Quality Report

on Waste Statistics 2012
generation of waste and recovery and disposal of waste
accordning to EU Regulation on Waste Statistics

Sweden

CONTENTS OF THE QUALITY REPORT

Heading (file name) of the quality report

QR_WASTE_SE_2012_0

Quality report of Sweden accordning to EU Regulation on Waste Statistics

Identification

Country name: Sweden

Reference year: 2012

Description of data set(s) delivered

GENER	Waste generation by waste category (EWC-STAT) and economic activity (NACE), tonnes/yearGenerated waste 2012
REGIO1 and REGIO2	Number and capacity of recovery and disposal facilities (per NUTS 2 region)
TREATM	Waste treatment by waste category (EWC-STAT) and treatment category, tonnes/year
Key Aggregates	Totals and coefficients of variation for the key aggregates in 2012

Description av data sets submitted; the transmission format defines the three data sets which must be submitted

Transmission date

27 of June 2014

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1. DESCRIPTION OF THE 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 **Fel! Hittar inte referenskälla.** and **Fel! Hittar inte referenskälla.**.

A quality system has been developed covering the areas of responsibility for SMED[1] and the 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)*, 12 november 2012, version 4

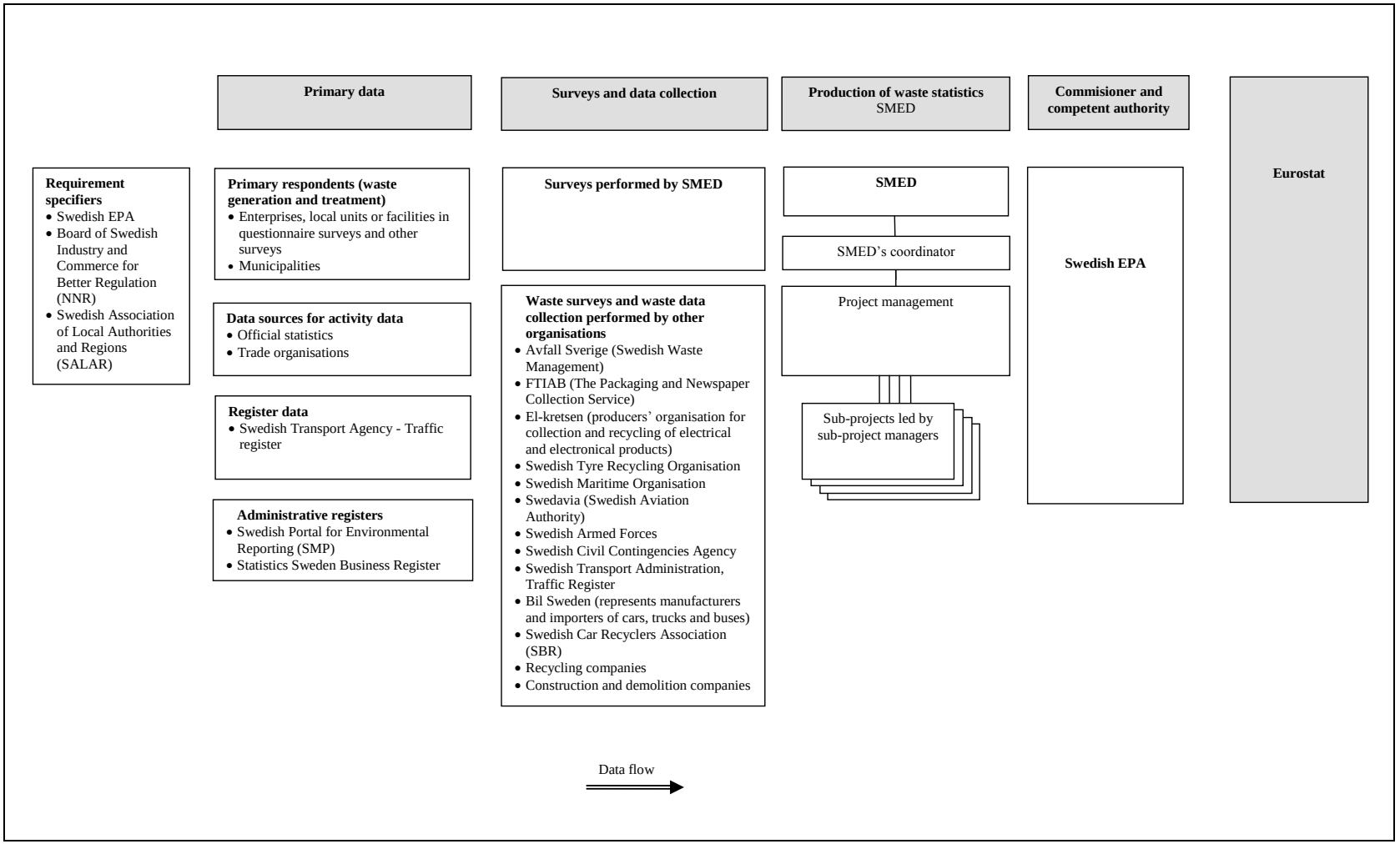
Primary data
Surveys and data collection
Production of waste statistics
SMED
Commisioner and competent authority
Eurostat
Requirement specifiers
• Swedish EPA
• Board of Swedish Industry and Commerce for Better Regulation (NNR)
• Swedish Association of Local Authorities and Regions (SALAR)
Primary respondents (waste generation and treatment)
• Enterprises, local units or facilities in questionnaire surveys and other surveys
• Municipalities
Data sources for activity data
• Official statistics
• Trade organisations
Register data
• Swedish Transport Agency - Traffic register
Administrative registers
• Swedish Portal for Environmental Reporting (SMP)
• Statistics Sweden Business Register
Surveys performed by SMED
Waste surveys and waste data collection performed by other organisations
• Avfall Sverige (Swedish Waste Management)
• FTIAB (The Packaging and Newspaper Collection Service)
• El-kretsen (producers' organisation for collection and recycling of electrical and electronical products)
• Swedish Tyre Recycling Organisation
• Swedish Maritime Organisation
• Swedavia (Swedish Aviation Authority)
• Swedish Armed Forces
• Swedish Civil Contingencies Agency
• Swedish Transport Administration, Traffic Register
• Bil Sweden (represents manufacturers and importers of cars, trucks and buses)
• Swedish Car Recyclers Association (SBR)
• Recycling companies
• Construction and demolition companies
SMED
SMED's coordinator
Project management
Sub-projects led by sub-project managers
Swedish EPA
Data flow

Table1. 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 and documenentation have been produced by SMED (only IVL Swedish Environmental Institute and Statistics Sweden have been involved) 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.
• Swedish Waste Management (Avfall Sverige)	Swedish Waste Management is the trade association for municipal waste companies and municipalities. 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 (The Packaging and Newspaper Collection Service) is responsible for collection and recycling of packages and newsprint according to theextened producer's responsibility legislation. They have provided data of generated and treated packaging and newsprint waste.
• 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
• SDAB Swedish Tyre Recycling Association (Svensk Däckåtervinning)	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.
• Swedish Steel Producer's Association (Jernkontoret)	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.
• Swedish Forest Industries Federation (Skogsindustrierna)	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
• Bil Sweden	Bil Sweden represents manufacturers and importers of cars, trucks and buses. They make a yearly survey of waste from their members.
• Swedish Maritime Administration (Sjöfartsverket)	Swedish Maritime Administration has provided data about waste from harbours.
• Swedavia	Swedavia is a state-owned group that owns, operates and develops ten airports across Sweden. Data from airports.
• Swedish Armed Forces (Försvarsmakten)	Swedish Armed Forces has provided data about waste from the Armed Forces facilities.
• Swedish Civil Contingencies Agency (Myndigheten för samhällsskydd och beredskap)	Swedish Civil Contingencies Agency has provided data about waste from rescue organisations.
• 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 (SKL)	Specification of requirements for inquiries, e.g. recommendation of scope and layout of inquiries.
• SDC, the forest industry's IT company	SDC has provided data useful for calculating wood waste to NACE 16 Manufacture of wood and wood products.

2. GENERAL DESCRIPTION OF WHICH METHODS ARE USED IN WHICH PART OF THE DATA SET

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

General description of methodology

Several methods have been combined to collect data. When selecting methods, a 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 the survey environmental reports were used as a 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 and does not increase 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 for a sector. For example a web survey 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 2 is the major method used.

Table 2. Description of 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		Mix of methods	Environmental reports	Environmental reports	Environmental reports, Web survey	Data from trade associations	Environmental reports, Web survey	Environmental reports	Reuse of data	Reuse of data	Environmental reports, Web survey	Reuse of data	Reuse of data	Web survey, Environmental reports and reuseof data	Reuse of data	Sewage sludge from official statistics, other waste factors	Reuse of data	Environmental reports	Mix of methods	Mix of methods	Environmental reports	Mix of methods
1.2																						
01.2H																						
..																						
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..																						
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..																						
12.8, 13																						
12.8H, 13H																						

3. DETERMINATION OF WASTE GENERATION BY (SAMPLE) SURVEY

The business register was used as base for the sampling, except for NACE 38 and NACE 46.77 where the register of environmentally hazardous activities was used. 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 has 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:

- 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).

For some sectors, units not registered as environmentally hazardous, data was also collected by web-questionnaires, see below.

Due to matching and classification problems (mainly caused by use of different classification systems in SMP and the business register, respectively), a number of the selected non-responding web survy objects showed to be covered by environmental reports. In these cases, data from the environmental report was used for imputation of the non-responding web survey object. There were also a few cases where one environmental report covered several local units in different strata (but same NACE group, e.g. 24-25) according to the business register.This makes it difficult to show number of responding units separately for web-survey and environmental reports. Hence the numbers of statistical units used for estimation shown in the sector specific tables for NACE 13-15, NACE 17-18 and NACE 24-25 in the following sections include a mix of web-survey answers and environmental reports.

Surveys in mining and quarrying (NACE 04-09)

For this sector, data was collected in a total survey of environmental reports covering all local units in NACE 07. Earlier studies, e.g. WStatR 2010, have shown that neglible amounts of waste are generated by the other NACE sections belonging to this item. Hence only NACE 07 was covered by the survey this time.

NACE 07						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	57	33	5	3	3	3
Local units sampled in web-survey						
Environmental reports (SMP)	23					
Over coverage	7					
Number of statistical units used for the calculation of the totals	16					

Surveys in manufacture of food products, beverages and tobacco (NACE 10-12)

The same methodology as in WStatR 2012 was used. The data source was all environmental reports belonging to local units in NACE 10-11. In this sector, the environmental reports do not cover all local units. A post stratification based on type of activity on a lower NACE level was used to calculate raising factors for different sub-populations in NACE 10-11:

Sub-population	Employees, total	Employees, covered by environmental reports.	Raising factor
Butcheries and meat product	10352	4913	2,11
Fish, shellfish	1804	823	2,19
Fruit, vegetables and beverages	6900	2388	2,89
Cheese, ice-cream, vegetable oils	2578	1010	2,55
Milk	3014	2857	1,05
Flour and fodder	2369	1352	1,75
Sugar production	333	327	1,02
Bakeries	13442	600	22,40
Other	7154	1510	4,74

The division into sub-populations was based on the assumption that similar production processes generate similar types and amounts of waste per employee. As no environmental reports exist for NACE 12, this part of the population was not covered.

NACE 10-12						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	352	271	88	54	31	11
Environmental reports (SMP)	124					
Over coverage / no useful data	22					
Number of statistical units used for the calculation of the totals	102					

Surveys in manufacture of textiles + wearing apparel and leather and related products (NACE 13-15)

All 15 environmental reports available in this sector were used. The local units covered by these reports were excluded from the sample frame to the web survey that was based on the business register. The sample design was a total survey in all strata except the strata 10-19 and 20-49 employees in NACE 13. However, it turned out that due to frame imperfections, some of the sampled local units were actually covered by environmental reports.

In total, 96 local units were included in the sample, of which 3 were covered by environmental reports and 3 were considered over-coverage (2 due to different codes in business register and

register of hazardous activities, and one was shut down before 2012). 29 of the selected units responded to the survey, but 5 of them refused to report data.

NACE 13-15						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	80	45	11	6	4	
Local units sampled in web-survey*	55	26	10	4	1	0
Environmental reports (SMP)	17					
Over coverage / no useful data	2					
Number of statistical units used for the calculation of the totals (environmental reports + web-survey respondents)	43					

*the number of sampled units in the total survey strata is lower than the total number of units in the business register because some of the local units are covered by the envirionmental reports.

Post stratification was used due to low response rate in some strata. Data from web survey and environmental reports, respectively, where allocated to separate strata. For estimation of totals, straight expansion within each stratum was used. For cutoff raising, the raising factor was equal to the total number of employees not covered by the environmental reports divided by number of employees in local units above the cutoff limit of 10 employees. The cutoff raising factor was 1.56.

Surveys in manufacture of pulp, paper and paper products + printing and reproduction of recorded media (NACE 17-18)

All environmental reports belonging to this sector (62 included useful data) were used. The local units covered by these reports were excluded from the sample frame to the web survey that was based on the business register. The cut-off was 10 employees for NACE 17 and 20 employees for NACE 18. The sample fractions for the web survey were as follows:

NACE	Sampling fraction					
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
17	0,20	0,50	1,00	1,00	1,00	-
18	0,00	0,20	0,30	1,00	1,00	1,00

The number of environmental reports, local units and useful responses are shown in the table below.

NACE 17-18						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	203	165	56	37	31	18
Local units sampled in web-survey	9	46	26	27	12	1
Environmental reports (SMP)	62					
Number of statistical units used for the calculation of the totals (environmental reports + web-survey respondents)	97					

The estimation routines were the same as for NACE 13-15. The cutoff raising factor was 1.17.

Manufacture of coke, refined petroleum products (NACE 19)

All manufacture of coke oven coke in Sweden takes place at two integrated iron and steel plants, which are included in NACE 24 and not in NACE 19. Hence, the survey of this sector covers petroleum refining and manufacture of lubricants etc. Only environmental reports were used as data source. In total, there were 14 facilities with useful environmental reports. These facilities cover all local units with 100+ employees and 9 of 10 facilities with 10-99 employees. The waste from local units with 0-99 employees not included in the environmental reports was estimated by using the raising factor (no. of employees on all local units with 0-99 employees)/(no. of employees on local units with 0-99 employees covered by environmental reports). The raising factor was 1.30.

NACE 19						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	1	5	5	-	3	1
Environmental reports (SMP)	14					
Number of statistical units used for the calculation of the totals (environmental reports)	14					

Manufacture of basic metals and fabricated metal products (NACE 24-25)

The calculation routines were the same as for NACE 17-18. In cases when data from environmental reports was not complete, data from the Swedish Steel Producers' Association was used for imputation. The cutoff limit was 20 employees and the cutoff raising factor was 1.72.

NACE 24-25						
Employees per local unit	10-19	20-49	50-99	100-199	200-499	500+
Local units (business register)	964	649	171	78	39	17
Local units sampled in web-survey	0	64	33	29	19	4
Environmental reports (SMP)	106					
Number of statistical units used for the calculation of the totals (environmental reports + web-survey respondents)	148					

Energy (NACE 35)

For combustion facilities, a total survey based on the register from the annual electricity-, heat- and gas survey (AREL) was used. 252 questionnaires were sent out and 96 repsonses received. The amount (MWh) of energy produced was used as help information to estimate the population totals. The responding units covered about 70% of the energy produced. For ashes from combustion, a more sophisticated approach was used, where the types and amounts of fuels combusted were accounted for.

Environmental reports were used for 4 gas suppliers. The amounts of waste from these facilities were negligible. Data for waste from renewable energy sources and electricity distribution companies were reused or extrapolated from earlier surveys.

Waste collection, treatment and disposal activities; materials recovery (NACE 38) and wholesale of waste and scrap (NACE 46.77)

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 2012, environmental reports from 2010 or 2011 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 2012.

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.

3. For dismantling of cars, data was used from the producer's responsibility organisation, Bil Sweden that is the umbrella organisation for all registered car dismantlers. Bil Sweden collects annually data covering 100 % of the registered car dismantlers and report to Swedish EPA. In Sweden there is an extened producer´s responsibility for end of life vehicles.

A list of facilities was extracted from the register of hazardous activities. The facilities (in 38.3 and 46.77 together) with useful environmental reports covered approximately 50 % of all employees. in 38.3 and 46.77 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.

	NACE 38.1-38.2						NACE 38.3						NACE 46.77					
Employees per local unit	10-19	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+
Local units (business register)	105	79	27	12	1	1	53	36	6	1			39	19	4			
Environmental reports (SMP)	310						56						60					
Number of statistical units used for the calculation of the totals	310						56						60					

There were 53 facilities with insufficient waste information in the environmental reports:

- 30 of the environmental reports did not have any waste data at all, but from the information in the environmental reports we draw the conclusion that these facilities did not have any activities that were expected to generate waste, nor did they have any waste treatment that has to be reported.
- Another 11 reports had classified waste data, that is available for the county administration only. From the information in the environmental report we judged that these facilities did not have any waste generation of importance (they were commercial recycling centers (collection centers), transfer stations, intermediate storage or similar.
- Another 11 environmental reports either had no waste data, or had the waste data classified, but was classified in NACE 38.3 or 46.77. These were compensated by the described numerical adjustment.
- There was 1 facility with classified information, and with activities that are expected to generate waste, and with treatment that should be reported. We did not make any imputation or adjustment for this.

4. DETERMINATION OF WASTE GENERATION IN THE ECONOMY ON THE BASIS OF INFORMATION ON WASTE TREATMENT

Data for waste generation in construction (NACE 41-43) has partly been taken from waste treatment, for more details see below (other methods).

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

Some data, for example discarded vehicles in all sectors has been determined on the basis of waste collection. Also, in Services data on food waste has been determined by waste collection, for more information see Other methods.

6. 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 extract 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[2]. 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.

7. DETERMINATION OF WASTE GENERATION IN THE ECONOMY ON THE BASIS OF OTHER METHODS

In some cases waste data has been reused from earlier years, see below. These sectors and sub sectors have very small amounts of waste according to earlier surveys.

Waste from Agriculture, Forestry and Fishing (NACE 1-3)		
1	Scope of the model (waste types and economic sectors covered)	All wastes in NACE 1-3.
2	Basic data for the estimations (production figures etc.)	The results obtained from this sector were based on a combination of several different methods, mainly: • Waste factors • Trade organizations and other companies • Official statistics • Input from the Service Sector in WStatR • Development project

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

		• Reuse of data
3	Description of the model and the factors applied	**- Waste factors:** Based on an erlier development project ("Metodutveckling för Jordbruks-, skogsbruks- och fiskesektorn" By Kjell Rasmusson, SCB and Jan-Olov Sundqvist, IVL. 2007.) **- Trade organizations and other companies:** Organizations such as Keep Sweden Tidy, Konvex AB (cremation of animals), Swedish Waste Management. **- Official statistics:** From Swedish EPA and the Swedish Board of Agriculture. **- Input from the Service Sector:** Data from the Service Sector in WStatR, regarding paper/cardboard and scrapped vehicles. **- Development project:** See "Household waste from business" later in this tabel. - **Reuse of data:** For some waste streams ther was no other possibility than to reuse data from the prior WStatR rapportation (WStatR 2008).

Waste from Manufacture of wood and products of wood and cork (NACE 16)		
1	Scope of the model (waste types and economic sectors covered)	The waste type wood waste has been surveyed for WStatR2014, other waste types were reused. Wood by-products was classified as waste in WStatR2006 and WStatR2008, but is excluded in WStatR2010, WStatR2012 and WStatR2014.

Manufacture of coke, refined petroleum, chemicals, pharm., rubber and plastic (NACE 20-22)		
1	Scope of the model (waste types and economic sectors covered)	Data reused från WStatR 2012.

Manufacture of other non-metallic mineral products (NACE 23)		
1	Scope of the model (waste types and economic sectors covered)	Data reused från WStatR 2012.

Manufacture of computer, electronic, electrical eq, machinery and eq, motor vehicles etc (NACE 26-30)		
1	Scope of the model (waste types and economic sectors covered)	26-30 Data reused från WStatR 2012.

Manufacture of furniture, other manufacturing, repair and installation of machinery etc (NACE 31-33)		
1	Scope of the model (waste types and economic sectors covered)	31-33 Data reused från WStatR 2012.

Electricity, gas, steam and air conditioning supply (NACE 35)		
1	Scope of the model (waste types and economic sectors covered)	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 and gas supply has been surveyed.

Water supply, sewage, remediation act (NACE 36, 37 and 39)		
1	Scope of the model (waste types and economic sectors covered)	The reporting according to Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC) is due every two years. The last reporting period, referring to 2010 data, was published in April 2012[3].Next reporting period, referring to 2012 data, will not be available until March/April 2014. As a result, data from 2010 were used. These were the newest available data. It should be noted, that the sector is considered as very stable and that sludge quantities vary only marginally between years. Data reused from WStatR 2012 for 36 and 39. For 37 the developed method with waste factors from WStatR 2012 was used but updated with regards to quantity of produced sludge.

Construction (NACE 41-43)		
1	Scope of the model (waste types and economic sectors covered)	All wastes in NACE 41-43 Construction
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 plants
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 m2. 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 m2 as a scale factor. Information from construction and demolition companies: The major companies in the construction sector were contacted and information on the generated amounts 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. Only nine construction companies and four

[3] Statistics Sweden (SCB). (2012). *Discharges to water and sewage sludge production in 2010 Municipal wastewater treatment plants, pulp and paper industry and other industry*. MI 22 SM 1201.
http://www.scb.se/Statistik/MI/MI0106/2010A01/MI0106_2010A01_SM_MI22SM1201.pdf

		demolition companies provided information about generated waste amounts. Information from waste treatment facilities: The data were obtained from environmental reports which have been reviewed from about 1 000 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.

Service sector (part of G and Q)		
1	Scope of the model (waste types and economic sectors covered)	In the service sector data from several different public enterprises, authorities and agencies have been used, for example: - Swedish Transport Agency - Swedavia (Swedish Aviation Authority) - Swedish Armed Forces - Swedish Civil Contingencies Agency - Swedish Association of Local Authorities and Regions They make their own surveys to cover their own needs. Usually they cover all kind of wastes from their sphere of interest. Data for hazardous waste has been reused from WStatR2008. 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) Data about discarded vehicles is included. 09.1 Animal and mixed food waste from the retail sector (47), Restaurants and similar (55, 56) and institutional kitchens (education, health, ederly care and prison care) is included.
2	Basic data for the estimations (production figures etc.)	The food waste factors have been obtained from previous studies in Sweden. 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: 734- 1 307 kg/employee and year depending on the size of the grocery store. - Waste from restaurants: 1 363 kg/employee and year - Waste from catering: 0,118 kg/portion
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 2010-2011.

Waste paper from offices ("office paper") (included in other sectors, where no other data source was available)		
1	Scope of the model (waste types and economic sectors covered)	We have assumed that waste paper from offices is the major paper waste (07.2 Paper and cardboard wastes) in some sectors. The factor was obtained by taking 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 2012 is 0,1389 kg/office employee
3	Description of the model and the factors applied	From the statistics a number of "office employees" in different sectors was obtained to calculate the amount of office paper in each sector or sub sectors where no other data on paper and cardboard waste was available.
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	This factor is updated every revision time.

Household waste from business (included in other sectors, where no other data source was available)		
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 86 kg per employee. The number of employees is obtained from Statistics Sweden.
3	Description of the model and the factors applied	In 2013 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 86 kg/employee (CV = 31 %).
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..

8. DETERMINATION OF EXTRACTIVE WASTE GENERATION

Table 3: Coverage of waste statistics with regard to extractive waste[1)]

Coverage	Topsoil	Overburden	Waste-rock	Tailings (non-haz.)
Completely covered	X	X	X	X
Partially covered				
Generally excluded				

9. DETERMINATION OF WASTE GENERATED BY HOUSEHOLDS

The data about waste generation from households (see Table 4 below) is retrieved from different trade organisations and producer's responsibility organisations that make own surveys of the wastes they handle.

Table 4: 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: • Swedish Waste Management) collects data from all municipalities about household waste (including household waste from business) generation and treatment. • Swedish Waste Management also collects data of collected household waste from household (inquiry to the municipalities) • In Sweden, there are several material companies which are responsible for different types of packaging materials. The material companies have provided data about generated and treated packaging waste. • 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 2012.
1.2	Description of the reporting system (regular survey on waste collectors, utilisation of administrative sources)	Data is retrieved from the sources above, registers and from experts.
1.3	Waste types covered	EWC stat codes: 01.1; 01.2; 01.3; 01.4, 02, 03.1; 06.3; 07.1; 07.2; 07.3; 07.4; 07.5; 08; 08.1; 08.41; 09.1; 09.2; 10.1; 10.2; 11; 12.2; 12.3; 12.5
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 moste 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 experts from 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 surveys, 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 a waste is sometimes hard to define. The new waste directive specifies some criteria for when a residue product need not be classified as waste, but the actual interpretation may vary from case to case. The following rest products have been in most cases been 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 in the pulp and paper industry. This was 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.
- 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), since there are no information easy available about these materials. It can be discussed if these clean materials are waste or by-product.

There is also a difficulty to classify water-containing wastes thar are disposed as waste water in the industrial waste-water system. 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 a non-waste (that is as waste-water) by the respondents, even if it in principle should be a waste. Also, water-containing wastes have normally not been classified as waste if it has undergone a pre-treatment process at the site of generation; however the treatment residue has been reported as generated waste.

Generated quantities of waste may be 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 a waste sorting facility, 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 recyclable 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).

According to the waste directive there has been developed critieria for when wastes ceases to be a waste. The only waste that has had end-of-waste criteria in use during 2012 is metal waste. Earlier, recycling of metals has been reported in steel mills and other metal mills, but according to these criteria, recycling can also be reported in NACE 38 and NACE 46.77. However, in the survey we have not seen any references to the end-of-waste criteria for metal waste. Thus, the same interpretation as earlier has been made: in connection with recovery and recycling, a waste has been classified as waste until it has become a new product or part of a new construction.

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.

10. DATA SETS 2 AND 3: WASTE TREATMENT, GENERAL DESCRIPTION OF METHODOLOGY

Waste treatment occurs in several economic sectors. The waste treatment in all sectors has been investigated in a coordinated survey. The investigation was based on facilities registered as waste treatment plants in the register of environmentally hazardous activities. Also industries with treatment of waste is included in the register. Environmental reports were used as data sources.

Identification of relevant treatment facilities

The registers used for identification of waste treatment plants are presented in Table 5. It is the register of environmentally hazardous activities that has been the base register. The other registers have been used to check the completeness.

Table 5: Registers used for identification of waste treatment operations

Identification of register(s) used	Description of register
Environmentally hazardous activities (responsible: Swedish EPA and the county administrations)	The register covers all activities that have permission to environmentally 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.
Facilities for household waste (Responsible 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. They keep a record of faciilities that manage household wastes. 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 (responsible: 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).
Records from earlier WStatR surveys (responsible 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 for household waste were also 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 or used as material raw materials in manufacturing processes without waste treatment permits. 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 1256 facilities with permission or licence to treat waste were identified. Pre-treatment plants and sorting plants were included in this figure. The register also contained some non active facilities, for example 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 also facilities in manufacturing industry that use different wastes or rest products as raw material in their production without being registered as waste treatment facilities. 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, WStatR2010 and WStatR2012 about facilities with release of waste into water.

Data collection on treated quantities

An overview of methods and sources for waste treatment is shown in Table 6.

Table 6: 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)**
Environmental report, Supplementary data for household waste facilities were obtained from Avfall Sverige (Waste Managament Sweden)	Environmental reports	Environmental reports. In a few cases also data were obtained from the facility by telephone or mail contact. Recapping of tires was collected from producers organisation. Recycling at minor foundries was reused.	Environmental reports	Environmental reports. In a few cases also data were obtained from the facility by telephone or mail contact.	Environmental reports. Other disposal of Dredging spoils: from the reporting according to Helcom and OSPAR

The data on treated quantities were collected as follows:

1. Data from the HELCOM and OSPAR reporting were used for dredging spoils dumped at sea.
2. Data from producers responibility organisation Svensk Däckåtervinning (Swedish Tyre Recycling organisation), was used for amounts of rubber tires processed by recapping (those are not included in the registers above).
3. Data were reused from WStatR2010 for recycling of metal waste at minor foundries (those are not included in the registers above).
4. For all other treatment we used environmental reports:
5. 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 standardized reporting of waste treatment, but the decree states that the environmental report shall contain "production data".
6. 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 WStatR2012 (reference year 2010) was reused).

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 2012. There was one facility with classified waste information in the environmental report, and that was expected to have relevant waste treatment. We have made no imputation or adjustment for this facility

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 in NACE 38 and 46.77).
- 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.
- 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.

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.

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.

Primarily, capacities mean licensed capacity for waste treatment. When the licenses capacity was not applicable, the "technical capacity" for treatment facilities was identified and used for the 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.

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

- For landfilling, we used the latest data (from 2012) from the landfill directive reporting.

- 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 below.

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, neither as generated waste nor as recovered waste.

Treatment of 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, are 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 because no references to the end-of-waste criteria have been found in the survey. 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 as material 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 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

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 as "backfilling" 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 the earlier surveys (WStatR2006-WStatR2010) been classified as landfilling, but is classified as "Other disposal" in WStatR2012 and WStatR2014 according to the directions.

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, but only the dry weight is included in the reporting to Eurostat.

11. MAJOR CHANGES, CHANGES COMPARED WITH PREVIOUS YEARS

Amounts of generated waste

Agriculture, hunting and forestry; Fishing and aquaculture (NACE 01-03)

In WStatR 2012 122 ktonnes was reported as 09.2. This amount is now regarded as by-products and is therefore not reported.

06.3 (Metallic waste, mixed ferrous and nonferrous) have declined from 59 ktonnes to 3 ktonnes. We are aware of that the metal scrap can vary quite much from year to year due to campaigns and so on.

The amount of 09.1 (Animal and mixed food waste of food preparation and products) and 09.3 (Animal faeces, urine and manure) has raised relatively much. This is probably due to increased awareness of that biological waste should be taken care for treatment.

Mining and quarrying (NACE 04-09)

The largest change of the amount of generated waste from 2010 to 2012 is the rise of mineral waste from the mining and quarrying sector. In 2008 and 2010 the amount was 58.7 respective 89 million tonnes, while in 2012 the amount was raised to 129 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 2010 to 2012, which of course has led to an enormous increased amount of waste rock and tailings. Other mines have also increased their production, which increases the amount of waste. Also, new mines have started or taken up their prodution since last WStatR.

More hazardous waste from Chemical wastes (4 700 tonnes in 2012 compared to 1 400 tonnes in 2010) have been registered. However, no outliers were found during editing of microdata.

Metallic wastes, ferrous and non-ferrous have decreased and mixed metallic wastes have increased compared to last WStatR. However, metallic wastes, ferrous and non-ferrous together with mixed metallic wastes from WStatR 2010 are comparable with registered mixed metallics regarding WStatR2012.

Manufacture of food products and beverage and tobacco (NACE 10-12)

The amount of hazardous waste has decreased from 2010 to 2012 by 20 000 tonnes because of the two specific waste categories 01.3 (Used oils) and 08 (Discarded equipment excl. 08.1, 08.41). 01.2 (Acid, alkaline and saline wastes) stands a great part of the change of non-hazardous waste with a decrease from 2010 to 2012 of about 10 000 tonnes. No investigation has been done to conclude what caused such high amount in these specific categories during 2010 but the amounts reported in 2012 is in line with 2008. The amount of 09.2 (vegetable waste) has doubled

in 2012 compared to 2010. This is expected to be a result of a higher representation of a variety of industries in the 2012 statistics, when all reporting industries were included, compared to the sample of industries in 2010.

Manufacture of textiles + wearing apparel and leather and related products (NACE 13-15)

There is a major change in total amounts of waste from the textile sector. The non-hazardous waste decreased from about 31 250 tonnes to about 15 380 tonnes and the hazardous waste increased from about 230 tonnes to about 380 tonnes. Also there was a large change in specific waste categories, for example household waste. This time a survey was made. In WStatR 2012 data was reused mainly from 2002. During this time the textile sector has decreased, it can for example be seen in the amount of persons employed in the sector in 2012, around 7000 persons, in 2002 it was around 11 000 persons. This decrease was not reflected in data from 2010. Also, the survey from 2002 was not made for so many waste categories as today. Concerning specific waste categories, the amount of household waste (EWC 10.1) decreased from 2000 tonnes to 96 tonnes. We believe that some of the household waste is registrered by the companies as 10.2 now, which is one explanation for the difference. Also, the sector seems to better separate waste now, for example the waste categories 07.2 (paper waste), 07.4 (plastic waste), 07.5 (wodden waste) has increased a lot. To summarize, major changes has occurred in the data, changes are explained by better method this time and by real changes in the sector (less employed and more separation of waste).

Manufacture of pulp, paper and paper products + printing and reproduction of recorded media (NACE 17-18)

In the paper and pulp sector the total amount of generated waste has decreased from 3.6 million tonnes to 1.8 million tonnes between 2010 and 2012. This change is mostly caused by the decrease of wood waste, due tothe change of interpretation of wood by-products by the industries.

Manufacture of coke, refined petroleum products (NACE 19)

In the last survey a number of petrochemical companies were classified as NACE 19 but reclassified as NACE 20. The great decline in chemical waste (1.4*, 02*, 03.1*) is due to this reclassification.

The rise in 12.6 (Soils) can be derived to one single company. Probably, this company has completed some sort of project that generates this type of waste.

Electricity, gas, steam and air conditioning supply (NACE 35)

The sector was surveyed through surveys, which makes it a new method compared to previous WStatR reportings.

- Incineration of municipal waste has increased from 4.1 to 4.7 million tonnes[4]. This has resulted in an increased amount of mineral waste (EWC-Stat code 12.8) from waste treatment compared to WStatR 2012, from approximately 730 000 to 1 040 000 tonnes.
- The amounts of discarded equipment (EWC-Stat 08), industrial effluent sludges (03.2) and hazardous chemical waste (1.4*, 02*, 03.1*) have increased noteworthy. However, no outliers were found during editing of microdata. Almost every company in the survey registered amounts of chemical hazardous wastes. We believe that the increase is correct.
- Last WStatR reportings, amounts of metallic wastes, ferrous and non ferrous, (06.1 and 06.2) were collected from Swedish Waste Management to complete lacking information of the amounts of metallic wastes. Therefore, the population differs between WStatR2012 and WStatR2014 which are seen in the results. Also, another reason for decreasing amounts of metallic wastes, ferrous and non ferrous, could be that respondents in the survey registered this information as metallic wastes, mixed ferrous and non ferrous (06.3).
- The codes for mineral waste from construction and demolition (EWC-Stat 12.1) were not available when the sector was last surveyed. That's the reason the amounts have increased from zero.

Waste collection, treatment and disposal activities; materials recovery (NACE 38)

There is an increase in generated waste from NACE 38. Most of the wastes arisen are secondary wastes from different kind of pre-treatment. The reasons for the increased waste developement are mainly:

- The waste business is developing and a lot of wastes are directed through sorting and pretreatment plants.Between 2010 and 2012 the total annual turn-over in NACE 38 increased with 24 % between 2010 and 2012 and the number of employes with 15 %.
- Dismantling of end-of-life vehicles has earlier been reported in NACE 46.77, but has in WStatR2014 been allocated to NACE 38.
- Certain specific wastes have decreased amounts, for example hazardous soils and hazardous mineral wastes from construction, but are expected to be generated only in minor quantities in this sector. Also 10.2 Mixed and undifferentiated materials are also expected to be generated in small quantities, it is rather 10.3 sorting residues that are expected to be genereted. The decrease of these wastes may to a part depend on changed interpretation of the information in the environmental report.
- In many cases there is a difficulty to interpret the information in the environmental report. Several facilities in NACE 38.3 reports the quantities of waste they have managed and these can include both waste generated at the site, and waste stored and transfered.
- Sludges and liquids from waste treatment have decreased because the landfilling of waste (excluding mining waste) is decreasing, and several old landfills have been closed.

Construction (NACE 41-43)

The generated waste from construction sector is less in 2012 compared to 2010. The changes depend mainly on:

[4] Electricity supply, district heating and supply of natural and gasworks gas 2010 and 2012 (provisional statistics)

- The amount of dredging spoils in WStatR 2014 are considerably less compared to WStatR2012. This as there was one major dredging project in 2010 generating large amounts.
- The construction industry is greatly affected by the economy, causing fluctuations in waste amounts between years.

Services (G-Q excluding 46.77)

For food waste from the service sector (retail, food service and restaurants) the factors used have been updated and is now both including food waste sorted out (as last year) and food waste thrown in the mixed waste. Hence the amounts have increased in WStatR 2014 compared to WStatR 2012, due to more complete data this time.

Wholesale of waste and scrap (NACE 46.77)

The amounts between this year and previous reporting are rather small. Most of the wastes arisen are secondary wastes from different kind of pre-treatment. The reasons for the changes for individual wastthe increased are mainly:

- Dismantling of end-of-life vehicles has earlier been reported in NACE 46.77, but has in WStatR2014 been allocated to NACE 38 (see above). Considering this reallocation there has been a slight increase of the generated amounts in 46.77.
- The waste business is developing and a more wastes are directed through sorting and pretreatment plants, some of them classified in NACE 46.77.
- Certain specific wastes have decreased amounts, but are expected to be generated only in minor quantities in this sector.
- There are also some difficulties with classification of wastes. The information given in environmental reports are not standardized and may be interpretted in different ways. For example 10.2 Mixed and undifferentiated materials are also expected to be generated in small quantities, it is rather 10.3 sorting residues that are expected to be genereted. 07.5 Wood wastes sorted out from mixed wastes may sometimed be classified and 10.2 mixed nd undifferentiated materials if the wood also contains paper and plastics are are used as fuel in a heating plant.
- In many cases there is a difficulty to interpret the information in the environmental report. Several facilities in NACE 38.3 reports the quantities of waste they have managed and these can include both waste generated at the site, and waste stored and transfered.
- Sludges and liquids from waste treatment have decreased because the landfilling of waste (excluding mining waste) is decreasing, and several old landfills have been closed.

Households

09.1 (Animal and mixed food waste) has risen by 49 %, to 199 ktonnes. This is probably due to increase ofseparate collection for biological treatment.

Amounts of treated waste

The total amount of waste treated has increased from 110 million tonnes in 2010 to 151 million tonnes in 2012, above all depending on increased amounts of generated and treated mining wastes, both rocks and tailings.The major quantites of the mining wastes are treated by landfilling (rocks and soil) and other disposal (impoundment of tailings), but also smaller quantities of backfilling and recovery (use as construction). The major part of this increase is at two mines, one copper mine where the amount of waste has increased by about 20 million tonnes between 2010 and 2012 (total treatment by backfilling, recovery/construction, landfilling and impoundment), and one new mine where the landfilled waste was 8.5 millions tonnes of top soil and 4.6 millions of rock token away to open the lode of ore. The majority of the mining wastes are treated at 16 sites, and the treatment is well documentated.

When analysing the waste treatment, excluding the mineral wastes from mining, the total treatment has slightly decreased from 23.1 million tonnes in 2010 to 22.3 million tonnes in 2012, mainly depending on that the amount of 12.7 Dredging soils dumped at sea has decresed by about 1 million tonnes.

There is a slight decrease in recovery in 2012 but on the other hand an increase in backfilling, depending on changed classification routines.

There is also a difference in generated hazardous waste and treated hazardous waste. The total treatment of hazardous waste is only about 1.1 million tonnes. However, a great part of the hazardous waste is treated by preparatory treatment (D8 Biogical pretreatment and D9 Fysico-chemical pretreatment) which are not reported in WStatR. The total amount of hazardous waste processed by preparatory treatment is about 0.95 million tonnes.

The already mentioned increase of generated and treated mining waste also affects the capacity reported for landfilling.

12. FORESEEN CHANGES

The only known amendment today that affects the waste statistics is the implementation of the end-of-waste-criteria for different waste streams. These 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.

An emerging problem is that the waste information in the environmental reports tends to be more and more reported in classified appendices, which are only availble for the responsible authority (county adminsitration). In the surveys of waste treatment and waste treatment in NACE 38 and 46.77 there were only a few classified environmental reports in the 2010 survey, but in the 2012 survey (WStatR2014) there were about 100 facilities with classified waste data or with waste data omitted, and where we had to impute data from 2010 or 2011, ask for supplementary information by direct contact with the facility, or make numerical adjustment (facilities in NACE 38.3 and 46.77). We expect even more environmental reports with classified data in the next survey. There is a discussion going on how to tackle this problem in the future.

13. 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 and WStatR2014**
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.

14. 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.

Relevance

Relevance (validity) refers in general to whether you measure what you intend to measure. Here, 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.

Accuracy

Uncertainties in key aggregates

Table 7 presents the key aggregates reported. For waste generation, coefficients of variation from sample surveys and estimated uncertainties for data collected by other methods are weighed together (See explanation below Table 7). Uncertainty estimates have been produced for all surveys, and an assessment of the uncertainty for each point estimate has been made. For all sectors, a discussion on errors and uncertainties and how coefficients of variation have been estimated is included under the heading “Accuracy”.

For waste treatment, the coefficients of variation are calculated using the assumption that the uncertainty is zero for quantities of treated mining waste and 2 percent for other waste types.

Table7. Totals and coefficients of variation for the key aggregates in 2012.

Country: Sweden Reference year: 2008		Total hazardous waste (key aggregates), *Tonnes*	Total non-hazardous waste (key aggregates) *Tonnes*	Coefficient of variation hazardous waste *%*	Coefficient of variation non-hazardous waste *%*
Generation of waste					
1	**Households**	411 879	3 781 226	3	4
2	**Enterprises**	2 340 780	149 832 692	3	0
Recovery and disposal of waste					
1	**Incineration with energy recovery R1**	137 460	6 574 324	2	2
2	**Incineration as a means of disposal D10**	42 347	817	2	2
3	**Recovery R2-R11**	477 388	19 029 056	2	1
4	**Landfilling D1, D3, D4, D5, D12 Land treatment and release to water D2, D6, D7**	466 198	124 497 368	2	0

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

For waste treatment, the key aggregate uncertainties are assessed by expert judgements. Waste treatment is surveyed by a total survey to all registered waste treatment facilities. Since it is a total survey the variation coefficient will be =0, but we have assumed that the uncertainty is a little higher than 0, because we estimate there are some uncertanties in the reported data due to possible coverage- and measurement errors.

Sampling errors

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

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) are estimated together with the estimates of population totals for each waste category. Surveys are used for estimation of waste in mining and quarrying and manufacturing industries. As mentioned earlier, web surveys were used for NACE 13-15, 17-18, 24-25 and 35. For NACE 35, the web survey was the most important data source. For the other sectors, the web survey can be seen as a complementary data source to cover facilities that are not obliged to report environmental reports. Environmental reports were used for NACE 04-09, 10-12, 13-15, 17-18, 24-25, 35, 38 and 46.77.

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*

The mean error of the estimate is then calculated using

y_k

$$SE(\hat{t}) = \sqrt{\hat{V}(\hat{t})}$$

and the relative mean error (rmf) or coefficient of variation is calculated as

$$rmf = \frac{SE(\hat{t})}{\hat{t}}$$

In the tables reported, the variance coefficients are expressed as per cent of the point estimate.

Non-sampling errors

Coverage errors

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).

To compile data adapted to the waste statistics ordinance, different methods have been used for different sectors, as described in Part I. In the surveys for waste generation reaching 100 % coverage has been aimed for by the following strategies/techniques:

- In sample surveys, waste generation in small local units below cutoff (less than 10 or 20 employees) has been covered by multiplying each reported amount of waste by a factor

$$\frac{number\ of\ employees\ in\ the\ population}{number\ of\ employees\ in\ units\ above\ cutoff}$$

- When using waste factors, activity data that covers the whole sector have been used when applicable (e.g. turn-over, number of employees).
- When using other 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.

Different frames

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

- NACE 05 – 09 and NACE 10 - 33 are based on local units in the Statistics Sweden business register.
- NACE 38 and NACE 46.77 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.
- The frame of waste incineration plants in NACE 35 is based on the annual energy statistics survey (Electricity supply, district heating and supply of natural and gasworks gas 2012)

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.

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 or more facilities (two separate permissions or licences), as well as where one facility consists of two or more local units. This causes coverage problems in those sectors where the frame is based on the business register, i.e. local units, while the data is actually collected on facility level. We have tried to overcome this problem by checking that each local unit is only counted in one of the sub populations (web-survey and environmental reports population

respectively). In a few cases, data from one environmental report had to be distributed over several local units belonging to different strata.

There is 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 affect the distribution of waste between different sectors.

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.

The definition of waste has been interpreted 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 are no longer included.

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 reported quantities.

Classification errors

The information in environmental reports is not always unambiguous. The information can sometimes be interpreted in different ways, for example classification of waste (e.g. when the waste is called only "sludge") or treatment (e.g. is it a pre-treatment or is it a final treatment).

The corresponding error may also arise in questionnaire surveys. The respondents have to make the interpretation of which information that should bereported in the questionnaire and how, and there is an obvious risk for misunderstanding and misinterpretation.

In the questionnaires and in the use of environmental reports we have primarily used LoW codes 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) for example EWC-Stat 01.3H, 03.2H, 02H, 10.2H, and 08H.
2. "Sludge" can be classified as Industrial effluent sludge (03.2), Sludges and liquid wastes from waste treatment (03.3) or Common sludge (11), but can also be other categories such as 12, 09.2, 09.1, 02H, 01.3H.
3. “Ash” 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.

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.

Questionnaires were used in WStatR 2014. The forms and the design of the survey have been discussed with the Board of Swedish Industry and Commerce for Better Regulation (NNR). The questionnaires have also been discussed with Statistics Sweden's questionnaire design department.

Processing errors

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

- *Editing errors. In the surveys, all the submitted questionnaires and environmental reports are checked and corrected. Minor errors have been corrected and some imputations have been carried out when data were missing.*
- *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 (for example only approved classification codes for waste classification as well as treatment method).*
- *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, extreme values from one responding local unit can result in a considerable adjustment error. This is also reflected in the coefficients of variation.*
- *Coding errors. If a waste or treatment method is described in free text, the waste or treatment code must be assessed manually which could lead to coding errors. These*

errors can occur when the person checking the questionnaire or environmental report misunderstands the responses and makes an incorrect amendment.

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

Non-response errors

The response rate for the web surveys on waste generation was low, around 30-40 percent. However, on the aggregate level, the response rate is much better because all facilities with significant environmental impact were surveyed by using environmental reports, where item nonresponse is very rare. When possible, data from earlier years was used for imputation of item nonresponse, but usually a proportional adjustment to compensate for the non-response was made, that is, linear expansion within each stratum. Thus it was assumed that each stratum 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 within each stratum, 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.

The description above concerns item nonresponse. Partial nonresponse can also occur. In NACE 24-25, data from the e Swedish Steel Producers' Association could in some cases be used for imputations, but apart from this, no adjustment for partial nonresponse has been made because it is not obvious which types of waste that should occur for a specific facility.

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

Straight expansion within strata is based on the assumption that the responding and non-responding parts of the population have similar properties regarding the parameterst hat are surveyed, in this case waste generation. If this assumption is wrong and waste generation is systematically lower or higher in non-responding units than in the responding units used for estimation, straight expansion leads to over- or underestimation.

Some of the objects in the sample could be extreme in some way. An extreme value together with a high design weight and/or low response rate implies a risk for errors. 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.

Model assumption errors

The different models have been described above in Part I.

Data from earlier surveys has been reused for some sectors, which have shown to have only small amounts of waste, especially small amounts of hazardous waste. 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 population in the sector surveyed. 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 as described under „Coverage errors“.

Proportional adjustments

In NACE 38.3 (Recovery) and NACE 46.77 (Wholesale of waste and scrap) only major facilities were investigated (usually facilities that have permission to handle more than 10 000 tonnes of waste per year). 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

The main problem with waste factors is that only one or a few factors that can affect the amount of generated waste is reflected by the factor. For example, if the factor is expressed as tonnes of waste per employee, the change in amounts of generated wast between two years only mirrors the change in number of employees and does not capture any measures taken to reduce the amount of waste generated per employee.

Waste factors have been used in several cases. In some cases the factors are based on current measurements, e.g. household waste from enterprises, paper. waste from offices. 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 factors for the service sector has been developed within the project.

Timeliness and punctuality

A general time schedule for the reporting according to the EU waste statistics regulation is shown in **Fel! Hittar inte referenskälla.**8.

Table 8. Time schedule for reporting waste statistics

Activity	Start	Completed
Planning, preparations and supplementary method developments	Jan 2013	March 2013
Data collection and processing	March 2013	Feb 2014
Compilation of statistics	Sept 2013	March 2014
Compilation of checking documentation	January 2014	April 2014
Drafting of Quality Report	1 jan 2012	13 April 2012
Final checking of statistics and documentation	Feb 2014	May 2014
Data processing (checks of accuracy, completeness etc.)	Feb 2014	March 2014
National independent controls and approval for reporting	March 2014	May 2014
Drafting of national statistical report	Jan 2014	April 2014
Supplementary work, follow-up, archiving	June 2012	30 September 2012

Delivery of statistics and quality report to Eurostat		30June 2014 or earlier
National publication of statistical report		Around Sept 2014

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[5], when reporting to Eurostat is complete. A report will be published in autumn 2014, 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.

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, also 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. Different countries may have different practices how to handle the by-products in the waste surveys.
- Local unit, establishment, facility, station has mostly been used as survey objects. A local unit, establishment, facility or station or can have several different activities, one main activity and several secondary activities. In this case the entire local unit, establishment, facility, station 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.

[5] www.naturvardsverket.se

Regional comparability of waste treatment

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, earlier surveys (WStatR2006, WStatR2008, WStatR2010 and WStatR2012), and other international reporting.

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 WStatR2014 is basically comparable to the prior survey WStatR2012.

However, there were earlier some changes that gave relatively large changes between WStatR2008 and WStatR 2010 due to the new categories of EWC-Stat in the reporting and rearrangement of the sectors follwing the NACE revision.

Over the years there have also been some changes in methodology and interpretations described in earlier quality reports:

- The amount of rest products classified as by-products are increasing. In the first surveys (WStatR2006 and WStatR2008) these were reported as waste by not in the latests reportings. For example, 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.
- Some survey methods have been changed, which may influence the results. For example earlier changed methods for waste generation in Construction have given better data for some waste types.

The results so far have shown that there sometimes may be relatively large uncertainties associated with some results. 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 2016 and refers to generation of waste and waste treatment during 2014) will be possible to compare with this year's survey.

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.

15. BURDEN ON RESPONDENTS

In earlier WStatR projects an evaluation of the burden of respondents was made. Then we estimated that the avergae time per respondant to answer the inquiry was 1 hour. In WStatR2014 environmental reports have been the major data source, and they are not connected to any extra burden for the respondants. In the case of web surveys, there is an extra burden for the respondants, which we estimate to less than 500 hours in total.We also have collected data from organisations and authorities that collect waste data for their own purposes, independant of the WStatR work. That work is not included in the figure.