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A handbook for data collection on waste generation and treatment

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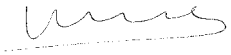
Preface

Demand for statistics on waste generation and treatment has grown and developed considerably in recent years. Regular statistics on the production and management of waste from businesses and private households are collected from Member States to monitor the implementation of European Union waste policy, which is based on the principles of waste prevention, maximisation of recovery and safe disposal. Sustainability and resource efficiency are key concepts of the "Europe 2020" strategy. Waste related data have already formed part both of the Structural Indicators monitoring the Lisbon Strategy, and of the indicators monitoring the EU Sustainable Development Strategy.

Waste statistics at EU level have had a legal basis since 2002 as a response to the need for comparable and harmonised data. Data are collected and published every two years following common methodological recommendations. With the growing experience in collecting the required data, some shortcomings of the original legislation and the methodological manual have become apparent. As a consequence, Commission Regulation 849/2010, which takes effect from reference year 2010 onwards, brings about various simplifications and improvements to the legal framework. This new version of the manual on waste statistics, which is in accordance with the new legal basis, reflects in detail the methodological development and refinement which the experience of the first data collections has made both necessary and possible.

A number of experts from Eurostat, national statistical offices, environmental agencies and consultants have developed this manual over several years. It is the result of many consultations and discussions. I would like to thank all those who have contributed.



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MANUAL FOR THE IMPLEMENTATION OF
REGULATION (EC) No 2150/2002 ON WASTE STATISTICS

Contents

Foreword

The first edition of this manual was prepared in 2006. Since then several changes have occurred in the European legislation and in data requirements. Furthermore the first two data collections raised some issues thereby leading to a revision of the Waste Statistics Regulation. This edition of the manual was finalised in early 2010 and takes into account changes in legislation and some simplification in reporting obligations as described briefly below.

The main changes in the legislation are as follows:

- The Annexes I, II and III of the Waste Statistics Regulation have been revised. The new version entered into force in 2010 and will thus have to be applied for the first time in 2012 for the reference year 2010.
- The Waste Framework Directive of 2006/12/EC has been repealed by Directive 2008/98/EC. The main changes that have affected the content of this manual are the changes in the scope of the directive; additional waste streams are excluded and a new recycling definition is included.
- The classification of economic activities according to NACE has been revised. In the previous version of the manual, NACE Rev. 1.1 was mentioned. From the 2008 reporting year onwards, countries will have to use NACE Rev. 2.
- The amendment of Regulation (EC) No 1059/2003 on the common classification of territorial units for statistics (NUTS) has created some changes in the classification for some countries. According to Regulation (EC) No 11/2008, countries are required to redeliver 2004 data in the new classification.
- The Council Regulation (EEC) No 2186/93 on Community coordination in drawing up business registers for statistical purposes has been repealed by Regulation (EC) No 177/2008.

The following simplifications that are part of the WStatR revision have already been effective since the reference year 2008.

- The 'L' flag that was used for reporting in years 2004 and 2006 is no longer an option. Countries should use the 'M' flag to indicate that no data source exists and introduce a zero in cases where a certain waste does not, or cannot occur.
- Since reporting year 2008, reporting sludges in both dry and wet weight has no longer been mandatory. Countries should report sludges in dry weight only.
- Change of reporting units for waste generation and treatment from 1000 tonnes with three decimals to tonnes (without decimals).

Aside from the general changes due to new legislations, Chapter 2 (Waste generation and treatment: specifications and concepts), Chapter 4 (The Quality Report) and Chapter 5 (Transmission of data) underwent a more in-depth revision and a new chapter (Chapter 6) on data quality controls was added.

It is envisaged that all these changes will improve the readability and clarity of the manual and will help data compilers of waste statistics to improve data coherence and comparability across European countries.

CHAPTER 1: Introduction

1.1 Aim of the manual

The primary goal of this manual is to guide and assist the Member States in their efforts to produce high-quality, harmonised and efficient waste statistics in accordance with the Waste Statistics Regulation (WStatR)[1]. In particular, the manual focuses on aspects of harmonisation and quality.

The manual is mainly aimed at national experts involved in the production of national waste statistics and is designed as a 'handbook' for them. However, experts should not only use and apply the manual but also provide comments on it so that it can be amended and supplemented. The relationship between the (primary) users of the manual and the manual itself is a complex and dynamic one: the manual will be updated periodically on the basis of the remarks and comments collected from those with practical experience in the field.

In addition to the primary users of the manual, i.e. the national experts involved in the production of waste statistics, the end-users of waste statistics (scientists, members of the public and politicians) should also find the manual useful, as it will provide them with additional content-related information.

On account of the revision of the Waste Statistics Regulation in 2010, the manual will have to refer to two different versions of the Regulation. In order to avoid confusion and to keep the wording as simple as possible, the two versions will be referred to as WStatR 2002 and WStatR 2010, according to their date of entry into force.

1.2 User needs

General situation regarding waste reporting

Over the past decades, the amount of waste produced in the European Union (EU) has steadily increased. EU policies are now aimed at significantly reducing the amount of waste generated, through new waste prevention initiatives, better use of resources, and encouraging a shift to more sustainable consumption and production patterns. Within the general framework of the Sustainable Development Strategy (SDS), this has been translated into two thematic strategies of the 6th Environment Action Programme (6th EAP).

The renewed SDS sets out a single, coherent strategy on how the EU will more effectively live up to its long-standing commitment to meet the challenges of sustainable development. It recognises the need to change our current unsustainable consumption and production patterns gradually and move towards a more integrated approach to policy-making. A direct mention of waste generation is present in the key challenge 'Conservation and management of natural resources' as one of the operational objectives, and its target is 'avoiding the generation of waste and enhancing efficient use of natural resources by applying the concept of life-cycle thinking and promoting reuse and recycling'.

[1] Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics (OJ L 332, 9.12.2002, p.1).

The 6th EAP promotes full integration of environmental protection requirements into all EU policies and actions, and provides the environmental component of the EU's strategy for sustainable development. This program takes a broad look at environmental challenges and provides a strategic framework for the Commission's environmental policy up to 2012. It defines four priority areas: climate change; nature and biodiversity; environment and health; and natural resources and waste[2]. These four priority areas are translated into seven thematic strategies. Two of these strategies have a direct or indirect link to waste: the sustainable use of natural resources strategy, and the waste prevention and recycling strategy.

The aim of the strategy on the sustainable use of natural resources is to ensure that the consumption of resources and their associated impact do not exceed the carrying capacity of the environment and do not break the linkages between economic growth and resource use.

The aim of the strategy on the prevention and recycling of waste is to limit waste production and to reduce the negative impact on the environment that is caused by waste throughout its lifespan, from production to disposal, via recycling. The main focus of the strategy for preventing waste production is on reducing the environmental impact of waste and products that will become waste at every stage of a resource's lifespan. Applying the strategies set up under existing EU legislation, such as disseminating best available techniques or the eco-design of products, is an important factor in achieving this. This approach complements those in the IPPC Directive, the Directive on integrated product policy and the Strategy on the use of natural resources. The strategy places particular emphasis on biodegradable waste, two thirds of which must be redirected to be disposed of using methods other than landfill as is required under Directive 1999/31/EC. The strategy provides for the EU to adopt guidelines, for Member States to adopt management strategies, and for this matter to be included in the revision of the IPPC Directive and the Directive on the use of sewage sludge in agriculture. The strategy is one of the seven thematic strategies set out in the Sixth Action Programme for the Environment adopted in 2002.

In order to monitor the progress made towards the goals set out in these two strategies, reliable data are needed throughout the years from the different countries on the amount of waste generated, treated or shipped.

Since the 1980s (and until reference year 2003), the Joint Questionnaire OECD/Eurostat was an important source of data for waste. In particular, it provided good quality data on some waste related issues such as municipal waste. However, it proved to be unsatisfactory in providing quality waste data by economic sectors and waste categories. The level of detail was indeed not sufficient, the waste categories were not based on the European list of waste and the data were supplied on the basis of a 'gentlemen's agreement'. Apart from being incomplete, the data sets presented enormous differences among the countries due to the lack of harmonisation in data collection methodologies.

All this led to a European Union approach on waste statistics. Starting with 2004 as the first reference year, the Waste Statistics Regulation created a new framework for collecting and reporting waste data.

After the first data delivery, an intensive data validation was carried out and several revisions were made. First steps towards comprehensive and valuable data sets on waste in Europe were taken. Considerable work is still being done both by individual countries and Eurostat to improve data quality and harmonise methodologies over the coming years. Thanks to the work of numerous experts, the quality of the data has increased every new reporting year.

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[2], http://ec.europa.eu/environment/newprg/intro.htm.

The Joint Questionnaire and WStatR

Waste data were collected using the waste part of the Joint Questionnaire OECD/Eurostat until reference year 2003. In order to maintain the series and to offer coherent data in an international context outside the EU (OECD, UN), Eurostat has agreed with the OECD on a conversion tool. This tool derives the variables of the Joint Questionnaire from the data received on the basis of the Regulation.

This allows a chronological continuation of the data and prevents double reporting by the Member States but is quite challenging due to important conceptual differences between the data from the WStatR and the Joint Questionnaire. These differences come from different breakdowns or classifications between both data collection schemes, such as, e.g. different level of detail in waste breakdown, different waste source categories for waste generation, different categories for treatment types, or different waste classifications codes. One obvious example of these differences is the fact that the Joint Questionnaire considers municipal waste as a separate category, whereas the WStatR includes it under the waste generating activity 'households' and the waste category 'households and similar wastes'.

The Joint Questionnaire also collected information that is not required by the Waste Statistics Regulation. This is mainly information on the import and export of waste, preparatory treatment, and breakdown of waste treated according to waste source. Moreover, the Joint Questionnaire collects annual data whereas the WStatR requires data every second year.

The general disadvantage of the method is therefore that no data are available for the odd years. In order to collect information for the structural indicators on an annual basis, a small set of variables on municipal waste are still collected annually.

Despite these conceptual differences, the Regulation on Waste statistics can be seen as a more valuable tool for waste statistics due to the great improvements made in the completeness and harmonisation of the data.

Waste management indicators

One of the challenges of collecting more reliable statistics on waste generation and treatment was to produce reliable indicators that could supply information, support policy development and priority settings or monitor the effect of policy responses.

Several indicators on waste have already been defined and used in international contexts (e.g. OECD, UN), but Eurostat is developing new indicators on the basis of data collected using the Regulation on Waste Statistics.

Eurostat publishes the sustainable development indicators (SDI) which measure the sustainability of consumption and production.

The data collected through the Regulation on Waste Statistics will be used to build structural indicators and sustainable development indicators. The indicators for waste that are currently under development are indicators on the 'Generation of total waste, by economic activity' and on the 'Generation of hazardous waste'.

1.3 Legal basis for EU waste statistics

The Waste Statistics Regulation was adopted by the European Parliament and the Council of the European Union on 25 November 2002 and revised in 2010. Since 2002, several implementation measures have been adopted:

- Commission Regulation (EC) No 574/2004 of 23 February 2004 amending Annexes I and III to Regulation (EC) No 2150/2002 on waste statistics (OJ L 90, 27.3.2004, p.15);
- Commission Regulation (EC) No 782/2005 of 24 May 2005 setting out the format for the transmission of results on waste statistics (OJ L 131, 25.5.2005, p. 26);
- Commission Regulation (EC) No 783/2005 of 24 May 2005 amending Annex II to Regulation (EC) No 2150/2002 on waste statistics (OJ L 131, 25.5.2005, p. 38);
- Commission Regulation (EC) No 1445/2005 of 5 September 2005 defining the proper quality evaluation criteria and the contents of the quality reports for waste statistics for the purposes of Regulation (EC) No 2150/2002 of the European Parliament and of the Council (OJ L 229, 6.9.2005, p. 6).
- Draft Commission Regulation amending Regulation (EC) No 2150/2002 of the European Parliament and of the Council on waste statistics, adoption expected in autumn 2010.

The Regulation consists of a general part and three Annexes. The Annexes deal with the generation of waste (Annex I), the treatment of waste (Annex II) and the waste classification (Annex III) which should be used for observation and registration. The Regulation starts with the usual 'whereas' phrases, giving the reasons and considerations which motivated and led to the creation of the Waste Statistics Regulation in the form in which it was adopted.

General part of the Regulation — the Articles

The Waste Statistics Regulation contains nine Articles. These Articles focus on Objectives (Article 1), Definitions (2), Data collection (3), Transitional period (4), Import and export of waste (5), Implementation measures (6), Committee procedure (7), Report (8) and the Entry into force of the Regulation (9). From a technical point of view, Articles 3 and 6 are the most important. The other Articles largely provide the usual statistical framework.

Article 3 specifies both the conditions and options for data collection.

Conditions for data collection and further handling of results:

- In order to reduce response burdens, the national authorities and the Commission must have access to administrative data sources, subject to relevant restrictions and conditions (Article 3(1)).
- Enterprises with fewer than 10 employees must be excluded from surveys, unless they contribute significantly to the generation of waste (Article 3(2)); the exclusions must be consistent with the coverage and quality criteria (Article 3(4)). Although the regulation does not stipulate this explicitly the data for enterprises with less than 10 employees should be estimated.
- Member States must produce statistical results following the breakdown set out in Annexes I and II (Article 3(3)), and transmit the statistics to Eurostat in time, in an appro-

priate format (Article 3(5)) and in accordance with existing EU provisions on statistical confidentiality (Article 3(6)).

Options for data collection:

Article 3(1) specifies the data collection methods. There are four types of methods that can be applied:

- surveys
- administrative or other sources
- statistical estimations
- or a combination of these methods.

Chapter 3 of this manual reviews the different data collection methods in detail.

Article 6 lays down, in seven paragraphs, the measures that are necessary for the implementation of the Regulation.

1. The measures are to be adopted in accordance with the regulatory procedure laid down in Article 7(2):

(a) allowance for nation-specific reduction in the scope of reporting (reduction of level of detail);

(b) setting out the appropriate formats for the transmission of results.

2. The measures are to be adopted in accordance with the regulatory procedure referred to in Article 7(3):

(a) adjustment to economic and technical developments;

(b) adaptation of the specifications listed in Annexes I, II and III, which set out the specific data requirements and the classifications to be used;

(c) definition of quality criteria and the content of the quality report;

(d) implementation of the results of the pilot studies on agriculture and fisheries (Article 4(3)) and import and export of waste (Article 5).

Specific parts of the Regulation — the Annexes

Annex I deals with the generation of waste. The statistics which have to be produced are defined in Sections 2, 3 and 8 of the Annex. Section 2 defines the types of waste which have to be differentiated (51 waste types) and Section 8 the sources (economic activities and households) which have to be surveyed and specified. Section 3 specifies the characteristics to be surveyed (waste quantities generated and population served by a collection scheme). The table which has to be produced is explained in Chapter 2 and also documented in Annex II of this manual. The table below outlines the remaining sections of Annex I which stipulate the conditions for the production of waste statistics.

Table 1: Sections in Annex I stipulating 'how' statistics should be compiled

Section	Subject	Rules
1	Coverage	Total economy and all wastes
2	Waste categories	Item numbers, codes of waste, description and hazardousness of the different waste categories to be reported are described
3	Characteristics	The quantity of waste generated for each waste category reported in section 2 should be provided together with the percentage of population served by a collection scheme for mixed households and similar waste
4	Reporting unit	Tonnes of normal wet waste; for sludge, the dry matter should be produced (also tonnes); for the coverage of the collection scheme, the reporting unit should be the percentage of the population
5	1st reference year and periodicity	2004 and every second year thereafter
6	Transmission of results to Eurostat	Within 18 months of the end of the reference year
7	Report on the coverage and quality of statistics	Report on the coverage and quality of statistics; indication of degree of precision for collected data
8 (1)	Production of results	Description of activities for which statistics on waste generation have to be produced
8(2)	Statistical units relating to economic activities	Local units or kind-of-activity units in accordance with Regulation (EEC) No 696/93

Annex II deals with the recovery and disposal of waste. The statistics which have to be produced are set out in Sections 2, 3 and 8 of the Annex. Section 2 lists the waste categories for which statistics are to be produced. Until reference 2008, between 12 and 18 categories depending on the treatment type, had to be reported. As of 2010, treatment has to be reported for the 51 waste categories defined in Annex I. Section 8 lists the waste treatment operations that have to be surveyed and specified. Section 3 specifies the characteristics to be surveyed (number of facilities and their capacity at NUTS 2 level and total quantities of treated wastes at national level). The tables which have to be produced are explained in Chapter 2 and are also documented in Annex II of this manual. The table below sets out the remaining sections of Annex II which define the conditions for waste statistics production.

Table 2: Sections in Annex II defining 'how' statistics should be compiled

Section	Subject	Rules
1	Coverage	All recovery and disposal facilities carrying out one of the operations referred to in Section 8(2), excluding internal recycling facilities
2 same as Annex I	Waste categories	…
3	Characteristics	Regional: number of facilities and their capacity at NUTS 2 level National: total quantities of treated wastes specified by waste types and types of waste treatment facilities
4 – 7 same as Annex I	Reporting unit	...
	1st reference year and periodicity	...
	Transmission of results to Eurostat	…
	Report on the coverage and quality of statistics	...
8(2)	Production of results	List of recovery and disposal operations for which statistics have to be compiled

Annex III provides the table of equivalence for EWC-Stat Ver. 4 (substance oriented waste statistical nomenclature) and the European List of Waste (LoW) established by Commission Decision 2000/532/EC[3].

1.4 Content of the manual

The manual explains how the formal requirements laid down in the Regulation should be met in practice and outlines the entire process, including the definition of concepts, data collection and processing procedures, and quality criteria. The manual has six chapters.

The **Introduction** (Chapter 1) provides an overview of the historical and political background and structure of the Waste Statistics Regulation. It is followed by a chapter on definitions and principles.

Chapter 2 defines key concepts as implemented in practice, such as household waste and internal recycling. These definitions should serve as a basis for the development of harmonised waste statistics. This Chapter also sets out principles concerning statistical coverage (exclusion or inclusion of units) and source attachment (who generates the waste?). These general princi-

[3] OJ L 226, 6.9.2000, p.3. Decision as last amended by Decision 2001/573/EC (OJ L 203, 28.7.2001, p. 18).

ples should help to guide the Member States when they are faced with situations which are unclear and should ensure that statistics are more consistent. Finally, Chapter 2 classifies and explains the EWC-Stat categories to be used in the reporting process with a view to facilitating their application in the Member States.

Chapter 3, which deals with data collection and data processing, explains the various methods that can be used in this area. This chapter focuses on the conditions for the application of the various methods and the points which must be taken into consideration. It serves as a basis for explaining the quality requirements dealt with in Chapter 4.

The Waste Statistics Regulation not only requires data to be collected but also calls for a report to be drawn up on data quality. **Chapter 4** provides guidance on the drafting of the quality report. The report describes the methods used in the production of waste statistics. It also assesses the quality of statistics on the basis of the statistical quality elements.

Chapter 5 explains and sets out the requirements concerning the transmission of data from the Member States to Eurostat. Guidance is provided on the transmission tools and on the transmission formats.

Finally, **Chapter 6** deals with quality control within Eurostat and the dissemination of results. This Chapter explains the methods and tools to be used for the quality control of data and of the quality report received by Eurostat from the Member States. It also outlines the dissemination strategy.

CHAPTER 2: Waste generation and treatment: specification of concepts

This chapter is structured in line with the Waste Statistics Regulation. The following sections give a presentation of the definition of waste according to European legislation, followed by explanations on the kind of data that are required in waste generation and waste treatment. These explanations are given separately for waste generation, waste treatment and waste treatment facilities.

2.1 Waste definition and overview of the Regulation

2.1.1 Waste definition

'Waste' is defined by EU legislation in the Waste Framework Directive[4] as any substance or object which the holder discards or intends to or is required to discard. Six exclusions have been made to the scope of the Waste Framework Directive (Table 3).

Table 3: Waste excluded from the scope of Directive 2008/98/EC (Article 2)

(a)	Gaseous effluent emitted into the atmosphere
(b)	Land (in situ) including unexcavated contaminated soil and buildings permanently connected with land
(c)	Uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated
(d)	Radioactive waste
(e)	Decommissioned explosive
(f)	Faecal matter, straw and other natural non-hazardous agricultural or forestry material used in farming, forestry or for the production of energy from such biomass through processes or methods which do not harm the environment or endanger human health.

Substances and materials, which are residues of production or consumption processes, are not necessarily waste, and a distinction between residue and waste should be made.

As Figure 1 overleaf illustrates, three different types of residues currently exist: production residues, consumption residues and waste treatment residues. Waste arising from consumption residues and production residues are classified as primary waste and waste from waste treatment residues as secondary waste.

[4] Directive 2008/98/EC on waste and repealing certain Directives (OJ 312, 22.11.2008, p. 3), replacing Directive 2006/12/EC on waste as of 12 Dec. 2010.

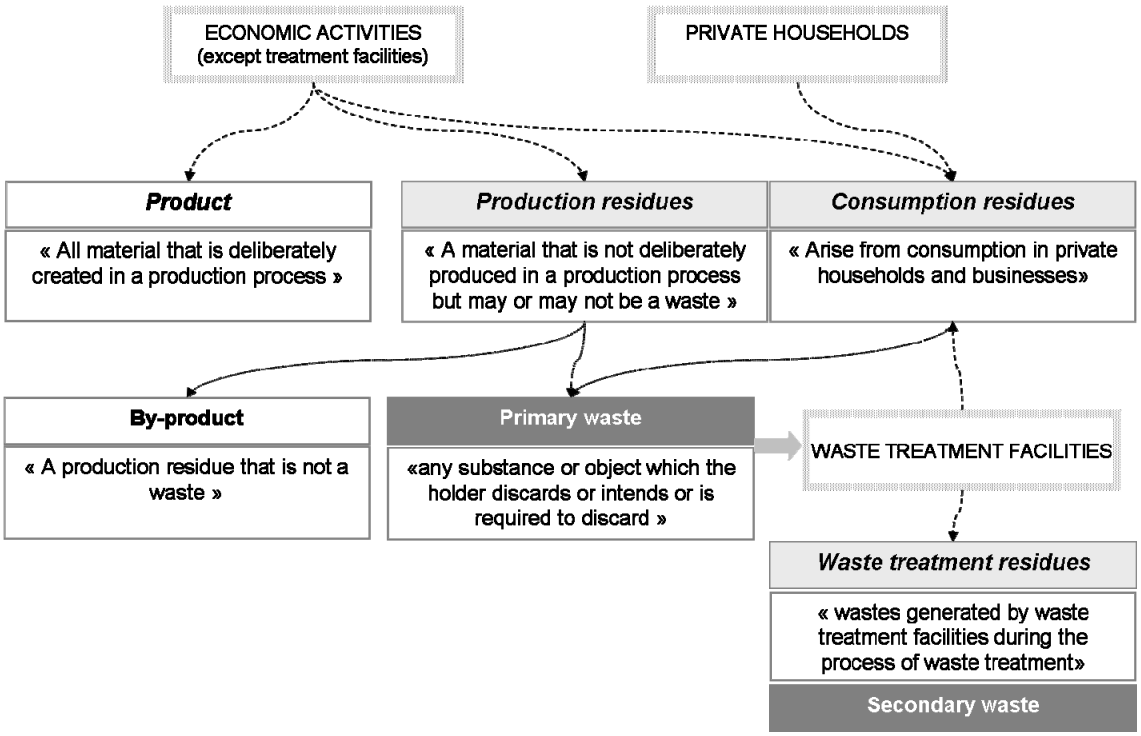

Figure 1: Definition of waste

'Production residues' are materials that are not deliberately produced in a production process but may or may not be waste. Boundaries between waste and by-product have been clarified by European laws in the revision of the Waste Framework Directive 2008/98/EC. Based on recent jurisprudence[5] a four-part test has been included in the new version of the Waste Framework Directive. A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste but as being a by-product only if the following conditions are met:

(a) Further use of the substance or object is certain;

(b) The substance or object can be used directly without any further processing other than normal industrial practice;

(c) The substance or object is produced as an integral part of a production process;

(d) Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific purpose and will not lead to overall adverse environmental or human health impacts.

Using this four-step definition, one can for instance define 'blast furnace slags' as by-products and 'de-sulphurisation slags' as waste. Both production residues occur during the production of iron steel. Blast furnace slag is produced in parallel with hot iron and the production process of iron is adapted to ensure that the slag has the requisite technical qualities. Use of slag is moreover certain in a number of clearly defined end-uses and blast furnace slag does not need further processing that is not an integral part of the production process. In contrast, de-sulphurisation slag is produced due to the need to remove sulphur prior to the processing of iron into steel. The resulting slag is rich in sulphur and cannot be used or recycled.

[5] E.g. Case C-9/00 Palin Granit Oy (2002) ECR I-3533.

More examples and a decision-making tree can be found in COM(2007)95 on the interpretative communication on waste and by-products[6].

'Consumption residues' are primary wastes that arise from consumption in private households and businesses and are for instance food residuals, packaging material, paper, glass and plastic.

'Waste treatment residues' are secondary wastes generated by waste treatment facilities during the processing of waste. This includes waste for disposal and for recovery. The Waste Framework Directive provides conditions that should help countries developing criteria determining the point at which a given waste ceases to be waste when it has undergone a recovery, including recycling, operation. These conditions are:

(a) The substance or object is commonly used for specific purposes;

(b) A market or demand exists for such a substance or object;

(c) The substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and

(d) The use of the substance or object will not lead to overall adverse environmental or human health impacts[7].

2.1.2 Scope of the Waste Statistics Regulation

The Waste Statistics Regulation covers substances and materials which are defined as wastes in accordance with the EU legislation, and which are covered by the Waste Framework Directive as described above.

Reporting obligations

As mentioned earlier, statistics should be compiled on both waste generation and waste treatment. Reporting obligations on waste generation are described in Annex I of the Regulation and reporting obligations on waste treatment in Annex II. In addition, countries should also deliver information on the treatment infrastructure and on the waste collection scheme. Concretely, reporting has to be performed by delivering three different data sets. The first data set contains statistics on waste generation, data set 2 contains statistics on waste treatment and data set 3 contains data on treatment infrastructure and coverage of the waste collection scheme. Table 4 shortly describes the structure and the level of detail of the data sets to be delivered. The right side of the table shows the structure that applies as of reference year 2010. The left side of the table reflects the structure that applied until the reference year 2008.

This chapter will first present how statistics on waste generation should be compiled (data set 1), then statistics on waste treatment (data set 2) and finally how statistics on treatment infrastructure and coverage of collection scheme (data set 3) should be reported.

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[6] http://ec.europa.eu/environment/waste/framework/by_products.htm.
[7] Article 6 of directive 2008/98/EC.

Table 4: Data sets according to the Waste Statistics Regulation before and after revision in 2010

Structure of data sets until reference year 2008				Structure of data sets as of reference year 2010			
Data set		**Description and breakdown**	**Regional level**	**Data set**		**Description and breakdown**	**Regional level**
1	Generation	Waste generation by: - 20 waste producing activities: 19 industries, households - 48 waste categories	National	1	Generation	Waste generation by: - 19 waste producing activities: 18 industries, households - 51 waste categories	National
2	Incineration	Incineration of waste by: - 2 treatment types: - 14 waste categories	NUTS 1	2	Treatment	Waste treatment by: - 6 treatment types - 51 waste categories	National
3	Recovery excl. energy recovery	Waste recovery by: - 1 treatment type - 17 waste categories	NUTS 1				
4	Disposal other than incineration	Waste disposal by: - 2 treatment types: - 16 waste categories	NUTS 1				
5	Treatment Infrastructure	No/capacity of recovery/disposal facilities by: - 5 treatment types	NUTS 2	3	Treatment Infrastructure	No/capacity of recovery/disposal facilities by: - 4 treatment types	NUTS 2
	Coverage of the collection scheme	Percentage of population / dwellings covered by a collection scheme for household and similar waste.	NUTS 2		Coverage of the collection scheme	Percentage of population covered by a collection scheme for household and similar waste.	National

Waste included

The Waste Statistics Regulation makes a clear distinction between 'waste generation' and 'waste treatment'. Waste generation includes all wastes generated by economic activities and by households. Because economic activity includes activities of treatment facilities, waste generated by these facilities (secondary waste) should also be reported under waste generation. This includes both residues of waste treatment and consumption residues that are produced by these facilities.

Waste treatment includes all waste entering treatment facilities for final treatment (this includes both public and private waste treatment facilities).

Please note: The different concepts of the WStatR for the handling of secondary waste in Annex I (waste generation) and in Annex II (waste treatment) have consequences with regards to the double counting of waste:

- Data on waste generation shall cover all waste (primary and secondary waste) generated by the statistical units which means that double counting of waste is part of the concept.

- Data on waste treatment refer to the final treatment; treated waste should thus be counted only once. The only exemption is the double counting of combustion residues from waste incineration and energy recovery.

Waste excluded

Some waste streams are however not covered by the Regulation. These are:

- wastes excluded from the scope of the Waste Framework Directive and listed in Table 3;

- wastes that are internally recycled (see section 2.3.1 for further details).

For waste treatment, only waste entering facilities for final treatment should be reported, excluding waste pre-treatment. More details on the definitions of internal recycling and final treatment will be provided in section 2.3 on waste treatment.

Wastes excluded from the scope of the Waste Framework Directive and listed in Table 3 are also excluded from the scope of the Waste Statistics Regulation. Waste streams excluded from the scope of the Waste Framework Directive[8] because they are covered by other Community legislation however fall within the scope of the Waste Statistics Regulation. This applies to:

- animal carcasses and animal by-products covered by Regulation (EC) No 1069/2009;
- waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries covered by Directive 2006/21/EC.

Reporting periodicity

Since 2006 statistics have to be reported every second year. The delay for data transmission is 18 months after the end of the reference year which means, for instance, that statistics for reference year 2008 will be delivered in June 2010. Countries which are able to produce their data earlier are encouraged to transmit the data as soon as they are available (preferably 15 months after the end of the reference year).

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[8] Directive 2008/98/EC, Article 2, par. 2(b, c, d).

2.2 Waste generation: data set 1

2.2.1 Required variable

Data on waste generation should be reported as the total amount of waste generated by all economic sectors and households. As already mentioned, this includes waste produced by treatment facilities, i.e. residues of waste treated in the treatment facilities (secondary waste) and other waste generated by these facilities as a result of their activities (e.g. consumption residues from offices).

Because residues from waste treatment need to be reported, it is important to determine in which cases this leads to double counting and in which case it does not. As a general rule, it has been decided that treatment residues should only be reported when the treatment did result in a considerable change in the chemical and/or physical structure of the waste. There are, for example, some types of pre-treatment which do not change the structure of the waste; this includes for instance re-packaging (D14) and temporary storage (R13, D15) (Table 5). The inclusion of waste from these pre-treatment operations would result in double counting of the same unaltered waste. Facilities performing such operations should therefore not report waste originating from such operations but only waste generated as a result of other activities (e.g. consumption residues).

Table 5: Pre-treatment not changing the physical or chemical nature of the waste

Code	***Types of recovery and disposal operations***
	Disposal operation
D14	Repackaging prior to submission to any of the operations numbered D1 to D13
D15	Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)
	Recovery operation
R13	Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)

Reporting units

The reporting unit to be used for all waste categories is tonnes of normal wet weight, without decimals[9]. For the 'sludge' categories, i.e. categories 03.2 (industrial effluent sludges both non-hazardous and hazardous); 03.3 (sludges and liquid wastes from waste treatment), 11 (common sludges, non-hazardous) and 12.7 (dredging spoils both non-hazardous and hazardous), this would seriously reduce the comparability as these waste streams could contain very different fractions of water. For this reason, data on sludges had to be reported not only in normal wet weight but also in dry weight[10] for year 2004 and 2006. Starting with the reference year 2008, countries report sludges in dry weight only. Countries that have data on sludges in both dry and wet weight are asked to report both figures (dry weight in the data set; wet weight in the quality reports).

This allows Eurostat to compile conversion factors and allow countries that only have data on wet weight to report on dry matter.

[9] Section 4 of Annexes I and II specifies the reporting units which must be used when reporting quantities of waste.

[10] Conversion factors are defined as the percentage of dry matter so that: dry weight=%dry matter*wet waste.

When sludges are included in aggregated waste streams (for instance 'other wastes'), the dry weight should be used.

In other waste streams too, the inclusion of different fractions of water can hinder comparability; this applies to used oils, for instance. In the case of waste oils, Member States are advised to subtract the (estimated) water content.

Reference period

Waste should be reported the year it has been generated. This can be difficult to estimate in some situations. The year waste has been handed over to waste collectors or special containers can be easier to use.

There can however be great discrepancies between the date of waste generation and the date of handover for some waste categories. For instance, mining waste and construction and demolition waste can be handed over one year after their generation. In such cases, an explanation must be provided in the quality report.

Some enterprises can have special tanks where sludge is stored (e.g. in the case of galvanic processes). These tanks are emptied on demand (but not necessarily every year). If waste generation data are recorded when the tank is emptied, the figures produced can result in rather irregular waste production patterns. In such cases, an explanation must be provided in the quality report.

Regional level

Waste generation should be reported at national level.

2.2.2 Classifications

Reporting countries must break down the total waste generated into 19 sources and 51 waste categories; these breakdowns are included in Annex I Section 2 and 8 of the Waste Statistics Regulation.

Breakdown in sources: NACE sectors and households

Definition of NACE classification

Waste generation needs to be broken down according to the source (businesses or households) that generated the waste. Waste generated by businesses is broken down by economic activity in 18 categories based on the statistical classification of economic activities (NACE Rev. 2 or 2008 and thereafter, Statistical Classification of Economic Activities in the European Community)[11]. Households are the 19th category (Table 6).

[11] The list of NACE sectors can be found at http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC.

Table 6: Sources for waste generation to be specified in accordance with Section 8 of Annex I on waste generation

Item No	*NACE Rev.2 divisions*	*Code Description*
Section A: Agriculture, forestry and fishing		
1	01+02+03	Agriculture, hunting and forestry; Fishing and aquaculture
Section B: Mining and quarrying		
2	04 to 09	Mining and quarrying
Section C: Manufacturing		
3	10+11+12	Manufacture of food products + beverage + tobacco
4	13+14+15	Manufacture of textiles + wearing apparel + leather and related products
5	16	Manufacture of wood and wood products
6	17+18	Manufacture of pulp, paper and paper products + printing and reproduction or recorded media
7	19	Manufacture of coke, refined petroleum products
8	20+21+22	Manufacture of chemicals, chemical products + basic pharmaceutical products and preparations + rubber and plastic products
9	23	Manufacture of other non-metallic mineral products
10	24+25	Manufacture of basic metals + fabricated metal products
11	26+27+28+29+30	Manufacture of computer, electronic and optical products + electrical equipment + machinery and equipment + motor vehicles, trailers and semi-trailers + other transport equipment
12	31+32+33	Manufacture of furniture + other manufacturing + repair and installation of machinery and equipment
Section D: Electricity, gas, steam and air conditioning supply		
13	34+35	Electricity, gas, steam and air conditioning supply
Section E: Water supply, sewerage, waste management and remediation activities		
14	36+37+39	Water collection, treatment and supply + Sewerage + Remediation activities and other waste management services
15	38	Waste collection, treatment and disposal activities; materials recovery
Section F: Construction		
16	41+42+43	Construction
Section G to U: Services activities		
17	Sections G - U Excluded 46.77	Wholesale and retail trade; Repair of motor vehicles, motor cycles + Transportation and storage + Accommodation and food service activities + Information and communication + Financial and insurance activities + Real estate activities + Professional, scientific and technical activities + Administrative and support service activities + Public administration and defence; compulsory social security + Education + Human health and social work activities + Arts, entertainment and recreation + Other service activities + Activities of households as employers; undifferentiated goods - and services – producing activities of households for own use + Activities of extraterritorial organisations and bodies
18	46.77	Wholesale of waste and scrap

- As of reference year 2008 NACE Rev. 2 replaces NACE Rev. 1.1. A synopsis of the categories according to NACE Rev. 1.1 and NACE Rev. 2 is shown in Annex III.
- As of reference year 2010, the NACE divisions 01/02 ‘Agriculture, hunting and forestry’ and division 03 ‘Fishery and aquaculture’ are summarised under one item which reduces the number of generating sectors from 20 to 19. For the reference year 2008, the breakdown has to be reported according to the 20 sectors as defined in WStatR 2002.

The purpose of the breakdown of waste generation according to sources is to relate the production of waste to business and household activities. The principal activity of a statistical unit (e.g. an enterprise) is defined as the one that contributes most to its value added.[12] This means that generally the creation of value added is the criterion for the allocation of any measure, such as waste generation in our case, to NACE activities. Therefore, in order to assign the generated waste to the correct NACE activity, the unit to be considered should be the unit that actually generates the value added and that also causes the waste rather than the unit of the customer. For instance, waste arising from the construction of a building should be assigned to the activity of the construction company itself (NACE F) rather than to the activity of the future building owner (e.g. services).

Recommendations for breakdown: statistical unit

As already mentioned, the waste should be attributed to the sector which generates it and hands it over to the waste management sector or takes it directly to a dump or treatment site. The allocation of waste to the 18 categories of economic activities therefore depends on the definition of the statistical unit and how these statistical units are linked to economic activities. Statistical units for economic activities can be either local units (LUs) or kind-of-activity units (KAUs)[13].

Local unit (LU)

The local unit (LU) is an enterprise or part thereof (e.g. a workshop, factory, warehouse, office, mine or depot) situated in a geographically identified place. At or from this place economic activity is carried out for which — save for certain exceptions — one or more persons work (even if only part-time) for one and the same enterprise.

With regard to work carried out at different places (maintenance, construction and demolition, etc.), the LU is taken to be the place from which instructions emanate or from where the work is organised.

A 'geographically identified place' must be subject to a strict interpretation: two units belonging to the same enterprise must be seen as two units even if they are located close to each other and a large single site straddling two administrative regions must be regarded as a single unit, with the postal address determining the location of the unit.

The boundaries of the unit are determined by the boundaries of the site.

Kind-of-activity unit (KAU)

The kind-of-activity unit (KAU) groups all the parts of an enterprise contributing to the performance of an activity at class level (four digits) of NACE Rev. 2 and corresponds to one or more operational subdivisions of the enterprise. The enterprise's information system must be capable of indicating or calculating for each KAU at least the value of production, intermediate consumption, manpower costs, the operating surplus, and employment and gross fixed capital formation.

The KAU was devised as an observation unit in order to improve the homogeneity of the results of statistical surveys by activity and hence the international comparability of these results, since at the level of the enterprise different types of horizontal and vertical integration can be observed at both national and international level.

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[12] See NACE Rev. 2 handbook, chapter 3.1 on classification rules http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-015/EN/KS-RA-07-015-EN.PDF

[13] Section 8(2) of Annex I of the Waste Statistics Regulation. These terms are defined in accordance with the Council Regulation (EEC) No 696/93 of 15 March 1993.

Combustion facilities may serve as an illustrative example for the impact of the statistical unit on the attribution of waste to the generating sector: many power plants, waste incinerators and other combustion facilities are directly attached to specific enterprises, such as chemical plants, hospitals, public defence and transport enterprises. However, if KAUs are used as statistical units in these enterprises, then the integrated combustion plants must be separated from the enterprises to which they are physically attached and must be allocated to Section D or Division 36, 37, 39. If LUs are used as statistical units, then integrated combustion plants cannot be separated and their waste must be 'spread' over the economy instead of being allocated only to Section D and Division 36, 37, 39.

Recommendations for waste statistics

Most harmonised business statistics use the enterprise or the kind-of-activity unit (KAU) as the statistical unit. For the sake of consistency, it is recommended that preference should be given to the KAU rather than the LU.

Consistency with business statistics for the delineation of statistical units and the coding of economic activity (NACE) is guaranteed by using the statistical business register. The business register can be used directly as a sampling frame; it can also be used indirectly by matching the waste data collected from administrative sources to the statistical units in the business register. If it is impossible to use the business register in either way, the delineation of statistical units should still adhere as closely as possible to business register practice. The local unit should only be used as a last option.

In either cases, the quality report provided by Member States should give a description of how the chosen statistical unit affects the groupings of NACE Rev. 2 so that statistics comparability is ensured as much as possible among countries.

A problem arises when both KAUs and LUs are used as statistical units and different outcomes are obtained as a result. In order to obtain results which are consistent, all the Member States should be restricted to using one type of statistical unit or an agreement should be reached on the handling of such cases.

Breakdown in waste categories: EWC-Stat classification

Definition of EWC-Stat classification

Waste categories are defined on the basis of the statistical European Waste Classification (EWC-Stat), which is a substance-oriented nomenclature and which has been specially created for EU waste statistics[14]. The 51 waste categories that must be reported in waste generation include 21 hazardous waste categories and 30 non-hazardous waste categories.

Countries which use the European List of Waste (LoW) for collecting data on waste generation and treatment can use the table of equivalence that has been established between the LoW and the EWC in order to convert their statistics in EWC categories[15]. This transposition table is also useful for countries using the EWC-Stat for their compilation of waste statistics as it provides useful information on the composition of the waste categories listed in EWC-Stat.

[14] See Commission Regulation (EC) No 574/2004 amending Annex III of the Waste Statistics Regulation. The complete list of this classification can also be found at http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC

[15] Table of equivalence established presented in Annex III of the Waste Statistics Regulation (Commission Regulation (EC) No 574/2004).

When countries use national waste classifications, they should always convert them into the corresponding classification in EWC-Stat. They should indicate in the quality report the national waste types and conversion practices used.

- Until reference year 2008, waste generation was broken down according to the 48 categories defined in WStatR 2002. A synopsis of the breakdown according to WStatR 2002 and WStatR 2010 is shown in Annex IV.
- Short remarks on major changes of waste categories are given in the following section.

Recommendations for breakdown

Almost all combinations of economic activities and waste codes are possible. For instance, businesses other than construction companies can perform in-house construction activities and thus produce construction waste. In the same way, businesses usually discard some household-type waste produced by their staff and clients at the business site. Some waste streams are however produced by a small number of economic activities and are unlikely to occur as a result of other economic activities.

In the following paragraphs, definitions of waste are given as well as examples and main NACE sectors that produced them. More information can be found in the 'Guidance on classification of waste according to EWC-Stat categories' document[16]. This document should be consulted when a hesitation occurs on the assignment of a waste to any waste source or waste category. It also gives additional information on correspondence between EWC-Stat and List of Waste codes.

Spent solvents (01.1): item 1. These are hydrocarbons, fluorocarbons, chlorinated carbons; organic halogenated, non-halogenated solvents, including organic washing liquids; and organic fluorinated refrigerants. They are used in chemical industries as reaction agent and in extraction processes, cleaning processes in mechanical engineering and surface treatment and appear almost exclusively in the manufacture of chemicals, chemical products, basic pharmaceutical products and preparations, and rubber and plastic products (item 9 of Section 8 of Annex I of the Waste Statistics Regulation). To a lesser extent, this type of waste can also be generated during the fabrication of metal products and during recycling. Separately collected fractions of spent solvents can be generated by almost all economic activities, including private households.

Acid, alkaline and saline wastes (01.2): items 2/3. These are inorganic acids (like hydrochloridric, sulphuric, phosphoric, nitric acids); alkaline like calcium ammonium, sodium hydroxide and inorganic salts mainly from the manufacturing of acids or alkaline and salt slags or solid slags. They mainly originate from surface treatment in metallurgy and equipments sectors and inorganic chemical processes. In general, acids and alkaline are hazardous except lime mud and degreasing waste without dangerous substances (like oil, heavy metals or cyanides). Saline waste is dangerous when containing dangerous substances like heavy metals, arsenic or oil.

Used oils (01.3): item 4. These wastes are mineral-based, synthetic oils and biodegradable engine oils. This category includes engine, gear, hydraulic and lubricating oils, oils for insulation and heat transmission; emulsions from metal surface shaping and residues from tank cleaning. They originate both from the refining process and from the mechanical engineering and maintenance of vehicles in all sectors. Most used oils are collected and treated by a small number of collectors and treatment facilities. Because of the hazards involved, these facilities are monitored and data coverage is relatively good with regard to the quantities collected. Problems of comparability arise when used oils are mixed with other substances such as emulsions for metal surface shaping and residues from tank cleaning. All used oils are hazardous.

[16] Guidance on EWC-Stat waste categories http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/Guidance%20on%20EWCStat%20categories%202010.pdf

Chemical wastes (01.4, 02, 03.1): items 5/6. These are solid or liquid spent chemical catalysts; off-specification products and wastes like agro-chemicals, medicines, paint, dyestuff, pigments, varnish, inks and adhesives, including related sludges; chemical preparation waste like preservatives, brake and antifreeze fluids, waste chemicals; tars and carbonaceous waste like acid tars, bitumen, carbon anodes, tar and carbon waste; fuels, emulsions, sludges containing oil, like bilge oil, waste fuels oil, diesel, petrol, waste from oil water separator; aqueous rinsing and washing liquids, aqueous mother liquors; spent filtration and adsorbent material like activated carbon, filter cakes, ion exchangers. They mainly originate from the chemical industry and from various industrial branches producing and using chemical products. They are hazardous when containing toxic chemical compounds, oil, heavy metals or other dangerous substances.

- Until reference year 2008 chemical waste was split into the three categories:
  - Spent chemical catalysts (01.4)
  - Chemical preparation wastes (02)
  - Chemical deposits and residues (03.1)

Industrial effluent sludges (03.2): items 7/8. These wastes are sludges and solid residues from industrial waste water treatment including external/physical treatment; solid and liquid wastes from soil and groundwater remediation; sludges from boiler cleaning; wastes from cooling water preparation and cooling columns; and drilling mud. Waste water treatment takes place in many industrial manufacturing sectors. Industrial effluent sludges are hazardous when containing oil and heavy metals. A problem of comparability among countries might arise when LUs are used as statistical units, as the waste water treatment processes might not be geographically isolated and the sludges might not be attached to the primary activity.

Sludges and liquid wastes from waste treatment (03.3): items 9/10. These wastes comprise different types of sludges and liquid wastes from waste treatment facilities. They include wastes from the physico/chemical treatment of hazardous wastes, liquids and sludges from the anaerobic treatment of waste, landfill leachate and effluent treatment sludges from oil regeneration. Sludges and liquid wastes from waste treatment are hazardous and non-hazardous.

- New category to be reported as of 2010; wastes were formerly included in the categories
  - Industrial effluent sludges (03.2)
  - Common sludges (11)
  - Chemical preparation wastes (02)

Healthcare and biological waste (05): items 11/12. These wastes comprise only biological waste from the healthcare of animals and humans. They mainly originate from clinics and hospitals, including veterinary activities, but can also be produced by industries generating healthcare and biological products as production wastes and in lower quantities by all industrial sectors as they all have first-aid kits. Healthcare and biological waste is hazardous when infectious.

Metallic wastes, ferrous (06.1): item 13. These wastes are ferrous metals (iron, steel) and alloys. They include wastes like mill scales from the iron and steel industry, metal filings, turnings and particles from metal processing, construction and demolition waste, discarded moulds from ceramic production, metals from mechanical treatment and shredding of waste, and metals removed from waste incineration slag. The ferrous metal wastes covered by category 06.1 are non-hazardous.

Metallic wastes, non-ferrous (06.2): item 14. These wastes are non-ferrous metals (aluminium, copper zinc, lead, tin, etc.) and alloys. They include wastes like metal filings, turnings and particles from the processing of non-ferrous metals, hard zinc from galvanising processes, cables, construction and demolition waste, components from ELV dismantling and metals from the mechanical treatment and shredding of waste. Non-ferrous metal wastes covered by category 06.2 are non-hazardous.

Metallic wastes, mixed ferrous and non-ferrous (06.3): item 15. These wastes are mixtures of ferrous and non-ferrous metals and alloys or unspecified metal wastes. They include mixed metals from construction and demolition, mixed metals from separate collection (e.g. metal packaging) and unspecified metal waste from the agricultural sector. Mixed metal wastes covered by category 06.3 are non-hazardous.

- Until reference year 2010 all metal wastes (ferrous, non-ferrous and mixed) were reported under one category (EWC-Stat 06)

Glass wastes (07.1); items 16/17. These wastes can be waste from glass packaging; glass waste from the production of glass and glass products; and waste glass from sorting and recycling processes. Glass waste occurs in a small number of production sectors (construction and demolition, recycling of end-of-life vehicles and electrical, electronic equipment and glass manufacturing) and also as a result of the separate sorting by businesses and households, but can be generated by all sectors as consumption residues or packaging. Glass wastes are hazardous in case of glass powder (particle size relevant) and when containing heavy metals.

Paper and cardboard wastes (07.2): item 18. These wastes are paper and cardboard from sorting and separate sorting by businesses and households. This category includes fibre, filler and coating rejects from pulp, paper and cardboard production. These wastes are largely generated by three activities: separate collection, mechanical treatment of waste and pulp, and paper and cardboard production and processing. All paper and cardboard wastes are non-hazardous.

- Two codes on production waste and unspecified wastes were removed from this category; as a consequence, quantities might be lower as of 2010.

Rubber wastes (07.3): item 19. These wastes are only end-of-life tyres which come from the maintenance of vehicles, and end-of-life vehicles. All rubber wastes are non-hazardous. They can be generated in all sectors.

Plastic wastes (07.4): item 20. These are plastic packaging; plastic waste from plastic production and machining of plastics; plastic waste from sorting and preparation processes; and separately collected plastic waste. They originate from all sectors as packaging waste, from sectors producing plastic products and from separate sorting by businesses and households. All plastic wastes are non-hazardous. A distinction should be made between plastic waste and mixed packaging (mixed and undifferentiated materials, items 36/37).

Wood wastes (07.5): items 21/22. These wastes are wooden packaging, sawdust, shavings, cuttings, waste bark, cork and wood from the production of pulp and paper; wood from the construction and demolition of buildings; and separately collected wood waste. They mainly originate from wood processing, the pulp and paper industry and the demolition of buildings but can occur in all sectors in lower quantities due to wooden packaging. Wood wastes are hazardous when containing hazardous substances like mercury or tar-based wood preservatives.

Textile wastes (07.6): item 23. These wastes are textile and leather waste; textile packaging; worn clothes and used textiles; waste from fibre preparation and processing; waste tanned leather; and separately collected textile and leather waste. They originate from only a small number of activities: the leather and fur industry, the textile industry, the mechanical treatment of waste and separate collection. All textile wastes are non-hazardous.

Waste containing PCB (07.7): item 24. These wastes are oil-containing PCB (e.g. hydraulic oil, insulation and heat transmission oil from transformers); PCB containing components from post-consumer products; construction and demolition wastes containing PCB (e.g. sealants resin-based floorings). They originate from the construction and demolition sector, the mechanical treatment of waste, the manufacture of computer, electronic and optical products, and in lower quantities by all sectors still discarding PCB-containing components (e.g. batteries). All wastes containing PCB are hazardous.

Discarded equipment (08 excl. 08.1, 08.41): items 25/26. These wastes are discarded electrical and electronic equipment (e.g. small and large household equipment, IT equipment, electric tools) and fluorescent tubes. Batteries and end-of-life vehicles are excluded from this category as they should be reported in items 28/29 and 30/31, respectively. They can be generated by all economic sectors and need to be separately collected in accordance with EU directives on electrical and electronic equipment[17].

Discarded vehicles (08.1): items 27/28. These are all kinds of end-of-life vehicles. They originate from businesses and households. Discarded vehicles are hazardous when containing dangerous substances (e.g. cooling liquids, engine oil or fuel, chlorofluorocarbons from air conditioning).

Batteries and accumulators wastes (08.41): items 29/30. These wastes mainly originate from households although they can be produced in lower quantities by all sectors. Batteries and accumulators are hazardous when containing dangerous substances; e.g. nickel, cadmium, mercury, lead and unsorted batteries and accumulators wastes.

Animal and mixed food wastes (09.1): item 31. These wastes are animal and mixed wastes from food preparation and products, including sludges from washing and cleaning; separately collected biodegradable kitchen and canteen waste, and edible oils and fats. They originate from food preparation and production (agriculture and manufacture of food and food products) and from separate collection. Animal and mixed waste of food preparation and products are non-hazardous.

Vegetal wastes (09.2): item 32. These wastes are vegetal wastes from food preparation and products, including sludges from washing and cleaning, materials unsuitable for consumption and green wastes. They originate from food and beverage production, and from agriculture, horticulture and forestry. Vegetal wastes are non-hazardous.

- Categories 09.1 and 09.2 were restructured. The sum of both categories should be comparable to the sum of the previous categories 09 (excl. 09.11 and 09.3) and 09.11.

Animal faeces, urine and manure (09.3): item 33. These wastes are slurry and manure including spoiled straw. They originate from agriculture. Animal faeces, urine and manure are non-hazardous.

Household and similar wastes (10.1): item 34. These wastes are mixed municipal waste, bulky waste, street-cleaning waste like packaging, kitchen waste, and household equipment except separately collected fractions. They originate mainly from households but can also be generated by all sectors in canteens and offices as consumption residues. Household and similar wastes are non-hazardous.

Mixed and undifferentiated materials (10.2): items 35/36. These are unspecified and mixed waste without any general waste source. This category covers not only mixed packaging but also mainly residual categories from different branches of industry (food production, textile industry, combustion

[17] Directive (EC) 2002/96 of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment and Directive (EC) 2002/95 of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

plants, surface treatment of metals and plastics, etc.). These residual categories are often used for nation-specific waste codes. Mixed and undifferentiated materials are hazardous when containing heavy metals or organic pollutants.

- As of 2010 the category summarises all unspecified LoW-codes; the amount of category 10.2, non-hazardous, should be higher than before.

Sorting residues (10.3): items 37/38. These wastes are sorting residues from mechanical sorting processes for waste; combustible waste (refuse derived fuel); and non-composted fractions of biodegradable waste. They mainly originate from waste treatment and separate collection. Sorting residues from demolition activities are excluded. They are hazardous when containing heavy metals or organic pollutants.

Common sludges (11): item 39. These are waste water treatment sludges from municipal sewerage water and organic sludges from food preparation and processing. They mainly originate from households and industrial branches with organic waste water (mainly pulp and paper as well as food preparation and processing). They can also occur in waste water treatment plants or in the anaerobic treatment of waste. All common sludges are non-hazardous. Comparability can be problematic between countries using different statistical units as they will not assign the waste to the same economic sector.

- Some sludges were reallocated to category 03.3; as of 2010 quantities should be lower than before.

Mineral waste from construction and demolition (12.1): item 40/41. These are concrete, bricks, and gypsum waste; insulation materials; mixed construction wastes containing glass, plastics and wood; and waste hydrocarbonised road-surfacing material. They originate from construction and demolition activities. They are hazardous when containing organic pollutants.

- New category to be reported as of 2010; wastes were formerly included in the category 'Mineral Waste' consisting of EWC-Stat 12.1, 12.2, 12.3 + 12.5

Other mineral wastes (12.2, 12.3, 12.5): items 42/43. These are waste gravel, crushed rocks, waste sand and clays, muds and tailings from extractive industries; blasting materials, grinding bodies, sludges, particulates and dust from the manufacture of glass, ceramic goods and cement; casting cores and moulds from the casting of ferrous and non-ferrous pieces; linings and refractories from thermal processes; and asbestos materials from all branches (asbestos processing, cement, brake pads etc.). They are hazardous when containing asbestos, oil or heavy metals.

- New category to be reported as of 2010; wastes were formerly included in category 'Mineral Waste' consisting of EWC-Stat 12.1, 12.2, 12.3 + 12.5

Combustion wastes (12.4): items 44/45. These are wastes from flue gas cleaning (desulphurisation sludges, filter dust and cakes, fly ashes); slags, drosses, skimmings, boiler dusts, and ashes from thermal processes. They originate from any thermal and combustion process (power stations and other combustion plants, thermal metallurgy, casting of ferrous and non-ferrous pieces, manufacture of glass and glass products, manufacture of ceramic goods, bricks, tiles and construction products, manufacture of cement, lime and plaster). Combustion wastes are hazardous when containing organic pollutants, oil and heavy metals.

- Wastes from waste incineration were removed from 12.4 and are reported in a separate category (12.8, 13); as of 2010, the amount of category 12.4 should be lower than before.

Soils (12.6): items 46/47. These wastes are soils and stones that originate mainly from construction activities, the excavation of contaminated sites and soil remediation. They are hazardous when containing organic pollutants, heavy metals or oil.

- New category to be reported as of 2010:
  - Non-hazardous soils were formerly reported in category 'Mineral Waste' consisting of EWC-Stat 12.1, 12.2, 12.3 + 12.5
  - Hazardous soils were reported together with dredging spoils in category 12.6 'Contaminated soils and polluted dredging spoils'

Dredging spoils (12.7): items 48/49**.** These are wastes that mainly come from the construction and maintenance of water projects, dredging and subsurface work. They are hazardous when containing heavy metals or organic pollutants.

- Hazardous dredging spoils are reported separately as of 2010; they were reported together with hazardous soils in category 12.6 'Contaminated soils and polluted dredging spoils'
- For non-hazardous dredging spoils only the EWC-Stat code has changed (formerly 11.3).

Solidified, stabilised or vitrified wastes, Mineral waste from waste treatment and stabilised wastes (12.8, 13): items 50/51. These are wastes from the incineration and pyrolysis of waste (bottom ash, slag, fly ash, sands from fluidised beds, boiler dust, filter cake from gas treatment); mineral fraction from the mechanical treatment of waste; and wastes from treatment processes that solidify waste, stabilise or neutralise dangerous substances by a chemical reaction or vitrify waste in a thermal process. The wastes are hazardous when containing organic pollutants or heavy metals, or when only partly stabilised.

- New category to be reported as of 2010; wastes were formerly reported under category 'Mineral Waste' consisting of EWC-Stat 12.1, 12.2, 12.3 + 12.5 or under EWC-Stat 13 'Solidified, stabilised or vitrified wastes'.

2.3 Waste treatment: data set 2

Data collection on waste treatment as laid down in Annex II of the WStatR is closely linked to the definitions of Directive 2008/98/EC. Accordingly, waste treatment is understood as the generic term for all recovery and disposal operations including preparatory operations.

Recovery means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

Recycling is a subset of recovery and 'means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.' It in-

cludes the reprocessing of organic material (e.g. composting, anaerobic digestion etc.) but excludes the use as fuels and the use for backfilling operations.

Disposal 'means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy.'

Lists of treatment operations are set out in Annex I (**D**isposal operations) and Annex II (**R**ecovery operations) of Directive 2008/98/EC. The lists of R and D operations build the basis for the breakdown of data by treatment categories (see chapter 2.3.2)

2.3.1 Required variables

Data on waste treatment should be reported as the total amount of waste entering recovery and disposal facilities[18] for final treatment.

- In case of disposal, the final treatment is for most of the waste the thermal treatment or the final deposit on a landfill. For specific wastes other disposal operations may apply (see D2 to D4, D6, D7 in Table 8).
- In case of recovery, the final treatment step is either the incineration of waste for energy recovery, or the treatment step where the waste ceases to be waste because it is turned into a product or used in another way where it replaces primary material. Concerning the point where the waste ceases to be waste, the provisions of the Waste Framework Directive (and the corresponding European case law) apply.
- In case of recycling, the final treatment step frequently takes place in production facilities like, for instance, paper mills, glass works, metal works and plastic converters. These facilities may not need a waste permit according to national legislation but are nevertheless covered by Annex II of the WStatR. In cases where these production facilities are not covered by a survey the respective countries have to make sure that the waste flows destined for recycling are covered by other means (e.g. by the output data of pre-treatment facilities).

End-of-waste criteria according to the Waste Framework Directive

Article 6(1) of the Waste Framework Directive allows a definition for certain wastes material-specific criteria to determine when the respective material ceases to be waste. This mechanism is intended to encourage recycling by creating legal certainty on the end-of-waste for materials destined for recycling.

End-of-waste criteria shall be prepared for ferrous scrap metal, aluminium scrap metal, copper scrap metal, paper and glass. A Commission Regulation establishing end-of-waste criteria for iron and steel scrap and aluminium are expected to come into force in 2011. Further Regulations on waste paper, copper scrap metal and waste glass will follow.

The new mechanism will lead to changes concerning the final treatment step for the concerned materials. The final treatment may then take place in treatment plants that prepare the waste for use in a production process (recycling) / prior to the recycling in production facilities.

These legal changes will affect the appropriate data collection point for waste statistics. Member states should take care that the methods for the compilation of waste statistics are adapted accordingly in order to safeguard the full coverage of waste statistics.

[18] The term recovery and disposal facility means a facility that requires a permit or registration pursuant to Articles 23 to 27 of Directive 2008/98/EC.

Some recovery and disposal operations (mainly preparatory treatments) fall out of the scope of reporting for Annex II as well as internal recycling. Preparatory treatments and internal recycling are defined hereafter before describing how data should be reported. The recovery and disposal operations to be reported under the Waste Statistics Regulation are listed in Table 7 and Table 8.

Table 7: Recovery operations pursuant to Annex II of the Waste Statistics Regulation

Code	***Types of recovery operations***
R1	Use principally as a fuel or other means to generate energy
R2	Solvent reclamation/regeneration
R3	Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)
R4	Recycling/reclamation of metals and metal compounds
R5	Recycling/reclamation of other inorganic materials
R6	Regeneration of acids or bases
R7	Recovery of components used for pollution abatement
R8	Recovery of components from catalysts
R9	Oil re-refining or other reuses of oil
R10	Land treatment resulting in benefit to agriculture or ecological improvement
R11	Use of wastes obtained from any of the operations numbered R1 to R10

Table 8: Disposal operations pursuant to Annex I of the Waste Statistics Regulation

Code	***Types of disposal operations***
D1	Deposit into or onto land (e.g. landfill, etc.)
D2	Land treatment (e.g. biodegradation of liquid or sludgy discards in soils, etc.)
D3	Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)
D4	Surface impoundment (e.g. placement of liquid or sludgy discards into pits, ponds or lagoons, etc.)
D5	Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
D6	Release into a water body except seas/oceans
D7	Release into seas/oceans including sea-bed insertion
D10	Incineration on land
D12	Permanent storage (e.g. emplacement of containers in a mine, etc.)

Exclusion of some recovery and disposal operations, pre-treatment

The recovery and disposal operations that fall in the scope of Annex II are presented in Table 7 and Table 8, respectively. This list specifically excludes disposal and recovery operations defined as preparatory operations (Table 9). Also excluded is disposal operation D11 'incineration at sea' since this treatment option is banned by international agreements.

Table 9: Treatment operations excluded from reporting on waste treatment: pre-treatment and incineration at sea

Code	***Types of recovery and disposal operations***
Disposal operations	
D8	Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12
D9	Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12 (e.g. evaporation, drying, calcination, etc.)
D11	Incineration at sea
D13	Blending or mixing prior to submission to any of the operations numbered D1 to D12
D14	Repackaging prior to submission to any of the operations numbered D1 to D13
D15	Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)
Recovery operations	
R12	Exchange of wastes for submission to any of the operations numbered R1 to R11
R13	Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)

Biological treatment (D8) comprises operations which use aerobic or anaerobic biological processes in order to prepare the waste for subsequent disposal, e.g. by reducing the amount of biodegradable components, or by degradation of organic pollutants. This includes, in particular:

- biological-mechanical treatment of municipal waste;
- biological treatment of contaminated soil, sludges or mineral wastes, if followed by disposal.

Chemical-physical treatment (D9) covers the pre-treatment of mainly fluid and pasty hazardous waste by a variety of chemical, thermal and physical processes in order to achieve an output which can be disposed of. Physico-chemical treatment is typically deployed for:

- emulsions and oil/water mixtures;
- neutral aqueous organics and inorganics (production specific waste water, leachate, etc.);
- cyanides;
- acids and alkalis.

Typical treatment steps are detoxification (oxidation/reduction), precipitation, neutralisation, emulsion separation, immobilisation, electrolysis and osmosis.

Blending, mixing and repackaging of waste (D13 and D14) covers similar preparatory activities whose purpose is the conditioning and packaging of waste for subsequent transport and further treatment. Such operations typically include:

- basic sorting activities;
- crushing and shredding of waste in order to reduce the volume of waste for transport or landfilling;
- mixing and blending of waste (e.g. mixing of similar wastes from different waste generators);

- homogenisation, conditioning and solidification;
- packaging of asbestos;
- transfer and compaction of waste.

Exchange of wastes (R12): The wording of recovery operation *R12* is used for the assignment of preparatory treatment activities such as:

- basic sorting activities;
- mixing of waste from different generators before it is sent to a recovery facility;
- transfer and compaction of waste;
- shredding of wood waste prior to energy recovery.

Temporary storage (D15 and R13) cover the temporary storage of waste prior to disposal and recovery, respectively. This does not involve the storage of waste prior to collection at the site at which it was generated. The 'temporary' dimension is different between the two treatment operations. For operation D15, temporary means that the storage is limited to a period of less than one year whereas for operation R13, temporary means that the storage is limited to a period of less than three years[19].

Exclusion of co-incineration plants using specific biomass wastes

Excluded from Annex II of the Waste Statistics Regulation are co-incineration plants in the meaning of Directive 2000/76/EC on the incineration of waste[20] that use as a fuel only the following biomass wastes:

- vegetable waste from agriculture and forestry;
- vegetable waste from the food processing industry;
- fibrous vegetable waste from virgin pulp production and from the production of paper from pulp;
- uncontaminated wood waste (excluding wood from construction and demolition or other wood waste that may contain halogenated organic compounds or heavy metals);
- cork waste.

This means that no statistics have to be compiled on:

- the number and capacity of such co-incineration facilities, and
- the amount of waste treated in such facilities.

It is important to emphasise that the exemptions refer only to co-incineration plants that use no other wastes than the biomass wastes listed above. Statistics have to be compiled for:

- all co-incineration plants that use as a fuel other wastes than those listed above;
- all incineration plants dedicated to the thermal treatment of waste, with or without energy recovery.

The exclusions concerning biomass waste shall provide for coherence with the scope of Directive 2000/76/EC on the incineration of waste.

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[19] in accordance with the Landfill Directive (Directive 1999/31/EC, Article 2(g)).

[20] Co-incineration facilities are defined in Art. 3(5) of Directive 2000/76/EC on the incineration of waste as follows: 'Co-incineration plant' means any stationary or mobile plant whose main purpose is the generation of energy or production of material products and:
- which uses wastes as a regular or additional fuel; or
- in which waste is thermally treated for the purpose of disposal.

Exclusion of internal recycling

No statistics have to be compiled for waste that is recycled on the site where the waste is generated; i.e. internal recycling. Internally recycled waste is excluded from reporting on waste generation (Annex I) and from reporting on waste treatment (Annex II). This provision of the Waste Statistics Regulation aims to exclude from reporting the recycling of waste which is an integral part of the production process.

'Recycling' is defined in Article 3(17) of the Directive 2008/98/EC and illustrated by a list of included and excluded operations below.

The 'site of waste generation' is understood as the statistical unit that is applied for the compilation of waste statistics under Annex I, i.e. the local unit or the kind-of-activity unit.

Internal recycling includes the following operations where they take place at the site of waste generation:

- the reprocessing of production waste (e.g. of cuttings, shavings, rejects, etc.) in the same or a similar process by which it was generated, as typically carried out in the paper and glass industry, in steel works, or other sectors of the manufacturing industries ('traditional' recycling);
- the regeneration of spent process materials in order to be reused for the same or a similar purpose (e.g. regeneration of spent solvents, waste oils, acids and bases, catalysts, adsorbents);
- the (re)use of bitumen, gravel or other wastes at road works.
- disposal of by-catches and fish guttings from fishery at sea.

Internal recycling excludes:

- any disposal operation, such as the disposal of waste at a company's own landfill;
- energy recovery operations;
- any backfilling operation, i.e:
    - the use of waste for stowage of mines and quarries.
    - the use of waste for recultivation, land reclamation or landscaping;

These two lists are not exhaustive and can be extended when necessary.

Enterprises which recycle waste internally may also receive waste from other companies for recycling. In these cases, statistics should include recycling of external waste and exclude recycling of internal waste.

Figure 2 illustrates the coverage of the Waste Statistics Regulation with regard to internal recycling, taking an automotive manufacturer as an example. The facility includes a coating line for automobiles, a facility for the regeneration of waste solvents, a heating installation and a landfill. The dashed frame represents the manufacturer's production site. Black arrows show the waste flows covered by the Waste Statistics Regulation, whereas the dashed arrows indicate the internally recycled waste flow not covered by the Regulation.

The solvent reprocessing plant regenerates waste solvents which are generated by the manufacturer's local coating facility but also receives and reprocesses waste solvents from external waste generators.

The Waste Statistics Regulation does not cover the quantities of waste solvents generated and reprocessed at the production site (waste flow W3), but it does cover the quantities of solvents received from outside (W4).

Note that waste entering treatment facility 1 (heating installation) and waste entering treatment facility 3 (landfill) are included in the waste that falls in the scope of the Regulation as it is not recycling.

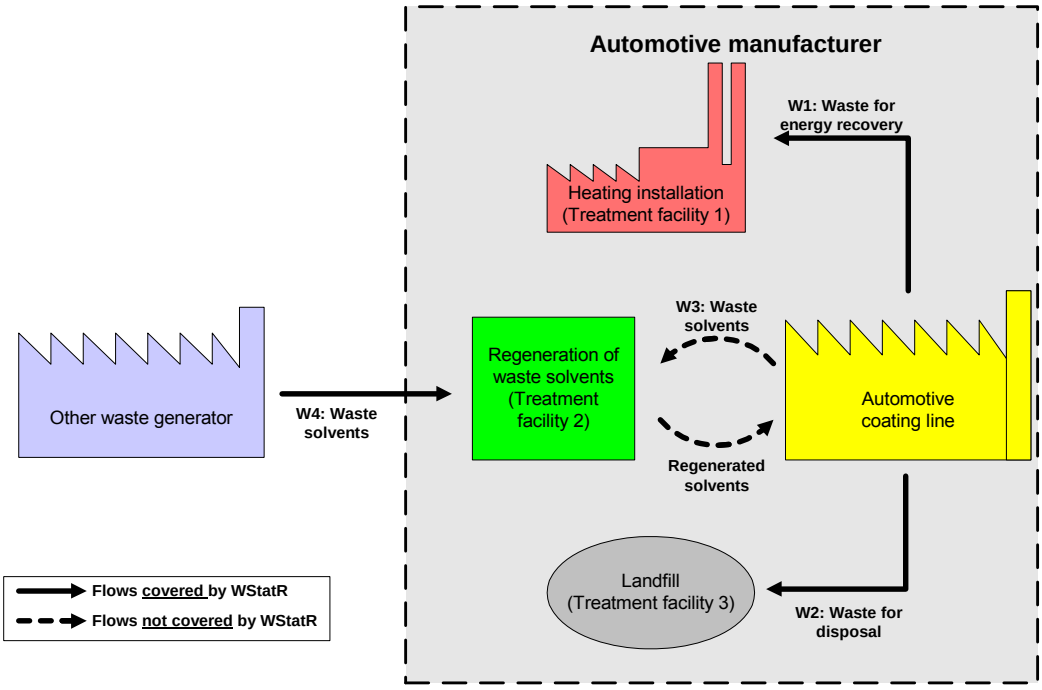

Figure 2: Example of the scope of the Waste Statistics Regulation with regard to internal recycling.

Reporting units

Reporting units are the same as those for waste generation:

- All waste categories except for sludges shall be reported in tonnes of normal wet weight.
- Sludges (EWC-Stat categories 03.2, 03.3, 11 and 12.7) shall be reported in dry weight.
- In the case of waste oils that consist to a high degree of water, Member States are advised to subtract the (estimated) water content.

Reference period

Statistics must be compiled for all waste which undergoes one of the treatment operations listed in Table 7 during the reference year. Waste is considered to be treated when it enters the treatment process.

Regional level

Statistics on waste treatment have to be compiled on a national level.

2.3.2 Classifications

Breakdown in treatment types

Statistics on waste treatment are broken down into the following five treatment categories[21]:

- Item 1: energy recovery (R1)
- Item 2: waste incineration (D10)
- Item 3: recovery (other than energy recovery) (R2 to R11)
    - Item 3a: recycling
    - Item 3b: backfilling
- Item 4: landfilling (D1, D5, D12)
- Item 5: other forms of disposal (D2, D3, D4, D6, D7).

Recovery and disposal operations[22] (hereinafter referred to as R and D codes) must be understood and applied in a consistent way so that the data produced are comparable.

The European Court of Justice established the following basic principles for distinguishing between recovery and disposal operations[23]:

- The decision as to whether the treatment of waste constitutes a recovery operation depends on the principal objective of the operation.
- The principal objective of a recovery operation must be that the waste serves a useful purpose in replacing other materials which would have had to be used for that purpose.

These basic principles should generally be applied as a first step when classifying a waste treatment process.

Item 1: Energy recovery (R1)

The treatment operation *R1 Use principally as a fuel or other means to generate energy* covers the incineration and co-incineration of waste in power stations and industrial facilities such as cement kilns so that the resultant energy can be used to generate heat or electricity. Common examples of energy recovery are:

- the use of tyres, waste oils, or spent solvents in cement kilns;
- the co-incineration of sewage sludge or refuse-derived fuel (RDF) from municipal waste in power stations.

To be classified as an energy recovery operation, the incineration of waste must meet the following criteria[24]:

- The main purpose of the operation must be to use the waste as a means of generating energy, replacing the use of a source of primary energy.
- The energy generated by, and recovered from, the combustion of the waste must be greater than the amount of energy consumed during the combustion process (net energy production).
- The surplus energy must effectively be used, either immediately in the form of the heat produced by incineration or, after processing, in the form of electricity.
- The greater part of the waste must be consumed during the operation and the greater part of the energy generated must be recovered and used.

[21] Please see Table 7 for the explanation to the R and D codes.
[22] Defined in Directive 2008/98/EC.
[23] Judgment in case C-6/00.
[24] established by the EJC's rulings in the cases C-228/00 and C-458/000.

R1 also includes incineration facilities dedicated to the processing of municipal solid waste under the condition that their energy efficiency is equal to or above the level set in Annex II of the Waste Framework Directive (footnote to recovery operation R1) and referred to as R1 energy efficiency formula. The application of the efficiency formula is specified and explained in the document '*European Guidance for the use of the R1 energy efficiency formula for incineration facilities dedicated to the processing of Municipal Solid Waste according to Waste Framework Directive 2000/98/EC, Annex II, R1 formula*'.

Item 1 does not cover:

- The combustion of municipal solid waste in incineration facilities that do not fulfil the energy efficiency standards set in Annex II of the Waste Framework Directive (→ Item 2).
- The combustion of non-municipal waste in dedicated waste incineration plants where the main purpose of the operation is the thermal treatment of the waste and not the production of energy (→ Item 2).

Item 2: Waste incineration (D10)

Disposal operation *D10 Incineration on land* covers the incineration of waste where the main purpose of the incineration is the thermal treatment of waste in order to reduce the volume and the hazardousness of the waste, and to obtain an inert product that can be disposed of. This primarily includes incineration plants dedicated to the thermal treatment of wastes by oxidation or other thermal treatment processes (e.g. pyrolysis, gasification or plasma processes)[25], with or without recovery of the combustion heat generated. The most common examples are:

- municipal solid waste incineration plants (unless they fulfil the energy efficiency standards set in Annex II of the Waste Framework Directive);
- hazardous waste incineration plants;
- sewage sludge incineration plants;
- incineration plants for clinical waste;
- incineration plants for animal carcasses.

D10 also covers the incineration of waste in co-incineration plants[26] where the waste undergoes thermal treatment rather than being used as a fuel.

Item 2 does not cover:

- the use of waste as fuel for energy production (→ Item 1);

Item 3: Recovery (excluding energy recovery) (R2 — R11)

In Item 3, the Waste Statistics Regulation lists all operations which may lead to the recovery of waste, apart from energy recovery and preparatory treatment operations. The R-codes covered by Item 3 differ considerably with regard to their level of specification. While some operations are quite specific, others are very general and cover a wide range of waste types and activities. They can be divided into four different groups:

- five operations deal with the recovery of clearly defined, specific waste streams (solvents (R2), metals (R4), acids and bases (R6), pollution abatement components (R7), catalysts (R8), and waste oils (R9));
- two operations cover the reclamation and recycling of all organic substances (R3) and inorganic substances (R5) which do not belong to one of the specific waste streams above;
- a specific code covers the use of waste as fertiliser or soil improver in agriculture or for other ecologically beneficial purposes (R10);

[25] within the meaning of the Incineration Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste; Article 3(4).

[26] pursuant to Article 3(5) of Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste.

- a specific code covers recovery of secondary waste from recovery operations (R11);

In order to produce data on recycled waste amounts in compliance with the recycling definition of the Waste Framework Directive, Item 3 is further broken down into 3a 'recycling' and 3b 'backfilling'.

Item 3a: Recycling

Item 3a comprises the following operations:

R2 Solvent reclamation/regeneration covers all treatment activities, whose purpose is the regeneration or recovery of spent solvents, e.g.:

- re-refining of solvents in order to separate contaminants and to restore the solvent to its original quality or to a lower grade product (e.g. lacquer thinner);
- preparation of secondary liquid fuels (SLF)

R3 Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) comprises operations whose purpose is the recovery of biodegradable and non-biodegradable organic materials. These operations include the following, in particular:

- recycling of waste paper and board;
- reprocessing and recycling of plastic waste;
- composting of bio waste and green waste;
- fermentation of biodegradable waste for biogas production (biogas plants).

R4 Recycling/reclamation of metals and metal compounds covers all treatment operations whose purpose is the recycling of metal waste, and of complex products with metals as the predominant material. These treatment operations include a variety of mechanical, thermal and chemical treatment steps and processes, such as the following:

- recycling of scrap and production waste in steelworks;
- shredding and reprocessing of end-of-life vehicles and waste electrical and electronic equipment;
- thermal treatment of cables or oil-contaminated metals;
- battery recycling;
- electrolytic recovery of silver from photo chemicals.

R5 Recycling/reclamation of other inorganic materials covers all treatment operations whose purpose is the recovery of inorganic non-metal wastes and which are not covered by other more specific operations (e.g. R6, R8, R10). Inorganic non-metal wastes represent a large proportion of the total waste generated and consist of a broad spectrum of waste types. The main groups are waste from thermal processes (slag, ashes, sands, dust, etc.), construction and demolition waste, and waste from mining and quarrying. The treatment processes applied are manifold and include the following, for example:

- reprocessing of construction and demolition waste;
- reprocessing and recycling of glass waste;
- use as secondary raw material in cement kilns;
- asphalt mixing plants using mineral wastes;

R6 Regeneration of acids or bases comprises operations whose purpose is the regeneration and subsequent reuse of spent acids/bases for the original purpose or for other purposes. Such operations include:

- the re-concentration of spent acids;
- the thermal decomposition of spent sulphuric acid for use as feedstock in sulphuric acid production.

R7 Recovery of components used for pollution abatement includes treatment operations whose purpose is the regeneration of pollution abatement materials such as activated carbon and ion exchange resins. Common applications are:

- the regeneration of activated carbon from water purification and flue gas treatment, mainly by thermal treatment;
- the regeneration of resins by solvent washing.

R8 Recovery of components from catalysts covers treatment operations whose purpose is:

- the regeneration of catalysts to be reused as catalysts;
- the recovery of catalyst components, mainly of metal components, e.g. recycling of precious metals from catalytic converters in vehicle exhausts.

R9 Oil re-refining or other reuses of oil covers all processes whose purpose is the reuse of waste oil. The two main options are the re-refining of waste oil and the preparation of fuels from waste oils:

- Re-refining reconverts waste oils into base oils which can be used to manufacture lubricating products. The treatment typically includes distillation, treatment with acids, solvent extraction, contact with activated clay and hydrotreating.
- Waste oils are also used to generate fuel which can be used as a substitute for, for example, coal, diesel and light fuel. This usually involves the separation of solids and water, e.g. by heating, filtering, dehydrating and centrifuging.

R10 Land treatment resulting in benefit to agriculture or ecological improvement comprises:

- the use of organic and mineral wastes as fertilisers or soil conditioners in agriculture;
- other applications of waste on land on which no food and feed crops are cultivated, and which result in ecological improvement such as landscape restoration and restoration of old disused quarries.

In practice, the following land treatments are assigned to R10:

- the use of sewage sludge in agriculture in compliance with the Sewage Sludge Directive[27];
- the spreading on land of compost from the treatment of separately collected biowaste;
- the use of manure in compliance with agricultural regulations[28];
- the use of mineral wastes as fertilisers in compliance with national legislation.

R11 Use of wastes obtained from any of the operations numbered R1 to R10 comprises the recovery of residual waste from previous recovery operations.

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[27] Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.

[28] The treatment and use of waste consisting of or containing animal by-products (manure, catering waste, etc.) falls under the provision of Regulation (EC) No 1774/2002 on animal by-products

R11 is a redundant entry as it covers only treatment operations that could also be assigned to one of the more specific codes R2 to R10. Priority should be given to the most specific assignment.

Item 3a does not cover:

- the spreading of waste on land for the purpose of final disposal (→ Item 5);
- the incineration of secondary fuels; Item 3a includes the preparation of secondary fuels (e.g. from spent solvents or waste oils) while incineration itself is covered by Item 1 or Item 2;
- the backfilling of waste (→ Item 3b).

Item 3b: Backfilling

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

- the use of waste for stowage of mines and quarries;
- the use of waste for recultivation, land reclamation or landscaping;

Backfilling does not have a clear assignment to the R-codes. Depending on the wastes used for backfilling it may be assigned to R5 or R10. In both cases backfilling operations build a sub-set of the respective recovery operations. However, as mentioned earlier, in order to produce data in compliance with the recycling definition of the Waste Framework Directive, Item 3b 'backfilling' has been introduced as a separate reporting item.

Item 4: Landfilling (D1, D5, D12)

Item 4 comprises the deposit of waste on landfills within the meaning of Directive 1999/31/EC on the landfill of waste[29]. This includes:

- landfills for inert waste, non-hazardous waste and hazardous waste above ground;
- landfills for the underground storage of waste.

Item 4 does not cover the following treatment operations:

- the use of waste for underground stowage, where it fulfils the criteria for recovery (→ Item 3b);
- the use of inert waste for redevelopment and construction purposes on landfills, where it fulfils the criteria for recovery (→ Item 3b);
- temporary storage of waste;
- sea-bed insertion, impoundment or deep injection of waste (→ Item 5).

Item 5: Other disposal operations (D2, D3, D4, D6, D7)

Item 5 summarises other methods of disposal such as land treatment (D2), deep injection (D3), impoundment of waste (D4) and the release of waste into water bodies (D6 and D7). These disposal methods can be used only for a limited range of waste types. However, the quantities of waste can be considerable, with many tonnes of sludge being involved, depending largely on geographical conditions.

D2 Land treatment (e.g. biodegradation of liquid or sludgy discards in soils, etc.) means the spreading of waste on land, often followed by the incorporation of the waste into the soil. Land treatment activities are assigned to D2 if the treatment constitutes a disposal operation and does not result in benefit

[29] OJ L 182, 16.7.1999, last amended by OJ L 311, 21.11.2008.

to agriculture or other ecological improvements. In practice, land treatment within the meaning of D2 is deployed for non-hazardous sludge and for liquid wastes, e.g. for the disposal of dredging sludge.

D3 Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.) means the injection of waste into natural or artificial cavities, or into porous formations of rock.

D4 Surface impoundment (e.g. placement of liquid or sludgy discards into pits, ponds or lagoons, etc.) means the deposit of waste in natural or engineered ponds, pits or lagoons which is, for instance, the predominant method for the management of tailings[30] in mining operations (e.g. in the metal mining sector and in certain coal extraction industries).

D6/7 Release into water bodies including sea-bed insertion is restricted by law to only a few types of waste and includes:

- the deposit of non-hazardous dredging sludge and other non-hazardous sludge in surface water including the bed and the subsoil;
- the discharge of waste at sea in accordance with the OSPAR Convention[31] (e.g. the discharge of fish processing waste and inert materials of natural origin).

Item 5 does not cover:

- the spreading of waste on land for agricultural or other ecologically beneficial purposes (→ Item 3a);
- the treatment of liquid wastes such as leachate, emulsions or oil/water mixtures (→ preparatory treatment operations for disposal).

Breakdown in waste categories: EWC-Stat classification

The breakdown by waste categories for waste treatment is the same as for waste generation. This means that the treated waste quantities have to be broken down by the 51 EWC-Stat categories that are described in detail in section 2.2.2 of this manual.

[30] Tailings are the waste solids which are left over from the mineral processing of ore, which involves a number of different methods. The resulting fine slurry has the consistency of sand, clay and silt and is commonly stored in impoundments retained by tailings dams.

[31] The OSPAR Convention is the current legal instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic. See www.ospar.org for more information.

2.4 Treatment infrastructure and waste collection coverage: data set 3

2.4.1 Required variables

Aside from statistics on waste generation and waste treatment, additional information is needed on the number and capacity of recovery and disposal facilities and on the coverage of the collection scheme for mixed household and similar waste.

Number and capacity of waste treatment facilities

Information should be provided on the number and capacity of waste treatment facilities, specified by treatment categories as described in Chapter 2.3.2. The following information shall be reported:

- number and capacity of incineration facilities (Item 1 and 2);
- number and capacity of landfills, and number of landfills closed since the last reference year (Item 4);
- number of recovery facilities (Item 3).

The information on landfills has to be broken down into landfill types as defined by Directive 1999/31/EC, i.e. landfills for hazardous waste, for non-hazardous waste and landfills for inert waste. The required information is summarised in Table 10 below.

Table 10: Reporting requirements on number and capacity of treatment facilities

Item No	Type of facility		Required variables		
			No of facilities	Capacity	No of facilities closed since last reference year
1	Energy recovery		X	X	-
2	Waste incineration		X	X	-
3a	Recovery facilities (recycling)		X	-	-
3 b	Backfilling installations		X		
4	Landfills for:	haz. waste	X	X	X
		non-haz. waste	X	X	X
		inert waste	X	X	X
5	Other disposal facilities		-	-	-

Reporting units

For *incineration facilities* (Items 1 and 2), the Waste Statistics Regulation asks for the maximum treatment capacity in tonnes/year. The 'maximum capacity' should be understood as the maximum operational capacity, unless the operational capacity exceeds the permitted capacity. Where the operational capacity is greater than the treatment capacity laid down in the facility's permit, the permitted quantity must be reported.

In the event of co-incineration, only the maximum capacity reserved for the input of waste must be reported, but not the total capacity of the combustion plant. The relevant information will usually be laid down in the facility's permit. If no information on the co-incineration capacity is available the total waste that was energetically recovered in the reference year may be used as an estimate.

In the case of *landfills* (Item 4), the capacity in m³ which remains at the end of the reference year must be reported. The remaining capacity is understood to be the operational capacity, if not restricted by the permitted disposal capacity.

Regional level

Data on treatment facilities should be provided at provincial (NUTS 2) level.

Coverage of waste collection scheme

Data on coverage should provide information on the percentage of population covered by a collection scheme for household and similar waste.

Reporting unit

Percentage of population.

Regional level

Data should be provided at national level.

- Until reference year 2008 the coverage of waste collection had to be reported on the NUTS 2 level.

2.4.2 Classifications

Number and capacity of waste treatment facilities

In order to ensure a good consistency between the quantities of waste treated and the capacities of waste treatment facilities, the number and capacities of treatment facilities should relate to those facilities that have a permit or that are registered according to Directive 2008/98/EC and from which quantities of waste treated were reported in the data set waste treatment (data set 2).

2.5 Summary: reporting obligations

Table 11 summarises the classifications and levels of detail required for all three data sets.

Table 11: Summary of the reporting dimensions asked by the Waste Statistics Regulation on both waste generation and waste treatment

	Waste generation	Waste treatment	Treatment infrastructure and collection	
Data Set	1 GENER	2 TREATM	3 REGIO	
	Generation of waste	Treatment of waste	Number and capacity of disposal and recovery operations	Coverage of waste collection scheme
Sectors	19 items - 18 economic sectors (NACE) - 1 sector 'households'	6 items - Incineration - Energy recovery - Recycling - Backfilling - Landfilling - Other forms of disposal	5 items - Incineration - Energy recovery - Recycling[2] - Backfilling[2] - Landfilling[3]	1 item Population
No of waste categories (EWC-Stat)	51	51	NA	1 (mixed household and similar waste)
Reporting units[1]	tonnes	tonnes	tonnes/year m³	% of pop covered by collection scheme
Geographical level	National	National	NUTS 2	National

NA: Not Applicable
[1] Waste is reported in normal wet weight, except sludges that have to be reported as dry matter
[2] Only the number of recovery facilities has to be reported; no capacities.
[3] In addition to number and capacities of landfills, the number of landfills closed since the last reference year has to be reported. All characteristics have to be broken down by landfill type (landfills for hazardous, non-hazardous and inert waste).

CHAPTER 3: Data collection and processing

3.1 Data collection on waste generation

This Chapter is structured in line with the Waste Statistics Regulation. Article 3 of the Waste Statistics Regulation lists four different methods which Member States can use to collect the necessary data:

- surveys;
- administrative or other sources;
- statistical estimation procedures;
- a combination of the above methods.

The following sections outline the various methods of data collection and the problems involved. As the distinction between the different methods is not always clear, explanations are provided.

3.1.1 Surveys

Definition

Surveys are used in order to collect information from units, i.e. response units. Information on waste generation will generally be collected using a questionnaire on waste and the units will be enterprises (or parts of enterprises) or private households.

As a method of data collection, 'surveys' include both total (comprehensive) surveys and sample surveys which are carried out regularly in order to collect statistical data on waste generation directly. Surveys carried out to establish the basis for models are not included. Surveys of this kind will be examined in Section 3.1.3 on statistical estimation procedures. Surveys conducted primarily with a view to the supervision and monitoring of enterprises are also excluded. If the results of these surveys are also used for waste statistics, then these surveys will be seen as 'administrative sources'.

Figure 3 shows the various stages of a (business) survey and how they are connected. The starting points (externally defined preconditions) are the target population(s), the target variables and the business register, which is the most important source of data. The sampling frame, the sampling design and the questionnaires must be developed and the sampling selection scheme established on the basis of these external preconditions. The survey strategy covers the various activities involved and should ensure that the sample selection scheme is effective.

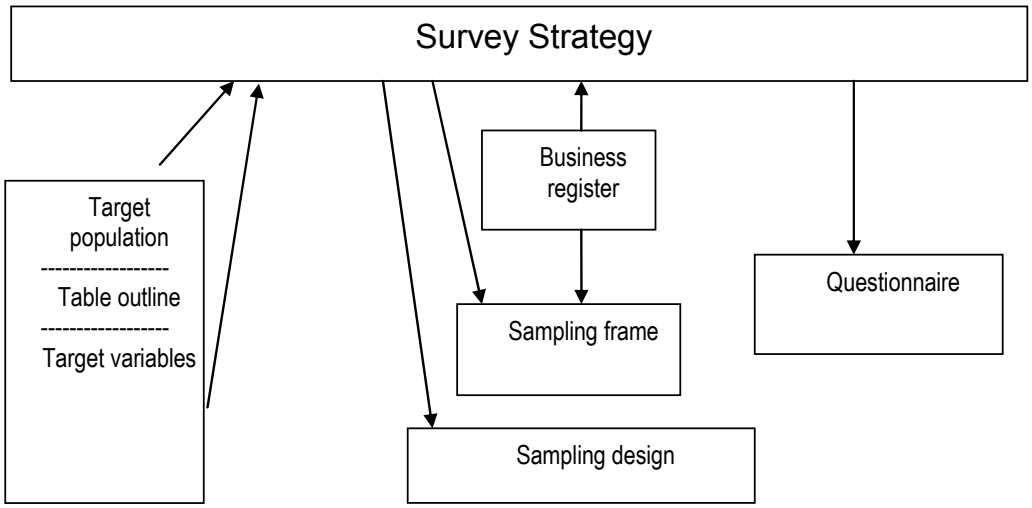

Figure 3: Elements of survey preparation[32]

The Survey strategy directs the activities involved in the survey, including its preparation. It requires information on the 'target population' and 'target variables' as input and generates the 'sampling frame', the 'sampling design' and the 'questionnaire' as output.

The Target population is the set of units which is the object of the survey. In the present case, the target population is defined in two stages. First, 19 items or categories are defined in relation to NACE Rev. 2 (except Item 19); and second, these categories include all the units which correspond to the item definitions. The target population consists of a set of 19 units, each of which contains an (unknown) number of sub-units which can be approximated by the business register or another administrative source.

The Target variables are the relevant dimensions for the units of the target population. In the present case, 51 dimensions (waste types) are defined, for which values can be assigned to the units[33]. The quantities of waste generated by each unit should be split up into the 51 dimensions. Values on each dimension do not need to be provided for each unit.

The Business register can be described as 'an up-to-date file of all statistical units, active within the country's territory and generating value added, as well as their relevant statistical and administrative attributes'[34]. A business register can be seen as a system for converting data from administrative sources (tax registers, social insurance registers and registers of chambers of commerce) into data which can be used in statistics[35].

The Sampling frame defines (a) the type of units and (b) the scope or quantity of units to be included from each unit type in the sampling process. The sampling frame refers to the target

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32 Figure 3 is taken from: WILLEBOORDSE, A. (Ed.), *Handbook on the design and implementation of business surveys*, European Commission, 1998; part B, Preparing the Survey Operations p. 69 ff. Some changes have been made to the diagram.

33 Following a survey of the units, values are assigned to them for the variables studied, i.e. the values are the responses or outcomes which are obtained when the units are exposed to the stimuli (questionnaire).

34 WILLEBOORDSE, A., p. 79

35 Ibid, p. 78

population. The units defined in the sampling frame should be the same as the units defined in the target population, the so-called 'analytical units'. The sampling units should preferably be composed of analytical units[36]. If the business register is used as a source for sampling, problems may arise with regard to the use of different statistical units in the target population and in the sampling frame.

The Sampling design describes the samples to be drawn[37]. As the sampling process has an impact on the estimates which can be produced, sampling design and estimates are usually handled together in sampling theory. A huge variety of sampling types exist. The most relevant are probability samples, which can be further divided into 'simple random samples', 'systematic samples', 'stratified samples' and others[38].

The Questionnaire is the method used to collect the information from the units included in the sample.

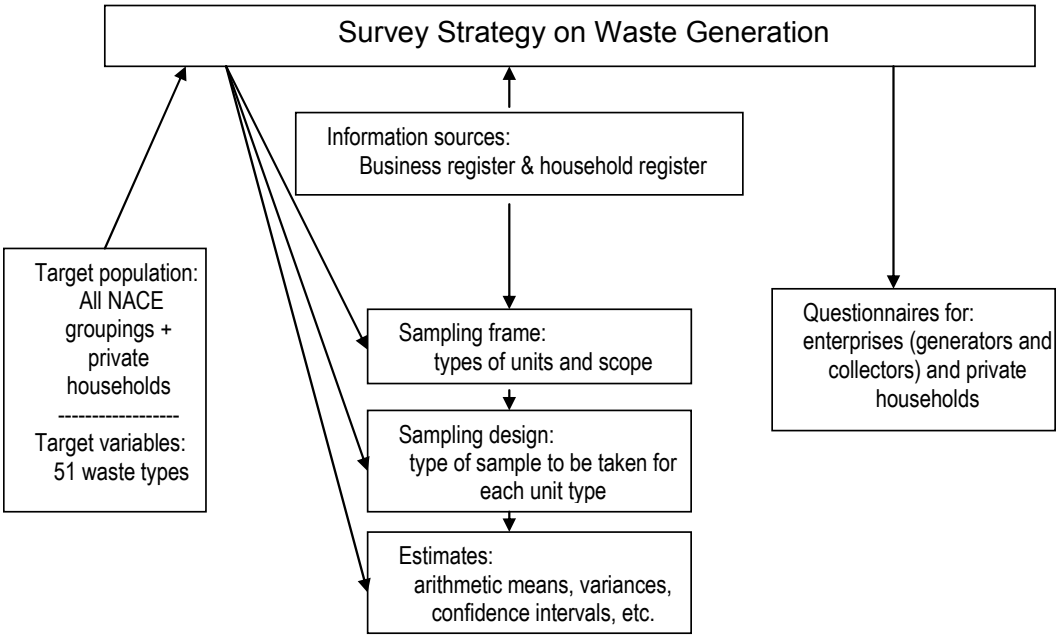

Figure 4: Elements of the survey on waste generation

Figure 4 shows the different stages of a survey on the generation of waste and how they are connected. It provides more sources of information than Figure 3: not only the business register but also the population register can be a source of information.

Target population and the target variables for waste generation are defined in Annex I of the Waste Statistics Regulation[39]:

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36 Ibid, p. 85

37 'The sampling design is a set of specifications, which defines the target population, the sampling units and the probabilities attached to the possible samples'

38 GALTUNG, J., *Theory and Methods of social research*, p. 56 ff

39 OJ L 332, 9.12.2002

The target population (NACE groupings + Households) is defined in paragraph 1.1 of Section 8 and the target variables (waste items) are defined in paragraph 1 of Section 2.[40]

The target population consists of:

- 18 economic activities classified in accordance with NACE rev. 2; they cover the economy as a whole and are therefore highly aggregated;
- all households.

The target population can be split into two distinct sub-populations: economic activities and households. The two sub-populations, which can also be roughly differentiated by activity (production versus consumption) and waste types produced, are usually entered in different registers. Economic activities are consistently entered in the national 'business registers for statistical purposes' and households are registered in residents' registration offices or other population registers, which may differ from country to country.

The target variables are 51 waste types. These waste types cover the entire waste universe as defined by the waste classification EWC-Stat.

Information sources

Business registers

Articles 2 and 3 of Regulation (EC) 177/2008[41] define the units (legal unit, enterprise and local unit) included in, and the scope of, the business register. It is important that the inclusion of enterprises whose main activity falls within Section A or O of NACE Rev. 2 is optional. In addition, the extent to which small enterprises should be included will be determined in accordance with the procedure laid down in Article 9.

Annex II of the Regulation on business registers defines the 'identity number and descriptive details' of each of the three records or unit types which must be included (legal unit, local unit and enterprise).

The NACE activity code and other information relating to waste generation are important for waste statistics. It goes without saying that the information on the activity code, in particular, is crucial. Without this code, less valuable results would be obtained from a survey which uses information from the register.

The record for a legal unit does not contain a NACE activity code, although the record for a local unit and also for an enterprise contains the NACE activity code at the four-digit level. This is valid for the main activity. The registering of secondary activities is optional for local units and only necessary for enterprises if these activities account for at least 10 % of the (total) 'gross value added at factor costs' of the enterprise or 5 % of this activity at national level.

The record of an enterprise should also contain the information on size measured by:

- the number of persons employed or, failing that, by allocation to one of the size classes;

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[40] Amended by Commission Regulations (EC) No 574/2004 and (EC) No 783/2005

[41] Regulation (EC) No 177/2008 of the European parliament and of the Council of 20 February 2008 establishing a common framework for business registers for statistical purposes and repealing Council Regulation (EEC) No 2186/93

- the net turnover from sales of goods and services (except for financial intermediaries); failing that, by allocation to one of the size classes.

Another register which can be used to gather statistics on waste generation, especially for a sector not covered by the business register, is the farm register, which is used for the Farm Structure Survey (FSS).

Population register

For household waste generation, a sample from the national population register can be taken. The periodical Household Survey can also be used for the direct determination of waste generation.

Sampling frame

The sampling frame specifies:

(a) the sampling units to be included in the survey;

(b) the scope of the sampling frame.

(a) ***Sampling units***

In principle, the units in the sampling frame should not necessarily be identical to the target units in the target population, i.e. to the analytical units. However, in most business surveys, a discrepancy of this kind would cause problems[42].

The target units are enterprises or parts of enterprises which belong to certain economic activities, on the one hand, and households, on the other.

Economic activities

Section 8(2) (Production of results) of Annex I of the Waste Statistics Regulation stipulates that 'for economic activities, statistical units are local units or kind-of-activity units, ... according to each Member State's statistical system'. This means that countries are not obliged to define their sampling units in accordance with the target units (as kind-of-activity units) but are also allowed to use local units as sampling units. If countries use KAUs or LUs in statistical surveys, this will not necessarily produce non-comparable results, provided that the questionnaires differentiate between the various activities carried out at LUs or by enterprises[43]. This subject is dealt with below under 'questionnaire design'. This imperfect situation means that estimates based on waste factors to be applied to units recorded in the business register and their characteristics (employment, turnover) will be of restricted quality.

Waste collectors and transport operators can also be sampling units. In such cases, the sampling units are not identical to the target units. Waste collectors and transport operators must be able to identify the NACE code of the primary waste sources and to split up all wastes they have transported or collected accordingly.

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[42] Cf. p. 85.

[43] The business register in most countries does not break down enterprises entirely into primary and secondary activities. This is not only because of the aforementioned thresholds for specification but also because the business register in most countries has not reached an optimum stage of development. Member States are therefore obliged in practice to use either enterprises or local units as statistical units in their sample surveys.

A census of waste collectors and transport operators is necessary. The comprehensiveness of the census can be evaluated (and improved upon) using waste treatment operators as an information source.

Households

If a survey of households is carried out directly, sampling units and target units are identical. However, the waste generation of households can also be determined by conducting a survey of waste collectors. This has been the norm hitherto and, in such cases, target units and sampling units are different.

(b) ***Scope of the sampling frame***

Both of the target populations are comprehensive. There is therefore no risk in theory that the sampling frame will lead to over-coverage.

Economic activities

The business register will not necessarily include all economic activities and size-classes. Many registers leave out agriculture and fishing, and coverage of small enterprises can be incomplete. Appropriate measures should be taken to compensate for under-coverage. More complete coverage is required under the new Business Register Regulation.

Enterprises which went out of business or were created in the reference year constitute special cases. Enterprises which have been liquidated can still appear in the business register if the sample was taken before the register was updated. For the same reason, enterprises which have just been set up cannot be incorporated into the register. The business register will therefore not be a suitable source of data for estimating the waste generated by enterprises of this kind.

Enterprises which went out of business in the reference year but continued to produce waste until their date of liquidation should also be included. These enterprises sometimes cannot be contacted, with the result that waste generated by them is underestimated.

The 'survey strategy' should indicate how all special cases are to be handled (i.e. NACE A enterprises, small enterprises, defunct enterprises, new enterprises and other enterprises which are not included in sufficient detail in the business register).

Households

Household surveys have been conducted in a number of countries for over 100 years. Household surveys on consumer issues and opinion polls now have a very important role to play. Only a small number of countries conduct household surveys on waste generation. The generation of household waste is usually determined indirectly using waste collectors or waste treatment operators as data sources. However, household waste surveys are likely to take on a more important role as they are one of the few reliable ways of determining household waste in particular rather than 'municipal waste' in general.

Sampling design and estimates

'The sampling design is a set of specifications which define the target population, the sampling units and the probabilities attached to the possible samples[44].' The definition should also include the sampling method used. Figure 5 below gives examples of the different types of sampling methods which may be used for determining waste generation. The terms are taken

[44] Cf. p. 88.

from J. GALTUNG[45] and have been adapted to the subject of waste. Figure 5 is not necessarily comprehensive and other sampling procedures may also be used in the Member States.

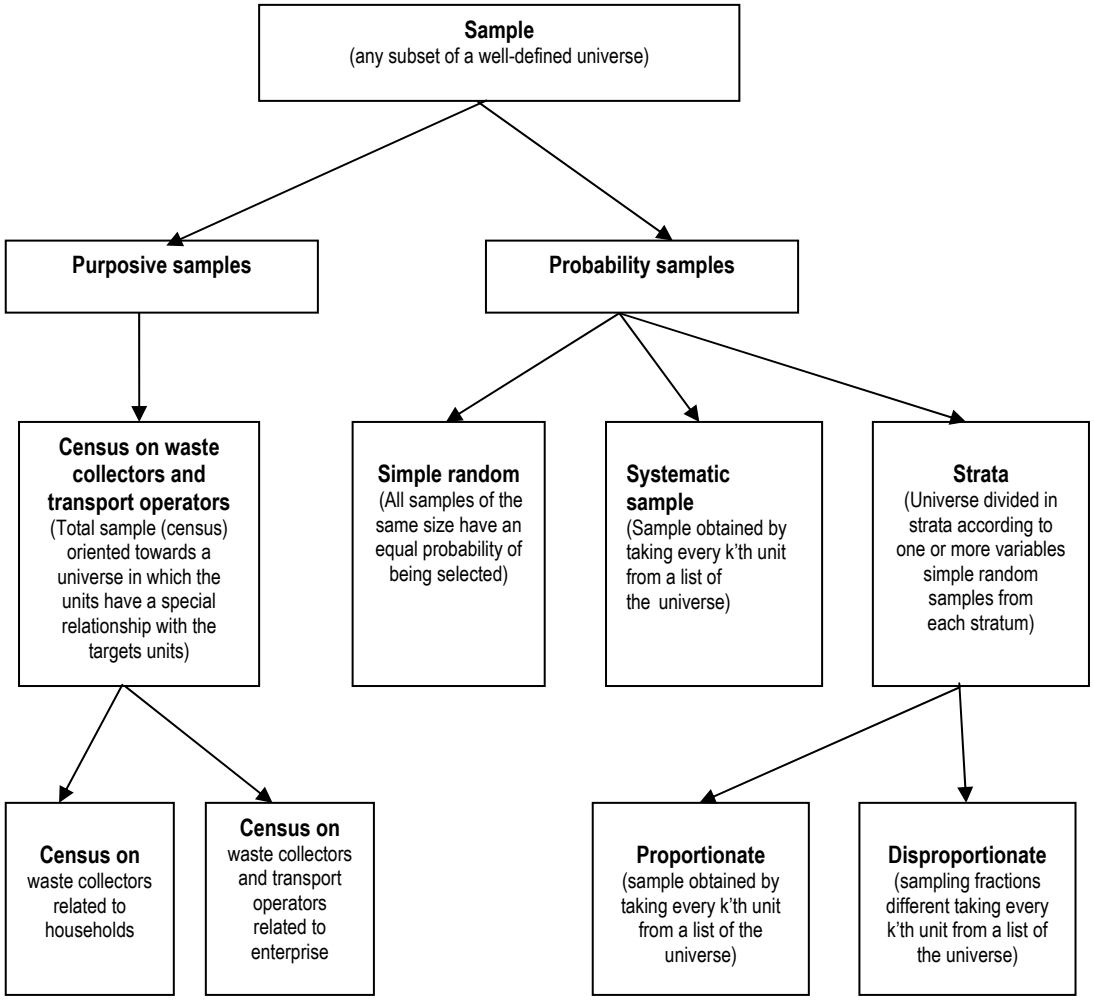

Figure 5: Different sampling methods

Probability samples

The sampling procedure, i.e. the sampling method and the number n of units selected from the sampling frame, determines the estimation procedure to be applied and the quality of the estimates.

It is evident that a strata probability sample will produce better results than simple random or systematic samples. A strata sample, especially a disproportionate strata sample which includes nearly all large industrial waste generators, will reduce the risk of underestimating the generation of waste. The amount of waste generated is not always proportional to the size of

[45] Galtung, Johan: *Theory and Methods of Social Research*, p. 37 ff. (See in particular p. 57.).

the enterprise but increases in line with it[46]. Underestimations are therefore more likely in sample surveys which do not use special strata for large enterprises.

Estimates to be calculated

General consideration: in the case of all the estimates discussed below, we can assume that the sampling frame does not correspond fully to the target universe. At the time of sampling, some new enterprises will be missing in the business register, some will already have ceased, and others may have changed activity. . This will lead to errors of the mean values. Member States should describe the way in which they have identified and compensated for this bias.

(a) Estimates of the total amount of waste generated per waste type i from source j. These estimates should be used to complete the cells of the target matrix.

The calculation should be made on the basis of the assumed distribution of the universe from which the sample is taken. The estimates are done for the separate NACE groupings and the waste types produced by these groupings. If stratified samples are taken, then the calculation must be done in steps: first for the strata and then for the NACE groupings in total.

(b) Estimates of variances of a sample set (taken from a distinct NACE grouping) concerning all or some of the waste types generated by this NACE grouping.

The variances provide valuable information. They complete the picture and are therefore important. They should be calculated and provided for all waste types because the calculation can be done automatically and therefore does not need any additional resources.

(c) Determining confidence intervals for estimates of the variances of a sample set (taken from a distinct NACE grouping).

The different kinds of probability samples (illustrated above) are connected to different distributions of the expected mean value. On the basis of the assumed distribution of the mean (or total) value, confidence intervals are computed which directly show the precision of the estimation.

Purposive samples

Waste generation can also be determined via waste collection. This can be seen in the case of household waste, where the census of (municipal) waste collectors is the traditional surveying method which is still applied in most Member States.

However, the source 'waste collectors and transport operators' can also be used to determine important fractions of waste generation by economic activities. All wastes leaving the enterprise site must be either collected or transported away from the site. This means that industrial waste collectors and transport operators account entirely for those quantities of waste which do not remain on the site for internal recovery or disposal, i.e. those quantities of waste which should be covered by the Waste Statistics Regulation.

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[46] In special sectors like agriculture and forestry, some countries come to the conclusion that waste is generated only by large enterprises.

Questionnaire design

The questionnaires proposed in the following section illustrate the topics to be considered and how they could be incorporated into a questionnaire.

These model questionnaires refer to enterprises. The recipients of the questionnaire can differ from country to country. Some countries, such as the Netherlands, send questionnaires directly to the KAUs of enterprises while other countries, such as Germany, send them to municipalities which deal with waste collection. Questionnaires which are sent directly to KAUs can of course be much simpler. It is not necessary to differentiate between KAUs.

Survey strategy

The survey strategy should outline how the various objectives will be achieved and how any problems will be solved.

Objectives:

- targeted surveys, i.e. closely linked to the target units;
- comprehensiveness of surveys, i.e. prevention of under-coverage but also of over-coverage (double counting) and consideration of population changes during the reference period;
- high accuracy of estimates (small variances and also relatively small confidence intervals);
- reduce considerable burden on respondents.

Questionnaires for waste generators

Table 12: Part 1 of the questionnaire for waste generators: Identification of the addressee and specification of the parts of the enterprise

Information on the enterprise		
1	Identification code of the enterprise in the SBR or, if unavailable, in another register (chamber of commerce, social insurance, etc.) and the contact details of the enterprise:	This information can be entered in the questionnaire beforehand, with enterprises being asked to correct it if necessary
2	Starting date of the business:	
3	Main kind of activity of the enterprise and its NACE code:	
4	Further kind-of-activity units operating in the enterprise and their NACE-codes at four-digit level:	
5	Kinds of waste treatment activities carried out at the enterprise and the KAUs to which they belong:	
6	Ancillary activities carried out at the enterprise and the estimated percentage distribution of their services over the KAUs, including the aforementioned treatment facilities:	

The questionnaire proposed in Table 12 is usually addressed to enterprises. The relevant administrator of the enterprise should specify the code(s) and the contact details in order to facilitate further contact (row 1).

It is useful to obtain information on the 'starting date of the business' (row 2) in order to assess how much experience the enterprise has with waste reporting. Further information could

also be requested by asking the respondent directly to give details of its experience with waste reporting and European waste classifications.

Rows 3 and 4 ask for information on principal and secondary activities. The criteria and conditions for the specification of secondary activities outlined in Council Regulation (EEC) No 2186/93 on business registers for statistical purposes should be added as an Annex to the questionnaire.

Row 5 asks explicitly for information on the waste treatment operations carried out at the enterprise and for the KAUs to which these activities belong. Although this information is not necessary for the purpose of collecting data on waste generation, it will be useful from the point of view of understanding the enterprise's waste management policy and can also be helpful when it comes to identifying waste treatment facilities which are not included in administrative registers.

Row 6 refers to ancillary activities as defined in Council Regulation 2186/93/EEC, which is mentioned above. These ancillary activities can also produce waste, which should be assigned to the various KAUs within the enterprise. It is proposed that the enterprise be allowed to decide how to split up the ancillary activities.

Table 13: Part 2 of the questionnaire for waste generators: Generation of waste by economic activities and waste types

Waste generation							
1	2	3	4	5	6	7	8
Waste types pursuant to LoW and/or EWC-Stat	Main kind-of-activity unit A	Secondary KAU B	Secondary KAU C	Secondary KAU …..	Secondary KAU X, including waste treatment	Net tempo-rary storage	Total waste generation
Code (a)							
Code (b)							
….							
Code (z)							

Table 13 is the core table. The enterprises included in the sample survey should specify the waste they generate by waste codes and KAUs.

It is proposed that the waste treatment facilities within the enterprise should also be specified. This will explain how secondary waste is generated. In Table 13, a possible waste treatment facility is assigned to only one KAU (column 6). Several waste treatment facilities forming part of a number of KAUs might exist within the same enterprise. The situation should be clarified in Table 12.

Column 7 is optional. If enterprises are equipped with temporary storage facilities, and if temporary storage interferes in the waste flow, i.e. if temporary storage results in a considerable time lag between the generation of waste and its release for waste treatment, then temporary storage must be taken into account. It is proposed that the net effect be recorded, i.e. temporary storage at the beginning of the reference year minus temporary storage at the end, and that this net figure be added to the figure for the total in column 8.

Table 14: Part 3 of the questionnaire for waste generators: Further handling of waste generated

Waste management						
1	2	3	4	5	6	7
Waste types pursuant to LoW and/or EWC-Stat	Total waste generated (column 8 of Table 2)	Internal treatment				Handed over or transported away for external treatment
		Recycling at the site of generation	Recycling together with external wastes	Other recovery	Disposal	
Code (a)						
Code (b)						
…..						
Code (z)						

Part 3 of the proposed questionnaire (Table 14) specifies the further management of the waste generated. Enterprises which do not carry out internal treatment of waste do not need to complete this part of the questionnaire. In enterprises of this kind, the total amount of waste generated is handed over for external treatment.

Enterprises equipped with internal treatment facilities should split up the waste amounts generated according to further handling. They should become familiar with and understand the difference between waste generated and recycled at the same site in an 'exclusive' facility (column 3) and waste recycled in a 'non-exclusive' facility (column 4).

The quantities of waste generated, which are treated in an exclusive recycling facility (in a recycling facility on the site of waste generation), should be deducted from the totals. These wastes should not be reported as these facilities are excluded from the scope of Annex II (Section 1(2) of Annex II). This deduction should be made by the Statistical Offices on the basis of the replies received from enterprises. The quality of the data produced in this way is certainly better than if the enterprises were asked to deduct the amounts themselves.

Questionnaires for waste collectors and transport operators

Table 15: Questionnaire for waste collectors and transport operators: Identification of the addressee and specification of the enterprise

Enterprise details		
1	Identification code of the enterprise to which the waste collector/transport operator is assigned in the business register or, if unavailable, in another register (chamber of commerce, social insurance, etc.) and the contact details of the enterprise:	Once again, this information can be entered in the questionnaire beforehand, with enterprises being asked to correct it if necessary
2	Starting date of business:	
3	Main kind of activity of the enterprise and its NACE code:	
4	Does the enterprise carry out additional waste management activities on site, e.g. other waste transport activities and waste treatment activities? Please give details of all waste management activities conducted at the enterprise.	

As mentioned with regard to waste generators, questionnaires are usually addressed to enterprises. Table 15 must prepare the enterprise for the questions which follow.

The questions concerning information on the enterprise refer to the contact details of the enterprise (row 1) and to the structure of the enterprise as regards waste management (rows 3 and 4).

Table 16: Questionnaire for waste collectors and transport operators: Waste quantities collected and received

Waste collection and transport							
1	2	3	4	5	6	7	8
Waste types pursuant to LoW and/or EWC-Stat	Total amount collected and transported (except for internal recycling)	Waste collection from enterprises			Municipal waste collection		
		Waste collected or received from other enterprises	Waste received from own enterprise	Waste collected or received from waste traders	Waste collected from households	Commercial waste collected together with household waste	Waste collected from public places and others
Code (a)							
Code (b)							
…..							
Code (z)							

Column 2 of Table 16 specifies the total amount of waste collected and transported. Only waste transported for internal recycling should be excluded. The quantity given in column 2 should be the exact figure requested in Annex I of the Waste Statistics Regulation, i.e. the total amount of waste generated.

Columns 3 to 8 specify different sources of waste which are important. Further details should be provided in column 3 using NACE codes — also in column 7, as far as possible.

Column 5 prevents double counting. Column 2 should be constructed by adding together columns 3 to 8 and subtracting column 5.

Table 16 aims to identify and separate 'waste from enterprises or economic activities' and 'waste from households'. This questionnaire can be seen as a comprehensive tool designed to cover both sides of the process of waste generation (production and consumption).

Problems with the integrated questionnaire and the census on waste collectors:

- Waste collectors and transport operators do not necessarily belong to one NACE grouping. Transport operators do not have to be restricted to waste transport. Waste transport can be an ancillary or secondary activity of a given enterprise. It is difficult to cover all waste transport operators by questioning only enterprises whose main activity is 'transport'.

- Waste collectors may also have problems specifying the sources from which they receive the waste. This applies to municipal waste, in particular. For waste collectors, the specification should be manageable to a certain degree.

3.1.2 Administrative or other sources

Definition

An administrative information source is established by an institution which regularly collects and puts together information from enterprises or institutions. If any information which is collected and put together by the administration for purposes other than for waste statistics can also be used directly or with some additional effort to generate some of the information required for waste statistics, then this data set serves as an administrative source for waste statistics.

Administrative sources can be data sets from:

- public institutions (environment agencies and other supervising authorities);
- associations and organisations in the public sector which organise or handle specific aspects of waste management (dual system in Germany and France, regional waste oil collectors, etc.);
- others, such as the reporting obligations under EU legislation on waste management.

Figure 6 provides an overview of administrative sources and the way in which they are used:

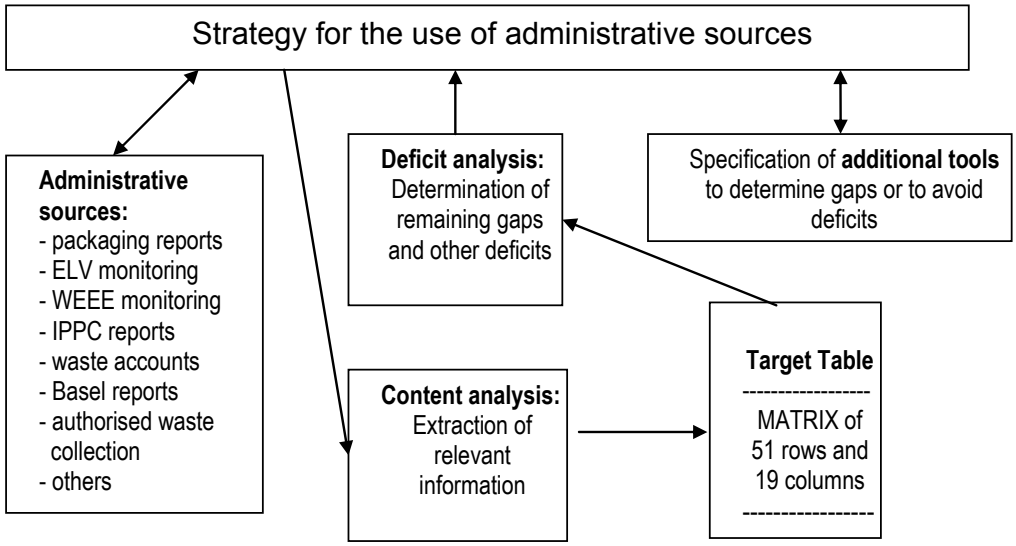

Figure 6: Flow chart on the use of administrative sources

Administrative sources

The administrative sources available generally account for only a small proportion of the information required on waste generation. Moreover, slight differences in the waste classifications used sometimes mean that the information cannot always be used directly to provide information on waste generation, e.g. in the Basel reports on imports and exports of hazardous wastes.

Administrative sources are primarily useful for filling in gaps but not for supplying the core data set.

Content analysis

The administrative data set should be analysed with regard to units (economic activities, households) and variables (waste types). The concept of 'statistical unit' as it is required under the Waste Statistics Regulation is usually not relevant in data used for administrative purposes. Therefore it may be difficult to identify the correct statistical unit if such data are used for statistical purposes. The situation with regard to waste types is better, but recycling-related administrative data sets tend to include product-related terms which need to be translated into waste categories.

Deficit analysis

The deficit analysis should focus not only on specifying the residuals which are not covered but also on drawing up quality criteria for the data sets to be used.

'Quality criteria' are very important with regard to administrative data sets. Usually, it is either not possible to obtain enough information on how the data set was put together, or the data set was created without taking statistical principles into account. In any case, administrative data sets pose special problems in terms of quality. Important points which should be borne in mind when conducting a deficit analysis are the following:

- Continuity of the source
  Is the information source regularly updated? Are changes planned or might the information source be shut down?

- Validity of information
  Are there incentives in the system for over or under-reporting, e.g. are enterprises interested (or not interested) in being included in the administrative register for monetary reasons?

- Possibility of exerting an influence
  Where necessary, is there any chance of shifting and directing the information contained in the administrative sources so that it can be better applied to waste statistics?

The subject of quality will be dealt with in greater depth in Chapter 4.

Additional tools and system of data sources

This part of the strategy should explain additional tools and the way in which they relate to the (main) administrative data. A description should then be provided of the complete system of data sources which is to be used to cover waste generation.

Strategy for the utilisation of administrative sources

The utilisation of administrative data sets should be prepared in a strategic way. The function of the administrative data set(s) in the statistical process should be defined. Will the administrative data form the core of the statistical data, will they serve as supplementary data (e.g. for specific waste streams) or will they be used mainly to check plausibility? This question needs to be answered first. The function of administrative data sets must first be clarified before examining the objectives of using the data set, i.e. which cells of the target matrix should be completed or which totals should be checked.

Another preparatory task is content analysis. Differences between units and waste types used in the administrative data sets and in the Waste Statistics Regulation should be explained and information should be provided on how to overcome them.

A related aspect of content analysis is the analysis of under-coverage and over-coverage. This is not only a question of administrative rules, but also of identifying possible incentives

for over- or under-registration. Another aspect of quality is the dating of waste streams. Administrative bodies often register several dates, such as date of collection, date of treatment and date of registration. Steps need to be taken to determine which date is most suitable for statistical purposes.

In general terms, the application of administrative sources means that the quality of the statistics depends directly on the quality of the administrative system. It is necessary to establish what quality procedures are in place, e.g. a quality monitor on the classification of waste or a waste accounting system which allows for check sums on waste stocks and flows.

3.1.3 Statistical estimation procedures

Definition

This section covers the statistical estimation procedures which are not dealt with in Section 3.1.1 on surveys. Surveys, as defined in Section 3.1.1, are carried out in order to gather the relevant information directly from enterprises or households.

Statistical estimation procedures can be:

- the estimation of waste generation by waste factors to be applied to waste-related activities;
- the estimation of waste generation via (causal) models based on 'visible' variables;
- the indirect determination of waste generation via waste treatment or waste collection;
- others.

Figure 7: Flow chart on the application of statistical estimation procedures

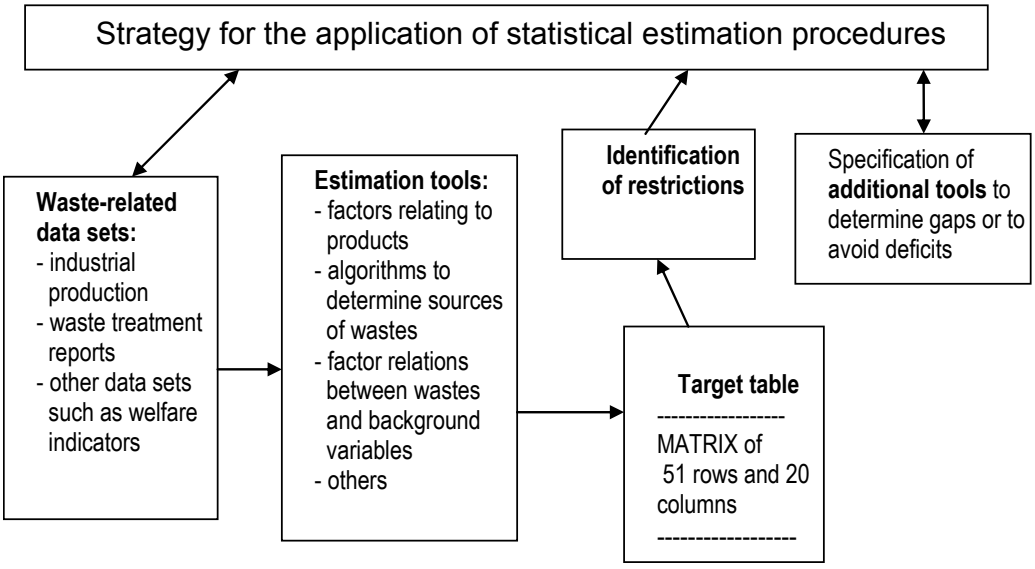

Figure 7: Flow chart on the application of statistical estimation procedures

Strategy for the application of statistical estimation procedures

The strategy must be explained. It should consist of (i) a description of the basic data sets, (ii) an exploration of the estimation procedure(s) and (iii) an identification of the restrictions of the methods proposed. Finally, the strategy should outline how the available procedures should be combined to form an integrated and comprehensive method of data collection.

Waste-related data sets

Two data sets tend to be used for the estimation procedure:

(A) EU production statistics

EU production statistics in accordance with the PRODCOM — classification[47] are restricted to mining, manufacturing industry, energy production and water supply (i.e. to sections B, C, D and E of the NACE Rev. 2 classification). None of the remaining sectors, like agriculture, construction and demolition, and services, are included, although some of them are quite important.

(B) Waste treatment reports

Waste treatment reports are without doubt the most important source when it comes to determining waste generation indirectly. They are comprehensive, provided that all the waste always ends up at the waste treatment facilities in question[48] and that a sufficient distinction is made between waste types.

Two problems are associated with the use of waste treatment reports in determining waste generation: a practical problem and a theoretical or ideological problem.

The practical problem is that the waste treatment operators usually do not know, or do not want to know, from whom (i.e. from what source) they receive the waste. The reports must therefore be split up by sources according to waste substances. This cannot be done satisfactorily because a lot of waste types are non-specific.

The theoretical problem is that the Regulation seeks to ensure that data is collected on the two cornerstones of the waste cycle (waste generation and waste treatment), with independent methods being used to guarantee that both aspects are covered. If one country uses, for example, only one source of information, such as waste treatment, in order to determine both cornerstones of the waste cycle, then the results will be entirely consistent. But consistency of this kind provides only limited additional information. It is only logical that consistency could be achieved in such cases, but this would be at the expense of the information contained in the data. If the amounts of waste generated and treated are established independently, the differences which will arise will reflect both real differences (e.g. storage, time lags) and the quality of the estimation methods.

Other sources of data also exist. These are summarised under:

(C) Other data sets such as welfare indicators

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[47] Council Regulation (EEC) No 3037/90 of 9.10.1990 on the statistical classification of economic activities in the European Community.

[48] Statisticians usually take this for granted. They argue that illegal waste 'management' is a matter for the police and not for statisticians.

The generation of household waste and of agricultural waste can also be estimated on the basis of models linked to variables which are regularly observed. Economic indicators can be used to estimate household waste, while agricultural data, such as the number of animals, can be used to estimate manure, etc.

Estimation tools

(A) and (C)

Comparable estimation tools are used for the cases covered by (A) and (C). The aim is to identify causal relations and to translate these into mathematical formulas. Waste factors, which establish the relation between the production of a certain product (measured by weight or even by monetary value) and the quantity of waste generated during the production process, depend on a number of assumptions. These assumptions are not very practical for a large segment of manufacturing industry. The application of waste factors suggests a constant relation between the level of production in an industry and waste generation. Changes in the composition of the industry or changes in the production processes should appear in new waste factors.

The factor 'analytic approach', which has already been used by some Member States, would appear to be more practical than waste factors[49].

(B)

The estimation tools used in waste treatment reports are pure algorithms which assign to a certain type of waste the source(s) from which the type of waste 'appears'.

Identification of restrictions

(A) and (C)

The following main restrictions apply to waste factor applications:

- Variability of causal relation in time and space, i.e. production techniques periodically change and are renewed, and the techniques applied can vary.
- Figures on some products are not available as physical measurements but only as monetary values. Even if the product figures are available as physical measurements, waste factors can be almost impossible to generate because the products are too complex (e.g. motor vehicles).

Waste factors can be applied successfully only for a small proportion of basic products, where stable and strong causal relations exist between production and waste generation. Waste factors seem to be most useful when applied to agriculture.

(B)

The problems and restrictions associated with the use of waste reports for the estimation of waste generation are manifold.

[49] See: Pilot study on Waste Management in Agriculture, Forestry and Fishing from Statistics Lithuania, final report April 2005. Statistics Lithuania is developing multiple regression models for quantities of waste such as straw. The variables used are, for example, 'farm agricultural land', 'number of cattle' and 'number of machines'.

The problem of 'ideology' has already been mentioned, i.e. where the method does not look independently at the two cornerstones of the waste cycle but looks at waste generation only from the point of view of waste treatment.

The most important problem is how to break down the waste types which do not belong exclusively to one sector. A related problem is reduced comparability with other Member States which collect data via surveys on waste generators. These 'survey-based MS' will have NACE groupings which are not pure, i.e. they will necessarily include ancillary activities and non-specified secondary activities. However, the NACE groupings which are isolated via waste treatment will be pure.

Additional tools and system of data sources

As with the previous type of data source, additional tools and the way in which they relate to the (main) data estimations should be explained. A description should then be given of the entire system of data sources which is to be used to cover waste generation.

3.1.4 Combination of the foregoing methods

Definition

The data collection method 'combination of the foregoing methods' is a method which is not only based on several of the foregoing methods but which can also include small additional tools to close data gaps.

Data collection methods which are (mainly) based on one of the foregoing methods and use only small tools to cover residual data gaps are not considered to be a combination method. Methods of this kind should be attached to their primary data collection method.

Examples of combination methods:

- combination of (i) indirect determination of waste generation via waste treatment for specific waste types and (ii) business survey of waste generation for the distribution of the remaining waste types;
- combination of (i) business survey of selected economic sectors and (ii) administrative sources for remaining sectors or specific waste types;
- combination of (i) business survey of the economy and (ii) household survey of private households;
- others.

Problems associated with a combination of different sources

Three problems in particular can occur:

- double counting and/or lack of clarity in the delimitation of methods or data sets;
- differences in level of detail;
- differences in level of quantity.

The three problems are explained in the examples described below.

Double counting

The most important and difficult case with regard to double counting and unclear delimitation is where two comprehensive surveys are planned and carried out for economic activities, on the one hand, and households, on the other. It is even more complicated if the household waste data are obtained from a census of waste collectors[50].

Using a census of waste collectors to determine household waste already presents a number of problems. If a survey of this kind is designed to complement a business survey, further problems will arise.

1. 'Internal' problems associated with using a census on waste collectors to determine household waste:

   Waste collectors collect not only household waste but also similar waste from enterprises; it is not easy to differentiate between the two if enterprises and households are located in the same districts or even in the same buildings.

   Waste collectors, in particular collectors of waste for recycling, are not easy to identify. In addition to specialist waste management companies or municipal authorities, charity organisations and traders also collect and trade in waste. Traders of this kind mainly deal with the administrative aspects of the transaction and use transport companies and specialist companies for the logistics. Double counting can occur if both types of companies are included in the survey. This also applies to waste which is traded several times before treatment.

2. The business survey of economic waste generation should exclude those enterprises (or special activities from those enterprises) which handle household waste only, and should include collectors which collect waste similar to household waste from enterprises and public institutions.

   To avoid double counting and under-coverage, the survey questionnaires must take into account the possibility of waste fractions being wrongly included or excluded.

Differences in level of detail

If waste generators are questioned directly, the level of detail (e.g. the number of relevant waste types) can be very high:

If the source of waste generation is determined indirectly, e.g. via waste treatment operators, the determination of the source is only clear for the waste streams which relate to specific economic activities. For non-specific waste types, the indirect determination of the source will generally lead to less detail in the waste streams per source.

Differences in level of quantity

If different methods are used to determine the quantities of waste generated, e.g. for the important waste streams 'waste oils' and 'construction and demolition wastes', the comparability of the resultant data can be undermined. This reduction in comparability can appear at international and at inter-sectoral level.

Non-comparable results can be obtained if motor waste oil is estimated either on the basis of the operating vehicles and the average waste-oil changes or on the basis of the material accounts of exclusive waste-oil collectors. The estimations will usually lead to comparable higher amounts because it can be assumed that not all of the waste oils will end up with authorised waste-oil collectors.

The aim should be not to eliminate the differences but to prepare for and explain them. This is possible only if the methodological information is also provided along with the figures.

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[50] Both methods are described in Section 3.1.1.

Construction and demolition waste (C&D waste) is often used directly in the construction and repair of pathways in forests and agricultural land or in noise-control walls. Waste of this kind is also treated directly on site to reduce treatment costs or to increase the value of the residuals. This type of waste will probably not appear in input waste statistics. But the waste will be registered if C&D companies are surveyed directly. The national figures available on C&D waste include a certain amount of non-comparable data. These differences may be somewhat reduced by the reduced scope of the new Waste Framework Directive (2008/98/EC) that now excludes the uncontaminated soil and other naturally occurring material excavated in the course of the construction activities where it is certain that the material will be used for the purposes of construction on the site from which it was excavated.

3.2 Data collection on waste treatment

The objective of Annex II of the Waste Statistics Regulation is to draw a comprehensive picture of waste recovery and disposal. Annex II indicates that statistics should provide information on the final destination of all types of waste (except radioactive waste) and on the type, number and capacity of treatment facilities.

Statistics are to be compiled on two types of characteristics:

- the quantities of waste treated by treatment category and waste category;
- the waste treatment infrastructure, i.e. number and capacity of waste treatment facilities by treatment category and region.

This Section seeks to describe the most relevant sources and approaches for the collection of data on waste treatment and to highlight the aspects which are crucial to the compilation of data in accordance with Annex II of the Waste Statistics Regulation.

3.2.1 Introduction

The collection of data on waste treatment differs from the collection of data on waste generation in the following ways:

- The number of operators of waste treatment facilities is much lower than the number of waste generators.
- Treatment facilities are subject to a stricter supervision regime than waste generators on account of the possible environmental impacts of waste treatment. This enhances the availability of administrative data which can be used for statistical purposes.
- Data requirements on waste treatment refer to treatment facilities, not to local units or kind-of-activity units. This means that specific technical information is required which is below the level at which it is usually recorded in business registers.
- Most treatment facilities are unique with regard to the waste types treated, their capacities, the actual throughput and the technology applied. This makes it almost impossible to draw an inference from a sample, which clearly limits the use of sample surveys or estimation procedures.
- Currently statistics on waste treatment also include imported waste and statistics on waste generation include exports of waste.
- The constant improvements in the technical standard of recovery and disposal operations mean that waste treatment is increasingly becoming a multi-step process and this makes double counting an important issue.

Sources of data on waste treatment and data collection methods

The main sources of data on waste treatment are the treatment facilities themselves. The most important requirement for comprehensive data on waste treatment is a complete overview of all treatment facilities, i.e. comprehensive, accurate and up-to-date waste facility registers. Comprehensive registers are a prerequisite for the collection of facility-related information and for data on treated quantities, irrespective of the method of data collection used.

The sources and collection methods used to compile statistics on waste treatment can be summarised as follows:

- Data collection on waste treatment relies strongly on the use of administrative data collected for licensing and monitoring purposes such as facility registers, consignment notes, or waste management reports.
- Statistics on waste treatment are usually based on total surveys which only exclude small treatment facilities, if at all. Sample surveys and estimations play a negligible role.
- Due to the wide variety of waste treatment operations and waste streams, data often have to be drawn from different sources, which makes the harmonisation of definitions, classifications and reporting requirements an important issue.
- Some countries use data from industrial or public associations, and from the monitoring of waste products, in addition to data from other sources. This option is mainly used for data on the recycling, recovery and export of green list waste.

The different sources of data and methods of data collection are described in detail below.

3.2.2 Administrative sources

Types of administrative data and data sources

As defined in Section 3.1, administrative data are understood to be data which are not collected primarily for statistical use but for administrative purposes such as licensing, monitoring and law enforcement. A distinction can be made between:

- data collected or recorded by competent authorities on the basis of legal provisions;
- other data collected on a voluntary, economic or other basis by the private or public sector; this includes, in particular, data collected by associations for their own purposes.

The use of administrative data for statistics is increasing across the board. The most important reason for this is undoubtedly to reduce the burden on response units and administrative bodies by avoiding redundant data collection. In general, administrative data are also assumed to have a higher coverage than statistical sources. A further advantage is that administrative registers usually refer to facilities and not to statistical units, which complies with the requirements of Annex II of the Waste Statistics Regulation.

On the other hand, administrative sources are by definition not designed primarily for statistical use. As a consequence, administrative data may be based on inappropriate definitions or classifications, may lack important information or may have other shortcomings. Also lack of timeliness often militates against the use of administrative data.

Figure 8 provides an overview of the main administrative data sources and their use in the compilation of waste treatment statistics.

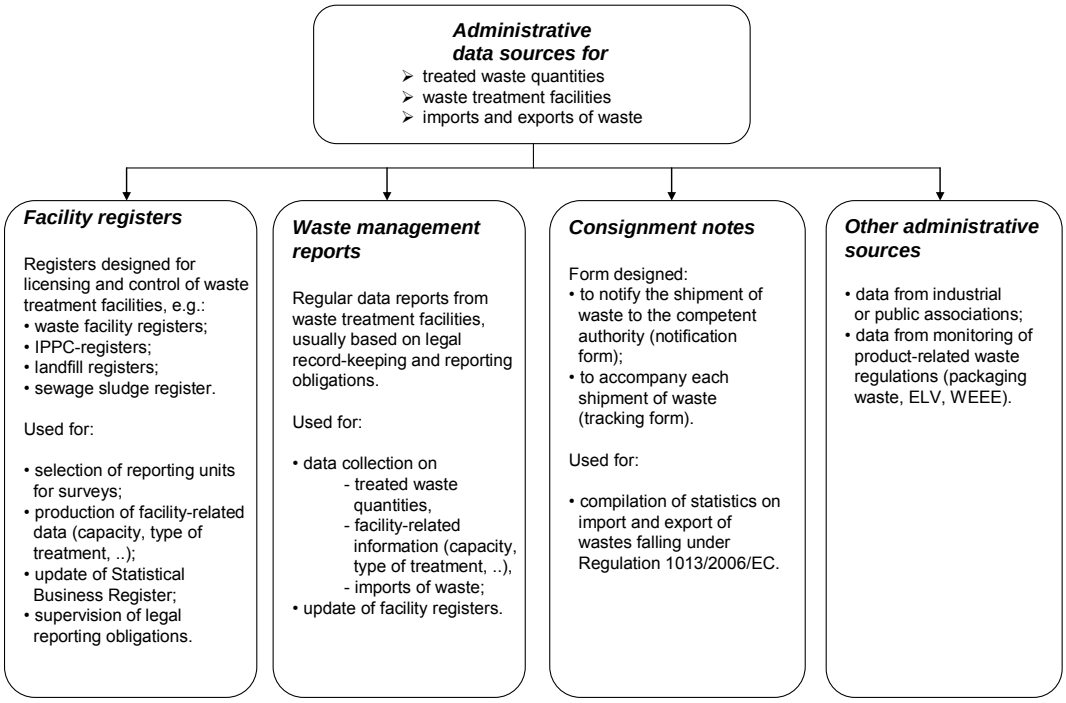

Figure 8: Overview of administrative data sources used for waste treatment statistics

Waste facility registers

Waste facility registers are designed to assist the competent authorities in the registration and licensing of waste treatment facilities, in the issuing of permits and in monitoring compliance with legal requirements. Waste facility registers usually form the core of a waste information system.

For the purposes of waste statistics, waste facility registers are used in different ways:

- as a database for the selection of reporting units for surveys, i.e. for the identification of plants falling with the scope of the Waste Statistics Regulation;
- for the production of facility-related information: data on capacity, treatment method, regional location can be retrieved directly from the register;
- for the supervision and enforcement of legal reporting obligations;
- as a source for updating statistical registers used in surveys on waste treatment.

Issuing of permits to and the registration of waste treatment facilities

The provisions of Directive 2008/98/EC (Waste Framework Directive) on the issuing of permits to and the registration of waste treatment facilities can be seen as the legal basis underpinning the obligation of Member States to register waste treatment facilities.

Article 23 of the Waste Framework Directive requires all establishments or undertakings which carry out waste treatment to obtain a permit. Under certain conditions, Articles 24 and 25 allow the Member States to exempt specific treatment operations/facilities from this obligation. Operations which are exempt from the obligation must be registered with the competent authority. This means that every waste treatment operation which falls within the scope of Directive 2008/98/EC must be registered in one way or another.

However, this does not mean that the Member States have to establish a central database of authorised or registered treatment facilities. Member States handle the issuing of permits and registration in very different ways.

In practice, responsibilities with regard to the issuing of permits, registration, monitoring and enforcement are spread across different administrative bodies and different administrative levels. It is often the case that national authorities are in charge of the licensing and supervision of large treatment facilities while smaller facilities and low-impact operations are handled at regional or municipal level.

Furthermore, the licensing and registration of waste treatment facilities does not necessarily take place in accordance with waste legislation but may be regulated by other laws. This applies, in particular, to types of waste which are excluded from the scope of Directive 2008/98/EC, as stipulated in Article 2.

Here are some typical examples of cases in which waste treatment is regulated under legislation other than waste legislation:

Environmental legislation:	Waste treatment activities falling under the IPPC Directive
Agricultural legislation:	Spreading of waste on land
Building laws:	Management of waste arising and treated in the context of construction measures
Mining legislation:	Management of waste from mining and quarrying
Water rights:	Management of dredging sludges; spreading of waste on land
Public health laws:	Management of animal carcasses, infectious waste, etc.

Information on waste treatment facilities may therefore be spread across different registers and authorities depending on the national legislation and administrative structure in place. This might make it very difficult to select the treatment facilities which are to be covered by waste statistics. The problems of combining data from different sources are discussed in Section 3.2.4.

Structure and content of waste facility registers

The concept and structure of a waste facility register are conceived in the light of the register's principal purpose, e.g. the administration of permits, and the monitoring and control of facilities. The basic advantage of facility registers compared to statistical registers is the fact that the units, i.e. the 'facilities', are defined in line with the requirements of Annex II of the Waste Statistics Regulation. The data recorded in the waste treatment registers are usually taken from permits or registration forms. Additional information may be collected from reports, surveys or other registers.

Waste facility registers usually contain a set of base data for each waste treatment facility. This typically includes:

- identification number of the treatment facility (licence number, registration number, etc.);
- name and address of the treatment facility;
- name and address of the operator;
- purpose of the plant;
- type of treatment operation(s) carried out;

- waste types for which the facility is authorised;
- licensed capacities of the treatment plant.

Where registers are used for statistical purposes, some further characteristics and aspects should be taken into consideration:

The legal classification of treatment operations by R and D codes is necessary for identifying whether the facility falls within the scope of the Waste Statistics Regulation and for assigning the data collected (facility-related data and quantities of treated waste) to the treatment category, as required in Section 8(2). In practice, however, the type of treatment is often classified in a national technical classification, which is more meaningful from the point of view of waste management than the classification by R and D codes. Where a national classification of waste treatment facilities is used, it is important that the register contains both classifications (national and R/D-codes), and that they are compatible.

Besides indicating the legal classification of the type of treatment concerned, the register should provide information on the point at which the facility is located in the treatment chain (hereinafter referred to as the treatment level) in order to distinguish between pre-treatment facilities and facilitate the prevention of double counting. This information should be coded so that the relevant facilities can be selected easily.

In the case of treatment facilities which carry out a variety of treatment operations and operate several process lines, it is useful to specify these lines in the register, i.e. to add a sub-level to the facilities.

Wherever possible, the classification of waste in the facility registers should be done in accordance with the European List of Waste or at least in accordance with a classification which is compatible with the List of Waste and EWC-Stat. This is a prerequisite for combining different data sources and producing results pursuant to Annex II of the Waste Statistics Regulation.

It is also important to use unambiguous identifiers for the treatment facilities and the operating enterprises, such as registration numbers, licence numbers, or business identity numbers. The same identifiers should be used in different registers to facilitate the combination of data sources and to provide for convenient and accurate data exchange. It should be possible to use the data on the operator to interface with statistical registers, where this is legally possible.

In general, it is of the utmost importance that the same definitions, classifications and coding systems be used in different registers.

Coverage of waste facility registers

The coverage of waste facility registers depends primarily on the legal basis of the register, i.e. the definition of facilities which need a permit or have to be registered. Depending on the legal provisions in place, small facilities which fall below defined thresholds might not be covered.

Secondly, coverage depends on the completeness, accuracy and up-to-dateness of the registers.

Thresholds for the issuing of permits and registration

As pointed out above, European waste legislation does not exclude small treatment facilities from the requirements regarding permits and registration. In practice, however, Member States may have established legal exemptions of this kind for small treatment facilities in or-

der to reduce red tape. Thresholds are usually defined with reference to the quantities of waste treated or the facility's treatment capacity.

Where legal thresholds mean that treatment facilities are not included in the statistics, this should be mentioned in the quality report. The quality report should specify the treatment operations for which a threshold exists and the threshold values. Where different thresholds exist for the treatment of hazardous and non-hazardous waste, this should also be specified.

Furthermore, an estimate should be given for the number and capacity of facilities falling below the threshold, and for the quantities of waste treated in these facilities.

Comprehensiveness of the register

In general, administrative data are assumed to have a higher coverage than statistical data, thus having a lower risk of under-coverage. This may be true where procedures concerning permits, and the monitoring and enforcement of legal provisions are well-established. However, in countries which are still in the process of establishing administrative structures and implementing relatively new waste regulations, registers which are incomplete pose serious problems.

In such cases, the comprehensiveness of the registers must be improved continually by using other registers and further surveys. The quality of the register should be discussed in the quality report.

Use of other registers

Obtaining a complete list of treatment facilities for which statistics have to be compiled usually involves gathering information from several registers. Relevant types of registers are described in brief below.

Register of IPPC-licensed facilities

Depending on national regulations and permitting arrangements, waste treatment facilities may operate under IPPC licences and not under waste licences. This is likely in the case of waste treatment facilities covered by Annex I of Directive 96/61/EC[51], i.e.:

- municipal waste incineration facilities with a capacity exceeding 3 tonnes/hour;
- landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes (excl. landfills of inert waste);
- installations for the treatment of waste oil with a capacity exceeding 10 tonnes/day;
- installations for incineration and treatment of hazardous waste with a capacity exceeding 10 tonnes/day.

IPPC registers may also cover waste treatment facilities associated with facilities which fall under the IPPC Regulation. In Ireland, experience has shown that a large proportion of the private waste treatment infrastructure is associated with facilities which fall under the IPPC Directive.

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[51] Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (OJ L 257, 10.10.1996, p. 26), last amended by Directive 2003/35/EC (OJ L 156, 25.6.2003, p.17).

IPPC registers therefore cover a large proportion of large treatment facilities and may also provide information on further treatment facilities in the private sector.

Sewage sludge register

An important source of data on the use of sewage sludge in agriculture are the records which must be kept pursuant to Article 10(1) of Directive 86/278/EEC[52]. Member States have to make sure that records are kept on the generation and agricultural use of sewage sludge. Characteristics to be registered are:

- quantities of sludge produced by waste water treatment plants;
- quantities of sludge used in agriculture;
- properties of the sludge (e.g. water content, heavy metal content, etc.);
- the place where the sludge is used.

The records include all the information required for statistical use, i.e. the quantity treated, the type of treatment (R10) and the water content.

National data on the quantities of sludge generated and used in agriculture (in dry matter) have to be produced from the registers and reported to the Commission in sectoral reports at three-yearly intervals.

Registers on landfills

All the facility-related information on landfills which is needed for the purposes of the Waste Statistics Regulation can be obtained from comprehensive landfill registers. This information consists of:

- the number and location of landfills;
- the remaining capacity (m^3);
- the status of the landfill (active/closed).

The scope of the register will determine whether the register includes data on disposal sites and impoundments of the mining and quarrying industry or whether data on these facilities must be obtained from other sources.

Waste management reports

Article 35 of Directive 2008/98/EC on waste stipulates that waste treatment facilities must keep records of their activities. The records must, among other things, provide information on the 'quantity, nature, origin, and treatment method' of the treated waste. The information must be made available to the competent authority on request.

Several Member States have not only transposed this provision into national law but also use the records as a basis for regular reporting. Several countries have established in their national waste law the general obligation for waste management facilities to submit regular reports to the competent authority summarising the information on the treated waste and the

[52] Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (OJ L 181, 04.07.1986, p.6), last amended by Regulation 807/2003/EC (OJ L 122, 16.05.2003, p.36).

treatment methods carried out. These reports, hereinafter referred to as waste management reports, are used by the competent authorities for a variety of purposes, such as:

- monitoring compliance with permit provisions;
- updating facility registers;
- compiling reports on waste management and waste management infrastructure;
- compiling waste treatment statistics.

Reporting obligations of this kind usually depend on thresholds which typically refer to the quantity of waste treated annually. Different thresholds usually apply to hazardous and non-hazardous waste.

Content and format of reports

Mandatory standardised formats for reports must be established so that the data obtained is useful and can be handled easily. The formats must specify the minimum content of the reports, the classification and coding of characteristics and, where appropriate, the technical formats for data transmission. The minimum content of the reports, in view of the requirements of the Waste Statistics Regulation, is summarised in Table 6. The list is complemented by characteristics which, although not obligatory, are considered to be useful for data processing and the production of results.

In order to eliminate double counting, it is important that information be collected on the origin and destination of the treated waste. With regard to the origin of the waste, the reports should distinguish between:

- waste from waste generators, specified by name, NACE code and registration number of the generator;
- waste from treatment facilities (secondary waste), specified by name and registration number of the facility.

The destination of the waste should be specified by the name, address and registration number of the treatment plant which receives it and the type of treatment it undergoes (R or D code). This information makes it possible to identify the locations at which the waste undergoes several treatment processes and to prevent treated quantities from being counted twice.

In order to assess the quality of the data collected, it is particularly useful to request information on the way in which the quantities of treated waste have been determined. The reporting form should distinguish between the following measurement methods:

- weighing;
- measurement of volume or numbers (counting is quite common for end-of-life vehicles and large household appliances);
- estimation (e.g. estimates based on the number of truckloads).

Furthermore, it is recommended that the economic activity of the operating company, as indicated in NACE, be included in the reporting formats. This ensures that the reports may also be used for the compilation of statistics on generation in accordance with Annex I.

Reporting obligations on waste treatment usually refer to the operator of a waste treatment plant. In cases where one enterprise operates several plants, the operator should be obliged to submit separate reports for each of the facilities. Data which are more detailed are more usable from the point of view of monitoring and control and are necessary for the regional breakdown of data on waste treatment infrastructure pursuant to Annex II of the Waste Statistics Regulation.

The waste reports are often submitted to and managed by the environmental authorities at local or regional level which are responsible for the monitoring and control of treatment plants. However, this means that the data are handled and used by a large number of different authorities. A well-developed information system will need to be put in place so that the data can be merged at national level for statistical purposes.

Reporting should preferably be done electronically in order to reduce the burden of reporting on the response unit and the competent authority. This facilitates the completion of reports and the validation and processing of data, and furthers the standardisation of data.

Coverage of reports

Unlike surveys, reports have to be compiled and submitted by enterprises on their own initiative and not in response to questionnaires. The companies concerned must therefore be informed about their reporting obligations, must check whether they exceed the legal thresholds, where applicable, and must be willing to complete the reports. The creation of new facilities, the closure of old facilities and changes in capacities or quantities treated will lead to continuous changes in the number of parties subject to reporting obligations. There is therefore a risk of under-coverage if reporting obligations are not strictly enforced. Coverage must be checked regularly, e.g. by comparing waste reports with data from other sources such as facility registers and consignment notes.

Table 17: Content of reports and questionnaires for data collection on waste treatment pursuant to Annex II of the Waste Statistics Regulation

Minimum content of reports or questionnaires				
Enterprise details		Treated waste quantities		
Name and address of the treatment facility	Licensed capacity of the treatment plant	By waste types pursuant to: - European List of Waste and/or EWC-Stat.	By treatment operation pursuant to: - R codes; - D codes.	Water content for sludge

Useful additional information				
Enterprise details		Origin of waste		
Identification number of the treatment plant, compatible with other registers e.g.: - registration number; - license number.	Economic activity of the operator pursuant to NACE.	Waste from waste generators specified by: - name; - NACE code; - registration number of the generator.	Waste from treatment facilities (secondary waste), specified by: - name; - registration number of the facility.	Method of measurement: - weighing; - volume measurement; - counting; - estimation.

Consignment notes for the shipment of waste

Pursuant to the Waste Shipment Regulation (113/2006/EC), consignment notes must be completed for all shipments of waste falling within the scope of the Regulation. Consignment notes are designed:

- for notification prior to the shipment;
- to accompany every shipment of waste;
- as certificates of recovery or disposal for the notifier.

The consignment note consists of a notification form, which is valid for a certain period of time, and a movement/tracking form, which is required for each shipment. A standard consignment note setting out the minimum content of the note is shown in Commission Decision 94/774/EC[53].

The notification form contains, among other things, information on:

- notifier/exporter (name, address, registration number);
- waste generator (name, address, process and location of generation);
- disposal/recovery facility (name, location, address, registration number);
- code of disposal/recovery operation (R and D codes);
- name and chemical composition of waste;
- waste identification code (LoW, OECD, national code of exporting and importing country, etc.);
- hazard criteria (H number).

The tracking form contains additional information, in particular:

- the actual quantity of the waste shipped;
- the dates of shipment and reception.

If filled in completely, the consignment notes (notification form together with the tracking form) contain all the information required for the production of statistics on imports and exports. The LoW codes together with the R and D codes make it possible to edit the data in accordance with the requirements of Annex II of the Waste Statistics Regulation, i.e. by waste types and treatment categories.

Some countries use these data to compile statistics on waste imports and exports because data on the shipment of waste are difficult to obtain from other sources. The fact that the data are used for statistical purposes means that the completeness of the forms must be strictly enforced, in particular with regard to the LoW codes, the R and D codes, and the quantity of waste shipped. The reference period should be assigned on the basis of the actual date of shipment.

In practice, problems can arise from a lack of timeliness, which can occur in the handling of the consignment notes. The use of data for statistical purposes will hopefully be made easier in future by the introduction of electronic consignment notes.

Furthermore, the data are limited to the waste types which fall under the Waste Shipment Regulation. This means that they do not cover exports of green list waste for recovery.

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[53] Commission Decision 94/774/EC of 24 November 1994 concerning the standard consignment note referred to in Council Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European (OJ L 310, 03.12.1994, p. 70).

Data from the monitoring of specific product-related waste

In EU legislation on waste and in national legislation in the Member States, there are a number of regulations which apply the principle of producer responsibility by setting targets for the recycling and recovery of specific product-related waste. Data collection systems which provide for the necessary data have been (or are being) put in place so that the targets can be monitored. In some countries, these data are also used for statistics on waste treatment.

As regards EU legislation on waste, the EU has adopted product-related Directives on the packaging of waste (94/62/EC), on end-of-life vehicles (2000/53/EC) and on waste electrical and electronic equipment (2002/96/EC). Each Directive requires the Member States to set up a monitoring system and to report on compliance with the targets. The content and format of the reporting obligations are (or will be) stipulated in separate decisions. In the case of the packaging of waste, monitoring and reporting have been obligatory since 1997. Reporting for WEEE and ELV has been mandatory since the reference years 2005 and 2006 respectively.

The characteristics to be reported with regard to waste treatment are:

- the total quantities recycled;
- the total quantities recovered;
- the quantities of waste exported for recycling or recovery of the respective waste products.

The way in which the Member States collect the data is left to them. In practice, data are usually based on different sources, in particular on:

- data from obligated parties, i.e. producers, importers or compliance schemes responsible for collection and treatment;
- data from collection and treatment facilities;
- statistical surveys.

The use of monitoring data for waste statistics is an efficient approach as it avoids redundant data collection. Furthermore, the monitoring of waste products provides data on exports of green list waste, thus closing a data gap for the targeted waste streams.

On the other hand, the use of these data for waste statistics presents a number of problems:

- In order to ensure that the data can be used in a variety of ways, the definitions and classifications applied to monitoring must be compatible with those of the Waste Statistics Regulation as regards waste types and treatment categories. This is not the case for all the European product-related waste Directives mentioned above.
- The data on specific waste streams have to be integrated into the overall data set on waste treatment without leading to double counting or data gaps.
- Questions may rise with regard to data quality where the data are collected by private organisations, and where the methodology is not clear and well documented.

The European Commission and Eurostat officially acknowledge that the reporting obligations laid down in the EU directives must be harmonised with the data requirements of the Waste Statistics Regulation as a matter of high priority. It can be expected that reporting obligations will be streamlined in the medium term so that the data can be used simultaneously.

As regards the quality of monitoring data, the relevant Directives require the Member States to provide information on the methodology used. Where such data are used for waste statistics, the methodological descriptions should be included in the quality reports.

Data from associations

A number of public and industrial associations at national and European level compile statistics for their own use on the management of specific waste streams and/or on specific treatment operations. Sectoral data of this kind are used by some Member States in their national statistics on waste treatment, e.g. data from the paper industry on the recycling of paper and board.

Where such data are used, steps must be taken to ensure that they meet the requirements and quality criteria of the Waste Statistics Regulation. The following conditions should be met:

- In compiling their data, associations should include all enterprises in a particular sector in order to ensure complete coverage. This requirement can usually be met only by associations in sectors which are well organised and which have a limited number of enterprises/facilities.
- The definitions and classifications of waste types and treatment categories must comply with the requirements of the Waste Statistics Regulation.
- The waste flows and treatment operations under consideration must be clearly defined and delimited so that the data can be incorporated into the overall data set on waste treatment without double counting or data gaps.
- The methodology applied should be clear and well documented.

Where data from associations are used, information on the methodology used, and on the definitions and classifications applied should be set out in the quality report.

3.2.3 Surveys

As defined in Section 3.1, surveys are understood to involve the collection of data specifically for the compilation of statistics. As the methods of data collection are chosen specifically with a view to the data being used for statistical purposes, the information collected is usually more in line with statistical requirements than administrative data.

Where data on waste treatment are not obtained from administrative sources, they are usually gathered through surveys carried out by the Statistical Offices. The reporting units may be selected on the basis of waste facility registers, the statistical business register or specific statistical registers on waste treatment facilities.

As pointed out above, surveys on waste treatment facilities, unlike operations to collect data on waste generation, are usually designed as total surveys which seek to cover all facilities which are subject to the relevant obligations.

In the field of waste treatment statistics, surveys are used:

- as the principal method of data collection and are sometimes split up into different specialised surveys;
- in addition to administrative data in order to plug gaps, enhance data or assess the coverage of data collection;
- to check the completeness of administrative registers, especially as regards recycling facilities.

Scope of surveys

When it comes to the approach adopted in the survey and the selection of reporting units, it is crucial that the scope of the survey be defined, i.e. what waste treatment facilities it will cover. The scope of the survey is usually established in the statistical regulations or statistical programmes of the Member States.

Some Member States define the scope of waste treatment surveys on the basis of the licensing obligations of waste facilities, i.e. the surveys cover all licensed facilities. In cases of this kind, the Statistical Offices depend on administrative data relating to the facilities which have permits. The Statistical Offices may manage their own facility registers, which are updated regularly with data from the administrative registers.

Other Member States select reporting units on the basis of statistical business registers or specialised registers which they have established. When using the business register, the problem arises as to how to identify companies which operate waste treatment facilities. The following sections describe the way in which waste treatment activities are classified in the NACE and outline the options available and problems which arise when selecting reporting units on the basis of the business register. This analysis is based on the new version of the classification of economic activities NACE Rev. 2 that was incorporated into the statistical business registers in 2008.

Economic activities in the NACE relating to waste treatment

Economic activities which explicitly relate to the treatment and disposal of waste are covered by Division 38 of NACE rev. 2 *Waste collection, treatment and disposal activities; materials recovery.*

Division 38 includes the collection, treatment and disposal of waste materials. This also includes local hauling of waste materials and the operations of materials recovery facilities (i.e. those that sort recoverable materials from a waste stream). The bulk of those treatment operations fall within the scope of Annex II, but Division 38 also covers operations which are excluded from the scope of Annex II as preparatory operations. Division 38 is divided into three groups.

Group 38.1 Waste collection

This group includes the collection of waste from households and businesses by means of refuse bins, wheeled bins, containers, etc. It includes the collection of non-hazardous and hazardous waste e.g. waste from households, used batteries, used cooking oils and fat, waste oil from ships and used oil from garages, as well as construction and demolition waste.

Group 38.2 Waste treatment and disposal

This group includes the disposal, and treatment prior to disposal, of various forms of waste by different means, such as the treatment of organic waste with the aim of disposal, and treatment and disposal of, toxic live or dead animals and other contaminated waste; the treatment and disposal of transition radioactive waste from hospitals; dumping of refuse on land or in water; burial or ploughing-under of refuse; the disposal of used goods such as refrigerators to eliminate harmful waste; and the disposal of waste by incineration or combustion. Included is also energy recovery resulting from the waste incineration process.

Group 38.3 Materials recovery

This group includes dismantling of wrecks of any type (automobiles, ships, computers, televisions and other equipment) for materials recovery. Also included is the processing of metal and non-metal waste and scrap and other articles into secondary raw materials, usually involving a mechanical or chemical transformation process; the recovery of materials from waste streams in the form of (1) separating and sorting recoverable materials from non-hazardous waste streams (i.e. garbage) or (2) the separating and sorting of mixed recoverable materials, such as paper, plastics, used beverage cans and metals, into distinct categories.

The economic activities listed above do not cover the following:

- Industries which use waste as fuel, e.g. cement kilns and power plants. Incineration facilities which use waste as a secondary fuel are mainly found in the energy sector or in the sector 'manufacturing of non-metallic mineral products' (cement kilns) but can, in principle, be found in all economic sectors where enterprises operate their own combustion facilities.
- Industries which use secondary raw materials for production, i.e. the manufacturing of paper, glass, plastics, metals, etc.
- Waste treatment activities which do not constitute economic activities as they are carried out by an enterprise for its own purposes.

Table 18: Economic activities (divisions and classes) relating to waste management pursuant to NACE Rev. 2

NACE code	Description of Division/Class
38	Waste collection, treatment and disposal activities; materials recovery
38.1	Waste collection
38.11	Collection of non-hazardous waste
38.12	Collection of hazardous waste
38.2	Waste treatment and disposal
38.21	Treatment and disposal of non-hazardous waste
38.22	Treatment and disposal of hazardous waste
38.3	Materials recovery
38.31	Dismantling of wrecks
38.32	Recovery of sorted materials

Selection on the basis of the business register

The business register is a list of enterprises and other units whose activities contribute to the gross domestic product of the Member State. The minimum content of statistical business registers is stipulated in the Registers Regulation (177/2008)[54]. The Regulation stipulates that business registers must contain information on the following statistical units[55]:

- enterprises carrying on economic activities contributing to gross domestic product and their local units;
- legal units of which those enterprises consist;
- truncated enterprise groups and multinational enterprise groups; and
- all-resident enterprise groups.

Other statistical units, such as kind-of-activity units and local kind-of-activity units, are subsidiary entities which are included only in some Member States.

[54] Regulation (EC) No 177/2008 of the European parliament and of the Council of 20 February 2008 establishing a common framework for business registers for statistical purposes and repealing council regulation (EEC) No 2186/93.

[55] Statistical units are defined in Council Regulation (EEC) No 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community.

Enterprises should be identified in the register by their principal and secondary activity. The register should identify local units by their principal activity (code NACE 4-digits), and should indicate whether this activity constitutes an ancillary activity of the enterprise. The economic activity is classified in accordance with NACE Rev. 2.

The structure of the business register is such that ways of identifying waste treatment facilities are limited. The business register records information on enterprises and their local units, but not on facilities.

The business register can therefore be used to identify enterprises for which the collection, handling or treatment of waste represents an important economic activity, i.e. enterprises belonging to NACE 38. It can also be used to select enterprises which are likely to use secondary raw materials or secondary fuel in their production on account of their economic activity, e.g. paper industries and glass manufacturers, cement kilns, power stations. However, the business register cannot be used to isolate waste treatment facilities which are operated by enterprises for their own use. These activities do not constitute economic activities and will therefore not be recorded in the business register.

Hence, for a complete selection of facilities falling within the scope of the Waste Statistics Regulation, additional information on the facility level is needed. Such information may be obtained from administrative sources or from specialised statistical registers (e.g. satellite registers). In principle, facility-related information can also be incorporated into the business register by introducing facilities as statistical units at a level below the local units or the kind-of-activity units.

Satellite registers

Registers which are used for surveys on waste treatment must include a facility-related level. This level can either be incorporated into the business register as a sub-level, or a satellite register can be created for these data.

Satellite registers are registers which do not form part of the business register but are closely linked to it. They are usually more limited in scope than the general business register, e.g. in terms of NACE Rev. 2, but may have more comprehensive coverage within their scope. They contain characteristics which are not found in the general business register. Satellite registers are often used for incorporating data from administrative sources[56].

Where satellite registers for waste treatment facilities are used, they should contain all the characteristics which are necessary for the selection of reporting units, as already outlined for administrative registers in Section 3.2.2.

The satellite register should also contain an identifier for each facility in order to create an unambiguous link to other registers or data sources with which data have to be exchanged. Establishing a link of this kind between statistical registers and administrative registers might not be possible for legal reasons.

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[56] Eurostat 2003: Business register — Recommendations manual
http://ec.europa.eu/eurostat/ramon/statmanuals/files/KS-32-10-216-EN-C-EN.pdf
European Commission, 2000: Implementation of Council Regulation (EEC) No 2186/93 of 22 July 1993 on Community coordination in drawing up business registers for statistical purposes. (COM(2000) 3 final).
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2000:0003:FIN:EN:PDF

Coverage

Where the scope of the survey is defined according to licensed treatment facilities, the data will be drawn from administrative registers. In such cases, the competent authorities must guarantee the integrity of the data. However, the business register can be used to check the completeness of the administrative data, especially in the field of recovery and recycling.

Where the survey is based on statistical registers, the Statistical Offices must guarantee the integrity of the data. To prevent under-coverage, the comprehensiveness of the information should be ensured by using data from related registers and surveys to update and synchronise the data. Relevant information can be drawn not only from administrative registers but also, for example, from business surveys, energy surveys or farm structure surveys. Business surveys are carried out at frequent intervals and may include total surveys covering small enterprises. These data are useful for updating general information, such as the establishment and closure of enterprises or changes in economic activities. Energy surveys can provide information on enterprises which use waste as a secondary fuel in combustion facilities.

Over-coverage, on the other hand, may pose a problem where statistics on the capacity and number of treatment facilities are produced on the basis of outdated facility registers. In such cases, statistics may include information on facilities which have been closed down, which have reduced their treatment capacity or which have changed in other ways. This can be avoided by regularly updating and synchronising the data with related registers, as described in the previous section. Over-coverage with regard to the waste quantities treated could, in principle, occur where data are grossed up on the basis of faulty data. In practice, this should not be a problem, as treated waste quantities are usually not extrapolated.

3.2.4 Estimation procedures

It would be almost impossible to use statistical estimation procedures to determine treated quantities of waste by treatment categories; estimations of this kind would be highly speculative in nature. In the context of waste treatment, estimation tends to be a provisional method which is used to close data gaps rather than an accepted methodological approach.

An exception to this is the development and application of so-called *process-specific key factors,* which are discussed in the context of the monitoring of waste products (ELV, WEEE)[57].

Key factors express, for a specific waste stream, the recycling and recovery rates for a subsequent treatment process or treatment chain. In practice, key factors are applied to the waste generated as a result of the dismantling and shredding of ELV and WEEE in order to minimise the monitoring work required for the purpose of determining recycling and recovery rates. If key factors were used, the waste would not need to be monitored until the final stage of recovery and recovery could be calculated on the basis of the treatment output.

This methodology is still under discussion but might become more important with the implementation of the ELV and WEEE Directives and the compilation of the first monitoring reports on ELV and WEEE. This approach would also allow for the calculation of recycling and recovery rates for waste exported for further treatment, provided that information on the treatment process were available.

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[57] For more detailed information, please refer to: Ökopol, 2002: Rule on Compliance with Article 7.2 of Directive 2000/53/EC. Report compiled for DG ENV. http://ec.europa.eu/environment/waste/studies/elv/compliance_art7_2.pdf

3.2.5 Combination of different sources and methods

In practice, it is quite common for different data sources and collection methods to be used simultaneously and in combination. Sources are combined for a variety of purposes:

- different sources are used to identify treatment facilities and provide for a complete coverage of registers and surveys;
- data from different sources are combined to avoid multiple and overlapping data collection;
- data needs to be combined where responsibilities for registers or data collection are spread across different administrative bodies and/or administrative levels.

The merging of data is usually associated with a variety of problems. Registers are often incompatible because they are based on different concepts. Units used in administrative registers, for instance, do not correspond to statistical units, and definitions and classifications might be different. Sources can also be difficult to combine because of overlaps or gaps; and, last but not least, the use of different data can result in a lack of timeliness of the results.

The main requirements for minimising problems of this kind are:

- the harmonisation of the definitions and classifications applied;
- the establishment of clearly defined interfaces between registers;
- the development of integrated data collection systems, i.e. the harmonisation of reporting obligations with regard to scope, characteristics, frequency, formats, etc.

Compatibility requires a common set of definitions and classifications, and coding systems for waste types, facility types, source sectors and locations.

The classification of treatment operations should be harmonised in such a way that the data can be combined and aggregated according to five categories, as defined in Annex II of the Waste Statistics Regulation. Where different classifications are used, these classifications should be designed in such a way that they are clearly and unambiguously convertible.

Similarly, waste classification should be carried out in a harmonised way. The LoW codes or the EWC-Stat codes should be used, wherever possible, at least in addition to other names/classifications, in order to link waste data from different sources.

Where legally possible, different registers should use common identifiers for waste treatment facilities and operating enterprises in order to facilitate the exchange and synchronisation of data. In some countries, this is done by *business identity numbers,* which can be used or linked in both the statistical and the administrative contexts[58]. In other countries, however, identifiers of this kind do not yet exist or have not been established for legal reasons.

In general, data collection should adhere to an integrated approach. Statistical and administrative reporting obligations should be examined in their entirety and should subsequently be compared with data requirements in order to identify overlaps and streamline data collection. This will relieve the burden on administration and reporting units at the same time.

[58] *Use of administrative sources for business statistics purposes: Handbook of good practices.* Eurostat, THEME 4 Industry, trade and services, 1999.

3.3 Data processing

Data processing is carried out by statistical offices in accordance with fixed rules which are based on a wealth of experience. This section of the manual deals with all the subjects which have a special relevance to waste statistics.

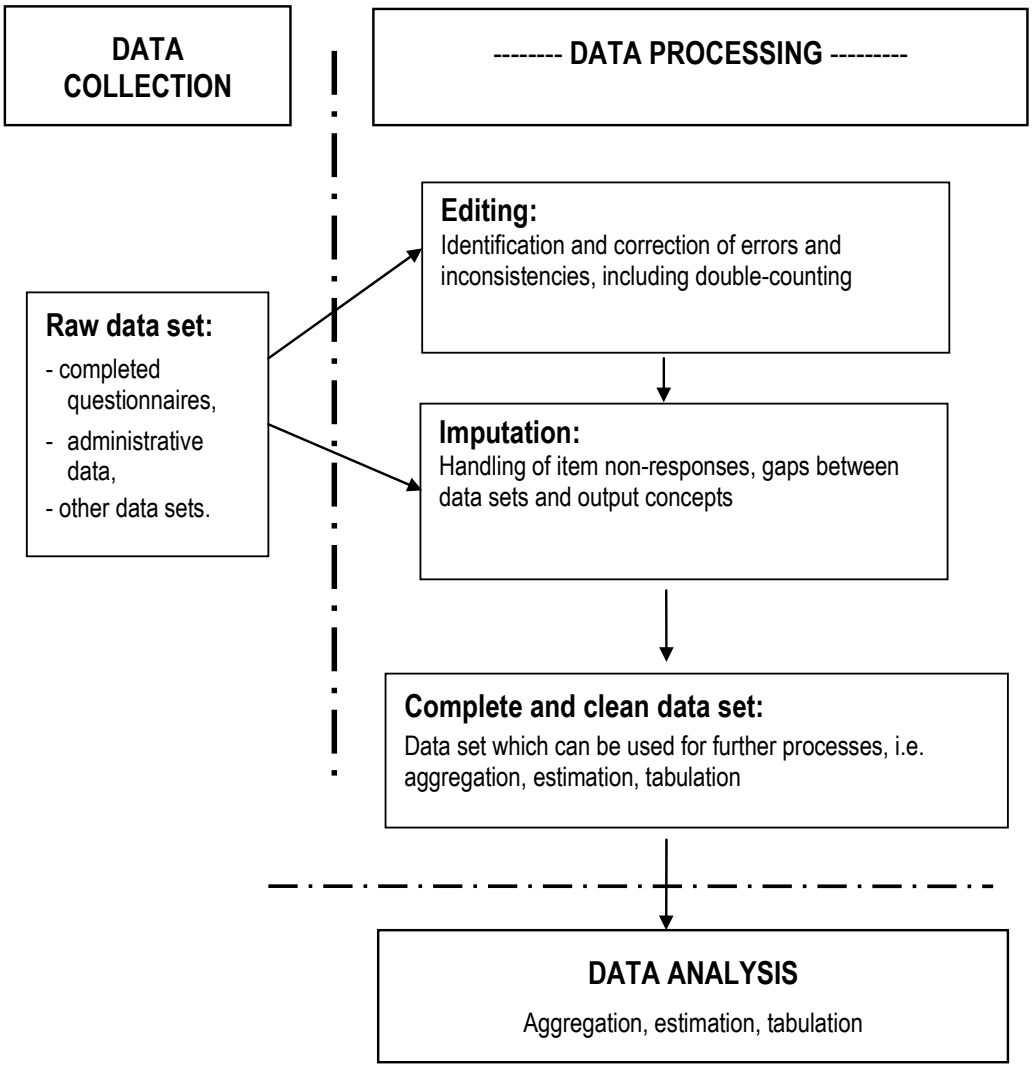

Figure 9: Elements of data processing and differences vis-à-vis data collection and analysis

It must be pointed out that neither the distinction between the concepts of data collection and data processing, nor the content of these concepts is natural or evident. Data collection can be restricted to the collection of responses from units, while data processing can be restricted to the pure technical handling of the raw data matrix created from these responses.

More complex and extended definitions are applied in this manual. As described in Sections 3.1 and 3.2, data collection in the field of waste statistics does not only refer to the collection of responses from units but also includes the use of data sets which have already been collected and prepared for different objectives. Data collection is defined in this manual as the system or process of generating the basic data set. The foregoing Chapters on data collection therefore also describe the problems associated with collection methods and specify the principles which should be applied when considering problems which relate to coverage and quality.

The definition of data processing in this manual is based on the definition contained in the Eurostat Handbook on the Design and Implementation of Business Surveys. According to that definition, 'processing' takes place at an early stage: 'The starting point for the processing stage is the information as collected from respondents. Processing and analysis can be said to comprise all operations, applying for 'promotion' to the level of the intended statistical output as specified'[59]. The Handbook focuses on survey methodology as a method of data collection. The present manual indicates that other methods are also possible, which means that it also deals with other subjects. In addition to the processes of editing and imputation as they relate to surveys, the manual also discusses the problem of double counting, which can occur, in particular, when other methods are used or when a number of sources need? to be combined.

3.3.1 Data editing

Data editing is the application of checks to identify missing, invalid or inconsistent entries, or data records which might contain errors[60]. Editing includes checks on completeness, logical checks on the coherence of related variables and checks for data consistency.

The process of editing can be defined as a process which is used to identify (potential) errors in the data material or data matrix received from respondents. The editing of data involves correcting the information received from respondents or data suppliers. Data editing can (and must) take place at several points in the process of information generation: at the beginning, when the information is supplied, at the end before the completed data sets are delivered to final clients like Eurostat and also in the middle, when different data sets are incorporated. The data editing process, which is by far the most important process, takes place at the beginning and is therefore given priority in this manual. Data editing can take place during or after data entry.

A distinction can be made between the following basic editing processes:

- Completeness check with regard to sample survey (How should non-respondents be handled?)
- Completeness or routing check with regard to questionnaire (Have all the questions which should have been answered been answered?)
- Data validation (Are answers permissible and plausible?)

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[59] p. 141.

[60] Eurostat Working Group 'Assessment of quality in statistics': *Glossary of quality terms*, Luxembourg, 2/3 October 2003.

Completeness check with regard to sample survey

Generally speaking, replies will not be received from all the units selected. There can be various reasons for this:

(a) the enterprise no longer exists and has 'shut up shop';

(b) the address, name or ownership of the enterprise has changed;

(c) the enterprise is not able or willing to reply and has therefore not replied (yet).

The cases indicated in (a) and (b) occur in every survey. They relate to the fact that none of the registers are ever complete at any given time. However, the percentage of 'wrong' addresses in a sample survey reflects the quality of the register. The quality report should therefore include not only the percentage of non-replies which can be attributed to mistakes in the register but also information on the further handling of these cases.

Case (c) deserves special attention:

- Enterprises which are not willing to provide information can either be forced to do so or be excluded from the sample. Although information which is provided as a result of enforcement measures is of inferior quality, every effort should be made to encourage enterprises which do not reply to comply with their reporting obligation. Measures usually include reminders in writing and by phone in accordance with a clear time schedule. In the event of non-compliance, enforcement measures can be taken in line with national legislation.
- Assistance should be provided to enterprises which are not able to answer the questionnaires. A number of explanatory documents on waste classifications are available. Enterprises should familiarise themselves with the EU waste classifications as this will also help to improve European integration in practice.

Completeness or routing check with regard to the questionnaire

If all questions which should be answered have been answered, the routing check can be carried out automatically. An automatic check can be carried out only if the questionnaire is based on precise logic. If an automatic routine is applied, then only those replies which are identified as incompatible need to be handled manually.

Data validation (Are answers permissible and plausible?)

Several methods are used to test whether data are permissible and plausible:

- Data can be compared with historical data and data from comparable enterprises.
- Data should not exceed certain boundaries (negative figures are impossible, fraction amounts cannot be higher than the total, etc.).

The possibilities for the detection of errors depend on the sources and methods available at national level. Herewith are some suggestions for the table on waste generation:

1. In an economic activity (NACE) a waste type does not occur in the sample.

Please reflect on the content of this economic activity. If this waste type is impossible in this activity, then a zero value should be inserted and no flag added to the cell. If you are aware of important waste streams in the units not sampled, please note this in the Quality Report.

2. In a combination of economic activity (NACE) and waste type almost all units report zero, but a few have a positive waste value.

Please reflect on the application of the classifications. If the waste stream is impossible or highly improbable in the economic activity, an error might have occurred in either the application of the economic activity or the classification by waste type. If more detail is available in either the NACE classification or in the waste classification, this will assist in the interpretation of the situation.

3. In a combination of economic activity (NACE) and waste type almost all units report a positive, but a few have a zero waste value.

The case is similar to the one above. Could we imagine businesses in this economic activity without the generation of this specific waste stream?

4. The waste value for a combination of economic activity (NACE) and waste type is dominated by one or a few units.

This is only a natural result if the economic activity is dominated by one or a few large enterprises. For the detection of outliers the size of the enterprises should be taken into account. Positive outliers might be the result of misclassification (of either economic activity or waste type); it could also be an error in the reporting measure (kilograms or tonnes).

All the examples above could be generalised in the analysis of waste profiles within an economic activity; this means that all waste types of the enterprises within a NACE category are evaluated together, not only one isolated waste type. In the illustration below the manufacture of pulp, paper and paper products contains 7 enterprises (named 1 to 7). For these enterprises the distribution of the total generation of waste over the waste types is presented. In this example the profile of enterprise 4 clearly does not fit in the general pattern; probably a more formal Chi-squared test is possible to detect the outliers. The enterprise could be classified in the wrong way according to the NACE, but it could also have an activity quite different from the other enterprises in the group, but still fitting in the broad NACE category.

Table 19: Illustration: waste profiles of enterprises in the manufacture of pulp, paper and paper products (%)

	Enterprises						
Waste types	1	2	3	4	5	6	7
1	*7*	*8*	*6*	*15*	*7*	*8*	*6*
2	*12*	*11*	*11*	*5*	*13*	*11*	*11*
3	*11*	*11*	*13*	*0*	*10*	*11*	*13*
4	*0*	*0*	*0*	*5*	*0*	*0*	*0*
5	*20*	*24*	*22*	*15*	*20*	*13*	*22*
6	*5*	*4*	*4*	*0*	*5*	*5*	*4*
7	*5*	*2*	*4*	*24*	*5*	*2*	*4*
8	*0*	*0*	*0*	*3*	*0*	*0*	*0*
9	*37*	*35*	*38*	*18*	*37*	*35*	*37*
10	*1*	*3*	*1*	*2*	*1*	*3*	*2*
11	*1*	*1*	*0*	*2*	*1*	*1*	*0*
12	*1*	*1*	*1*	*6*	*1*	*1*	*1*

In some cases the detected errors can be corrected in the individual record (based on extra information available or collected). The general procedure for detected errors is to set either the waste value or the NACE code as missing and treat the missing value in the imputation procedure.

3.3.2 Data imputation

Although data editing will undoubtedly increase the response rate, some data will still remain missing. A distinction can be made between two types of missing data: unit non-response and item non-response.

Unit non-response is handled in the editing process. Remaining unit non-responses are managed in the surveying process by recalculating weights (reweighting). Imputation refers only to item non-response.

Item non-responses can be handled in two ways:

- ignore the missing values: restrict the analysis to forms which have been completed in full (complete case analysis) or use all the information available (available case analysis);
- impute the missing values (imputation can range from simple and intuitive methods to sophisticated methods).

As regards statistics on waste generation, imputation can be difficult but it is sometimes unavoidable if large generators of waste cannot deliver complete information. Item non-response also can be introduced in the processing of data because of detected errors.

Imputation models can be based on:

- expert knowledge (this waste stream can not occur in that economic activity; waste stream 1 should be less than waste stream 2);
- observation of the same enterprise in a previous period;
- observation of similar enterprises in the same period (or even similar enterprises in a previous period).

If the number of imputations is large, the results will become dependent on the imputation method. Where relevant the number of imputations and the imputation method should be reported in the Quality Report.

Double counting or overlapping

Double counting in relation to waste generation

Double counting of waste generation primarily occurs when several data sources are used and integrated. Here are two examples of double counting:

- (A) Household waste is estimated via the household survey and (B) the additional survey of waste generation by economic activities also includes waste collectors. Double counting arises when waste collectors are assumed to be the generators of the quantities of waste they have collected.

- (A) Agricultural waste is estimated via waste factors applied to agricultural structure data and (B) household waste is determined via waste collectors which also provide their services to farms (farm households). Double counting arises when farmers put some of their farming waste into the bin which is emptied by the household waste collectors.

However, double counting can also arise when only one source is used: if enterprises, when questioned about their waste generation, include waste that they have taken in from other enterprises, then this waste will be counted twice. This type of double counting, which is similar to double counting of waste treatment, can be avoided by ensuring that the questions in the questionnaire are specific. If attention is drawn to the fact that enterprises should only

report waste which has been generated by them (N.B. waste does not have to be reported by waste traders), then double counting can be avoided. There is always a risk of double counting if waste collectors and transporters are used as an (additional) source of information.

The subject of double counting is also discussed briefly in the section of the manual that deals with the 'strategic' considerations relating to each of the possible methods of data collection and in the section on the design of the questionnaire (Section 3.1). Proposals are made as to how double counting may be avoided.

Double counting in the case of multi-step treatment

Double counting can occur when waste undergoes two or more treatment processes in different treatment facilities which are covered by Annex II of the Waste Statistics Regulation. The Regulation tries to minimise double counting by excluding preparatory operations from the scope of Annex II. However, this does not eliminate the problem completely. In the following section, the problem is discussed from the point of view of disposal operations, on the one hand, and recovery operations, on the other.

Disposal operations

The situation concerning disposal operations is comparatively simple. As outlined in Section 2.3 of the manual, Annex I of Directive 2008/98/EC lists five preparatory treatment operations which are followed by other disposal operations. These are:

- biological treatment (D8);
- chemical-physical treatment (D9);
- blending, mixing and repackaging of waste (D13 and D14);
- temporary storage (D15).

The remaining operations, i.e. waste incineration, landfilling and discharge into the environment, can be considered as final treatment steps. Hence, for disposal operations, the distinction between pre-treatment and final treatment is relatively clear. Provided that the treatment facilities are correctly assigned to the D codes, double counting can be largely avoided.

In principle, this is not true of waste incineration. Incineration can be considered to be thermal pre-treatment which generates secondary waste (slag ashes, residuals from air exhaust treatment, etc.); this secondary waste is subsequently recovered or landfilled. In the latter case, the waste is counted twice as waste which is disposed of. In this case, however, double counting is deliberate and does not have to be eliminated.

Recovery operations

In the case of recovery operations, the situation differs in several ways. First of all, Annex II of Directive 2008/98/EC does not define preparatory operations for recovery as clearly as Annex I on disposal. The operations R12 'Exchange of wastes' and 'Temporary storage of waste' (R13) are excluded from the scope of the Waste Statistics Regulation. Facilities for depollution, dismantling and sorting (see Section 2.3) are also excluded. However, the distinction between pre-treatment and 'final' treatment operations covered by Annex II of the Waste Statistics Regulation is not very clear for recovery and will not prevent double counting.

The chain of treatment processes for recovery is also more complex and more versatile than for disposal. The number of treatment steps varies for different types of waste.

The issue of double counting must therefore be taken into consideration during data collection and processing.

As pointed out in Section 3.2.1, facility registers used for the selection of reporting units should contain information which makes it possible to assign a treatment facility to a specific step in the treatment chain, i.e. to determine the level of treatment carried out. This information must be coded in such a way that it can be used for the selection of reporting units. This information can be used to reduce double counting by reliably excluding pre-treatment facilities which are not covered by the survey.

It was also pointed out previously that the data collected on the quantities of waste treated should provide information on the origin and destination of the waste. In order to avoid double counting, it is particularly important to know whether the treated waste comes directly from the waste generator as a primary waste or is a secondary waste originating from a treatment facility. Furthermore, the destination of the generated waste should be specified by giving the name, address and registration number of the receiving treatment plant and the type of treatment (R or D code).

This information can be used to ensure that quantities of waste which have been counted twice are identified and eliminated from the data.

CHAPTER 4: The quality report

4.1 Guidelines for the quality report

In order to take advantage of the sources available at national level and take proper account of differences in (economic) structure, the Member States are left to decide which methods of data collection are most suitable. However, this is not conducive to the drawing up of harmonised waste statistics. The quality report, which each Member State is expected to submit together with the data, seeks to supply the information necessary for assessing the quality of statistics at both national and Community level. In many Member States, a number of different parties are involved in the collection of data. The Member States must decide themselves which organisation will coordinate the submission of the quality report (and the submission of data).

The national quality reports will also be used to draw up a quality report at EU level. Eurostat is required to report to the European Parliament and the Council on the quality of statistics and the burden on businesses (Article 8(1) of the Waste Statistics Regulation). The national quality reports will be used as a basis for the European report.

The content of the quality report for waste statistics is laid down in Commission Regulation (EC) No 1445/2005. Part I of the quality report presents a general description of the data and gives an overview of the methods applied. Part II of the report follows the standard elements used to define quality in the European Statistical System.

A large number of elements are set out in the aforementioned Commission Regulation and in this manual. Depending on the methods used in each Member State, various elements will not apply or will be less relevant. Please select the elements which apply to your Member State and adjust them where necessary. But please retain in the report the (sub)paragraphs which are not applicable or not relevant and indicate 'not applicable' or 'not relevant', as appropriate. Although information is required on all seven of the elements used to define quality, priority should be given to the elements 'accuracy' and 'comparability'.

If data is amended, a note should be appended to the quality report. The note should specify the area to which the amendment applies, e.g. generation of agricultural waste in all waste categories. It should also explain why an amendment was necessary, e.g. because better waste factors were used in the model. The impact assessment should refer to the key variables as defined below. For instance: total non-hazardous waste generated by businesses rises by 100 ktonnes, i.e. 7 % of the original value. The number of revised cells per set should be reported (see Chapter 5: flags).

Two sets of key variables have been defined for the quality report. For the generation of waste, the key variables are hazardous waste generated by households, non-hazardous waste generated by households, hazardous waste generated by enterprises (all of which are NACE categories) and non-hazardous waste generated by enterprises. The key variable hazardous waste generated by households is added for completeness and symmetry; it is not particularly important in itself.

For the treatment of waste, the key variables consist of 'hazardous'/'non-hazardous' combined with four waste treatment operations (the two disposal operations are combined).

An overview of the required contents of the quality report is given in the table overleaf.

Requirements to be met by the quality report		Explanation
1	Heading (file name) of the quality report	QR_WASTE_BE__2004_0:= **Q**uality **R**eport **WASTE** from **Be**lgium for the year **2004** primary delivery. QR_WASTE_EL__2006_1:= **Q**uality **R**eport **WASTE** from **Greece** for **2006 1st revision**. QR_WASTE_NL__2010_7:= **Q**uality **R**eport **WASTE** from the **Netherlands** for **2010 7th revision**.
Part I: Description of the data		
2	Identification	(a) Country name and reference year. (b) Description of data sets submitted; the transmission format defines the three data sets which must be submitted. The description should be quite general at this stage and should refer to any derogations which apply to the submission of (parts of the) data sets. (c) Transmission date.
3	Contact information	Name of the contact person/coordinator in the Member State and contact details (phone number and email address, institution and function).
4	Institutions involved and sustainability of data collection	Description of the parties involved/sources used in the collection of data. How do the parties and sources relate to the domains of the Waste Statistics Regulation? What is the legal basis of the data source? How is continuity assessed? (see **Table 20)**
5	Methods applied	The tables in Section 4.2 may be helpful with a view to describing the methods in a systematic way: (a) **Table 22** on classifications used (b) **Table 21 and Table 23 to Table 25 on** waste generation by businesses (c) **Table 26** on waste generation by households (d) **Table 27 to Table 28** on the collection of data on waste treatment.
6	Changes compared to history and comparability over time	Any changes which have taken place since the previous reference year should be reported here, together with an assessment of their impact on data quality. Special attention should be paid to comparability over time. No reference needs to be made to the data collected through the Joint Questionnaire.
7	Changes planned or expected in the next reference year	Changes expected in the next reference year should be reported, with an assessment of the impact on data quality.

Part II: Report on the quality attributes		
1	Relevance	Description of the primary users and of political requirements with regard to waste statistics at national level.
	Additional general explanations	To complete the information provided in Point 2 (Identification) of Part I of the quality report, the Member States should explicitly identify any data gaps in their data sets (restricted breakdown, missing values). The Eurostat production system requires complete data sets. If a data cell is missing, the data line should still be supplied, with a special value to explain why this cell is not available (see also Chapter 5: missing values): • a real zero, which must be represented by '0'; • value not available, coded as 'M'. Specify the number of special values per set. Explanations should be given for the 'M' values. Information should be provided (**Table 29, Table 30**) on how to overcome the deficits. The value '0' should also be used if a specific combination does not occur, e.g. as Luxembourg does not have a fishing industry, it should enter '0' for the quantity of waste generated by the fishing industry.
2	Accuracy	
2.1	Sampling errors	
		The information required on sampling methods (sampling frame, sampling scheme, stratification and sample volumes) is covered in **Table 21 to Table 28. Table 31** contains the information on the coefficient of variation for the key variables. In the quality report, information on the coefficient of variation is required for each key variable. **The coefficient is defined as the standard error of the estimated amount of waste divided by the total amount of waste in the key variable.** To facilitate comparison between countries, the amount of waste in the denominator should include not only waste amounts estimated using sample surveys but also waste amounts derived from administrative sources. If a derogation applies to part of the key variable, the total refers only to the items included in the data. The coefficient will be reported in percentages with one decimal position. For further explanation, see **Table 31**.
2.2	Non-sampling errors	
2.2.1	Errors concerning coverage	For Annex I on waste generation: description of the method(s) applied to achieve coverage of 100 % (**Table 21**). For Annex II on waste treatment: description of the waste treatment facilities which are excluded from reporting and the basis for this exclusion (**Table 32**). Finally, a description should be provided of the main cause of misclassification, i.e. problems of under-coverage and over-coverage in the collection of data.

2.2.2	Measurement errors	Instruments to reduce potential risks and avoid errors Application of statistical units: Description of the statistical units selected; have they been applied in accordance with the rules of the Statistical Business Register or in accordance with other procedures? Precision of quantities: The core values are measured in kilotonnes of waste. What is the precision of the original measurement? What validation procedures are applied to detect errors in measurement units (for instance, reporting in kilograms, where tonnes were expected)? If the basic data is collected in volumes (cubic metres), where and how is it converted to tonnes? Data collection instrument: Has the questionnaire been validated, e.g. by a focus group or data collection experiments? Incentives for over-reporting or under-reporting in sources of administrative data: identify the advantages and disadvantages of inclusion in administrative records.
2.2.3	Processing errors	Please summarise the processing steps between the collection and production of statistics. List of processing errors identified and their extent. Presentation of processes put in place to control and correct processing errors. Coding of waste category: Description of how coding is handled and of the validation routines established (e.g. use of waste profiles for certain economic activities). NACE category (source category): Is the NACE code taken from the statistical business register, is it applied in accordance with business register procedures, or what other procedure is followed? Type of treatment operation: Is the type of treatment operation established in accordance with the explanations in the handbook or in accordance with some other procedure? Region: How is the regional code applied to statistical units which carry out activities in more than one region?
2.2.4	Non-response errors	Response rate at the level of the 19 NACE groupings and households; **Table 23 and Table 26**. Description of the handling of non-responses (unit and item non-responses) in surveys; **Table 23 and Table 26**.
2.2.5	Model-assumption errors	Description of models, sources used, scope, assumptions connected with the model application and expected errors and how to cope with them. Results from sensitivity analysis, e.g. different factor lists from different countries or institutions which seem to be reasonable and well-justified should be analysed with regard to potential effects.

3	Timeliness and punctuality	The 'P' flag in the transmission format can be used to flag cells as provisional (see Chapter 5: flags). The Waste Statistics Regulation did not make provision for this option. If any cell is flagged as provisional, provide: • the number of provisional cells per set; • an explanation; • a plan for the revision of the data. Description of the **key data collection steps** in the process of establishing the data sets in a time schedule; **Table 33** Description of the **key data processing steps** (e.g. starting and finishing dates for completeness, coding and plausibility checks, data validation and non-disclosure measures) in a time schedule; **Table 33.** Description of the **key publication steps** (e.g. when the advance and detailed results were calculated and disseminated) in a time schedule. Punctuality of data transmission to Eurostat will be evaluated in accordance with the Waste Statistics Regulation, giving details of periodicity and deadlines for data transmission. An explanation should be provided for any delay. The report should also give details of the measures taken to avoid delays in future.
4	Accessibility and clarity	The NSIs should give details of: • dissemination policy on waste statistics; • measures and tools to establish/improve clarity; • consistency of the statistics disseminated nationally with the data reported pursuant to the Waste Statistics Regulation; • relevant confidentiality policy; • the total number of cells, with confidentiality flags per data set and type of confidential flag; for further explanations, see Chapter 5: flags.
5	Comparability	To facilitate the comparability of national data generated using different methodologies, the (potential) restrictions with regard to coverage and precision of the data should be mentioned: • What is the reporting unit (for sample surveys and for administrative sources)? • How is the regional comparability of data on waste treatment facilities validated? What statistical unit is used? How are mobile waste treatment facilities handled? • Comparability over time, anticipated changes. Give details of changes in definitions, coverage or methods since the previous Waste Statistics Survey and evaluate the consequences (refer to Part I).
6	Consistency	Member States are invited to comment on consistency with: • trade statistics; • environment-economic accounting, including national accounts; • other statistics e.g. waste streams It is proposed that Member States identify differences in the application of statistical units and classifications. Additional remarks on this by Member States are welcome. Consistency with national waste statistics is covered by Item 4 (accessibility and clarity).
7	Burden on respondents	An evaluation of the burden on respondents in physical terms (time required for response) and the actual number of respondents from businesses and households separately. For administrative sources: the burden on respondents resulting from additional questions for statistical purposes; **Table 34**.

4.2 Explanations to the Quality report tables

The following section sets out proposals for the tables to be completed and included in the quality report. The tables provide more detailed information for the quality report which is to be submitted by the Member States. The following section provides a kind of checklist of the items which the Member States should include. A common format will help Eurostat to evaluate reports and to incorporate the information at European level.

Only those tables that are relevant, i.e. that refer to the methods applied, should be completed.

Section 4.2.1 contains the tables which relate to Part I of the quality report on the description of the methods applied. Section 4.2.2 contains specific tables for Part II of the quality report on the specification of some of the quality elements.

4.2.1 Part I: Description of the methods applied

This section provides a number of tables which show the methods applied:

- Table 20 gives an overview of the institutions involved in the collection of data and distribution of tasks;
- Table 22 gives an overview of the classifications used;
- Table 21 and Table 23 to Table 25 give details of the methods applied to estimate waste generated by businesses;
- Table 26 provides information on the methods applied to waste generated by households;
- Table 27 and Table 28 detail the methods used to estimate the amount of waste treated.

The tables are made available to the Member States in the form of a Quality Report template (QRt)[61]. To facilitate the combination of this manual and the template the table headings make reference to the number of the corresponding tables in the template.

Some tables are illustrated with examples that are taken from quality reports of Member States for the years 2004 or 2006. Accordingly, the examples are based on the WStatR 2002 and do not consider the revisions of WStatR 2010. Nevertheless, the examples were maintained because they are considered helpful.

[61] https://circabc.europa.eu/w/browse/a1ece011-84a5-4e13-8d0e-4624477378f2

Description of the parties involved in the data collection

Table 20: Institutions involved in the collection of data and distribution of tasks (table 1 Quality Report template, QRt)

Name of institution	Description of key responsibilities

Table 20 should be used to list the parties involved and their relationship to the different areas covered by the WStatR.

Example 1: United Kingdom (QR 2004), Description of the parties involved/sources used in the data collection

Area	Organisation/contacts	Key responsibilities
UK	Department of Environment	Coordination UK data collection Preparing UK quality report and estimates for certain sectors on a UK basis e.g. mining and quarrying waste
England (84 % UK population, 82 % UK waste)	Defra	Coordination and collection of England data for Annexes I and II, including survey of municipal waste Estimates for small waste facilities not licensed by the EA
	Environment Agency (EA)	Waste Management Licensing system, survey of industrial and commercial waste
Wales (5 % UK population, 7 % UK waste)	Welsh Assembly Government Environment Agency (Wales)	Production of data and quality report for Wales, Agriculture
Scotland (8 % UK population and UK waste)	Scottish Environment Protection Agency (Sepa)	Production of data and quality report for Scotland, fishing
Northern Ireland (3 % UK population, 2 % UK waste)	Environment and Heritage Service (EHS)	Production of data and quality report for Northern Ireland, ELV

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

General description of methodology

Table 21: Description of methods determining waste generation (table 2 QRt)

Waste item	Source									
	1	2	3	4	5	_….__	16	17	18	19
1										
2										
3										
__….__										
49										
50										
51										

The sources are the businesses (18 NACE groupings) and households which generate waste. The waste types are the 51 waste categories for which data is required under the Waste Statistics Regulation.

The aim of this table is to provide an overview of the methods applied. The two examples below will help to clarify the idea.

Example 2: Spain (QR 2004), Description of methods determining waste generation

Country: SPAIN Reference year: 2004							
	Source						
Waste type	From 1 to 14	15	16	17	18	19	20
1	Sample survey	Sample survey Model for small enterprises	Sample survey on parts of the service sector Model for small enterprises and for some activities within the sector	Sample survey		Combined estimation by the information sources waste and additional survey?	Indirect estimation via waste collection
2							
-…-							
45							
46							
47							
48							

Example 3: Slovenia (QR 2004), Description of methods determining waste generation

	Activity item number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Waste item	NACE REV 1.1/EWC-STAT VER. 3	A	B	C	DA	DB,DC	DD	DE	DF	DG,DH	DI	DJ	DK, DL, DM	DN excl. 37	E	F	G-Q excl. 51, 57, 90	37	51.57	90	HH
1	Spent solvents	All active statistical units: - with more than 10 employees or - according to national Decree on waste management also included are units which generated more than 5 kg hazardous waste or more than 10 tonnes of non-hazardous waste														F-O sample survey on stat. units with more than 5 employees. Excluded 50.200, 74.810, 93.010 — full coverage		All active statistical units — full coverage			KO-Z survey — full coverage of waste collectors
2	Acid, alkaline or saline wastes																				
3	Acid, alkaline or saline wastes																				
4	Used oils																				
5	Spent chemical catalysts																				
6	Spent chemical catalysts																				
...	....																				
44	Combustion wastes																				
45	Combustion wastes																				
46	Contaminated soils and polluted dredg-ing spoils																				
47	Solidified, stabilised or vitrified wastes																				
48	Solidified, stabilised or vitrified wastes																				

Table 22: Description of classification used (table 3 QRt)

	Name of classification(s) used	Description of the classification(s) (in particular compatibility with WStatR require-ments)
Economic activities		
Waste types		
Recovery and treatment opera-tions		

Information should be provided on the classifications used for data collection and on the compatibility of the classifications with WStatR requirements.

Example 4: Finland (QR 2006), Description of classifications used

	Name of classification(s) used	Description of the classification(s) (in particular compatibility with WStatR requirements)
Economic activities	NACE REV 1.1	Directly compatible with WStatR requirements
Waste types	List of Waste	Converted into EWC-Stat classification with conversion key
Recovery and treatment operations	R & D codes	Used as described in Directive 2006/12/EC

Determination of waste generation by (sample) survey

Table 23: Estimation of waste generation in the economy on the basis of a sample survey (table 4 QRt)

Description of the sample survey		Item 1 (NACE A)				Item 2 (NACE B)				…	Item 18 (NACE 46.77)				Total
		1	2	..	n	1	2	..	n	…	1	2	..	n	
1	Number of statistical units per stratum and item in accordance with the available register(s)									… … …					
2	Number of statistical units selected for a sample survey and questionnaires sent out														
3	Number of non-responses (no replies provided; replies are unusable; units are not identifiable)														
4	Part of 3: Quantity of data registered incorrectly (statistical units which do not exist, statistical units which cannot be identified)														
5	Number of units (statistical units) used to calculate totals														
6	Factor for weighting														

Table 23 gives details of the sample survey carried out to determine waste generation by economic activities. This table should be used if kind-of-activity units (KAUs) are selected as the sampling unit. If local units (LUs) or enterprises are selected, then the table must be adapted accordingly. The Waste Statistics Regulation requires either the kind-of-activity unit, or the local unit to be used as the statistical unit; as indicated in Chapter 2, the kind-of-activity unit is considered preferable (see Section 2.2.2).

The numbers 1 to n (in the second row) refer to the strata selected. Strata can be created by differentiating between employment classes (size of enterprises) and/or economic activities (further breakdown of NACE grouping). The stratification selected, which can include several steps, should be shown/explained in the table.

The columns in the table must be adjusted in accordance with the stratification selected and the scope of the sample survey, e.g. the sample survey can be restricted to manufacturing industry or to selected economic activities or can encompass the whole economy.

The table should indicate the register from which the sample is taken and the sample survey itself. The number of statistical units available in the register per stratum (row 1) and the number of statistical units selected (row 2) should be indicated first. Rows 3 and 4 refer to non-responses. In such cases, a

further differentiation could be made between initial non-responses (3a) and final non-responses (3 b) to illustrate action taken to 'resolve' non-responses. This differentiation is optional. Row 5 should give the number of statistical units per stratum. These statistical units should be used to calculate totals (row 6).

Example 5: Slovenia (QR 2004), Estimation of waste generation in the economy on the basis of a sample survey

Country: **Slovenia** Reference year: **2004**		Strata	Number of LUs per strata and item according to the available register(s)	Number of LUs selected for sample survey and questionnaires sent out	Number of non-responses (No answers, non-usable answers; non identifiable units)	Part of 3: Number of incorrect register data (Non existing LUs, non identifiable LUs)	Number of units (LUs) used for the calculation of the totals	Factor for summing up (weight)
Item 1	NACE F	1	1312	142	98		44	29,818182
		2	851	230	129	3	98	8,4257426
		3	135	37	15		22	6,1363636
		4	22	22	2		20	1,1
Item 2	NACE G	1	160	17	6		11	14,545455
		2	137	37	6		31	4,4193548
		3	24	7			7	3,4285714
		4	4	4			4	1
		5	894	97	42		55	16,254545
		6	631	171	67		104	6,0673077
		7	74	20	3	1	16	4,3529412
		8	5	5			5	1
		9	591	64	33		31	19,064516
		10	311	84	33		51	6,0980392
		11	69	19	6		13	5,3076923
		12	19	19	4		15	1,2666667
Item 3	NACE H	1	752	81	40		41	18,341463
		2	364	99	45		54	6,7407407
		3	42	11	3		8	5,25
		4	9	9	2		7	1,2857143
Item 4	NACE I	1	487	53	38		15	32,466667
		2	215	58	38	2	18	10,75
		3	31	8	4		4	7,75
		4	7	7	1		6	1,1666667
		5	5	5	3		2	2,5
		6	3	3	2		1	3
		7	1	1			1	1
		8	5	5	1		4	1,25
		9	1	1	1			
		10	1	1			1	1
		11	108	12	7		5	21,6
		12	71	19	7		12	5,9166667
		13	20	7	3		4	5
		14	6	6			6	1
		15	17	7	3		4	4,25
		16	20	7	3		4	5

Determination of waste generation in the economy on the basis of information on waste treatment

Table 24: Estimation of waste generation in the economy on the basis of information on waste treatment (table 5 QRt)

		Description of the method					
1	Scope of indirect determination (waste types and economic sectors covered)						
2	Number of waste treatment facilities selected by items:	INC R1	INC D10	RECYC	BACK	DISPO I	DISPO II
3	Method(s) applied for differentiation by waste sources:						
4	Restrictions of the applied methods:						
4.1	Waste streams not covered:						
4.2	Problems of source attachment:						
4.3	Other problems:						

Table 24 shows the proportion of waste generation covered by indirect calculation on the basis of waste treatment and how the method is applied.

Row 1 indicates what proportion of waste generation is covered by information concerning waste treatment. This can be done by referring to selected parts of the economy or to selected waste streams. This should be consistent with Table 21.

Row 2 identifies the number of waste treatment facilities included in the calculation. The numbers are expected to be equal to the number of facilities in Table 32. Any differences should be explained.

Rows 3 to 4.3 provide a more detailed description of the methods applied. Does the original data set contain quantities of waste classified by the List of Waste, by the European Waste Classification for Statistics (EWC-Stat) or by a national classification? On what basis is waste which has been treated transformed into waste which has been generated? How are non-specific wastes distributed across sources and how are imported wastes excluded?

If the method is applied only to waste generated by households, this table can be ignored and Table 26 should be used. The differentiation between waste generated by household and waste generated by businesses is covered in Table 26; it does not need to be included in this table.

Example 6: Finland (QR 2004), Estimation of waste generation in the economy on the basis of information on waste treatment

	Description of the method					
1. Scope of indirect determination	G-Q Services and (HH) Households; in other branches of industry only in the context of small specific waste items					
2. Number of waste treatment facilities selected by items:	INC R1	INC D10	RECOV	DISPO II	DISPO I	Total
	94	26	324	336	13	793
3. Differentiation by waste type at waste treatment facilities	The classification follows the List of Waste.					
4. Differentiation by waste sources	Differentiation between services and households is made with the calculation model, which is based on shares obtained from a survey of the YTV Metropolitan Area Council and material flow accounts calculated by the Thule Institute.					
5. Additional methods applied for differentiation by waste type and source						

Description of the estimation of waste generation in the economy on the basis of administrative sources

Obviously there is a big variety of possible administrative sources. An administrative data source is established by an institution which is **regularly** collecting and preparing information from enterprises or institutions.

Data sets may stem from

- public institutions (e.g. EPA);
- associations / organisations established by the public sector to organise/handle specific parts of waste management;
- others, such as reporting obligations under Community legislation;

Important points to be considered when describing the data quality:

- continuity of the source;
- validity of information;
- possibility to influence so that the administrative data can be better applied for waste statistics.

Determination of waste generation in the economy on the basis of other methods

Table 25: Estimation of waste generation in the economy on the basis of models or other methods (table 6 QRt)

Description of the models		
1	Scope of the model (waste types and economic sectors covered)	
2	Basic data for the estimations (production figures etc.)	
3	Description of the model and the factors applied	
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	
Description of other information sources		
5	Scope for the OTHER information sources (waste types and economic sectors covered)	
6	Description of the other information source which is not fitting to the type of information sources mentioned above	

Table 25 is similar to Table 24 in that it shows the proportion of waste generation covered by other methods and how these methods are applied. Within this table, a distinction is made between methods based on modelling and other methods. Member States which apply other methods should consider what relevant information to include in the table.

The information provided in rows 1 and 5 should also be reflected in Table 21.

If these other methods are used only for waste generated by households, this table can be ignored and Table 26 should be completed. The differentiation between waste generated by households and waste generated by businesses is covered in Table 26; it does not need to be included in this table.

Example 7: France (QR 2004), Estimation of waste generation by models and other methods

Country: France		
Reference year 2004		
Table V: Waste generation estimated applying other methods		
	MODEL	
1	Scope for the estimation	Section F
2	Data applied for the estimations	Surveys, data available from business statistics and utilisation of technical coefficients
3	Methods applied	Four sub-sections were chosen and several methodologies were combined: surveys, data available from business statistics and application of technical coefficients. The data available from business statistics are up-dated annually.
4	Routines applied or foreseen to guarantee sufficient quality	Survey envisaged in certain sub-sectors aiming at revising the technical coefficient. The data available from business statistics are up-dated annually.
	OTHERS	
5	Scope for the OTHER information sources	Section E: Data collected directly from businesses (electricity and gas) covering largely the section – section 51.57: data from the business statistics' files allowing the estimation of waste generation.
6	Description of other information sources not described above	Section 37: The recycling balance of l'Ademe (French Environment and Energy Management Agency) derived from the data collected from the sources or surveys of the Recovery and Recycling Associations (FEDEREC).

Example 8: United Kingdom (QR 2004), Estimation of waste generation by models and other methods

Country: UK		
Reference year: 2004		
	MODEL	
1	Scope for the estimation (certain waste types or NACE sections)	• Agriculture NACE A — see Wales/UK quality report for details • Fishing NACE B — see Scotland/UK quality report for details • Mining and Quarrying NACE C — see below
2	Basic data for the estimations (production figures, etc.)	• Production figures
3	Factors and models applied (factor list or address: description of the model)	• Agriculture — see Wales/UK quality report for details • Fishing — see Scotland/UK quality report for details • Mining and Quarrying — see below
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification, etc.)	• Agriculture — will be reviewed as part of the process to extend UK waste controls to this sector • Mining and Quarrying — will be reviewed during transposition/implementation of Mining Waste directive (see below)
	OTHER	
5	Scope for the OTHER information source (certain waste types or NACE sections)	Construction NACE F — estimates for non-aggregate material generated by the industry
6	Description of the other information source which is not fitting to the type of information sources mentioned above	See below

Determination of waste generated by households

Table 26: Determination methods for waste generated by households (table 7 QRt)

1	Indirect determination via waste collection	
1.1	Description of reporting unit applied (waste collectors, municipalities)	
1.2	Description of the reporting system (regular survey on waste collectors, utilisation of administrative sources)	
1.3	Waste types covered	
1.4	Survey characteristics (1.4a — 1.4d)	
	a) Total no. of collectors /municipalities (population size)	
	b) No of collectors/municipalities selected for survey	
	c) No of responses used for the calculation of the totals	
	d) Factor for weighting	
1.5	Method applied for the differentiation between the sources household and commercial activities	
1.6	Percentages of waste from commercial activities by waste types	
2	Indirect determination via waste treatment	
2.1	Specification of waste treatment facilities selected	
2.2	Waste types covered	
2.3	Method applied for the differentiation between the sources household and commercial activities	
2.4	Percentages of waste from commercial activities by waste types	

Table 26 focuses on the methods applied in order to estimate the amount of waste generated by households. The various methods are identified in different parts of the table. An important distinction is made between waste generated by households, on the one hand, and waste generated by businesses, i.e. 'commercial contamination', on the other.

In row 2.1, the number of treatment facilities is expected to be in line with the corresponding figures in Table 32 on waste treatment installations.

Example 9: Hungary (QR 2004), Methods for estimating waste generated by households

Country: HUNGARY **Reference year: 2004**		
1	Population in thousands	10116
3	**Indirect determination via waste collection**	
3.1	Information source waste collection system (description of the area (municipalities) and waste fractions covered and included in the reporting system on waste collection)	Waste collectors supply data on municipal waste collected by WIS. They supply data on the amount of waste collected separately and by traditional waste collection.
3.2	Implementation of the reporting system (regular survey on waste collectors, utilisation of administrative sources (waste management plans), etc.)	Annually reporting obligation by WIS, full scale.
3.4 a	Method envisaged for the differentiation between the sources household and commercial activities	Waste collectors supply data on waste collected from households by settlement code and they supply data on waste generated in commercial activities by the environmental code of the institutions. This is how municipal waste collected from households and municipal waste collected from institutions and business can be determined separately. But in many cases collectors did not use the correct code in the report, so this method cannot be used for the reference year 2004. However, for the next reference year, the use of codes improved and determination of pure household waste from WIS is possible.
3.4 b	Method applied for the differentiation between the sources household and commercial activities	Estimation was based on the data set coming from WIS, but according to the historical time series data validation was necessary.

Data sets 2 and 3: treatment of waste

General description of methodology

The methodological description builds the basis for the assessment of the quality attributes in Part II of the report. The description should therefore be comprehensive, clear and consistent.

For waste treatment three questions have to be answered:

- How are the relevant facilities identified?
- How are the data on treated quantities collected?
- How are the data on number and capacity of treatment facilities collected?

Identification of relevant treatment facilities

Information is usually drawn from one or more administrative or statistical registers. The QR should list all registers that are used and for each of the registers the QR should specify:

- type of register and responsible institution;
- legal basis;
- coverage of register;
- frequency and procedure of updating the register.

The QR should also describe the selection procedure.

Table 27: Registers used for identification of treatment operations (table 8 QRt)

Identification of register(s) used (name; responsible institution)	Description of register(s) (coverage; frequency and procedure of updating, etc.)

Table 27 gives details of the registers used to gather information on waste treatment. This table should include not only the registers from which information is taken directly but also the registers which are used to draw up a list of addresses for a survey.

Problems relating to the completeness of various sources and their integration should be explained. Are there major incentives for under-registration or over-registration? Are all activities and size-classes included? Where several registers are used, how are overlaps avoided?

Data collection on treated quantities

Table 28: Determination of treated waste quantities (table 9 QRt)

Description of data sources and methods by treatment categories					
Item 1 Incinera-tion (R1)	Item 2 Incinera-tion (D10)	Item 3a Recycling (R2 — R11)	Item 3 b Backfilling	Item 4 Landfilling (D1, D5, D12) I	Item 5 Other disposal (D2, D3, D4, D6, D7)

Table 28 gives an overview of the methods and sources used to produce the data sets on waste treatment.

Example 10: Finland (QR 2004), Methods for estimating waste treatment

Country: FINLAND **Reference year: 2004**				
Item 1 Incineration (R1)	Item 2 Incineration (D10)	Item 3 Recovery (R2 — R11)	Item 4 Landfilling (D1, D5, D12) I	Item 5 Other disposal (D2, D3, D4, D6, D7)
The VAHTI Compliance Monitoring Data System: - annually, by NACE and LoW	The VAHTI Compliance Monitoring Data System: - annually, by NACE and LoW	The VAHTI Compliance Monitoring Data System: - annually, by NACE and LoW	The VAHTI Compliance Monitoring Data System: - annually, by NACE and LoW	The VAHTI Compliance Monitoring Data System: - annually, by NACE and LoW
		Vehicle Administration Centre's (AKE) Motor Vehicle Register: - annually, by type of cars	The Mining and Quarrying register of the Ministry of Trade and Industry: - annually, by type of mining and mineral	
		The Mining and Quarrying register of the Ministry of Trade and Industry: - annually, by type of mining and mineral	YTV Metropolitan Area Council's Survey	
		YTV Metropolitan Area Council's Survey	VTT Technical Research Centre of Finland: - at intervals by construction material	
		VTT Technical Research Centre of Finland: - at intervals by construction material	Population Register Centre's Building and Dwelling Register	

4.2.2 Part II: Report on quality attributes

This section provides a number of tables to help to describe the quality attributes:

- Table 29 and Table 30 describe the missing data;
- Table 31 describes the total and the coefficients of variation for the key aggregates;
- Table 32 describes the coverage of waste treatment facilities and the criteria used for their exclusion;
- Table 33 helps in describing the followed time schedule of the whole process;
- Table 34 helps to report on the burden on respondents.

This section is structured on the quality attributes: relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability, consistency and burden on respondents.

Relevance

A summary, including a description of primary users and of political requirements with regard to waste statistics at the national level, should be provided.

Member States should indicate the degree of completeness of the data sets. They should identify the variables and/or breakdowns required by the Regulation on Waste Statistics which are not available (e.g. the cell value is shown as 'M' in the transmitted data set). For cases not covered by a derogation an explanation is required. In the case of cells indicated as missing, steps must also be taken to rectify the deficiency. Table 29 and Table 30 could be used for this purpose.

Table 29: Description of missing data in data set 1 on waste generation (table 10 QRt)

Description of missing data (waste category, economic activity, etc.)	Explanation	How to overcome the deficit

Table 30: Description of missing data in data sets 2 and 3 on treated waste quantities and capacities (table 11 QRt)

Description of missing data (waste category, treatment category, region, etc.)	Explanation	How to overcome the deficit

Accuracy

Sampling errors

Reference should be made to Part I for a delineation of the relevant survey area. Information should be provided for the following aspects:

- Sample frame applied;
- Sampling scheme applied;
- Stratification (e.g. specify whether by size-class, NACE group, etc.);
- Sample volumes: specify the number of enterprises in a population and the number in the survey (per stratum if relevant);
- Coefficient of variation for the total amount of waste generated and the breakdown into four key aggregates. The denominator of the coefficient is the total amount of waste generated in the relevant aggregate; this includes the strata not estimated using sampling methods. In order to estimate the variation, the level of non-response should be taken into account;
- Coefficient of variation for the total amount of waste treated and the breakdown into eight key aggregates. The denominator of the coefficient is the total amount of waste treated in the relevant aggregate, including the strata not estimated using sampling methods. In order to estimate the variation, the level of non-response should be taken into account.

Table 31: Total and coefficients of variation for the key aggregates (table 12 QRt)

Country: _____ Reference year: _____ Key aggregate	Hazardous waste [1000 tonnes]	Non-hazardous waste [1000 tonnes]	Coefficient of variation: hazardous waste [%]	Coefficient of variation: non-hazardous waste [%]
Waste generation				
Waste generated by households:				
Waste generated by businesses:				
Waste treatment				
Waste used as fuel (incineration in the form of recovery R1):				
Waste incinerated (incineration in the form of disposal D10):				
Waste recovered (R2 — R11):				
Waste disposed of (landfilling (D1, D5, D12) and other disposal operations (D2, D3, D4, D6, D7)):				

In the quality report, information on the coefficient of variation is required for each key aggregate. The coefficient is defined as the standard error of the estimated amount of waste divided by the total amount of waste in the key aggregate. To facilitate comparison between countries, the amount of waste in the denominator should include not only waste amounts estimated using sample surveys but also waste amounts derived from administrative sources. The coefficient should be given as a percentage with one decimal position.

Two examples for the key aggregate ‘hazardous waste generated by businesses’:

1. A sample survey is used for the entire area covered by the key aggregate. The estimated amount of hazardous waste is 300 ktonnes with a standard error of 30 ktonnes. The coefficient of variation for the key aggregate is 30/300 * 100 % = 10.0 %.

2. Part of the key aggregate is estimated by means of a sample survey (manufacturing industry) and part of it is counted from administrative sources (other industries). The amount of hazardous waste generated by the manufacturing industry is estimated to be 200 ktonnes on the basis of a sample survey with a standard error of 20 ktonnes. The amount of hazardous waste generated by other industries is counted from administrative sources; it totals 100 ktonnes. For the sample area, the coefficient of variation would be 20/200*100 % = 10.0 %. For the key aggregate as a whole, however, the coefficient would be 20/300*100 % = 6.7 %. We would ask you to report on the key aggregate as a whole.

If the key aggregate is derived entirely from administrative sources, the coefficient of variation equals zero (0).

Modelling can sometimes be used to calculate standard errors; these standard errors should be taken into account when calculating the coefficient of variation.

When calculating the standard error, the total design of the data collection must be taken into account: allocation, stratification and application of various estimation techniques. The quality report only requires the summary of this in the coefficient of variation for the key aggregate. Please retain more detailed calculations for clarification or future reference.

In many statistical textbooks, you will find that the coefficient of variation is defined for the sample mean only: the standard error of the sample mean divided by the sample mean. For the sample area, this produces exactly the same result as directly calculating the coefficient of the total amount of waste. If the total population of manufacturing enterprises in our example were 100, then the average amount of hazardous waste per enterprise would be 2 ktonnes and the standard error 0.2 ktonnes, giving a coefficient of variation of 10.0 %. It is a matter of multiplying both numerator and denominator by the same factor, leading to the same result. The results are different if part of the key aggregate is not estimated through a sample survey. The coefficient of variation of the mean would depend on the total number of businesses in the non-sampling part. So please take care to use the correct formula.

Totals for waste generation (and for treatment) should be calculated by using dry figures for sludge items (sludge items for waste generation are numbers 11, 12 and 40). This should apply not only to the calculation of the coefficient of variation, but also to the calculation of the total waste generated or treated.

Example 11: Sweden (QR 2004), Total and coefficients of variation for the key aggregates

Country: Sweden **Reference year: 2004**		Total hazardous waste (key aggregate) (1000 tonnes)	Total non-hazardous waste (key aggregate) (1000 tonnes)	Coefficient of variation hazardous waste (%)	Coefficient of variation non-hazardous waste (%)
Generation of waste					
1	Households	372.617	4 458.730	10	15
2	Enterprises	981.127	113 482.302	6	4
Recovery and disposal of waste					
1	Incineration: used principally as a fuel or other means to generate energy R1	310.802	10 771.750	14	13
2	Incineration: incineration on land D10	71.120	0.742	1	8
3	Recovery (excluding energy recovery) R2-R11	291.560	17 544.391	13	13
4	Disposal operations: Landfilling D1, D3, D4, D5, D12. Land treatment and release to water D2, D6, D7	494.124	66 412.751	2	2

Non-sampling errors

Coverage errors

- For Annex I on waste generation: description of the method(s) applied to reach 100 % coverage;
- For Annex II on waste treatment: description of the waste treatment facilities which are excluded from reporting and the reason for their exclusion;
- Description of how the amount of commercial waste from enterprises/shops included in household waste is assessed; what method is used to estimate pure household waste;
- Description of the main problems of misclassification, under-coverage and over-coverage encountered in collecting the data.

Table 32: *Coverage of waste treatment facilities and criteria for exclusion (table 13 QRt)*

	No of facilities included	No of facilities excluded	Reasons for exclusion of facilities and other comments
Item 1 Incineration (R1)			
Item 2 Incineration (D10)			
Item 3a Recycling (R2-R11)*			
Item 3 b Backfilling			
Item 4 Disposal I (D1, D5, D12)			
Item 5 Disposal II (D2, D3, D4, D6, D7)			

Table 32 identifies the number of waste treatment installations which are included in or excluded from the compilation of data. There can be several reasons for excluding waste treatment operations: because they treat only internal waste, because they are pre-treatment facilities or because the capacity is below a nationally defined threshold, etc. The Member States should always give the reason for the installations being excluded. Where possible, information should be provided on the number of installations excluded; this information will be useful for further harmonisation.

Example 12: United Kingdom (QR 2004), Coverage of waste treatment facilities

Country: UK **Reference year: 2004**	Item 1: Incineration (R1)	Item 2: Incineration (D10)	Item 3: Recovery (R2-R11)	Item 4: Disposal I (D1, D3, D4, D5, D12)	Item 5: Disposal II (D2, D6, D7)
Installations included	617	1277	15 230	908	-
Installations excluded; reason for exclusion	(A description of the installations excluded and the reasons for exclusion were provided by the UK in text form in the Quality Report)				-

Measurement errors

- Which statistical units are applied in which part of the data set? What is the outcome of the assessment of potential errors in the application of statistical units?
- Errors in precision of quantities: the manner in which weighing and subsequent recording is carried out and the validation procedures applied to detect weighing errors should be described. What is the outcome of the error detection procedures in place?
- A description of the information quality of the data collection instrument should be given. For instance, in the case of sample surveys with a questionnaire: was the questionnaire validated in a focus group? For administrative data: are there incentives in the reporting unit or in the administration itself for over-reporting, under-reporting or lags?

Processing errors

- Summary of the processing steps between collection and production of statistics, including measures to detect and rectify processing errors;
- Listing of processing errors identified, their extent and impact;
- Coding errors in the coding of waste category, NACE-category, type of treatment operation and region. A description should be given of how the coding is carried out and what validation procedures are applied to detect coding errors. What is the outcome of the error detection procedures in place?
- Percentage of the category 'waste generated by households' which actually originates from businesses. How is this misclassification assessed?

Non-response errors

- Response rate at the level of the key aggregates;
- Description of the handling of non-responses (unit and item non-responses) in surveys;
- Determination of expectancy of errors resulting from non-responses.

Model assumption errors

- Description of models, assumptions connected with the model application and expected errors and how to cope with them;
- Results of sensitivity analysis;
- Sources used (refer to description of sources in Part I).

Timeliness and punctuality

- Description of the key data collection steps in the process of establishing the data sets in a timetable;
- Description of the key data processing steps (e.g. starting and finishing dates for completeness, coding and plausibility checks, data validation and non-disclosure measures) in a timetable;
- Description of the key publication steps in a timetable (e.g. when are the advanced and detailed results calculated, validated and disseminated).

Punctuality of data transmission to Eurostat will be evaluated according to the Regulation on Waste Statistics, which specifies the periodicity and deadlines for data transmission. An explanation should be given for any delay. In addition, the report should state what measures have been taken to avoid delays in future.

Table 33: Time schedule of the whole process (example)

Country: _____ Reference year: _____	Time period (from month/year to month/year)
Development of sampling strategy:	
Development and testing of questionnaires:	
Selection of enterprises and sending out of questionnaires:	
Data processing (editing and imputation):	
Data analysis and validation:	
Key publication activities:	

This is merely an example of a rough description of the time schedule for the entire process (a simple sample survey). The actual processes in the Member States will generally be much more complex, as they will combine and involve several methods. The actual process should be described in a limited number of steps (no more than 10). This table will be useful for identifying ways in which the timeliness of waste data can be improved. It will also help to improve planning at European level.

Example 13: Austria (QR 2004), Key steps in the compilation of the statistics on the generation of waste and on waste treatment

Key steps in the compilation of the statistics on the generation of waste (Annex I)														
	2005							2006						
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Development of the methodology for the analysis of the generated waste quantities (Hazardous waste)														
Data query from the database, preprocessing of the data and preparing the mass-balances (Hazardous waste)														
Development of the methodology for the compilation of waste statistics														
Development of the conversion key for the waste classifications (ONORM $2100 → EWC-Stat)														
Allocation of the waste owners to the NACE categories (Hazardous waste)														
Compilation of the data set 1 on waste generation by waste category (EWC-Stat) and economic activities (NACE)														
Data quality checks by means of the time series. Corrections														
Description of the methodology and quality attributes for the Quality Report														
Evaluation of the results by experts														
Transmission of the data														

Key steps in the compilation of the statistics on waste treatment (Annex II)														
	2005							2006						
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Development of the conversion key for the waste classifications (ONORM $2100 → EWC-Stat)														
Identifying the active recovery and disposal facilities in Austria covered by Annex II														
Checking the completeness of the data on R & D codes of the facilities. Allocation of the facilities, for which the data on R & D codes was missing to R & D operations														
Excluding all preparatory treatment operations not listed in Annex II														
Compilation of the data set 5 on the number and capacity of recovery and disposal operations and population served by collection scheme per NUTS 2 region														
Using the data of the Federal Waste Management Plan 2008 and additional information from the owners of treatment facilities for the calculation of the treated waste quantities														
Compilation of the data sets 2, 3 and 4 on recovery, incineration and disposal by waste category and NUTS 0 region														
Data quality checks and corrections														
Description of the methodology and quality attributes for the Quality Report														
Evaluation of the results by experts														
Transmission of the data														

Accessibility and clarity

The national reporting organisation (identified in Part I of the quality report) should describe:

- the policy on dissemination of waste statistics;
- the measures and tools to establish/improve clarity;
- the relevant confidentiality policy.

Comparability

- In order to assess the comparability between national data generated using different methodologies, it is necessary for the impact of restrictions with regard to coverage and precision of the data to be clarified (based on elements of accuracy above).
- How is the regional comparability of data on waste treatment facilities validated? What statistical unit is used? How are mobile waste treatment facilities handled?
- Comparability over time: both changes relative to the previous reference period and anticipated changes in the next reference period should be reported. Details of changes in definitions, coverage or methods should be specified (refer to Part I). An evaluation of the consequences should be carried out.

Coherence

Environment statistics:

- The coherence of national dissemination with the data reported under the Regulation on Waste Statistics.

There is no need to report on coherence with:

- OECD/Eurostat Joint questionnaire.

- Specific waste reporting obligations (end-of-life vehicles, waste from electrical and electronic equipment, packaging and packaging waste, waste shipment, etc.).
- Integrated pollution prevention and control (IPPC) reporting.
- Reporting to the European Environmental Agency.

The Commission (Eurostat) will deal with this directly.

Socio-economic statistics:

Member States are invited to comment on coherence with:

- Trade Statistics,
- Environment-Economic Accounting including National Accounts,
- Production of structural indicators.

The comments on these items could include the identification of differences in the application of statistical units and classifications.

Burden on respondents

An evaluation should be made of the burden on respondents in physical terms (time required for response) and of the actual number of respondents. For administrative sources, the burden on respondents resulting from additional questions for statistical purposes should be evaluated. The following table may be used for this purpose.

Table 34: Burden on respondents (table 14 QRt)

Survey / Source	Type and total number of respondents	Actual no. of respondents	Time required for response	Measures taken to minimise the burden

Example 14: Czech Republic (QR 2004), Burden on respondents

Country: Czech Republic **Reference year: 2004**	Waste generation and treatment in economy	Waste generation by households
Type of respondent	Enterprises by economic activity and by number of employees	Municipalities by number of inhabitants
Time required for response	Within 45 minutes	Within 45 minutes
Actual number of respondents	18 106	981
Instruments used for minimisation of response burden	Units with 20+ employees used for sample design	Rotation scheme used for sample design

CHAPTER 5: Transmission of data

From a technical point of view, data transmission involves using a tool to send data to Eurostat and define the format of the data file. In order to ensure that data can be exchanged as effectively as possible within the statistical system, it is important that the proper file names and file structure are applied. Section 5.1 briefly describes eDAMIS, Eurostat's set of data transmission tools to be used by all data providers. Section 5.2 gives an overview of SDMX and its purpose. Section 5.3 describes the file naming convention, and finally section 5.4 explains details on how to compile the data to be reported.

A detailed file specification for the data transmission format is not provided in this manual. The reason is that — although formats and standards are always expected to remain stable for a certain period — details of this transmission format may change from one data collection to the next. Even a minor change of a code for technical reasons would make this manual obsolete. Therefore, the less durable information on record formats, code lists, etc., will be specified in a document that can be updated more easily, and which Eurostat will make available to the data suppliers for each data collection.

5.1 The standard transmission tool (eDAMIS)

The standard transmission tool should be used to transmit not only the data but also the quality report. The standard transmission tool currently used within the European Statistical System is eDAMIS (electronic Dataflow Administration and Management Information System). It has been developed as a 'single entry point' which ensures that files can be transmitted securely and which creates a log file to document all files which have been delivered. The system confirms to the sender that the files have been delivered properly (acknowledgement). For data files which adhere to naming conventions, a formal check can be carried out automatically:

- on the file structure;
- on correct items in the classification;
- on correct values for the data variables;
- on the appropriate metadata flags.

Rapid feedback can thus be obtained on possible errors in the data files.

This immediate check is only the first step in the Eurostat validation procedure. This first step cannot be used to compare information over time, across countries or across different data files for the same year or for the same country. The first check is carried out only at the level of the records; it cannot be used to calculate aggregates, to compare data with other records or to count the total number of records. Eurostat performs these checks at a later stage of the production process. The immediate check is nevertheless important as it ensures that major errors are identified straight away.

An additional advantage of the system is that it operates independently of individuals (changes in tasks, holidays or illness) both at the statistical offices and at Eurostat.

Almost all national statistical offices have installed the eDAMIS tools, but ministries and environmental protection agencies also play a role in waste statistics. These organisations have three options:

- *At their institution:* using a local installation of the 'eDAMIS web application' (eWA). eWA is a web server that takes care of the file transmissions between the data provider and Eurostat.

- *Via the national statistical office:* transmitting the files to the NSI who will send them to Eurostat via eDAMIS.
- *Directly at Eurostat:* using the eDAMIS web portal. This is a web server running at Eurostat for the direct reception of files from data providers.

Detailed guidance on how to use eDAMIS is available at the 'eDAMIS help centre':

https://circabc.europa.eu/w/browse/4f9d865b-3d6b-4afc-9e29-7ee1acde73ba

5.2 The transmission format and SDMX

5.2.1 What is SDMX?

For the data collection on waste statistics, as for any other data collection, a common standard for the transmission of the data is necessary to make the data flow from the national providers to Eurostat as efficient as possible.

This standard concerns firstly the file format in which data are submitted. Several formats have been used for data transmission to Eurostat in the past, for instance Excel files, text files with comma separated values (CSV), or other specific text files (like GESMES).

Secondly, a common standard should exist for the way in which data are structured and described *within* such a file. In order to speak the same language at technical level, common codes, an agreed order of items in the file, separators, etc. should be used. This is usually referred to as the 'transmission format'.

For both aspects of the data transmission, Eurostat, the ECB, the OECD, the United Nations and other international bodies have established the common standard SDMX (Statistical Data and Metadata Exchange). Technical information on this standard is available on the website of the SDMX initiative (http://sdmx.org); however, detailed knowledge of this complex technology is not necessary to transmit waste statistics to Eurostat.

The file format used for SDMX-based data transmission can be either XML (extensible markup language) or GESMES. The latter is used only for specific purposes and is not relevant for waste statistics; XML is the format to be used. XML files whose contents follow the SDMX conventions are referred to as 'SDMX-ML' files. The advantage of the XML file format is that it is an open standard. In contrast, for instance, the Excel file format is proprietary, i.e. it can be processed correctly only by Microsoft Excel (and only less accurately by some other software products) because the specification of the file format is not available to the general public. XML files can be produced and processed by a variety of software products because in principle there are no secrets about their format. This makes it very easy to exchange data even though the senders and receivers may use very different IT tools.

So what makes an XML file an SDMX-ML file? Here, the second aspect of standardisation comes in, i.e. the conventions on how to present data within a file. SDMX provides rules on how to structure an XML file that contains statistical data: the numeric values, flags, the classifications or codes, but also metadata, for instance, on the sender, the receiver and the time of transmission. The descriptions of specific SDMX files, e.g. for waste statistics, are stored in separate files called Data Structure Definition (DSD). In order to create and interpret an SDMX-ML file for waste statistics, the respective program needs the DSD telling it how the data is structured, which codes are allowed, etc. The DSD for waste statistics is provided by Eurostat for the Member States.

In summary, the advantage of SDMX is that an SDMX file along with its DSD makes it possible to transfer any statistical data between institutions regardless of different IT environments and without the need to refer to any additional metadata. All the data and the metadata describing the data are provided in an SDMX file and its DSD.

Why not just use CSV (comma separated values)?

CSV has been a popular file format for data transmission in the past. It is attractive because it is quite easy to generate, following a simple structure like 'key;key;key;…;value;flag', and therefore equally easy to read by a user. However, SDMX should be preferred to CSV for several reasons:

- SDMX files are self-explanatory. Every data item is described explicitly by its meta-data directly embedding it, for instance the value 'FR' in this case:

  ```
  <generic:Value concept='REPORTING_COUNTRY' value='FR'/>
  ```

- SDMX files are easy to validate and to interpret as the rules defining them are stored in the DSD. In contrast, a CSV file may be designed by rules that are not obvious to the reader or the program reading it.

- SDMX files contain additional metadata for instance on the sender, the recipient, the date and time of file creation, the target dataset, the encoding ('ISO-8859-1', 'UTF-8', etc.), and whether the data are possibly updates of already existing data.

The drawback of SDMX is that it is more difficult to generate SDMX-ML files than CSV files. This problem is addressed in the next section.

5.2.2 How to provide data to Eurostat according to the SDMX standard

There are various ways to generate the SDMX compliant data sets for waste statistics.

1. Using a data entry tool provided by Eurostat

For the first data collections on waste statistics, Eurostat provided an Excel-based data entry tool to Member States, which generated the SDMX-ML files from the data that the user entered into the Excel spreadsheets. This has proven to be a feasible solution; however it requires a lot of development and maintenance and relies on the use of Excel as the same software in all institutions providing the data.

Another option to be investigated is the use of eDAMIS web forms, where the data can be entered into a spreadsheet-like form that is displayed in a web browser using Java. This still requires the use of specific software (Java Runtime Environment) on the computer where the data is entered, but the software is platform independent and available free of charge. The advantage of eDAMIS web forms is that the data arrive at Eurostat immediately after their entry into the form; it is no longer necessary to send a file to Eurostat manually. The SDMX-ML file is generated automatically when saving the web form. Another advantage is the reduced maintenance and distribution effort for Eurostat.

2. Generating the SDMX-ML files from a national database

It may be a good option for Member States to generate the results for the WStatR data collection automatically from the respective database used in the national institution providing the results. The advantage would be that data do not have to be entered manually into a form (Excel, web), but can be extracted by a program that queries the source database.

Various database products (e.g. Oracle and Microsoft SQL server) make it possible to store and process data in XML format, and thus to create SDMX-ML files according to their specification.

It may be an easier option, however, to extract the results in a traditional CSV (comma separated values) format rather than the more complex SDMX-ML format. Eurostat provides and supports a tool called 'SDMX Converter'. This tool makes it possible to generate a SDMX-ML file from a CSV source file. The user specifies the name of the source file and the location of the DSD to the program in an entry screen. Then SDMX converter will generate the SDMX-ML as an output, and the user can send it to Eurostat via eDAMIS. The open source software, which runs on Windows and Unix / Linux, can be downloaded at https://joinup.ec.europa.eu/software/sdmx-converter/description

5.3 File naming convention

The Regulation on Waste Statistics stipulates that three data sets must be transmitted for each reference year. The data must be transmitted in a system independent way and in accordance with a commonly agreed interchange standard.

The three data sets must be named as follows:

- Generation of waste = GENER.
- Treatment of waste = TREAT (this covers the formerly separate data sets on incineration, recovery and disposal).
- Number and capacity of recovery and disposal operations; coverage of waste collection scheme by NUTS 2 region = REGIO.

A file must be transmitted for each data set. The file name consists of six parts:

Domain	5	Value: WASTE
Set	5	GENER, TREAT, REGIO
Periodicity	2	Value: A2 for data sent every second year
Country code	2	Two-letter country code
Year	4	Reference year (e.g. 2010)
Period	4	Value: 0000 (zero, zero, zero, zero) for annual data

The naming convention is a general provision to be used in all statistical domains; it therefore does not contain any elements which are not relevant to current waste statistics (domain, periodicity and period).

The parts of the file name are separated by an underscore. A text-based format will be used.

Examples of file names:

WASTE_GENER_A2_BE_2004_0000	generation of waste from BELGIUM for 2004
WASTE_GENER_A2_CZ_2006_0000	generation of waste from the CZECH REPUBLIC for 2006
WASTE_TREAT_A2_DK_2008_0000	treatment of waste from DENMARK for 2008
WASTE_TREAT_A2_DE_2010_0000	treatment of waste from GERMANY for 2010
WASTE_REGIO_A2_ES_2010_0000	number and capacity of recovery and disposal operations; coverage of waste collection scheme by NUTS 2 region from SPAIN for 2010

5.4 Conventions for data reporting

This section outlines several conventions to be followed for the compilation of the three data sets, giving examples and explanations.

Wet or dry matter

As explained in chapter 2, amounts of waste must be reported as normal wet waste, with the exception of data on sludges, which must be reported as dry matter only.

Waste generation and waste treatment

The values are given in tonnes per year, expressed as an integer, i.e. without any decimal positions. If the estimation method does not allow this level of precision, the value should be given with significant digits only. In the case of small countries and hazardous waste with a high environmental risk, a high level of precision is required.

Number and capacity of recovery and disposal operations and population served by collection schemes per region

The data set on the number and capacity of recovery and disposal operations and on the population served by municipal waste collection schemes is broken down into NUTS 2 regions. The aggregate for the country as a whole is also required. If a country consists of only one NUTS 2 region, then only the results for the country total have to be transmitted.

The values in this set have different measures: the number of facilities, capacity measured in tonnes per year or cubic metres and the population served by waste collection. The number format for all these measures is also integers; for instance, the number of facilities is 25, 96 % of the population are served by a municipal waste collection scheme.

In the case of incineration facilities, the capacity has to be measured in tonnes.

Missing values and flags

Missing values

Records should be provided for each combination of the classifying variables (e.g. waste category, economic activity, NUTS 2 region, type of waste treatment facility), even if information is missing. Data processing within Eurostat requires complete data sets. There will be no missing values in the classifying variables. It is important to distinguish three types of missing values for the data values:

- All records in which the combination does not occur should be sent with a value set to 0 (zero); for instance, Luxembourg does not have a fishing industry, which means that no waste is generated by this sector in this country.
- All records for which data are not available should be provided with the value coded as missing (value ‘M’); in general, missing values will have to be explained in the quality report; they might, for instance, be the result of the methods used.

It is important to distinguish between real zeros and missing values, as aggregates cannot be calculated directly over missing data.

Revision flag

The revision flag is generally expected to be empty. The Waste Statistics Regulation does not make any provision for the submission of provisional data. However, it may be a useful provision if a country is unable to submit some of the data. Please note that flagging some of the data cells as provisional with flag P does not exempt the country from the obligations laid down in the Regulation; they must be followed by a revision. Furthermore, provisional data must always be accompanied by an explanation and an updating schedule.

If some of the data have to be revised, the country should always provide the complete data set containing the revised data but also the data that remain unchanged, as the production system in Eurostat will always check the completeness and coherence of data sets. Within the data set, all revised cells should be flagged with R. Revision does not necessarily mean that the data value has to change:

- due to rounding of the value;
- because a flag has changed (the provisional value is now accepted as final, a confidential value is now regarded as non-confidential).

Confidentiality flags

Confidential data should be transmitted to Eurostat properly flagged as confidential. What is regarded as confidential depends on the national confidentiality policy for statistical data. In general, data from public authorities are not regarded as confidential; also the secondary use of public information for statistical purposes will not be regarded as confidential. Confidentiality issues usually occur when the National Statistical Institute does a (sample) survey and the identity of respondents can be disclosed by the presentation of the data. This will happen, for instance, if the data cell is based on information from one or two respondents. Another example is when one or two respondents dominate the data value.

The countries should also indicate the cells which should be treated as confidential in order to avoid disclosure through derivation: secondary confidentiality. If the data cell identified by combination A, X were to be regarded as confidential, simply deleting this value from the table would still disclose the value, as it could be calculated from the row total, the column total and the general total. To guarantee confidentiality, more data cells must be suppressed in all dimensions defining the multidimensional table (e.g. NACE, EWC-Stat). There is no highly satisfactory way of doing this. A general strategy is to choose cells with low values and to avoid hiding any totals as this would require hiding more totals. In the example given, the following three cells could be an option: A, Y; B, X; B, Y. When choosing suppression partners to hide the confidential cell, please bear in mind:

- the environmental impact of the information;
- the availability of totals over sources or over waste streams.

Example 15: Secondary confidentiality

	A	B	C	Total
X	1	2	3	6
Y	4	5	6	15
Z	7	8	9	24
Total	12	15	18	45

Eurostat will use confidential data to calculate aggregates and indicators without disclosing the confidential data as supplied by the Member States.

The Member States are asked to give a brief description of their confidentiality policy in their quality report.

The CASC project, led by Statistics Netherlands, has developed a comprehensive website on statistical disclosure control: http://neon.vb.cbs.nl/casc/. The software T-Argus for the treatment of secondary confidentiality in tabular data and a 'Handbook on Statistical Disclosure Control' are available for download.

CHAPTER 6: Quality control and dissemination of results

This chapter deals with the control of data quality and the dissemination of data. Figure 10 presents the main steps that occur between data reception and dissemination by Eurostat.

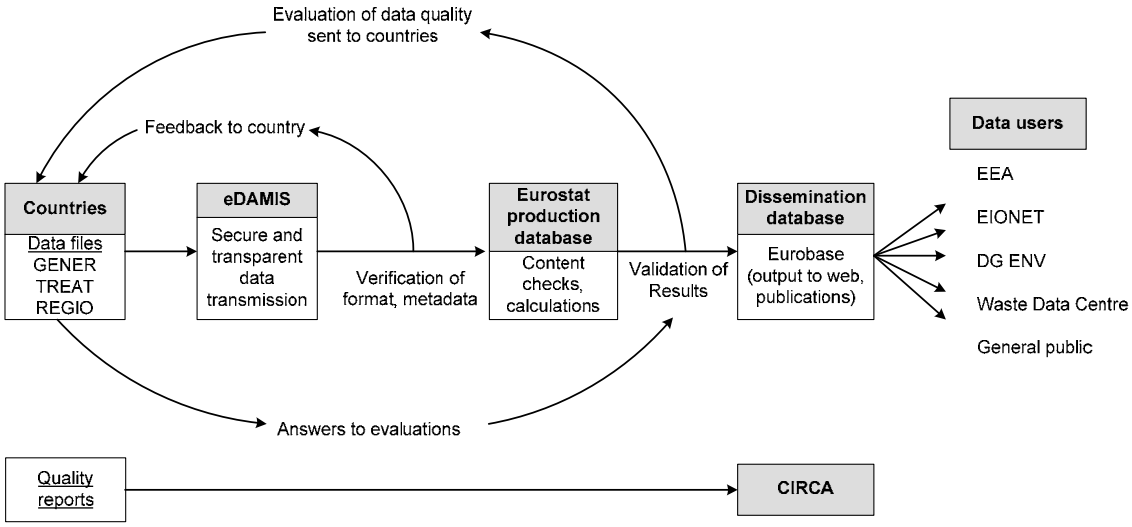

Figure 10: Schematic presentation of the structure of the chapter

The first part of this chapter explains how data are pre-processed, reformatted, uploaded in the production database, validated and exported to the dissemination database. The second part of this chapter deals with the dissemination of the results.

6.1 Quality control: data collection, validation and feedback

6.1.1 Arrival of the data and the Quality Report in the eDAMIS system

The standard transmission tool eDAMIS was described in Chapter 5 from a Member States point of view. It allows the secure transfer of data from Member States to Eurostat and allows the tracking of the delivery dates.

The Eurostat domain manager receives a notification of the data delivery by email. The file is automatically copied into a folder on a file server. If the sender has used the file name convention (see Chapter 5), then the eDAMIS system will recognise the file; only a version number will be added. If the file name is not in line with the naming convention, the eDAMIS system renames the file on the basis of information on the data set, the country of the sender and the indicated reference year.

```
EDAMIS/STADIUM IV – Advance Notification of Data Transfer (C)
-----------------------------------------------------

Data set: WASTE_GENER_A2
Collect date: 08/12/2012 09:00
Action: replacement
Period: 0/2010
Original file name: WASTE_GENER_A2_CY_2010_0001.xml
Data file destination: WASTE_GENER_A2_CY_2010_0000_V0002_R.XML
Forwarded file(s): WASTE_GENER_A2_CY_2010_0000_V0002_R.XML

User id: <id of national contact>
Full Name: <name of national contact>
Email: <email of national contact>
Phone: <telephone number of national contact>
Destination directory: <destination of the file>
```

Mistakes in the file name do occur, especially mixing up the reference year (the year the data refer to, which should be in the file name) and the year of data delivery. The Eurostat project manager does not have any tools to correct wrong file names and has to request the eDAMIS team to make the correction. As a result of a wrong year in the file name a wrong version number may be produced.

In the past, some countries have not sent the XML files, but the complete data entry tool in Excel. They usually sent only one data file containing all the tables or worksheets; the other data sets remained missing in the eDAMIS system. The Eurostat project manager does not have any tools to search and correct for files that do not seem to be delivered.

From the Eurostat perspective the main advantages of the eDAMIS system are that the delivery is independent of an individual mailbox and that the system can produce overviews monitoring the delivery of the data. All users, both the senders in the Member States and the Eurostat project managers, can monitor the file traffic. The user can monitor the file traffic by selecting ‘Reports’, ‘Traffic monitoring’, ‘Data file traffic’ in eDAMIS. The data set or domain, the country or group of countries and the period can be used as selection criteria.

6.1.2. Upload into the production database

Files should arrive in line with the transmission format. The data entry tool guarantees that the transmission format is respected.

Archive copies of the data files are kept on a file server at Eurostat before they are loaded into the production database. The loading procedure in the production database checks the files for valid entries and offers a brief overview of confidential cells, missing values and provisional or revised data.

Chapter 5 describes the way files should be named and how individual records and flags should be reported by countries. It is important to apply these rules as the software created to upload the data will reject records that are not in accordance with the classifications that are used. Each country submits three datasets that are classified into the respective tables in the production database: one on waste generation, the second on waste treatment and the third on the number and capacities of treatment facilities.

The upload procedure of the incoming files into the production database contains several checks (explained below). If the checks are not passed, error messages will be written to the logfile and the data file will not be processed further. On the basis of the error messages it will be decided to either:

1) contact the country involved to send a more coherent file;

2) correct the incoherence manually;

3) suppress the error message.

Option 1 is the only correct approach. Option 2 is chosen, for instance, for small amounts of sludges. Option 3 is chosen, for instance, where not all the waste is attributed to regions (the national total is higher than the sum of the regions). This should be documented in the Quality Report.

The spreadsheet on the uploading of data files documents the error message and the solution chosen.

The upload procedure performs four coherence checks.

Completeness of the data sets

A record for every possible valid combination of the key dimensions (e.g. treatment type, economic activity, hazardous/non-hazardous, etc.) is expected to be present in the data set. This first step therefore checks for the completeness of the data sets and reports an error when a record is missing.

Intra-record checks

These checks implement the constraints described in Chapter 5 on file structure and the valid data line. They act at four different levels. Further checks are on non-negativity of the value.

Consistency of the totals

Some records in the data set contain values which correspond to an aggregation of the values of other records in the same data set (e.g. total values of EWC-Stat codes or total hazardous and non-hazardous wastes). Those values are recalculated by the program and an

error message is reported if the recalculated aggregates are not the same as those reported in the data set. The totals are calculated over all reported values (missing values count as zero).

A small tolerance is accepted to allow for rounding differences. The default tolerance level can be raised manually to get a data set accepted.

6.1.3 Imputations; calculation of new aggregates

In order to compute aggregates, some missing values are to be imputed. As long as some country files are missing, the EU aggregates cannot be calculated. It is an option to impute a complete country file; this could be considered if the expected delay is considerable, the impact of the country on the EU total is fairly small and a good basis for the imputation is available. Such imputations have been performed on the basis of a previous year. The imputation method is to be discussed with the Member State. The imputations will not be published at country level; the EU aggregates containing imputed country values will be flagged as Eurostat estimated (s).

For the reporting on 2004 some countries had derogations for waste produced by NACE rev 1.1 sections A and B (agriculture and fishery) and/or the aggregate of NACE sections G to Q (services). To make the information more comparable between countries and over time it was decided to impute the missing 2004 values with the reported 2006 values. The imputed cells are flagged as Eurostat estimates (s).

The countries were supposed to report sludges both in wet and in dry value. In the original 2004 data more than half of the countries reported only the dry or the wet value. On the basis of the countries that did report both values a conversion factor was established. This conversion factor was made available to the countries for future use. Eurostat used conversion factors to impute the missing values in the 2004 and the 2006 data. As the procedure was agreed with the working group, the imputed values are flagged as country estimates (e). The confidentiality flag is copied from the donor cell; if the donor cell is confidential, then the imputed cell is confidential as well. Please note that, as a result of the imputation of an individual cell, the derived totals will also have to be updated. From reference year 2008 onwards, sludges are reported in dry matter only.

The following EU-aggregates were calculated for the 2004 and 2006 data: EU27, EU25, EU15, EA13 and EA15 (where EA is Euro Area). It has been decided to limit the aggregates to EU27, EU25 and EU15 in the next revision of the program.

For better presentation in the main tables some new aggregates are calculated (see table 35). Also totals are calculated over hazardous and non-hazardous waste in all categories; missing hazardous or non-hazardous categories count as zero value.

Table 35: Computed aggregated values for economic activities (NACE) and waste codes (European Waste Classification for statistical purposes EWC-Stat)

Aggregated activities NACE rev 2	
TOTAL_HH	All NACE activities plus households
TOTAL	All NACE activities — Total
Aggregated waste categories EWC-Stat	
W01-05	Chemical and medical wastes
W06_07A	Recyclable wastes
W06	Metallic wastes

W077_08	Equipment
W09	Animal and vegetal wastes
W10	Mixed ordinary wastes
W12-13	Mineral and solidified wastes
W12A	Mineral wastes (except combustion wastes, contaminated soils and dredging spoils
W126_127	Soils and dredging spoils
CHEM_A	Chemical wastes, liquids and sludges
NMIN	Non-mineral wastes

6.1.4 Validation and feedback to reporting countries

Data validation is carried out in two steps. The first step is a quick validation; it leads to an evaluation of the delivery, which has to be sent to the countries within two months after the reporting deadline. The second step is a more in depth validation with no strict deadline.

The evaluation report

The quick evaluation results in an evaluation of the delivery as specified in the Regulation on the quality report (EC) No 1445/2005 (Official Journal L229/6 of 6.9.2005). The evaluation is made on the basis of five criteria:

1. Complete data sets (missing data sets, missing values, under-coverage).
2. Complete quality report (description of the methods and the quality attributes; whether the report offers an interpretation for the developments over time).
3. Timeliness.
4. Correct application of definitions and classifications.
5. The application of sound statistical methods.

In this phase the validation concerns mainly the internal coherence of the new data and the developments over time. The analysis is made at a very aggregate level. Eurostat tries to detect important breaks in the series and looks for explanations in the quality report that the country has supplied.

The countries are expected to react on the evaluation and to send updates if necessary.

Eurostat uses the feedback to the countries to monitor countries' compliance with the Regulation on Waste Statistics. Every year at the end of the summer the Eurostat board of directors receives an overview of the compliance with statistical regulations in all domains and decide on the proper follow up.

Validation

All the previous checks could and should be performed by the national data providers, because they have the micro data and the detailed knowledge on the local situation. Parts of these checks are repeated at European level, just to avoid some obvious mistakes. The validation at Eurostat mainly concerns the comparison of patterns and developments over countries. The real validation is less technical, rather a matter of 'craftsmanship' requiring sound knowledge of the subject matter to interpret the relevance of differences.

The country data will be published in the dissemination database after the more technical checks; the advantage is that others can be involved in the validation process. The EEA and the Topic Centre in particular have given useful comments. The publication of the (non-confidential) data makes it also easier to involve consultants in the validation process.

Some ideas for the validation

- Detection of outliers on the basis of indicators per value added or number of persons employed.
- Analysis of the composition over waste categories per economic activity in order to detect misclassification.
- Analysis of the percentage of hazardous waste per economic activity or per waste category in order to assess the proper distinction in hazardous/non-hazardous. Check of the coherence of data on waste generation and waste treatment. Differences can occur due to import and export of waste, secondary waste included in waste generation, time lags, drying, etc. Coherence of data on waste treated and on waste treatment capacity.

Potential questions are checked against the quality report. If the quality report does not supply sufficient answers, questions will be sent to the country concerned. As a general rule, Eurostat does not correct the country data, but will ask the country to send new data if necessary.

6.2 Dissemination of results

6.2.1 Flags

The flags that Member States report are not the same as those found in the dissemination database. Correspondence should therefore be made between the flags reported in the input file and the translation that occurs before data dissemination.

Table 36: Flag translation between input file, production database and dissemination database

In input file	In production database	In dissemination database	Meaning
M	:	:	Not available
B	b	b	Break in series
A	W	c	Confidential (one unit)
D	Z	c	Confidential (secondary confidentiality)
E	e	e	Country estimate
P	p	p	Provisional value (not used in published WStatR data)
none	s	s	Eurostat estimate

6.2.2 Aggregate calculations

In the process of creating a file for the dissemination database some new aggregations are added. These aggregations do not have any function in the production database, but they are necessary for the production of summary tables in the dissemination database.

All aggregates are calculated as the simple sum over the relevant cells in the database. If one (or more) of the elements is missing, the sum is missing. If one of the elements is confidential, the sum is confidential. However, if two or more elements are confidential, the sum is no longer confidential. If one of the elements is estimated (country estimate, Eurostat estimate), the sum is also an estimate (the flag for Eurostat estimate has priority over the country estimate flag).

It has been agreed to introduce a break in series flag from reference year 2008 onwards.

A new aggregate in this phase is the sum of hazardous and non-hazardous waste in the separate waste categories. If one of the categories is missing by definition (for instance, non-hazardous used oils), it counts as zero.

The publication will no longer have the distinction between wet and dry amounts of waste. All waste is reported and published in normal wet amounts, except sludges. Sludges have to be reported by the Member States in dry amounts. The totals are calculated including the sludges in dry matter.

6.2.3 Derivation of data for the OECD/Eurostat Joint Questionnaire

In order to avoid double reporting to both Eurostat and the OECD and to guarantee coherence at international level, it was agreed with the OECD to convert the data collected on the basis of the Regulation in the format of the OECD/Eurostat Joint Questionnaire (JQ). As the Regulation does not yet offer time series, this also provides series of a reasonable quality.

The analysis of both data sets shows that a reasonable conversion is not possible in all cases. The conversion is made in the Eurostat production database. A technical document describes the program. These results are not published, but they are available in the Eurostat production database for analysis. The data will be extracted in the JQ format and made available to the Member State concerned and to the OECD when the data from the Member States are complete and validated. This data will be revised only once in two years.

Please note that the OECD will have no access to the confidential data.

6.2.4 Data publication

Upload of quality report on CIRCA

Quality reports are uploaded on CIRCA and available at the following address:

https://circabc.europa.eu/w/browse/a1ece011-84a5-4e13-8d0e-4624477378f2

Publication in the dissemination database (Eurobase)

The production database is used to export data in Eurostat's dissemination database (Eurobase). The data on reference year t are to be delivered to Eurostat before end of June year t+2; the available new data at country level are uploaded in September t+2 and complete data including EU-aggregates are available in November t+2. Afterwards, the complete publication data are revised only twice a year (July and December), unless important errors urgently need correction.

A brief description of the data versions is available in a spreadsheet which is accessible from the metadata sheets.

Example

Versions of the waste data: waste generation

Date	Reference Year	Country	Comment
03.08.2009	all	five	Updates DK (2004, 2006), CY (2004, 2006), FI 2004, PT 2006, SK 2006
24.11.2008	2004	eight	Imputation of missing NACE A and B: LT, LU, PL, RO; imputation of missing NACE A, B and G to Q: CY, EL, FR, SE
24.11.2008	all	CY, BE, FR, NL, EL	Updates
24.11.2008	2006	PT	Upload PT; recalculation of EU-aggregates
03.10.2008	2006	IT	Upload IT; calculation of EU-aggregates based on unpublished Eurostat estimates for PT
03.10.2008	all	all	Change in order NACE categories: first the totals, then the breakdowns and then the waste management categories
18.08.2008	2006	all	Upload of country files (some countries missing); no EU-aggregates
18.08.2008	all	all	New intermediate aggregates for economic activity and waste category; calculated total over hazardous and non-hazardous

The statistics on the Eurostat website are organised in main tables and databases: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database. The main tables offer summary information on the more detailed information in the databases. The main tables on waste statistics also contain the tables based on the separate data collection on municipal waste. The main tables are technically linked to the database, so that an update in the database will also appear in the table. Waste statistics is in the folder Environment and Energy, Environment.

The upload of new data may also require an update of the corresponding metadata. The metadata are linked to the dissemination database; the metadata are accessible via the document icon behind the folder. The metadata describe the coverage of the data (periods, countries), sources and methods and some quality information.

6.2.5 Other organisations using waste statistics

Important users of data compare developments at national level with other countries and analyse the causes and consequences. In this paragraph we limit ourselves to the European and the broader international environment.

Eurostat collects waste data to monitor the effects of European waste policies. Four European organisations collaborate in the domain of environment: Directorate General Environment (DG ENV), the European Environment Agency (EEA), the Joint Research Centre (JRC) and Eurostat. In this collaboration, the collection, validation and publication of data on waste are important tasks of Eurostat.

The European Topic Centre on Sustainable Consumption and Production and the European Environment Information and Observation Network (EIONET) are linked to the EEA.

In the broader international context the United Nations and the OECD are important. Eurostat tries to avoid double data collection and checks the coherence of data at international level.

Some useful links:

EIONET: http://scp.eionet.europa.eu/facts/wastebase

DG Environment: http://ec.europa.eu/environment/waste/publications/

EEA: http://www.eea.europa.eu/themes/waste

6.2.6 Examples of publications

The first reference year for the Regulation on Waste Statistics is 2004 and countries have to report once in two years. It will take some time before time series will be available. The data on 2008 were presented in a Statistics in Focus publication. The data have however already been used to build waste indicators which are presented in the pocketbook Energy, transport, and environment indicators.

6.2.7 Archiving

In order to be able to reproduce results and trace possible errors data has to be archived at some points in the production process. At least the following data is kept:

- the original delivery;
- the uploaded files in the production database;
- the uploaded files in the dissemination database.

The original deliveries of the quality report are also archived. The latest version of the quality report is kept on CIRCA.

Annex I — Relevant legislation

Commission Regulation (EU) No 849/2010 of 27 September 2010 amending Regulation (EC) No 2150/2002 of the European Parliament and of the Council on waste statistics Text with EEA relevance *(*OJ L 253, 28.9.2010, p. 2–41)

Regulation (EC) No 223/2009 of the European Parliament and of the Council of 11 March 2009 on European statistics and repealing Regulation (EC, Euratom) No 1101/2008 of the European Parliament and of the Council on the transmission of data subject to statistical confidentiality to the Statistical Office of the European Communities, Council Regulation (EC) No 322/97 on Community Statistics, and Council Decision 89/382/EEC, Euratom establishing a Committee on the Statistical Programmes of the European Communities. (OJ L 87, 31.3.2009, p.164 – 173)

Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (OJ L 190, 12.7.2006, p. 1–98)

Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OJ L 182, 16.07.1999, pp. 1-19) last amended by Regulation (EC) No 1882/2003 of the European Parliament and of the Council of 29 September 2003.

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing Directives (OJ L 312, 22.11.2008, p. 3).

Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (OJ L 181, 04.07.1986, p. 6), last amended by Regulation 807/2003/EC (OJ L 122, 16.05.2003, p. 36).

Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control codifying council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (OJ L 24, 29.1.2008, p. 8–29).

Regulation (EC) No 177/2008 of the European Parliament and of the Council of 20 February 2008 establishing a common framework for business registers for statistical purposes and Repealing Council Regulation (EEC) No 2186/93 of 22 July 1993 (OJ L 61, 5.3.2008, p. 6–16*).*

Council Regulation (EEC) No 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community.

Council Regulation (EEC) No 3037/90 of 9 October 1990 on the statistical classification of economic activities in the European Community.

Decision 2000/532/EC concerning the list of wastes (OJ L 226, 6.9.2000, p.3), as last amended by Council Decision 2001/573/EC.

Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme (OJ L 242, 10.9.2002).

Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles (OJ L 269, 21.10.2000).

Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) - Joint declaration of the European Parliament, the Council and the Commission relating to Article 9. (OJ L 37, 13.2.2003, p. 24–39)

Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste.

Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste (OJ L 332, 28.12.2000, p. 91).

Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market (OJ L 283, 27.10.2001, p. 33).

Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants (OJ L 309, 27.11.2001, p. 1).

Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC - Statement by the European Parliament, the Council and the Commission. (OJ L 102, 11.4.2006, p. 15–34).

Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption. (OJ L 273, 10.10.2002, p. 1–95); (in force until March 2011)

Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation). (OJ L 300, 14.11.2009, p. 1–33); (It shall apply from 4 March 2011)

Draft guidance note on the application to animal by-products of Community legislation regarding animal and public health and waste (SANCO/445/2004). Draft working document prepared jointly by the Directorate General for Health and Consumer Protection and the Directorate General for the Environment, March 2004.

Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics (OJ L 332, 9.12.2002, p.1).

Regulation (EC) No 1059/2003 of the European Parliament and the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics (NUTS), amended by Regulation (EC) No 105/2007 (OJ L 154, 21.6.2003, p. 1–41).

Annex II — Set of deliverables

Set 1. Waste generation by waste category (EWC-STAT) and economic activities (NACE), tonnes/year

	activity item number				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TA
Waste item	**NACE Rev. 2 ➔** **EWC-Stat Ver. 4**		Hazardous	Dry	01_03	04_09	10_12	13_15	16	17_18	19	20_22	23	24_25	26_30	31_33	34_35	36+37+39	38	41_43	ex-cluded	46.77	HH	Total
	Code	Description																						
1	01.1	Spent solvents	H																					
2	01.2	Acid, alkaline or saline wastes																						
3	01.2	Acid, alkaline or saline wastes	H																					
4	01.3	Used oils	H																					
5	01.4, 02, 03.1	Chemical wastes																						
6	01.4, 02, 03.1	Chemical wastes	H																					
7	03.2	Industrial effluent sludges		T																				
8	03.2	Industrial effluent sludges	H	T																				
9	03.3	Sludges and liquid wastes from waste treatment		T																				
10	03.3	Sludges and liquid wastes from waste treatment	H	T																				
11	05	Health care and biological wastes																						
12	05	Health care and biological wastes	H																					
13	06.1	Metallic wastes, ferrous																						
14	06.2	Metallic wastes, , non-ferrous																						
15	06.3	Metallic wastes, mixed ferrous and non-ferrous																						
16	07.1	Glass wastes																						
17	07.1	Glass wastes	H																					
18	07.2	Paper and cardboard wastes																						
19	07.3	Rubber wastes																						
20	07.4	Plastic wastes																						
21	07.5	Wood wastes																						
22	07.5	Wood wastes	H																					
23	07.6	Textile wastes																						
24	07.7	Waste containing PCB	H																					
25	08 (excl. 08.1, 08.41)	Discarded equipment (excl. discarded vehicles, batteries/accumulators)																						

	activity item number				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TA
Waste item	**NACE Rev. 2 ➔** **EWC-Stat Ver. 4** Code	Description	Hazardous	Dry	01_03	04_09	10_12	13_15	16	17_18	19	20_22	23	24_25	26_30	31_33	34_35	36+37+39	38	41_43	ex-cluded	46.77	HH	Total
26	08 (excl. 08.1, 08.41)	Discarded equipment (excl. discarded vehicles, batteries/accumulators)	H																					
27	08.1	Discarded vehicles																						
28	08.1	Discarded vehicles	H																					
29	08.41	Batteries and accumulators wastes																						
30	08.41	Batteries and accumulators wastes	H																					
31	09.1	Animal and mixed food waste																						
32	09.2	Vegetal wastes																						
33	09.3	Animal faeces, urine and manure																						
34	10.1	Household and similar wastes																						
35	10.2	Mixed and undifferentiated materials																						
36	10.2	Mixed and undifferentiated materials	H																					
37	10.3	Sorting residues																						
38	10.3	Sorting residues	H																					
39	11	Common sludges		T																				
40	12.1	Mineral waste from construction and demolition																						
41	12.1	Mineral waste from construction and demolition	H																					
42	12.2, 12.3, 12.5	Other mineral wastes																						
43	12.2, 12.3, 12.5	Other mineral wastes	H																					
44	12.4	Combustion wastes																						
45	12.4	Combustion wastes	H																					
46	12.6	Soils																						
47	12.6	Soils	H																					
48	12.7	Dredging spoils																						
49	12.7	Dredging spoils	H																					
50	12.8, 13	Mineral waste from waste treatment and stabilised wastes																						
51	12.8, 13	Mineral waste from waste treatment and stabilised wastes	H																					
TN		Total, non-hazardous																						
TH		Total, hazardous	H	T																				
TT		Total, general		T																				

Set 2. Waste treatment by waste category (EWC-STAT) and treatment category, tonnes/year

	treatment item number				1	2	3a	3b	4	5
Waste item	**Treatment categories ➔** **EWC-Stat Ver. 4** Code	Description	Hazardous	Dry	Energy recovery (R1)	Waste incineration (D10)	Recycling (R2 — R11)	Backfilling	Landfilling (D1, D5, D12)	Other disposal (D2, D3, D4, D6, D7)
1	01.1	Spent solvents	H							
2	01.2	Acid, alkaline or saline wastes								
3	01.2	Acid, alkaline or saline wastes	H							
4	01.3	Used oils	H							
5	01.4, 02, 03.1	Chemical wastes								
6	01.4, 02, 03.1	Chemical wastes	H							
7	03.2	Industrial effluent sludges		T						
8	03.2	Industrial effluent sludges	H	T						
9	03.3	Sludges and liquid wastes from waste treatment		T						
10	03.3	Sludges and liquid wastes from waste treatment	H	T						
11	05	Health care and biological wastes								
12	05	Health care and biological wastes	H							
13	06.1	Metallic wastes, ferrous								
14	06.2	Metallic wastes, , non-ferrous								
15	06.3	Metallic wastes, mixed ferrous and non-ferrous								
16	07.1	Glass wastes								
17	07.1	Glass wastes	H							
18	07.2	Paper and cardboard wastes								
19	07.3	Rubber wastes								
20	07.4	Plastic wastes								
21	07.5	Wood wastes								
22	07.5	Wood wastes	H							
23	07.6	Textile wastes								
24	07.7	Waste containing PCB	H							
25	08 (excl. 08.1, 08.41)	Discarded equipment (excl. discarded vehicles, batteries/accumulators)								
26	08 (excl. 08.1, 08.41)	Discarded equipment (excl. discarded vehicles, batteries/accumulators)	H							
27	08.1	Discarded vehicles								
28	08.1	Discarded vehicles	H							
29	08.41	Batteries and accumulators wastes								
30	08.41	Batteries and accumulators wastes	H							

Waste item	*treatment item number*			Hazardous	Dry	1	2	3a	3b	4	5
	EWC-Stat Ver. 4 **Treatment categories ➔**					Energy recovery (R1)	Waste incineration (D10)	Recycling (R2 — R11)	Backfilling	Landfilling (D1, D5, D12)	Other disposal (D2, D3, D4, D6, D7)
	Code	Description									
31	09.1	Animal and mixed food waste									
32	09.2	Vegetal wastes									
33	09.3	Animal faeces, urine and manure									
34	10.1	Household and similar wastes									
35	10.2	Mixed and undifferentiated materials									
36	10.2	Mixed and undifferentiated materials		H							
37	10.3	Sorting residues									
38	10.3	Sorting residues		H							
39	11	Common sludges			T						
40	12.1	Mineral waste from construction and demolition									
41	12.1	Mineral waste from construction and demolition		H							
42	12.2, 12.3, 12.5	Other mineral wastes									
43	12.2, 12.3, 12.5	Other mineral wastes		H							
44	12.4	Combustion wastes									
45	12.4	Combustion wastes		H							
46	12.6	Soils									
47	12.6	Soils		H							
48	12.7	Dredging spoils			T						
49	12.7	Dredging spoils		H	T						
50	12.8, 13	Mineral waste from waste treatment and stabilised wastes									
51	12.8, 13	Mineral waste from waste treatment and stabilised wastes		H							
TN		Total, non-hazardous									
TH		Total, hazardous		H							
TT		Total, general									

Set 3. Number and capacity of recovery and disposal facilities (per NUTS 2 region) and population served by collection scheme (national)

treatment item number	1		2		3		4											
Treatment categories ➔	Energy recovery (R1)		Waste incineration (D10)		Recovery (R2 — R11)		Landfilling (D1, D5, D12)											Population served by collection
					3a	3 b	landfills for haz. waste			landfills for non-haz waste			landfills for inert waste			landfills total		
Regions, NUTS 2 level	no. of facilities	capacity t/a	no. of facilities	capacity t/a	no. of facilities		no. of facilities	rest capacity m³	closed	no. of facilities	rest capacity m³	closed	no. of facilities	rest capacity m³	closed	no. of facilities	rest capacity m³	%
Region 1																		
Region 2																		
Region 3																		
…																		
….																		
…																		
National total																		

Shaded cells: No data required

Annex III — Synopsis NACE Rev. 1.1 — NACE Rev. 2

Item No	*NACE Rev.1.1 divisions*	*Code Description (Rev.1.1)*	*Item No*	*NACE Rev.2 divisions*	*Code Description (Rev.2)*
1	A	Agriculture, hunting and forestry	1	A01 A02 A03	Agriculture, hunting and forestry; Fishing and aquaculture
2	B	Fishing			
3	C	Mining and quarrying	2	B04 — B09	Mining and quarrying
4	DA	Manufacture of food products; beverage and tobacco	3	C10 C11 C12	Manufacture of food products + beverage + tobacco
5	DB + DC	Manufacture of textile and textile products; Manufacture of leather and leather products	4	C13 C14 C15	Manufacture of textiles + wearing apparel + leather and related products
6	DD	Manufacture of wood and wood products	5	C16	Manufacture of wood and wood products
7	DE	Manufacture of pulp, paper and paper products; publishing and printing	6	C17 C18	Manufacture of pulp, paper and paper products + printing and reproduction or recorded media
8	DF	Manufacture of coke, refined petroleum products and nuclear fuel	7	C19	Manufacture of coke, refined petroleum products
9	DG + DH	Manufacture of chemicals, rubber and plastic products	8	C20 C21 C22	Manufacture of chemicals, chemical products + basic pharmaceutical products and preparations + rubber and plastic products
10	DI	Manufacture of other non-metallic mineral products	9	C23	Manufacture of other non-metallic mineral products
11	DJ	Manufacture of basic metals and fabricated metal products	10	C24 C25	Manufacture of basic metals + fabricated metal products
12	DK+DL+DM	Manufacture of machinery and equipment n.e.c.; man. of electrical and optical equipment; man. of transport equipment	11	C26 C27 C28 C29 C30	Manufacture of computer, electronic and optical products + electrical equipment + machinery and equipment + motor vehicles, trailers and semi-trailers + other transport equipment
13	DN36	Manufacture of furniture; manufacturing n.e.c.	12	C31 C32 C33	Manufacture of furniture + other manufacturing + repair and installation of machinery and equipment
14	E	Electricity, gas and water supply	13	D34 D35	Electricity, gas, steam and air conditioning supply
19	O90	Sewage and refuse disposal, sanitation and similar activities	14	E36 E37 E39	Water collection, treatment and supply + Sewerage + Remediation activities and other waste management services
17	DN37	Recycling	15	E38	Waste collection, treatment and disposal activities; materials recovery
15	F	Construction	16	F41	Construction

Item No	*NACE Rev.1.1 divisions*	*Code Description (Rev.1.1)*	*Item No*	*NACE Rev.2 divisions*	*Code Description (Rev.2)*
				F42 F43	
16	G — Q excluded 90 and 51.57	Services activities: Wholesale and retail trade; Repair of motor vehicles, motor cycles and personal and household goods + Hotels and Restaurants + Transports, storage and communications + Financial intermediation + Real estate, renting and business activities + Public administration, defence and compulsory social security + Education + Health and Social work + Other community, social and personal activities + Activities of households + Extra-territorial organisations and bodies	17	Sections G — U Excluded G46.77	Service activities: Wholesale and retail trade; Repair of motor vehicles, motor cycles + Transportation and storage + Accommodation and food service activities + Information and communication + Financial and insurance activities + Real estate activities + Professional, scientific and technical activities + Administrative and support service activities + Public administration and defence; compulsory social security + Education + Human health and social work activities + Arts, entertainment and recreation + Other service activities + Activities of households as employers; undifferentiated goods — and services – producing activities of households for own use + Activities of extraterritorial organisations and bodies
18	G51.57	Wholesale of waste and scrap	18	G46.77	Wholesale of waste and scrap
20	HH	Households	19	HH	Households

Annex IV — Synopsis of Waste Categories between WStatR 2002 and 2010

	EWC-Stat / Version 3				EWC-Stat / Version 4		
Item No	Code	Description	Hazard-ous / Non-Hazard-ous waste	Item No	Code	Description	Hazard-ous / Non-Hazard-ous waste
1	01.1	Spent solvents	Hazardous	1	01.1	Spent solvents	Hazardous
2	01.2	Acid, alkaline or saline wastes	Non-Hazardous	2	01.2	Acid, alkaline or saline wastes	Non-Hazardous
3	01.2	Acid, alkaline or saline wastes	Hazardous	3	01.2	Acid, alkaline or saline wastes	Hazardous
4	01.3	Used oils	Hazardous	4	01.3	Used oils	Hazardous
5	01.4	Spent chemical catalysts	Non-Hazardous	5	*01.4, 02, 03.1*	*Chemical wastes*	Non-Hazardous
6	01.4	Spent chemical catalysts	Hazardous	6	*01.4, 02, 03.1*	*Chemical wastes*	Hazardous
7	02	Chemical preparation wastes	Non-Hazardous	7	03.2	Industrial effluent sludges	Non-Hazardous
8	02	Chemical preparation wastes	Hazardous	8	03.2	Industrial effluent sludges	Hazardous
9	03.1	Chemical deposits and residues	Non-Hazardous	9	*03.3*	*Sludges and liquid wastes from waste treatment*	Non-Hazardous
10	03.1	Chemical deposits and residues	Hazardous	10	*03.3*	*Sludges and liquid wastes from waste treatment*	Hazardous
11	03.2	Industrial effluent sludges	Non-Hazardous	11	05	Health care and biological wastes	Non-Hazardous
12	03.2	Industrial effluent sludges	Hazardous	12	05	Health care and biological wastes	Hazardous
13	05	Health care and biological wastes	Non-Hazardous	13	*06.1*	*Metallic wastes, ferrous*	Non-Hazardous
14	05	Health care and biological wastes	Hazardous	14	*06.2*	*Metallic wastes, non-ferrous*	Non-Hazardous
15	06	Metallic wastes	Non-Hazardous	15	*06.3*	*Metallic wastes, mixed ferrous and non-ferrous*	Non-Hazardous
16	06	Metallic wastes	Hazardous	16	07.1	Glass wastes	Non-Hazardous
17	07.1	Glass wastes	Non-Hazardous	17	07.1	Glass wastes	Hazardous
18	07.1	Glass wastes	Hazardous	18	07.2	Paper and cardboard wastes	Non-Hazardous
19	07.2	Paper and cardboard wastes	Non-Hazardous	19	07.3	Rubber wastes	Non-Hazardous
20	07.3	Rubber wastes	Non-Hazardous	20	07.4	Plastic wastes	Non-Hazardous
21	07.4	Plastic wastes	Non-Hazardous	21	07.5	Wood wastes	Non-Hazardous
22	07.5	Wood wastes	Non-Hazardous	22	07.5	Wood wastes	Hazardous
23	07.5	Wood wastes	Hazardous	23	07.6	Textile wastes	Non-Hazardous
24	07.6	Textile wastes	Non-Hazardous	24	07.7	Wastes containing PCB	Hazardous

	EWC-Stat / Version 3				EWC-Stat / Version 4		
Item No	**Code**	**Description**	**Hazardous / Non-Hazardous waste**	**Item No**	**Code**	**Description**	**Hazardous / Non-Hazardous waste**
25	07.7	Wastes containing PCB	Hazardous	25	08 (excl. 08.1, 08.41)	Discarded equipment	Non-Hazardous
26	08	Discarded equipment	Non-Hazardous	26	08 (excl. 08.1, 08.41)	Discarded equipment	Hazardous
27	08	Discarded equipment	Hazardous	27	08.1	Discarded vehicles	Non-Hazardous
28	08.1	Discarded vehicles	Non-Hazardous	28	08.1	Discarded vehicles	Hazardous
29	08.1	Discarded vehicles	Hazardous	29	08.41	Batteries and accumulators wastes	Non-Hazardous
30	08.41	Batteries and accumulators wastes	Non-Hazardous	30	08.41	Batteries and accumulators wastes	Hazardous
31	08.41	Batteries and accumulators wastes	Hazardous	31	*09.1*	*Animal and mixed food waste*	Non-Hazardous
32	09 (excl. 09.11, 09.3)	Animal and vegetal wastes (excluding animal waste of food preparation and products; and excluding animal faeces, urine and manure)	Non-Hazardous	32	*09.2*	*Vegetal wastes*	Non-Hazardous
33	09.11	Animal waste of food preparation and products	Non-Hazardous	33	09.3	Animal faeces, urine and manure	Non-Hazardous
34	09.3	Animal faeces, urine and manure	Non-Hazardous	34	10.1	Household and similar wastes	Non-Hazardous
35	10.1	Household and similar wastes	Non-Hazardous	35	10.2	Mixed and undifferentiated materials	Non-Hazardous
36	10.2	Mixed and undifferentiated materials	Non-Hazardous	36	10.2	Mixed and undifferentiated materials	Hazardous
37	10.2	Mixed and undifferentiated materials	Hazardous	37	10.3	Sorting residues	Non-Hazardous
38	10.3	Sorting residues	Non-Hazardous	38	10.3	Sorting residues	Hazardous
39	10.3	Sorting residues	Hazardous	39	11	Common sludges	Non-Hazardous
40	11	Common sludges (excluding dredging spoils)	Non-Hazardous	40	*12.1*	*Mineral waste from construction and demolition*	Non-Hazardous
41	11.3	Dredging spoils	Non-Hazardous	41	*12.1*	*Mineral waste from construction and demolition*	Hazardous
42	12.1 + 12.2 + 12.3 + 12.5	Mineral wastes (excluding combustion wastes, contaminated soils and polluted dredging spoils)	Non-Hazardous	42	*12.2, 12.3, 12.5*	*Other mineral wastes (excl. C&D waste, combustion wastes, soils, dredging spoils, waste from waste treatment)*	Non-Hazardous
43	12.1 + 12.2 + 12.3 + 12.5	Mineral wastes (excluding combustion wastes, contaminated soils and polluted dredging spoils)	Hazardous	43	*12.2, 12.3, 12.5*	*Other mineral wastes (excl. C&D waste, combustion wastes, soils, dredging spoils, waste from waste treatment)*	Hazardous
44	12.4	Combustion wastes	Non-Hazardous	44	12.4	Combustion wastes	Non-Hazardous
45	12.4	Combustion wastes	Hazardous	45	12.4	Combustion wastes	Hazardous
46	12.6	Contaminated soils and polluted dredging spoils	Hazardous	46	*12.6*	*Soils*	Non-Hazardous
47	13	Solidified, stabilised or vitrified wastes	Non-Hazardous	47	*12.6*	*Soils*	Hazardous

	EWC-Stat / Version 3				EWC-Stat / Version 4		
Item No	**Code**	**Description**	**Hazardous / Non-Hazardous waste**	**Item No**	**Code**	**Description**	**Hazardous / Non-Hazardous waste**
48	13	Solidified, stabilised or vitrified wastes	Hazardous	48	*12.7*	*Dredging spoils*	Non-Hazardous
				49	*12.7*	*Dredging spoils*	Hazardous
				50	12.8, 13	*Mineral waste from waste treatment and stabilised wastes*	Non-Hazardous
				51	12.8, 13	*Mineral waste from waste treatment and stabilised wastes*	Hazardous

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