Quality Report

for statistics on generation of waste and recovery and disposal of waste in Sweden 2010, according to EU Regulation on Waste Statistics

May 2012

Agreement 307 1104

SMED on the request of SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Part I Description of the data

1 QR_WASTE_SE_2010_0

Quality report of Sweden according to EU Regulation on Waste Statistics

2 Identification

Country: *Sweden*
Reference year: *2010*
Description of data set(s) delivered: WStatR
Transmission date: 25 June 2012

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4 Parties involved/sources used in the data collection

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.

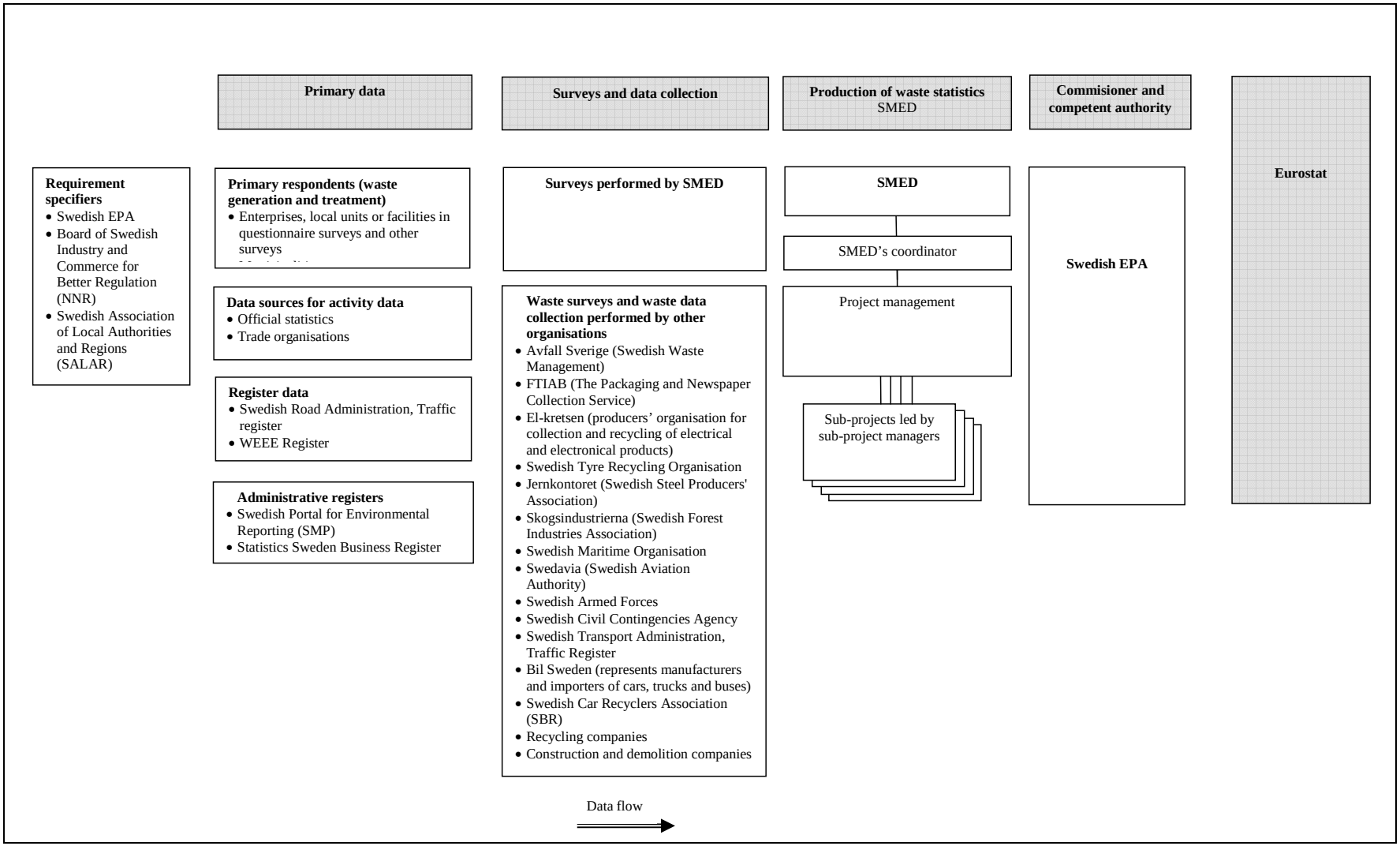

Figure 1: Organisation of the work and institutions involved

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. have 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 harbours.
• Swedavia (Swedish Aviation Authority)	• Data from airports.
• Swedish Armed Forces	• Swedish Armed Forces has provided data about waste from the Armed Forces facilities.
• Swedish Civil Contingencies Agency	• Swedish Civil Contingencies Agency has provided data about waste from rescue organisations.
• Construction and demolition companies	• Data on construction and demolition waste
• Waste management facilities	• Data on waste from construction and demolition
• Board of Swedish Industry and Commerce for Better Regulation (NNR)	• Specification of requirements for inquiries, e.g. recommendation of scope and layout of inquiries.
• Swedish Association of Local Authorities and Regions	• Specification of requirements for inquiries, e.g. recommendation of scope and layout of inquiries.

A quality system has been developed covering the areas of responsibility for SMED[1] and the Swedish EPA[2] for the reporting according to the waste statistics regulation. 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 (*in Swedish)*, 31August2010
[2] Swedish Environmental Protection Agency Quality Manual for reporting of waste statistics according to EU Regulation No 2150/2002 (*In Swedish)*

5 General description of methods

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

GENERAL DESCRIPTION OF METHODOLOGY – WASTE GENERATION

Several methods have been combined to collect 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
		NACE	01-03	04-09	10-12	13 -15	16	17 - 18	19	20 - 22	23	24 - 25	26 -30	31 - 33	35	36	37	39	38	41 - 43	G - U, excl. 46.77	46.77	HH
01.1H	Spent solvents	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
1.2	Acid, alkaline or saline wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
01.2H	Acid, alkaline or saline wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
01.3H	Used oils	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
01.4, 02, 03.1	Chemical wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
01.4H, 02H, 03.1H	Chemical wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
3.2	Industrial effluent sludges¤	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
03.2H	Industrial effluent sludges¤	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
3.3	Sludges and liquid wastes from waste treatment	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[6]	D	C[8]
03.3H	Sludges and liquid wastes from waste treatment	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
05	Health care and biological wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
05H	Health care and biological wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D1	C3	C	C	B[1]	A	E	B[3]	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
		NACE	01-03	04-09	10-12	13 -15	16	17 - 18	19	20 - 22	23	24 - 25	26 -30	31 - 33	35	36	37	39	38	41 - 43	G - U, excl. 46.77	46,77	HH
6.1	Metallic wastes, ferrous	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
6.2	Metallic wastes, non-ferrous	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
6.3	Metallic wastes, mixed ferrous and non-ferrous	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
7.1	Glass wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
07.1H	Glass wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
7.2	Paper and cardboard wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	E	A	E	B[3]	D	E	E	D	C[8]
7.3	Rubber wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
7.4	Plastic wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
7.5	Wood wastes	Non-H	A	C[0]	B[2]	B	A	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	E	C[7]	D	C[8]
07.5H	Wood wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[2]	D	C[8]
7.6	Textile wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
07.7H	PCB-containing wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[2]	C[2]	D	C[8]
08	Discarded equipment	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
08H	Discarded equipment	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
8.1	Discarded vehicles	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
08.1H	Discarded vehicles	H	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
		NACE	01-03	04-09	10-12	13 -15	16	17 - 18	19	20 - 22	23	24 - 25	26 -30	31 - 33	35	36	37	39	38	41 - 43	G - U, excl. 46.77	46,77	HH
8.41	Batteries and accumulators	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
08.41H	Batteries and accumulators	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[2]	D	C[8]
9.1	Animal and mixed food waste	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	E	D	C[8]
9.2	Vegetal waste	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
9.3	Animal faeces, urine and manure	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[5]	C[7]	D	C[8]
10.1	Household and similar wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	E	A	E	B[3]	D	E	E	D	C[8]
10,2	Mixed and undifferentiated materials	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[7]	D	C[8]
10.2H	Mixed and undifferentiated materials	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[2]	D	C[8]
10.3	Sorting residues	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[7]	D	C[8]
10.3H	Sorting residues	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[2]	D	C[8]
11	Common sludges¤	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	I	B[3]	D	C[6]	C[7]	D	C[8]
12.1	Mineral waste from construction and demolition	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	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
		NACE	01-03	04-09	10-12	13 -15	16	17 - 18	19	20 - 22	23	24 - 25	26 -30	31 - 33	35	36	37	39	38	41 - 43	G - U, excl. 46.77	46,77	HH
12.1H	Mineral waste from construction and demolition	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.2, 12.3, 12.5	Other mineral wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.2H, 12.3H, 12.5H	Other mineral wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	A	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.4	Combustion wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	A	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.4H	Combustion wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	A	A	E	B[3]	D	C[6]	C[2]	D	C[8]
12.6	Soils	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.6H	Soils	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[2]	D	C[8]
12.7	Dredging spoils	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	I	C[7]	D	C[8]
12.7H	Dredging spoils	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	B[1]	A	E	B[3]	D	C[6]	C[2]	D	C[8]
12.8, 13	Mineral wastes from waste treatment and stabilised wastes	Non-H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	A	A	E	B[3]	D	C[6]	C[7]	D	C[8]
12.8H, 13H	Mineral wastes from waste treatment and stabilised wastes	H	A	C[0]	B[2]	B	B	C[1]	C[2]	C	D[1]	C[3]	C	C	A	A	E	B[3]	D	C[6]	A	D	C[8]

Notation

A	Reuse of data from WStatR2008 (reference year 2006)
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
B[2]	Sample survey, where environmental reports were used as data source

B[3]	Sample survey by telephone
C	Environmental reports were used as main data source. For the rest of the sector a web-based sample survey was used.
C[0]	Total survey on NACE 07 (Mining of metal ores). Other sub-sectors in NACE 04-09 are reused. Old EWC-Stat 06 regarding reused sub-sectors has this year become 06.3
C[1]	For members of Swedish Forest Industries Association data from a survey by Swedish Forest Industries Association was used. For the rest of the sector data from WStatR2010 was used
C[2]	Reuse of data from WStatR2010 (reference year 2008)
C[3]	Sample survey: For members in Swedish Steel Producer's Association data from a survey by Swedish Steel Producer's Association was used. For the rest of the sector data from WStatR2010 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 Construction and Demolition companies. Waste generators in construction sector
C[6]	Survey to Waste management facilities for Construction and demolition waste.
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.
D[1]	Total survey of all facilities that write environmental reports. Reuse of the rest of the sector from WStatR2010
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. Also data about pre-treatment was collected (but not reported)

DETERMINATION OF WASTE GENERATION BY (SAMPLE) SURVEY

An overview of surveys (sample surveys and total surveys) are given in Table 4. Each survey is further described and discussed below after the Table.

Table 4: Waste generation in the economy – sample survey

		Item 3 (NACE 4-9; only NACE 7 surveyed)	Item 7 (NACE 17-18; only NACE 17 was surveyed)						Item 9 (NACE 20-22)						Item 11 (NACE 24-25)						
Description of the sample survey		Facilities	Facilities						Local units / Business Register, row 1-3 and 5-6 and facilities, row a-b						Facilities						
			20-49	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)	18						45	217	155	74	26	7	1							24
2	Number of statistical units selected for sample survey and questionnaires sent out	18						45	54	50	41	26	7	1							24
3	Number of non-responses (No answers, non-usable answers; non identifiable units)	0							50	38	32	13	4	1							
a	Number of responses from environmental reports	15							271												
b	Number of reused responses from WStatR2008	3																			
c	Number of responses through trade organisation	-						45													24
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	18						45	4	12	9	13	3	0							24
6	Enumeration factor	1						1	6	5	2,5	1	1	1							1

*) From Swedish Forest Industries Federation. The rest of the sector was reused from 2008 (WStatR210)

**) From Swedish Steel Producer's Association. The rest of the sector was reused from 2008 (WStatR210)

Description of the sample survey		Item 12 (NACE 26-30) Local units / Business Register, row 1-3 and 5-6 and facilities, row a-b						Item 13 (NACE 31-33) Local units / Business Register, row 1-3 and 5-6 and facilities, row a-b					
		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)	577	552	243	110	87	28	421	244	86	38	15	2
2	Number of statistical units selected for sample survey and questionnaires sent out	23	105	129	110	87	28	84	73	44	38	15	2
3	Number of non-responses (No answers, non-usable answers; non identifiable units)	18	157	106	79	42	16	76	59	35	25	10	2
a	Number of usable responses from environmental reports	54						0					
b	Number of reused responses from WStatR2010												
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	5	28	23	31	45	12	8	14	9	13	5	0
6	Enumeration factor	25	3	2	1	1	1	5	3	2	1	1	1

Description of the sample survey		Item 14 (NACE 39) 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
		0-4	5-10	10 - 19	20-49	50-99	100+	NACE 38.1-38.2	NACE 38.3	
1	Number of statistical units per strata and item according to the available register(s)	89	12	1	3*	1**	0	655	68	73 ##)
2	Number of statistical units selected for sample survey and questionnaires sent out	10	12	1	2	0		655	68 #)	73 #)
3	Number of non-responses (No answers, non-usable answers; non identifiable units)	5	3		2			86	12	13
a	Number of usable responses from environmental reports							569	56	60
b	Number of reused responses from WStatR2010							19	2	1
4	Part of 3: Number of incorrect register data (Non existing statistical units, non-identifiable units)							36	3	8
5	Number of statistical units used for the calculation of the totals							n.a.	n.a.	n.a.
6	Enumeration factor							1	2 (Employed according to Business register / Employed in surveyed facilities)	2 (Employed according to Business register / Employed in surveyed facilities)

*) One of which was over-coverage and removed from the sample

**) One of which was over-coverage and removed from the sample

#) Facilities handling more than 10 000 tons/year

##) Excluding 46.771 Wholesale of scrap cars

Surveys in Mining and quarrying and Manufacture sectors

The Mining and quarrying and Manufacture sectors cover 11 different items in the reporting of waste generation. Several different methods have been applied this time to produce waste generation data in those sectors.

Data from earlier surveys (WStatR2010, 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 often 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. For some sectors, units not registered as environmentally hazardous, data was also collected by web-questionnaires. Those sectors are the chemistry sector (NACE 20-22), workshops (NACE 26-30) and other industries (NACE 31-33). Information was obtained by means of sample surveys containing units with more than 10 employees (20 in some sub sectors). Statistical weighting was then performed, for all these sectors, using 6 different strata.
3. The Swedish Forest Industry makes a yearly survey among their members (a little less 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.
4. The Swedish Steel Producer's Association (Jernkontoret) makes an annual or biannual waste survey to their members (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.

When no data for a unit was available according to the above methods, data from WStatR2010 (reference year 2008) were reused. In some cases this implies that also data from WStatR2008 (reference year 2006) and WStatR2006 (reference year 2004) was used.

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 measured 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 sources were
   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. If no usable data was found in the environmental report from 2010, environmental reports from earlier was used when possible.

   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 2010.

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 the activities in NACE 38.3 and NACE 46.77 (excl. car dismantling) in the Business Register, it was found that the classifications of very similar activities in practice could be classified as either NACE 38.3 or 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.

Survey in NACE 39 Remediation activities and other waste management services

A small sample survey was made for NACE 39 Remediation activities and other waste management services. The business register contained 106 enterprises classified as NACE 39. The sector is dominated by small enterprises: there are only five enterprises that had 10 employees or more. The two largest enterprises were judged as over-coverage. They were already in the frame for NACE 38, and the descriptions of their activities also showed that NACE 38 was a more relevant classification than NACE 39. We made a sample of 26 enterprises (all enterprises that had 2 or more employees) and made telephone interviews. 10 of the respondents were not available at all. From the rest we got some estimates of kind of waste and the amount. Several had just “household waste” or similar collected by the municipality’s service.

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

No information has been based on data from waste collection.

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

End-of-Life-Vehicle

Statistics Sweden and the Swedish Agency for Transport Policy Analysis publish statistics about registration of vehicles, including private cars, lorries, cars, buses, trailers, semi-trailers, caravans, motor-bikes, mopeds class 1, tractors, snow mobiles. Also the organisation registration number (VAT number) of the owner, in the case of private car the birth registration number, is registered as well as the kerb weight of each vehicle. All changes in the ownership, as well as deregistering are reported to the register continuously.

A search in the register was made to pick out all information about all deregistered vehicles, including organisation registration number of the last owner and the kerb weight that were deregistered during 2010. 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, including households for vehicles owned by private persons.

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

WEEE and batteries

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 official EE- and Battery Register.

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

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 below.

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

Description of the models		
Waste from Construction (NACE 41-43)		
1	Scope of the model (waste types and economic sectors covered)	All wastes in NACE 41-43 Construction (except ELV)
2	Basic data for the estimations (production figures etc.)	The results obtained from the construction- and demolition sector were based on a combination of three different methods: • Waste factors • Survey to companies in the sector • Information from waste treatment plant
3	Description of the model and the factors applied	- **Waste factors:** Based on the results from several construction- and demolition projects in Norway from which data was obtained regarding amounts and types of waste being generated per m^2. These factors were adjusted to better adapt to the conditions in Sweden. Based on national statistics regarding new constructions, retrofits/conversions and demolitions, the total amount of waste for each type of waste was calculated using m^2 as a scale factor. - **Information from construction and demolition companies:** The major companies in the construction sector were contacted and information on the generated amount and types of waste was obtained. Based on this information and national statistics on sales the amounts were scaled up to a national level. The response frequency was however very poor. We contacted 30 enterprises and information was obtained from only two construction companies and one demolition company. The two construction companies which provided information had together a turnover equivalent to 15 % of the total construction sector. The corresponding percentage for the demolition company providing information was 9%. - **Information from waste treatment facilities:** The data were obtained from environmental reports which have been reviewed from about 1000 waste treatment facilities. In the review, all waste quantities originating from the construction and demolition sector (List of waste chapter 17) were collected. As the origin of the waste was not specified in

		many of the reports, this method underestimates the total amount of waste for some waste flows such as mixed and combustible waste. Waste streams which with certainty have their origins in the construction and demolition sector, have been assumed to originate from this sector. This regardless of whether it has been indicated in the environmental report or not. Examples of these waste flows are asbestos, contaminated soils and soils from construction works. The three methods have then been compared with each other. An expert panel has made a final assessment of which of the three methods is most appropriate to use for each EWC-Stat category.
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	
Animal and vegetable waste from trade		
1	Scope of the model (waste types and economic sectors covered)	09.1 Animal and mixed food waste 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 have been obtained from a study made within the project (SMED 99:2011) 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 retail sector: 565 kg/employee Waste from restaurants: 1059 kg/employee Waste from catering: 0.102 kg/portion The factors are most likely a bit low
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 2010. They are most likely underestimated since they are based on food that is thrown separately – most likely food is also thrown together with mixed wastes.
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 is 0,1266 kg/office employee

<table>
<tr><td>3</td><td>Description of the model and the factors applied</td><td>From the statistics a number of "office employees" in different sectors was obtained to calculate the amount of office paper in each sector or sub sectors where no other data on paper and cardboard waste was available.</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>This factor is updated every year.</td></tr>
<tr><td colspan="3">Waste from car dismantling</td></tr>
<tr><td>1</td><td>Scope of the model (waste types and economic sectors covered)</td><td>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 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 Transport 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 Transport 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-mant-led car</th></tr>
<tr><td>01.4H, 02H, 03.1H</td><td>Chemical waste</td><td>8,92</td></tr>
<tr><td>01.4, 02, 03.1 non-H</td><td>Chemical waste</td><td>3,3</td></tr>
<tr><td>06.3 non-H</td><td>Metal wastes</td><td>49,5</td></tr>
<tr><td>07.1 non-H</td><td>Glass wastes</td><td>12,2</td></tr>
<tr><td>07.3 non-H</td><td>Rubber wastes</td><td>22,2</td></tr>
<tr><td>07.4 non-H</td><td>Plastic wastes</td><td>0,0</td></tr>
<tr><td>08.1 non-H</td><td>Discarded vehicles</td><td>874,5</td></tr>
<tr><td>08.41 H</td><td>Batteries and accumulator wastes</td><td>14,1</td></tr>
<tr><td>08. H</td><td>Discarded equipment, hazardous</td><td>0,5</td></tr>
<tr><td>08. non-H</td><td>Discarded equipment, non-hazardous</td><td>0,3</td></tr>
<tr><td>10.2 non-H</td><td>Mixed and undifferentiated materials</td><td>4,4</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td>The relative error is based on how the waste factor has varied between different years 2003-2008</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">Generation of ash and slag from combustion and incineration</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 and 12.8 Mineral waste and stabilised waste from waste treatment 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 for energy production are published by Statistics Sweden and by the Swedish Energy Agency.
Ash contents for different fuels are given in literature as, for example, kg ash per kg of fuel and kg ash per MJ 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
<table>
<tr><th>Generated amount of ash and slag
weight-% per tonne wet fuel</th><th>Non-Hazardo-us</th><th>Hazar-dous</th></tr>
<tr><td>Heating Gas Oil (EWC-Stat 12.4)</td><td></td><td>0,00%</td></tr>
<tr><td>Fuel oil (EWC-Stat 12.4)</td><td></td><td>0,03%</td></tr>
<tr><td>Tall pitch oil (EWC-Stat 12.4)</td><td>0,35%</td><td></td></tr>
<tr><td>Coal (EWC-Stat 12.4)</td><td>9%</td><td></td></tr>
<tr><td>Natural Gas (EWC-Stat 12.4)</td><td>0,0%</td><td></td></tr>
<tr><td>Peat (EWC-Stat 12.4)</td><td>5,0%</td><td></td></tr>
<tr><td>Wood (EWC-Stat 12.4)</td><td>2,7%</td><td></td></tr>
<tr><td>Pellets, briquettes and wood powder (EWC-Stat 12.4)</td><td>1,0%</td><td></td></tr>
<tr><td>Municipal solid waste (EWC-Stat 12.8)</td><td>18%</td><td>4,5%</td></tr>
</table></td></tr>
</table>

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 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 reporting, but then the base year should be updated.

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 (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..
Data from public companies, public agencies etc.		
1	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 - Swedavia (Swedish Aviation Authority) - Swedish Armed Forces - Swedish Civil Contingences 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.
2	Description of the other information source which is not fitting to the type of information sources mentioned above	

Reuse of data from WStatR2010, WStatR 2008 and WStatR2006		
1	Scope for the OTHER information sources (waste types and economic sectors covered)	Data from earlier surveys (WStatR 2010), 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: • 01-03 Agriculture, hunting, Forestry and Fishing • 05, 06, 08, 09 Mining and quarrying (note: NACE 07 was surveyed) • 13-15 Textiles, wearing apparel, leather • 16 Manufacture of wood (wood bi-products was classified as waste in WStatR2006 and WStatR2008, but is excluded in WStatR2010 and WStatR2012 • 19 Manufacture of coke, refined petroleum products and nuclear fuel • 35 Some sub sectors with small amounts of waste 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 Water supply • G-Q – Data for hazardous waste has been reused from WStatR2008. • G-Q, waste from public cleansing (street, parks etc.) was reused. (In WStatR 2010 this was reported in sector 39, but has now been moved to G-Q (sector 81.29) 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.
2	Description of the other information source which is not fitting to the type of information sources mentioned above	Not applicable

DETERMINATION OF EXTRACTIVE WASTE GENERATION

The coverage of waste from mining is shown in Table 6. We have no data about topsoil, but topsoil seems to not occur in Swedish mines (metal ore mines).

Table 6: Coverage of waste statistics with regard to extractive waste[1)]

Coverage	Topsoil	Over-burden	Waste rock	Tailings (non-haz.)
Completely covered	n.a.	x	x	x
Partially covered	n.a.			
Generally excluded	n.a.			

1) Marked with X when the listed materials are completely covered, partially covered or generally excluded

DETERMINATION OF WASTE GENERATED BY HOUSEHOLDS

The data about waste generation from households (see Table 7 below) is retrieved from different trade organisations and producer's responsibility organisations that make own surveys of the wastes they handle.

Table 7: 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 organisations make their own inquiries: • Avfall Sverige (Swedish Waste Management) 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 is obliged to report data to Swedish EPA about collection and recycling 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) reports collected and treated amounts of WEEE. Remark: we have assumed that 08 Discarded equipment from household mainly consists of WEEE. • The national corporation of Swedish pharmacies have earlier collected data about medical wastes, but due to reorganisation no data was available for 2010.
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; 06.3; 07.1; 07.2; 07.4; 07.5; 08; 08.1; 08.41; 09.1; 09.2; 10.1; 10.2; 11
1.4	Survey characteristics (1.4a – 1.4d)	
	a) Total no. of collectors /municipalities (population size)	Not applicable
	b) No. of collectors/municipalities selected for survey	Not applicable
	c) No. of responses used for the calculation of the totals	Not applicable
	d) Factor for weighting	Not applicable
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.
1.7	Population served by collection scheme for mixed household and similar waste, in %	100

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

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.

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. Some materials have been classified as by-product rather than waste.

- Rest products of wood in sawmills (cuttings, sawdust and similar). This was applied already in WStatR2010.
- Felling residues from forestry. This was applied already in WStatR2010.
- Wood and bark from pulp and paper industry that are used as fuel. This is new for WStatR2012, and was reported as waste in earlier reporting.
- Metal scrap has been classified as by-product, when the quality has been well specified by the respondent, and it has been sold directly by the manufacturing industry to a metal work. This interpretation was made in WStatR2010 and now in WStatR2012.
- In the steel sector electric arc furnace and blast furnace slag have been classified as by-product in WStatR2012, but not in earlier reporting.
- Clean excavated materials from Construction that are used as construction material on-site have been excluded (only the quantities that have been handed over to the waste management sector have been counted as waste). This was applied already in WStatR2010.

Another distinction that is difficult to make is 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. Water-containing wastes have normally not been classified as waste if it has undergone a treatment process at the site of generation; however the treatment residue has been reported as generated waste.

Generated quantities of waste may have been counted twice in the event of a waste firstly being generated as one type of waste (primary waste) and during treatment becoming another type of waste (secondary 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 (secondary 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.

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.

Inventories of some types of waste (sludges and dredging spoils) have been performed collecting data about both dry and wet weight. In WStatR2010 and WStatR2012 the key aggregates, and the reported amounts, are based on the dry weights only.

Data sets 2 and 3: Waste treatment

GENERAL DESCRIPTION OF METHODOLOGY FOR DATA COLLECTION ABOUT WASTE TREATMENT

Waste treatment in all sectors, except NACE 35 (energy sector), has been investigated in a coordinated survey according to the following sections. The investigation was based on facilities registered as waste treatment plants in the register of environmental hazardous activities. Environmental reports were used as data sources.

Waste incineration in NACE 35 facilities was determined as follows. Information about quantities of household waste incinerated, and number of facilities and incineration capacity of facilities combusting household waste, was collected from Avfall Sverige (Swedish Waste management is a trade association in the field of waste management and recycling), and quantities of other wastes incinerated were reused from WStatR2010.

IDENTIFICATION OF RELEVANT TREATMENT FACILITIES

The registers used for identification of waste treatment plants are presented in Table 8. 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 8: 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 have 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.
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 economic activity are included in Statistics Sweden's Business Register. Earlier surveys have shown that waste treatment facilities, especially facilities run by municipalities, often cannot 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, WStatR2008 and WStatR2010	SMED	The databases from the earlier surveys contain the treatment plants that have been identified in the earlier surveys.

The waste 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 facilities with incineration, landfilling and biological treatment of more than 50 tonnes/year are in the register. Incinerator plants were identified by information from the trade organisation Avfall Sverige (Waste Management Sweden), see previous page.

Some types of waste are legally used as fuel in facilities without waste incineration permits. It is mainly industrial heating plants that use own rest products and waste as fuel together with ordinary fuels. These facilities cannot be identified by their activity code. Most of them have been identified in earlier surveys or in connection with the waste generation surveys, but there may be some facilities that are not included.

From the registers above 1106 facilities with permission or licence to treat waste were identified plus 30 incinerator plants in NACE 35. Pre-treatment plants and sorting plants were included in this figure.

DATA COLLECTION ON TREATED QUANTITIES

An overview of methods and sources for waste treatment is shown in Table 9.

Table 9: Determination of treated waste quantities

Description of data sources and methods by treatment categories					
Item 1 Incineration (R1)	**Item 2 Incineration (D10)**	**Item 3a Recycling (R2 – R11)**	**Item 3b Backfilling**	**Item 4 Landfilling (D1, D5, D12)**	**Item 5 Other disposal (D2, D3, D4, D6, D7)**
Use as fuel in NACE 17*: survey made by Skogs-industrierna (Swedish Forest Indust-ries Federa-tion) Incineration of household waste in NACE 35: data from Avfall Sverige Incineration of other waste in NACE 35: reuse of data from WStatR2010		Composting and land recovery in NACE 17*: survey made by Skogs-industrierna (Swedish Forest Indust-ries Federa-tion)		Landfilling of waste in NACE 24**: Survey made by Jernkontoret (Swedish Steel Producers' Association) Landfilling of waste in NACE 17: survey made by Skogsindustrier na (Swedish Forest Industries Federation)	Other disposal of Dredging spoils: from the reporting according to Helcom and OSPAR
All other facilities and wastes: Environmental reports from all registered facilities registered or known as waste treatment plant.					

*) Only members of Swedish Forest Industries Federation were surveyed

**) Only members of Swedish Steel Producers' Association were surveyed

The data on treated quantities were collected as follows:

1. For the following facilities/wastes information was collected separately:
    - Skogsindustrierna (Swedish Forest Industries Federation) makes an annual inquiry among its members about waste generation and treatment. The members are classified in NACE 17. Data from 45 facilities were gained. Treatment data covers use as fuel, composting (of sludges and bark wastes), recovery on land, and landfilling.
    - Jernkontoret (Swedish Steel Producers' Association) makes an annual inquiry among its members about waste generation and landfilling. Data from 24 members were obtained.

- For dredging spoils dumped at sea, data from the HELCOM and OSPAR reporting were used.
- Data about incineration (R1) of household waste in energy sector NACE 35 were taken from the trade organisation Avfall Sverige (Waste management Sweden). Other incineration (R1) in energy sector was reused from WStatR2010.

2. For all other treatment we used environmental reports:
   - 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. There is no standardizes reporting of waste treatment, but the decree states that the environmental report shall contain "production data".
   - If the environmental report was not available, or if it contained no usable data about treatment, we reused data from earlier environmental reports, or data from WStatR2010 (reference year 2008) was reused. We reused data for 35 facilities).

Data from more than 90% 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 in most cases did not have any real activity in 2010.

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; the treatment Other recovery was divided into composting, anaerobic digestion, land recovery (including landfill cover on closed landfills and use as construction material) and other recovery.
- Waste type (List of Waste or other classification) and quantity treated.
- Waste generated at treatment plant (used for the waste generation survey).
- Capacity of facility, when required. 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.
- All facilities were identified with a code giving the location on NUTS3 level.

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

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 mean 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.
- 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 in NACE 35 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, we used the latest data (from 2009) from the landfill directive reporting, where information about rest capacity was gathered by a survey to the county administrations. The rest capacity was decreased by the amount landfilled during 2010.
- 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.

The number of facilities in different regions has been retrieved automatically from the database.

DEFINITIONS AND INTERPRETATIONS OF IMPORTANCE FOR THE STATISTICS

In the survey of waste treatment we have applied the same interpretation of waste and of by-products as for waste generation, see page 29.

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.

Waste from mining is included in the survey of waste treatment. The treatment of mineral waste from mining is reported as

- Backfilling (use of waste for stowage of mines and quarries)
- Recovery (use as construction material)
- Landfilling (for example of rocky material)
- Other disposal (mainly tailings).

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

Incineration: recovery operation R1

The incineration of waste in NACE 35 (Energy) 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. In Sweden, these constitute base production units in the district heating network to which they provide heating. The energy efficiency as defined in the waste directive is well above 65%.

Energy plants in industry that use waste as fuel, for example cement industry, is included. Also industrial energy facilities that use their own waste as fuel are included, for example chemical industries using own solvent waste as energy source.

Incineration: disposal operation D10

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 mainly built for research and development.

Recovery

When classifying recovery and when waste ceases to be waste, the Mayer Parry judgment (European Court of Justice judgement 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 or a part of a construction.

The use of wastes for covering closed waste landfills and/or as construction material has been classified as recovery (see also Backfilling below). Also use of wastes for construction, e.g. road construction, is reported as recovery. There may be some under-coverage for this form of recovery since some wastes are used in construction works that are not registered as waste treatment facility.

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

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

Backfilling

Backfilling means a recovery operation where waste is used in excavated areas (such as underground mines, gravel pits) for the purpose of slope reclamation or safety or for engineering purposes in landscaping and where the waste is substituting other non-waste materials which would have had to be used for the purpose. This includes the use of waste for stowage of mines and quarries, and the use of waste for recultivation, land reclamation or landscaping.

Backfilling does not have a clear assignment to the R-codes. Depending on the wastes used for backfilling it may be assigned to R5 or R10. In both cases backfilling operations build a sub-set of the respective recovery operations.

We have classified a recovery operation as backfilling when the waste is used to backfill on excavated areas (such as underground mines, gravel pits). When the waste material has been used for special engineering construction purposes, for example covering of landfills or for road construction it has rather been classified as Recovery.

The main data source has been environmental reports. Backfilling has not been specified in any environmental report, so our judgement is based on the verbal description in the report.

Landfilling

All licensed waste facilities with landfills are included in the survey. Landfilling also covers intermediate storage for more than one year. Using waste material for construction purposes, for example covering of closed landfills, has been classified as recovery. However, use of waste for daily cover is usually classified as landfilling.

Surface impoundment of mine tailings has in earlier survey been classified as landfilling but is classified as "Other disposal" in WStatR2012.

Other disposal

Other disposal mostly refers to Release to water (D6 and D7) and Land treatment (D2), deep injection D3 and surface impoundment D4. The largest amounts of other disposal are surface impoundment of mine tailings and dumping of dredging spoils at sea.

Wet and dry quantities

Inventories of some types of waste (mostly sludges and dredging spoils) have been performed collecting data about both dry and wet weight. In WStatR2010 and WStatR2012 the key aggregates, and the reported amounts, are based on the dry weights only.

6. Major Changes

CHANGES COMPARED WITH PREVIOUS YEARS

Amounts of generated waste

The largest change of the amount of generated waste from 2008 to 2010 is the rise of mineral waste from the mining and quarrying sector. In 2008 the amount was 58.7 million tonnes, while in 2010 the amount was raised to 89 million tonnes. The reason for this is above all that the largest metal mine in Sweden has considerable increased the extraction of metal ore from 2008 to 2010, which of course has led to an enormous increased amount of waste rock and tailings.

In the paper and pulp sector the total amount of generated waste has decreased from 6.7 million tonnes to 3.6 million tonnes between 2008 and 2010. 0.6 million tonnes is a real decrease due to reduced production, while 3.2 million tonnes are explained by reclassification of wood and bark rest products to by-products in 2010. Above that a reclassification of some waste in EWC-Stat 07.2 to EWC-Stat 10.2 has been done for 2010.

The generated waste from construction sector has changed considerably between 2008 and 2010. The changes depend mainly on:

- The amount of dredging spoils has increased. The same methods were used in WStatR2010 and WStatR2012, and there is one major dredging project that is responsible to the increase.
- Mineral waste from construction has increased due to improved methodology - data on mineral waste from construction was collected in connection with the waste treatment survey. All treated wastes with LoW code beginning with 17 were assumed to have been generated in the construction sector.
- Changed of data collection method can explain most of the other changes.

The metal industry shows a decrease in the generated waste amount due to some slags have been classified as by-products by the respondents.

Amounts of treated waste

The total amount of treated waste has changed according to the waste generation: increased waste from mining and construction and decreased waste amounts from for example NACE 17-18 and NACE 24-25 due to by-product classification.

Use as fuel has decreased due to bark and wood residues from the pulp- and paper industry (NACE 17-18) has been classified as by-product in WStatR2012, but was reported as waste in WStatR2010.

Backfilling is a new treatment item and was previously reported as recovery.

Another significant change is the increase in other disposal and decrease in landfilling, due to the changes in these items. It is mainly mine tailings that were reported as landfilled in WStatR2010, but as other disposal in WStatR2012. The increased amount of dredging spoils also contributes to the increase of other disposal.

Key aggregates
The increase in generation, recovering and landfilling of non-hazardous waste and the decrease of incineration with energy recovery of non-hazardous waste is explained through the sub-chapters Amounts of generated waste and Amounts of treated waste above.

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 waste statistics will consider the national need of waste statistics.

The only known amendment today that affects the waste statistics is the implementation of the end-of-use-criteria for metal waste and paper waste may give other figures for generation of secondary waste and for recovery. It is also to expect that more rest products will be reclassified from waste to by-product.

7 Specific issues concerning the data collection on reference year 2010

Changes in waste categories

The changes of waste categories have not in general caused any problems. Most data has been collected in LoW categories and has been transposed to the appropriate EWC-Stat automatically.

However, some difficulties have arisen when reusing data from WStatR2010 and earlier. Most of the old EWS-Stat categories have been used without changes, but some has been more difficult. We have used the following principles when converting old categories to new:

Classification in WStatR2010 and earlier	**Classification in WStatR2012**
06	06.3 Mixed ferrous and non-ferrous,
06H	01.4H+ 02H+ 03.1H or 10.2H depending on the sector
09 excl 09.11 and 09.3	09.1 or 09.2 depending on the dominant waste types in the sector (vegetable waste or animal or mixed waste)
09.11	09.1
12	12.1, 12.2+12.3+12.5 or 12.6 depending on the dominant waste types in the sector (is it construction, soil or other mineral waste)

Backfilling

The main data source has been environmental reports. Backfilling has not been specified in any environmental report, so our judgement is based on the verbal description in the report.

We have classified a recovery operation as backfilling when the waste is used to backfill an excavated areas (such as underground mines, and gravel pits). When the waste material has been used for special engineering construction purposes, for example covering old landfills or for road construction it has rather been classified as Recovery than Backfilling.

Reorganisation of treatment categories

The reorganisation of treatment categories, for example moving of disposal operations D3 and D4 from item 4 to item 5, has not caused any problems. We have found that it is only tailings from mining that is covered by this reorganisation. We have not found any other wastes that are concerned.

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, the national waste management plan, and other 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 when the quantity of waste of a certain category is close to zero.

2 Accuracy

2.1 Sampling errors

KEY AGGREGATES

Table 10 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.

Table 10. Totals and coefficients of variation for the key aggregates in 2010.

Country: Sweden Reference year: 2010		**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**	366 754	3 671 518	7	6
2	**Enterprises**	2 148 660	111 431 545	7	3
Recovery and disposal of waste					
1	**Incineration with energy recovery R1**	82 826	6 178 215	4	4
2	**Incineration as a means of disposal D10**	85 829	914	4	4
3	**Recovery R2-R11**	245 358	16 341 734	4	4
4	**Landfilling D1, D3, D4, D5, D12 Land treatment and release to water D2, D6, D7**	355 733	87 185 144	4	4

UNCERTAINTIES IN DATA

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

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.

UNCERTAINTY IN DATA FROM STATISTICAL 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 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 from 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 bases 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 confident.

- **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%, then ±35% is specified. This is done if to keep the point estimate is requested.

- Model for 95% confidence interval for **qualified, substantiated expert estimate:**
    - ±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)

- 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 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 presented as it was. In WStatR2008, WStatR2010 and WStatR2012, the uncertainty has been considered as a preliminary gross uncertainty that can be affected by other factors. For example, this may be needed where the data for a certain sector are made up of several investigations: sample survey combined with 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** The sector or trade organisations have contributed in different ways
  - In NACE 17 – 18 and NACE 24 - 25, we have obtained data from Skogsindustrierna (Swedish Forest Industries Federation) and Jernkontoret (Swedish Steel Producers' Association) on individual mills/works, and they have been considering as questionnaire responses in the survey, see above.
  - 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:

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

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

2.2 Non-sampling errors

2.2.1 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 has 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[4].
- 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 construction enterprises, 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 “under-coverage”.
- The same local unit or facility is included in several sub-surveys, known as “over-coverage”.

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

Under- and over-coverage problems that have been detected in connection with the collection of data include local units with incorrect NACE codes in the Business 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 (under-coverage).

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 from 2008 and 2010. These descriptions can differ from the NACE 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.

[4] 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.

- NACE 38 and NACE 46.77 and waste incineration plants in NACE 35 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 over-coverage (object being counted twice in several surveys) as well as under-coverage (an object being missed by several frames). The different frames have been checked against each other with the aim of detecting 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. 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[5]. This figure has then been used in the sectors where no data from questionnaire surveys were obtained

In practice, sorted household waste (from business) can also have been classified as EWC-Stat 10.2 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 from business often is not mentioned at all in the environmental reports.

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 G-U excl. 46.77 may need some special comments. The Service sector surveys have 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

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

(100 kg/employee). Special factors, based on number of guests, have been used for hotels camping grounds and caravan sites .

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 under-coverage occurs to a greater extent than that which is described under the errors noted below.

We have interpreted the definition of waste according to European regulation and practices. During the last years there has been a tendency towards classifying some rest-products as by-products instead of waste. This means that rest products that earlier have been included in the waste statistics is no longer included. In all cases a rest product has changed classification to by-product from waste we have applied the "by-product rules" according to the waste directive.

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, WStatR2008 WStatR2010) 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 if we judged that the facility was active, data from earlier environmental reports, WStatR2008 or WStatR2010 was reused. If data was not available from environmental reports and there was no data from earlier surveys or earlier environmental reports, 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.

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. There are some heating plants in NACE E and NACE 10-33 that use some wastes as fuel, but without a waste incineration permit. There are also facilities in Manufacture industry that use different wastes or rest products as raw

material in their production without being registered as waste treatment facility. We have tried to identify as many as possible of these (for example in connection with the waste generation surveys), but there may still be an under-coverage.

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, WStatR2008 and WStatR2012 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.

2.2.2 Measurement errors

Measurement errors can occur when incorrect data are received from respondents (in questionnaires or in environmental reports) 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 one facility consists of two local units.

We have used the same principles during WStatR2006, WStatR2008. WStatR2010 and the current survey WStatR2012, and we have mapped out all connections between local units, facilities and enterprises.

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 big 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 waste shall be classified (e.g. when the waste is called only "sludge") or how a certain waste treatment shall be classified (e.g. is it a pre-treatment 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.

Quality of Information

In the survey environmental reports were used as one 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.

Questionnaires were used in WStatR 2012. When we make inquiries with questionnaires, the 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

In the questionnaires and in the use of environmental reports we have used LoW codes as primary data to label the waste. However, in many cases, both in questionnaires and environmental reports as well as in both waste generation and waste treatment, the respondents do not always apply the LoW classification, but use their own nomenclature, for example naming wastes as “other waste”, “rest waste”, “oil waste”,” sludge”, “combustible waste”, “landfill waste”, and similar. For those cases we have made a reclassification to LoW or EWC-Stat. However, several waste types are difficult to unambiguously classify to LoW or EWC-Stat:

1. "Oil wastes" (waste that contains oil) can be classified under several different codes according to EWC-Stat).
2. "Sludge" can be classified as Industrial effluent sludge (03.2) or Common sludge (11);
3. “Ash”, especially in waste treatment can mean both EWC-Stat 12.4 and 12.8.
4. “Other wastes” and “rest wastes” have usually been classified as EWC-Stat-10.2, unless further information was given.

2.2.3 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 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.

2.2.4 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 Manufacture 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 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 over-estimation 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 cause any extra uncertainties, more than is shown by the coefficient of variation.

2.2.5 Model assumption errors

The different models have been described above in Part I.

Reuse of data from WStatR2010, WStatR2008, and WStatR2006.
Data from earlier surveys (WStatR2010, WStatR2008 or WStatR2006) has been reused for some sectors, which have shown to have only small amounts of waste, especially small amounts of hazardous waste, see Table 5 in Part I. 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 have a very small impact on the total flow of each waste type.

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). A proportional adjustment based on the 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.

For food waste new waste factor has been developed within the project.

3 Timeliness and punctuality

A general time schedule for the reporting according to the EU waste statistics regulation is shown in **Fel! Hittar inte referenskälla.**11.

Table 11. Time schedule for reporting waste statistics

Activity	Start	Completed
Planning, preparations and supplementary method developments	Jan 2011	March 2011
Data collection and processing	March 2011	Feb 2012
Compilation of statistics	Sept 2011	March 2012
Compilation of checking documentation	January 2012	April 2012
Drafting of Quality Report	5 March 2012	13 April 2012
Final checking of statistics and documentation	March 2012	May 2012
Data processing (checks of accuracy, completeness etc.)	Feb 2012	March 2012
National independent controls and approval for reporting	March 2012	May 2012
Drafting of national statistical report	Jan 2012	April 2012
Supplementary work, follow-up, archiving	June 2012	30 September 2012
Delivery of statistics and quality report to Eurostat		30June 2012 or earlier
National publication of statistical report		Sept 2012

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[6] 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.

[6] 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), trade organisations, WStatR2006, WStatR2008 and WStatR2010), and other international reporting.

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 some exceptions that give relatively large changes between WStatR2010 and WStatR 2012:

1. The new categories of EWC-Stat in the reporting.
2. The latest NACE revision has changed some reporting items (waste from public cleansing reported in NACE 39 in WStatR2010 and in Services G-U excluding 46.77 in WStatR2012; also the frame NACE 31-33 was renewed in WStatR2012, and was based on the earlier NACE in WStatR2010).
3. There are two waste types in the steel sector which now have been classified as by-products: electric arc furnace and blast furnace slag. In paper industry bark and wood residues that are used as fuel have been classified as by-products.
4. Some survey methods have been changed, which may influence the results. For example changed methods for waste generation in Construction have given better data for some waste types.

The results so far have shown that there sometimes are relatively large uncertainties associated with the result. 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 or different interpretations of for example by-products.

Results from the next survey (which will be reported in 2014 and refers to generation of waste and waste treatment during 2012) will be possible to compare with this year’s survey. The only known amendment today is the implementation of the end-of-use-criteria for metal waste and paper waste may give other figures for generation of secondary waste and for recovery.

6 Coherence

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

7 Burden on respondents

An evaluation has been made of burden on the respondents. Table 12 shows the total time different actors have spent on producing the statistics. The time for Swedish Environmental protection Agency is not included, neither is the time for their consultants (the SMED consortium).

The burden shows the extra work for each respondent to give us the information they have available. In most cases trade organisations and public authorities have made own surveys, for their own use. This time is not included.

Table 12: 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
Construction and demolition companies (Construction sector)	7	2	8	16	
Trade organisation, public enterprises	15	15	8	120	
Hospitals	20	20	1	20	
Sample survey to local units	997 (sample)	234	1	234	
Total				**390**	