn-over.

Coverage errors regarding the population occur when the survey method results in waste:

- Quantities from some local units/facilities included in the target group being missed in the survey, known as “undercoverage”.
- The same local unit or facility is included in several sub-surveys, known as “overcoverage”.

Coverage errors lead to waste quantities either being missed or counted twice.

Under- and overcoverage problems that have been detected in connection with the collection of data include local units with incorrect NACE codes in the Business

[5] Quality Report for statistics on generation and recovery and disposal of waste in Sweden 2004 according to EU Regulation on Waste Statistics 2150/2002. Swedish Environmental Protection Agency. Report 55594. June 2006.

Register and out-of-date information in the Business Register on local units that are no longer active or new enterprises starting during the last years (undercoverage).

It has been discovered that some of the local units have incorrect NACE codes in the Business Register. There were activity descriptions in the questionnaires in WStatR2008 and description in environmental reports. These descriptions can differ greatly from the industry code they have been given in the Business Register. Local units with an incorrect NACE classification have been excluded from the sample (over coverage).

Different frames

Different frames have been used in different surveys, i.e.:

- NACE 05 – 09 and NACE 10 - 33 are based on local units in the Statistics Sweden Business Register.
- NACE 35 (sub-sector Energy production from combustion) is based on the register of energy enterprises used for the official energy statistics.
- NACE 38 and NACE 46.77 and waste incineration plants in NACE E are based on the register of environmentally hazardous activities in SMP (The Swedish Emission Reporting Portal) operated by the county administrative boards and the Swedish Environmental Protection Agency, which covers facilities with permits for environmentally harmful operations according to the Environmental Code. Facilities with permits for the treatment of waste were selected from this database.

This may lead to overcoverage (object being counted twice in several surveys) as well as undercoverage (an object being missed by several frames). The different surveys have been checked against each other with the aim of detecting any objects that have appeared in several of the frames. Any cases identified where data have appeared twice have been corrected. It is hence assumed that no data have been counted twice.

Household waste (municipal waste)

Household and similar wastes (i.e. EWC-Stat code 10.1) can arise within all activities. Household waste is included as a surveyed waste type in the surveys, e.g. within NACE D and NACE 38. Prior to commencing data collection, an analysis was performed during WStatR 2008 of how household waste from industrial sectors (examined in the questionnaire survey) had reported Household waste. The results showed that the average amount of generated household waste for about 1000 local units that reported household waste was around 100 kg per employee[6]. This figure has then been used in the sectors where no data from questionnaire surveys were obtained

[6] ARAP - Study of the use of waste factors. Study performed by SMED at the behest of the Swedish Environmental Protection Agency. 15 January 2007

In practice, sorted household waste (from business) can also have been classified as mixed and undifferentiated materials. Many enterprises usually have a sorted fraction for combustible waste. Household waste from business can often be put into a waste fraction called "combustible waste". In these cases the entire quantity has been reported as mixed and undifferentiated materials (EWC-Stat 10.2), even when it is suspected that 10.1 Household waste is included. We have also found that household waste often is not mentioned in the environmental report.

In the survey covering waste generated by households, it has been estimated how much of the household waste that originates from business operations and how much from households. The result showed that nearly 85% of the household waste was generated in households.

The service sector may need some special comments. The service sector survey has been designed to catch a number of interesting wastes or waste sources. We have judged that the waste that may be missing is waste that is collected by the municipal services, and by competing private waste companies. These wastes are usually constituents of the household waste. The household waste in the service sector was estimated by waste factors based on number of employees (100 kg/employee). Special factors, based on number of guests, have been used for hotels (0,1 kg/guest,night), camping grounds and caravan sites (0,5 kg/guest,night).

Internal recycling

Recycling at the same site where the waste was generated (known as “internal recycling”) has caused several interpretation problems when interpreting the environmental reports. According to the waste statistics regulation, neither the existence nor the recovery of these quantities should be reported but respondents can have included this in their responses without it being detected.

Coverage errors regarding waste quantities

The methods used are intended to give 100% coverage of waste generation, waste treatment and capacities. There is no reason to suspect that over- and undercoverage occurs to a greater extent than that which is described under the errors noted below. Data can be included twice in several ways. Some of the main examples of these are:

- Construction and demolition waste does not only arise in the construction industry but also in the manufacturing industry.
- A type of waste can be treated several times, within or outside a sector. Sometimes the waste classification changes after treatment and sometimes it does not.

We have interpreted the definition of waste rather broadly. Some difficulties affecting data collection have been due to the fact that respondents have in practice not fully applied the official definition. This concerns for example:

- By-products. The boundary between a by-product and waste is sometimes hard to define. The new waste directive specifies some criteria for when a residue product need not be classified as waste. Even if the directive is not implemented yet, some materials have been classified as by-product rather than waste, for example off-cuts from sawmills, felling residues from forestry and some metal scrap from the metal industry (where the quality of the scrap has been well defined and the enterprise in question has claimed that the scrap is sold to a steel mill. Clean excavated material that are used as construction material have been excluded (the quantities that has been handed over to the waste management sector have been counted as waste). Data on these wastes are associated with uncertainties since many respondents do not consider this material as waste.

- Liquid water-containing waste that is released into sewers. There is a legal definition of waste, but not of waste water. In practice, some liquid wastes that are released into waste-water systems may be classified as non-waste/waste-water by the respondents, even if it in principle should be a waste.

Waste treatment facilities

In the survey of waste treatment a register of all permitted or licensed waste treatment plants are used. The register was checked against other sources (including WStatR2006 and WStatR2008) to really identify all waste treatment plants, see Section 5.2 in Part I above. Environmental reports were the main data source except for the NACE 35 waste incineration facilities. If environmental reports were not available, and we judged that the facility was active, data from WStatR2008 was reused. If data was not available from environmental reports and there was no data from WStatR2008, we regarded the facility as inactive. A special study for those non-responses was made and it was found that they were inactive: older facilities that have closed down but still were registered or new facilities with new permits or licences that still were in the planning or building stage. This approach was not used for the NACE 35 incineration facilities.

The register of waste treatment plants included all facilities with a permitted or licensed treatment capacity of more than 50 tonnes/year of incineration, landfilling and biological treatment. Treatment plants with lower capacity have been excluded. This exclusion is considered to be of no importance, there are only a few known facilities with such a low capacity and they have no influence on the waste statistics. For waste incineration in NACE 35, however, substantial quantities of waste is probably incinerated in facilities without a waste incineration permit. These facilities cannot be identified by their activity code and are therefore not included.

The register of all permitted or licensed waste treatment plants does not contain any facilities with permission to release waste to water. However, we have judged that release to water occurs mainly from facilities already in the register (for example landfills releasing leachate water), or from industries that are studied in

the waste generation survey (in which also treatment not included in our register was looked for). There is also information from WStatR2006 and WStatR2008 about facilities with release of waste into water.

We have earlier found that it is difficult to survey recovery in manufacturing industries. The respondents often have a broad concept of "recovery", and in earlier questionnaire surveys it was found that respondents often classify different kind of pre-treatment as "recovery" and "recycling". For the WStatR statistics is required the "final" recovery or recycling when the waste cease to be a waste and is transposed to a new product, material or construction. Often industries does not classify that as recovery or waste treatment, they regard it as use of secondary raw materials. Special efforts have been made to survey the real "final" recovery and recycling, and to exclude different kinds of pre-treatment and sorting.

Interpretations of recovery and disposal

We have applied the following interpretations and limitations regarding recovery and disposal:

1. Incineration: recovery operation

The incineration of waste in Sweden is, in general, classified as a recovery operation: R1 Use as fuel. Waste incineration facilities are integrated in the district heating system and, to a certain extent, also in electricity production systems. Facilities are designed to produce district heating and electricity. In most cases, the facilities are also run by private or municipal energy companies and not by waste management companies. This applies also to facilities that incinerate household and similar wastes. In Sweden, these constitute base production units in the district heating network to which they provide heating.

2. Incineration: disposal operation

One large-scale facility in NACE 38 that incinerates hazardous waste has been classified as D10 Incineration on land. Even if this facility produces electricity and district heating, it was assumed that it was designed and is operated primarily with a view to disposing of waste and, only in second place, for producing energy (this facility will likely be classified in the future as R1 Use as fuel according to the definition of R1 in the waste directive).

Also classified as D10 are crematories for animals, and some smaller incineration plants.

3. Recovery

When classifying recovery and when waste ceases to be waste, the Mayer Parry judgment (European Court of Justice judgment C-444/00) have been followed. This has meant that material recycling occurs mainly in the manufacturing industry. In waste statistics, only “final” recovery has been included when the waste becomes a new product in connection with a manufacturing process.

A waste ceases to be waste only when it has become a new product in a manufacturing process or until it is part of a construction. The use of wastes for covering closing waste landfills and/or as construction material has been classified as recovery, because the waste in these cases replaces other material. There may be some under coverage for this form of recovery. Large quantities of ash, slag and some inert waste are used as material in construction works, replacing another virgin material. We cover use as final coverage for landfill sites quite well, but recovery on various building sites, roadwork and the like has been difficult to survey.

Anaerobic digestion and composting, occurring primarily within NACE 38 and to a limited extent in manufacturing industries, has been classified as recovery. All licensed composting and anaerobic digestion facilities are included in the survey.

Different pre-treatment operations occur in several sectors (sorting, grinding, other processing) and these can lead to recovery, but these have been classified as pre-treatment, which is not covered by the reporting.

4. Landfilling

All licensed waste facilities with landfills are included in the survey. Landfilling also covers intermediate storage for more than one year. Waste from mining is covered in the survey on NACE C. Most of the waste from mining is used in various ways to restore the mining pits (terracing, landscaping and such like). This has been classified as landfilling D1, apart from in one case where, in our opinion, the waste really does replace another material.

5. Other disposal

Other disposal mostly refers to Release to water (D6 and D7) and Land treatment (D2). Treated and cleaned water, e.g. leachate from landfill sites or some industrial water-containing wastes have not been considered as waste in this year's survey when they have been subject to a more advanced cleaning process.

6. Pretreatment

Some facilities in manufacturing industries have had large quantities of pre-treated water-containing oil waste. This treatment consists of the separation of oil and water using various physic-chemical methods. The water phase is often released via the sewers into a watercourse or a municipal sewage facility after purification, and the oil phase is sent on to an oil waste facility. That has been considered that, for this process, the treatment (separation) should not be reported according to the regulation on waste statistics (D9). Generated waste is made up of oil waste. In cases where the water phase is treated (which is the norm), the

treated water is not classified as waste when it leaves the facility. Untreated water is however classified as waste. The treated waste is only the untreated water that is released into watercourses (D6, D7). If the water is released to a municipal sewage facility, this is not reported as treatment.

Measurement errors

Measurement errors can occur when incorrect data are received from respondents and are not corrected during reviewing. Furthermore, estimated values have been permitted in the surveys. This can affect the precision of the quantities given.

Statistical units

Local units have been used as statistical unit in the surveys of Mining and Quarrying and Manufacture. In the surveys of NACE 38 and 46.77 **facilities** were applied. A "facility", in this case, is a unit that has a licence or permission for environmental hazardous activities. Usually a facility is equivalent to local unit, but there are exceptions. There are examples where one local unit consists of two facilities (two separate permissions or licences), as well as where a facility consists of two local units. New data for combustion in NACE 35 is based on facilities, while reused data from 2006 was based on **enterprises**.

We have used the same principles during WStatR2006, WStatR2008 and the current survey WStatR2010, and we have mapped out all connections between local units, facilities and enterprises, except in NACE 35 where only the connections between facilities that were investigated this year, and those enterprises investigated in WStatR2006 have been mapped.

The use of local unit and facility not kind of activity unit is the applicable statistical object in the survey. There is therefore a risk that several types of activities can occur at the same local unit. This is only a problem if the combination of activities leads to a classification under NACE codes outside the reporting sectors. We do not know how great this particular problem is and we do not have a method or the intention of solving it. This does not have any influence on the total amount, but may have on the distribution of waste between different sectors.

Interpretation of environmental reports

The information in environmental reports is not always unambiguous. The information can sometimes be interpreted in different ways, for example how a not coded waste shall be classified (e.g. the waste is called only "sludge") or how a certain waste treatment shall be classified (e.g. is it a pretreatment or is it a final treatment).

The corresponding error may also arise with inquiries. Then the respondents have to make the interpretation of the information that is put into the inquiry, and there is an obvious risk for misunderstanding and misinterpretation.

Errors in precision of quantities

Most quantities are based on weighing. In principle all waste management facilities are equipped with weighing-machines. Figures from waste generators are usually based on data from the waste management facilities.

Conversion factors have been used if other units have been reported. Conversion factors have been obtained from data from respondents and other experts, including Swedish Waste Management (Avfall Sverige), Statistics Sweden energy statistics, the Swedish Forest Industries Association (Skogsindustrierna), etc. Some of the conversion factors are not particularly controversial, such as tonne per m^3 of oil or tonne per m^3 of sludge, while problems have occurred when the waste has been mixed, for example, or when we do not know whether the waste has been compressed or not. The same conversion factors have been used in all sub-surveys for similar wastes.

Often the amount of “fluorescent tube” has been given in number instead of a weight measure. We have converted to a weight measure using 0.2 kg/item.

When checking the data in the environmental reports and questionnaires, we have carried out a rationality test: is the type of waste reasonable for the sector, is the magnitude reasonable, is there some other type of waste not given that should arise in the sector, etc. In several cases, we have detected relatively large errors in the submitted responses. There can however still be incorrect responses that we have not detected. It is hard to quantify these errors as we have made a lot of effort to eliminate them.

Information quality

In the survey environmental reports was used as data source. The environmental report is a legal requirement, and it is one of the instruments that the authorities have to inspect an environmental hazardous activity. The information in the environmental report is expected to be of high quality.

No questionnaires were used in WStatR 2010. When we earlier made inquiries with questionnaires, the paper forms and the design of the survey was discussed with the Board of Swedish Industry and Commerce for Better Regulation (NNR) and to The Swedish Association of Local Authorities and Regions. The questionnaires have also been discussed with Statistics Sweden's questionnaire design department.

Classification of waste

Common problems we encountered when collecting data from environmental reports were that the activities sometimes used own nomenclature for the waste:

1. "Oil wastes" (waste that contains oil) can be classified under several different codes according to EWC-Stat).
2. There has often been confusion between the three EWC-Stat codes Household and similar waste (10.1), Mixed and undifferentiated materials (10.2) and Sorting residues (10.3).
3. "Sludge" has occasionally been incorrectly classified: Industrial effluent sludge (03.2) should be coded as Common sludge (11) or vice versa;

Many respondents have submitted data on generated quantities of waste, often small quantities, in the "Other waste" section of the questionnaire. Where the respondents have noted the type of waste in words, we have moved this value to the appropriate EWC-Stat code. In other cases, we have mostly moved the value to Mixed, undifferentiated material (10.2), unless the local unit was included in the previous survey and we were able to see from this which type of waste it was.

Processing errors
Processing errors occur when the raw data are processed in various ways during the data production. The following processing errors can occur:

1. Checking errors. In the surveys, all the submitted questionnaires and environmental reports are checked and corrected. When larger possible errors have been detected, contact has been made with the respondent. Lesser errors have been corrected and some imputations have been carried out when data were missing. A processing error can occur when the person checking the questionnaire or environmental report misunderstands the responses and makes an incorrect amendment. Checking errors can result in incorrectly coded waste or an incorrect quantity for a specific type of waste.

2. Input errors. The questionnaires and environmental reports are checked and reviewed in paper format and then the data has been entered into a database manually. When entering the data, the "right figure" can be input in the "wrong place", or a mistake can be made (e.g. one digit too few or too many). The database also has a built-in system to prevent some of the most common input errors (only approved classification codes (for waste classification as well as treatment method).

3. Adjustment errors. A significant processing error can occur when carrying out extrapolation, in particular with questionnaire surveys. Extrapolation is carried out principally for the adjustment of inhomogeneous groups. If the sample group is small, it is easy for extreme values from one responding local unit to result in a considerable adjustment error. This is reflected at the same time in the coefficients of variation.

4. Coding errors - region. Coding errors related to regions are not relevant for this survey as the sample has been drawn from the register of hazardous activities, where the object is registered with county and municipality codes.

The processing errors mentioned above have been avoided by regularly checking the results. The project group has checked the results several times (individual types of waste in every reporting sector or sub-survey) in order to identify extraordinary values. Checks are made both before and after the input to the database. Industry experts, both within SMED and within the Swedish

Environmental Protection Agency, have also carried out review, assessing the rationality of the produced data.

Non-response error

The response rates have been given in Table 4 in Part I. In this year's survey a non-response was regarded when there were no data from the environmental report, and no data (micro-data) was possible to reuse from WStatR2008 or WStatR2006. Usually a proportional adjustment to compensate for the non-response was made. Thus it was assumed that the whole sample is homogeneous and that the respondents are representative for the non-respondents. The non-response adjustment and the sample adjustment are made at the same time. Such adjustments have been made for the surveys in Industry, NACE 46.77 and NACE 38.3 (sub-sector in NACE 38). With the assumption that the population is homogeneous, the coefficient of variation will reflect the uncertainties arisen by the variation within the sample group. In the waste generation survey for NACE 38.1 and 38.2 it was judged that the non-responses were from non-active facilities, and no adjustment was made. Also in the survey of waste treatment, except for the NACE 35 incineration facilities, it was judged that the non-responses were from non-active facilities, and no adjustment was made.

When making adjustments for non-response at least two different errors can occur:

1. There may be a poor correlation between the number of employees and waste quantities. This risk becomes smaller with every survey carried out so that better models can be developed to simulate the correlation between waste quantities and number of employees in the different NACE groups and size classes.

2. Some of the objects in the sample could be extreme in some way. As the values for these objects are then multiplied by a factor of 10 or more, when the sample has been sparse and there may also have been large non-response, the result can be a large overentimation of a particular type of waste. This risk for error is not easy to detect if the error is not so large that experienced waste and industry experts can detect it when checking various compilations. Even if this type of error is detected, it has not been clarified how it should be handled, which is why sometimes no measure has been taken.

We judge that the non-responses causes any extra uncertainties, more than is shown by the coefficient of variation.

Model assumption errors
The different models have been described above in Part I Section 5.1.5.

Reuse of date from WStatR2008 and WStatR2006.
Data from earlier surveys (WStatR2008 or WStatR2006) have been reused for some sectors, which have shown to have only small amounts of waste, especially small amounts of hazardous waste. These sectors are:

- 01-02 Agriculture, hunting and Forestry
- 03 Fishing
- 05, 06, 08, 09 Mining and quarrying (note: NACE 07 was surveyed)
- 10-12 Food, beverages, tobacco
- 13-15 Textiles, wearing apparel, leather
- 16 Manufacture of wood (wood bi-products was classified as waste in the earlier surveys, but in this reporting it is excluded)
- 31-33 Manufacture of furniture, other manufacture, repair
- Several sub sectors have been reused. Other sub sectors have been adjusted (e.g. according to produced quantities, fuels used or number of facilities in operation). Secondary waste generated from waste incineration has been surveyed. Data on waste incineration is reused.
- 36 + 38 Water supply, remediation and other waste management services

These sectors and sub sectors generally have small amounts of waste according to earlier surveys. It is to expect that the waste quantities have been changed in these sectors, but these changes has a very small impact on the total flow of each waste type. In NACE 35, however, the generation of combustion waste and solidified, stabilised and vitrified waste is of significant quantities. The sector also has a major contribution to the incineration of waste.

Waste from small enterprises
None of the surveys cover the entire reporting sector in question. The surveys are instead designed to capture data on the most important waste flows in the sector and then supplementary work has been done to achieve 100% coverage. An example of such supplementary work is as follows is manufacturing industries where results from WStatR 2006 have been used for enterprises with less than 10 employees (20 employees in certain sectors) that were not included in the frame.

Proportional adjustments
In NACE 38.3 (Recovery) and NACE 47.77 (Wholesale of waste and scrap) only major facilities were investigated (usually facilities that has permission to handle more than 10 000 tonnes per year of waste). Aa proportional adjustment according to number of employees (metal facilities in one group and non-metal in another) have been made. This calculation is based on the assumption that the waste generation is the same per employee in small enterprises as in big enterprises.

Waste factors

Waste factors have been used in several cases. In some cases the factors are based on current measurements, e.g. waste generation from car disassembling, household waste from enterprises, office paper. These factors can be regarded as rather accurate. In other cases data from literature, e.g. degradable wastes from shops and restaurants have been used.

The office paper factor has been projected by taking the quantity of office paper waste divided by the number of assumed office workers. The quantity of paper waste is an accurate figure, although the number of "office workers" is an uncertain one.

Avfall Sverige has developed a waste factor for degradable waste from shops in the service sector. The waste factor has been projected from a few numbers of local units, which means the accuracy is low. Furthermore, the waste factor should preferably be extrapolated using number of year-employees, something which is not possible with the statistics available. Number of employees has instead been used.

The waste factor for returns of food in the service sector is based only on data from one respondent and the quality is hence uncertain. Several enterprises responded that they did not have data on returns of food.

Waste from combustion

In the energy sector (NACE 35) the amount of waste from combustion has been estimated by reusing the figures from WStatR2008 (which were based on a total survey) and use of specific production of ashes and slag on the changes in the use of main fuels between 2006 and 2008. The specific production is based on amount of used fuel (tonnes). This method is more reliable than to use the specific productions of ashes and slag on the actual amount of fuels.

Appendix 2. Wet and dry matters.

Generated quantities of wet and dry sludges and dredging spoils

	Industrial effluent sludges, hazardous	Industrial effluent sludges, hazardous	Industrial effluent sludges, non-hazardous	Industrial effluent sludges, non-hazardous	Common sludges (excl dredging spoils)	Common sludges (excl dredging spoils)	Dredging spoils	Dredging spoils	Sum non-hazardous	Sum non-hazardous
EWC-Stat	03.2	03.2	03.2	03.2	11. excl. 11.3	11. excl. 11.3	11.3	11.3		
Hazardous (H)	H	H								
Dry/Wet	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Item 1	0	0	0	0	0	0	0	0	0	0
Item 2	0	0	0	0	27 334	6 834	0	0	6 834	27 334
Item 3	108	30	42 023	11 557	1 263	346	0	0	11 903	43 286
Item 4	195	13	272 787	62 255	107 807	17 305	0	0	79 560	380 594
Item 5	0	0	1 000	250	0	0	0	0	250	1 000
Item 6	35	9	127	26	679	187	0	0	212	807
Item 7	92	19	316 448	137 847	570 418	124 706	0	0	262 553	886 866
Item 8	1 173	270	2 933	733	164	4	0	0	737	3 097
Item 9	53 621	3 734	31 923	4 874	11 855	2 808	0	0	7 683	43 778
Item 10	155	8	8 298	3 851	4 133	1 210	0	0	5 060	12 430
Item 11	49 638	12 879	60 786	7 473	29	3	0	0	7 476	60 815
Item 12	11 291	1 901	673	181	839	21	0	0	202	1 512
Item 13	500	125	1 000	250	0	0	0	0	250	1 000

Item 14	587	97	2 231	250	0	0	475	36	286	2 706
Item 15	0	0	0	0	1 907 147	218 800	0	0	218 800	1 907 147
Item 16	26 628	1 794	7 410 790	74 072	82	10	0	0	74 082	7 410 872
Item 17	600	60	0	0	38	4	148 500	74 592	74 596	148 538
Item 18	93 470	11 323	0	0	550 350	137 589	0	0	137 589	550 350
Item 19	1 579	0	118 284	1 390	37	5	0	0	1 395	118 321
Item 20	0	0	0	0	850 260	85 026	0	0	85 026	850 260
SUM	239 673	32 261	8 269 303	305 008	4 032 436	594 858	148 975	74 628	974 494	12 450 714

Treated quantities of wet and dry sludges and dredging spoils

	Industrial effluent sludges, hazardous, wet	Industrial effluent sludges, hazardous, dry	Industrial effluent sludges, non-hazardous, wet	Industrial effluent sludges, non-hazardous, dry	Common sludges (excl. 11.3), wet	Common sludges (excl. 11.3), dry	Dredging spoils, wet	Dredging spoils, dry	Sum non-hazardous, wet	Sum non-hazardous, dry
EWC-Stat	03.2	03.2	03.2	03.2	11.	11.	11.3	11.3		
Hazardous (H)	H	H								
Wet/Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry		
Energy recovery	0	0	234 901	103 114	237 129	57 942	0	0	472 029	161 056
Incineration on land	39 300	786	0	0	0	0	0	0	0	0
Recovery	554	77	195 989	57 978	497 078	109 220	0	0	693 067	167 198
Deposit onto or into land	46 590	11 829	41 757	10 580	75 277	13 140	4 390	2 537	121 424	26 257
Land treatment or release into water bodies	0	0	1 138 261	11 351	0	0	144 110	72 055	1 282 371	83 406
Total treatment of sludges and dredging spoils	121 982	15 126	1 610 936	183 078	810 451	180 544	148 500	74 592	2 569 887	438 214