

# Waste generated and treated in Europe

**Data 1995-2003**

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The views expressed in this publication are those of the authors and do not necessarily reflect the opinion of the European Commission.

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# 1 Introduction

International waste statistics are collected through a questionnaire developed jointly by Eurostat and the OECD which is briefly referred to as Eurostat/OECD Joint Questionnaire (JQ). The questionnaire is sent to the participating countries every second (even) year and collects annual data on waste generation, waste treatment and the waste management infrastructure. The JQ has so far been the only standardised source for international waste data. The JQ data build the basis for the indicator set on municipal waste that is part of the set of Structural Indicators designed to measure the success or failure of EU policies and published every year.

Starting with 2004 as first reference year, the Waste Statistics Regulation<sup>(1)</sup> will replace the Joint Questionnaire as main data source for the EU. The Waste Statistics Regulation requires the EU Member States to report data on waste generation, waste treatment and waste treatment infrastructure for every even year. The Regulation is expected to improve data availability as well as quality and comparability of data considerably. The publication of first results on the basis of the Waste Statistics Regulation can be expected by the beginning of 2007.

This issue is the third publication of Eurostat on the generation and treatment of waste in Europe. The time series in the text generally cover the period 1995 to 2003. For the detailed breakdowns the year 2002 was selected because data for this year is both recent and fairly complete. Other data sources have been used only for the recycling of specific waste streams in chapter 6.

Although the availability and the quality of data improves from year to year it is still difficult to draw a complete and reliable picture of waste generation and treatment in Europe. Comparability of data has certainly benefited from the introduction of the European List of Wastes<sup>(2)</sup> (LoW) which has to be applied by EU Member States for administrative purposes since the beginning of 2002. The List of Waste has replaced the European Waste Catalogue<sup>(3)</sup>. Although the European List of Wastes is not obligatory for the compilation of statistics most countries actually use it for statistics as well. The majority of countries use the European classification already since several years. Some countries, however, adhered to their national catalogues until 2001. Since 2002 all countries have to use the List of Waste or, at least, have to ensure that the national catalogues still in use are compatible.

Whereas comparability of actual data has increased through the introduction of a European waste classification the repeated changes of classifications in recent years reduce the expressiveness of time series. It is often difficult to distinguish between the influence of waste classifications and real developments.

## *Structure and principles of the publication*

The raw data provided by the countries with the Joint Questionnaire 2004 are shown in Annex 4, Tables 1 to 12<sup>(4)</sup>, to this publication. Eurostat did not carry out any estimations of missing

data at national level. Only the footnotes were edited in order to reduce their number and to enhance their clarity. As regards the terminology the publication refers to the definitions of the Joint Questionnaire, the most important of which are displayed in Annex 1.

Chapter 2 of the publication presents the available data on total waste generation and origin of waste by economic sectors. Estimates were carried out in order to produce aggregated data on the European level. Aggregates were built for the entire EU (EU 25), for the 'old' Member States (EU 15) and for the 10 new Member States (NMS 10) that entered the European Union on 1 May 2004. The estimation was performed based on suitable indicators in order to gain a comparable data basis. For this purpose the waste amounts by economic sectors were related to the sectorial Gross Value Added (GVA). Annex 5 contains all calculated indicators that were used as basis for estimations. The GVA data were downloaded from the NewCronos data server<sup>(4)</sup>. A definition of the Gross Value Added is provided in Annex 1.

Chapter 3 provides a country comparison of industrial waste generation by economic sectors. To enable comparison waste generation is presented in relation to the country population (kg/person) and to the sectorial GVA (kg/1 000 EUR GVA). More detailed information is provided on the generation and treatment of waste from the manufacturing industry. The population data were downloaded from the NewCronos data server<sup>(4)</sup> and are included in Annex 5 of the publication.

Chapter 4 gives an overview of the generation, collection and treatment of municipal waste. The complete set of the Structural Indicators on municipal waste referred to in Chapter 4 is included in Annex 3 of the publication. Chapter 5 highlights the generation and treatment of hazardous waste. Finally, chapter 6 focuses on the recycling of packaging waste and waste paper.

The graphs shown in chapters 2 to 5 include all countries whether or not they did provide suitable data on the subject. On the one hand, this shall illustrate the data availability. On the other hand, the use of the same format and country order in all graphs shall improve the clarity and readability of the figures. In all graphs, the countries are grouped by EU 15, NMS 10, Candidate Countries and EFTA countries in order to visualise structural differences between those country groups.

The abbreviations used in the publication are explained in Annex 2 which contains also a list of the countries covered by the publication together with the two-digit country codes.

(1) Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics (OJ L 332, 09.12.2002, p. 1), last amended by Regulation (EC) No 782/2005 (OJ L 131, 25.05.2005, p.26)

(2) Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a List of Wastes (OJ L 226, 06.09.2000, p.3), last amended by Decision 2001/573/EC (OJ L 203, 28.07.2001, p.18)

(3) Commission Decision 94/3/EC of 20 December 1993 establishing a List of Wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste

(4) The country data can be drawn from NewCronos, the data server of Eurostat, under:  
[http://epp.eurostat.cec.eu.int/portal/page?\\_pageid=0,1136239,0\\_45571447&\\_dad=portal&\\_schema=PORTALr](http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTALr)

## 2 Total Waste Generated

### Main findings:

- Waste generation in EU 25 is estimated for 2002 at about 1.3 billion tonnes. This figure includes waste from the manufacturing industry (427 million tonnes), from energy production and water supply (127 million tonnes), from the construction sector (510 million tonnes), and municipal waste (241 million tonnes).
- The estimated amount excludes waste from agriculture, forestry and fishery (01, 02, 05), from mining and quarrying (10-14), and from the service and public sector (50-93). For these sectors a valid estimate is currently not possible.

The aim of this section is to provide an overview of the amount of total waste generated in Europe. The amounts of total waste originate from production, represented by sectors of economic activity, and from consumption, represented by municipal waste. Municipal waste mainly consists of waste collected from households, but also includes waste generated by economic activities and collected together with waste from households (e.g. commerce and trade, small businesses, office buildings, institutions).

The Joint Questionnaire asks for the total waste generated, including hazardous and non-hazardous waste, and for the breakdown by the main economic sectors. The economic sectors are classified according to the major sections of the Statistical Classification of Economic Activities in the European Community (NACE-Rev.1.1) as follows:

Sector	NACE Rev1.1 Division Code
Agriculture and forestry	01 – 02
Mining and quarrying	10 – 14
Manufacturing industry	15 – 37
Energy production & Water purification and distribution <sup>(a)</sup>	40 - 41
Construction	45
Other sectors	05, 50-93

(a) Note that waste generation by the sectors energy production (NACE division 40) and water purification and distribution (41) is addressed separately in the Joint Questionnaire. However, for the purposes of the publication the two divisions were aggregated because the data on the Gross Value Added were not available separately for the two sectors

The category 'other sectors' includes fishery, the wholesale and retail trade, hotels and restaurants, the transport and communication sector, financial institutions, public administration, community services, and similar activities.

The figures 2-1 and 2-2 show the origin of total waste generated in the year 2002 in percentages and kg/person for all countries. The two diagrams include all 18 countries which reported a value for the total waste generated. Where the sum of the sectors fell below the value of the generated total, the difference was assigned to 'other economic sectors'. In addition, the figures show three countries (Spain, the Netherlands, Lithuania<sup>(1)</sup>) that reported no generated waste total but provided data on municipal waste and on at least three economic sectors. For

these countries, the bars only represent the sum of the available sectors plus municipal waste.

The underlying raw data of the countries are available in Table 1 and Table 2 of Annex 4. The gaps in the figures illustrate that not all countries provided the required data. Whether or not the countries were able to report the generated total and the breakdown by sources depends on the coverage, the methodological approach and the frequency of their national waste surveys. The main reasons for data gaps can be summarised as follows:

- Some countries cover with their surveys only a part of the economic sectors and are thus not able to report a generated total.
- Some countries cover all types of waste but are not able for methodological reasons to specify the economic sector of origin. They can report a waste total but without breakdown by sectors.
- Some countries have two or three-yearly survey frequencies or no regular data collection at all and may not have submitted data for the year displayed in the graphs.
- A fourth possible reason for data gaps is the lack of timeliness of results.

These problems hamper data evaluation and have to be kept in mind when interpreting figures 2-1 and 2-2. The two diagrams include all countries which reported at least on three economic sectors. Where the sum of the sectors fell below the value of the total waste generated, the difference was assigned to 'other economic sectors'. If a figure for total waste generated was not available (Spain, the Netherlands and Lithuania), the bars only represent the sum of the available sectors plus municipal waste. Detailed information on the availability of data by countries can be retrieved from the raw data shown in Table 2 of Annex 4.

The figures show that data availability is higher in the new Member States than in EU 15 countries. The figures contain data from 8 of the 15 old Member States. The other 7 countries did not submit data for 2002 or reported only on one or two economic sectors for the reasons mentioned above. In contrast, data are available from 8 of the 10 new Members and from 3 of the 4 Candidate Countries.

Most of the countries provided data on the manufacturing industry (15-37) and on the aggregate of energy production (40) and water purification & distribution (41). In a majority of those countries, these two positions together with the municipal waste represent more than half of the total waste generated. The proportions of the sectors agriculture and forestry (01-02) and mining and quarrying (10-14) show the highest variation

(1) Lithuania is for methodological reasons not able to break down the industrial waste generated by economic sectors. All non-municipal waste is therefore summarised under the heading 'other economic sectors'



among the countries. Particularly in those countries with very high overall amounts per person (Finland, Sweden, Bulgaria and Romania), one of these two sectors dominates the overall value. For some countries the proportion of municipal waste appears to be over represented. This is most likely due to aspects of coverage and to problems with the assignment of waste to the generating sources. In the case of Latvia, for instance, the figure on municipal waste includes also non-hazardous wastes from industry, and in Iceland more than half of the municipal waste

originates from commerce and trade, small businesses, office buildings etc.

Legend of Figure 2-1 and of Figure 2-2:

- Other economic sectors - incl. non spec.
- Agriculture and forestry (01-02)
- Mining and quarrying (10-14)
- Construction (45)
- Energy Production (40) and Water Purification & Distribution (41)
- Manufacturing industry (15-37)
- Municipal waste

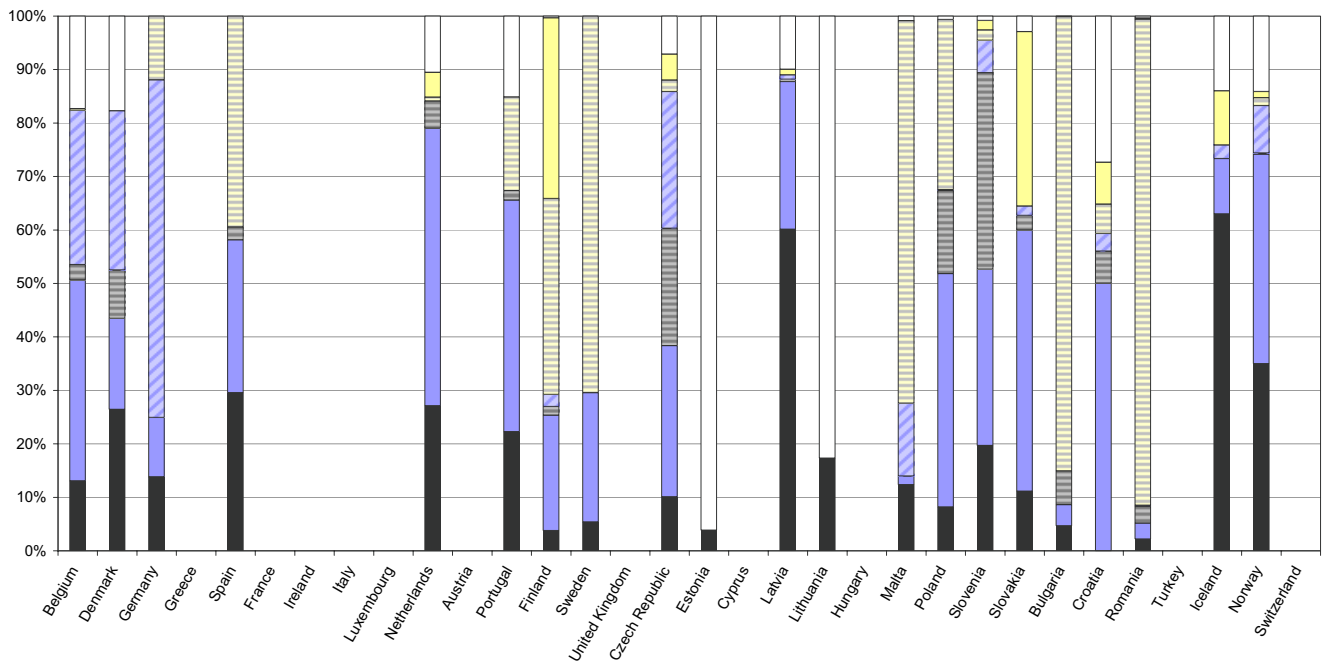


Figure 2-1 Origin of total waste generated by economic sectors and country for 2002 (%)

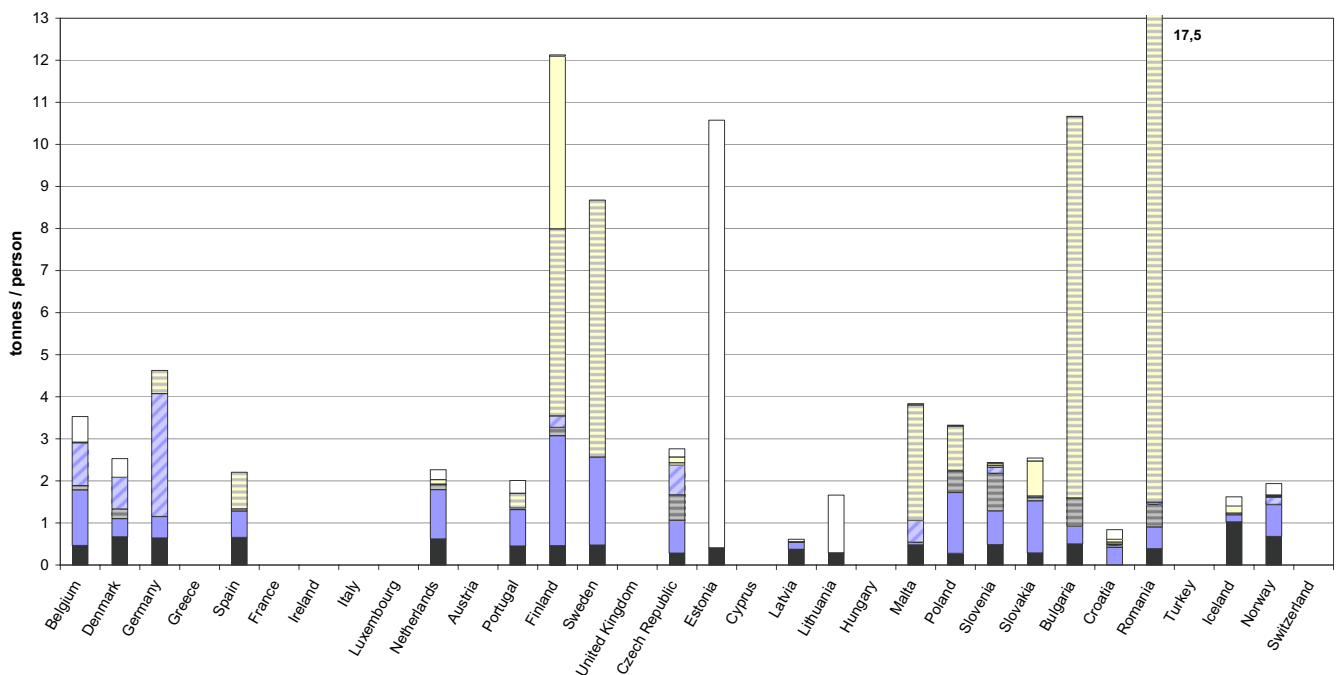


Figure 2-2 Origin of total waste generated by economic sectors and country for 2002 (tonnes/person)

In order to provide aggregates on the European level, the lack of data on sectoral waste generation made it necessary to close data gaps by estimates. For this purpose the indicator 'waste generated per GVA' was used. This approach is based on the assumption that economic growth within an economic sector will result in an increase (or decrease) of waste generation according to a sector-specific ratio.<sup>(1)</sup>

The analysis of available data showed that valid estimates on the generated totals for EU aggregates were only possible for the three economic sectors manufacturing industry (15-37), energy production / water supply (40-41) and construction (45). The estimated totals for EU 25, EU 15 and NMS 10 in 2002 are shown in Table 2.1.

**Table 2.1** Total waste generated in the EU 2002

Level	1	2	3	4	5	6	7	8	9
	Waste total (hazardous and non-hazardous waste) by sectors							Sum of columns 3, 4, 5 and 7 <sup>(b)</sup>	Hazardous waste total <sup>(c)</sup>
	Agriculture and forestry (01-02) <sup>(a)</sup>	Mining and quarrying (10-14) <sup>(a)</sup>	Manufacturing industry (15-37)	Energy Prod. (40), Water Purification & Distribution (41)	Construction (45)	Other <sup>(a)</sup>	Municipal waste		
	1 000 t								
<b>EU 15</b>	23 000	258 106	348 796 s	89 760 s	499 947 s	9 535	217 164 s	1 155 666	46 748 s
<b>NMS 10</b>	5 935	42 646	78 695 s	37 516 s	10 058 s	7 794	23 586 s	149 856	11 603 s
<b>EU 25</b>	<b>28 935</b>	<b>300 753</b>	<b>427 491 s</b>	<b>127 276 s</b>	<b>510 005 s</b>	<b>17 329</b>	<b>240 750 s</b>	<b>1 305 522</b>	<b>58 351 s</b>
	kg/person								
<b>EU 15</b>	61	682	922 s	237 s	1 321 s	25	574 s	3 054	124 s
<b>NMS 10</b>	79	571	1 054 s	502 s	135 s	104	316 s	2 007	155 s
<b>EU 25</b>	<b>64</b>	<b>664</b>	<b>944 s</b>	<b>281 s</b>	<b>1 126 s</b>	<b>38</b>	<b>531 s</b>	<b>2 882</b>	<b>129 s</b>
	kg/1 000 EUR value added (at current prices)								
<b>EU 15</b>	141	3 533	221 s	547 s	1 062 s	1 440	-	-	6 s
<b>NMS 10</b>	432	12 606	952 s	2 642 s	411 s	52 699	-	-	29 s
<b>EU 25</b>	<b>163</b>	<b>3 934</b>	<b>258 s</b>	<b>714 s</b>	<b>1 029 s</b>	<b>2 560</b>	-	-	<b>7 s</b>

(a) Sum of available data, i.e. based on a limited number of countries (EU 25: NACE 01-02: 6 countries; NACE 10-14: 13; Other: 15)

(b) Sum of estimated aggregates, including NACE divisions 15-37, 40, 41, 45 and municipal waste; excluding NACE divisions 01-02, 05, 10-14, 50-93

(c) Covers hazardous waste from all economic sectors plus hazardous municipal waste. On account of the wider coverage the hazardous waste total is no subset of the sum in column 8

s: Eurostat estimate of the generated totals; covers all countries of the respective EU aggregate

Table 2.1 presents the estimated EU totals by sectors (marked with 's' for Eurostat estimate) and the sum of the available data for those sectors for which estimates were not possible. Results are given in 1 000 tonnes, in kg/person and in kg/1 000 EUR GVA.

For EU 25 the waste total generated by the manufacturing industry in 2002 is estimated at 427 million tonnes (944 kg/person). The waste arising related to population is similar in EU 15 and NMS 10 countries and amounted to 922 kg/person and 1 054 kg/person respectively. In relation to the Gross Value Added waste generation is more than four times higher in NMS 10 than in EU 15.

Energy production and water supply accounted in 2002 for about 127 million tonnes (281 kg/person) of waste in EU 25. Waste generation per person and per valued added was clearly higher in the NMS 10 than in the EU 15 countries. In the new Member States generation amounts to 502 kg/person compared to 237 kg/person in EU 15.

For the sectors agriculture and forestry (01-02), mining and quarrying (10-14) and the 'other sectors' the data basis was too weak to estimate EU totals. Hence, the respective figures in Table 2.1 represent only the sum of the available raw data and do not cover all countries.

Furthermore, an estimation was carried out for hazardous waste generation. This estimate was based on the hazardous waste total reported by the countries, and includes hazardous waste from all economic sectors and hazardous municipal waste. Data gaps were closed using the indicator 'hazardous waste total/1 000 EUR GVA'.

About 510 million tonnes of waste (1 126 kg/person) were generated by the construction sector. With regard to construction waste the data indicate a significant difference between old and new Member States. Measured as waste per GVA the EU 15 generate double the amount of the NMS 10 countries. Expressed as waste per person the arising in EU 15 (1 321 kg/person) is about ten times higher than that of the new Member States (135 kg/person). The big discrepancy not only reflects real differences in construction activities, but also differences in coverage of construction waste streams between old and new Member States.

Together with the municipal waste the EU waste arising in 2002 amounted to 1.3 billion tonnes, not including waste from agriculture and forestry, mining and quarrying and 'other sectors'. Of this amount, 1.16 billion tonnes were generated by EU 15 countries and 150 million tonnes by the new Member States.

The generated total including the agricultural and the mining sector would certainly be considerably higher. A valid estimate

(1) With the given data on waste generation and the sectoral value added growth at constant prices (as available in NewCronos database) the indicator 'waste per Gross Value Added (GVA)' was calculated for every economic sector, country and year. For the years with lacking data the indicator was estimated by linear best fit on the basis of indicators from previous and/or following years. Estimators for waste generation then were calculated according to the equation: 'waste generated = indicator \* sectoral value added'. Where this approach was not feasible because none of the required data were available, average data from comparable countries were used to fill in data gaps. These estimations have been used only for the assessment of aggregates in Table 2.1. No estimates for a specific country or sector are presented in this report. The calculated indicators are shown Tables 2 to 4 in Annex 5

for these sectors, however, is not possible on the basis of the available data.

The total of hazardous waste generated in 2002 is estimated at 58.4 million tonnes (129 kg/person) for EU 25, of which 46.7

million tonnes were generated in the EU 15 and 11.6 million tonnes by the NMS 15. The generation related to population is in a similar range in EU 15 and NMS 10 countries and amounted to 124 kg/person and 155 kg/person, respectively.

## 3 Industrial Waste

### Main findings:

- Data on industrial waste are most solid for the manufacturing industry. Waste generation in 2002 ranged in most countries between 300 and 1 500 kg/person (EU 25: 944 kg/person), and was highest in Finland and Sweden with values over 2 000 kg/person.
- Main waste generating sub-sectors within the manufacturing industry are the manufacture of basic metal products (NACE 27), of food, beverages, tobacco (15-16), of non-metallic mineral products (26) and of wood and wood products (20).
- Waste generation by the sector energy production / water supply is higher in the new Member States and Candidate Countries than in the old Member States. For 2002, EU 15 countries report amounts of up to 300 kg/person whereas in NMS 10 and Candidate Countries the sector accounted for up to 900 kg/person.
- Generation of construction waste seems to be considerable higher in EU 15 than in NMS 10, both related to inhabitants and to the Gross Value Added.

### 3.1 Waste Generation by Economic Sectors

The following figures present the waste generation for the main economic sectors on country level. The amounts represent the generated total of the sectors including hazardous and non-hazardous waste. The raw data for the graphs submitted by the countries in the Joint Questionnaire are included in Table 2 of Annex 4.

To enable comparison between the countries the generated quantities are standardised by division through a) the Gross Value Added of the respective economic sectors and b) the number of inhabitants of the respective country. The figures cover the period from 1999 to 2002 in order to increase the availability of data and to visualise trends in waste generation. Furthermore, the deviations between different years for individual countries indicate to a certain degree the stability and the reliability of data.

As outlined earlier, not all countries are able to break down their total waste generation by economic sectors as required by the Joint Questionnaire. Nevertheless, all countries were included in the figures in order to illustrate the availability of data. Thus, the graphs provide an impression of the data basis for the estimations made to yield the estimated aggregates shown in Table 2.1 in the previous chapter. In general, the figures on waste generation per Gross Value Added show more gaps than those with amounts per person as in some cases no sector-specific GVA-data were available.

The presentations are limited to the sectors mining/quarrying, manufacturing industry, energy production/water supply, and construction. A country comparison for waste from agriculture and forestry was omitted due to the poor data availability. Country comparisons on municipal waste are provided in Chapter 4.

Figures 3-1 and 3-2 show the waste amounts generated by mining and quarrying activities. It is obvious from the graphs that data availability for the mining sector is poor. The reported amounts vary extremely between the countries in both presentations. The reasons for the variation are manifold. The waste arising depends primarily on the economic importance of the

mining and quarrying sector in the country, but also on the type of the extracted minerals and on the technology used. However, the variation may also result from differences in definitions and survey methodology which can have a strong impact on the reported amounts.

Figure 3-2 shows that in 2002 the waste arising per person was highest in Romania, Bulgaria, Finland and Sweden with values ranging from 4 450 kg/person up to nearly 16 000 kg/person. In these four countries mining and quarrying is the main waste generating sector (see also figure 2-1). Most of the other countries generated less than 1 600 kg/person in 2002. As shown in Table 2.1, the average generation for EU 25 on the basis of available data amounted to 664 kg/person (NMS 10: 571 kg/person; EU 15: 682 kg/person).

Figure 3-1 gives a similar picture for the GVA-related amounts. As pointed out in chapter 2 the available data are too poor to give an estimate on the EU generation total.

The figures 3-3 and 3-4 display the waste amounts generated by the manufacturing industries by country. The two graphs show different characteristics. Figure 3-3 indicates that waste generation per valued added is generally higher in the New Member States and the Candidate Countries. The highest values in 2002 are reported by Romania, Poland and the Slovak Republic (> 1 500 kg/1 000 EUR GVA). In EU 15 all countries fell below 500 kg/1 000 EUR GVA in 2002. For some countries like Finland, the Czech Republic, and Poland the figures per GVA indicate a steady decline of waste generation in comparison to the production output.

The figures on waste per person show no general differences between old and new Members. The highest waste arising is reported by Finland and Sweden with values over 2 000 kg/person in 2002. The high amounts result from the strong wood, pulp and paper industry in these two countries. Most other countries generated between 300 and 1 500 kg/person. The EU 25 average amounted to 944 kg/person with an arising of 1 054 kg/person in the new Member States generating and 922 kg/person in EU 15.

The breakdown of waste generation by sub-sectors and the treatment of the non-hazardous waste from the manufacturing industry is discussed in more detail in section 3.2.

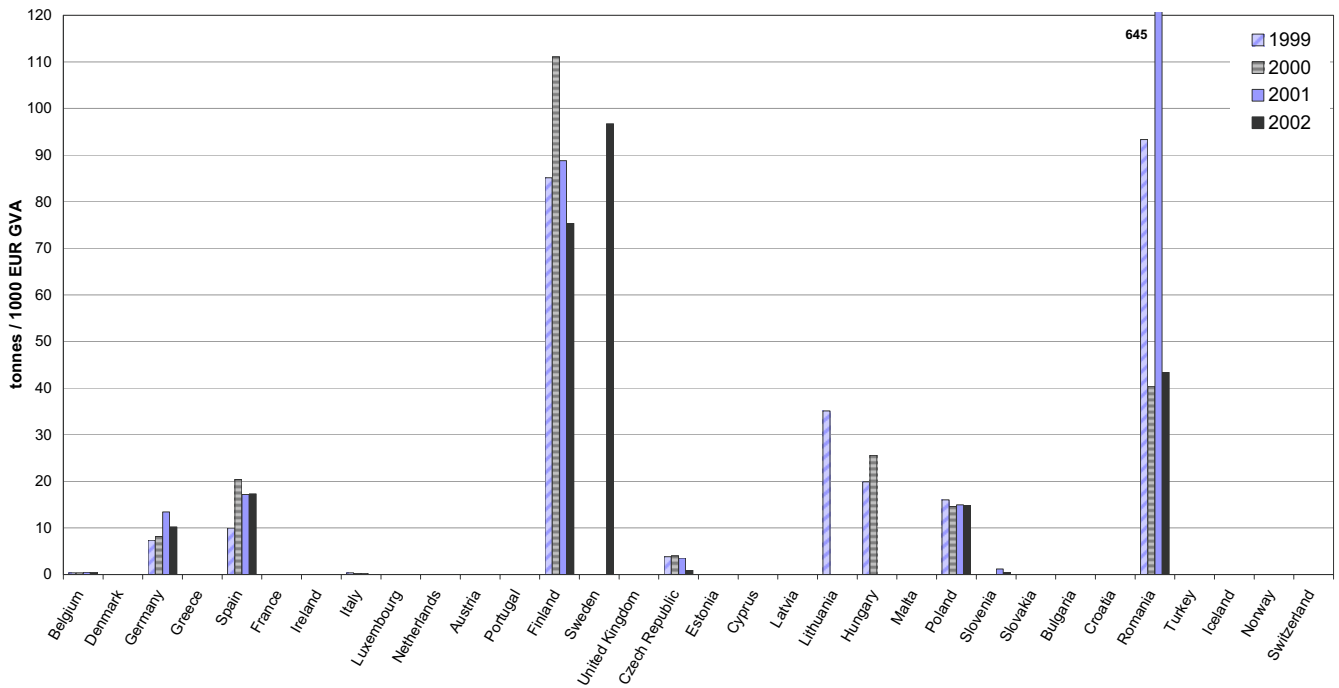


Figure 3-1 Waste generated by the mining and quarrying sector (10-14) by countries from 1999 to 2002 (tonnes/1000 EUR GVA)

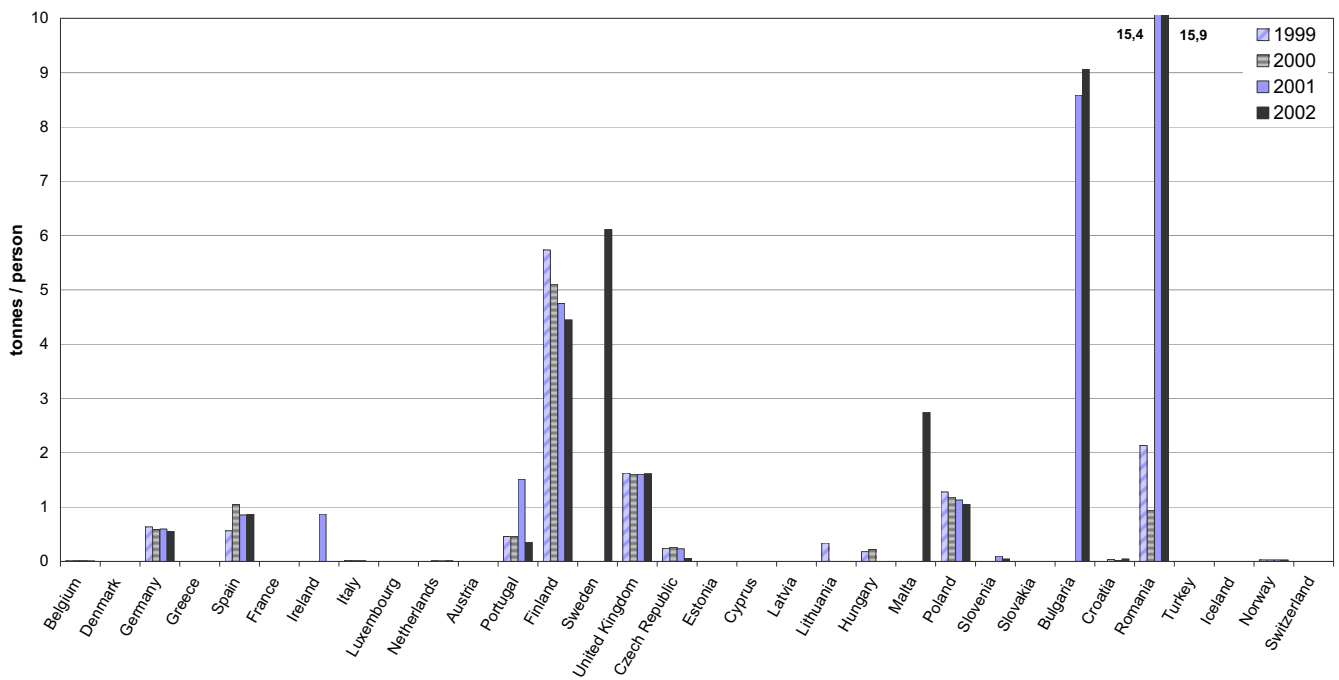


Figure 3-2 Waste generated by the mining and quarrying sector (10-14) by countries from 1999 to 2002 (tonnes/person)

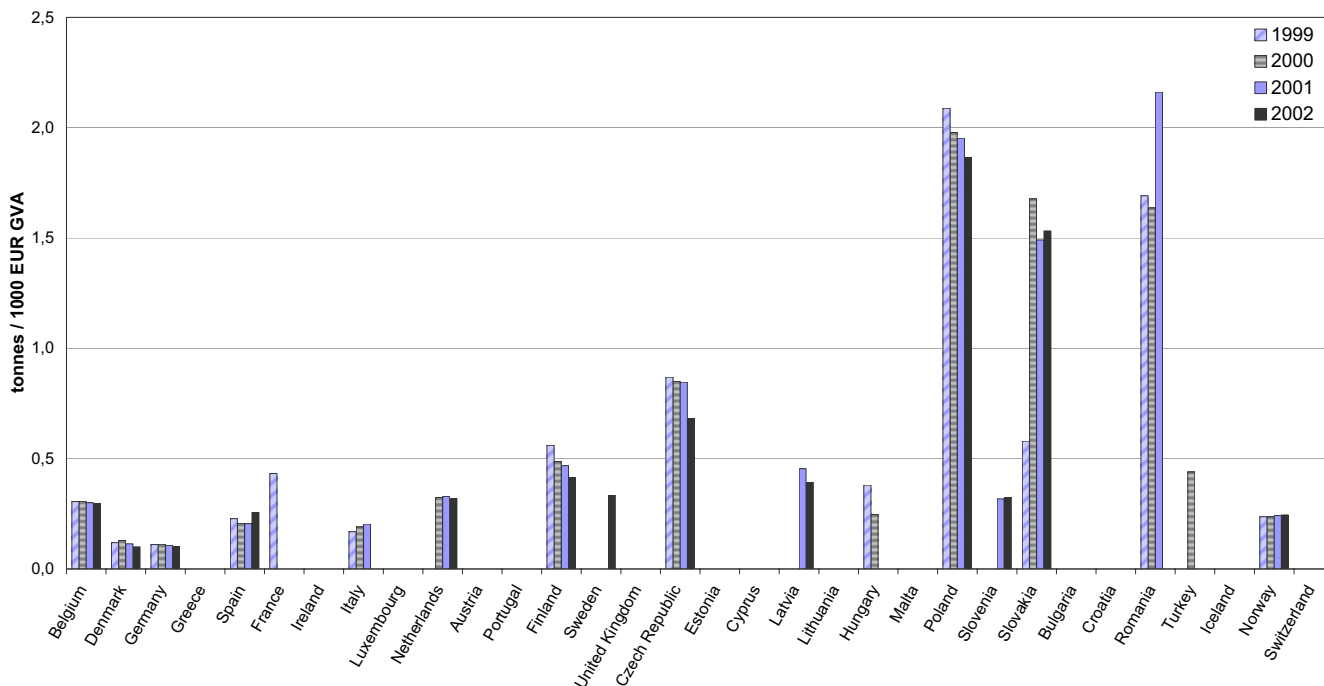


Figure 3-3 Waste generated by the manufacturing industry (15-37) by countries from 1999 to 2002 (tonnes/1000 EUR GVA)

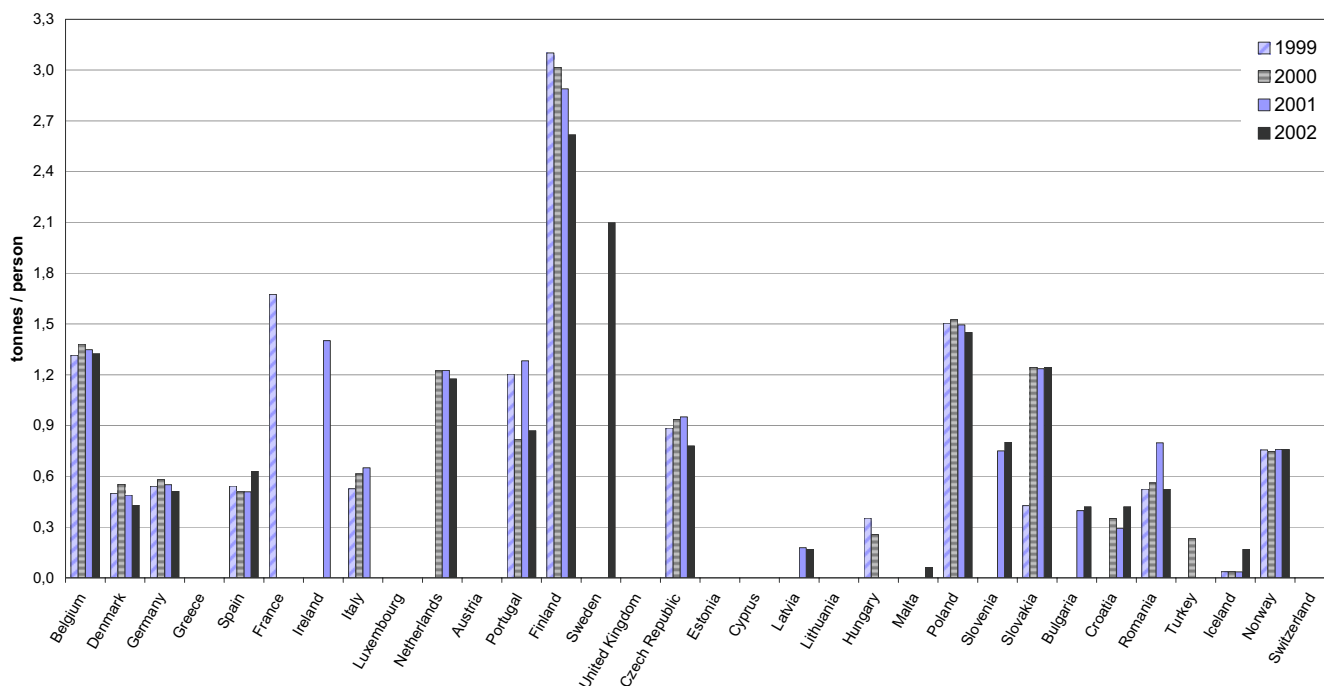


Figure 3-4 Waste generated by the manufacturing industry (15-37) by countries from 1999 to 2002 (tonnes/person)

Waste generation by energy production and water supply is shown in figures 3-5 and 3-6. The two sectors are presented together as data on the Gross Value Added are not available separately for both sectors. In general, the waste quantities of both sectors are clearly dominated by energy production waste. Waste from water supply accounts on average for about 10 % of the amount generated by energy production. Both graphs indicate a clearly higher relative waste generation in new Member States and Candidate Countries than in EU 15. Probable reasons are the type of energy sources used and the efficiency of energy production.

Waste generation per value added is quite homogenous in the old Member States for which data are available, ranging between 132 and 426 kg/1 000 EUR GVA. Generated amounts and variation of data are considerably higher in the new Member States and in the Candidate Countries. The Czech Republic, Hungary, Poland, Slovenia and Turkey report amounts between 3 000 and 6 000 kg/1 000 EUR GVA. Extremely high amounts of about 21 000 kg/1 000 EUR are reported by Romania.

The picture of waste generation per person is similar. Waste arising in the old Member States ranges between 36 kg/persons and 300 kg/person. Amounts are higher in most new Member States and Candidate Countries with values up to 900 kg/

person in 2002 in Slovenia. Averages for 2002 are 281 kg/person for the EU 25, 502 kg/person for the new Member States and 237 kg/person for the EU 15.

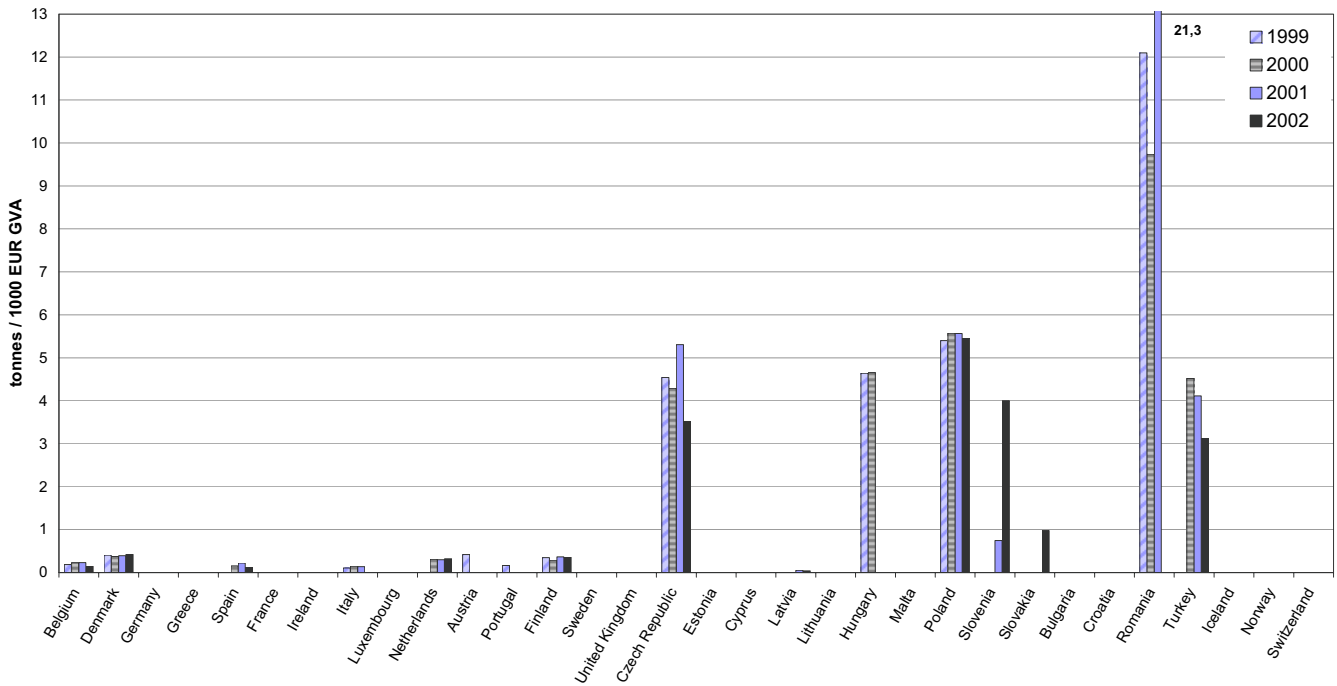


Figure 3-5 Waste generated by the sectors energy production (40) and water supply (41) by countries from 1999 to 2002 (tonnes/EUR GVA)

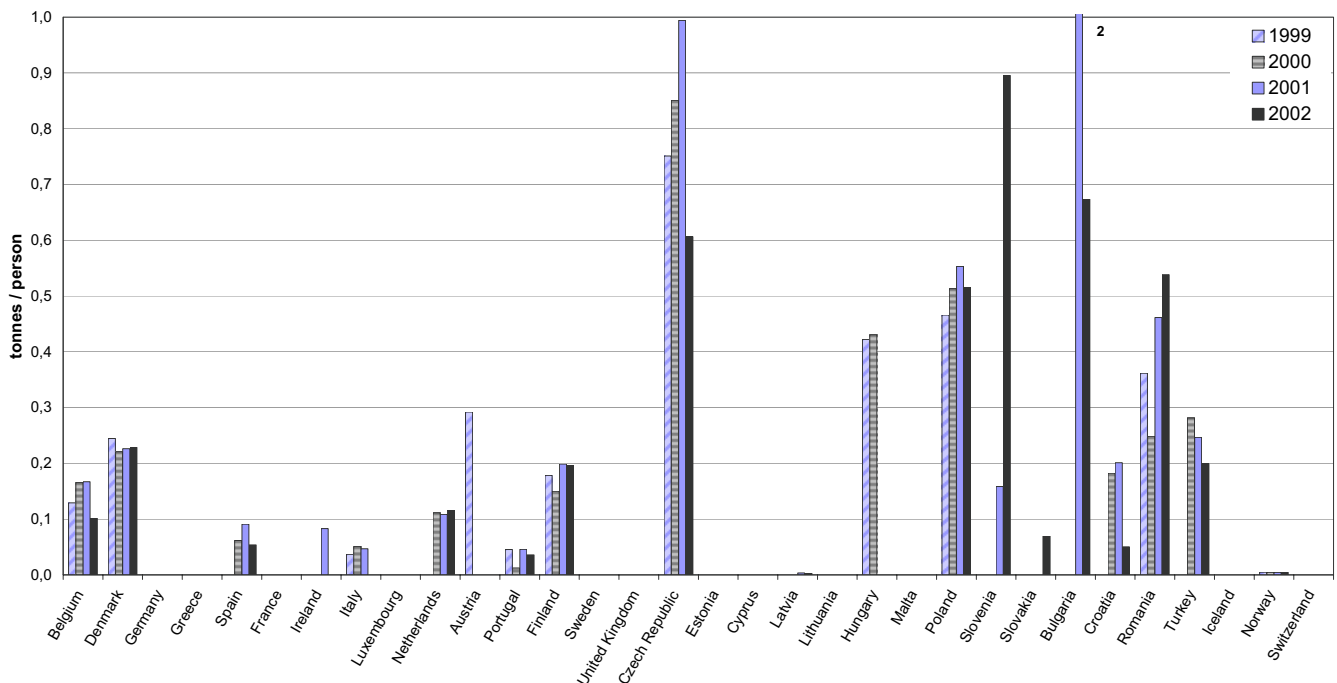


Figure 3-6 Waste generated by the sectors energy production (40) and water supply (41) by countries from 1999 to 2002 (tonnes/person)

The data on waste generated by the construction sector are displayed in figures 3-7 and 3-8. The figures show a broad variation that makes it difficult to draw general conclusions. It has to be considered that data on waste from the construction sector are sensitive to issues of waste definitions, survey coverage and methodological approaches. Whether or not data collection in

the countries covers, for instance, non-contaminated excavated soil, or demolition waste that is reused at the construction site may influence the reported figures considerably. Finland, for example, explicitly notes that their data on construction waste exclude 30.5 million tonnes of surplus soil and stones. For Finland, the inclusion of this amount would lead to an arising of

5 900 kg/person instead of the 273 kg/person displayed in figure 3-8.

The per person values in figure 3-8 indicate that waste generation by the construction sector is considerably higher in EU 15 (1 321 kg/person) than in NMS 10 (135 kg/person) and the Candidate Countries. The reported figures are highest in Germany and Austria (referring to the 1999 figure) with amounts of 3 000 kg/person and more. The other EU 15 countries report

amounts between 270 kg/person (Finland) and about 1 000 kg/person (Belgium) for 2002. For EU 15 the available figures indicate an increase of waste generation by the construction sector in most of the countries. The highest arising for NMS 10 is reported by the Czech Republic with about 700 kg/person. However, the data of the new Member States and the Candidate Countries on construction waste are sketchy and make it difficult to draw general conclusions.

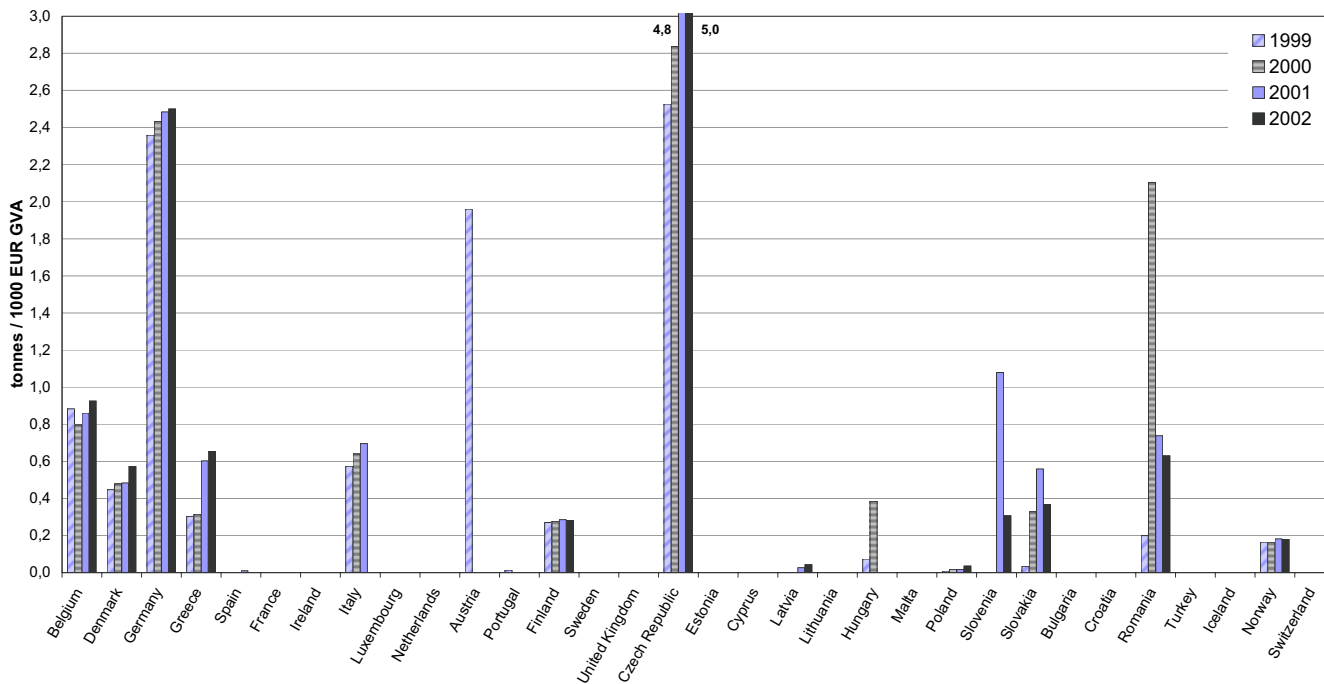


Figure 3-7 Waste generated by the construction industry (45) by countries from 1999 to 2002 (tonnes/1000 EUR GVA)

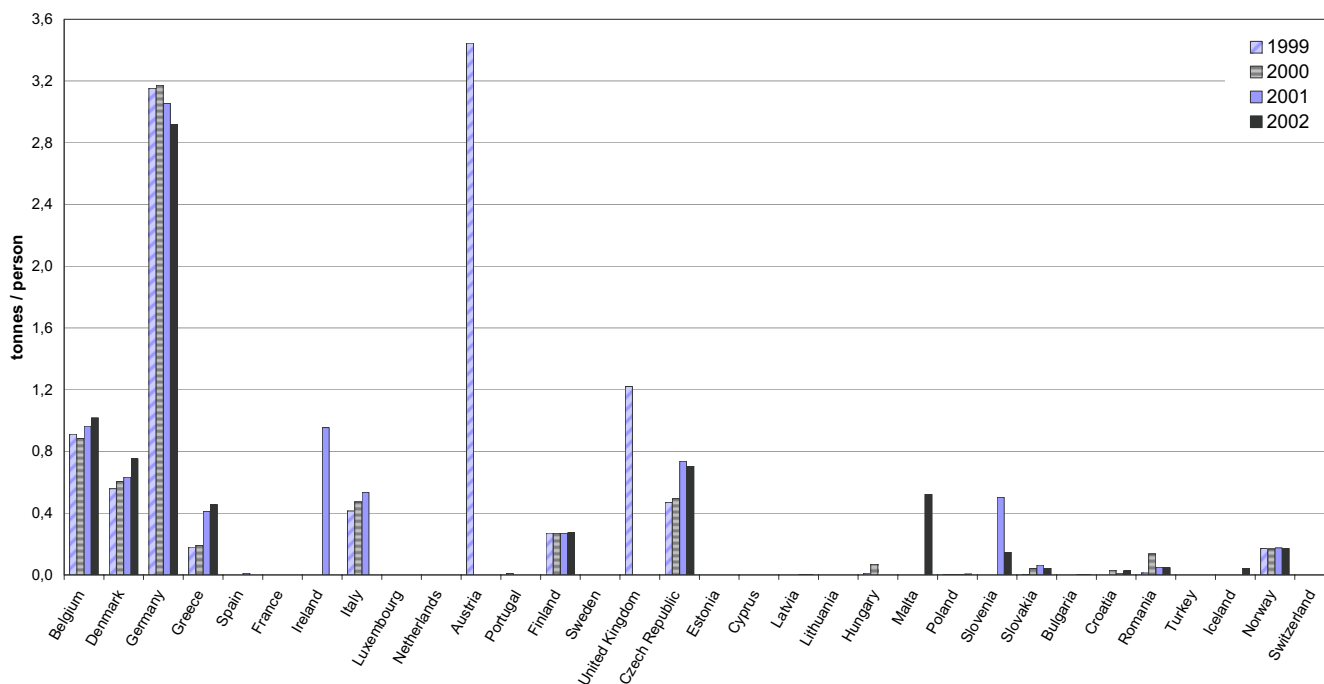


Figure 3-8 Waste generated by the construction industry (45) by countries from 1999 to 2002 (tonnes/person)



## 3.2 Manufacturing Industry

### 3.2.1 Origin of Waste from the Manufacturing Industry by Sub-sectors

In addition to the waste generation on sector-level discussed so far, the JQ collects data on the manufacturing industry in more detail. This includes data on waste generation by manufacturing sub-sectors on the one hand, and data on recovery and disposal of the non-hazardous waste fraction on the other. The raw data on waste generation by sub-sectors are included in Table 3 of Annex 4, the data on the treatment of waste in Table 10 of Annex 4.

The analysis of data on the country level revealed, that data on waste generation by sub-sectors for the year 2002 related to GVA were only available for five countries. Thus, it was abstained from presenting these figures. However, a country comparison regarding the origin of waste from manufacturing industry is possible for 12 countries, which is presented in figure 3-9. The sub-sectors covered in the JQ again follow the structure of the NACE nomenclature as follows:

Sub-Sector	NACE Rev1.1 Division Code
Food, beverages, tobacco industry	15 - 16
Textile industries	17 - 18
Leather industries	19
Wood and wood products	20
Paper and paper products	21
Printing and publishing	22
Refineries, etc	23
Chemical industries	24
Rubber and plastics	25
Non-metallic mineral products	26
Basic metal industries	27
Fabricated metal products, machinery, electrical, optical and transport equipment	28 - 35
Other manufacturing industries	36 - 37

In figures 3-9 and 3-10 all countries with detailed data on sub-sectors were plotted, but only those sub-sectors are shown in the figure with a share of more than 10 % of the total waste

generated in the manufacturing industry. Sub-sectors of a smaller share were included in the position 'other manufacturing industries'. Where the sum of the sub-sectors fell below the section total, the difference was assigned to 'other manufacturing industries'.

Figures 3-9 and 3-10 illustrate that the sub-sectors basic metal industries (NACE 27) and food, beverages, tobacco (15-16) are represented most often as significant sources of waste within the manufacturing industries of the various countries. Base metal industries contribute a particularly high share of waste in Poland, Romania and Bulgaria. The sub-sector food, beverages and tobacco is most important in Iceland (waste from fish processing and slaughterhouses) and in the Netherlands.

The sub-sectors non-metallic mineral products (26) and wood and wood products (20) are represented less often, but if so, they are one of the most important waste generating sub-sectors. The manufacture of non-metallic mineral products generates a significant share of waste in Croatia, Spain and Portugal. High percentages of waste from the wood industry are reported by Latvia and Sweden. Sweden furthermore reports high amounts of waste from the pulp and paper industry. Wood, and pulp and paper industries are also the predominant waste producers within the manufacturing industry in Finland which is not included in the graphs as no data for 2002 are available.

### 3.2.2 Treatment and Disposal of Non-hazardous Waste from the Manufacturing Industry

Figure 3-11 and figure 3-12 show how non-hazardous waste from the manufacturing industry (15-37) is managed in the countries. Figure 3-11 illustrates the share of treatment operations, whereas figure 3-12 gives the treated quantities per inhabitant. The presentations distinguish between landfilling, incineration, recycling and composting. Incineration encompasses the incineration of waste with and without energy recovery. Recovery and disposal operations that were not specified in the Joint Questionnaires are summarised under the heading 'other treatment'.

The graphs illustrate the variations of waste management systems. The new EU Member States and the Candidate Countries still report higher landfill rates than most of the old Member States, for which data were available. The lowest landfill rates of about 10 % or less are reported by the Netherlands, Sweden and Switzerland. Particularly high recycling rates of over 60 % are achieved by the Netherlands, Denmark, and the Czech Republic.

Legend of Figure 3-9 and of Figure 3-10:

- Other Manufacturing industries
- ▨ Paper and Paper Products (21)
- ▨ Fabricated Metal Products, Machinery (28-35)
- ▨ Chemical industries (24)
- ▨ Non-metallic Mineral Products (26)
- ▨ Wood and Wood Products (20)
- ▨ Food, Beverages, Tobacco (15-16)
- Basic Metal industries (27)

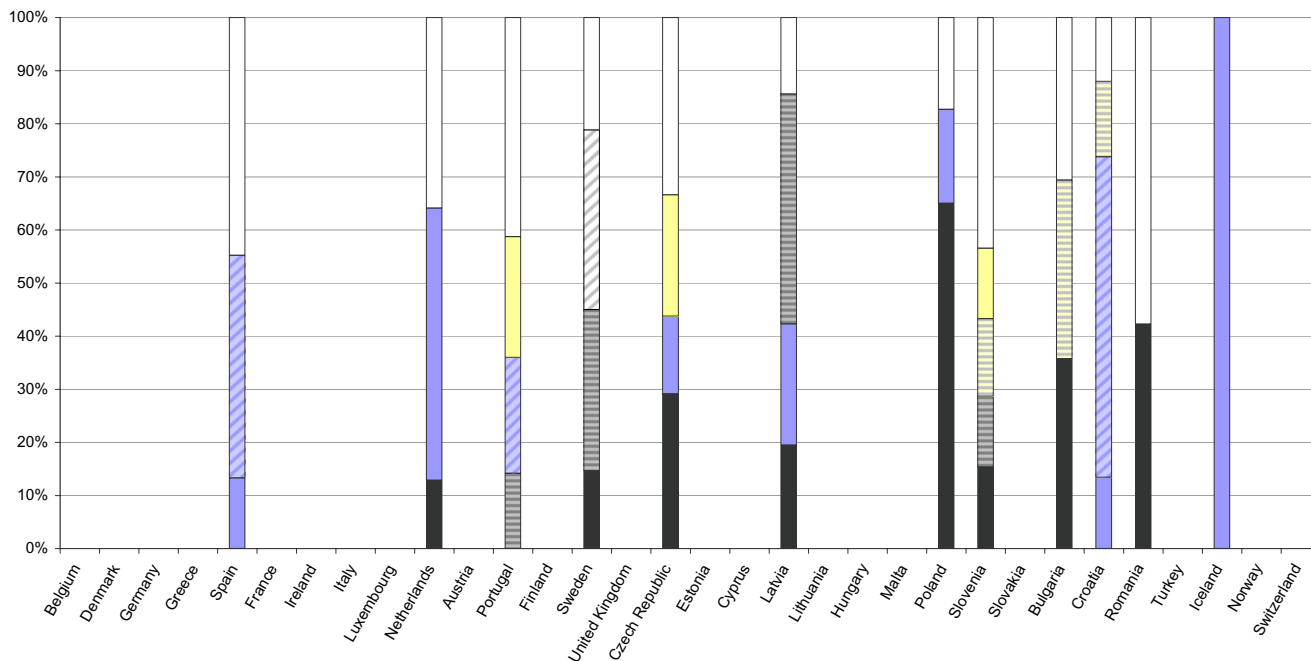


Figure 3-9 Waste generated by the manufacturing industry (15-37) by countries and sub-sectors for 2002 (%)

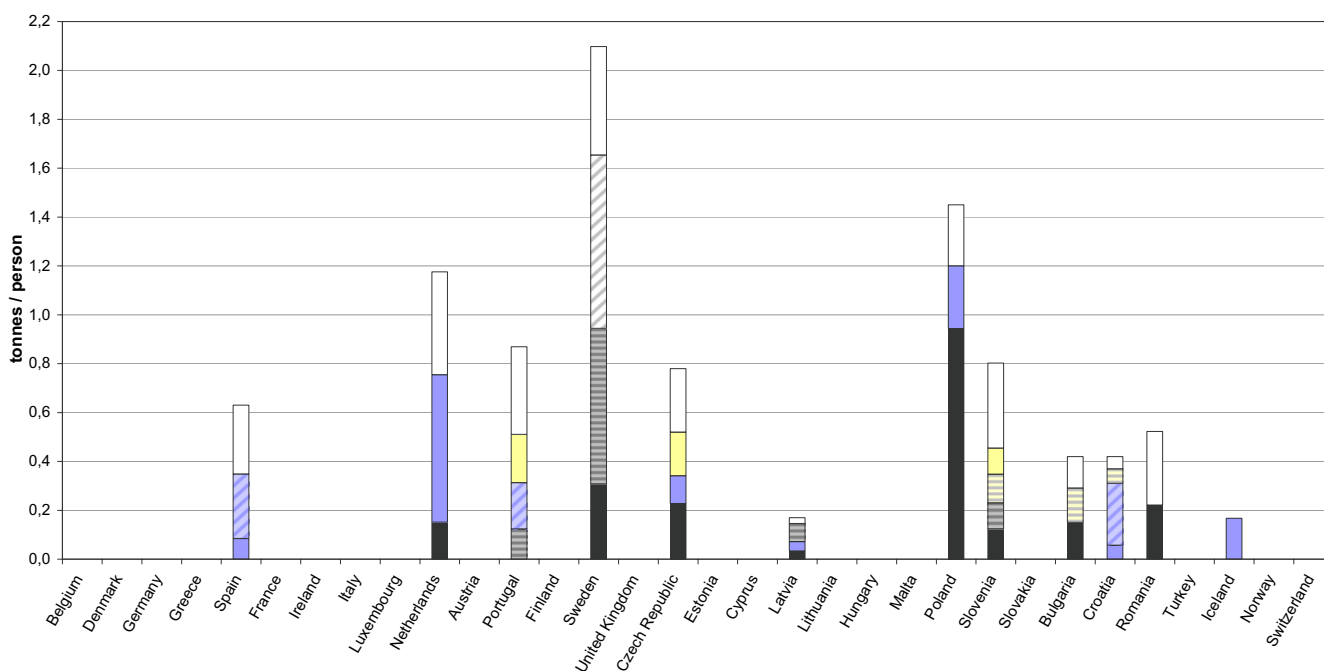


Figure 3-10 Waste generated by the manufacturing industry (15-37) by countries and sub-sectors for 2002 (tonnes/person)

Legend of Figure 3-11 and of Figure 3-12:

- Other treatment
- ▨ Composting
- ▩ Recycling
- Incineration (with and without energy recovery)
- Landfilling

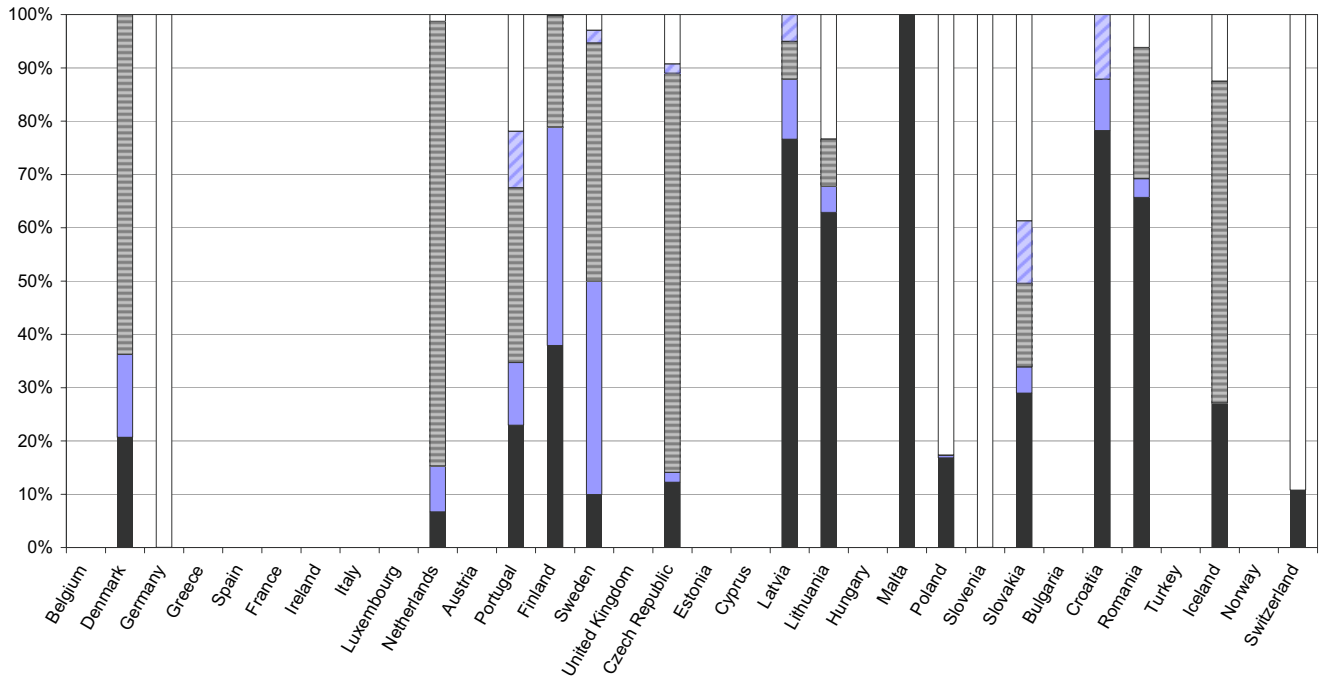


Figure 3-11 Recovery and disposal of non-hazardous waste from the manufacturing industry (15-37) by countries for 2002 (%)

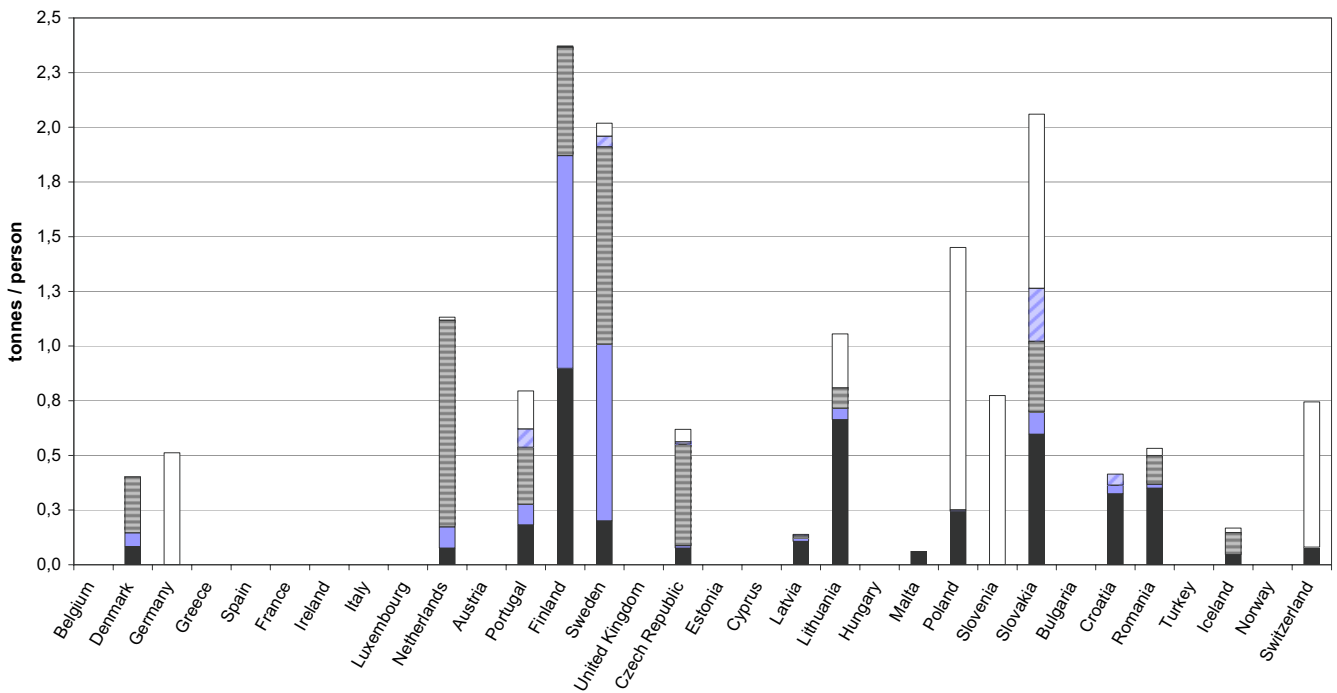


Figure 3-12 Recovery and disposal of non-hazardous waste from the manufacturing industry (15-37) by countries for 2002 (tonnes/person)

## 4 Municipal Waste

### Main findings:

- From 1995 to 2003 municipal waste generation in EU 25 has constantly grown by about 2 % per year from 204 million tonnes (457 kg/person) in 1995 to 243 million tonnes (534 kg/person) in 2003. Generation is higher in the old Member States with 574 kg/person compared to 312 kg/person in the new Member States.
- The landfilled total has decreased in the same period by about 10 % from 131.4 million tonnes in 1995 to 118.5 million tonnes in 2003 on account of increased incineration and recycling rates. In 2003, 48.8 % of the municipal waste generated was landfilled, 17.3 % were incinerated and 33.9 % were recycled or treated otherwise.

### 4.1 Generation and Treatment in the European Union

The Eurostat/OECD Joint Questionnaire asks for the generation, treatment and disposal of municipal waste. As stated in the definitions of the Joint Questionnaire, municipal waste includes household waste and similar waste from commerce and trade, small businesses, offices and institutions (mixed waste and separately collected fractions). The definition also includes street sweeping, content of litter containers, market cleansing waste, yard and parks waste, and bulky waste (see Annex 1).

The JQ data on generation and treatment of municipal waste are used to calculate the indicator set on municipal waste. The municipal waste indicators are part of the Structural Indicators designed to measure the success or failure of EU policies on an annually basis. The set consists of the three indicators 'municipal waste generated', 'municipal waste landfilled' and 'municipal

waste incinerated' expressed as amount in kg per person and year. The municipal waste indicators for the years 1995 to 2003 build the basis for the overview of waste generation and treatment given in this section (4.1) and in section 4.2.1. The complete set of indicators is included in Annex 3 of this publication and can also be found on the Eurostat website. The more detailed presentations on municipal waste collection and treatment in the sections 4.2.2 and 4.3 are based on the JQ data shown in Annex 4, Table 7 (municipal waste generation and collection), Table 8 (composition of municipal waste) and Table 12 (treatment and disposal of municipal waste).<sup>(1)</sup>

Figure 4-1 presents the development of municipal waste generation and treatment for EU 25 from 1995 to 2003. The graph shows that municipal waste generation in this period has constantly been growing. The arising has increased by 39 million tonnes (19 %) from 204 million tonnes (457 kg/person) to 243 million tonnes (534 kg/person) which corresponds to an average yearly increase of about 2 %.

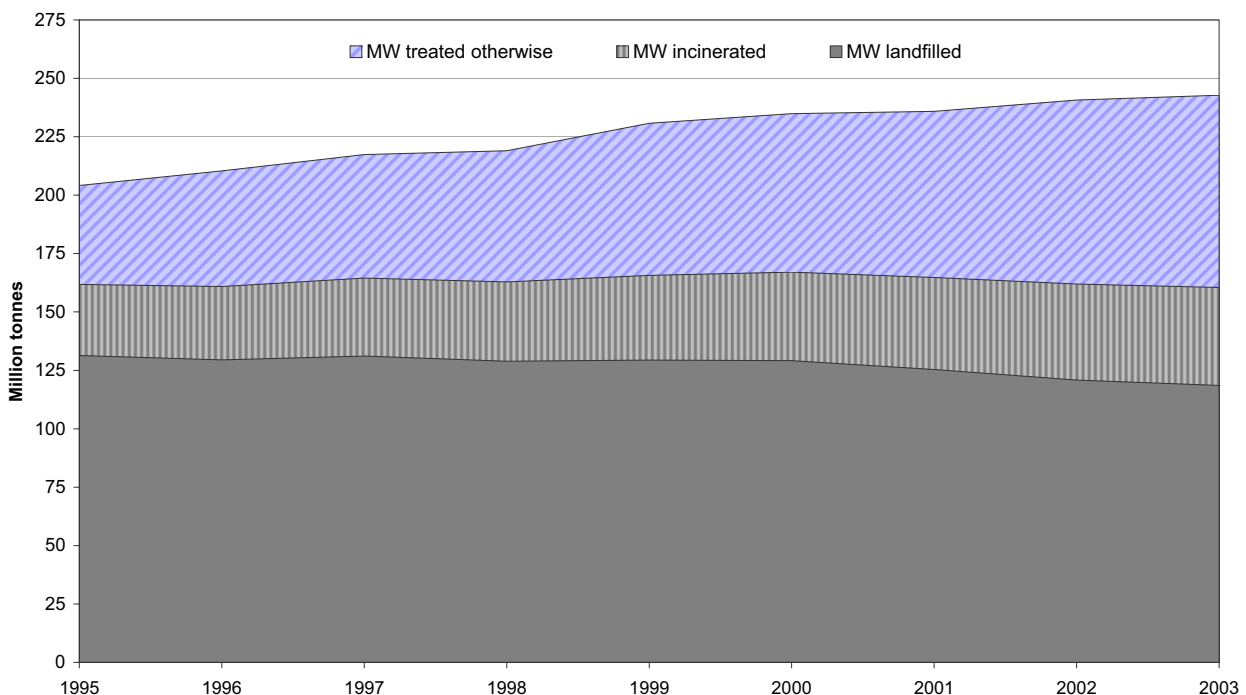


Figure 4-1 Generation and treatment of municipal waste in EU 25 from 1995 to 2003 (Million tonnes)

(1) As the municipal waste indicators are derived from the JQ data; the indicators are in principle identical with the corresponding raw data shown in Table 7 and Table 12 of Annex 4. However, some deviations occur since data validation for indicators and JQ data have been carried out at different times, and estimations were used to close data gaps in the indicator time series

Landfilling is still the main option for the disposal of municipal waste. In 2003, nearly half of the generated total (48.8 %) was landfilled. The landfilled totals, however, have shown a slight but constant decrease in recent years. The municipal waste landfilled has been reduced by 12.9 million tonnes (9.8 %) from 131.4 million tonnes in 1995 to 118.5 million tonnes in 2003. This is the result of increased separate collection and recycling, and of the steady rise of incineration (thermal treatment and energy recovery). Incineration has increased by 11.5 million tonnes or 38 % respectively in the reference period, and accounted in 2003 for 41.9 million tonnes (17 %) of the treated waste. Recycling and other treatment operations have risen by

40 million tonnes to 82.3 million tonnes and thus nearly doubled in the same time.

The comparison of old and new Member States in figure 4-2 shows that the overall growth of municipal waste generation results from the development in the old EU Member States. Waste generation increased in EU 15 by 23 % from 482 kg/person to 577 kg/person within the reference period. In contrast, the data suggest a slightly decreasing trend in the new Member States since 1999. In 2003, generation amounted to 312 kg/person in NMS 10 as compared to 334 kg/person in 1995.

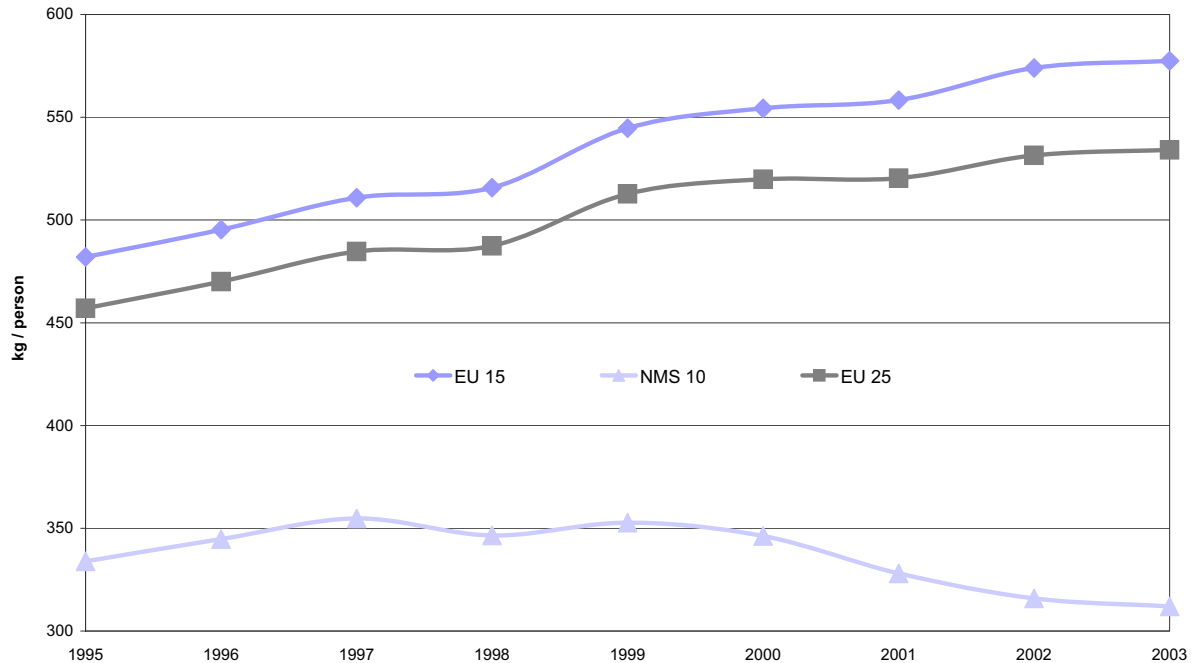


Figure 4-2 Generation of municipal waste in the European Union from 1995 to 2003 (kg/person)

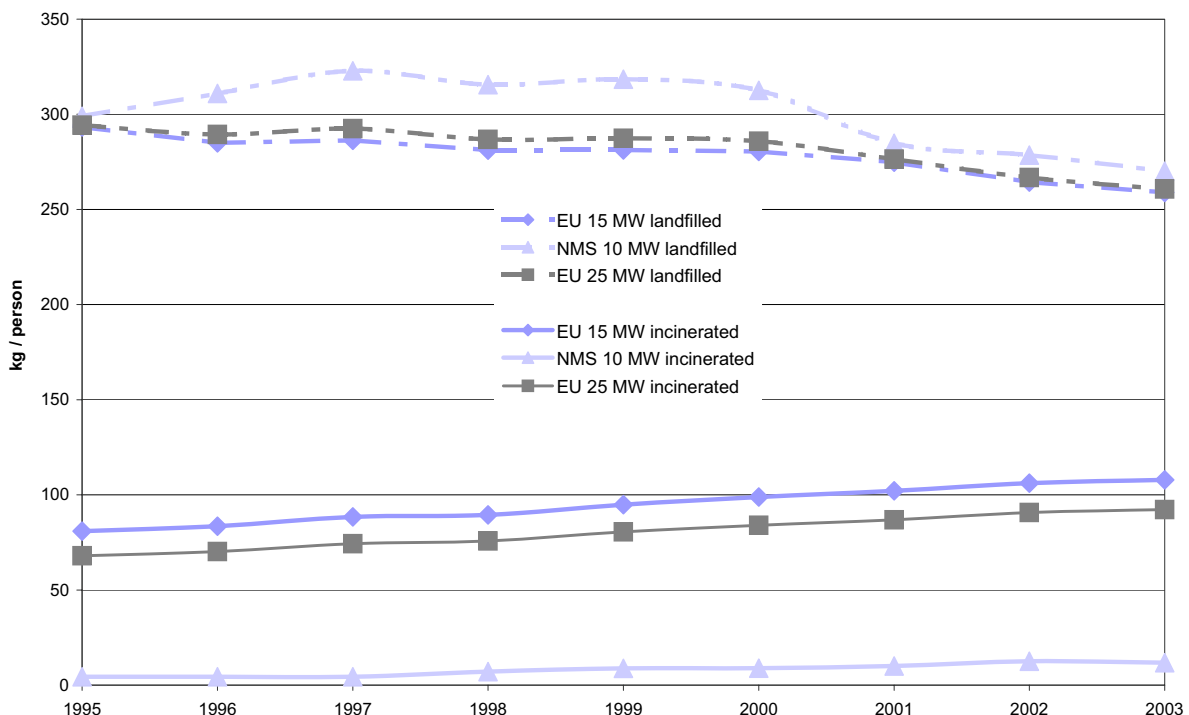


Figure 4-3 Treatment and disposal of municipal waste in the European Union from 1995 to 2003 (kg/person)

Figure 4-3 shows the development of the structural indicators for landfilling and incineration in the European Union specified by old and new Member States. It illustrates that the per person amounts of municipal waste going to landfills are quite similar in NMS 10 and EU 15. Considerable differences exist with regard to waste incineration. Whereas in EU 15 more than 100 kg/person were incinerated in 2003 the respective amounts in the new Member States are still low ranging at about 12 kg/person.

## 4.2 Generation and Collection by Countries

### 4.2.1 Generation by Countries

Figure 4-4 shows the indicators on municipal waste generated by countries for the year 2003. To indicate the development in recent years figure 4-4 compares the arisings in 1995 and 2003. The generated totals in 2003 vary considerably between countries ranging from 260 kg/person in Poland to 1 040 kg/person

in Iceland. With the exception of Belgium, all EU 15 countries report considerable higher amounts for 2003 than for 1995. The same applies to the EFTA states Iceland, Norway and Switzerland. In the new Member States and the Candidate Countries the development differs from country to country. Clear increases are reported by Malta, Latvia, Cyprus and Estonia. Most other countries report declines in municipal waste generation that are highest in Bulgaria, Slovenia and Lithuania.

### 4.2.2 Origin of Municipal Waste and Type of Collection

The Eurostat/OECD Joint Questionnaire asks for the amounts of generated and collected municipal waste. In countries where not the whole population is served by municipal waste collection systems the generated amounts will be higher than the collected ones. Hence, figures on municipal waste collected presented in the following may deviate from the generated amounts for individual countries and years. The raw data for this section are available in Table 7 of Annex 4.

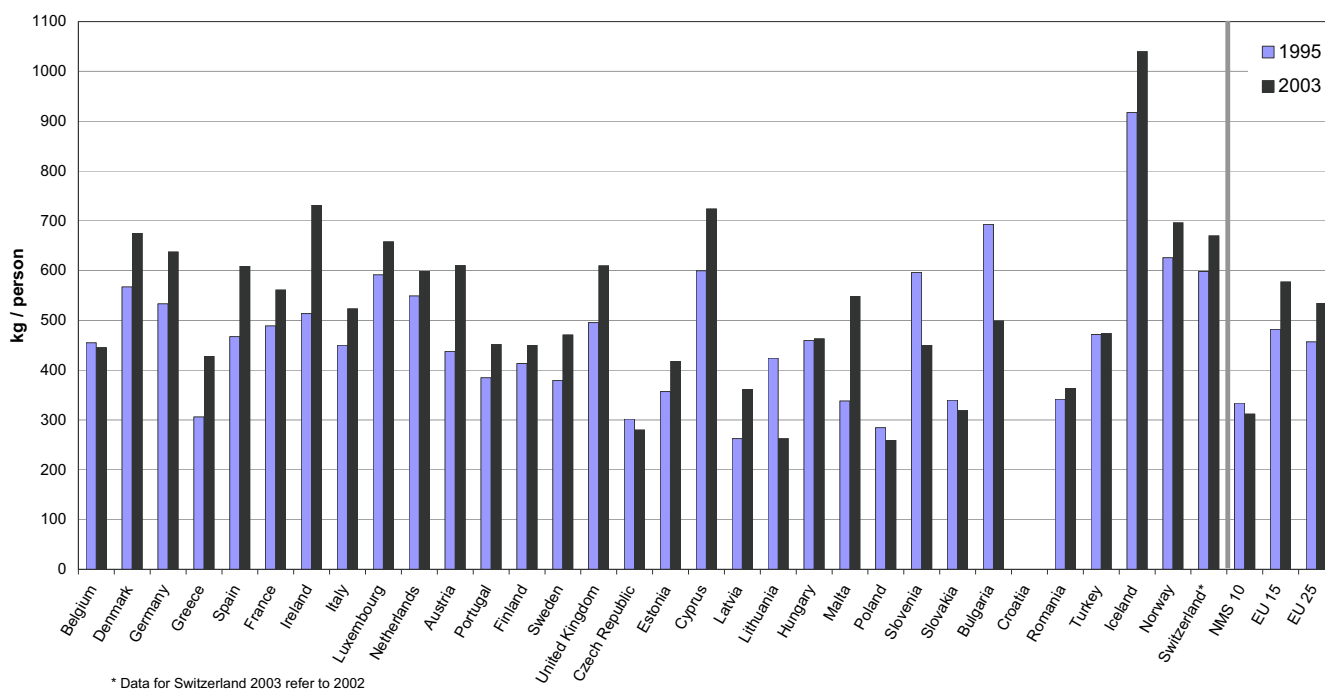


Figure 4-4 Municipal waste generation by countries and the European Union for 1995 and 2003 (kg/person)

The reported amounts for municipal waste generation and collection depend on the collection systems established in the countries. Differences between individual countries exist in particular with regard to the degree to which waste from commerce, trade, shops and administration is covered by municipal waste collection and co-collected with waste from households. This is illustrated by figure 4-5 and figure 4-6. Both graphs show the amount of the collected municipal waste specified by origin, differentiating between waste from households, waste from commerce and trade, and waste from municipal services.

The share of waste from households ranges for most countries between 60 % and 90 % depending on the amount of other waste collected under the responsibility of the municipality. A few countries are above or below this range. In Iceland, for

example, municipal waste includes a high share of commercial waste which might explain the high municipal waste arising reported in figure 4-4.

The percentage of commercial waste in municipal waste ranges for most countries between 10 % and 35 %. In a few countries the share of commercial waste is as high or even higher than the waste from households (Estonia, Finland, Iceland). The share of waste from municipal services generally falls below 10 %.

However, when interpreting the data, it has to be considered that some countries are not able to determine exactly the share of waste from different sources that are collected by the same collection system. Hence, the figures give only a rough image of the situation.

Legend of Figure 4-5 and 4-6:

- Not specified
- From street and market cleaning, yards, litter containers, etc
- From commerce and trade, small businesses, office buildings, institutions
- From households

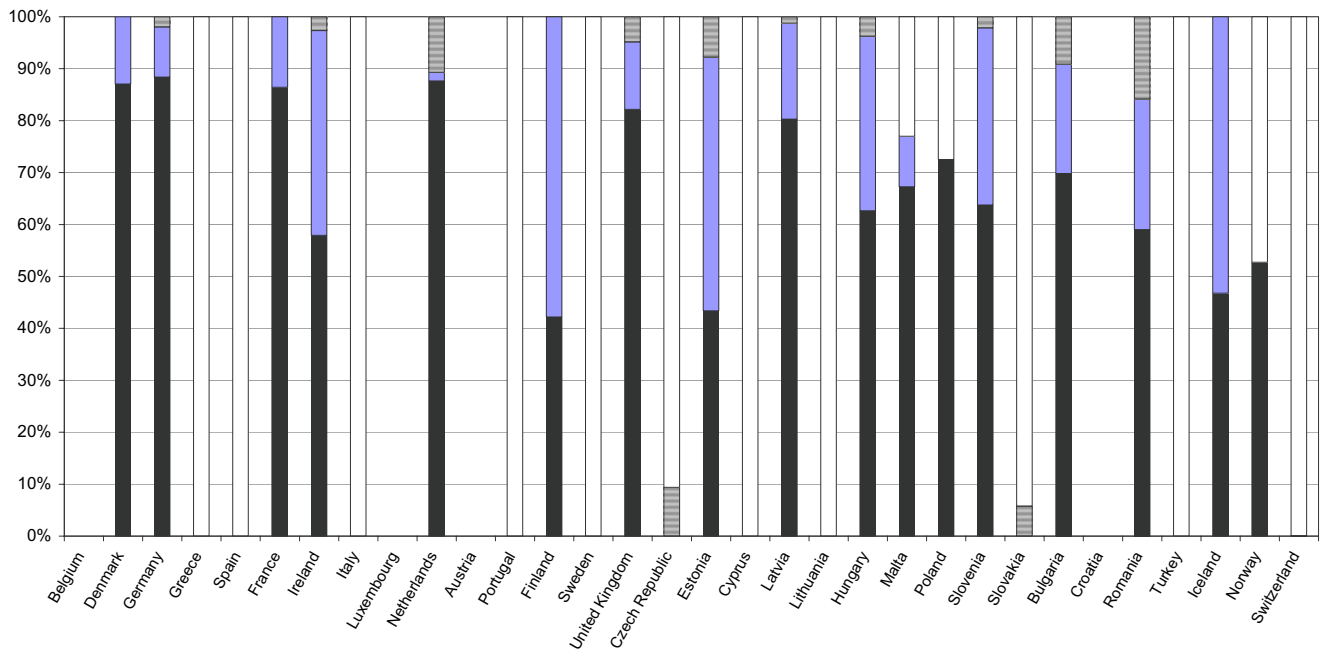


Figure 4-5 Municipal waste collected by origin and by countries for 2002 (%)

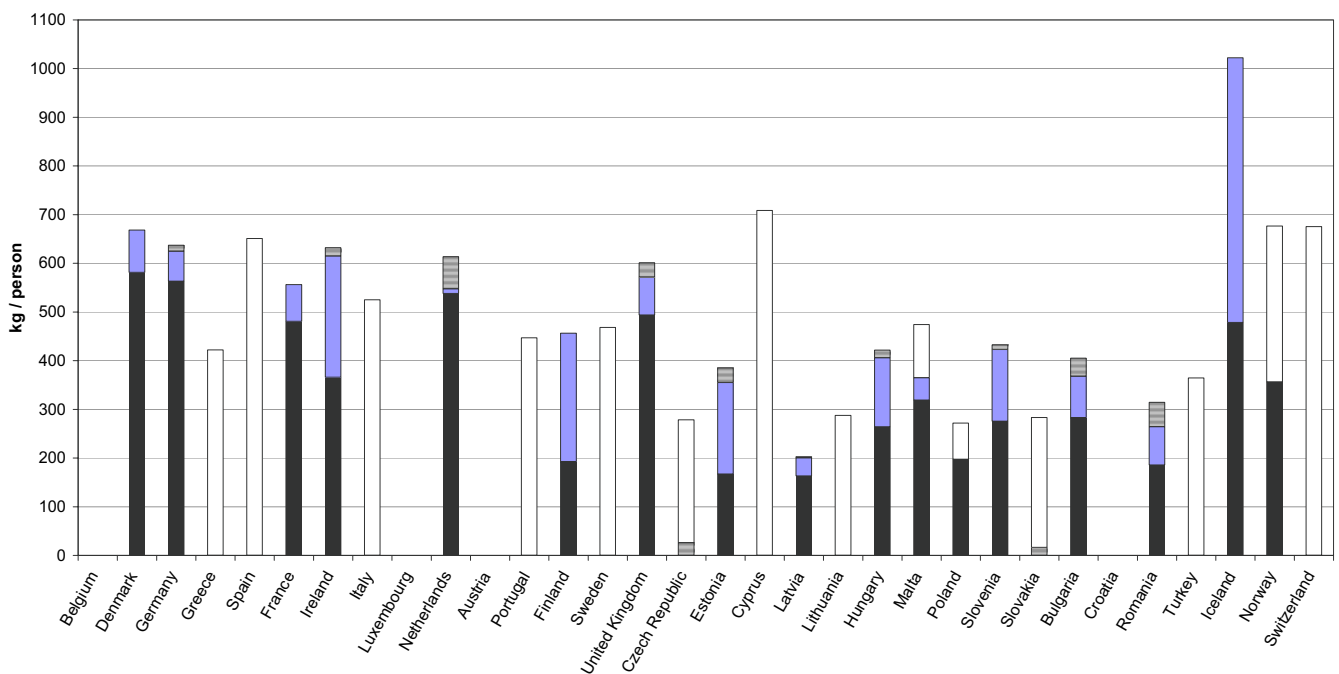


Figure 4-6 Municipal waste collected by origin and by countries for 2002 (kg/person)

Another view on municipal waste collection is presented in figure 4-7 which shows the collected amounts by type of collection, distinguishing between traditional collection (door-to-door collection of mixed household or similar waste in bags or bins), collection of bulky waste, and separate collection of recyclables

and special wastes (e.g. refrigerators). The figures reflect the organisation of municipal waste collection and the stage of development of separate collection.

The share of separate collection varies considerably between countries. Separate collection of waste fractions is best estab-

lished in Western Europe and the Scandinavian countries with a share of 30 % to 46 % in Denmark, Germany, the Netherlands, Finland, Sweden and Switzerland. Between 15 % to 30 % of the municipal waste are collected separately in France, Ireland, Italy, Estonia, Slovenia and Norway. In some of the new Member States separate collection systems are in the process of being built up and figures are still low or not available. The share of bulky waste collection accounts mostly for up to 10 % of the collected total.

A few countries with well established separate collection systems have reduced the share of traditional collection to about 50 % of the municipal waste or even below (Denmark, Germany, the Netherlands and Switzerland).

Legend of Figure 4-7

- Not specified
- ▨ Separate collection of waste fraction
- Collection of bulky waste
- Traditional collection

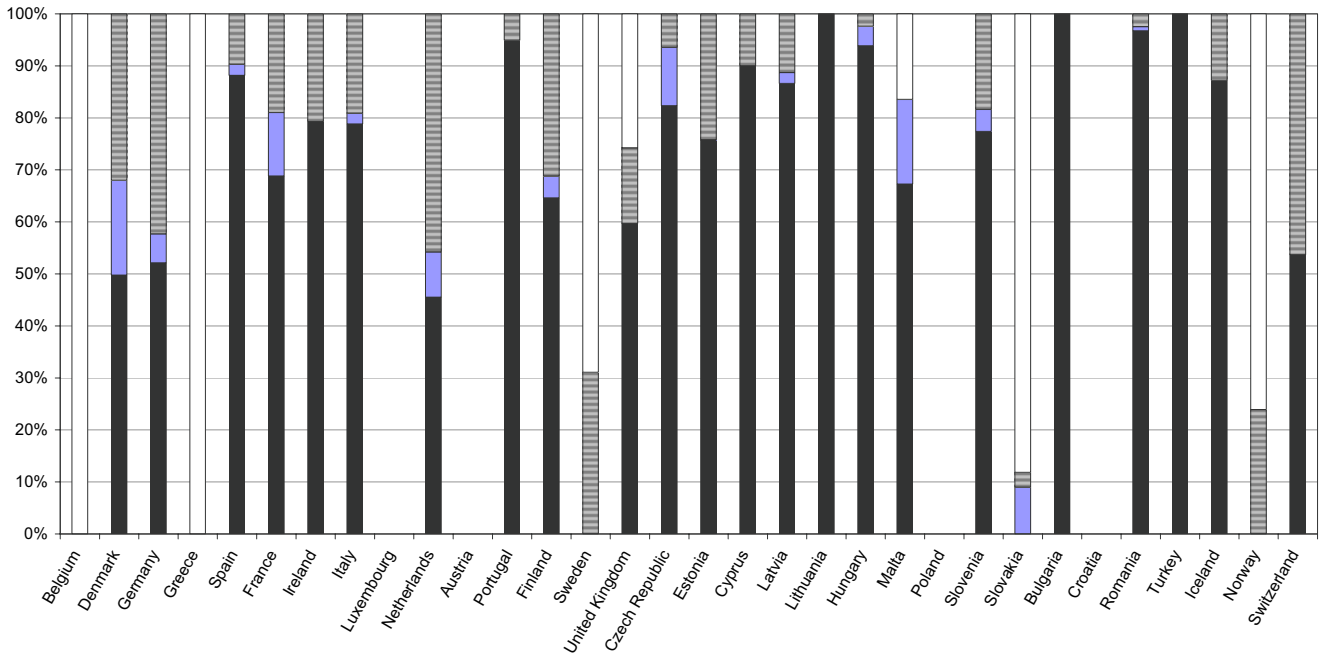


Figure 4-7 Municipal waste collected by type of collection and by countries for 2002 (%)

Figure 4-8 and figure 4-9 present a more detailed look on the separately collected materials and quantities. Although data are incomplete the graph shows that paper, glass and organic materials account for the biggest share in separate collection. Separately collected quantities amount up to 160 kg/person for waste paper and 40 kg/person for glass waste. The quantities of separately collected plastics and metals are mostly below 5 kg/person with the exception of a few countries.

Of major interest with regard to the implementation of Directive 1999/31/EC on the landfill of waste is the reduction of biodegradable waste going to landfills by separate collection of

organic materials. The quantities reported by the countries refer mainly to the separate collection of food and garden waste by bio-bins but may also include green waste from parks, cemeteries or other origin.

Of the 32 countries represented in the graph 13 did report figures on separate collection of organic waste. The highest amounts of separately collected organic waste are reported by Denmark, the Netherlands and Switzerland. These countries diverted in 2002 about 100 to 120 kg/person of biodegradable municipal waste from landfills. Germany, France, Italy and Estonia collected between 30 and 50 kg/person.



Legend of Figure 4-8 and 4-9

- Other
- ▨ Organic material
- ▨ Metal
- ▨ Plastic
- ▨ Glass
- Paper

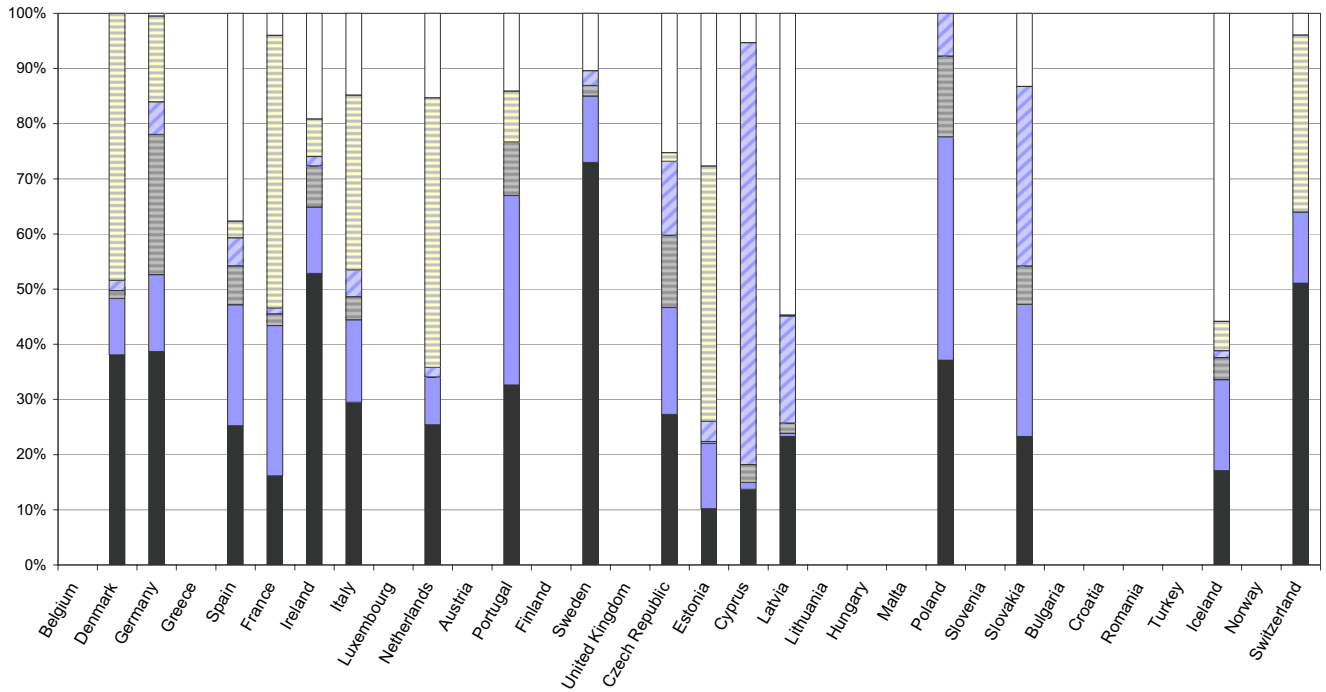


Figure 4-8 Separate collection of municipal waste by materials and countries for 2002 (%)

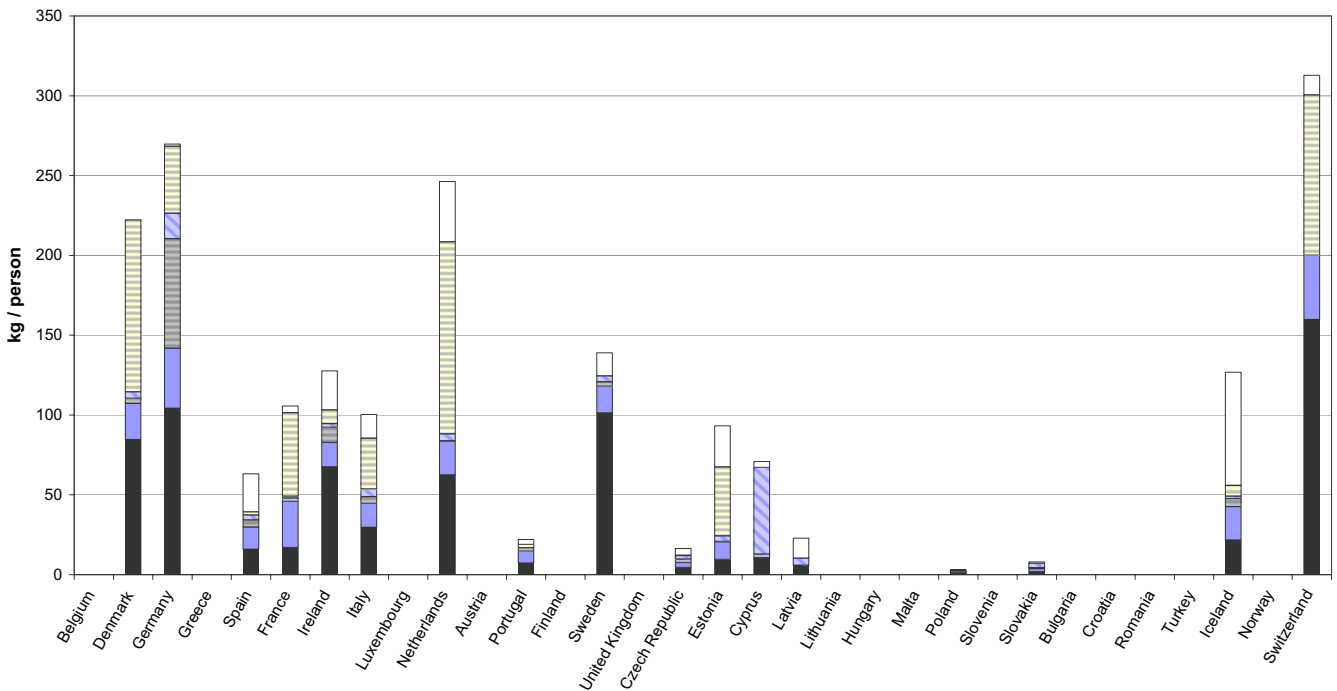


Figure 4-9 Separate collection of municipal waste by materials and countries for 2002 (kg/person)

### 4.3 Treatment and Disposal of Municipal Waste

Figure 4-11 and figure 4-10 show how municipal waste is managed in the countries. Figure 4-11 gives the quantities per inhabitant whereas figure 4-10 shows the percentage of treatment operations. The raw data for the graphs are included in Table 12 of Annex 4. The presentations distinguish between landfilling, incineration, recycling and composting. Incineration encompasses the incineration of waste with and without energy recovery. Recovery and disposal operations that were not specified in the Joint Questionnaires are summarised under the heading 'other treatment'.

The graphs highlight the differences of national waste management systems and strategies. The new EU Member States and the Candidate Countries still rely very much on the disposal of municipal waste on landfills. With the exception of the Czech Republic and the Slovak Republic all new Member States and Candidate Countries report landfill rates of 80 % or more. This applies also to the old EU Members Greece and Ireland.

By far the lowest landfill rates are achieved by Belgium, Denmark and the Netherlands. The three countries have reduced the share of waste going to landfills to 12 % or less of their municipal waste total. This is achieved through a mix of incineration, recycling and composting. Denmark is the country that relies most on incineration with an incineration rate of 56 %.

Recycling has gained an important role in nearly all EU 15 countries, and accounts for the treatment of up to 33 % (Germany) of the municipal waste total. The figures also show that composting contributes considerably to waste management in several countries like Belgium, Denmark, Germany, Spain, France, Italy and the Netherlands. Between 13 % to 24 % of municipal waste are treated by composting in these countries, the composted amounts ranging between 71 kg/person in France and 147 kg/person in the Netherlands.

Legend of Figure 4-10

- Other treatment
- Composting
- Recycling
- Incineration (with and without energy recovery)
- Landfilling

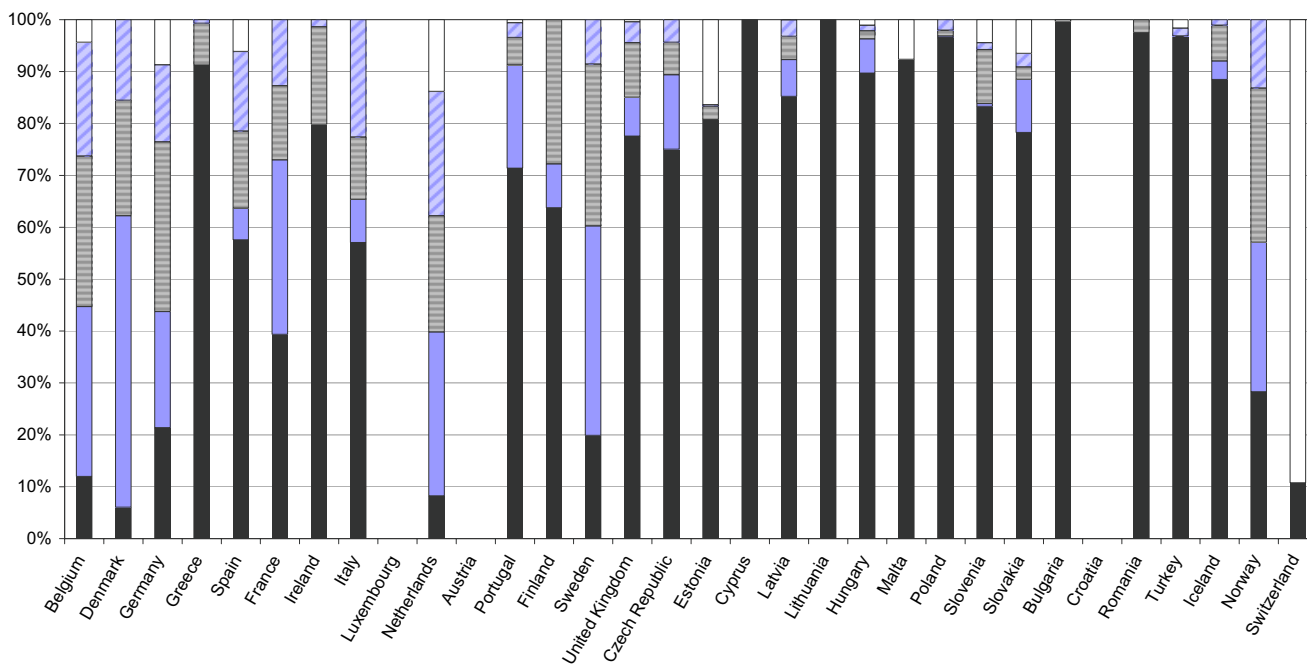


Figure 4-10 Recovery and disposal of municipal waste by countries for 2002 (%)

Legend of Figure 4-11

- Other treatment
- ▨ Composting
- ▩ Recycling
- ▣ Incineration (with and without energy recovery)
- Landfilling

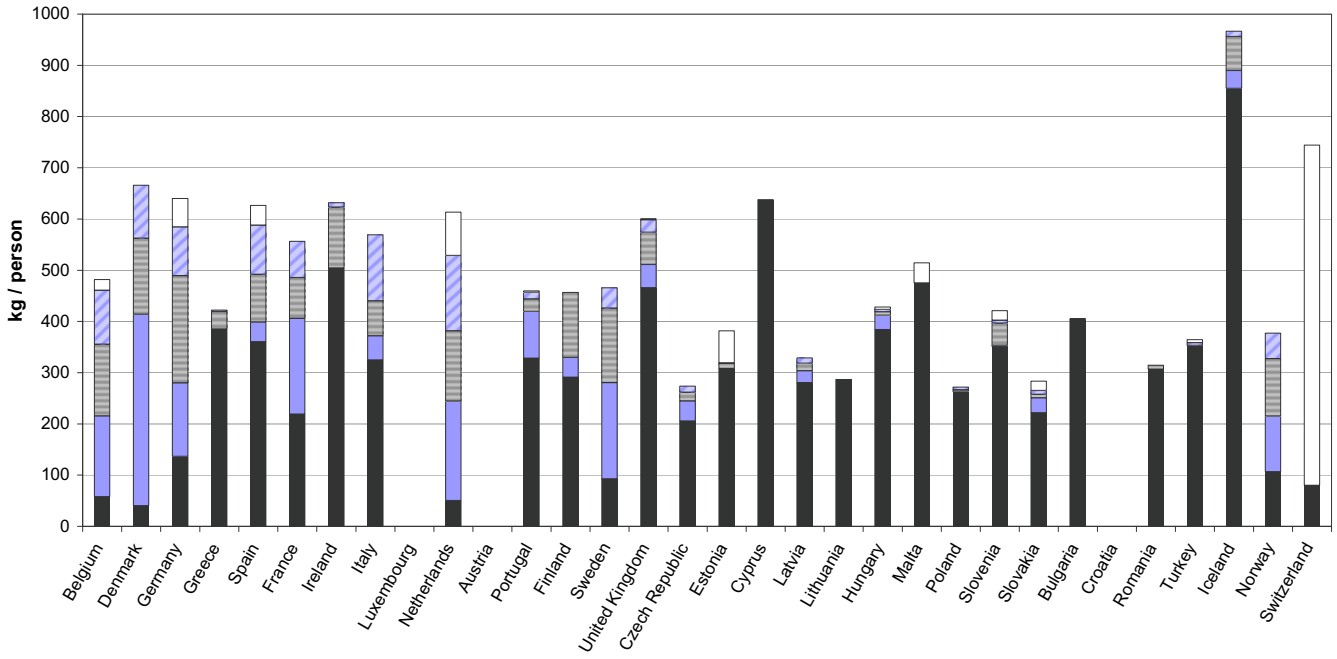


Figure 4-11 Recovery and disposal of municipal waste by countries for 2002 (kg/person)

## 5 Hazardous Waste

### Main findings:

- Since 1998 hazardous waste generation in EU 25 has increased by about 13 % from 51.8 million tonnes (115 kg/person) to 58.4 million tonnes (129 kg/person) in 2002. With an average of 155 kg/person generation is higher in the new Member States than in EU 15 (124 kg/person) but shows a converging tendency.
- Main source of hazardous waste is the manufacturing industry, which accounts for 40 % up to over 90 % of the generated total.

### 5.1 Generation of Hazardous Waste

The Eurostat/OECD Joint Questionnaire collects data on the generation of hazardous waste by origin (i.e. generation by economic sectors) and on the treatment and disposal of hazardous waste. As regards the definition and classification of hazardous waste the Joint Questionnaire refers in principle to the waste categories that are controlled under the Basel Convention, i.e. to the waste codes Y1 to Y18. However, the countries are free to refer to their national catalogues or to the European classification where data are not available according to the Basel Convention.

Whereas several countries referred to their national catalogues in previous years, it seems that starting with the year 2002 the European List of Wastes<sup>(1)</sup> is widely applied for the classification of hazardous wastes by nearly all countries covered by this publication. This increases the comparability of data from 2002 and 2003 considerably but does not solve the problem of retrospective comparability and consistency of time series.

The introduction of the European List of Waste has different effects on the time series of countries depending on the waste classification previously used. For countries that referred to the European Waste Catalogue before 2002 it is likely that the introduction of the List of Wastes leads to an increase of hazardous waste amounts on account of reclassification of some waste types. For other countries which used national catalogues with a very broad definition of hazardous waste, like for instance the Czech Republic, the opposite might be true. These aspects should be kept in mind when interpreting the development of hazardous waste generation as shown in this section.

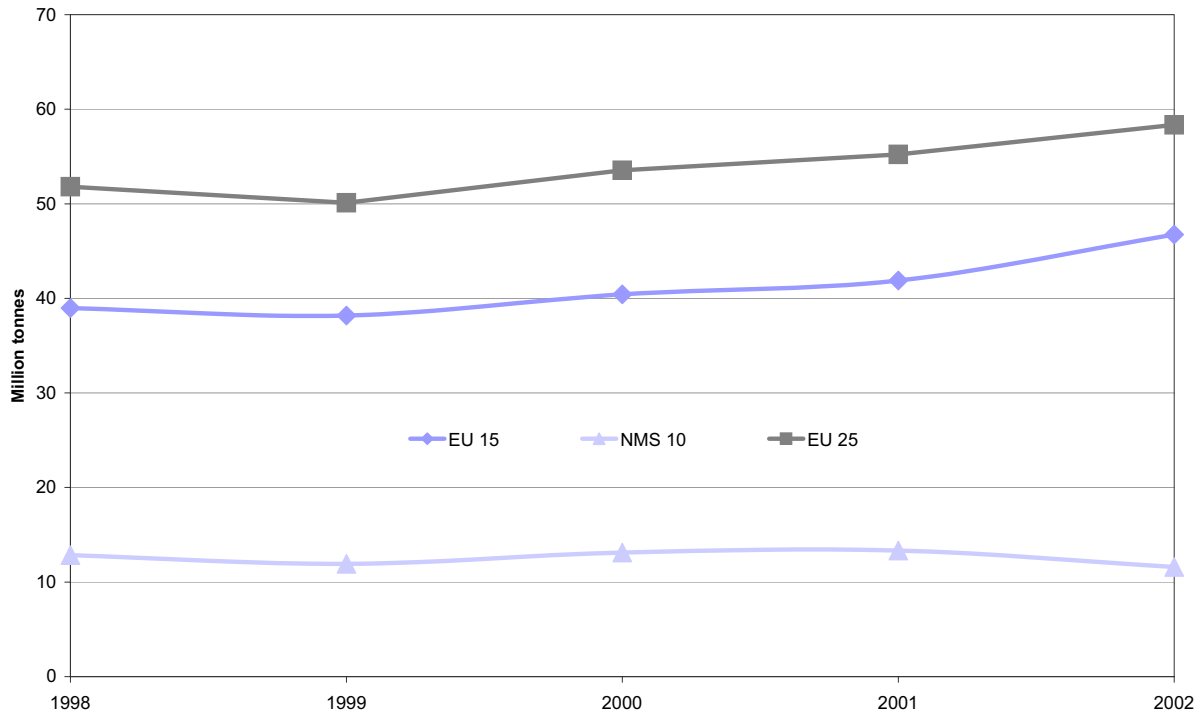
Furthermore, it has to be noted that the Joint Questionnaire asks for hazardous waste generation in two different tables and contexts. Hence, for each country two data sets on hazardous waste

generation exist which may in some cases deviate from each other. Both data sets are included in Annex 4. The data set on hazardous waste generation by origin is displayed in the Tables 4 and 5, the data set on hazardous waste generation (which also includes data on generation) is available in Table 11 of Annex 4. Reasons for deviations can partially be retrieved from the countries' footnotes to the raw data. The following graphs draw on both sources in order to provide a data set as complete as possible.

Figure 5-1 shows the development of the hazardous waste total for EU 25 together with the aggregates for EU 15 and NMS 10 for the years 1998 to 2002. As the raw data are incomplete data gaps had to be closed by estimation. Estimates for lacking data were based on the ratio of 'hazardous waste total/1 000 EUR GVA' of previous years or comparable countries. The generated time series is limited to the years 1998 to 2002 because the data base for previous years and for 2003 was considered to be too sketchy for grossing up the data.

According to the estimates the hazardous waste arising for EU 25 has increased between 1998 and 2002 by about 6.5 million tonnes from 51.8 million tonnes (115 kg/person) to 58.4 million tonnes (129 kg/person). This increase of 13 % is slightly higher than the Gross Value Added growth of 10 % in the same period. Figure 5-1 illustrates that this overall increase is caused by the development in EU 15 countries. There, hazardous waste generation has risen from 39.0 million tonnes (104 kg/person) in 1998 to 46.7 million tonnes (124 kg/person) in 2002. As pointed out earlier, this increase could be partially due to the introduction of the European Waste List in 2002. For the new Member States the available data indicate slightly declining amounts of hazardous waste in spite of a Gross Value Added growth of 13 %. The generated total in NMS 10 decreased from 12.8 million tonnes (171 kg/person) in 1998 to 11.6 million tonnes (155 kg/person) in 2002.

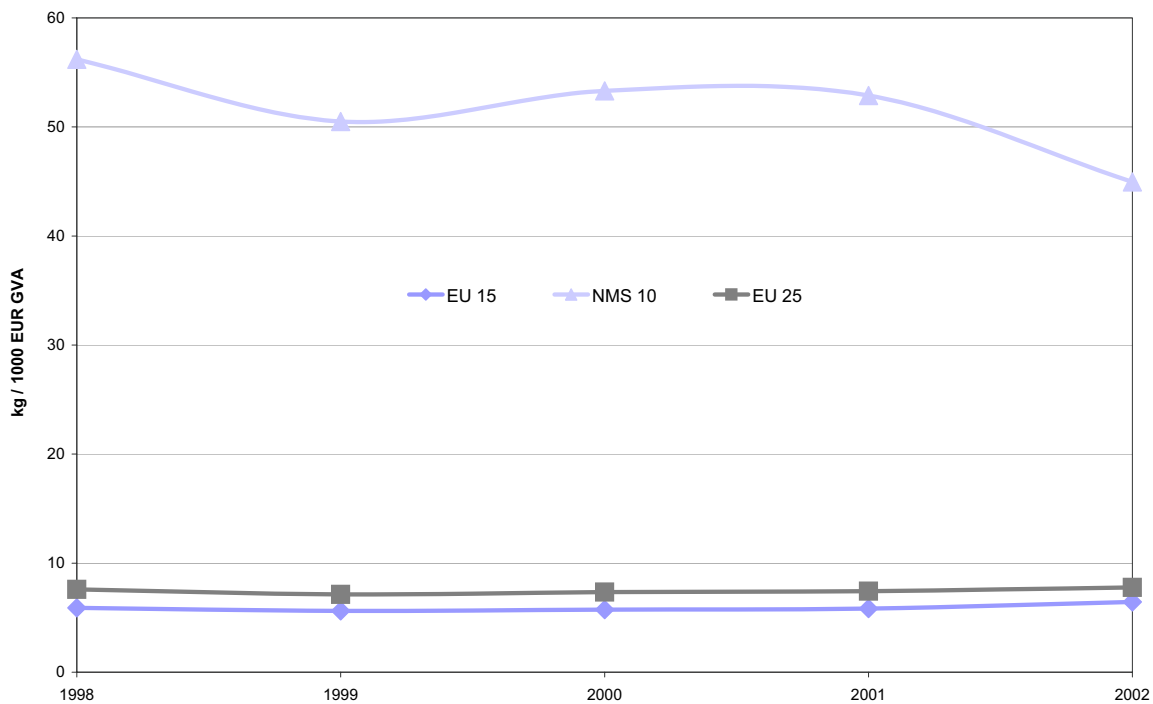
(1) Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a List of Wastes (OJ L 226, 06.09.2000, p.3), last amended by Decision 2001/573/EC (OJ L 203, 28.07.2001, p.18)



**Figure 5-1** Generation of hazardous waste in the European Union from 1998 to 2002 (Million tonnes)

The relation between hazardous waste generation and the Gross Value Added is illustrated by figure 5-2 which shows the estimated hazardous waste totals in relation to the GVA at constant prices. For the EU 15 countries the calculated ratio is quite stable amounting to about 6 kg/1 000 EUR. Hence, economic

growth has resulted in a nearly proportional increase of hazardous waste. For the NMS 10 countries the ratio is 7 to 10 times higher than in EU 15 countries but shows a decreasing trend. As a result, the hazardous waste total has been declining in spite of a higher output measured as GVA.



**Figure 5-2** Generation of hazardous waste in the European Union from 1998 to 2002 (kg/1000 EUR GVA)

Figure 5-3 and figure 5-4 show the hazardous waste totals by countries related to the national Gross Value Added at constant prices and to the number of inhabitants. Graph 5-3 illustrates the differences between old and new Member States already mentioned above. In the old Member States the ratio between

waste generation and GVA is generally lower than in the new Member States and Candidate Countries, and rarely exceeds 10 kg/1 000 EUR GVA. In contrast, the Slovak Republic, Bulgaria and Romania report amounts of up to 100 kg/1 000 EUR GVA. The huge amounts reported by Estonia result from the use of oil

shale for energy production. Estonia has large oil shale deposits which are used for the production of almost 100 % of Estonia's electrical power. The mining of oil shale, the reprocessing in the chemical industry and the oil shale based energy production generates huge amounts of waste that are classified as hazardous.

The amounts per person presented in figure 5-4 vary in a broad range and show no clear feature. The wide range of data cer-

tainly reflects differences in the economic structure of the countries. However, the considerable variation and the abrupt changes of quantities from one year to another may also result from differences and changes in the classification of hazardous waste and in the coverage of data collection. Altogether the data indicate that the figures in several countries are still quite unstable and influenced by methodological changes and questions of classification.

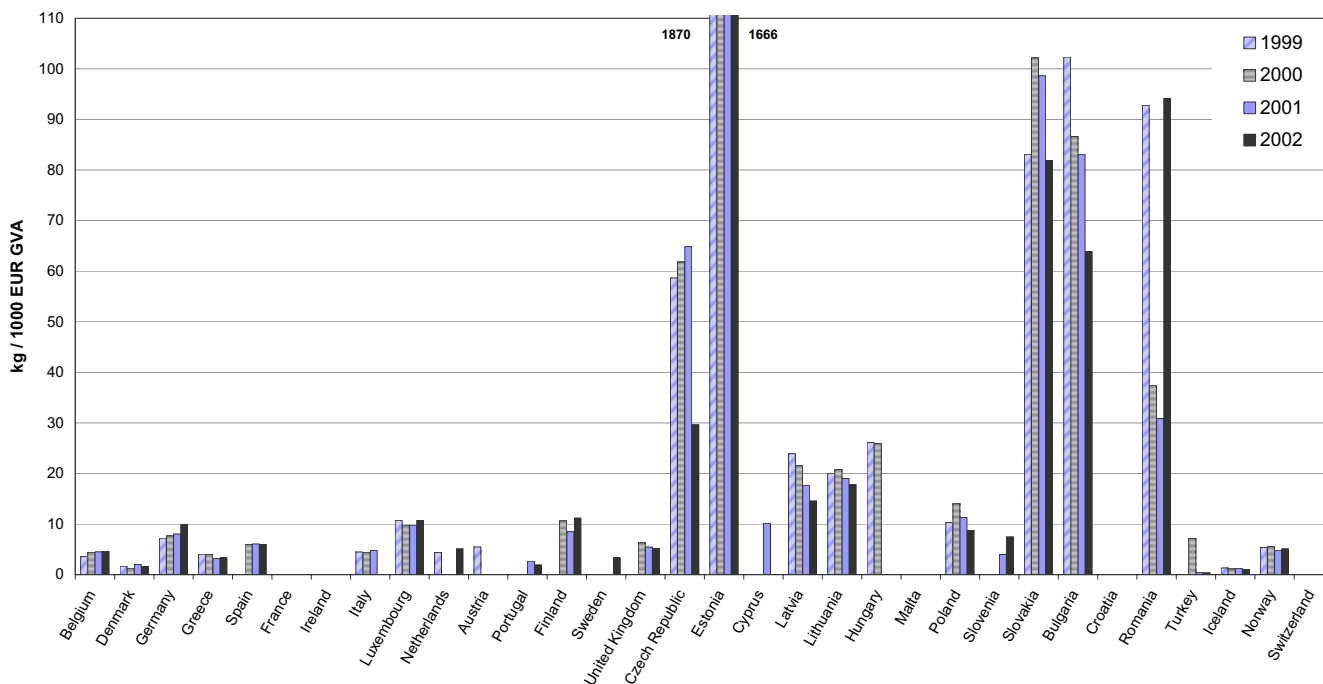


Figure 5-3 Generation of hazardous waste by countries from 1999 to 2002 (kg/1000 EUR GVA)

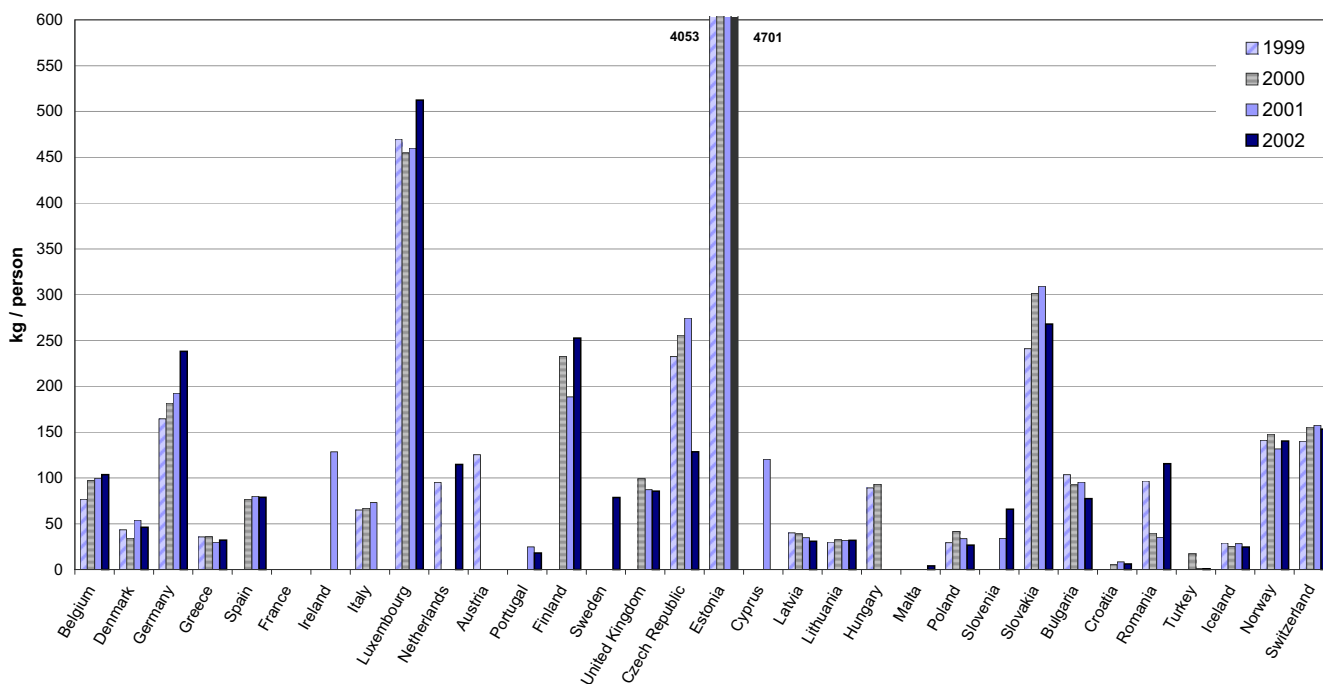


Figure 5-4 Generation of hazardous waste by countries from 1999 to 2002 (kg/person)

Quantities and types of the hazardous waste generated depend very much on the economic structure of a country. Figure 5-5

and figure 5-6 display the origin of hazardous waste by economic sectors, as percentage and in relation to the population.

The graphs include all countries that reported at least on three economic sectors but only sectors with a share of more than 5 % are shown. Quantities falling below 5 % were assigned to 'other economic sectors'. If a figure for total hazardous waste generated was not available (Spain), the bars only represent the sum of the available sectors.

The graphs clearly show that the manufacturing industry is the main source of hazardous waste in all countries independent of economic structure. In most countries the manufacturing industry accounts for 40 % up to over 90 % of the hazardous waste total. Further major sources of hazardous waste are the con-

struction sector, mining and quarrying activities and the energy production, and in a few countries also municipal waste.

Legend of Figure 5-5 and 5-6

- Other economic sectors - incl. non spec.
- Agriculture and forestry (01-02)
- Mining and quarrying (10-14)
- Construction (45)
- Energy Production (40) and Water Purification & Distribution (41)
- Manufacturing industry (15-37)
- Municipal waste

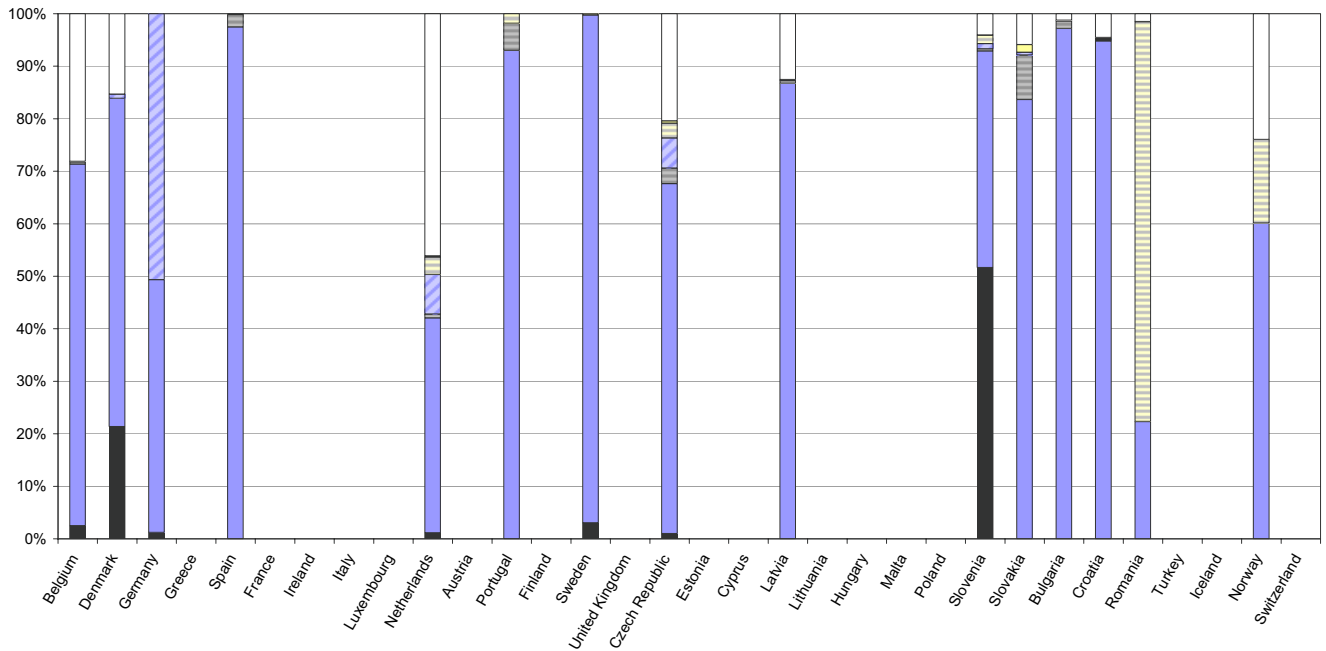


Figure 5-5 Origin of hazardous waste by economic sectors and countries for 2002 (%)

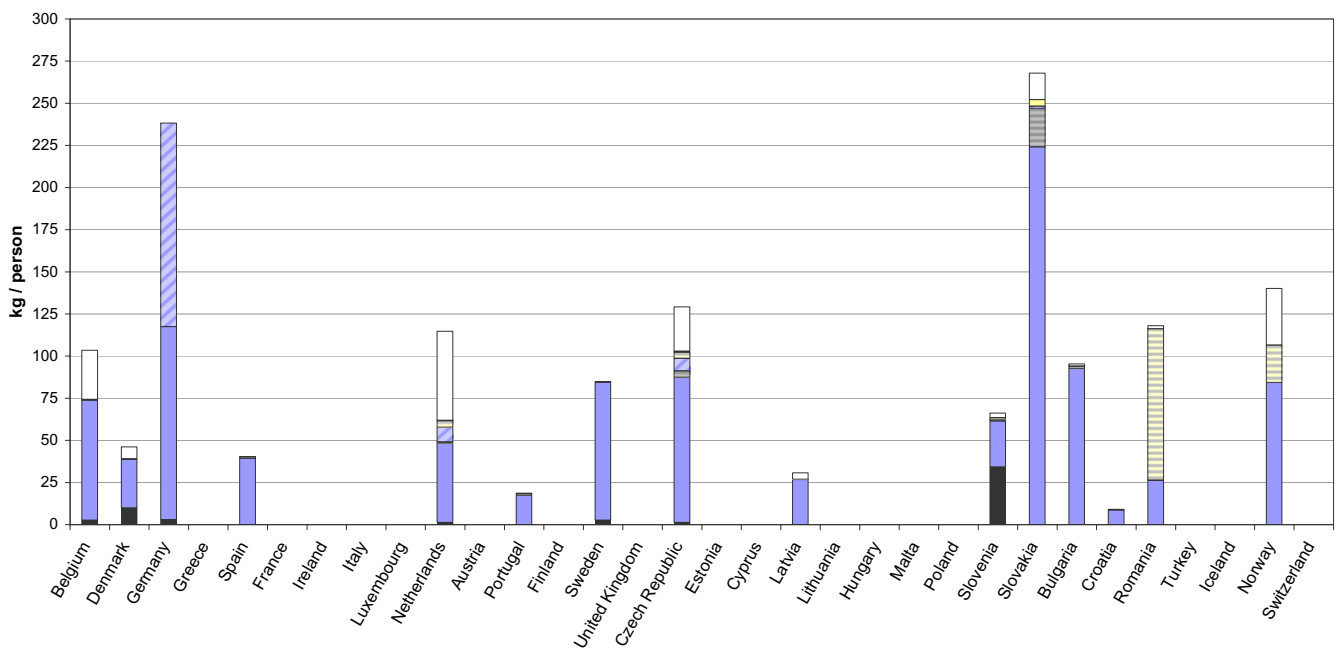


Figure 5-6 Origin of hazardous waste by economic sectors and countries for 2002 (kg/person)

More detailed data on the percentage of hazardous waste in the generated total (non-hazardous plus hazardous waste) is avail-

able in Table 5 of Annex 5. For about half of the countries the share of hazardous waste in the generated total fell below 2 %

in 2002. The highest percentages are reported by Latvia (6 %), Norway (7 %) and the Slovak Republic (10.5 %). Over 40 % of hazardous waste are reported by Estonia on account of its huge amounts of hazardous oil shale waste.

As expected from figure 5-5 and figure 5-6, the share of hazardous waste in the total is highest for the manufacturing industry ranging for most countries between 3 % and 11 %. The highest share is reported by Germany with 22 % hazardous waste in the manufacturing industry.

## 5.2 Treatment and Disposal of Hazardous Waste

Figure 5-7 gives an overview of the hazardous waste treatment in the countries. The information refers to the hazardous waste amounts that are managed within the respective country. The underlying JQ data are shown in Table 11 of Annex 4. It is necessary to point out that the data on hazardous waste treatment are incomplete and difficult to interpret. On the one hand, data are very sketchy. On the other, it is sometimes necessary to have additional information to make the information meaningful. Luxembourg, for instance, operates no landfills or incineration

plants dedicated to hazardous waste. Accordingly, wastes for final disposal are exported. The graph below shows only the operations carried out within the country, i.e. physico-chemical treatment and recovery operations, thus giving an incomplete picture. Furthermore, some of the new Member States like Latvia have not yet established the hazardous waste treatment facilities required for the appropriate treatment of their hazardous wastes. This may result in the temporary storage of large amounts of waste. The respective wastes will not appear in the presentation below thus giving a biased picture. Nevertheless, the graph gives a rough picture of the situation. It shows that the landfill rate for hazardous waste varies widely and ranges between 10 % in Slovenia and 94 % in Estonia (not considering Luxembourg and Latvia). Incineration rates range from 0 % to 50 %. Iceland even reports that all hazardous waste is incinerated.

Legend of Figure 5-7

- Other treatment
- Release into water bodies
- Recovery operations
- Biological treatment
- Physico/chemical treatment
- Incineration
- Landfilling

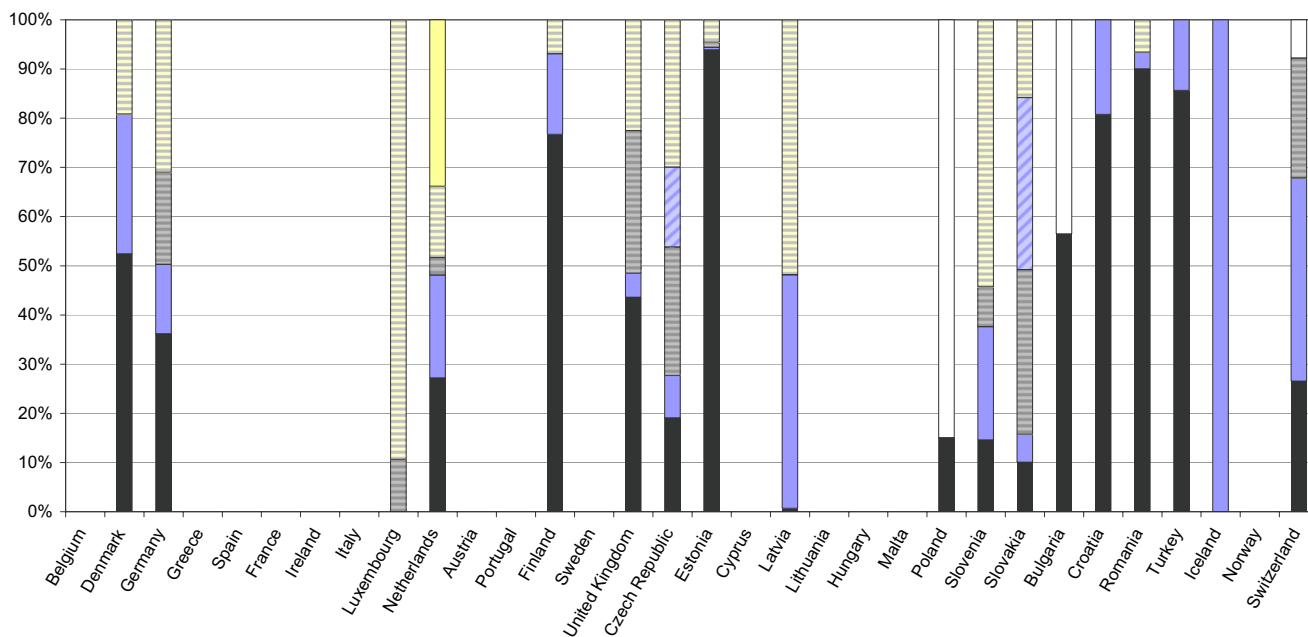


Figure 5-7 Recovery and disposal of hazardous waste by countries for 2002 (%)



## 6 Recovery and Recycling

### Main findings:

- In 2001, 64.9 million tonnes (171 kg/person) of packaging waste were generated in EU 15 of which 34.3 million tonnes (53 %) were recycled, 4.8 million tonnes (7 %) were recovered otherwise, and 25.7 million tonnes (40 %) were disposed of.
- Packaging waste generation has grown from 1997 to 2001 by 5.0 million tonnes (8 %) whereas the amount going to disposal has been reduced by 2.8 million tonnes.
- In 2002, EU 15 countries generated about 76.9 million tonnes (203 kg/person) of waste paper of which 43 million tonnes (114 kg/person) were collected separately for recycling. Waste paper generation and separate collection grew between 1990 and 2002 by nearly the same amount so that the quantity of waste paper to be disposed of or to be treated otherwise remained nearly constant.

This chapter highlights the recovery and recycling of packaging waste and waste paper. Both waste flows are part of the municipal and of the industrial waste stream and are therefore dealt with in a separate chapter. The data for this chapter are not retrieved from the Joint Questionnaire but from other sources that were considered to be more complete and consistent with regard to the discussed waste types.

### 6.1 Recycling and Recovery of Packaging Waste

Recycling and recovery of packaging waste in the EU is regulated by Directive 94/62/EC on packaging and packaging waste<sup>(1)</sup> which was adopted in 1994 and had to be transposed

into national law by 30 June 1996. Directive 94/62/EC establishes mandatory targets for recycling and recovery of packaging waste for all EU Member States. By the year 2001, a minimum of 25 % of all packaging put on the market had to be recycled (excl. energy recovery), and at least 50 % had to be recovered (incl. energy recovery). With the revision of Directive 94/62/EC in 2004 the recycling and recovery targets have been raised to 55 % and 60 % respectively. For Greece, Ireland and Portugal special transition periods apply.

The figures presented in this section are taken from the Member States' reports to the European Commission. Directive 94/62/EC requires the Member States to report annually on the generation, the recovery and the recycling of packaging waste in order to monitor compliance with the recycling and recovery targets established by the Packaging Directive.

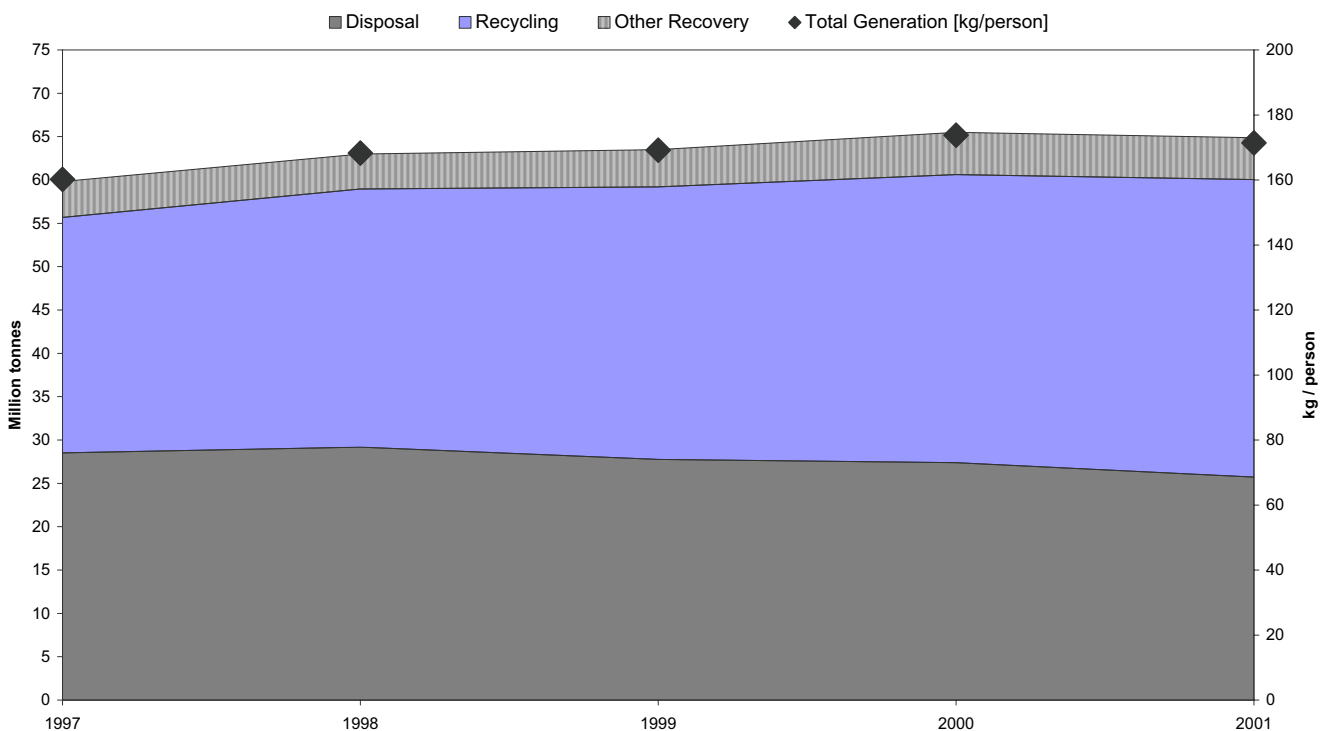


Figure 6-1 Generation and treatment of packaging waste in the EU 15 from 1997 to 2001 (Million tonnes, kg/person)

(1) European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste (OJ L 365, 31.12.1994, p.10), last amended by Directive 2004/12/EC (OJ L 047, 18.02.2004, p.26)

The reports provide a complete set of data for the old Member States covering the period from 1997 to 2001. The data are available from the WasteBase of the European Topic Centre on Resource and Waste Management (<http://waste.eionet.eu.int/>

wastebase/). Data from the new Member States are not included as they are obliged to report under the Packaging Directive only since their accession in 2004.

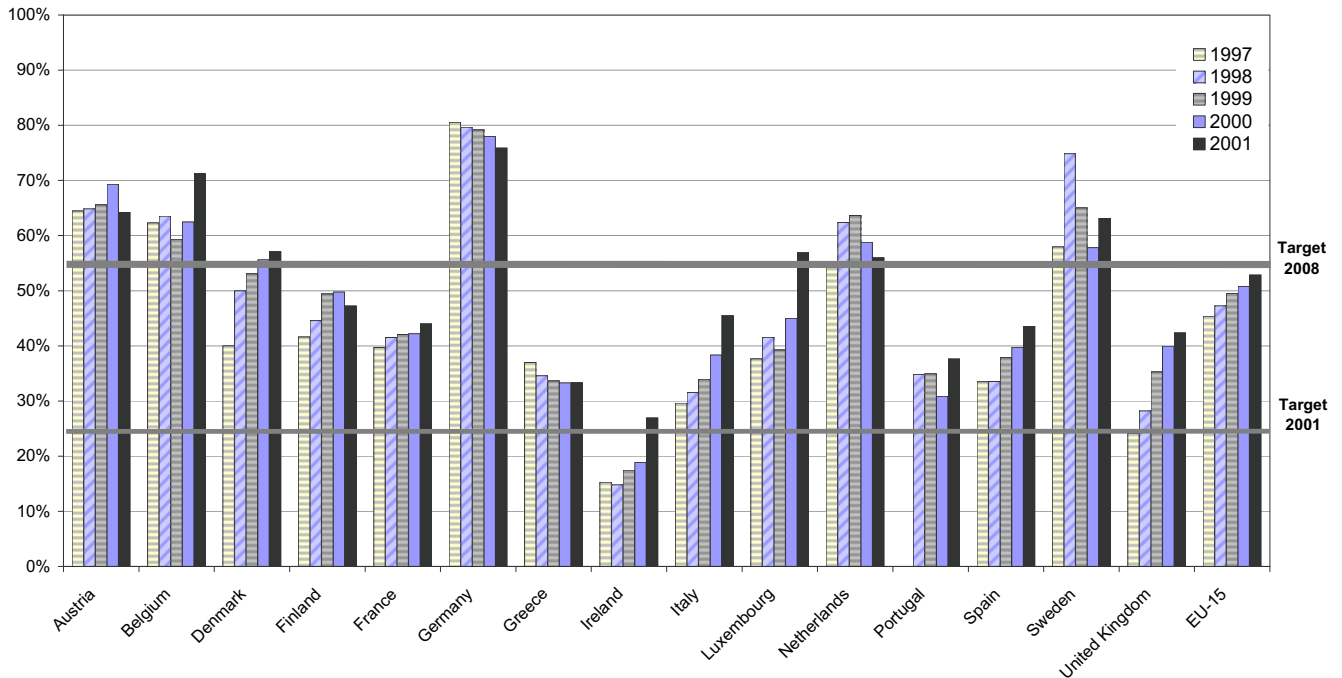


Figure 6-2 Recycling rates for packaging waste by countries and EU 15 from 1997 to 2001 (%)

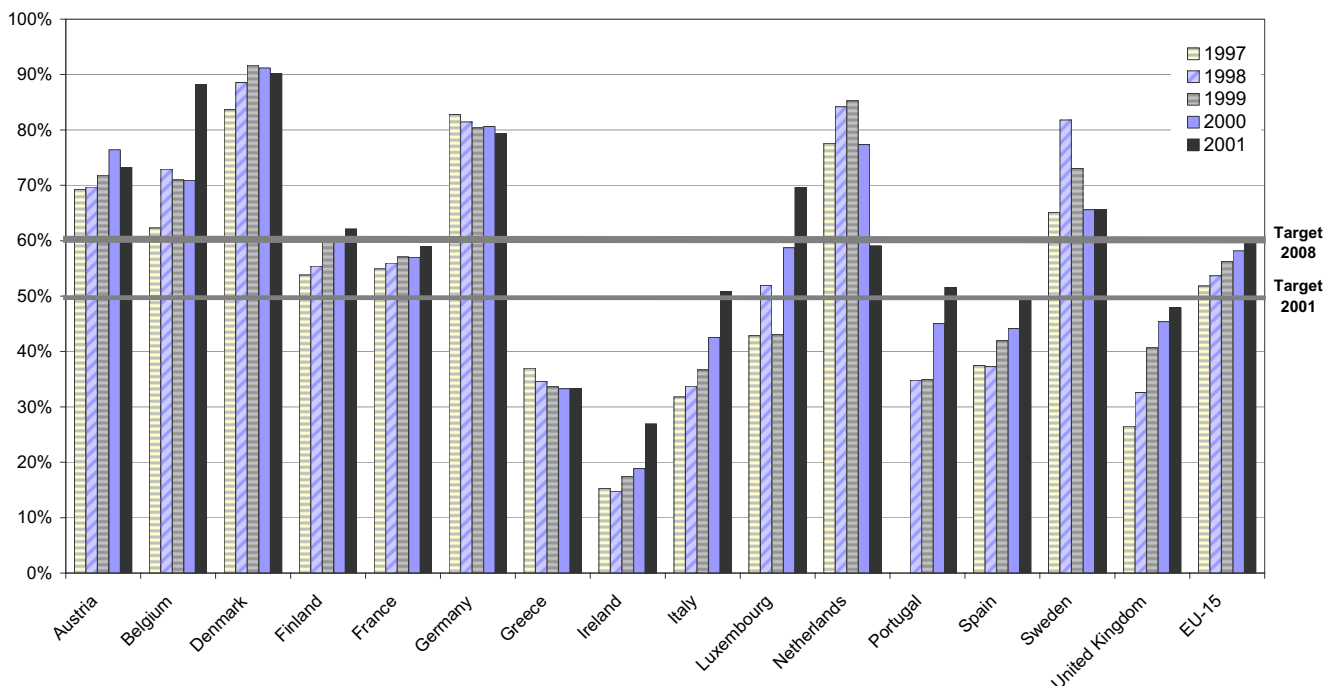


Figure 6-3 Recovery rates for packaging waste by countries and EU 15 from 1997 to 2001 (%)

The primary objective of Directive 94/62/EC is the prevention of packaging waste. As shown in figure 6-6.1, this target has obviously been missed so far. Packaging waste generation in EU 15 increased from 1997 to 2001 by 5.0 million tonnes (8 %) from 59.8 million tonnes (160 kg/person) to 64.9 million tonnes (171 kg/person)<sup>(1)</sup>. In the same time recovery could be raised by

8.1 million tonnes so that at least the amount of packaging waste going to disposal was reduced by 2.8 million tonnes. In 2001, a total of 39.2 million tonnes of packaging waste were recovered of which 34.3 million tonnes were recycled. This corresponds to overall recycling and recovery rates of 53 % and 60 % respectively.