

Review of selected waste streams:

**Sewage sludge, construction and demolition waste,
waste oils, waste from coal-fired power plants and
biodegradable municipal waste**

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Foreword

Condensed information on five priority waste streams is given in this report which presents statistical data on quantities generated but also on collection and treatment systems applied in several European countries and regions. The selection of these waste streams was made on the basis of on-going discussions in the European policy-making context, in order to define forthcoming priorities for policy development for the reduction of waste quantities.

Therefore this report provides a picture of the current situation for each specific waste stream as a basis for comparisons between Member States. This by no means should be understood as a 'mirror' of good or bad country performance: it simply highlights the existing differences in waste classification and various approaches adopted for waste reduction. In any case, the reference to waste quantities per capita is a very useful 'piece' of information to be seriously considered in policy-making.

We at the Agency are of the opinion that the compilation of this kind of information is a basic first step towards quantifying the challenges to be tackled. This action must be supplemented at a later stage with the assessment of the environmental and sustainable development implications caused by these or other waste streams and related material flows so that priorities for policy-making can be better justified and finally adopted.

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1. Introduction

In this technical report, prepared by the European Topic Centre on Waste (ETC/W) as part of the work programme of the European Environment Agency, five selected waste streams will be reviewed: construction and demolition waste, sewage sludge, biodegradable municipal waste, waste oil and waste from coal-fired power stations. The review will focus on quantities produced, and on collection and treatment of the waste. Data on the quantities of these waste streams produced, with the exception of biodegradable municipal waste and waste oils, is collected through the joint OECD/Eurostat questionnaire every second year. Several countries have not reported the relevant data to OECD/Eurostat and data from other countries is often scarce or insufficient. Information on waste oils and sewage sludge is also reported by Member States to the EU Commission (Environment DG). Due to these problems it was therefore decided to ask EEA national reference centres (NRCs) to provide all existing and readily available data from their countries on the five selected waste streams. Information on biodegradable municipal waste was collected as part of the ETC/W study on the management of biodegradable municipal waste in Europe (EEA topic report on *Biodegradable municipal waste management in Europe*, to be published). A summary of the dataset for biodegradable municipal waste is included in this report together with some of the main findings of the study.

The datasets used in this report will become available in WasteBase (<http://waste.eionet.eu.int>).

2. Information from member countries

Seventeen countries and three regions were asked to submit information on the five waste types: construction and demolition waste, sewage sludge, biodegradable municipal waste, waste oil and waste from coal-fired power stations. Table 1 lists the countries' responses.

Responses were expected only from countries which had additional information to that already submitted to OECD/Eurostat or Environment DG.

Table 1 indicates where additional information, beyond that provided to the OECD/Eurostat or Environment DG, has been submitted. However, the additional information provided is not necessarily presented in this report. If, for instance, a country has only qualitative information on a waste stream it has not been possible to include this in the tables and figures.

Therefore, the tables and figures in the following pages do not necessarily give a total picture of the data availability in each country, since they only present the comparable and quantifiable data.

Information supplied consisted of national reports, extracts from reports or, in some cases, corrections of the data earlier supplied through the OECD/Eurostat joint questionnaire.

Nearly all countries (16) submitted additional information on biodegradable municipal waste, thereby giving this waste fraction the highest rate of reply. This is due to the high response rate obtained from the survey conducted by ETC/W for the study on the management of biodegradable municipal waste in Europe.

The other four waste types have a more moderate rate of reply (6–10 replies). ETC/W received 10 replies on waste oils and on waste from coal-fired power stations, seven replies on construction and demolition waste and six replies on sewage sludge.

Table 1 Overview of countries that have submitted additional information on the selected waste types

Country	Sewage sludge	Construction and demolition waste	Waste oils	Waste from coal-fired power stations	Biodegradable municipal waste
Austria	●	●	●	●	●
Belgium (Flanders)			●	●	●
Denmark	●			●	●
Finland		●	●	●	●
France			●	●	●
Germany		●			●
Greece	●	●	●	●	●
Ireland		●			●
Italy		●	●	●	●
Luxembourg					
Netherlands	●	●			●
Portugal			●	●	●
Spain		●			●
Sweden	●			●	●
United Kingdom			●	●	●
Norway	●	●	●		●
Iceland			●		
Liechtenstein					●
Total responses	6	9	10	10	16

3. Review of the waste streams

In this section the datasets for the five waste streams will be presented. Along with the data presented in this section, additional data can be found in Annex 1-5 of the report.

3.1. Sewage sludge

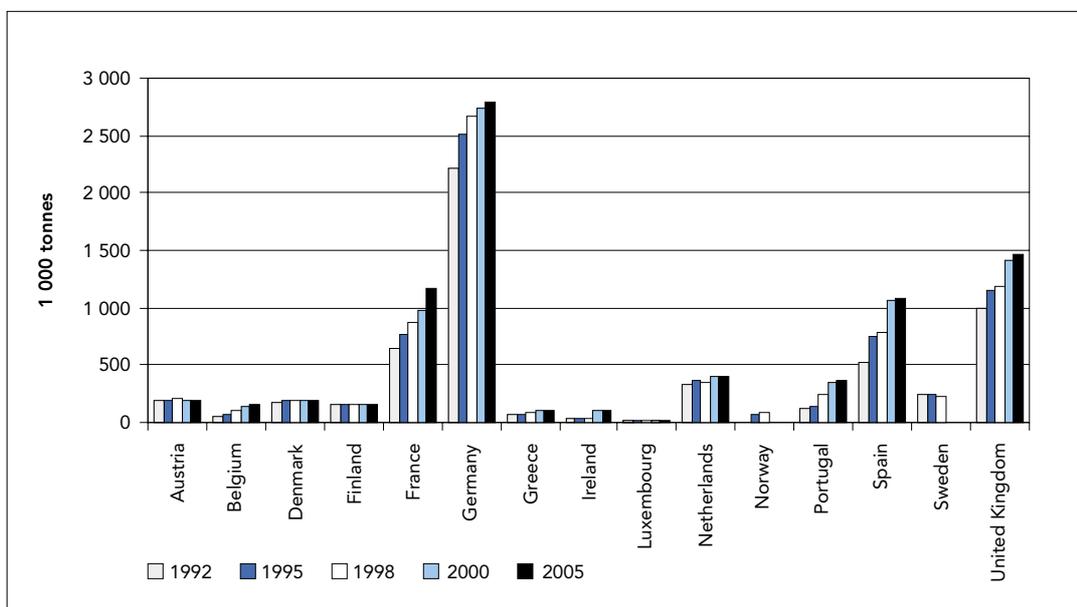
Sewage sludge is a residual product from the treatment of urban and industrial wastewater. Sewage sludge can be used as a fertiliser or soil additive in agriculture, forestry, etc. However, at high levels of contamination with toxic substances such as heavy metals, it is necessary to incinerate or landfill the sludge, since it would not be suitable for application to agricultural land.

Figures 1 and 2 show the generation of sewage sludge ⁽¹⁾ in total and per capita in individual countries during the period 1992–98, including projections for 2000 and 2005. Sludge quantities have increased in most countries during the 1990s as a result of the implementation of the Urban Wastewater Directive (91/271/EC) requirement for widespread secondary treatment of urban wastewater. This increase is likely to continue in the coming years.

There are considerable variations in the per capita generation of sewage sludge, as illustrated in Figure 2. Denmark, Finland, Germany and Luxembourg all produced more than 30 kg of waste per capita in 1998. According to the projections Ireland and Portugal will also produce more than 30 kg per capita by 2005.

Total generation of sewage sludge including projections for 2000 and 2005

Figure 1

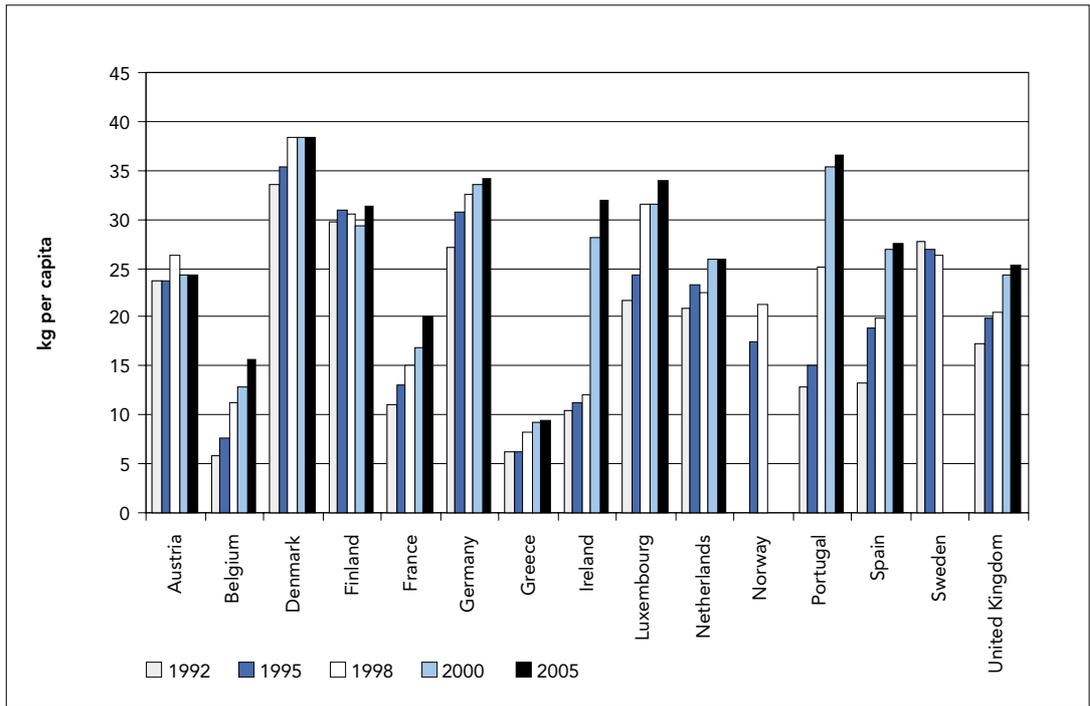


Source: European Commission 1999 and ETC/W questionnaire.

(1) The figures concern sewage sludge from wastewater treatment plants (municipal sewage sludge) and are given on the basis of dry substance.

Figure 2 Generation of sewage sludge per capita including projections for 2000 and 2005

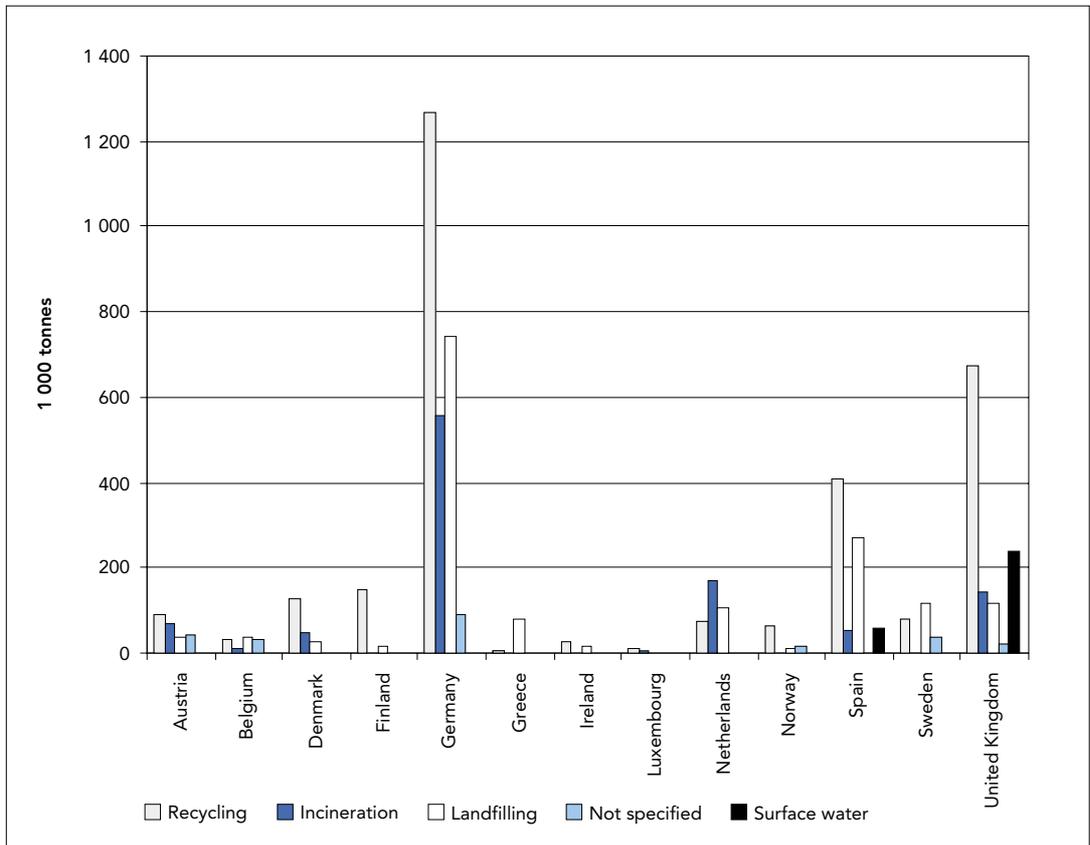
Source: European Commission 1999 and ETC/W questionnaire.



Figures 3 and 4 illustrate the various treatment methods employed for sewage sludge. It is obvious that recycling is the preferred treatment method in most countries. In particular, Denmark, Luxembourg, Norway and the United Kingdom have reported large increases in recycling with corresponding reductions in the landfilling of sewage sludge.

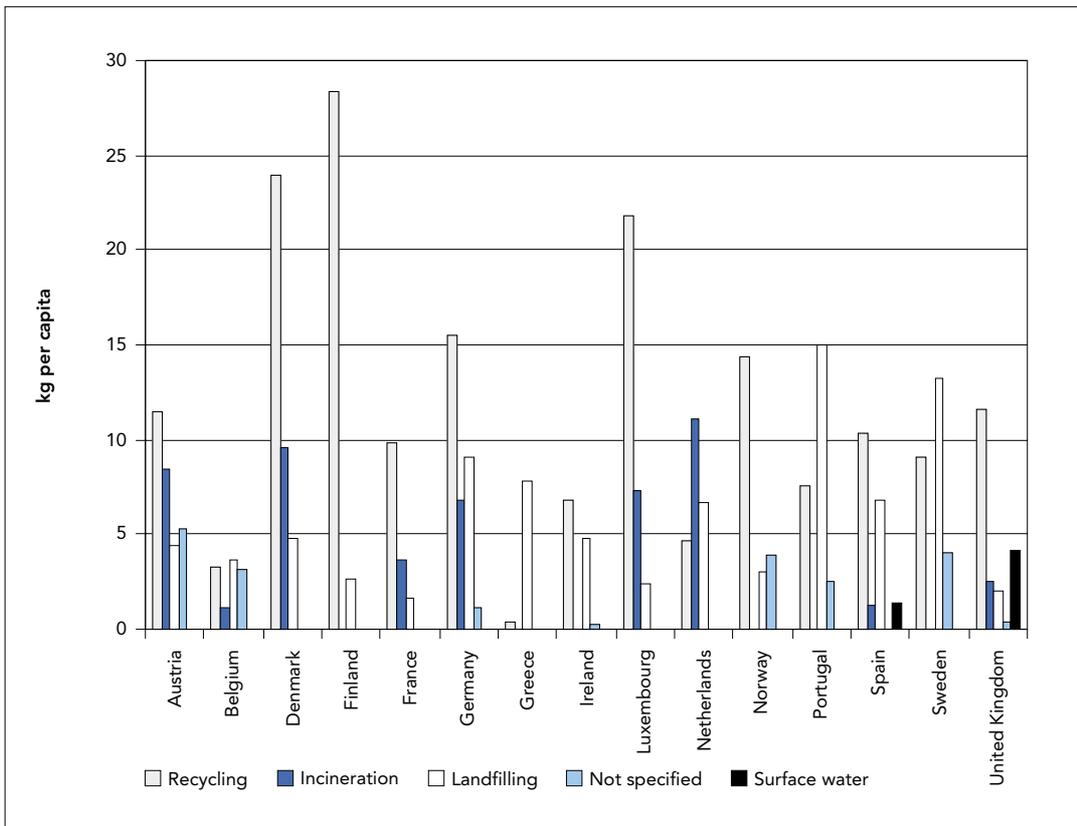
Figure 3 Treatment of sewage sludge in 1998

Source: European Commission 1999 and ETC/W questionnaire.



Treatment of sewage sludge in 1998 in kg per capita

Figure 4



Source: European Commission 1999 and ETC/W questionnaire.

3.2. Construction and demolition waste

Since construction and demolition waste as well as residues from coal-fired power stations represent a large part of the total waste generation and have a high potential for recycling, it is important to know the composition of this kind of waste. The OECD/Eurostat joint questionnaire asks for information on waste from the construction sector and for the total quantity of the relevant waste stream. As a consequence, there is a need to know more about the specific materials that make up the waste stream and their treatment. Nine countries provided additional data on the generation and treatment of specific fractions of construction and demolition waste.

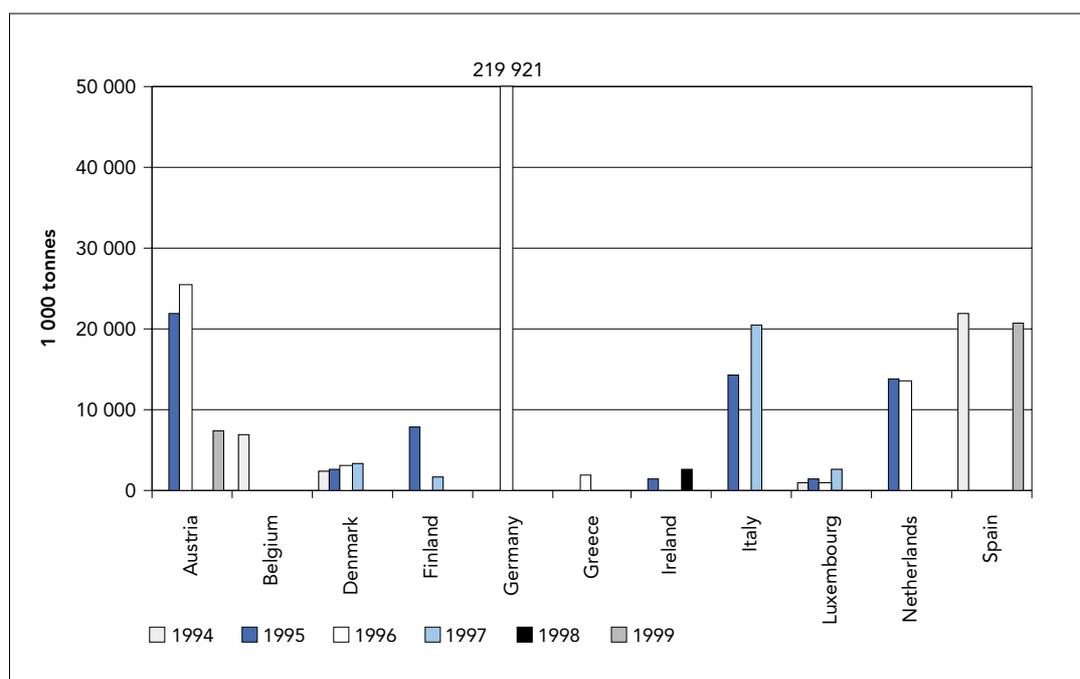
Table 2 Data availability on construction and demolition waste

	Total generation	Treatment	Concrete, bricks and tiles	Wood	Metals	Glass	Plastics	Insulation	Mixed and other
Austria	●	●	●			●			●
Belgium (Flanders)	●			●	●		●		●
Denmark	●	●	●	●	●	●	●	●	●
Finland	●	●	●	●	●			●	●
France									
Germany	●	●	●	●					
Greece	●								
Ireland	●	●	●	●	●	●			●
Italy	●	●							
Luxembourg	●	●							
Netherlands	●	●	●	●	●		●		●
Portugal									
Spain	●	●		●	●	●	●		
Sweden		●	●	●	●	●		●	
United Kingdom									
Norway									
Iceland									
Liechtenstein									
Total	11	10	7	8	7	5	4	3	6

Table 2 shows the total data availability on construction and demolition waste in EEA member countries. As can be seen the data availability is limited for some of the waste fractions, especially glass, plastics, insulation, and mixed waste. As a consequence, data for these fractions will not be included in the following presentation.

Figure 5 Total quantities of construction and demolition waste in selected EEA countries

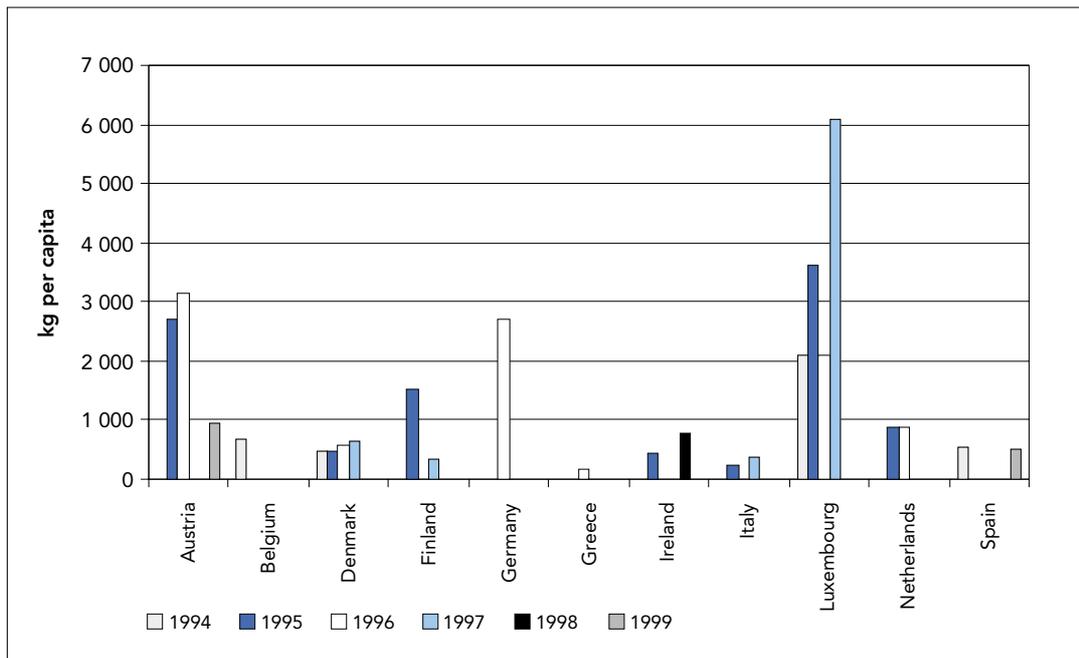
Source: OECD/Eurostat, Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.



Note: The 1999 figure for Austria does not include excavated soil.

Total quantities of construction and demolition waste per country and capita

Figure 6



Source: OECD/Eurostat, Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.

Note: The 1999 figure for Austria does not include excavated soil.

Waste amounts per capita vary considerably from one country to another. This can partly be explained by the economic and cultural differences that exist between countries. There are also differences in definitions used, for instance, the reason for the high level in Austria and Germany can be explained by the fact that these countries include excavated soil and stones in the waste data. The different rates could also, to some extent, be explained by the different traditions for registration and use of this kind of waste. For instance, if bricks and concrete are used directly as construction material for small roads and paths or as filling material at the site, it will often not be registered as waste.

The treatment of construction and demolition waste per capita is illustrated in Figure 7. It is surprising that Luxembourg is landfilling so much of its construction and demolition waste since the cost of landfilling in Luxembourg is very high. A clearer picture of the distribution of treatment methods in the countries is given in Figure 8. It appears that the percentage of recycling is more than 80 % in Denmark, Germany and the Netherlands. Finland, Ireland and Italy recycle 30–50 %, while the recycling percentage in Luxembourg is 10 %. Recycling includes crushing of bricks and concrete for use as filling in new building materials or simply as filling under new constructions to replace the use of gravel. In at least one country, Germany, use of non-contaminated excavated soil and smaller amounts of non-contaminated demolition and road construction waste to fill old sand and gravel pits for safety reasons is regarded as recovery.

Figure 7 Treatment of construction and demolition waste per capita

Source: Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.

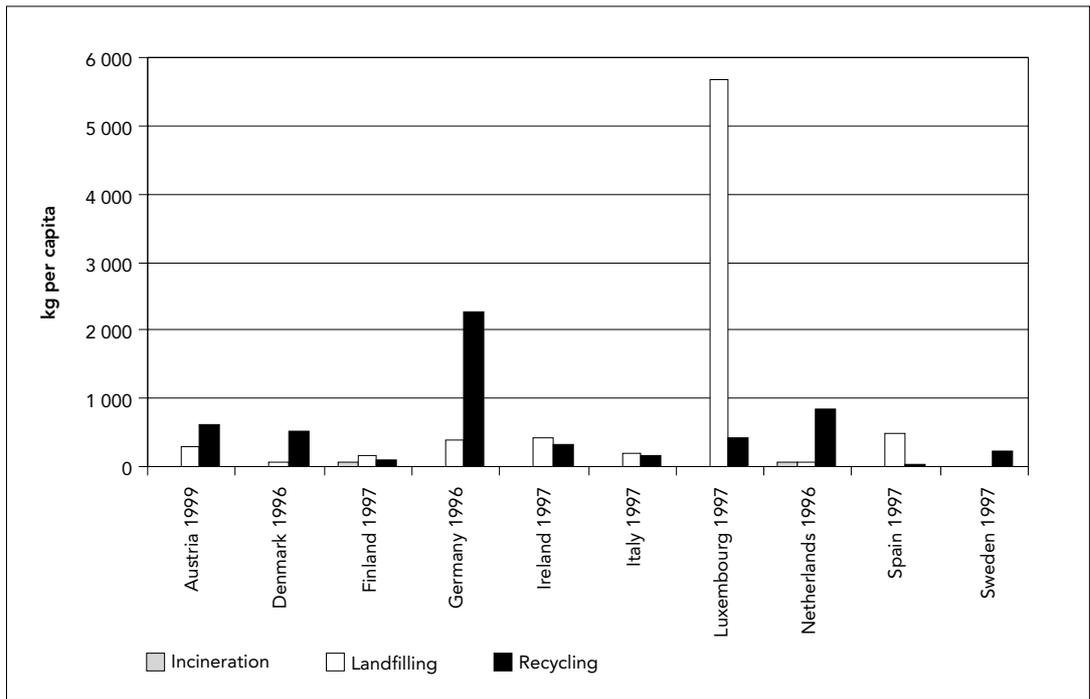
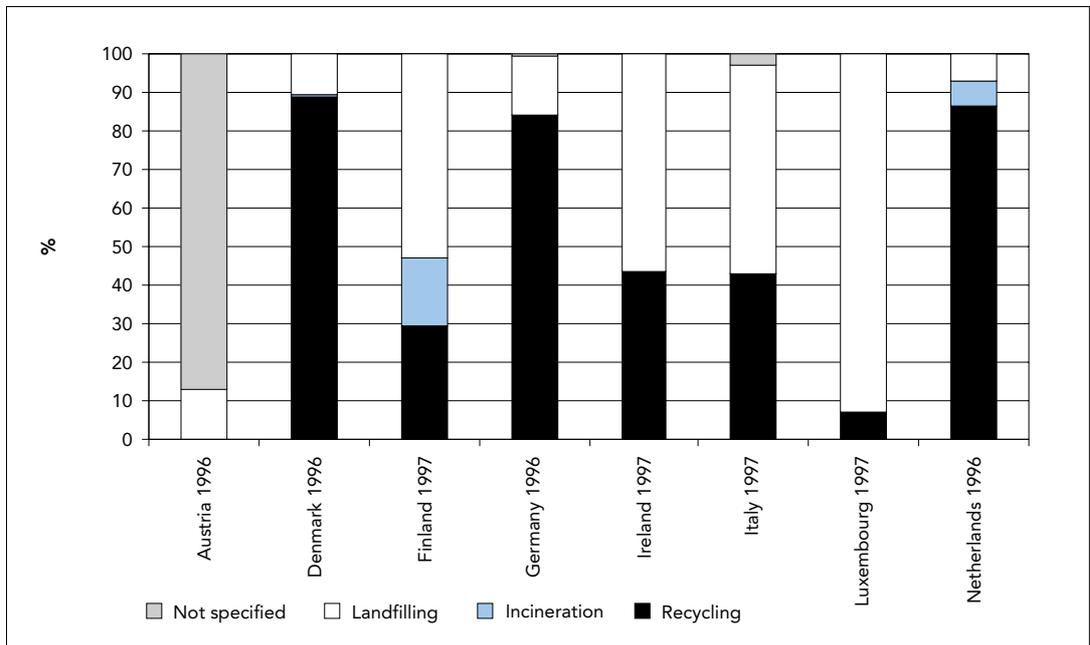


Figure 8 Percentage of construction and demolition waste recycled, incinerated and landfilled

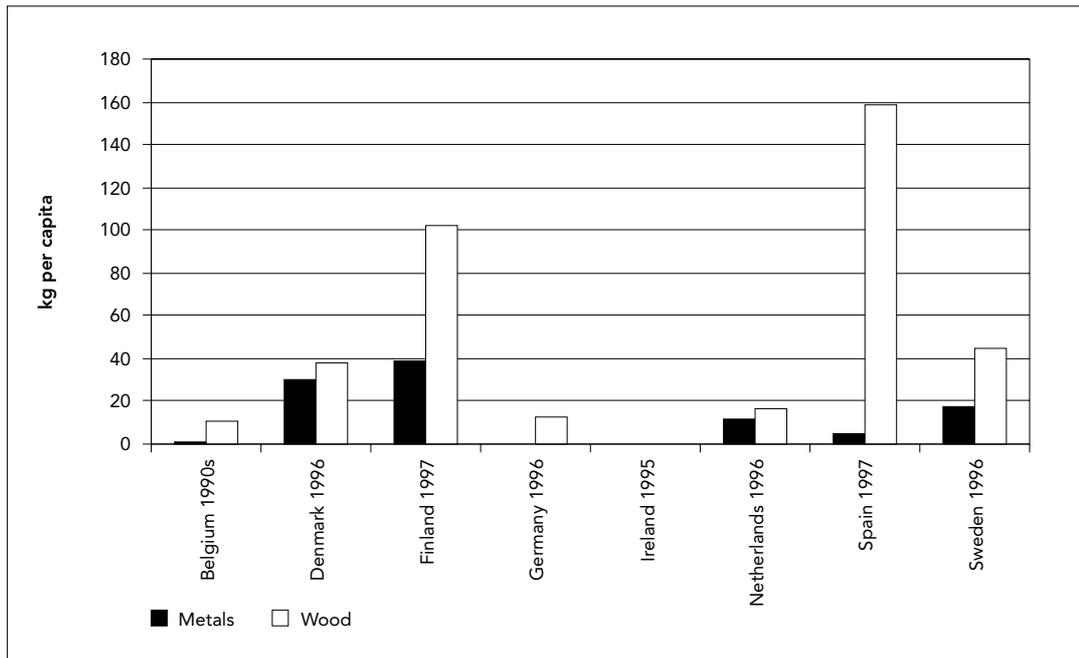
Source: Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.



Figures 9 and 10 show the quantities of metals, wood and concrete/brick/tiles in construction and demolition waste per capita in various countries. The fact that Finland and Sweden show relatively large quantities of wood in this waste stream is not surprising, since wood is a very common building material in these countries. However, a more detailed examination is required to explain the finding that Spain has the highest amount of wood waste per capita. As regards concrete/brick/tiles large quantities are found in Germany and the Netherlands, approximately 600–700 kg per capita.

Quantities of metals and wood of construction and demolition waste per capita

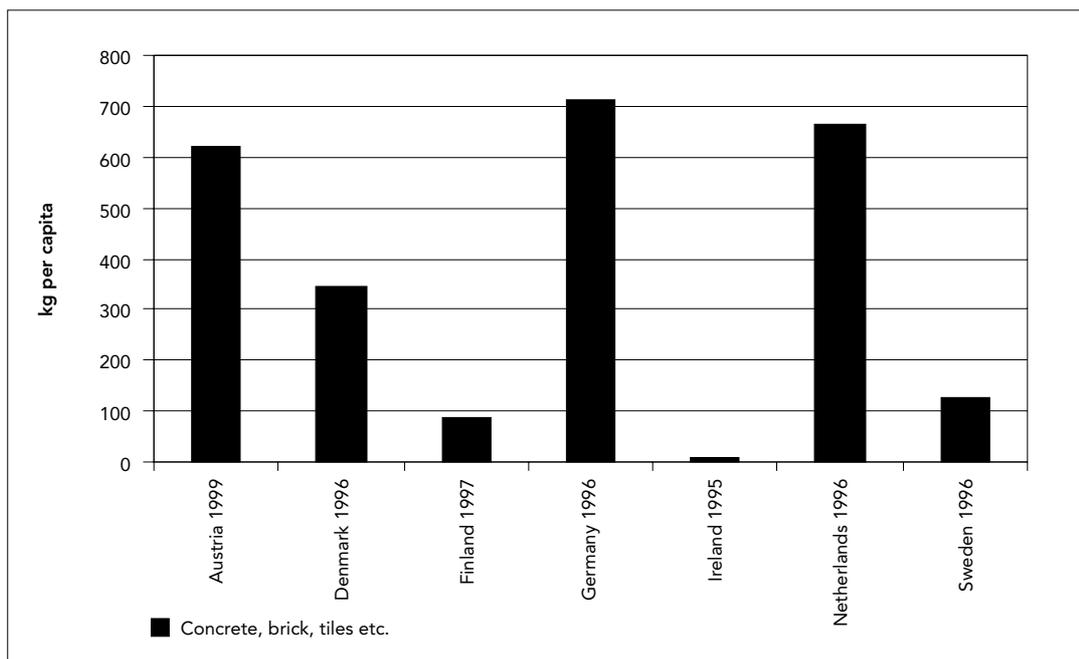
Figure 9



Source: Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.

Quantities of concrete, brick, tiles, etc. per capita

Figure 10



Source: Report to the European Commission DG XI.E.3 1999 and ETC/W questionnaire.

3.3. Waste oils

Waste oils are residual products typically originating from vehicles, ships, industrial machines, etc. They arise when lubricating oils in mechanical processes have to be changed after some period of use.

The collection schemes for waste oils vary from country to country, but principally they are collected at garages, harbours and industrial sites and from there transferred to a treatment facility by private or public conveyers.

The handling of waste oils has been regulated for many years by EU Directive 75/439/EEC. Reports based on the relevant questionnaire (Commission decision 94/741/EC) were used as

the starting point for establishing the ETC/W dataset. ETC/W also asked EEA member countries to provide supplementary information where available. Datasets submitted to the Commission include information on 12 Member States: Belgium and Luxembourg have no information on quantities of lubricating oils sold, which was also the case for Iceland. Fourteen EEA member countries have information on waste oils collected and some countries have estimates on waste generated.

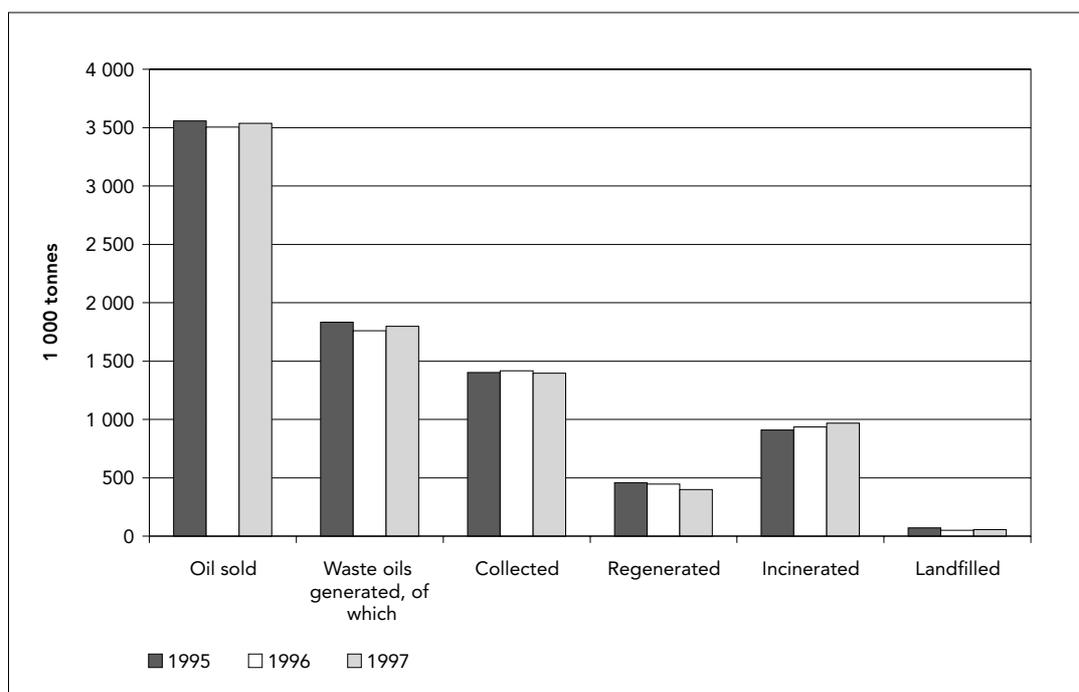
In Figure 11 the trends in generation, collection and treatment of waste oils are shown. The overall tendency is that half of the lubricating oils are lost through leaks or in the exhaust emissions during use. Approximately 75 % of the waste oil generated is collected, whereas the remaining 25 % is probably burned illegally or dumped in sewage or elsewhere into the environment. Distillation and other processes to remove contaminants are used for the regeneration of 25 % of waste oils generated. 50 % of waste oil generated is incinerated with energy recovery. Sales of oils and the generation and collection of waste oils has remained fairly static during the period 1995–97. However, quantities of waste oil generated can only be estimated and several countries have no relevant information.

Regarding the treatment of waste oils during the period 1995–97, there appears to be a slight increase in incineration at the expense of regeneration, while landfilling remained at the same level.

Figure 11

Trends in generation, collection and treatment of waste oils in eight EEA countries

Source: European Commission, 10 January 2000, and ETC/W questionnaire.

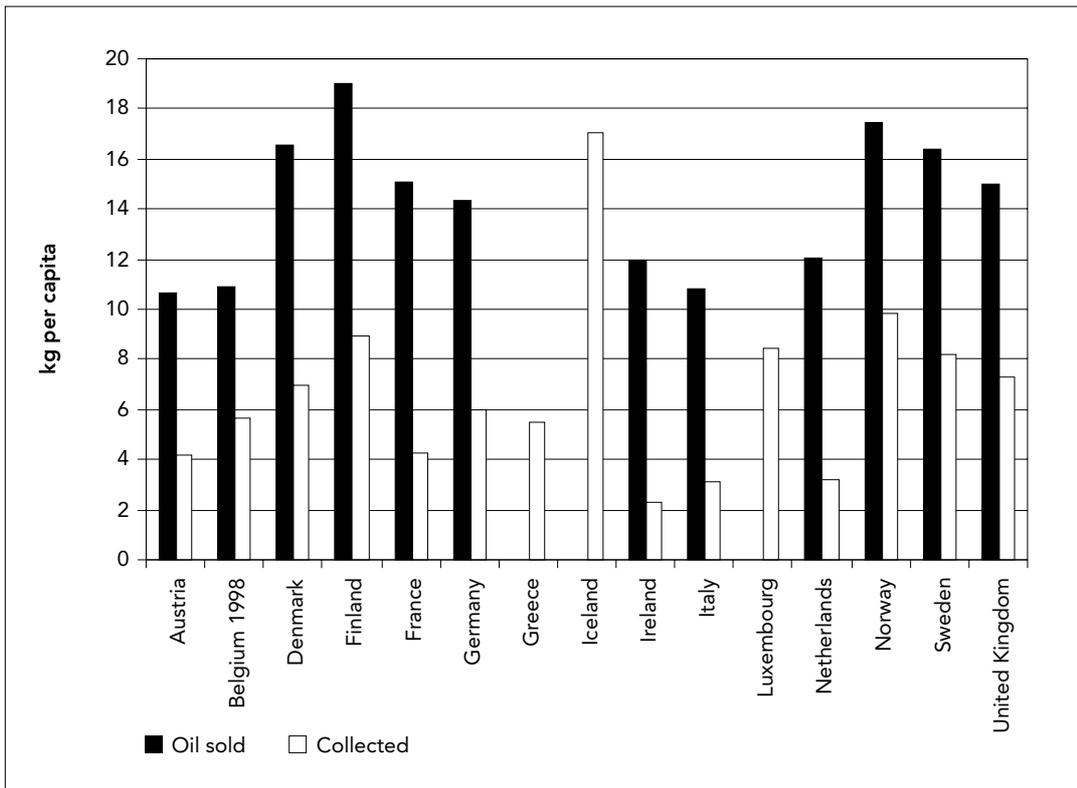


In Figures 12 and 13 sales and collection of waste oils are presented per country in total quantities and per capita.

The difference between countries in the quantities sold and collected or generated can be explained by the difference in the manufacturing industries, transport sector and number of cars/kilometres driven. Also the different sizes of international harbours in the countries could be considered, due to the fact that waste oils from ships are collected at harbours. To assess these matters more comprehensively, the quantities of waste oils sold, generated and collected should be related to specific economic sectors and indicators.

Oils sold and waste oils collected per country

Figure 12

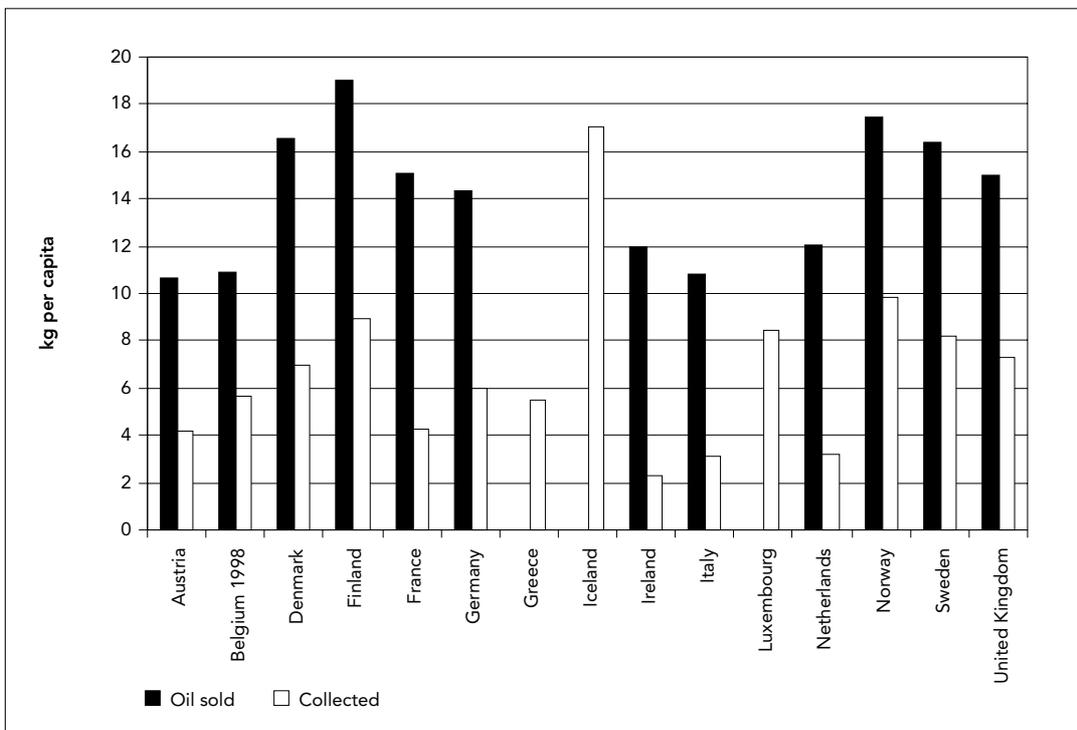


Source: European Commission, 10 January 2000, and ETC/W questionnaire.

Note: The figure on collection in Belgium only includes Flanders.

Oils sold and waste oils collected per country and capita

Figure 13



Source: European Commission, 10 January 2000, and ETC/W questionnaire.

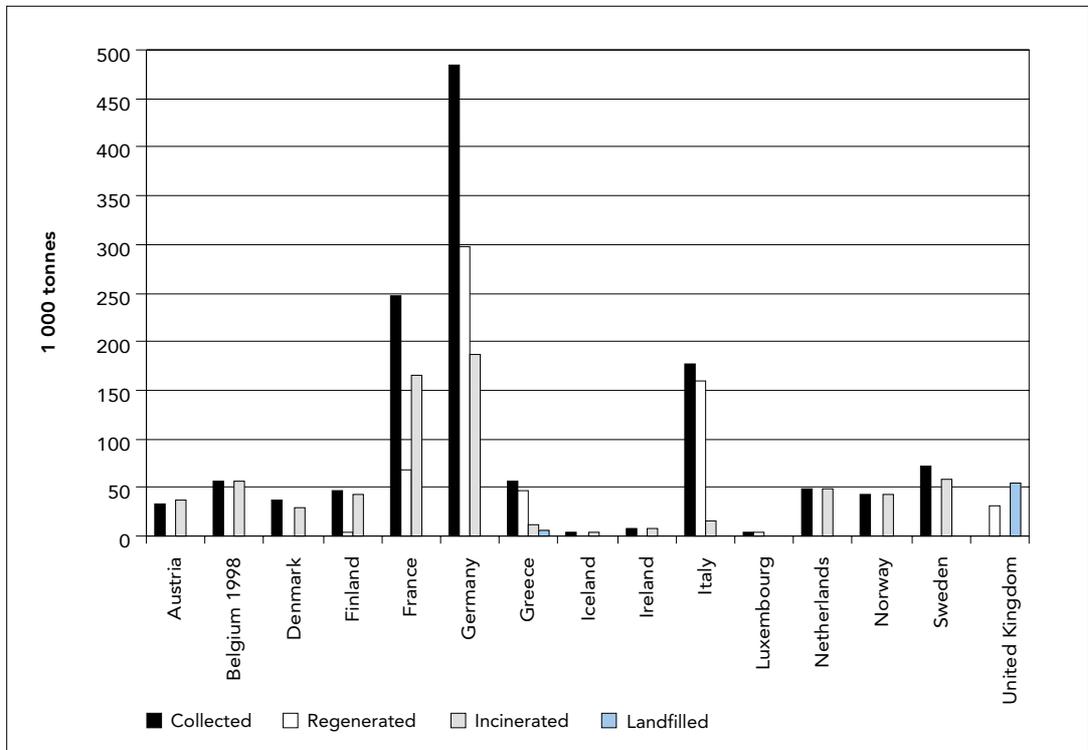
Note: The figure on collection in Belgium only includes Flanders

Figures 14 and 15 show the treatment of waste oils for each country in total quantities and per capita. In most of the countries nearly all waste oils collected are incinerated with little or no regeneration, while in Germany, Italy and Luxembourg most of the collected waste oils are

regenerated. However, the apparent low level of regeneration may be explained by lack of information on regeneration in the countries. The relatively high levels of collection per capita in Belgium and Iceland may be explained by the large harbours relative to number of inhabitants.

Figure 14 Treatment of waste oils per country (1997)

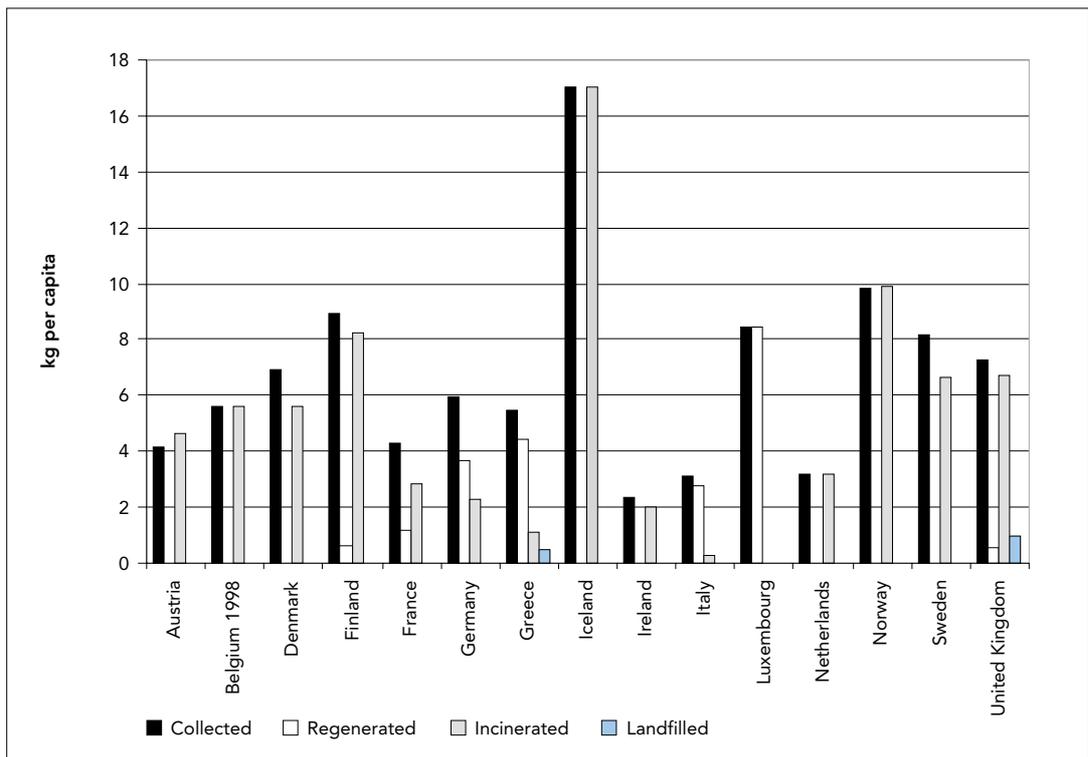
Source: European Commission, 10 January 2000, and ETC/W questionnaire.



Note: Figures for Belgium only include Flanders.

Figure 15 Treatment of waste oils per country and capita (1997)

Source: European Commission, 10 January 2000, and ETC/W questionnaire.



Note: Figures for Belgium only include Flanders.

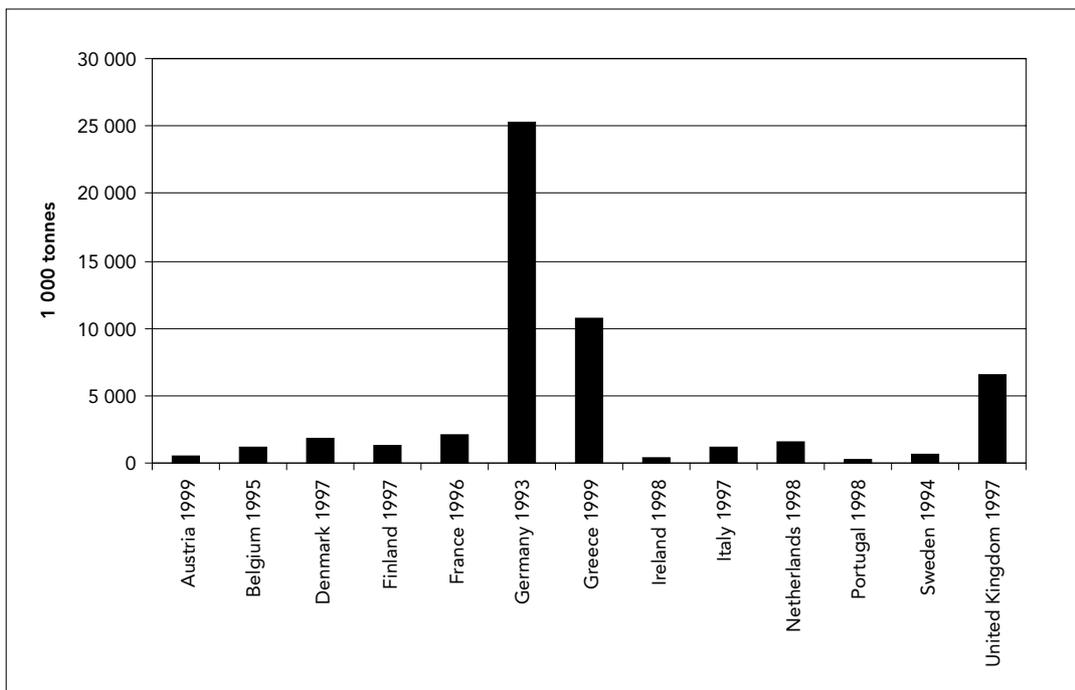
3.4. Waste from coal-fired power plants

Waste from coal-fired power stations represents a large part of total waste production in the EU. In countries with intensive exploitation of coal for energy generation this waste type is responsible for as much as 25 % of total waste produced. Residues from coal-fired power plants have a high potential for recycling. The ashes are widely used for construction purposes, while the residues from flue gas cleaning (gypsum) can be used in the production of gypsum products.

As shown in Figure 16, 13 countries supplied information on the production of waste from coal-fired power plants. It is not unexpected that Germany, as the largest country with large-scale exploitation of coal as energy source, has the largest waste quantities. However, Greece has the second largest waste amounts since lignite (brown coal) is used as the primary energy source in that country.

Quantities of waste from coal-fired power plants

Figure 16

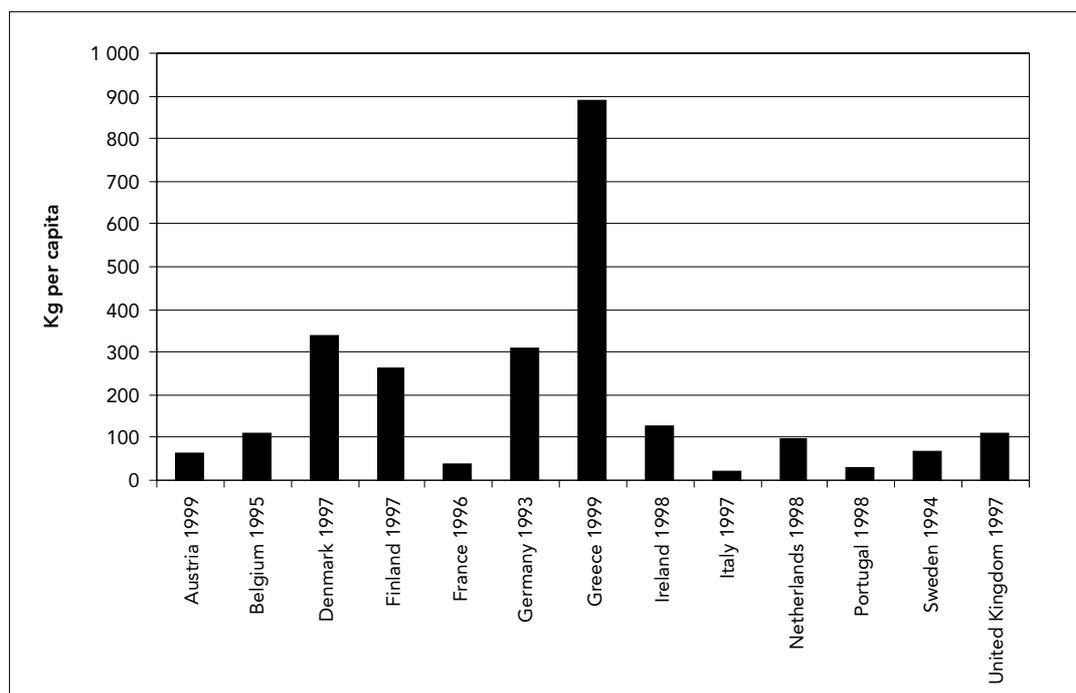


Source: OECD/Eurostat and ETC/W questionnaire.

Figure 17

Quantities of waste from coal-fired power plants per capita

Source: OECD/Eurostat and ETC/W questionnaire.



As shown in Figure 17 there are considerable differences between countries in waste generation from coal-fired power plants. These differences can be explained only by including detailed assessment of the exact situation in each country.

The dataset for waste from coal-fired power plants shows great differences between the countries when presented as waste generation per capita. However, it is possible to identify some of the factors which make the most important differences between countries and in that way explain the differences in waste quantities. The following factors influence the generation of waste from coal-fired power plants:

- Exploitation of different energy supply sources is probably the most important explanation of the national differences in waste generation from coal-fired power plants. In some countries coal is the most important source, while in other countries power generation is based primarily on hydropower (Norway), geothermal power (Iceland) or nuclear power (France).
- The need for energy is different due to differences in national industrial structure and energy consumption. For instance, the geographical position of the countries determines the needs for light and heating.
- The widespread use of district heating in some countries has led to an increase in combined heat and power production. On average, 10 % of the power in the EU is generated by combined heat and power, while the percentage in Denmark, the Netherlands and Finland is between 30 % and 55 %. The use of combined heat and power will mainly reduce the use of oil for single house heating, but lead to a slight increase in the use of fuels (for instance coal) for central heat production.
- Different types of coal generate different amounts of waste per produced energy unit: the use of lignite as primary energy source results in increased waste quantities (Greece).
- Residues from the gas cleaning are a minor part of the total waste from coal-fired power plants. However, the more effective the cleaning, the more waste will arise.

3.5. Biodegradable municipal waste

Biodegradable municipal waste (BMW) is organic waste from households and similar waste from other sources, typically food waste, garden waste, paper and cardboard, some textiles and wood waste.

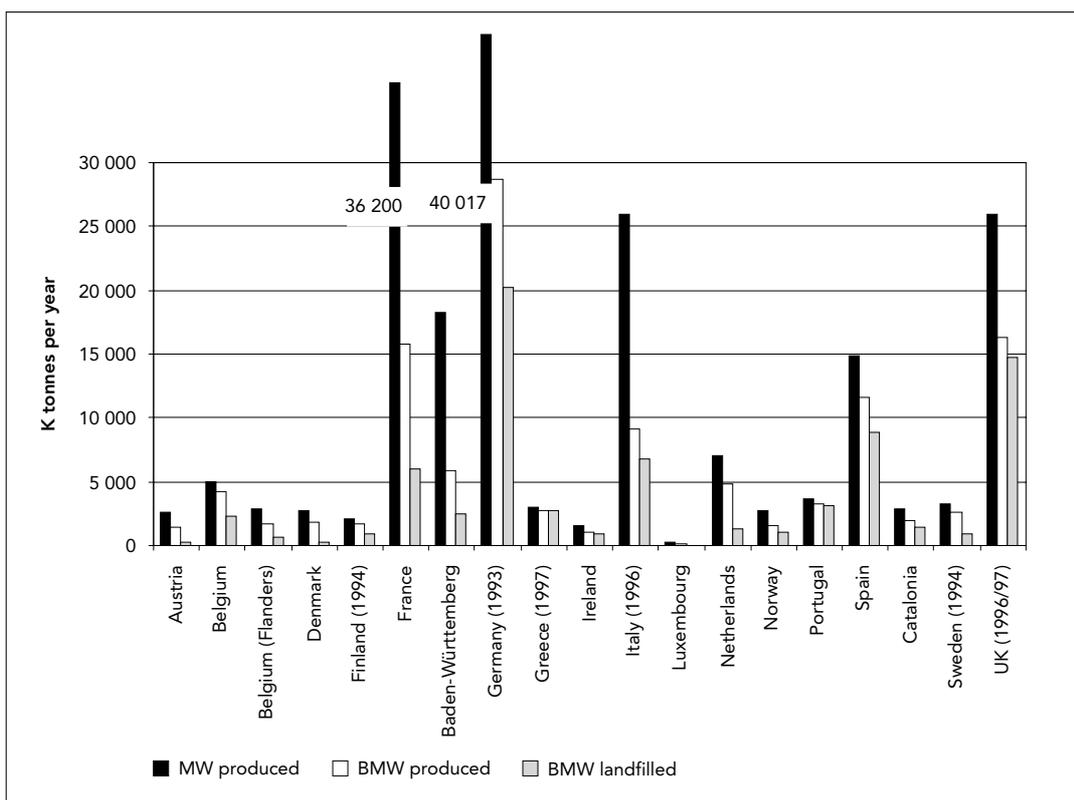
A dataset for BMW has been produced for the ETC/W study on the management of biodegradable municipal waste in Europe (topic report on *Biodegradable municipal waste management in Europe*, to be published). The principal objective of the study was to provide Europe-wide information on the current status of biodegradable municipal waste management and the various options available to reduce amounts going to landfill. The background for the study was the Landfill Directive, which places targets on Member States to reduce the quantities of biodegradable municipal waste going to landfill. To meet these targets, Member States are obliged to set up national strategies for the implementation of the reduction of biodegradable waste going to landfill.

The reference year against which the targets are to be measured is 1995 or the latest year before 1995 for which standardised Eurostat data is available. However, there is a problem with this approach since countries have not reported biodegradable municipal waste quantities for 1995 or earlier years. However, Eurostat has conducted a preliminary evaluation of its standardised data on household and municipal waste and has developed a set of figures for Member States. ETC/W, as a result of the surveys conducted for the project, has also developed baseline figures for each country where sufficient data was provided. Where a figure was not reported for 1995, the figure for the year closest to 1995 was chosen. Where a Member State supplied insufficient data, the Eurostat estimate was used.

Figure 18 provides an overview of the total tonnage of BMW in the various countries and regions in 1995 or the closest year. The large countries Germany, France, Italy, the United Kingdom, and Spain not surprisingly have the largest waste quantities. It is notable that the proportion of biodegradable municipal waste in most countries is about 2/3 of the total municipal waste amounts. Only in France, Italy and Baden-Württemberg the percentage is under 50 %.

Generation and landfilling of biodegradable municipal waste in selected countries and regions

Figure 18



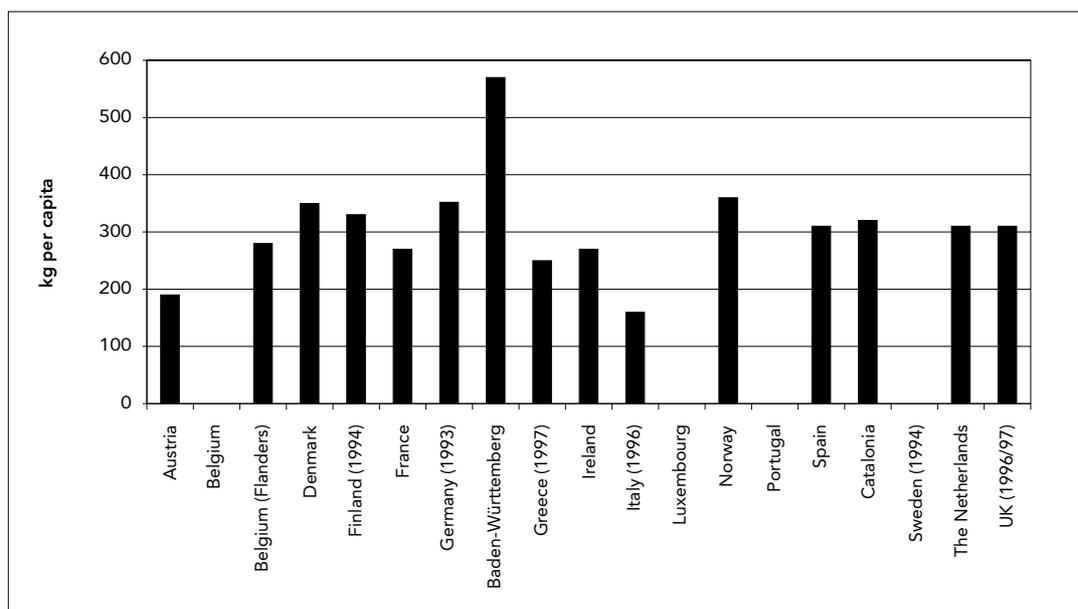
Source: OECD/Eurostat and ETC/W questionnaire.

Figure 19 shows the generation of BMW per capita. Per capita production ranges from 160 kg per person for Italy up to 570 kg per person for the German region of Baden-Württemberg ⁽²⁾. Per capita production of BMW is a key indicator for tracking progress towards the achievement of the Landfill Directive targets both at national and European level. Average production per capita for these countries is 300 ± 60 kg per annum indicating that apart from the abovementioned extreme examples, variations between different countries may not be so high. This is probably because biodegradable municipal waste in general is waste produced from the daily or routine activities of households and businesses that may not vary significantly from one country to another.

Figure 19

Biodegradable municipal waste generation per capita in selected countries and regions in 1995

Source: OECD/Eurostat and ETC/W questionnaire.



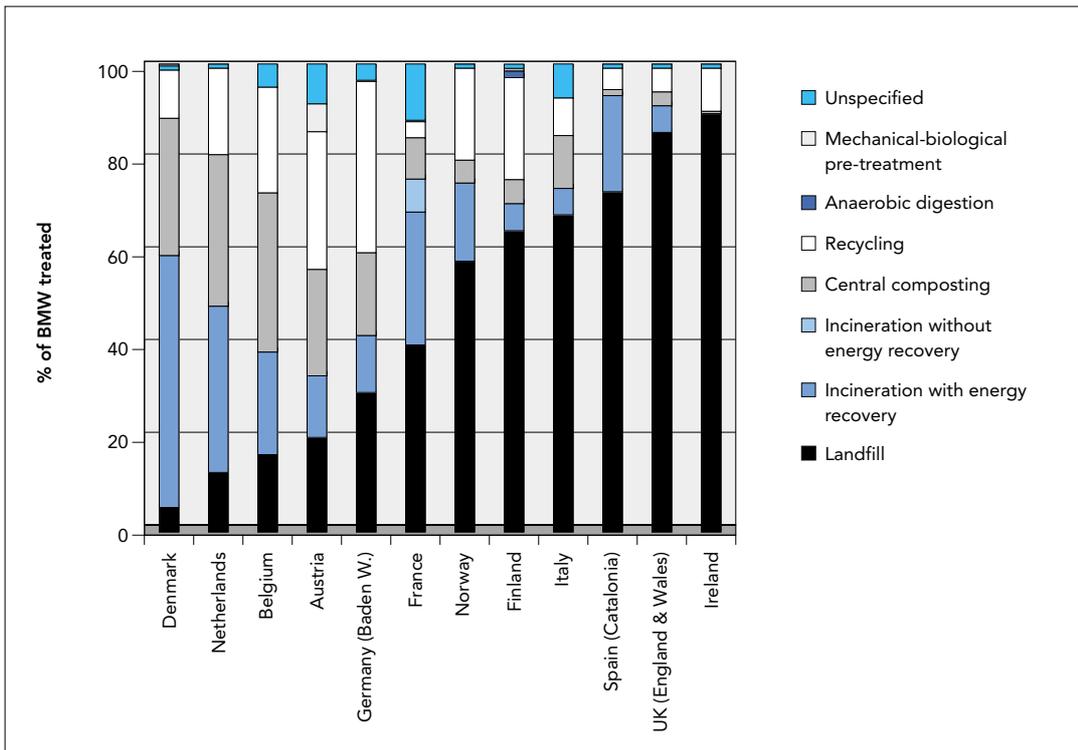
The management of BMW in countries and regions surveyed is summarised in Figure 20. The figure gives an indication of the range and extent of practices applied. For instance, countries such as Austria, Denmark, the Netherlands, the Flemish region of Belgium and Austria, which have low reliance on landfill, and employ a mixture of incineration, composting and recycling to treat BMW produced. Reliance on landfill for the treatment of BMW ranges from as low as 5 % in Denmark to over 80 % in the United Kingdom and Ireland.

The three principal routes for diverting BMW away from landfill are incineration with energy recovery, central composting and recycling. Countries and regions with low landfill rates for BMW tend to employ a mixture of incineration and central composting, along with recycling, mainly of paper.

(2) The reason for this large variation between countries may be that no common methodology exists for the estimation of the amounts of BMW generated. The most outstanding example is Baden-Württemberg, where the amount of mixed bagged waste and separate collection of paper and cardboard is around double that of other countries. This probably means that sources other than those normally contributing to municipal waste are also included.

Management of BMW in the countries and regions surveyed

Figure 20



Source: OECD/Eurostat and ETC/W questionnaire.

4. General findings

Based on the analysis of the data provided, the following conclusions can be drawn:

General conclusions

- Data on the five waste streams are generally available. However, there are large variations in data quality and reference years available.
- The comparability of the collected data is not very high. The variations in national waste generation are too large to be explained without further analysis of the specific conditions for data collection and the waste definitions in each country.
- Collection of data on specific waste streams is useful and should be continued. However, greater emphasis should be placed on the generation of harmonised and comparable datasets. The forthcoming adoption of an EU waste statistic regulation will improve the data availability and comparability considerably.

Specific conclusions

- Information on quantities and treatment of **sewage sludge** is comprehensive. Most countries have time series and projections for sewage sludge, due to the reporting obligations for the EU Directive on urban wastewater treatment. Recycling in terms of soil improvement appears to be the preferred treatment method in most countries. Variations in waste quantities between countries can be explained by different rates of development of wastewater treatment, which indicate that the data have a high degree of comparability.
- Some countries have extensive datasets for **construction and demolition waste** including time series and information on treatment methods used and the compositional breakdown of the waste stream. However, for the majority of countries only limited information is available (e.g. information on hazardous construction/demolition waste). Large variations in the amounts of waste per capita seem to be due to differences in definitions used and collection schemes employed and are unlikely to reflect real differences in the quantities produced.
- Information on collection and treatment of **waste oils** is available in most countries due to the reporting obligations of the Directive on waste oils. Large variations in waste quantities are most likely to indicate differences in industrial structures, waste collections systems, etc.
- Most countries have data on generation of **waste from coal-fired power plants**. However, information on treatment of this waste is very limited. Due to the use of different energy sources, different types of coal, etc. the quantities of waste from coal-fired power stations vary considerably between different countries.
- Nearly all countries have information on quantities of **biodegradable municipal waste** produced and its subsequent treatment. With a few exceptions, per capita production of biodegradable municipal waste is around 300 kg per capita per year in EEA member countries.

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Annex I: Sewage sludge

A 1

Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
Austria	1992	Total generation	190	23.6	1
Austria	1995	Total generation	190	23.6	1
Austria	1998	Total generation	211.9	26.4	7
Austria	2000	Total generation	196	24.4	1
Austria	2005	Total generation	195	24.2	1
Austria	1992	Total recycling	63	7.8	1
Austria	1995	Total recycling	63	7.8	1
Austria	1998	Total recycling	92.3	11.5	7
Austria	2000	Total recycling	68	8.5	1
Austria	2005	Total recycling	68	8.5	1
Austria	1992	Total incineration	66	8.2	1
Austria	1995	Total incineration	66	8.2	1
Austria	1998	Total incineration	68.4	8.5	7
Austria	2000	Total incineration	66	8.2	1
Austria	2005	Total incineration	65	8.1	1
Austria	1992	Total landfilling	58	7.2	1
Austria	1995	Total landfilling	58	7.2	1
Austria	1998	Total landfilling	35.4	4.4	7
Austria	2000	Total landfilling	58	7.2	1
Austria	2005	Total landfilling	58	7.2	1
Austria	1992	Not specified	3	0.4	1
Austria	1995	Not specified	3	0.4	1
Austria	1998	Not specified	42.5	5.3	7
Austria	2000	Not specified	4	0.5	1
Austria	2005	Not specified	4	0.5	1
Belgium	1992	Total generation	59	5.8	1
Belgium	1995	Total generation	78	7.7	1
Belgium	1998	Total generation	113	11.2	1
Belgium	2000	Total generation	131	12.9	1
Belgium	2005	Total generation	159	15.7	1
Belgium	1992	Total recycling	17	1.7	1
Belgium	1995	Total recycling	22	2.2	1
Belgium	1998	Total recycling	33	3.3	1
Belgium	2000	Total recycling	40	3.9	1
Belgium	2005	Total recycling	47	4.6	1
Belgium	1998	Total incineration	11	1.1	1
Belgium	2000	Total incineration	11	1.1	1
Belgium	2005	Total incineration	14	1.4	1
Belgium	1992	Total landfilling	34	3.4	1
Belgium	1995	Total landfilling	39	3.9	1
Belgium	1998	Total landfilling	37	3.7	1
Belgium	2000	Total landfilling	43	4.2	1

Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

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Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
Belgium	2005	Total landfilling	40	3.9	1
Belgium	1992	Not specified	8	0.8	1
Belgium	1995	Not specified	17	1.7	1
Belgium	1998	Not specified	32	3.2	1
Belgium	2000	Not specified	37	3.7	1
Belgium	2005	Not specified	58	5.7	1
Denmark	1992	Total generation	175	33.5	1
Denmark	1995	Total generation	185	35.4	1
Denmark	1998	Total generation	200	38.3	1
Denmark	2000	Total generation	200	38.3	1
Denmark	2005	Total generation	200	38.3	1
Denmark	1992	Total recycling	110	21.1	1
Denmark	1995	Total recycling	120	23.0	1
Denmark	1998	Total recycling	125	23.9	1
Denmark	2000	Total recycling	125	23.9	1
Denmark	2005	Total recycling	125	23.9	1
Denmark	1992	Total incineration	40	7.7	1
Denmark	1995	Total incineration	40	7.7	1
Denmark	1998	Total incineration	50	9.6	1
Denmark	2000	Total incineration	50	9.6	1
Denmark	2005	Total incineration	50	9.6	1
Denmark	1992	Total landfilling	25	4.8	1
Denmark	1995	Total landfilling	25	4.8	1
Denmark	1998	Total landfilling	25	4.8	1
Denmark	2000	Total landfilling	25	4.8	1
Denmark	2005	Total landfilling	25	4.8	1
Finland	1992	Total generation	150	29.7	6
Finland	1995	Total generation	158	30.9	1
Finland	1998	Total generation	158	30.6	6
Finland	2000	Total generation	150	29.4	1
Finland	2005	Total generation	160	31.3	1
Finland	1992	Total recycling	105	20.8	1, 6
Finland	1995	Total recycling	135.5	26.5	1, 6
Finland	1998	Total recycling	146	28.3	1, 6
Finland	2000	Total recycling	90	17.6	1
Finland	2005	Total recycling	115	22.5	1
Finland	1992	Total landfilling	45	12.3	1, 6
Finland	1995	Total landfilling	22.5	4.4	1, 6
Finland	1998	Total landfilling	14	2.7	1, 6
Finland	2000	Total landfilling	60	11.7	1
Finland	2005	Total landfilling	45	8.8	1
France	1992	Total generation	643	11.1	1
France	1995	Total generation	764	13.1	1
France	1998	Total generation	878	15.1	1
France	2000	Total generation	980	16.9	1
France	2005	Total generation	1 172	20.2	1
France	1992	Total recycling	402	6.9	1

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Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
France	1995	Total recycling	489	8.4	1
France	1998	Total recycling	572	9.8	1
France	2000	Total recycling	640	11.0	1
France	2005	Total recycling	765	13.2	1
France	1992	Total incineration	110	1.9	1
France	1995	Total incineration	161	2.8	1
France	1998	Total incineration	214	3.7	1
France	2000	Total incineration	269	4.6	1
France	2005	Total incineration	407	7.0	1
France	1992	Total landfilling	131	2.3	1
France	1995	Total landfilling	114	2.0	1
France	1998	Total landfilling	92	1.6	1
France	2000	Total landfilling	71	1.2	1
Germany	1992	Total generation	2 208	27.1	1
Germany	1995	Total generation	2 512	30.8	1
Germany	1998	Total generation	2 661	32.6	1
Germany	2000	Total generation	2 736	33.5	1
Germany	2005	Total generation	2 787	34.2	1
Germany	1992	Total recycling	1 018	12.5	1
Germany	1995	Total recycling	1 151	14.1	1
Germany	1998	Total recycling	1 270	15.6	1
Germany	2000	Total recycling	1 334	16.3	1
Germany	2005	Total recycling	1 391	17.0	1
Germany	1992	Total incineration	274	3.4	1
Germany	1995	Total incineration	411	5.0	1
Germany	1998	Total incineration	558	6.8	1
Germany	2000	Total incineration	732	9.0	1
Germany	2005	Total incineration	828	10.1	1
Germany	1992	Total landfilling	846	10.4	1
Germany	1995	Total landfilling	857	10.5	1
Germany	1998	Total landfilling	744	9.1	1
Germany	2000	Total landfilling	608	7.5	1
Germany	2005	Total landfilling	500	6.1	1
Germany	1992	Not specified	70	0.9	1
Germany	1995	Not specified	93	1.1	1
Germany	1998	Not specified	89	1.1	1
Germany	2000	Not specified	62	0.8	1
Germany	2005	Not specified	58	0.7	1
Greece	1992	Total generation	66	6.3	1
Greece	1995	Total generation	66	6.3	1
Greece	1998	Total generation	86	8.2	1
Greece	2000	Total generation	96	9.2	1
Greece	2005	Total generation	99	9.5	1
Greece	1992	Total recycling	1	0.1	1
Greece	1995	Total recycling	1	0.1	1
Greece	1998	Total recycling	4	0.4	1
Greece	2000	Total recycling	6	0.6	1

Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

A 1

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
Greece	2005	Total recycling	7	0.7	1
Greece	1992	Total landfilling	65	6.2	1
Greece	1995	Total landfilling	65	6.2	1
Greece	1998	Total landfilling	82	7.8	1
Greece	2000	Total landfilling	90	8.6	1
Greece	2005	Total landfilling	92	8.8	1
Ireland	1992	Total generation	37	10.4	1
Ireland	1995	Total generation	40	11.3	1
Ireland	1998	Total generation	43	12.1	1
Ireland	2000	Total generation	100	28.2	1
Ireland	2005	Total generation	113	31.9	1
Ireland	1992	Total recycling	4	1.1	1
Ireland	1995	Total recycling	7	2.0	1
Ireland	1998	Total recycling	24	6.8	1
Ireland	2000	Total recycling	65	18.3	1
Ireland	2005	Total recycling	84	23.7	1
Ireland	1992	Surface water	14	3.9	1
Ireland	1995	Surface water	15	4.2	1
Ireland	1992	Total landfilling	16	4.5	1
Ireland	1995	Total landfilling	14	3.9	1
Ireland	1998	Total landfilling	17	4.8	1
Ireland	2000	Total landfilling	35	9.9	1
Ireland	2005	Total landfilling	29	8.2	1
Ireland	1992	Not specified	3	0.8	1
Ireland	1995	Not specified	4	1.1	1
Ireland	1998	Not specified	1	0.3	1
Luxembourg	1992	Total generation	9	21.8	1
Luxembourg	1995	Total generation	10	24.2	1
Luxembourg	1998	Total generation	13	31.5	1
Luxembourg	2000	Total generation	13	31.5	1
Luxembourg	2005	Total generation	14	33.9	1
Luxembourg	1992	Total recycling	5	12.1	1
Luxembourg	1995	Total recycling	7	16.9	1
Luxembourg	1998	Total recycling	9	21.8	1
Luxembourg	2000	Total recycling	9	21.8	1
Luxembourg	2005	Total recycling	9	21.8	1
Luxembourg	1998	Total incineration	3	7.3	1
Luxembourg	2000	Total incineration	3	7.3	1
Luxembourg	2005	Total incineration	4	9.7	1
Luxembourg	1992	Total landfilling	4	9.7	1
Luxembourg	1995	Total landfilling	3	7.3	1
Luxembourg	1998	Total landfilling	1	2.4	1
Luxembourg	2000	Total landfilling	1	2.4	1
Luxembourg	2005	Total landfilling	1	2.4	1
Netherlands	1992	Total generation	324	20.9	1
Netherlands	1995	Total generation	362	23.4	2
Netherlands	1998	Total generation	349	22.5	2

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Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
Netherlands	2000	Total generation	401	25.9	1
Netherlands	2005	Total generation	401	25.9	1
Netherlands	1992	Total recycling	134	8.7	1
Netherlands	1995	Total recycling	80	5.2	2
Netherlands	1998	Total recycling	73	4.7	2
Netherlands	2000	Total recycling	110	7.1	1
Netherlands	2005	Total recycling	110	7.1	1
Netherlands	1992	Total incineration	12	0.8	1
Netherlands	1995	Total incineration	92	5.9	2
Netherlands	1998	Total incineration	172	11.1	2
Netherlands	2000	Total incineration	200	12.9	1
Netherlands	2005	Total incineration	200	12.9	1
Netherlands	1992	Total landfilling	177	11.4	1
Netherlands	1995	Total landfilling	180	11.6	2
Netherlands	1998	Total landfilling	104	6.7	2
Netherlands	2000	Total landfilling	68	4.4	1
Netherlands	2005	Total landfilling	68	4.4	1
Netherlands	1992	Not specified	1	0.1	1
Netherlands	1995	Not specified	0	0.0	2
Netherlands	1998	Not specified	0	0.0	2
Netherlands	2000	Not specified	23	1.5	1
Netherlands	2005	Not specified	23	1.5	1
Portugal	1992	Total generation	126	12.8	1
Portugal	1995	Total generation	147	15.0	1
Portugal	1998	Total generation	246	25.1	1
Portugal	2000	Total generation	348	35.5	1
Portugal	2005	Total generation	359	36.6	1
Portugal	1992	Total recycling	38	3.9	1
Portugal	1995	Total recycling	44	4.5	1
Portugal	1998	Total recycling	74	7.5	1
Portugal	2000	Total recycling	104	10.6	1
Portugal	2005	Total recycling	108	11.0	1
Portugal	1992	Total landfilling	75	7.6	1
Portugal	1995	Total landfilling	88	9.0	1
Portugal	1998	Total landfilling	147	15.0	1
Portugal	2000	Total landfilling	209	21.3	1
Portugal	2005	Total landfilling	215	21.9	1
Portugal	1992	Not specified	13	1.3	1
Portugal	1995	Not specified	15	1.5	1
Portugal	1998	Not specified	25	2.5	1
Portugal	2000	Not specified	35	3.6	1
Portugal	2005	Not specified	36	3.7	1
Spain	1992	Total generation	528	13.3	1
Spain	1995	Total generation	751	19.0	1
Spain	1998	Total generation	787	19.9	1
Spain	2000	Total generation	1 069	27.0	1
Spain	2005	Total generation	1 088	27.5	1

Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

A 1

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
Spain	1992	Total recycling	275	6.9	1
Spain	1995	Total recycling	390	9.8	1
Spain	1998	Total recycling	410	10.3	1
Spain	2000	Total recycling	578	14.6	1
Spain	2005	Total recycling	589	14.9	1
Spain	1992	Surface water	38	1.0	1
Spain	1995	Surface water	54	1.4	1
Spain	1998	Surface water	57	1.4	1
Spain	2000	Surface water	57	1.4	1
Spain	2005	Surface water	57	1.4	1
Spain	1992	Total incineration	35	0.9	1
Spain	1995	Total incineration	50	1.3	1
Spain	1998	Total incineration	52	1.3	1
Spain	2000	Total incineration	74	1.9	1
Spain	2005	Total incineration	75	1.9	1
Spain	1992	Total landfilling	180	4.5	1
Spain	1995	Total landfilling	257	6.5	1
Spain	1998	Total landfilling	268	6.8	1
Spain	2000	Total landfilling	360	9.1	1
Spain	2005	Total landfilling	367	9.3	1
Sweden	1992	Total generation	243	27.7	3
Sweden	1995	Total generation	236	26.9	3
Sweden	1995	Total recycling	120	13.7	3
Sweden	1995	Total landfilling	106	12.1	3
Sweden	1995	Not specified	11	1.3	3
United Kingdom	1992	Total generation	998	17.2	1
United Kingdom	1995	Total generation	1 158	19.9	1
United Kingdom	1998	Total generation	1 193	20.5	1
United Kingdom	2000	Total generation	1 407	24.2	4
United Kingdom	2005	Total generation	1 467	25.3	4
United Kingdom	1992	Total recycling	472	8.1	1
United Kingdom	1995	Total recycling	648	11.2	1
United Kingdom	1998	Total recycling	672	11.6	1
United Kingdom	2000	Total recycling	952	16.4	4
United Kingdom	2005	Total recycling	811	14.0	4
United Kingdom	1992	Surface water	282	4.9	1
United Kingdom	1995	Surface water	267	4.6	1
United Kingdom	1998	Surface water	240	4.1	1
United Kingdom	1992	Total incineration	90	1.5	1
United Kingdom	1995	Total incineration	110	1.9	1
United Kingdom	1998	Total incineration	144	2.5	1
United Kingdom	2000	Total incineration	262	4.5	4
United Kingdom	2005	Total incineration	315	5.4	4
United Kingdom	1992	Total landfilling	130	2.2	1
United Kingdom	1995	Total landfilling	114	2.0	1
United Kingdom	1998	Total landfilling	118	2.0	1
United Kingdom	2000	Total landfilling	63	1.1	4

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Generation, treatment and disposal of sludge from wastewater treatment, including projections for 2000 and 2005, cont.

Country	Year	Recovery/disposal	Quantity (1 000 tonnes dry matter)	Quantity (kg per capita)	Source
United Kingdom	2005	Total landfilling	56	1.0	4
United Kingdom	1992	Not specified	24	0.4	1
United Kingdom	1995	Not specified	19	0.3	1
United Kingdom	1998	Not specified	19	0.3	1
United Kingdom	2000	Not specified	130	2.2	4
United Kingdom	2005	Not specified	247	4.3	4
Norway	1993	Total generation	70	16.2	5
Norway	1994	Total generation	72	16.6	5
Norway	1995	Total generation	76	17.5	5
Norway	1996	Total generation	79	18.1	5
Norway	1997	Total generation	88	20.3	5
Norway	1998	Total generation	93	21.4	5
Norway	1993	Total recycling	49	11.3	5
Norway	1994	Total recycling	43	10.0	5
Norway	1995	Total recycling	51	11.7	5
Norway	1996	Total recycling	55	12.7	5
Norway	1997	Total recycling	55	12.8	5
Norway	1998	Total recycling	62	14.4	5
Norway	1993	Total landfilling	18	4.1	5
Norway	1994	Total landfilling	15	3.6	5
Norway	1995	Total landfilling	11	2.6	5
Norway	1996	Total landfilling	12	2.7	5
Norway	1997	Total landfilling	17	3.8	5
Norway	1998	Total landfilling	13	3.0	5
Norway	1993	Not specified	4	0.9	5
Norway	1994	Not specified	13	3.0	5
Norway	1995	Not specified	14	3.2	5
Norway	1996	Not specified	12	2.7	5
Norway	1997	Not specified	16	3.7	5
Norway	1998	Not specified	17	3.9	5

Sources:

1. Report on the implementation of Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment, as amended by Commission Directive 98/15/EC of 27 February 1998, 15 January 1999.
2. Letter to ETC/W from Huib Verhagen.
3. Statistics Sweden Na 22 SM 9701.
4. Letter from UK NRC to ETC/W 2000.
5. Sewage statistics, statistisk sentralbyrå, Norway.
6. Eurostat/OECD joint questionnaire 2000.
7. Letter to ETC/W from NRC Austria, 11 September 2001.

Contamination and content of sewage sludge as reported to the EU-Commission in mg/kg dry matter

A 2

Country	Year	Cd	Cr	Cu	Hg	Ni	Pb	Zn	N	P	Note
	86/278/EEC	20 – 40	-	1 000 – 1750	16 – 25	300 – 400	750 – 1 200	2 500 – 4 000			
Germany	1995	1.50	52	277	1.3	24	73	863	34 290	21 140	
	1996	1.5	52	273	1.2	23	67	831	35 460	21 930	
	1997	1.4	46	274	1	23	63	809	34 833	20 750	
Denmark	1995	1.5	34	298	1.4	25.7	72	878	40 500	31 000	
	1996	1.45	40.3	303.5	1.35	24.35	57.37	775.5	43 700	31 600	
	1997	1.31	24.8	250.3	1.11	18.4	50.4	678	43 775	30 230	
France	1995	5.3	80	334	2.7	39	133	921	40 000	45 000	
	1996	-	-	-	-	-	-	-	-	-	
	1997	2.9	58.8	309	3	31.9	106.7	754.2	40 000	45 000	
Finland	1995	1.3	82	283	1.6	41	47	575	28 000	20 000	
	1996	0.7	91	291	1.4	48	43	636	31 600	26 000	
	1997	1.04	84	290	1.3	34	39	606	32 000	28 000	
Ireland	1997	2.8	165	641	0.6	54	150	562	27 558	10 386	
Luxembourg	1995	-	-	-	-	-	-	-	-	-	
	1996	-	-	-	-	-	-	-	-	-	
	1995	1.6	37.7	517	1.8	19.6	52.4	638	36 000	30 600	
	1996	1.4	39	526	1.9	19	44	603	36 000	29 800	
	1997	-	-	-	-	-	-	-	-	-	
United Kingdom	1995	3.77	162	555	2.59	60	222	764	46 176	26 244	
	1996	3.3	157	568	2.4	57	221	792	43 395	22 394	
	1997	-	-	-	-	-	-	-	-	-	
Norway	1993	1.06	16	248	1.2	9	25.71	312	-	-	1
	1994	1	16	254	1.07	8	21	306.67	-	-	1
	1995	0.9	18	223.5	1.05	10	18.1	320.18	-	-	1
	1996	0.8	16	220.34	1.1	10	21.5	317.75	-	-	1
	1997	0.76	16	221	1.01	9	19.6	289	-	-	1
	1998	0.78	18	219.5	0.95	11	20	314.5	-	-	1
Greece	1997	1.5	840	295	4	85	325	2 580	3 500	18 000	2

Notes:

1. These figures are from sewage statistics, statistisk sentralbyrå, Norway.
2. These figures concern the sludge produced by the major sewage plant in Athens. The total sum is an approximation. The figures are not included in Directive 86/278/EEC.

Annex II: Construction and demolition waste

A 3 Total quantities of construction and demolition waste

Country	Year	Recovery/disposal text	Quantity (1 000 tonnes)	Quantity (kg per capita)	Source	Note
Austria	1995		21 907	2 722	1	
Austria	1996		25 392	3 155	2	
Austria	1999		7 500	930	18	I
Austria	1996	Total incineration	0	0	3	
Austria	1996	Total landfilling	3 330	414	3	
Austria	1999	Total recycling	5 130	630	18	I
Austria	1999	Total incineration	0	0	18	I
Austria	1999	Total landfilling	2 370	300	18	I
Belgium	1994		6 846	676	1	A
Denmark	1985		1 700	325	4	
Denmark	1994		2 433	466	5	
Denmark	1995		2 559	490	1	
Denmark	1996		3 088	591	5	
Denmark	1997		3 427	656	2	
Denmark	1985	Total recycling	100	19	4	
Denmark	1994	Total recycling	2 052	393	5	
Denmark	1995	Total recycling	2 173	416	5	
Denmark	1996	Total recycling	2 748	526	5	
Denmark	1985	Total incineration	100	19	5	
Denmark	1994	Total incineration	16	3	5	
Denmark	1995	Total incineration	18	3	5	
Denmark	1996	Total incineration	17	3	5	
Denmark	1985	Total landfilling	1 400	268	5	
Denmark	1994	Total landfilling	363	70	5	
Denmark	1995	Total landfilling	321	61	5	
Denmark	1996	Total landfilling	317	61	5	
Finland	1990		7 000	1 400	1	B
Finland	1995		7 800	1 524	6	B
Finland	1997		1 690	331	7	C
Finland	1997	Total recycling	500	98	7	
Finland	1997	Total incineration	300	59	7	
Finland	1997	Total landfilling	900	176	7	
France	1991		13 700	236	2	
France	1992		25 000	430	1	
Germany	1990		121 178	1 485	8	
Germany	1993		131 645	1 613	8	
Germany	1996		219 921	2 695	9	
Germany	1990	Total recycling	12 494	153	8	
Germany	1993	Total recycling	15 215	186	8	
Germany	1996	Total recycling	185 520	2 274	9	D
Germany	1996	Composting	557	7	9	E
Germany	1990	Total incineration	31	0	8	
Germany	1993	Total incineration	34	0	8	

Total quantities of construction and demolition waste, cont.

A 3

Country	Year	Recovery/disposal text	Quantity (1 000 tonnes)	Quantity (kg per capita)	Source	Note
Germany	1990	Total landfilling	38 456	471	8	
Germany	1993	Total landfilling	41 558	509	8	
Germany	1996	Total landfilling	32 861	403	9	
Greece	1991		1 718	164	10	
Greece	1996		1 809	173	2	
Ireland	1995		1 520	429	11	
Ireland	1998		2 705	763	12	
Ireland	1997	Total recycling	1 171	330	11	
Ireland	1997	Total landfilling	1 533	432	11	
Italy	1995		14 311	250	1	
Italy	1997		20 397	357	12	F
Italy	1997	Total recycling	8 713	152	13	
Italy	1997	Total landfilling	11 077	194	13	
Italy	1998	Other	600	10	13	
Luxembourg	1994		860	2 082	14	G
Luxembourg	1995		1 499	3 630	1	G
Luxembourg	1996		867	2 099	14	G
Luxembourg	1997		2 520	6 102	14	G
Luxembourg	1994	Total recycling	60	145	14	G
Luxembourg	1995	Total recycling	105	254	14	G
Luxembourg	1996	Total recycling	61	148	14	G
Luxembourg	1997	Total recycling	176	426	14	G
Luxembourg	1994	Total landfilling	800	1 937	14	G
Luxembourg	1995	Total landfilling	1 394	3 375	14	G
Luxembourg	1996	Total landfilling	806	1 952	14	G
Luxembourg	1997	Total landfilling	2 344	5 676	14	G
Netherlands	1985		12 230	790	15	
Netherlands	1995		13 700	885	16	
Netherlands	1996		13 650	882	16	
Netherlands	1985	Total recycling	6 050	391	15	
Netherlands	1995	Total recycling	12 550	811	16	
Netherlands	1996	Total recycling	13 100	846	16	
Netherlands	1985	Total incineration	6 075	392	15	
Netherlands	1995	Total incineration	1 000	65	16	
Netherlands	1996	Total incineration	1 050	68	16	
Netherlands	1985	Total landfilling	6 075	392	15	
Netherlands	1995	Total landfilling	1 000	65	16	
Netherlands	1996	Total landfilling	1 050	68	16	
Spain	1994		22 000	555	1	
Spain	1999		20 628	521	12	H
Spain	1997	Total recycling	1 030	26	17	
Spain	1997	Total landfilling	19 596	495	17	
Sweden	1993		3 300	376	1	
Sweden	1997	Total recycling	1 972	224	17	
United Kingdom	1990		70 000	1 205	1	
Norway	1993		3 578	62	1	

Sources:

1. OECD environmental data compendium 1997.
2. OECD/Eurostat (provisional 1998-questionnaire).
3. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact.
4. Waste in Denmark 1994, Danish EPA 1996.
5. Waste statistics 1996, Danish EPA.
6. Finnish National Waste Plan, 1998 and letter of 7 August 1998 to the EEA from Juhani Puolanne, Finnish Environment Institute.
7. Letter to ETC/W from NRC Finland, 24 November 2000.
8. Estimations of Statistisches Bundesamt, Germany (Letter of 15 October 1998 from the Federal Environment Agency, Germany to the EEA).
9. 'Arbeitsgemeinschaft Kreislaufwirtschaftsträger Bau, Monitoring – Bericht Bauabfälle, 20 March 2000.
10. Letter from the Greek NRC concerning construction and demolition waste in Greece.
11. National waste database, 1995 (Irish, EPA).
12. OECD/Eurostat joint questionnaire (February 2000) and the Irish national waste database report for 1998.
13. Estimated values, Italian National Environmental Agency.
14. Administration de l'Environnement, Luxembourg and letter to the EEA from Julia Georgi, EPA Luxembourg (7 August 1998).
15. Waste in the Netherlands, Ministry of Housing, Spatial Planning and Environment, 1997 and telephone conversation with Loek Bergman from the ministry, 24 June 1998.
16. RIVM (Letter to the EEA from Huib Verhagen, 10 August 1998).
17. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact and Subdirección General del Calidad Ambiental.
18. Letter to ETC/W from NRC Austria, 11 September 2001.

Notes:

- A. Data from Brussels are from 1992. Data for the other regions in Belgium are from 1994.
- B. 80 % is surplus soil.
- C. 1 690 000 tonnes is construction and demolition waste (=1 320 000 tonnes from building + 370 000 tonnes from civil engineering works), excluding excess soils. The amount for excess soils from construction and demolition sites (building) was 8 500 000 tonnes in 1997; the amount for excess soils from civil engineering works was 25 000 000 tonnes => total construction and demolition waste including excess soils was 35 190 000 tonnes.
- D. The figure includes recycling (71 490 000 tonnes), recovery in the surface mining industry (reuse) (68 210 000 tonnes) and recovery by local authorities (this material is primarily used in different kinds of road related constructions) (45 820 000 tonnes).
- E. The figure also includes 'Sonstige Behandlungsanlagen' (other treatment facilities). This is not hazardous waste treatment. It is soil treatment plants, composting facilities, etc.
- F. Construction and demolition waste excluding soil, stones and road plannings. Estimated values, by the National Environmental Agency. Total amount generated includes 26 600 000 tonnes of municipal waste.
- G. The amounts represent construction waste disposed from regional centres for inert waste.
- H. Estimaciones que se adoptan en el borrador del Plan Nacional de Residuos.
- I. Does not include excavated soils.

Recycling of specific fractions of construction and demolition waste

A 4

Country	Year	Fractions	Recovery/ disposal	Total quantity (1 000 tonnes)	Quantity (kg per capita)	Source	Note
Austria	1996	Concrete, brick, tiles, etc.	Generation	3 600	447.4	1	
Austria	1996	Concrete, brick, tiles, etc.	Total recycling	1 800	223.7	1	
Austria	1996	Concrete, brick, tiles, etc.	Landfill	1 800	223.7	1	
Austria	1999	Concrete, brick, tiles, etc.	Generation	5 000	620	8	
Austria	1999	Concrete, brick, tiles, etc.	Total recycling	4 000	500	8	
Austria	1999	Concrete, brick, tiles, etc.	Landfill	1 000	120	8	
Austria	1999	Mixed and other	Generation	1 100	140	8	
Austria	1999	Mixed and other	Total recycling	0	0	8	
Austria	1999	Mixed and other	Landfill	1 100	140	8	
Austria	1996	Mixed and other	Generation	1 100	136.7	1	
Austria	1996	Mixed and other	Total recycling	165	20.5	1	
Austria	1996	Mixed and other	Landfill	935	116.2	1	
Belgium	1990s	Wood	Generation	110	10.9	1	
Belgium	1990s	Wood	Incineration	61	6.0	1	
Belgium	1990s	Plastics	Generation	10	1.0	1	
Belgium	1990s	Plastics	Total recycling	1	0.1	1	
Belgium	1990s	Plastics	Incineration	6	0.6	1	
Belgium	1990s	Metals	Generation	10	1.0	1	
Belgium	1990s	Metals	Total recycling	9	0.9	1	
Belgium	1990s	Mixed and other	Generation	21	2.1	1	
Denmark	1996	Concrete, brick, tiles, etc.	Generation	1 800	344.6	2	
Denmark	1996	Concrete, brick, tiles, etc.	Total recycling	1 764	337.7	2	
Denmark	1996	Concrete, brick, tiles, etc.	Landfill	36	6.9	2	
Denmark	1996	Wood	Generation	200	38.3	2	
Denmark	1996	Wood	Total recycling	120	23.0	2	
Denmark	1996	Wood	Incineration	30	5.7	2	
Denmark	1996	Wood	Landfill	50	9.6	2	
Denmark	1996	Glass	Generation	50	9.6	2	
Denmark	1996	Glass	Total recycling	28	5.4	2	
Denmark	1996	Glass	Landfill	23	4.4	2	
Denmark	1996	Plastics	Generation	10	1.9	2	
Denmark	1996	Plastics	Total recycling	2	0.4	2	
Denmark	1996	Plastics	Incineration	3	0.6	2	
Denmark	1996	Plastics	Landfill	5	1.0	2	
Denmark	1996	Metals	Generation	160	30.6	2	
Denmark	1996	Metals	Total recycling	157	30.1	2	
Denmark	1996	Metals	Landfill	3	0.6	2	
Denmark	1996	Insulation	Generation	50	9.6	2	
Denmark	1996	Insulation	Total recycling	35	6.7	2	
Denmark	1996	Insulation	Landfill	15	2.9	2	
Denmark	1996	Mixed and other	Generation	370	70.8	2	
Denmark	1996	Mixed and other	Incineration	37	7.1	2	
Denmark	1996	Mixed and other	Landfill	333	63.8	2	
Germany	1994	Concrete, brick, tiles, etc.	Generation	45 000	551.5	1	
Germany	1996	Concrete, brick, tiles, etc.	Generation	58 100	712.1	3	A
Germany	1994	Concrete, brick, tiles, etc.	Total recycling	8 100	99.3	1	
Germany	1996	Concrete, brick, tiles, etc.	Total recycling	50 490	618.8	3	A
Germany	1994	Concrete, brick, tiles, etc.	Landfill	36 900	452.2	1	

A 4		Recycling of specific fractions of construction and demolition waste, cont.					
Country	Year	Fractions	Recovery/ disposal	Total quantity (1 000 tonnes)	Quantity (kg per capita)	Source	Note
Germany	1996	Concrete, brick, tiles, etc.	Landfill	7 490	91.8	3	A
Germany	1996	Wood	Generation	1 000	12.3	3	
Finland	1997	Concrete, brick, tiles, etc.	Generation	440	86.2	1	
Finland	1997	Concrete, brick, tiles, etc.	Total recycling	352	68.9	4	
Finland	1997	Concrete, brick, tiles, etc.	Landfill	88	17.2	4	
Finland	1997	Wood	Generation	520	101.8	4	
Finland	1997	Wood	Total recycling	47	9.2	4	
Finland	1997	Wood	Incineration	359	70.3	4	
Finland	1997	Wood	Landfill	114	22.4	4	
Finland	1997	Metals	Generation	200	39.2	4	
Finland	1997	Metals	Total recycling	162	31.7	4	
Finland	1997	Metals	Landfill	38	7.4	4	
Finland	1997	Insulation	Generation	10	2.0	4	
Finland	1997	Insulation	Total recycling	6	1.1	4	
Finland	1997	Insulation	Landfill	5	0.9	4	
Finland	1997	Mixed and other	Generation	170	33.3	4	
Finland	1997	Mixed and other	Incineration	14	2.7	4	
Finland	1997	Mixed and other	Landfill	156	30.6	4	
Spain	1997	Wood	Generation	561	158.2	5	
Spain	1997	Wood	Total recycling	17	0.4	5	
Spain	1997	Glass	Generation	14	0.4	5	
Spain	1997	Plastics	Generation	52	1.3	5	
Spain	1997	Plastics	Total recycling	1	0.0	5	
Spain	1997	Metals	Generation	200	5.0	5	
Spain	1997	Metals	Total recycling	4	0.1	5	
Ireland	1995	Concrete, brick, tiles, etc.	Generation	390	9.8	6	
Ireland	1995	Concrete, brick, tiles, etc.	Total recycling	20	0.5	6	
Ireland	1995	Concrete, brick, tiles, etc.	Landfill	371	9.4	6	
Ireland	1995	Wood	Generation	10	0.3	6	
Ireland	1995	Wood	Landfill	10	0.3	6	
Ireland	1995	Glass	Generation	10	0.3	6	
Ireland	1995	Glass	Landfill	10	0.3	6	
Ireland	1995	Metals	Generation	10	0.3	6	
Ireland	1995	Metals	Landfill	10	0.3	6	
Ireland	1995	Mixed and other	Generation	150	3.8	6	
Ireland	1995	Mixed and other	Landfill	150	3.8	6	
Netherlands	1996	Concrete, brick, tiles, etc.	Generation	10 300	665.3	7	
Netherlands	1996	Concrete, brick, tiles, etc.	Total recycling	9 579	618.7	7	
Netherlands	1996	Concrete, brick, tiles, etc.	Landfill	721	46.6	7	
Netherlands	1996	Wood	Generation	260	16.8	7	
Netherlands	1996	Wood	Total recycling	130	8.4	7	
Netherlands	1996	Wood	Incineration	26	1.7	7	
Netherlands	1996	Wood	Landfill	104	6.7	7	
Netherlands	1996	Plastics	Generation	40	2.6	7	
Netherlands	1996	Plastics	Total recycling	2	0.1	7	
Netherlands	1996	Plastics	Incineration	5	0.3	7	
Netherlands	1996	Plastics	Landfill	33	2.1	7	
Netherlands	1996	Metals	Generation	180	11.6	7	

Recycling of specific fractions of construction and demolition waste, cont.

A 4

Country	Year	Fractions	Recovery/ disposal	Total quantity (1 000 tonnes)	Quantity (kg per capita)	Source	Note
Netherlands	1996	Metals	Total recycling	180	11.6	7	
Netherlands	1996	Mixed and other	Generation	220	14.2	7	
Netherlands	1996	Mixed and other	Landfill	220	14.2	7	
Sweden	1996	Concrete, brick, tiles, etc.	Generation	1 120	127.4	1	
Sweden	1996	Concrete, brick, tiles, etc.	Total recycling	224	25.5	1	
Sweden	1996	Concrete, brick, tiles, etc.	Landfill	896	102.0	1	
Sweden	1996	Wood	Generation	390	44.4	1	
Sweden	1996	Wood	Total recycling	20	2.3	1	
Sweden	1996	Wood	Incineration	293	33.3	1	
Sweden	1996	Wood	Landfill	78	8.9	1	
Sweden	1996	Glass	Generation	10	1.1	1	
Sweden	1996	Glass	Total recycling	4	0.5	1	
Sweden	1996	Glass	Landfill	7	0.8	1	
Sweden	1996	Metals	Generation	150	17.1	1	
Sweden	1996	Metals	Total recycling	105	11.9	1	
Sweden	1996	Metals	Landfill	45	5.1	1	
Sweden	1996	Insulation	Generation	20	2.3	1	
Sweden	1996	Insulation	Landfill	20	2.3	1	

Sources:

1. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact.
2. Waste statistics 1996, Danish EPA.
3. 'Arbeitsgemeinschaft Kreislaufwirtschaftsträger Bau, Monitoring – Bericht Bauabfälle, 20 March 2000. UBA, Deutschland. Monitoring-Bericht: Bauabfälle. March 2000.
4. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact and letter from the Finnish NRC.
5. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact and Subdirección General del Calidad Ambiental.
6. National waste database report 1995, Irish EPA 1996.
7. European Commission DG XI.E.3; Construction and demolition waste management practices and their economic impact and RIVM (Letter to the ETC/W from Huib Verhagen, 2000).
8. Letter to ETC/W from NRC Austria, 11 September 2001.

Notes:

- A. The figure includes insulation-material (Steinwolle).

Generation and treatment/disposal of hazardous waste. Total and by sector.

A 5

Country	Year	Sector generating hazardous waste	Recovery/ disposal text	Quantity (tonnes)	Source
Austria	1990	Total		317 000	1
Austria	1996	Construction and demolition		8 402	2
Denmark	1996	Construction and demolition		8 383	2
Germany	1993	Construction and demolition		490 000	2
Ireland	1996	Construction and demolition	Excluding recovery on-site	159	2
Ireland	1996	Construction and demolition	Including recovery on-site	159	2
Spain/Catalonia	1996	Construction and demolition		1 855	2

Sources:

1. EPA, Austria 020698.
2. ETC/W.

Annex III: Waste oils

A 6 Sale, generation, collection and treatment of waste oils. Total quantities (1 000 tonnes)

Country/year	Total oil sold	Total waste oils generated, of which	Collected	Incinerated	Land-filled	Regenerated	Source	Note
1991								
France				56.1		110.9	1	
1992								
France				64		87.6	1	
1993								
France				107.2		86.3		
1994							1	
France				118.3		79.1		
1995							1	
Austria	86	45	39.500	41.8			2	
Belgium			186.5	186		0.5	2	A
Denmark	79.2		41.1	32	0	0	2	C
France	858.3	386	223.5	121.7		92.1	4	E
Germany	1 170.5	770.2	518	184	0	334	2	H
Greece	120	60	5	0	0	5	2	I
Iceland			4.6	4.6			5	
Ireland	40.5	13.2	7.2	6.1			2	J
Italy	625	208	180	30	0	150	2	I
Luxembourg		2.2	2.2	0.2	0.004	2.2	2	K
Netherlands	210	85	37	37			2	
Norway	72.3	41.5	41.5	36.8	0	0	7	
Portugal	98	45	35	13	0	0	8	IL
Spain	500	250	110	65	0	35	2	I
Sweden	144		72	58.5			2	M
United Kingdom	895	492.3	422	390	70.25	32	2	N
1996								
Austria	86	45	38	38.5			2	
Belgium			173.1	172.6		0.5	2	A
Denmark	79		37.7	29.5	0	0	2	C
France	860.1	368.2	235.2	136.8		89.7	4	F
Germany	1 128.5	735.5	510	187	0	323	2	H
Iceland			5.5	5.5			5	
Ireland	42.1	14.0	7.9	6.6			2	J
Italy	614		172	14		156	6	
Luxembourg		2.7	2.7	0.3	0	2.4	2	K
Netherlands	228	85	52	52			2	
Norway	73.4	41.1	41.1	35.3	0	0	7	
Portugal	96		42			0	8	
Sweden	144		72	58.5			2	M
United Kingdom	864.3	471.6	422	390	49.55	32	2	N
1997								
Austria	86	45	33.7	37.4			2	

Sale, generation, collection and treatment of waste oils. Total quantities (1 000 tonnes), cont.

A 6

Country/year	Total oil sold	Total waste oils generated, of which	Collected	Incinerated	Land-filled	Regenerated	Source	Note
Belgium		223	202.5	202		0.5	2	A
Denmark	86.4		36.3	29.3	0	0	2	C
Finland	97	50	45.8	41.9	0	3.4	9	
France	874.6	373	247.7	165.1		67.8	4	G
Germany	1 168	760.3	485	187	0	298	2	H
Iceland			4.6	4.6			5	
Ireland	42.3	14.13	8.3	7.2			2	J
Italy	620	392	177	15		159	6	
Luxembourg		3.5	3.5	0	0	3.5	2	K
Netherlands	187	85	49	49			2	
Norway	75.8	42.647	42.6	43	0	0	7	
Portugal						0	8	
Sweden	144		72	58.5			2	M
United Kingdom	872.4	476.6	422	390	54.6	32	2	N
1998								
Belgium	110.2	56.9	56.9	56.9	0	0	3	B
France			245.183	156.8		81.7	1	
Iceland			5.157	5.2			5	
Italy	640		184	11		171	6	
Norway	79.9	43.1	43.1	50.8	0	0	7	
1999								
Belgium	120.9						3	
France			247.7	162.1		81.4	1	
Iceland			6.2	6.187			5	
Norway	74.1	42.9	42.9		0	0	7	
2000								
Belgium	107.1						3	

Sources:

1. ADEME-report: Collecte et elimination des huiles usees en 1999.
2. Report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation. Directive 75/439/EEC on waste oils for the period 1995–97.
3. Letter to ETC/W from Lore Mariën, 31 October 2001.
4. ADEME-report: Collecte et elimination des huiles usees en 1999 and report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation. Directive 75/439/EEC on waste oils for the period 1995–97.
5. Letter to ETC/W from Cees Meyles, Environmental and Food Agency of Iceland, 11 August 2000.
6. Primo rapporto sui rifiuti speciali, ANPA 1999 — Consorzio Obbligatorio degli Oli Usati, 1999.
7. Letter from NORSAS, 18 August 2000, to ETC/W.
8. Letter from Instituto dos Resíduos, Portugal to ETC/W, 5 September 2000 and report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation. Directive 75/439/EEC on waste oils for the period 1995–97.
9. Letter to ETC/W from NRC Finland, 24 November 2000.

Notes:

- A. Data include Flanders and Wallonia but not Brussels.
- B. Figures on sold oil is for all Belgium while the other figures only include Flanders.
- C. Total oil sold is oil including water and quantity incinerated is an estimated calculation as pure oil.
- D. Waste oil landfilled is a temporary storage.
- E. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995–97 the amount of waste oil regenerated is 110 729 tonnes and the amount of waste oil incinerated is 124 196 tonnes.
- F. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995–97 the amount collected is 236 700 tonnes, the amount regenerated is 104 917 tonnes and the amount incinerated is 140 040 tonnes.
- G. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995–97 the amount collected is 242 000 tonnes, the amount regenerated is 80 813 tonnes and the amount incinerated is 168 571 tonnes.

- H. Waste oils will only be stored in very small amounts.
 I. Economics of waste oils regeneration, Coopers & Lybrand, The Hague, 29 January 1997. The figures cover the year 1994–95.
 J. For conversion from m³ to tonne, oil density of 0,9 tonne/m³ was used.
 K. Luxembourg exported all waste oils for regeneration.
 L. According to the report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation, Directive 75/439/EEC on waste oils for the period 1995–97, the amount of oil collected is 13 000 tonnes and the total amount sold is 89 000 tonnes.
 M. For total oil sold a conversion from m³ to tonne, oil density 0,9 tonne/m³ was used and the other waste quantities are estimates.
 N. The total amount of waste oil generated is an estimate and regarding incineration waste oil is combusted after treatment.

A 7

Sale, generation, collection and treatment of waste oils. Quantities per capita (kg)

Country/year	Total oil sold	Total waste oils generated, of which	Collected	Incinerated	Land-filled	Regenerated	Source	Note
1991								
France				1.0		1.9	1	
1992								
France				1.1		1.5	1	
1993								
France				1.8		1.5	1	
1994								
France				2.0		1.4	1	
1995								
Austria	10.7	5.6	4.9	5.2			2	
Belgium		0.0	18.4	18.4		0.0	2	A
Denmark	15.2		7.9	6.1	0.0	0.0	2	C
France	14.8	6.6	3.8	2.1		1.6	4	E
Germany	14.3	9.4	6.3	2.3	0.0	4.1	2	H
Greece	11.5	5.7	0.5	0.0	0.0	0.5	2	I
Iceland			17.1	17.1			5	
Ireland	11.4	3.7	2.0	1.7			2	J
Italy	10.9	3.6	3.1	0.5	0.0	2.6	2	I
Luxembourg		5.4	5.4	0.5	0.0	5.4	2	K
Netherlands	13.6	5.5	2.4	2.4			2	
Norway	7.4	9.6	9.6	8.5	0.0	0.0	7	
Portugal	10.0	4.6	3.6	1.3	0.0	0.0	8	IL
Spain	12.6	6.3	2.8	1.6	0.0	0.9	2	I
Sweden	16.4		8.2	6.7			2	M
United Kingdom	15.4	8.5	7.3	6.7	1.2	0.6	2	N
1996								
Austria	10.7	5.6	4.7	4.8			2	
Belgium	0.0		17.1	17.0		0.0	2	A
Denmark	15.1		7.2	5.7	0.0	0.0	2	C
France	14.8	6.3	4.0	2.4		1.5	4	F
Germany	13.8	9.0	6.3	2.3	0.0	4.0	2	H
Iceland	0.0		20.5	20.5			5	
Ireland	11.9	4.0	2.2	1.9			2	J
Italy	10.7		3.0	0.2		2.7	6	
Luxembourg	0.0	6.6	6.6	0.6	0.0	5.9	2	K
Netherlands	14.7	5.5	3.4	3.4			2	
Norway	16.9	9.5	9.5	8.2	0.0	0.0	7	
Portugal	9.8		4.3			0.0	8	

Sale, generation, collection and treatment of waste oils. Quantities per capita (kg), cont.

A 7

Country/year	Total oil sold	Total waste oils generated, of which	Collected	Incinerated	Land-filled	Regenerated	Source	Note
Sweden	16.4		8.2	6.7			2	M
United Kingdom	14.9	8.1	7.3	6.7	0.9	0.6	2	N
1997								
Austria	10.7	5.6	4.2	4.6			2	
Belgium	0.0	22.7	20.0	19.9		0.0	2	A
Denmark	16.5		7.0	5.6	0.0	0.0	2	C
Finland	19.0	9.8	8.9	8.2	0.0	0.6	9	
France	15.1	6.4	4.3	2.8		1.2	4	G
Germany	14.3	9.3	5.9	2.3	0.0	3.7	2	H
Iceland	0.0		17.0	17.0			5	
Ireland	11.9	4.0	2.3	2.0			2	J
Italy	10.8	6.9	3.1	0.3		2.8	6	
Luxembourg	0.0	8.4	8.4	0.0	0.0	8.4	2	K
Netherlands	12.1	5.5	3.2	3.2			2	
Norway	17.5	9.8	9.8	9.9	0.0	0.0	7	
Portugal						0.0	8	
Sweden	16.4		8.2	6.7	0.0	0.0	2	M
United Kingdom	15.0	8.2	7.3	6.7	0.9	0.6	2	N
1998								
Belgium		19.9	18.9	0.8	0.2		3	B
France			4.2	2.7		1.4	1	
Iceland			19.2	19.2			5	
Italy	11.2		3.2	0.2		3.0	6	
Norway	18.4	9.9	9.9	11.7	0.0	0.0	7	
1999								
France			4.3	2.8		1.4	1	
Iceland			23.0	23.0			5	
Norway	17.1	9.9	9.9		0.0	0.0	7	

Sources:

1. ADEME-report: Collecte et elimination des huiles usees en 1999.
2. Report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation. Directive 75/439/EEC on waste oils for the period 1995-97.
3. Letter to ETC/W from Mike Van Acoleyen OVAM, 14 July 2000.
4. ADEME-report: Collecte et elimination des huiles usees en 1999 and report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation, Directive 75/439/EEC on waste oils for the period 1995-97.
5. Letter to ETC/W from Cees Meyles, Environmental and Food Agency of Iceland, 11 August 2000.
6. Primo rapporto sui rifiuti speciali', ANPA 1999 — Consorzio Obbligatorio degli Oli Usati, 1999.
7. Letter from NORSAS, 18 August 2000, to ETC/W.
8. Letter from Instituto dos Residuos, Portugal to ETC/W, 5 September 2000 and report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation, Directive 75/439/EEC on waste oils for the period 1995-97.
9. Letter to ETC/W from NRC Finland, 24 November 2000.

Notes:

- A. Data include Flanders and Wallonia but not Brussels.
- B. Figures only include Flanders.
- C. Total oil sold is oil including water and quantity incinerated is an estimated calculation as pure oil.
- D. Waste oil landfilled is a temporary storage.
- E. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995-97 the amount of waste oil regenerated is 110 729 tonnes and the amount of waste oil incinerated is 124 196 tonnes.
- F. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995-97 the amount collected is 236 700 tonnes, the amount regenerated is 104 917 tonnes and the amount incinerated is 140 040 tonnes.

- G. According to information from the Commission in Directive 75/439/EEC on waste oil for the period 1995–97 the amount collected is 242 000 tonnes, the amount regenerated is 80 813 tonnes and the amount incinerated is 168 571 tonnes.
- H. Waste oils will only be stored in very small amounts.
- I. Economics of waste oils regeneration, Coopers & Lybrand, The Hague, 29 January 1997. The figures cover the year 1994–95.
- J. For conversion from m³ to tonne, oil density of 0,9 tonne/m³ was used.
- K. Luxembourg exported all waste oils for regeneration.
- L. According to the report from the Commission to the Council and the European Parliament on the implementation of Community waste legislation, Directive 75/439/EEC on waste oils for the period 1995–97, the amount of oil collected is 13 000 tonnes and the total amount sold is 89 000 tonnes.
- M. For total oil sold a conversion from m³ to tonne, oil density 0,9 tonne/m³ was used and the other waste quantities are estimates.
- N. The total amount of waste oil generated is an estimate and regarding incineration waste oil is combusted after treatment.

Annex IV: Waste from coal-fired power plants

Waste from energy production per year and per capita

A 8

Country	Year	Waste generation per year (1 000 tonnes)	Waste generated per year per capita (kg)	Source	Note
Austria	1993	125	15.5	1	
Austria	1997	500	62	17	
Austria	1998	360	44	17	
Austria	1999	510	63	17	
Belgium	1994	943	93.1	3	A
Belgium	1995	1 135	112.1	3	A
Denmark	1994	1 962	375.6	4	A
Denmark	1995	1 699	325.3	5	
Denmark	1996	2 332	446.5	4	A
Denmark	1997	1 775	339.8	1	
Finland	1992	1 100	220	6	
Finland	1997	1 274	250	16	
France	1996	2 100	36.1	8	
Germany	1990	31 058	380.6	7	C
Germany	1993	25 310	310.2	7	C
Greece	1990	7 680	734.6	3	A
Greece	1992	7 000	669.6	9	
Greece	1996	9 300	889.6	15	
Greece	1997	9 320	891.5	1	
Greece	1999	10 080	1 033.1	15	
Ireland	1995	353	99.5	5	
Ireland	1998	450	126.9	10	
Italy	1995	1 330	23.3	5	A
Italy	1997	1 192	20.8	11	D
Netherlands	1982	251	16.2	3	A
Netherlands	1986	698	45.1	3	A
Netherlands	1990	1 553	100.3	3	A
Netherlands	1992	1 273	82.2	3	A
Netherlands	1994	1 381	89.2	3	A
Netherlands	1995	1 320	85.3	12	A
Netherlands	1996	1 402	90.6	3	A
Netherlands	1997	1 420	91.7	7	
Netherlands	1998	1 525	98.5	7	
Portugal	1994	392	39.9	5	
Portugal	1995	882	89.9	3	A
Portugal	1996	276	28.1	13	
Portugal	1997	378	38.6	13	
Portugal	1998	302	30.8	13	
Sweden	1985	700	71.3	3	E
Sweden	1990	625	71.1	3	E
Sweden	1994	600	68.3	1	E
United Kingdom	1990	8,400	144.6	2	
United Kingdom	1997	6,500	111.9	14	F

Sources:

1. OECD/Eurostat (provisional 1998-questionnaire).
2. DETR, UK.
3. Waste generation in Europe 1985–97, Eurostat Theme 8, Luxembourg 2000.
4. Waste statistic 1996; Danish EPA, 1997.
5. OECD environmental data compendium 1997.
6. Finnish National Waste Plan, 1998 and letter of 7 August 1998 to the EEA from Juhani Puolanne, Finnish Environment Institute.
7. OECD/Eurostat joint questionnaire (February 2000).
8. Letter from Jean Louis Bergey, ADEME. 14 July 2000.
9. OECD, 1997: National Accounts 1983–95.
10. OECD/Eurostat joint questionnaire (February 2000) and the Irish national waste database report for 1998.
11. Primo rapporto sui rifiuti speciali, ANPA 1999.
12. RIVM, the Netherlands (Letter to the EEA and ETC/W from HuibVerhagen, 10 August 1998).
13. Letter from Instituto dos Resíduos, Portugal to ETC/W, 5 September 2000.
14. EPA UK: Waste strategy 2000 on waste oil and power station ash.
15. Letter from the Greek NRC concerning waste from coal-fired power plants to ETC/W, 9 October 2000.
16. Letter to ETC/W from NRC Finland, 24 November 2000.
17. Letter to ETC/W from NRC Austria, 11 September 2001.

Notes:

- A. Excluding residues from waste incineration with energy recovery.
- B. Waste from energy and water supply.
- C. Including 'water purification and distribution' and rest of 'mining' but excluding residues from waste incineration with energy recovery.
- D. Includes only 40.1 NACE code; Excluding residues from waste incineration with energy recovery.
- E. Only waste collected by municipalities. Excluding residues from waste incineration with energy recovery.
- F. This figure is the sum of furnace bottom ash and fuel ash.

A 9

Recovery and disposal of residues from coal-fired power plants

Country	Year	Fractions	EWC code	Recovery/disposal	Quantity (1 000 tonnes)	Source	Note
Austria	1997	Fly ash		Total recycling	220.7	6	
Austria	1998	Fly ash		Total recycling	212.3	6	
Austria	1999	Fly ash		Total recycling	334.5	6	
Austria	1997	Boiler ash		Disposal	0.2	6	
Austria	1998	Boiler ash		Disposal	0.1	6	
Austria	1999	Boiler ash		Disposal	0.1	6	
Austria	1997	Boiler ash		Total recycling	22.7	6	
Austria	1998	Boiler ash		Total recycling	16.5	6	
Austria	1999	Boiler ash		Total recycling	24.8	6	
Austria	1997	Gypsum		Total recycling	73.6	6	
Austria	1998	Gypsum		Total recycling	51.5	6	
Austria	1999	Gypsum		Total recycling	72.3	6	
Austria	1997	Gypsum		Disposal	5.5	6	
Austria	1998	Gypsum		Disposal	3.0	6	
Austria	1999	Gypsum		Disposal	2.2	6	
Austria	1997	Product from spray dry absorption		Total recycling	1.2	6	
Austria	1998	Product from spray dry absorption		Total recycling	1.2	6	
Austria	1999	Product from spray dry absorption		Total recycling	2.0	6	
Austria	1997	Sludge		Total recycling	0.3	6	
Austria	1998	Sludge		Total recycling	0.3	6	
Austria	1999	Sludge		Total recycling	0.3	6	
Denmark	1997	Fly ash	100102	Generation	1 158	1	
Denmark	1997	Fly ash	100102	Disposal	364	1	
Denmark	1997	Fly ash	100102	Total recycling	795	1	
Denmark	1997	Fly ash	100102	Cement	311	1	
Denmark	1997	Fly ash	100102	Concrete	220	1	
Denmark	1997	Fly ash	100102	Porous concrete	7	1	
Denmark	1997	Fly ash	100102	Asphalt	49	1	

Recovery and disposal of residues from coal-fired power plants, cont.

A 9

Country	Year	Fractions	EWC code	Recovery/disposal	Quantity (1 000 tonnes)	Source	Note
Denmark	1997	Fly ash	100102	Roofing felt	5	1	
Denmark	1997	Fly ash	100102	Backfilling cf. Stat. Order 568	34	1	
Denmark	1997	Fly ash	100102	Backfilling cf. Part 5 approvals (Env. Protection Act)	169	1	
Denmark	1997	Slag/bottom ash	100101	Generation	152	1	
Denmark	1997	Slag/bottom ash	100101	Disposal	36	1	
Denmark	1997	Slag/bottom ash	100101	Total recycling	116	1	
Denmark	1997	Slag/bottom ash	100101	Backfilling cf. Statutory Order 568	111	1	
Denmark	1997	Slag/bottom ash	100101	Backfilling cf. Part 5 approvals (Env. Protection Act)	5	1	
Denmark	1997	Gypsum	100105	Generation	374	1	
Denmark	1997	Gypsum	100105	Disposal	39	1	
Denmark	1997	Gypsum	100105	Total recycling	306	1	
Denmark	1997	Gypsum	100105	Plaster board	306	1	
Denmark	1997	TASP	100106	Generation	83	1	
Denmark	1997	TASP	100106	Disposal	37	1	
Denmark	1997	TASP	100106	Total recycling	40	1	
Denmark	1997	TASP	100106	Granulates	4	1	
Denmark	1997	TASP	100106	Backfilling	36	1	
Denmark	1997	Sulphuric acid	100109	Generation	8	1	
Denmark	1997	Sulphuric acid	100109	Disposal	0	1	
Denmark	1997	Sulphuric acid	100109	Total recycling	8	1	
Denmark	1997	Sulphuric acid	100109	Fertiliser	8	1	
Italy	1997	Bottom ash	100101	Generation	182	2	A
Italy	1997	Bottom ash	100101		167	2	
Italy	1997	Bottom ash	100101		5	2	
Italy	1997	Bottom ash	100101		10	2	
Italy	1997	Coal fly ash	100102	Generation	872	2	A
Italy	1997	Coal fly ash	100102		804	2	
Italy	1997	Coal fly ash	100102		46	2	
Italy	1997	Coal fly ash	100102		22	2	
Italy	1997	Oil fly ash	100104	Generation	40	3	
Italy	1997	Oil fly ash	100104		1	2	
Italy	1997	Oil fly ash	100104		5	2	
Italy	1997	Oil fly ash	100104		25	2	
Italy	1997	Calcium based reaction wastes from flue gas desulphurisation in solid form	100105	Generation	4	2	A
Italy	1997	Calcium based reaction wastes from flue gas desulphurisation in solid form	100105		4	2	
Italy	1997	Other solid wastes from gas treatment	100106	Generation	3	2	A
Italy	1997	Other solid wastes from gas treatment	100106		2	2	
Italy	1997	Other solid wastes from gas treatment	100106		1	2	
Italy	1997	Other sludges from gas treatment	100108	Generation	2	2	A

A 9		Recovery and disposal of residues from coal-fired power plants, cont.					
Country	Year	Fractions	EWC code	Recovery/disposal	Quantity (1 000 tonnes)	Source	Note
Italy	1997	Other sludges from gas treatment	100108		1	2	
Italy	1997	Other sludges from gas treatment	100108		1	2	
Italy	1997	Spent linings and refractories	100112	Generation	9	2	
Italy	1997	Spent linings and refractories	100112		3	2	
Italy	1997	Spent linings and refractories	100112		1	2	
Italy	1997	Spent linings and refractories	100112		6	2	
Italy	1997	Wastes not otherwise specified	100199	Generation	7	2	
Italy	1997	Wastes not otherwise specified	100199		2	2	
Italy	1997	Wastes not otherwise specified	100199		1	2	
United Kingdom	1997	Fuel ash		Generation	5 100	4	
United Kingdom	1997	Bottom ash		Generation	1 400	4	
Portugal	1996	Fly ash	100102	Generation	276	5	
Portugal	1997	Fly ash	100102	Generation	307	5	
Portugal	1998	Fly ash	100102	Generation	272	5	
Portugal	1996	Fly ash	100102	Disposal	0	5	
Portugal	1997	Fly ash	100102	Disposal	0	5	
Portugal	1998	Fly ash	100102	Disposal	14	5	
Portugal	1996	Fly ash	100102	Total recycling	276	5	
Portugal	1997	Fly ash	100102	Total recycling	307	5	
Portugal	1998	Fly ash	100102	Total recycling	258	5	
Portugal	1996	Fly ash	100102	Cement	207	5	
Portugal	1996	Fly ash	100102	Cement	231	5	
Portugal	1996	Fly ash	100102	Cement	194	5	
Portugal	1997	Slag/fuel oil ash ash	100101	Generation	71	5	
Portugal	1998	Slag/fuel oil ash ash	100101	Generation	30	5	
Portugal	1997	Slag/fuel oil ash ash	100101	Disposal	71	5	
Portugal	1998	Slag/fuel oil ash ash	100101	Disposal	30	5	

Sources:

1. Environmental review from the Danish Environmental Protection Agency No 1 1999.
2. ANPA 2000.
3. 'Primo rapporto sui rifiuti speciali', ANPA 1999.
4. EPA UK: Waste strategy 2000 on waste oil and power station ash.
5. Letter from Instituto dos Resíduos, Portugal to ETC/W, 5 September 2000.
6. Letter to ETC/W from NRC Austria, 11 September 2001.

Notes:

- A. Estimate based on recovery and disposal data.

Annex V: Biodegradable waste

Baseline figures for biodegradable waste produced and landfilled in 1995

A 10

Country/region	Year	MW produced	BMW produced	BMW landfilled
		Ktonnes	Ktonnes	Ktonnes
Austria	1995	2 644	1 495	302
Belgium ¹⁾	1995	5 014	4 312	2 397
Belgium (Flanders)	1995	2 890	1 671	623
Denmark	1995	2 787	1 813	205
Finland	1994	2 100	1 664	1 085
France	1995	36 200	15 746	5 988
Germany ¹⁾	1993	40 017	28 700	20 148
Germany (Baden Württemberg)	1995	18 300	5 859	2 502
Greece ¹⁾	1990	3 000	2 688	2 688
Iceland	1995	N/A	N/A	N/A
Ireland	1995	1 503	990	903
Italy	1996	25 960	9 170	6 821
Luxembourg ¹⁾	1995	278	160	34
Netherlands ³⁾	1995	7 105	4 830	1 365
Norway	1995	2 722	1 572	1 069
Portugal ¹⁾	1995	3 884	3 301	3 295
Spain ¹⁾	1995	14 914	11 633	8 823
Spain (Catalonia)	1995	2 834	1 985	1 481
Sweden ¹⁾	1994	3 200	2 656	956
United Kingdom ³⁾	1996/97	25 980	16 366	14 675

1) Source: Eurostat.

2) Figures relate to waste from households only.

3) England and Wales only.

N/A: Information not available

A 11 Management of BMW in countries and regions surveyed

	BMW management routes (% of total BMW produced)							
	Landfill	Incineration with energy recovery	Incineration without energy recovery	Central composting	Recycling	Anaerobic digestion	Mechanical-biological pre-treatment	Unspecified
Austria (1996)	20.4	13.3	0	22.9	29.7	0	6.0	7.7
Belgium (Flanders) (1998)	16.7	22.1	0	34.3	22.8	0	0	4.1 ¹
Denmark (1998)	5.3	54.3	0	29.6	10.4	0.4	0	0
Finland ² (1997)	64.9	5.8	0	5.2	22.0	1.4	0	0.6
France ³ (1998)	40.3	28.6	7.1	8.9	3.5	0.3	0	11.2
Germany	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Germany (Baden- Württemberg) (1998)	30.2	12.3	0	17.9	37.1	0	0	2.6 ⁴
Greece	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iceland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ireland (1998)	90.3	0	0	0.5	9.3	0	0	0
Italy (1999)	64.4	6.3 ⁵	0	12.4	8.9	0	0	1.9
Luxembourg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Netherlands (1998)	13.1	36.5	0	33.3	19.0	0	0	0
Norway (1997)	59.0	17.0	0	5.0	20.0	0	0	0
Portugal	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spain	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spain (Catalonia) (1998)	73.4	20.7	0	1.3 ⁶	4.6	0	0	0
Sweden	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
United Kingdom ⁷ (1998/99)	86.2	5.7	0	3.0	5.1	0	0	0

1. This figure refers to the percentage of BMW which is managed through reuse.
2. 0.58 % refers to 10 320 tonnes of packaging and wood waste separately collected in 1997, for which storage is the only known management route.
3. Waste management routes for France only account for 88.8 % of the total BMW produced. The remaining 11.2 % is accounted for by separately collected garden waste, the management route of which is unspecified or unknown.
4. This figure may include a fraction managed by anaerobic digestion.
5. This figure refers to incineration with/without energy recovery.
6. This figure is accounted for by 0.43 % central composting and 0.79 % mass composting.
7. England and Wales only.