

## I.2

# Solid waste origins: sources, trends, quality, quantity

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### I.2.1. Introduction

Effective waste management in the local, regional and global scale, which has the protection of human health and the environment as an essential and ultimate objective, requires reliable and complete statistical data on waste sources, amounts generated, qualitative and quantitative structure, properties determining their long-term environmental behavior and changes in waste streams as a function of time. Unfortunately, the available data are extremely limited, in particular with regard to long-term waste stream changes and future trends, even in the USA and in the EU. One of the major reasons for this situation is the lack of harmonized terms and definitions, as well as of the uniform classification and organization of statistical data collection. The lack of reliable long-term and current qualitative and quantitative data is a serious obstacle to setting priorities for environmentally safe and economically sound waste management in the different parts of our world. The global and transboundary effects of waste transport and disposal in the last decades have been increasingly an international issue. This brings about the priority range of the transmission of information on the distribution of transboundary movement of hazardous wastes and other wastes, based on reliable statistical data. The notorious incompleteness and lack of reliability of the waste statistics in the EU was confirmed quite recently. Obtaining reliable waste statistics was considered particularly difficult due to the differences in the definitions of waste categories, apart from the physical collection of the data (Bontoux and Leone, 1997).

Efforts of the EC legislative bodies in the last decade of the 20th and the first years of the 21st century resulted in several decisions directed to the improvement of statistics on waste, which visibly improved the quality of statistical data. Among these initiatives of EC, the most important are:

- Establishing a harmonized list of wastes (Commission Decisions 2000/532/EC and 2001/118/EC).
- Laying down decisions concerning database systems, formats and questionnaires for the reporting obligations of Member States on the implementation of certain Directives relating to the environment in the waste sector (Council Directive 91/692/EEC, 1991 implemented by Commission Decisions 94/741/EC, 1994 and 97/622/EC, 1997). Reporting on hazardous waste is regulated by Commission Decisions 96/302/EC (1996) and 98/184/EC (1998).

- Enacting decisions concerning the reporting on shipment of waste within, into or out of the EC (Commission Decision 1999/412/EC); on the landfill of waste (Commission Decision 2000/738/EC); on specific kinds of waste, e.g. on packaging and packaging waste (Commission Decision 1997/138/EC) or end-of-life vehicles (Commission Decision 2001/753/EC).
- Laying down Regulation (EC) No. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics.

Significant progress in measuring, presenting and interpreting the data on waste generation and management shows the recent EUROSTAT works focused on the elaboration of indicators for sustainable development (EUROSTAT, 2001a, EUROSTAT Web site), though the situation in this area is still far from being satisfactory.

In the USA, despite a variety of sources and databases on solid and hazardous waste generation and management, there is no single comprehensive, exhaustive and current, continuously updated database. This situation that was described more than a decade ago (Dietz and Burns, 1989) has not changed significantly until now. The most comprehensive database for the generation of hazardous wastes is the National Biennial RCRA Hazardous Waste Report with the most recent data being for 1997 (US EPA, 1999).

Demographic changes evidenced by the rapid growth of population and accelerated industrial development in the developing countries along with simultaneous proliferation of new technologies, materials and chemicals in the developed countries, which are transmitted by the international companies to the developing regions, have contributed to an increase in both the amount and variety of solid wastes all over the world. Reliable statistical data on the sources and amounts of waste generation, structure of solid waste streams, their movement and management is thus a basic prerequisite for optimization of waste management strategies in a national and global scale. They are of particular importance for setting priorities in waste management practice and for providing an adequate regulatory framework and enforcement procedures for its implementation. New efforts being undertaken by international bodies (OECD, EUROSTAT, Secretariat of the Basel Convention), US EPA and statistical offices of many countries significantly contribute to better integration of waste statistics, improvement of its reliability and completeness. Currently, the most reliable source of objective and internationally comparable ecological information, which includes also waste generation data, is the OECD Environmental Compendium. This statistical information is published every 2 years pursuant to the OECD Council Decision and follow-up obligations of the OECD and EU member countries. The data discussed below come from publications of the EU Statistical Office EUROSTAT and OECD–EUROSTAT Questionnaire – “Environment Protection” being submitted obligatorily by the OECD members. This questionnaire is a basic instrument of the integrated system of the environmental information in the framework of the OECD and EU, published in the form of the environmental compendia and other statistical studies by OECD (1997), (1998), (1999), (2001) and (2002). Some data originate from the estimates of the OECD Secretariat and other reliable international databases (UN, FAO, etc.). The main goal of these environmental statistics is identification of priorities focused on the protection of the environment, efficient implementation of policies and practice, including waste management and the promotion of sustainable development in the national and international arena. Integrated waste

statistics are still not equally satisfactory, and there remain vast information gaps. The statistical information at the national and international level still shows significant margins of uncertainty. Comprehensive, regionally and globally harmonized waste statistics based on univocal terms, definitions and classification, which exclude misinterpretation, remains a goal for the future, though current progress resulting from the growing recognition of the urgent need of environmentally safe and economically sound waste management strategies is unquestionable (e.g. see EU Europa Web site).

A crucial milestone in the development of the European statistics was enactment in 2002 by the European Parliament and the Council of the Regulation on waste statistics that established a framework for Community statistics on the generation, recovery and disposal of waste that would guarantee complete and comparable results by means of following obligatory harmonized forms and terms of supply by the Member States. Within the Regulation, the EU statistics covers:

- Generation of waste;
- Recovery and disposal of waste;
- Import and export of waste.

Regular Community statistics creates the basis for monitoring the implementation of waste policy in compliance with the principles of maximization of waste recovery and safe disposal, as well as for assessing compliance with the principle of waste prevention. Another target is to establish a link between waste generation data and global, national and regional inventories of resource use. Low compatibility of statistical data due to difference in reporting between the EU Member States has been planned to be overcome during a transitional period when national statistical systems will undergo adaptation. A significant improvement of the EUROSTAT data may be anticipated, though the development of the harmonized statistical data in the global scale, which is a basic prerequisite of the global waste management strategy still needs much more concerted effort of the countries.

### **I.2.2. Waste generation in the OECD countries: amounts and sources**

Data reported below are based on the official statistical sources (OECD, 1997, 1998, 1999, 2001, 2002; EUROSTAT, 2000a–c, 2001a,b) and national statistics, e.g. Central Statistical Office, 2001, 2002. The lack of complete data for every country and a long list of the explanatory footnotes reflect the current status of waste statistics and discrepancies in the definition of waste categories. In spite of these limitations, they give an approximate idea about the annual waste originating in the EU and OECD countries and the composition of waste streams with respect to the principal sources of solid waste generation (nuclear waste is excluded and not discussed here) (Tables I.2.1–I.2.7). The weakness of the estimated total current generation of solid waste in the OECD is due to the lack of incorporating complete source data on the major waste streams for the USA and Canada, and numerous statistical gaps for other countries with respect to several principal sources of waste. Shockingly high data on production waste in the USA or mining waste in Canada that appeared in the OECD Compendium (1997) have never reappeared again in the later OECD statistical reports (OECD, 1998, 1999, 2001, 2002). Apart from the production scale, the diversity between the data from the USA and the rest of the OECD

countries comes from the differences in the definitions of “solid waste”, and “hazardous waste”. The detailed definitions of these terms according to the European Community legislation have been given in the previous Chapter I.1, also in the form of excerpts from the relevant Council Directives (see Appendices A, B and C to the Chapter I.1). In this chapter, these definitions in accordance to the U.S. Code of Federal Regulations (Revised as in 1999) are quoted extensively in the Appendix A. The comparison of the legislative approaches confirms substantial divergences, despite of numerous similarities, which should have resulted in the weak compatibility of seemingly simple statistical data.

On the basis of available incomplete data (OECD, 1997, 1998, 1999; Central Statistical Office, 2000; EUROSTAT, 2000a,b) it has been estimated that in the OECD countries approximately 12,000 Mt (million tons) of solid waste are generated annually (3600 Mt without the USA and Canada). Of this, agricultural waste (23%), manufacturing/production residues (21%), mining waste (16%) and municipal waste (16%) are the major constituents of the waste stream. The biggest waste generator among the 30 OECD member countries is the USA. Its documented contribution to the total waste stream (production, municipal, construction/demolition and other waste – see Tables I.2.1 and I.2.2) accounts for 63%, while the share of the next in line, France and Japan, is more than 10-fold less for each. In the EU countries, besides agricultural, production and mining waste, a high position is held by construction/demolition residues. The range of each type of waste generation is extremely wide, thus the structure of waste stream is different in every OECD and EU country (Table I.2.1).

Incomplete and inconsistent data on the generation of selected *recyclable waste* (OECD, 1998, 1999; Central Statistical Office, 2000; EUROSTAT, 2000a,b) show their differentiated proportions in the total amount, determined by the specifics of the economy of each OECD member country (Table I.2.2). The documented generation of six groups of waste accounted for 1098 Mt, of these five kinds of packaging waste comprised about 11.4%. The highest amount of construction and demolition waste, which significantly deviated from the other OECD participants, was generated in Germany (26%) and the USA (22%). Japan produced 67% of the total sewage sludge; the USA participated in 65% in the total amount of end-of-life vehicles, in 73% in rubber waste and generated 45% of the total packaging waste.

Data on the annual per capita generation of *municipal waste* in the OECD countries (OECD, 1998, 2002) were less variable and ranged from 300 to 360 kg (Greece, Mexico, Poland, Czech Republic, Poland, Slovakia, Korea) to 760 kg (USA), of this per capita generation of household waste varied from 190 to 580 kg (OECD, 2002) (Table I.2.3a). In most of the reported cases an increase of the municipal waste generation has been observed in the last two decades, from 8% (Japan) to 195% (Ireland). Individual consumption in almost the same period generally increased from 7.5% (Sweden) to 164.9% (Korea), and in one case showed a 7.1% decrease (Mexico) (OECD, 1998). Compared to 1980, in four countries the overall decrease of waste generation within two decades was recorded (Australia, Slovakia, Hungary and Korea). In the last decade, though, in four EU Member States (the UK, Finland, Luxembourg and Germany) a positive trend of decreasing municipal waste generation occurred (from –3.4 to –2% annually), at annual increase rates in other EU Member States ranging from 1.6% (Austria) to 9.5% (Spain) and mean value for the EU that accounted for 2.3%. In the countries that are candidates to the EU, the annual increase rate for municipal waste generation was

considerably lower, from 0.5% in Hungary to 1.7% in Czech Republic, with a mean value of 1.2% (Table I.2.3b). Despite large amounts of municipal waste produced in the OECD countries, it accounted for only 15.7% of the total documented waste stream (Table I.2.1).

Annual generation of *hazardous waste (HW)* in the OECD countries according to the available data for mid-1990s without Japan (OECD, 1998) appeared to be extremely variable and ranged from only 6 thousand tons (Island) to 213,620 thousand tons (USA) (Table I.2.4). In 1997, 20,316 large quantity generators (LQGs) in the USA reported that they generated 40.7 Mt of RCRA hazardous waste (US EPA, 1999). The value contained in the OECD report is approximately fivefold greater than that in the EPA report, which indicates the differences that exist in defining hazardous wastes and that can be found in the statistical reports. Total annual hazardous waste generation, recorded in accordance with the Basel Convention, accounts for 269,675 thousand tons (without Japan), that is 18% of the total industrial manufacturing/production waste generation. The OECD countries without the USA and Japan generate in total only 56,055 thousand tons, i.e. just 8.6% of the estimated total industrial manufacturing/production waste generated in these countries. Despite a relatively low proportion of these materials in the waste stream, hazardous waste is subject to a special concern due to the extent of threat posed to human health and the environment. The US share of the generation of HW is extremely high, both in mass units and as measured in kg per thousand US \$ of GDP. According to the statistics, the amount of hazardous waste generation in the USA, also per US \$1000 of GDP are 1–2 orders of magnitude higher than in other OECD countries. These statistical data differ significantly from the estimates based on the hazardous waste generated per US \$1000 of GDP (named here HW factor) given in the UNEP study (UNEP, 1992). Hazardous waste in these estimates also includes high volume wastewater streams, which may somewhat deform the data. Nevertheless, the rationale behind these estimates was a clear relation between the level of industrialization and HW factor that was claimed to be as high as 75.0 for the USA, 10.0 for the former USSR, 5.0 for Western Europe and mature industrial countries, 2.0 for newly industrialized ones and 1.0 for developing countries (UNEP, 1992). This, though, was not confirmed in the analysis of statistical data for the OECD countries (Table I.2.4) (OECD, 1998). The sixfold higher HW factor for the USA reflects economical specifics rather than the level of industrialization. The OECD statistical data (Table I.2.4) display occurrence of the highest HW factors (besides the USA) for the countries with developed primary production (heavy industry and chemistry). HW factors > 10 (in the range from 11.3 to 58.2) include Canada, Mexico, Portugal, Luxembourg, Poland, Czech Republic and Hungary. Within the range of the lowest HW factor < 2, from 1.3 to 1.9, fall Island, Australia and the UK. Therefore, the direct relation between the level of industrialization and HW factor is rather doubtful.

HW generated in the USA dominates the total HW stream. The quantities and sources of HW in the USA were comprehensively analyzed by Dietz and Burns (1989) based on the data of the first national probability survey conducted for EPA by Westat Inc. in 1982 and 1983. In this survey, despite a large degree of uncertainty ( $\pm 50\%$  for 95% confidence level), the best national estimate of the quantity of RCRA-regulated HW generated in 1981 was 264 Mt. This number included solid HW and associated wastewater since both are hazardous waste under RCRA (Dietz and Burns, 1989, see also Appendix A). The later data on HW generation in the USA reported for 1993 accounted for 213.6 Mt (OECD, 1998). That means 21% reduction of annual waste generated, partially due to changes in

Table I.2.1. Amounts and sources of solid waste generated annually in the EU and OECD countries (after OECD, 1997, 1998, 1999; Central Statistical Office, 2000; EUROSTAT, 2000a,b, 2001b)\*.

Countries	Agriculture, forestry	Mining and quarrying	Manufacturing, production	Power generation	Water purification and supply	Construction, demolition	Other	Municipal	Total <sup>a</sup>
in thousand tons									
Canada <sup>b</sup>	14,000	1,052,990	–	–	–	–	–	20,600	20,600 <sup>a</sup>
Mexico	11,498	123,196	29,570	–	–	–	–	29,270	193,534
USA	–	–	7,080,000	–	–	–	–	190,200	190,200 <sup>a</sup>
Japan <sup>c</sup>	74,950	30,790	139,030	57,290	9060	76,930	74,690	50,540	513,280
Korea <sup>d</sup>	–	–	36,540	690	4270	11,150	–	18,220	70,870
Australia	560	–	37,040	11,000	–	10	–	12,000	60,610
New Zealand <sup>e</sup>	–	–	1760	–	–	–	–	1270	3030
Austria <sup>f</sup>	–	3 <sup>4</sup>	14,284 <sup>1</sup>	125 <sup>4</sup>	2300	25,392 <sup>1</sup>	13,690	5270 <sup>1</sup>	61,764
Belgium	–	389 <sup>2</sup>	13,734 <sup>1,2,3</sup>	1072 <sup>1,2</sup>	–	7718 <sup>2</sup>	–	5307	28,220
Czech Republic <sup>g</sup>	5460	5000	38,570	17,060	–	780	18,990	3017	88,877
Denmark <sup>h</sup>	–	–	2736 <sup>1</sup>	1775	170	3427	810	2951	11,869
Finland <sup>i</sup>	22,000	15,000 <sup>8</sup>	15,500	1350 <sup>8</sup>	2400	7000 <sup>3</sup>	–	2100 <sup>3</sup>	65,350
France <sup>e</sup>	377,000	75,000 <sup>8</sup>	101,000 <sup>2</sup>	–	–	13,700 <sup>9</sup>	–	34,700 <sup>2</sup>	601,400
Germany <sup>j</sup>	–	67,813 <sup>4</sup>	65,119 <sup>4</sup>	25,310 <sup>4</sup>	1870	131,645 <sup>4</sup>	940	43,486 <sup>4,3</sup>	336,983
Greece	7780	3900 <sup>2</sup>	6682 <sup>1</sup>	9320	–	1800 <sup>1</sup>	–	3900	33,382
Hungary <sup>k</sup>	62,000	790	6328	1080	–	–	10	4800	75,008
Iceland	–	–	10	–	–	–	30	150	190
Ireland	31,000	2200 <sup>2</sup>	3781 <sup>2</sup>	353 <sup>2</sup>	60	1320 <sup>2</sup>	280	2030 <sup>2</sup>	41,024
Italy <sup>l</sup>	–	–	22,210	1330	–	14,310	42,500	26,605	106,955
Luxembourg	–	–	1440 <sup>10</sup>	–	–	–	–	193 <sup>6</sup>	1633
The Netherlands <sup>m</sup>	17,000	326 <sup>1</sup>	8577 <sup>1</sup>	1402 <sup>1</sup>	70	13,950	2640	8782 <sup>1</sup>	52,747
Norway	18,000	7600	2880	–	–	3600	–	2720	34,800
Poland <sup>n</sup>	–	49,480	58,176	18,009	1325	68	522	12,317	139,897

Portugal <sup>o</sup>	–	<b>7120</b>	<b>10,989</b>	<b>569</b>	–	<b>7733</b>	–	<b>4313<sup>7</sup></b>	30,724
Spain	114,000	<b>70,000<sup>4</sup></b>	<b>13,800<sup>10</sup></b>	–	10,000	<b>115<sup>2</sup></b>	–	<b>15,307<sup>1</sup></b>	223,222
Sweden	–	<b>47,000<sup>4</sup></b>	<b>13,990<sup>4</sup></b>	<b>600<sup>3</sup></b>	–	<b>1500<sup>3</sup></b>	–	<b>3200<sup>3</sup></b>	66,290
Switzerland <sup>P</sup>	–	–	1500	–	40	3000	190	4280	9010
Turkey	–	–	28,110	8680	–	–	–	20,250	57,040
UK <sup>o</sup>	80,000	<b>74,000<sup>1</sup></b>	<b>56,000<sup>2</sup></b>	<b>13,000<sup>1</sup></b>	35,000	<b>70,000<sup>1</sup></b>	66,000	<b>28,000<sup>1</sup></b>	422,000
Slovakia	4500	790	6720	2900	550	170	2480	<b>1700</b>	19,810
EU15 <sup>a</sup>	648,780	362,751	351,342	56,206	51,870	299,610	126,860	186,144	2,083,563
%	31.14	17.41	16.86	2.70	2.49	14.38	6.09	8.93	100.00
OECD <sup>a</sup>	825,748	580,397	737,576	172,915	67,115	395,318	223,772	557,478	3,560,319
%	23.19	16.30	20.72	4.86	1.89	11.10	6.29	15.66	100.0

Sources: EUROSTAT, 2000a,b – 1997 data (**bold**); Central Statistical Office, 2000 – 1999 data (*italic bold*); OECD, 1999 (normal) and 1998 (*italic*) – data from the last available year in 1990s.

Data for: 1) 1996; 2) 1995; 3) 1994; 4) 1993; 5) 25,257 thousand tons collected during public waste collection according to the German Waste Act. 6) Without fractions collected separately. Data for: 7) 1998; 8) 1992; 9) 1991; 10) 1990. \* – Data related to the last available year in 1990s. Rounded total data may comprise estimates.

<sup>a</sup>The total estimates calculated by the authors are based on the available statistical data given in the respective column/row. Data after OECD (1997) for the USA and Canada (*italic*) were not considered.

<sup>b</sup>Data for municipal waste include waste from construction/demolition.

<sup>c</sup>Data on agriculture include waste from fishing. Data on other waste comprise waste from power generation and sewage sludge.

<sup>d</sup>Data on production activity comprise waste from agriculture, mining and quarrying, power generation and water purification and distribution.

<sup>e</sup>Data on municipal waste include only household waste.

<sup>f</sup>Valid classification does not relate to sectors but to groups of waste; data may not be comparable to other countries.

<sup>g</sup>Estimates comprise hazardous waste.

<sup>h</sup>Data comprise sewage sludge. Data on other waste include hazardous and other production waste. Total value does not include waste from agriculture, and mining and quarrying.

<sup>i</sup>Data on agriculture do not comprise waste from forestry.

<sup>j</sup>Data on other waste are related to hospital waste.

<sup>k</sup>Data do not include hazardous waste, lack of data from all privatized enterprises.

<sup>l</sup>Data on waste from production processes may comprise waste from mining and quarrying.

<sup>m</sup>Data on other waste include commercial waste and car scrapping.

<sup>n</sup>1999 data, comprise majority of industrial and power generation sources. Mining waste do not include overburden from opencast mines.

<sup>o</sup>Data comprise entirely hazardous waste (besides data on municipal waste).

<sup>P</sup>Data on other waste comprise sewage sludge.

Table I.2.2. Annual generation of some recyclable waste in the EU and OECD countries (after OECD, 1998, 1999; Central Statistical Office, 2000; EUROSTAT, 2000a,b)\*.

Countries <sup>a</sup>	Year	Construction, demolition	Excavation, dredging	Sewage sludge	Vehicles	Rubber	Packaging				
							Total <sup>b</sup>	Paper	Plastic	Glass	Metals
in thousands tons/yr											
Canada	1996	4881	7450 <sup>c</sup>	976	1000 <sup>d</sup>	232 <sup>e</sup>	6200	2400	1300	1400	1100
Mexico <sup>f</sup>	1994	–	–	–	–	223	7174	4146	1290	1738	–
USA <sup>g</sup>	1996	122,953	–	6700	12,500	10,110	56,809	34,909	7394	10,015	4491
Japan <sup>h</sup>	1995	60,238	–	180,490	–	92	–	–	–	–	–
Korea <sup>i</sup>	1996	11,145	–	6137	138	1844	12,146	5157	1102	840	5047
Australia	1992	1569	–	60,000	271	103	914	–	–	–	–
New Zealand <sup>j</sup>	1995	534	–	–	–	–	453	216	107	84	46
Austria <sup>k</sup>	1996/1997	6403	20,000	309	165	57	1170 <sup>6</sup>	710 <sup>6</sup>	160 <sup>6</sup>	203 <sup>6</sup>	97 <sup>6</sup>
Belgium	1995	7294	819	88	154	153	911	190 <sup>1</sup>	143 <sup>1</sup>	162 <sup>1</sup>	87 <sup>1</sup>
Czech Republic <sup>l</sup>	1996	777	1062	176	–	27	446	4	33	409	–
Denmark <sup>m</sup>	1997	3427	–	162	107	41	900 <sup>4</sup>	409 <sup>4</sup>	151 <sup>4</sup>	176 <sup>4</sup>	64 <sup>4</sup>
Finland <sup>n</sup>	1994	7000	3000	150	120	30	420	84	99	52	30
France <sup>o</sup>	1995	25,000	–	900	1400	350	9300	4000	1500	3000	800
Germany <sup>p</sup>	1993	142,252	–	4921	928	263	11,951	5080	1441	3290	699
Greece	1997	1800	–	59	4	43	600	270	180	115	35
Hungary	1996	–	–	84	–	50–55	700	305	140	195	62
Iceland	1995	–	–	0.18	–	–	45	20	16	5	4
Ireland	1995	–	785	29	–	–	–	–	–	–	–
Italy	1991	34,400	–	3400	1400	–	7726	3342	1777	2248	459
Luxembourg <sup>q</sup>	1997	3520	–	8	–	1	–	–	–	–	–
The Netherlands <sup>r</sup>	1996	13,950	36,382	600	257	87	2710	1401	613	472	224
Norway <sup>s</sup>	1996	3600	–	95	65	34	514	276	137	65	36
Poland <sup>t</sup>	1999	68	–	1397	–	–	317	108	58	111	40
Portugal <sup>u</sup>	1994	–	–	8	–	–	923	239	410	179	95

Spain <sup>v</sup>	1994	22,000	–	404	380	–	<b>2481<sup>d</sup></b>	–	<b>776<sup>d</sup></b>	<b>914<sup>d</sup></b>	<b>422<sup>d</sup></b>
Sweden	1994	1500	–	230	104	50	–	–	–	<b>84</b>	–
Switzerland <sup>w</sup>	1996	3000	–	190	97	41	556	174	45	309	28
Turkey		–	–	2786	–	–	–	–	–	–	–
UK	1996	70,000	51,000	1000	–	–	–	–	–	–	–
Slovakia	1997	371	138	89	52	10	–	–	–	–	–
EU15 <sup>a</sup>		338,546	111,986	12,268	5019	1075	39,092	15,725	7250	10,895	3012
OECD <sup>a</sup>		547,682	120,635	271,388	19,142	13,846	125,366	63,440	18,872	26,066	13,866

Sources: EUROSTAT, 2000a,b – 1997 data (**bold**); Central Statistical Office, 2000 – 1999 data (*italic bold*); OECD, 1999 (normal) and 1998 (*italic*) – data from the last available year in 1990s.

\* – Data related to the last available year. 1) Data for Walloon only. Data for: 2) 1995; 3) 1997 (if different from the indicated year).

<sup>a</sup>Total estimates calculated by the authors are based on the sums of available data given in the respective column.

<sup>b</sup>Data may comprise selected kinds of packaging waste.

<sup>c</sup>Data for 1988.

<sup>d</sup>Data for 1992.

<sup>e</sup>Data include only used tires and are related to 1994.

<sup>f</sup>Data on municipal waste are related only to used tires.

<sup>g</sup>Data on construction waste do not comprise road and bridge construction waste and waste from soil cleaning. Data on car scrapping are related to 1997. Data on packaging are related entirely to the municipal waste.

<sup>h</sup>Data on sewage sludge are related to 1993 and rubber waste to 1991.

<sup>i</sup>Data on car scrapping are related to 1995.

<sup>j</sup>Data on packaging are related to 1994.

<sup>k</sup>Data on vehicle scrapping are related only to the end-of-life cars and tires. Data on packaging are related to 1993 and comprise only household waste.

<sup>l</sup>Estimated data comprise hazardous waste. Data on sewage sludge are of 1997.

<sup>m</sup>Data on sewage sludge are for 1996, and packaging waste for 1995 (reused glass is not considered).

<sup>n</sup>Data on rubber waste comprise only used tires and are related to 1995.

<sup>o</sup>Data on construction waste are for 1992, and for vehicle scrapping for 1991. Data on packaging are related to household only and are of 1994.

<sup>p</sup>Data on sludge and packaging are of 1995.

<sup>q</sup>Data on rubber waste comprise entirely used tires.

<sup>r</sup>Data on soil excavation are of 1995 and are expressed da in m<sup>3</sup>. Data on rubber waste are of 1995 and comprise only used tires. Data on vehicle scrapping are related to 1997.

<sup>s</sup>Data on construction waste are related to 1993, waste from vehicle scrapping to 1997 and rubber waste – to 1992 and comprise only used tires.

<sup>t</sup>Data on packaging waste are related to 1999 and estimated from volumetric units. Data on construction waste do not comprise demolition.

<sup>u</sup>Data on sludge are related to 1991.

<sup>v</sup>Data on construction waste are of 1990.

<sup>w</sup>Data on rubber waste are of 1994, and on packaging waste – of 1995.

Table 1.2.3a. Amounts and trends of municipal waste generation vs. consumption per capita in the EC and OECD countries (after OECD, 1998, 2002).

Countries	Waste generation (2000)				Consumption (1995) <sup>a</sup>		
	Total, thousands tons	From households, thousands tons	In kilograms per capita	% change since 1980 <sup>b</sup> per capita	From households in kg per capita	In thousands US \$ GDP per capita	% change since 1980 per capita
Canada <sup>c</sup>	18,110 <sup>1</sup>	9926	640 <sup>1</sup>	25 <sup>1</sup>	330	11.0	18.3
Mexico	30,733	25,714	310	24 <sup>2</sup>	260	3.5	-7.1
USA <sup>d</sup>	208,520	125,112	760	27	460	16.8	31.6
Japan <sup>d</sup>	51,446	33,968	410	8	270	11.0	47.5
Korea <sup>c</sup>	16,950	14,375	360	-30	300	6.3	164.9
Australia <sup>f</sup>	12,000 <sup>1</sup>	7000 <sup>1</sup>	690 <sup>1</sup>	-2 <sup>1</sup>	-	10.4	29.3
New Zealand <sup>e</sup>	-	1450	-	-	380	8.9	18.3
Austria <sup>d</sup>	4496	3096	560	33 <sup>2</sup>	380	10.1	32.3
Belgium <sup>h</sup>	5588	4574	550	52	450	11.0	21.7
Czech Republic <sup>i</sup>	3434	2600	330	32	250 <sup>1</sup>	5.1	-
Denmark <sup>j</sup>	3546	3084	660	65	580	9.7	27.4
Finland <sup>h</sup>	2400	960	460	12 <sup>2</sup>	190	7.5	21.6
France <sup>l</sup>	30,744	22,041	510	13 <sup>2</sup>	360	10.7	23.5
Germany <sup>m</sup>	44,094	35,177	540	0 <sup>2</sup>	300 <sup>1</sup>	10.4	27.5
Greece <sup>n</sup>	4550	-	300	15 <sup>2</sup>	-	7.4	28.4
Hungary	4552	2674	450	-15 <sup>2</sup>	270	4.0	-
Iceland	198	74	710	14 <sup>2</sup>	260	9.7	13.0
Ireland <sup>o</sup>	2057	1221	560	195	330	8.3	40.1
Italy	29,000	-	500	100	-	11.1	33.5
Luxembourg <sup>p</sup>	278	221	640	82	510	16.5	36.3
The Netherlands <sup>q</sup>	9691	8495	610	24	530	10.5	18.6
Norway <sup>r</sup>	2755	1452	620	14	330	9.2	30.2
Poland <sup>s</sup>	12,226	8480	320	14.	220	2.9	-
Portugal <sup>t</sup>	4531	-	450	125	-	6.8	43.9
Spain	26,505	20,664	670	-	520	7.8	28.8
Sweden <sup>u</sup>	4000	3229	450	50	-	8.3	7.5
Switzerland	4681	2851	650	48	450	12.0	8.2
Turkey <sup>v</sup>	24,945	-	390	44	-	3.3	12.5

UK <sup>d</sup>	33,200	28,460	560	19 <sup>2</sup>	480	10.6	41.5
Slovakia <sup>w</sup>	1706	1093	320	- 14	200	-	-
Russian Fed <sup>x</sup>	50,000	-	340	112	-	-	-
North America	265,000	-	660	-	-	10.4	14.3
EU15	188,000	-	520	-	-	9.8	28.8
OECD-Europe	220,000	-	500	-	-	-	-
OECD <sup>y</sup>	551,000	-	560	-	-	9.3	30.7

Sources: OECD 1998: data for 1980 and 1995 related to consumption per capita.

\* - Data for 1990 and 2000 are related to 1992 and 1998.

<sup>a</sup>The *estimates (italic)* based on sums and average values of consumption per capita were calculated by the authors on the basis of available OECD (1998) data for 1980 and 1995 related to consumption per capita.

<sup>b</sup>% changes of total municipal waste generation per capita in 2000 compared to 1980 were calculated by the authors on the basis of available data of OECD (2002) for these or other years specified in reference marks c) - y) below; 1) If data for 2000 were not available, % changes were calculated for the decade 1980-1990. 2) If data for 1980 were not available, % changes were calculated for the decade 1990-2000.

<sup>c</sup>Data for 1990 and 2000 are related to 1992 and 1998.

<sup>d</sup>Data for 2000 are related to 1999.

<sup>e</sup>Data for 1980 are related to 1985.

<sup>f</sup>Data for 1980 and 1990 are related to 1978 and 1992.

<sup>g</sup>Data for 1980, 1990 and 2000 are related to 1982, average of 1986-1991 and 1999, respectively.

<sup>h</sup>Estimate.

<sup>i</sup>Data for 1990 and 2000 are related to 1987 and 1996.

<sup>j</sup>Data for 1990 are related to 1995. Data on household waste for 1980 are related to 1985.

<sup>k</sup>Data for 1990 are related to 1994. Estimates on household waste.

<sup>l</sup>Data for 1990 and 2000 are related to 1989 and 1999.

<sup>m</sup>Data for 1998.

<sup>n</sup>Data for 2000 are related to 2001.

<sup>o</sup>Data for 1990 are related to 1995; data for 2000 are related to 1998.

<sup>p</sup>Data for 1990 are related to 1992; data for 2000 are related to 1999.

<sup>q</sup>Data for 1980 are related to 1981.

<sup>r</sup>Data for 1990 are related to 1992.

<sup>s</sup>Data are related to collected waste; data for 1985 comprise liquid waste from containers and other tanks.

<sup>t</sup>Data are related also to Azores and Madeira Islands.

<sup>u</sup>Data for 2000 are related to 1998.

<sup>v</sup>Data for 1990 and 2000 are related to 1989 and 1998.

<sup>w</sup>Data for 1980 and 1990 are related to 1987 and 1992, respectively.

<sup>x</sup>Estimates based on studies of different towns.

<sup>y</sup>Data do not comprise former GDR, Czech Republic, Slovakia, Hungary, Poland and Korea.

Table 1.2.3b. Annual amounts and trends of municipal waste generation in the EC and associated/candidate European countries in the last decade (after Central Statistical Office, 2001, 2002; EUROSTAT, 2001a,b).

Countries	Waste generation, thousand tons				Annual % change <sup>a</sup>	In kilograms per capita <sup>b</sup>
	1990 and the closest available		2000 – the closest available			
	Year	Total	Year	Total		
<i>EU15</i>						
Austria <sup>c</sup>	1990	4782	1996	5270	1.6	654
Belgium	1991	4294	1999	5462	3.1	535
Denmark	1994	2803	1998	3141	2.9	593
Finland	1990	3100	1997	2510	- 3.0	489
France	1993	33,700	1998	37,800	2.3	644
Germany <sup>d</sup>	1990	50,183	1996	44,390	- 2.0	543
Greece	1990	3000	1997	3900	3.8	372
Ireland	1995	1550	1998	1933	7.6	523
Italy	1990	20,000	1998	26,846	3.7	466
Luxembourg <sup>c</sup>	1990	224	1998	184	- 2.4	434
The Netherlands	1991	7470	1999	9359	2.9	594
Portugal	1990	3000	1999	4364	4.6	433
Spain	1990	12,546	1999	24,470	9.5	670
Sweden	1990	3200	1998	4000	2.8	452
UK <sup>f</sup>	1989	35,000	1999	30,000	- 3.4	508
<i>Associated countries</i>						
Island	1992	159	1999	-	-	516
Norway	1990	2000	1999	2650	3.2	596
Switzerland	1990	4090	1999	4555	1.2	639
<i>Candidates to the EU</i>						
Czech Republic	1996	3200	1999	3365	1.7	327
Cyprus	1993	368	-	-	-	516
Estonia	1995	533	1999	569	1.6	394
Hungary	1990	4171	1999	4376	0.5	434
Poland	1990	11,098	1999	12,317	1.2	319
			<b>2000</b>	<b>12,226</b>	1.0	317
Slovenia	1995	1024				515
EU15		<i>178,852</i>		<i>203,623</i>	2.3	527
Associated-3		<i>6249</i>		<i>7205</i>	2.2	584
Candidate-6		<i>20,394</i>		<i>20,536</i>	1.2	417

Central Statistical Office, 2002–2000 data for Poland (**bold**).

Note: Total and mean values (*italic*) are estimated by the authors on the basis of available statistical data given in the respective columns.

<sup>a</sup>Annual increase rate is based on the data for the oldest and the latest available year from the last decade.

<sup>b</sup>Data are referred to the last available year.

<sup>c</sup>Data comprise construction waste.

<sup>d</sup>Preliminary data for 1996.

<sup>e</sup>Preliminary data.

<sup>f</sup>1999 data are for England and Wales.

Table I.2.4. Annual generation of industrial manufacturing/production waste and hazardous waste in the EU and OECD countries in mid-1990s (after OECD, 1998).

Countries	Generation of production/ manufacturing wastes <sup>a</sup>		Generation of hazardous waste <sup>b</sup>				
	Total in thousand tons	In kg/US \$1000 GDP	Year	Generation		In thousand tons	
				Total in thousand tons	In kg/US \$1000 GDP	Export–import	Amount for utilization
Canada		–	1991	5896	11.3	87.9	5808
Mexico <sup>c</sup>	29,570	60	1995	8000	16.1	– 152.8	8153
USA		–	1993	213,620	428.7	142.7	191,091
Japan	143,710	60	1995	–	–	2.0	–
Korea	27,010	50	1995	1622	3.1	–	1622
Australia <sup>d</sup>	37,040	130	1992	426	1.5	3.0	423
New Zealand <sup>e</sup>		–	1993	110	2.3	10.5	100
Austria <sup>f</sup>	10,470	80	1994	513	3.6	10.9	502
Belgium <sup>g</sup>	13,730	8	1994	776	4.44	– 317.0	1093
Czech Republic	19,770	230	1994	1867	21.9	– 4.9	1872
Denmark <sup>h</sup>	2560	30	1995	250	2.6	– 34.0	284
Finland <sup>f</sup>	11,500	140	1992	559	7.5	16.6	542
France <sup>f</sup>	105,000	100	1990	7000	6.8	– 447.6	
Germany <sup>f</sup>	64,860	50	1993	9100	6.6	522.6	8557
Greece <sup>i</sup>	510	10	1992	450	4.5	0.1	450
Hungary	6330	100	1994	3537	58.2	9.6	3527
Iceland <sup>j</sup>	10	–	1994	6	1.3	0.8	5
Ireland <sup>f</sup>	3780	70	1995	248	4.6	16.4	231
Italy	22,210	20	1991	3387	3.5	13.0	3374
Luxembourg <sup>f</sup>	1440	160	1995	180	15.7	180.0	
The Netherlands	7920	30	1993	1520	6.0	– 73.5	1593

Solid waste origins: sources, trends, quality, quantity

(continued)

Table I.2.4. Continued.

Countries	Generation of production/ manufacturing wastes <sup>a</sup>		Generation of hazardous waste <sup>b</sup>				
	Total in thousand tons	In kg/US \$1000 GDP	Year	Generation		In thousand tons	
				Total in thousand tons	In kg/US \$1000 GDP	Export–import	Amount for utilization
Norway	3290	40	1994	500	5.7	28.4	472
Poland <sup>k</sup>	22,610	120	1995	3866	20.0		
Portugal		–	1994	1356	13.2	– 6.2	1363
Spain	13,800	30	1987	1708	4.0	– 75.0	1783
Sweden	13,990	100	1985	500	3.8	30.0	470
Switzerland	1350	10	1995	834	5.6	96.0	738
Turkey	25,040	80	1995	–	–	–	–
UK <sup>l</sup>	56,000	60	1993/1994	1844	1.9	– 68.0	1912
EU15	32,770	63 <sup>**</sup>		29,391	5.9 <sup>**</sup>	– 231.7	22,154
OECD	1,500,000 <sup>*.n</sup>	90 <sup>** .n</sup>		269,675	24.6 <sup>**</sup>	– 8.5	235,965

Note: Total and mean values for EU15 and OECD (except Secretariat estimates) calculated by the authors are based on the available data given in the respective columns; n – Secretariat estimates; \* – without the USA; \*\* – mean.

<sup>a</sup>Data for mid-1990s.

<sup>b</sup>Waste controlled in accordance with the Basel Convention.

<sup>c</sup>Data on production of hazardous waste are for the year 1994.

<sup>d</sup>Data on industrial waste comprise region Queensland only, and on hazardous waste entirely Victoria region.

<sup>e</sup>Data on hazardous waste generation are for the year 1990.

<sup>f</sup>Data on hazardous waste are collected in accordance with the national legislation.

<sup>g</sup>Data related to export and import comprise entirely the region of Flanders and Walloon.

<sup>h</sup>Hazardous waste in accordance with the European Waste Catalogue.

<sup>i</sup>Export is related only to some kinds of wastes.

<sup>j</sup>Data on hazardous wastes do not comprise households and small enterprises.

<sup>k</sup>Not all hazardous wastes are classified in accordance with the Basel Convention.

<sup>l</sup>Data on hazardous waste are only for England and Wales.

the RCRA hazardous-waste management system. The structure of HW sources shows predominance (71%) of the chemical and petroleum industries as generators of HW. These industries may be responsible for as much as 85% of the total quantity of HW generated. Metal-related industries generate 22% of HW, while share of other industries accounts for 7%. Most of the waste comprises spent solvents, process wastewater and sludge and other waste from the listed industries. Reactive waste accounts for 52%, corrosive waste for 35%, toxic waste for 10%, ignitable waste for 1% and unspecified ones for 1–5% (some waste falls into two or more categories) (Dietz and Burns, 1989).

### **I.2.3. Waste arisings and structure of the waste stream in the EU States and candidate countries**

Until recently, the estimate of the quantity and source structure of the waste stream in the EU Member States and the European Union as a whole was based on the combined data from different national and international sources and displayed a high degree of uncertainty due to the lack of consolidated information. Also, at present the statistical data show wide confidence intervals and a lack of completeness. Much support for the generation of waste statistics was provided by the EWC – European Waste Catalogue (1994), though its adoption by the Member States was voluntary. The situation in the statistical arena has improved considerably after establishing a harmonized list of wastes (Commission Decision 2000/532/EC, amended by Commission Decision 2001/118/EC). Wastes included in the list, which replaced the European Waste Catalogue and a list of hazardous waste, are fully defined by the six-digit code for the waste and the respective two-digit and four-digit headings. The list is preceded by the description of steps that should be taken to identify a waste. Most of the countries – candidates to the EU and South-East European Countries have adopted the EWC and the list of hazardous wastes pursuant to the EC Council Directives, and replacing them the harmonized list of wastes (Commission Decision 2000/532/EC, amended in 2001).

A better resolution of uncertainties arising from the national differences and disharmony in the waste definitions in the EU member states is anticipated also after approval in 2003 of the European Standards EN 13965-1 and EN 13965-2 “Characterization of waste – Terminology” (CEN, 2003a,b). European standards have the status of national standards for CEN (European Committee for Standardization) members without any alteration, and are adopted also by the candidates to the EU.

Distinct improvement in completeness and time relevancy of statistical data in recent years demonstrates the EU and candidates’ status on HW statistics and comparison of data for mid-1990s (Tables I.2.4 and I.2.5). Completeness and compatibility of recent statistical data on HW for candidates to the EU are particularly striking. Comparison of data on hazardous waste generation in mid-1990s and in 1998 for candidate countries that are also OECD members indicates significant differences that originate from shifting to the European list of wastes from the national regulations.

Data for the EU15 Member States show a general trend to increase the amount of generated hazardous waste since 1992–1995, though in Finland, Portugal and Luxembourg some decrease also occurred (Austria, Belgium and Spain) (Table I.2.5, after EUROSTAT, 2000a–c, 2001a). Of the total amount 28.8 Mt in 1994/1995 and over

Table I.2.5. Annual generation and management of hazardous waste in the EC, associated and candidate countries in 1994–1998 (after EUROSTAT, 2000a–c, 2001a; Central Statistical Office, 2001).

Countries	Hazardous waste (thousand tons)											
	Generation				Management							
	Year	Total	Year	Total	Year	Incinerated	Disposed	Total	Year	Incinerated	Disposed	Total
<i>EU15</i>												
Austria	1994	513	1998	868	1994	99	–	99	1996	106	–	106
Belgium	1994	776	<b>1997</b>	<b>1625<sup>a</sup></b>	1994	75	530	605	1998	113	636	749
Denmark	1994	194	1998	281	1994	–	62	62	1998	156	57	213
Finland	<b>1992</b>	<b>559</b>	1997	485	1994	–	–	–	1997	101	234	335
France <sup>b</sup>	<b>1990</b>	<b>7000</b>	<b>1990</b>	<b>7000</b>	1994	1210	728	1938	1998	1361	803	2164
Germany <sup>c</sup>	<b>1993</b>	<b>9100</b>	1996	17,421	<b>1993</b>	<b>2034</b>	<b>3253</b>	5287	1996	–	–	–
Greece	1995	350	1997	–	1995	–	–	–	1997	1	226	227
Ireland	1995	248	1998	370	1995	50	5	55	1998	71	41	112
Italy	1995	2708	1997	3401	1995	112	643	755	1997	374	791	1165
Luxembourg <sup>d</sup>	1995	200	1997	143	1995	–	17	17	1997	–	–	–
The Netherlands	1994	885	1998	1448	1994	165	204	269	1998	244	370	614
Portugal	1995	668	1997	595	1995	–	–	–	1997	–	–	–
Spain	1995	3394	1998	–	1996	918	–	918	1998	–	–	–
Sweden	1994	139	1998	801	1994	–	–	–	1998	–	–	–
UK	<b>1993</b>	<b>2077</b>	1998	–	<b>1993</b>	<b>185</b>	<b>931</b>	1116	1998	–	–	–
<i>Associated countries</i>												
Island	1994	6	1998	8	1996	–	–	–	1998	–	–	–
Norway	1994	640	1998	655	1994	–	–	–	1998	119	–	–
Switzerland	1994	854	1998	1043	1994	295	201	496	1998	371	219	590
<i>Candidates to the EU</i>												
Czech Republic	1995	6005	1998	3399	1995	33	176	209	1998	16	406	422
Cyprus	1994	68	1997	52	1994	–	–	–	1997	–	–	–

Estonia	1995	7273	1998	6272	1995	–	6517	6517	1998	–	6050	6050
Hungary	1994	3338	1998	3915	1994	1517	1424	2941	1996	1110	1035	2145
Poland	1994	3188	1998	1105 <sup>c</sup>								
			<b>1999</b>	<b>1601</b>					<b>1999</b>	–	<b>96</b>	
Slovenia	1995	170	1998	–	1995	–	–	–	1998	–	–	–
EU15		28,811		34,438		4848	6373	11,221		2527 <sup>f</sup>	3158 <sup>f</sup>	5685 <sup>f</sup>
Associate-3		1500		1706		295	201	496		490	219	590
Candidate-6		20,042		15,239		1550	8117	9667		1126	7587	8713

*Italic bold* – data after EUROSTAT 2000a–c; **Bold** – data after Central Statistical Office (2001).

*Note: Total values (italic)* are estimated by the authors on the basis of available statistical data given in the respective columns. In case of lacking recent data for waste generation, the latest available data were used (France, Greece, Spain and UK).

<sup>a</sup>Flanders only; data for 1997.

<sup>b</sup>Data for incineration and disposal do not comprise internal management.

<sup>c</sup>Preliminary data for 1996.

<sup>d</sup>Preliminary data. Data for 1994 for disposal comprise also waste other than hazardous.

<sup>e</sup>Disparity of data for 1994 and 1998 results from the changes in waste classification.

<sup>f</sup>Incomplete data, without Germany, UK and four other Member States.

34 Mt in 1997/1998 (incomplete data, without Spain, UK and Greece, and old data from France) that is about 9–10% of production waste, 4.8 Mt (17%) were incinerated and 6.4 Mt (22%) disposed in 1994/1995 (data on waste management for 1997/1998 were incomplete). Of the EU Member States, the highest amounts of HW were generated in Germany and in France, while the highest amounts of HW generation per capita were in Luxembourg and Belgium. Hazardous waste generation per capita ranged in the EU countries from 16 to 341 kg/year (mean 103 kg/year).

In six countries – candidates to the EU – total amounts of HW generated in 1998 (15 Mt) showed deep decrease (for 24%) in comparison with 1994/1995 that was partly due to alteration of production profile (Czech Republic), but also resulted from the changes in waste classification (Poland) (Table I.2.5). Values of HW generation per capita (from 15 to 625 kg/year without Estonia) were comparable to those recorded for the EU countries (EUROSTAT, 2000a,b, 2001a). The highest HW generation among candidate countries was from Estonia and Czech Republic, within the range recorded for Germany and France. This resulted in extremely high amount of HW per capita in 1977 in small Estonia (5049 kg/year), and elevated value for Czech Republic (625 kg/year). Candidate countries disposed of about 30% more and incinerate three times less HW than EU countries (Table I.2.5).

Currently, the most reliable statistics on waste generation are provided by the reports of OECD and publications of the EUROSTAT. Tables I.2.1–I.2.7 illustrate the degree of uncertainty of the statistical data based on different, even relatively harmonized sources. In Table I.2.3a, two sets of parallel data for 1997 for the EU Member States originated from reports of OECD (1998), (1999) and EUROSTAT (2000a,b) show lesser or bigger divergence and incompleteness. It results in wide confidence intervals and significant differences both in estimates of the total amounts of waste generated and in the source structure of the waste stream in the particular Member States and the European Union as a whole.

As estimate still plays a considerable role in evaluation of the actual status and long-term prognosis for waste generation, it can be of interest to compare the UNEP (1992) estimate after Haines (1988) and a decade later EUROSTAT (2000a,b) statistical data (Table I.2.6). UNEP estimated total annual waste generation in the EU as approximately 2162 Mt. Of this, the major components of the waste stream were reported to be agricultural waste (44%), sewage sludge (14%) and extractive/mining waste (12%). EUROSTAT data for 1997, completed by OECD (1999) and national sources (Bontoux and Leone, 1997), at almost the same total amount, show lesser percentile of agricultural waste (33%), though their share can be higher, as the data on agricultural waste are the least complete. The amounts of industrial and construction/demolition waste appeared to be almost two times higher, while the amount of sewage sludge (OECD, 1999 data) was 24-fold less than the UNEP estimate.

To summarize, the biggest principal sources of waste in the EU appeared to be agriculture (32.7%), mining waste (17.0%), industrial manufacturing/production waste (16.4%) and construction/demolition waste (14.0%) (Table I.2.7). According to these data assembled from the available statistical sources including OECD (1999) and EUROSTAT (2000a,b) and national statistics (Bontoux and Leone, 1997), in the EU the biggest waste generators are France, Germany and the UK. They contribute 65% to the total waste generation. Their share in the source-related waste streams of the EU ranged from 60 to

Table I.2.6. Comparison of estimated and statistical data for annual waste generation in the European Community – principal sources (UNEP, 1992; OECD, 1999; EUROSTAT, 2000a).

Kind of waste	Million tons/yr		%	
	UNEP estimate <sup>a</sup>	Statistics 1997 <sup>b</sup>	UNEP estimate <sup>a</sup>	Statistics 1997 <sup>b</sup>
Household and consumer wastes	132	186	6	9
Agricultural wastes	950	698	44	33
Industrial wastes	160	350	7	16
Sewage sludge	300	12.3 <sup>c</sup>	14	0.6
Extractive (mining) wastes	250	362	12	17
Demolition and construction wastes	170	300	8	14
Other wastes (litter, etc.)	200	225 <sup>d</sup>	9	10.4
Total	2162	2133	100	100

<sup>a</sup>UNEP, 1992 (adapted from Haines, 1988).

<sup>b</sup>EUROSTAT, 2000a.

<sup>c</sup>After OECD, 1999.

<sup>d</sup>Together with power generation waste and waste from water purification and supply.

Table I.2.7. Amounts and percentile structure of waste generated in the EU (Mt/yr and % of the total for a country) (after Bontoux and Leone, 1997; OECD, 1999; EUROSTAT, 2000a,b)\*.

Country	Million tons/yr (% of the total for the country)							
	Agriculture	Mining	Industrial	Construction	Other <sup>a</sup>	Municipal	Total <sup>b</sup>	Hazardous <sup>c</sup>
Austria <sup>d</sup>	0.8 (1.28)	<b>0.003<sup>1</sup></b> (0.005)	<b>14.28<sup>1</sup></b> (22.82)	<b>25.39<sup>1</sup></b> (40.57)	16.84 (26.90)	<b>5.27<sup>1</sup></b> (8.42)	62.58 (100.0)	<b>0.61<sup>1</sup></b> (0.97)
Belgium	–	<b>0.39<sup>2</sup></b> (1.38)	<b>13.73<sup>1,2,3</sup></b> (48.65)	<b>7.72<sup>2</sup></b> (27.36)	1.07 (3.79)	<b>5.31</b> (18.82)	28.22 (100.0)	<b>1.63</b> (5.78)
Denmark <sup>c</sup>	–	–	<b>2.74<sup>1</sup></b> (20.81)	<b>3.43</b> (28.90)	3.02 (25.44)	<b>2.95</b> (24.85)	11.87 (100.0)	<b>0.25</b> (2.11)
Finland <sup>f</sup>	22.0 (33.66)	<b>15.00<sup>8</sup></b> (22.95)	<b>15.50</b> (23.72)	<b>7.00<sup>3</sup></b> (10.71)	3.75 (5.74)	<b>2.100<sup>3</sup></b> (3.21)	65.35 (100.0)	<b>0.56<sup>8</sup></b> (0.86)
France <sup>e</sup>	<u>377.0 (62.69)</u>	<u><b>75.00<sup>8</sup></b> (12.47)</u>	<u><b>101.00<sup>2</sup></b> (16.79)</u>	<u><b>13.70<sup>9</sup></b> (2.28)</u>	–	<u><b>34.70<sup>2</sup></b> (5.77)</u>	<u>601.40 (100.0)</u>	<u><b>7.00<sup>10</sup></b> (1.16)</u>
Germany <sup>h</sup>	<u>27.9 (7.65)</u>	<u><b>67.81<sup>4</sup></b> (18.58)</u>	<u><b>65.12<sup>4</sup></b> (17.85)</u>	<u><b>131.64<sup>4</sup></b> (36.08)</u>	<u>28.92 (7.93)</u>	<u><b>43.49</b> (11.92)</u>	<u>364.88 (100.0)</u>	<u><b>9.10<sup>4</sup></b> (2.49)</u>
Greece	7.78 (23.31)	<b>3.90<sup>2</sup></b> (10.78)	<b>6.68<sup>1</sup></b> (20.01)	<b>1.80<sup>1</sup></b> (5.39)	9.62 (28.82)	<b>3.90</b> (11.68)	33.38 (100.0)	<b>0.35<sup>1</sup></b> (1.05)
Ireland	31.00 (75.57)	<b>2.20<sup>2</sup></b> (5.36)	<b>3.78<sup>2</sup></b> (9.22)	<b>1.32<sup>2</sup></b> (3.22)	0.69 (1.68)	<b>2.03<sup>2</sup></b> (4.95)	41.02 (100.0)	<b>0.25<sup>2</sup></b> (0.61)
Italy <sup>h</sup>	–	–	22.21 (20.77)	14.31 (13.38)	43.83 (40.98)	<b>26.60</b> (24.87)	106.95 (100.0)	3.39 <sup>9</sup> (3.17)
Luxembourg <sup>i</sup>	–	–	<b>1.44<sup>10</sup></b> (88.34)	–	–	<b>0.19<sup>6</sup></b> (11.66)	1.63 (100.0)	<b>0.14</b> (8.59)
The Netherlands <sup>j</sup>	17.00 (32.23)	<b>0.33<sup>1</sup></b> (0.63)	<b>8.58<sup>1</sup></b> (16.27)	13.95 (26.45)	4.11 (7.79)	<b>8.78<sup>1</sup></b> (16.64)	52.75 (100.0)	<b>0.93<sup>1</sup></b> (1.76)
Portugal <sup>k</sup>	–	<b>7.12</b> (23.18)	<b>10.99</b> (35.77)	<b>7.73</b> (25.16)	0.57 (1.86)	<b>4.31<sup>7</sup></b> (14.03)	30.72 (100.0)	<b>0.56</b> (3.13)
Spain	114.0 (51.07)	<b>70.00<sup>4</sup></b> (31.36)	<b>13.80<sup>10</sup></b> (6.18)	<b>0.11<sup>2</sup></b> (0.05)	10.0 (4.48)	<b>15.31<sup>1</sup></b> (6.86)	223.22 (100.0)	<b>3.39<sup>2</sup></b> (1.52)
Sweden	<i>21 (24.06)</i>	<b>47.00<sup>4</sup></b> (53.84)	<b>13.99<sup>4</sup></b> (16.03)	<b>1.50<sup>3</sup></b> (1.72)	0.60 (0.69)	<b>3.20<sup>3</sup></b> (3.67)	87.23 (100.0)	<b>0.14<sup>3</sup></b> (0.16)
UK <sup>l</sup>	<u><b>80.0</b> (18.96)</u>	<u><b>74.00<sup>1</sup></b> (17.54)</u>	<u><b>56.00<sup>2</sup></b> (13.27)</u>	<u><b>70.00<sup>1</sup></b> (16.59)</u>	<u>114.0 (27.01)</u>	<u><b>28.00<sup>1</sup></b> (6.64)</u>	<u>422.00 (100.0)</u>	<u><b>2.08<sup>4</sup></b> (0.49)</u>

Total <sup>l</sup>	698.48 (32.74)	362.45 (16.99)	349.57 (16.39)	299.60 (14.04)	237.02 (11.58)	<b>186.14</b> (8.26)	2133.26 (100.0)	30.78 (1.44)
Total max <sup>l</sup>	484.90 (34.93)	216.81 (15.62)	222.12 (16.00)	215.34 (15.51)	142.92 (10.29)	106.19 (7.65)	1388.28 (100.0)	18.18 (1.31)

Sources: National statistical sources 1993–1997, after Bontoux and Leone, ITPS, 1997 (*italic*); OECD, 1999 (normal); EUROSTAT, 2000a,b (**bold**).

\* – Data related to 1997 or the last available year in 1990s. Rounded total data may comprise estimates. Data for: 1) 1996; 2) 1995; 3) 1994; 4) 1993; 5) 25,257 thousand tons collected during public waste collection according to the German Waste Act. 6) Without fractions collected separately. Data for: 7) 1998; 8) 1992; 9) 1991; 10) 1990. Data for three largest contributors are underlined.

Note: Total values were calculated by the authors on the basis of available data given in the respective columns/rows.

<sup>a</sup>Data comprise also waste from power generation, and water purification and supply.

<sup>b</sup>Total includes entirely sums of available data given in the column; also data on agricultural waste from national statistical sources 1993–1997 (*italic*).

<sup>c</sup>Waste controlled in accordance with the national legislation.

<sup>d</sup>Valid classification does not relate to sectors but to groups of waste; data may not be comparable to other countries.

<sup>e</sup>Data comprise sewage sludge. Data on other waste include hazardous and other production waste. Total value does not include waste from agriculture, and mining and quarrying.

<sup>f</sup>Data on agriculture do not comprise waste from forestry.

<sup>g</sup>Estimates comprise hazardous waste.

<sup>h</sup>Data on other waste are related to hospital waste.

<sup>i</sup>The latest statistical data on production waste are for 1990; no contemporary data are available.

<sup>j</sup>Data on other waste include commercial waste and car scrapping.

<sup>k</sup>Data comprise entirely hazardous waste (besides data on municipal waste).

<sup>l</sup>Data on other waste comprise sewage sludge.

<sup>m</sup>Amounts and percentile comprise entirely sums of available data given in the column, also data on agricultural waste from national statistical sources 1993–1997 (*italic*).

over 70%: they generated 72% of construction/demolition waste, 69% of agricultural waste, 64% of industrial manufacturing/production waste, 60% of mining and “other” residues and 57% of municipal waste. Besides these waste generators in the European Union, a high position with respect to the amount of agricultural and mining waste (second and third, respectively) also is held by Spain. Hazardous waste generation in the EU accounted for only 1.44% of the documented total annual waste generation. The HW produced in the three EU Member States – the biggest waste generators – constituted 59% of the total annual HW. The biggest generator of hazardous waste appeared to be Germany. Its share of the HW generation was estimated to be 30%. The next in line were France, Italy and Spain, which were responsible for generation of 23, 11 and 11%, respectively, of the total HW. The percentile structure of waste for each EU Member State differed considerably from the total for the EU and reflected the specifics of their economy. The proportion of agricultural waste (over 50%) was the highest for Ireland, France and Spain. Mining waste dominated in Sweden (54%), while a high amount of construction/demolition waste was specific for Austria and Germany. The percentile of hazardous waste ranged from 0.16% (Sweden) to 8.59% (Luxembourg).

Potentially recyclable waste generated in the EU accounted for 24% of the total registered waste generation. The bulk of this waste is construction/demolition (67%) and dredging (22%) material. Ultimately recyclable packaging waste accounted for no more than 7.7%. In the OECD Member States beside construction (50%) and dredging waste (11%), the proportion of sewage sludge (25%) was significant. Packaging waste accounted for 11%. Therefore, the structure of the recyclable waste in the EU and OECD as a whole is somewhat different (Table I.2.2).

There is still substantial degree of uncertainty in the European statistics, as both the OECD and EUROSTAT data suffer from being incomplete, and related to different years for some member countries that also often randomly merge various kinds of waste (e.g. compare OECD, 1999 and EUROSTAT, 2000a–c data for construction waste – Tables I.2.2 and I.2.7). Nevertheless, due to harmonization of statistical methods and of nomenclature based on the EWC (1994) these data are considered the most reliable. It is anticipated that enactment of the harmonized single European List of Wastes (2000) and Regulation on waste statistics (2002) and the adoption of this list by all the EU Member States and by the candidate and South-East European countries along with the establishing uniform questionnaire and reporting obligation due to implementation of the Regulation on waste statistics (2002) will greatly improve the status of the European statistics on waste in general. The recent progress in elaboration of clear and comparable indicators for sustainable development proposed by EUROSTAT (2001a) should considerably increase the application of statistics as an indispensable tool for the actualization of the sustainable development and auditing the efficiency of the undertaken measures. The inconsistency and incompleteness of data on waste generation in other OECD countries is much higher, and ways to overcome this problem are much more complicated. Especially problematic is lack of terminological and statistical compatibility between North America and the EU. A significant effort should be put into the harmonization area, in particular for the univocal interpretation of statistical data from the USA, which is the world’s biggest generator of waste. Excluding these data from the statistics undermines reliability of all the comparative analysis for the OECD (see Table I.2.1). In turn, taking them into consideration in their present status would cause no lesser misinterpretation.

The preceding analysis clearly shows that the inconsistency of the statistical data concerning major waste streams, their structure and amounts in the OECD, the EU and at the national levels is still high. The need for harmonization and unification of the national and international waste statistics based at present on the equivocal definitions and lists is urgent. In this field, closer cooperation of the US EPA and other national statistical offices, and international bodies (OECD, EC and SBC) is required.

#### **I.2.4. Waste generation in new countries of the former USSR**

If the waste statistics in the OECD (including the USA) and the EU Member States is still incomplete and inconsistent, there was almost no reliable or even any data on solid waste generation and control in most of the states of the former USSR (except Baltic states) until statistical data on the total amount of hazardous wastes in 1999 as reported by Parties by 10 October 2001 were issued by the Secretariat of the Basel Convention (SBC). Among 36 Parties that submitted numerical data on HW generation in that year, were Russian Federation, Uzbekistan, Kyrgyzstan and Moldova.

The huge amounts of solid and hazardous waste generated and disposed in the area of the former USSR in an uncontrolled manner can be only guessed, considering the historically strong pressure on the development of primary process industries, which generate the bulk of solid and hazardous wastes. In particular, these industries – high volume and hazardous waste generators – comprise the mineral and metal processing industries, chemical and engineering industries, as well as oil spills and crude oil processing. The reported amount of HW generated in Russian Federation in 1999 can be compared only with the scale of HW generation in the USA (108,070 thousand tons, that is about 50% of HW generated in the USA) and comprised 54% of the total HW that is 200,556 thousand tons, as reported by 36 Parties. Along with Uzbekistan, the second in size HW generator, it comprised 67.7% of the total, while other two former republics of the USSR contributed to the total reported HW generation to a lesser extent (SBC, 2001b).

Some rough idea about the scale of waste generation in the former USSR can provide also statistical data for the Central European candidate (three of them are OECD Members) that used to be within the influence of the USSR economy (Tables I.2.4 and I.2.5). These countries (Poland, Hungary and Czech Republic) display particularly high solid waste (SW) and HW generation per US \$1000, i.e. high SW and HW factors (100–230 and 20–58 kg, respectively) (Table I.2.4). For the former USSR countries, substantially higher SW and HW factors are anticipated.

Baltic states (Estonia, Latvia and Lithuania) – candidates to the EU and former republics of the USSR that are covered by the recent EU statistical report (EUROSTAT, 2000c, 2001a) are not typical for the whole country due to the small size and late annexing to the USSR. Nevertheless, on the background of Latvia and Lithuania where primary process industries were not particularly developed, HW generation in Estonia was reported to be extremely high (7361 thousand tons in 1997 and 6272 in 1998 that is comparable to France). The HW generation per capita in this small country accounted for 5049 kg that is 15 times higher than the highest value for the EU Member States (341 kg in Luxembourg). Of the generated HW, 89.6–96.5%, i.e. 6512–6050 thousand tons was disposed, which

was about equal to the total HW amount disposed by all 15 EU Member States (EU15) (Table I.2.5, after EUROSTAT, 2001a). These data give rough idea about the probable size of HW generation in the majority of the new countries of the former USSR.

### **I.2.5. Waste generation in the developing countries**

The data on solid waste generation and control in the developing countries are scarce. The governments of these countries have given a low priority to the development of controls over solid waste generation and safe disposal, often because of a failure to understand the threat, which inadequate management could pose to human health and the environment.

Even a very rough estimate of waste amounts and source structure, as well as composition of waste in the developing countries is extremely difficult. The notion of “developing countries” is eclectic due to considerable differences between regions and the particular developing countries with respect to the degree of urbanization, level and structure of the industrial development, and intensity and structure of agriculture, as well as cultural development, traditions, habits and a common life style. Though, according to *Down To Earth Magazine* (Anonymous, 2001a) based on UNEP (2000) data, the municipal solid waste (MSW) structure only to a limited extent depends on factors like geographical location, energy sources and the climate, being related mainly to the income per capita. The comparison of average MSW composition of low-income Asian countries (the latter data referring to India and China) with high- and middle-income countries reveals that ash is one of the main components of garbage that constitutes the “other” category in low-income countries, while in high- and middle-income countries the share of this category is about four times lower. In turn, the middle- and low-income countries have a high compostable organic content in their municipal wastes, while in MSW generated in the high-income countries the organic fraction is significantly smaller. In low-income countries, the fractional share of recyclable material is the lowest (Fig. I.2.1, after UNEP, 2000; Anonymous, 2001a).

The same sources consider also the direct relation between the income per capita and MSW generation, and assume waste generation per capita to increase from 1.6 to 2.74 times by 2025 in all three types of countries (in high-income countries the increase being the highest), in parallel with a growth of the income per capita from 30% to 2.4 times (in high-income countries being relatively the lowest) (Fig. I.2.2, after UNEP, 2000; Anonymous, 2001a). This prognosis, though, in view of the present status and trends (see Tables I.2.3a and I.2.3b), is based on the simplified assumptions and does not seem correct with respect to high-income countries where MSW generation strongly depends on the life style and though still growing, shows distinct trends to slowing down due to the implementation of waste management strategies focused on waste minimization, restrictive regulations and growing public awareness. Progressively increasing costs of landfilling, e.g. reported increase of landfill fee in Oregon, USA, from US \$18 to \$68 per ton between 1988 and 1991, and lack of new land for landfill siting also contribute to limitation of waste generation (Anonymous, 2000). Most likely, the municipal waste generation in the developing low- and middle-income countries will grow and its structure will change in the longer time span in parallel with growing income until both factors reach the actual level of developed countries; if by that time waste management,

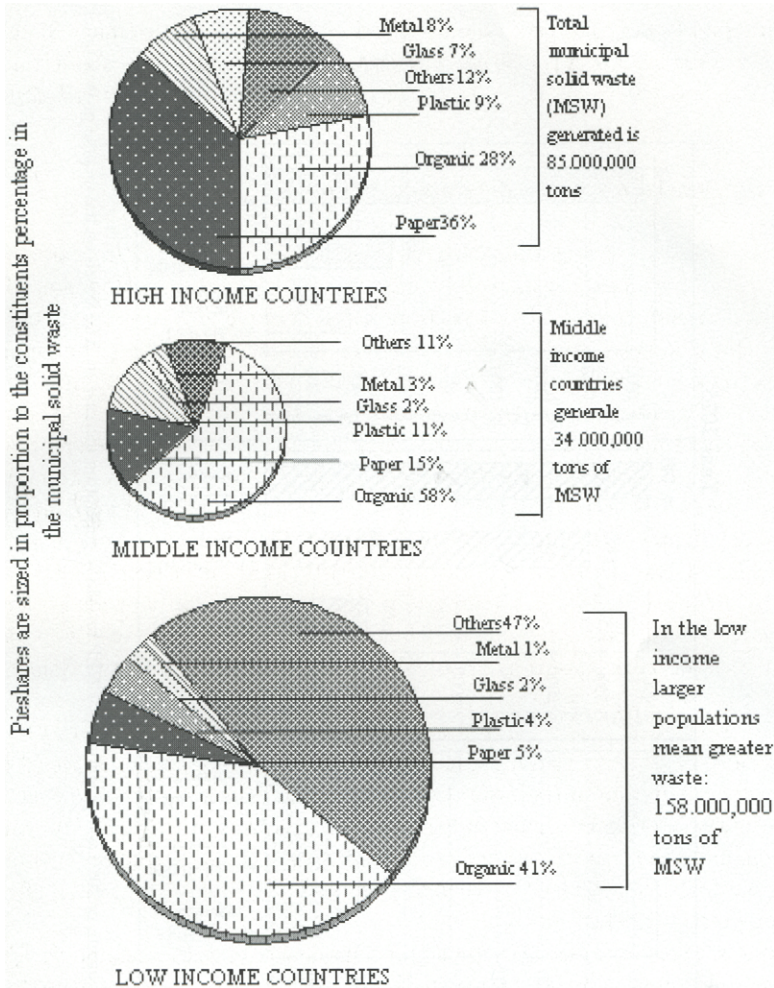


Figure 1.2.1. MSW composition vs. average income (after UNEP, 2000; Anonymous, 2001a). Ash is one of the main components constituting the “other” category in low-income countries, especially in India and China. The middle- and low-income countries have high amount of compostable organic content in their MSW.

legislation and public awareness in these countries also adequately improve, the increasing trends will cease.

The status of the reporting on HW in developing countries can be exemplified in Indian statistics (Anonymous, 2001b). Officially, there has never been an effort to secure a national inventory of such wastes. The State Pollution Control Boards (SPCBs) recently furnished data based on estimates from which could be concluded that the 13,011 units in the country generated approximately 4.4 Mt of hazardous waste per year, classified in three categories: recyclable, incinerable and disposable. At the same time, from the data given by the Secretary of Ministry of Environment and Forest (MoEF) appeared that

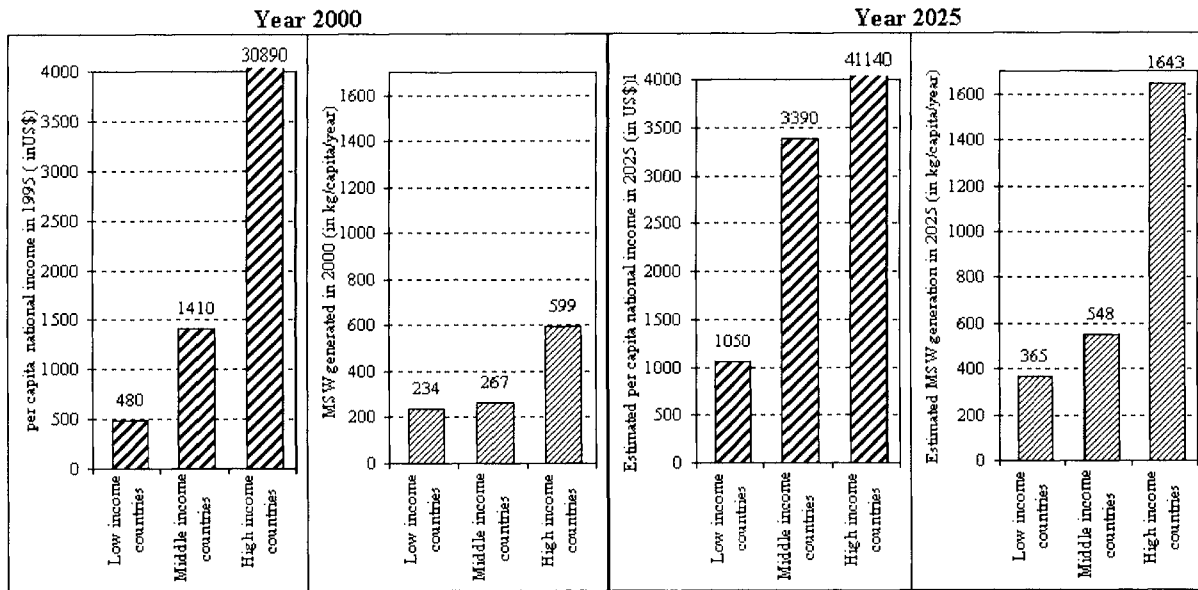


Figure 1.2.2. Average MSW generation vs. income per capita in 2000 and prognosis of UNEP for MSW generation increase in 2025 based on the income growth (after UNEP, 2000; Anonymous, 2001a).

the quantity of HW generated was merely 0.7 Mt. The reason for discrepancies of such magnitude was that the inventories made by SPCBs were based on the definition of HW provided in the unamended Hazardous waste Rules, 1989, which led to the inclusion of large quantities of high volume, low-toxic wastes such as phosphogypsum, red mud, slag from iron and steel and ferro alloy industries, etc. These wastes are now excluded from the category of hazardous waste due to amendments of 06.01.2000 to the HW Rules in order to comply with ratified Basel Convention. Currently, not even a preliminary figure of total hazardous waste quantities is available as per this amendment and will not be available for some more time. The unreliable statistical data in India originate thus from weak legislation and incompatible classification of HW. This example reflects an overall status on solid and hazardous waste statistics in developing countries; in many of them hardly any statistics in this field exists.

The increasing population and industrialization in these countries results in the increase of quantities and changing structure of solid and hazardous waste that intensifies threat to human health and the environment. Besides national economies, there is an already high and still growing influence on the amounts and structure of waste generation in these countries exerted by the activity of large international companies siting their plants close to resources, cheap manpower and liberal environmental regulations. In many cases, this enables avoidance of restrictions imposed by the Basel Convention on transboundary movement of hazardous waste.

### **I.2.6. Transboundary movement of hazardous waste**

For these “white spot” regions the only reliable source of data is transmission of information under the Basel Convention on HW transboundary movement. Recently, SBC – Secretariat of the Basel Convention – pays much attention to reporting and transmission of information on generation and transboundary movement of hazardous and other wastes (SBC, 1999a–c). These data comprise the total HW transboundary movement, which is also covered by the OECD statistics for the OECD countries (Table I.2.4). The amount of HW annually exported from the OECD Member countries varied in a wide range, from 0.1 thousand tons (Greece) to 522.6 thousand tons (Germany). The biggest HW exporters ( $\geq 100$  thousand tons annually) were consecutively Germany, Luxembourg, the USA and Switzerland. The annual import of HW reported by eight OECD Member States ranged from 4.9 (Czech Republic) to 447.6 thousand tons (France). Besides France, the biggest HW importers were Belgium and Mexico. The total export–import balance of HW in the OECD is almost 0 (export 1170.5 thousand tons, import 1174.1 thousand tons). Of this, the EU is the predominant importer/exporter, with a considerable excess of import (1021.3 thousand tons) over export (789.6 thousand tons) (OECD, 1998).

The structure of transboundary movement in 1993–1999 of HW and other wastes by Y-codes of Basel Convention lists, according to categories, generic types or constituents that render them hazardous, was also analyzed and presented by the SBC – Secretariat of the Basel Convention (1996), (1999a–c), (2000) and (2001a,b) (For explanation of Y-codes of the Basel Convention see Chapter II.2, Appendix A, Annexes I and II). The first

analysis of 1996 was based on the data provided by the Parties of the Basel Convention to the Secretariat for the year 1993, in accordance with Article 13 of the Convention. The data were reported in a form required by SBC by 18 of 101 Parties, among them by 10 OECD Member countries. The precision of these data, however, have to be considered with great caution due to the limited number of the Parties participating in the survey, as well as due to the differences in national definitions of hazardous waste and the difficulties in obtaining accurate data. This remark, underlined by SBC (1996), illustrates and confirms the most unsatisfactory state of statistical information on waste that time.

During the following years, a continuous trend in improving national reporting by the Parties to the Secretariat and in transmission of information under the Basel Convention has been observed. By 10 October 2001, the SBC prepared 87 Country Fact Sheets for the year 1999 containing the information on the generation and transboundary movement of hazardous and other wastes as reported by Parties (SBC, 2001a). Of this number, the data on amount of HW generation were submitted by 36 reporting Parties, among them by 14 OECD countries. Amounts of "other wastes" that cover wastes under Annex II: Y46–Y47 of the Basel Convention were reported by 24 Parties, among them 11 OECD countries. Of 200,556 thousand tons HW and 92,554 thousand tons of other wastes generated by the reporting Parties that give grand total 293,110 thousand tons, total amount of HW and other wastes by Y-codes generated in 1999 as reported by Parties was 26,738 thousand tons, i.e. covered only 9% of total reported amount (SBC, 2001b). This still shows the weakness and limitation of the SBC statistics despite of constantly growing number of the participating Parties.

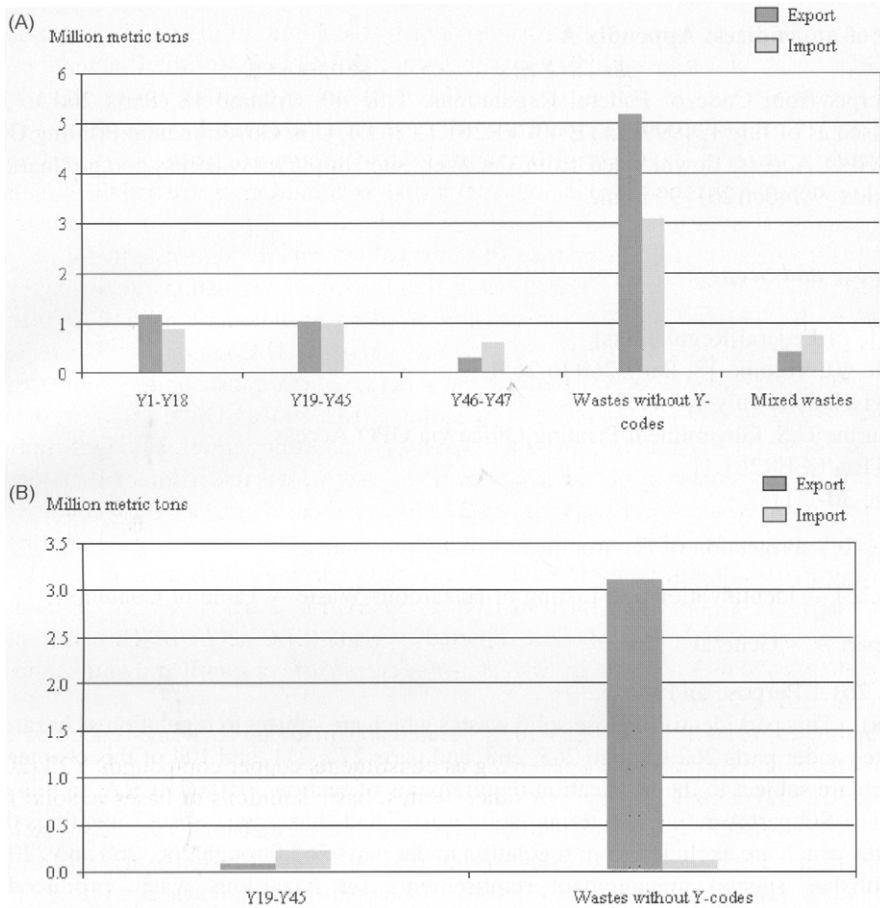
The highest percent of total amount generated was made up by wastes collected from the households Y46 (39%), wastes having as constituents copper compounds Y22 (20%), and in descending quantities by four other wastes: basic solutions or bases in solid form Y35 (6%), waste oils/water, hydrocarbons/water mixtures, emulsions Y9 (<6%), residues arising from industrial waste disposal operations (>4%) and residues arising from the incineration of household wastes Y47 (<4%). Other wastes by Y-codes comprised 21% of reported grand total.

The SBC data on transboundary movement in 1999 of HW and other wastes by Y-codes among all reporting Parties (Fig. I.2.3a) and non-OECD reporting parties (Fig. I.2.3b), display significant predominance of wastes without Y-codes over other wastes, and much higher reported export than import, particularly among non-OECD reporting parties.

The precision of these data, however, have to be considered with great caution due to the still limited number of the Parties participating in the survey, as well as due to the differences in national definitions of hazardous waste and the difficulties in obtaining accurate data, in particular in the developing countries. This remark, underlined by SBC in 1996, illustrates and confirms the unsatisfactory state of statistical information on waste that time, and inadequate improvement in this field until now.

### **I.2.7. Conclusion**

The concerted international systematic efforts focused on harmonization of waste terminological standards and on integrated waste and hazardous waste catalogue instead



**Figure I.2.3.** Transboundary movement of hazardous wastes and other wastes by Y-codes in 1999 (after SBC, 2001b). Explanation of Y-codes used in Figure I.2.3 – (Ref. Annex 1 of the Basel Convention – See Chapter II.2, Appendix A). Y1–Y18 – waste streams; Y19–Y45 – wastes having as constituents; Y46–Y47 – wastes requiring special consideration. a – transboundary movement among all reporting Parties. Total amount exported: 8,104,960 tons. Total amount imported: 6,338,474 tons. b – transboundary movement among non-OECD reporting Parties. Total amount exported: 3,203,289 tons. Total amount imported: 335,473 tons. The amount of Y1–Y18 exported was negligible (1400 tons). There was no import of Y1–Y18; there was no export and no import of Y46–Y47; the amount of mixed wastes exported was negligible (4561 tons); there was no import of mixed wastes.

of multiplication of waste lists by different international and national bodies, is an urgent task of the first priority on the way to complete and reliable regional and global waste statistics. It is obvious, that reliable information is an indispensable instrument and a prerequisite to sound and sustainable waste management strategies. Hence, much more attention should be paid to the improvement of the regional and global statistics on solid waste and hazardous waste generation, disposal of and transboundary movement.

**List of appendices: Appendix A**

Excerpts from Code of Federal Regulations, Title 40, Volume 18, Parts 260 to 265, Revised as of July 1, 1999, CITE 40CFR261.1–261.4, U.S. Governmental Printing Office via GPO Access, downloaded from the Web site: [http://www.access.gpo.gov/nara/cfr/waisidx\\_99/40cfr261\\_99.html](http://www.access.gpo.gov/nara/cfr/waisidx_99/40cfr261_99.html).

***Purpose and Scope***

[Code of Federal Regulations]

[Title 40, Volume 18, Parts 260 to 265]

[Revised as of July 1, 1999]

From the U.S. Government Printing Office via GPO Access

[CITE: 40CFR261.1]

[Page 30–31]

Title 40 – Protection of Environment Agency (continued)

Part 261 – Identification and Listing of Hazardous Waste – Table of Contents

Subpart A – General

Sec. 261.1 Purpose and scope.

(a) This part identifies those solid wastes which are subject to regulation as hazardous wastes under parts 262 through 265, 268, and parts 270, 271, and 124 of this chapter and which are subject to the notification requirements of section 3010 of RCRA. In this part:

(1) Subpart A defines the terms “solid waste” and “hazardous waste”, identifies those wastes which are excluded from regulation under parts 262 through 266, 268 and 270 and establishes special management requirements for hazardous waste produced by conditionally exempt small quantity generators and hazardous waste which is recycled.

(2) Subpart B sets forth the criteria used by EPA to identify characteristics of hazardous waste and to list particular hazardous wastes.

(3) Subpart C identifies characteristics of hazardous waste.

(4) Subpart D lists particular hazardous wastes.

(b)(1) The definition of solid waste contained in this part applies only to wastes that also are hazardous for purposes of the regulations implementing subtitle C of RCRA. For example, it does not apply to materials (such as non-hazardous scrap, paper, textiles, or rubber) that are not otherwise hazardous wastes and that are recycled.

(2) This part identifies only some of the materials which are solid wastes and hazardous wastes under sections 3007, 3013, and 7003 of RCRA. A material which is not defined as a solid waste in this part, or is not a hazardous waste identified or listed in this part, is still a solid waste and a hazardous waste for purposes of these sections if:

(i) In the case of sections 3007 and 3013, EPA has reason to believe that the material may be a solid waste within the meaning of section 1004(27) of RCRA and a hazardous waste within the meaning of section 1004(5) of RCRA; or

(ii) In the case of section 7003, the statutory elements are established.

(c) For the purposes of Secs. 261.2 and 261.6:

(1) A “spent material” is any material that has been used and as a result of contamination can no longer serve the purpose for which it was produced without processing;

(2) “Sludge” has the same meaning used in Sec. 260.10 of this chapter;

(3) A “by-product” is a material that is not one of the primary products of a production process and is not solely or separately produced by the production process. Examples are process residues such as slags or distillation column bottoms. The term does not include a co-product that is produced for the general public’s use and is ordinarily used in the form it is produced by the process.

(4) A material is “reclaimed” if it is processed to recover a usable product, or if it is regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvents.

(5) A material is “used or reused” if it is either:

(i) Employed as an ingredient (including use as an intermediate) in an industrial process to make a product (for example, distillation bottoms from one process used as feedstock in another process). However, a material will not satisfy this condition if distinct components of the material are recovered as separate end products (as when metals are recovered from metal-containing secondary materials); or

(ii) Employed in a particular function or application as an effective substitute for a commercial product (for example, spent pickle liquor used as phosphorous precipitant and sludge conditioner in wastewater treatment).

(6) “Scrap metal” is bits and pieces of metal parts (e.g., bars, turnings, rods, sheets, wire) or metal pieces that may be combined together with bolts or soldering (e.g., radiators, scrap automobiles, railroad box cars), which when worn or superfluous can be recycled.

(7) A material is “recycled” if it is used, reused, or reclaimed.

(8) A material is “accumulated speculatively” if it is accumulated before being recycled. A material is not accumulated speculatively, however, if the person accumulating it can show that the material is potentially recyclable and has a feasible means of being recycled; and that – during the calendar year (commencing on January 1) – the amount of material that is recycled, or transferred to a different site for recycling, equals at least 75 percent by weight or volume of the amount of that material accumulated at the beginning of the period. In calculating the percentage of turnover, the 75 percent requirement is to be applied to each material of the same type (e.g., slags from a single smelting process) that is recycled in the same way (i.e., from which the same material is recovered or that is used in the same way). Materials accumulating in units that would be exempt from regulation under Sec. 261.4(c) are not to be included in making the calculation. (Materials that are already defined as solid wastes also are not to be included in making the calculation.) Materials are no longer in this category once they are removed from accumulation for recycling, however.

(9) “Excluded scrap metal” is processed scrap metal, unprocessed home scrap metal, and unprocessed prompt scrap metal.

(10) “Processed scrap metal” is scrap metal which has been manually or physically altered to either separate it into distinct materials to enhance economic value or to improve the handling of materials. Processed scrap metal includes, but is not limited to scrap metal which has been baled, shredded, sheared, chopped, crushed, flattened, cut, melted, or separated by metal type (i.e., sorted), and, fines, drosses and related materials

which have been agglomerated. (Note: shredded circuit boards being sent for recycling are not considered processed scrap metal. They are covered under the exclusion from the definition of solid waste for shredded circuit boards being recycled (Sec. 261.4(a)(13)).

(11) "Home scrap metal" is scrap metal as generated by steel mills, foundries, and refineries such as turnings, cuttings, punchings, and borings.

(12) "Prompt scrap metal" is scrap metal as generated by the metal working/fabrication industries and includes such scrap metal as turnings, cuttings, punchings, and borings. Prompt scrap is also known as industrial or new scrap metal.

[45 FR 33119, May 19, 1980, as amended at 48 FR 14293, Apr. 1, 1983; 50 FR 663, Jan. 4, 1985; 51 FR 10174, Mar. 24, 1986; 51 FR 40636, Nov. 7, 1986; 62 FR 26018, May 12, 1997]

### ***Solid Waste***

[Code of Federal Regulations]

[Title 40, Volume 18, Parts 260 to 265]

[Revised as of July 1, 1999]

From the U.S. Government Printing Office via GPO Access

[CITE: 40CFR261.2]

Title 40 – Protection of Environment Agency (continued)

Part 261 – Identification and Listing of Hazardous Waste – Table of Contents

Subpart A – General

Sec. 261.2 Definition of solid waste.

(a)(1) A solid waste is any discarded material that is not excluded by Sec. 261.4(a) or that is not excluded by variance granted under Secs. 260.30 and 260.31.

(2) A discarded material is any material which is:

(i) Abandoned, as explained in paragraph (b) of this section; or

(ii) Recycled, as explained in paragraph (c) of this section; or

(iii) Considered inherently waste-like, as explained in paragraph (d) of this section; or

(iv) A military munition identified as a solid waste in 40 CFR 266.202.

(b) Materials are solid waste if they are abandoned by being:

(1) Disposed of; or

(2) Burned or incinerated; or

(3) Accumulated, stored, or treated (but not recycled) before or in lieu of being abandoned by being disposed of, burned, or incinerated.

(c) Materials are solid wastes if they are recycled – or accumulated, stored, or treated before recycling – as specified in paragraphs (c)(1) through (4) of this section.

(1) Used in a manner constituting disposal. (i) Materials noted with a "\*" in Column 1 of Table 1 are solid wastes when they are:

(A) Applied to or placed on the land in a manner that constitutes disposal; or

(B) Used to produce products that are applied to or placed on the land or are otherwise contained in products that are applied to or placed on the land (in which cases the product itself remains a solid waste).

Table 1

	Use constituting disposal (Sec. 261.2(c)(1))	Energy recovery/fuel (Sec. 261.2(c)(2))	Reclamation (Sec. 261.2(c)(3)) (except as provided in 261.4(a)(17) for mineral processing secondary materials)	Speculative accumulation (Sec. 261.2(c)(4))
	1	2	3	4
Spent materials	(*)	(*)	(*)	(*)
Sludges (listed in 40 CFR Part 261.31 or 261.32...)	(*)	(*)	(*)	(*)
Sludges exhibiting a characteristic of hazardous waste	(*)	(*)	-	(*)
By-products (listed in 40 CFR 261.31 or 261.32)...	(*)	(*)	(*)	(*)
By-products exhibiting a characteristic of hazardous waste	(*)	(*)	-	(*)
Commercial chemical products listed in 40 CFR 261.33...	(*)	(*)	-	-
Scrap metal other than excluded scrap metal (see 261.1(c)(9))...	(*)	(*)	(*)	(*)

Note: The terms “spent materials,” “sludges,” “by-products,” and “scrap metal” and “processed scrap metal” are defined in Sec. 261.1.

(ii) However, commercial chemical products listed in Sec. 261.33 are not solid wastes if they are applied to the land and that is their ordinary manner of use.

(2) Burning for energy recovery. (i) Materials noted with a "\*" in column 2 of Table 1 are solid wastes when they are:

(A) Burned to recover energy;

(B) Used to produce a fuel or are otherwise contained in fuels (in which cases the fuel itself remains a solid waste).

(ii) However, commercial chemical products listed in Sec. 261.33 are not solid wastes if they are themselves fuels.

(3) Reclaimed. Materials noted with a "\*" in column 3 of Table 1 are solid wastes when reclaimed (except as provided under 40 CF R261.4(a)(17)). Materials noted with a "-" in column 3 of Table 1 are not solid wastes when reclaimed (except as provided under 40 CFR 261.4(a)(17)).

(4) Accumulated speculatively. Materials noted with a "\*" in column 4 of Table 1 are solid wastes when accumulated speculatively.

(d) Inherently waste-like materials. The following materials are solid wastes when they are recycled in any manner:

(1) Hazardous Waste Nos. F020, F021 (unless used as an ingredient to make a product at the site of generation), F022, F023, F026, and F028.

(2) Secondary materials fed to a halogen acid furnace that exhibit a characteristic of a hazardous waste or are listed as a hazardous waste as defined in subparts C or D of this part, except for brominated material that meets the following criteria:

(i) The material must contain a bromine concentration of at least 45%; and

(ii) The material must contain less than a total of 1% of toxic organic compounds listed in Appendix VIII; and

(iii) The material is processed continually on-site in the halogen acid furnace via direct conveyance (hard piping).

(3) The Administrator will use the following criteria to add wastes to that list:

(i)(A) The materials are ordinarily disposed of, burned, or incinerated; or

(B) The materials contain toxic constituents listed in Appendix VIII of part 261 and these constituents are not ordinarily found in raw materials or products for which the materials substitute (or are found in raw materials or products in smaller concentrations) and are not used or reused during the recycling process; and

(ii) The material may pose a substantial hazard to human health and the environment when recycled.

(e) Materials that are not solid waste when recycled. (1) Materials are not solid wastes when they can be shown to be recycled by being:

(i) Used or reused as ingredients in an industrial process to make a product, provided the materials are not being reclaimed; or

(ii) Used or reused as effective substitutes for commercial products; or

(iii) Returned to the original process from which they are generated, without first being reclaimed or land disposed. The material must be returned as a substitute for feedstock materials. In cases where the original process to which the material is returned is a secondary process, the materials must be managed such that there is no placement on the land. In cases where the materials are generated and reclaimed within the primary mineral

processing industry, the conditions of the exclusion found at Sec. 261.4(a)(17) apply rather than this paragraph.

(2) The following materials are solid wastes, even if the recycling involves use, reuse, or return to the original process (described in paragraphs (e)(1) (i) through (iii) of this section):

(i) Materials used in a manner constituting disposal, or used to produce products that are applied to the land; or

(ii) Materials burned for energy recovery, used to produce a fuel, or contained in fuels; or

(iii) Materials accumulated speculatively; or

(iv) Materials listed in paragraphs (d)(1) and (d)(2) of this section.

(f) Documentation of claims that materials are not solid wastes or are conditionally exempt from regulation. Respondents in actions to enforce regulations implementing subtitle C of RCRA who raise a claim that a certain material is not a solid waste, or is conditionally exempt from regulation, must demonstrate that there is a known market or disposition for the material, and that they meet the terms of the exclusion or exemption. In doing so, they must provide appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste, or is exempt from regulation. In addition, owners or operators of facilities claiming that they actually are recycling materials must show that they have the necessary equipment to do so.

[50 FR 664, Jan. 4, 1985, as amended at 50 FR 33542, Aug. 20, 1985; 56 FR 7206, Feb. 21, 1991; 56 FR 32688, July 17, 1991; 56 FR 42512, Aug. 27, 1991; 57 FR 38564, Aug. 25, 1992; 59 FR 48042, Sept. 19, 1994; 62 FR 6651, Feb. 12, 1997; 62 FR 26019, May 12, 1997; 63 FR 28636, May 26, 1998; 64 FR 24513, May 11, 1999]

### ***Hazardous Waste***

[Code of Federal Regulations]

[Title 40, Volume 18, Parts 260 to 265]

[Revised as of July 1, 1999]

From the U.S. Government Printing Office via GPO Access

[CITE: 40CFR261.3]

Title 40 – Protection of Environment Agency (continued)

Part 261 – Identification and Listing of Hazardous Waste – Table of Contents

Subpart A – General

Sec. 261.3 Definition of hazardous waste.

(a) A solid waste, as defined in Sec. 261.2, is a hazardous waste if:

(1) It is not excluded from regulation as a hazardous waste under Sec. 261.4(b); and

(2) It meets any of the following criteria:

(i) It exhibits any of the characteristics of hazardous waste identified in subpart C of this part. However, any mixture of a waste from the extraction, beneficiation, and processing of ores and minerals excluded under Sec. 261.4(b)(7) and any other solid

waste exhibiting a characteristic of hazardous waste under subpart C is a hazardous waste only if it exhibits a characteristic that would not have been exhibited by the excluded waste alone if such mixture had not occurred, or if it continues to exhibit any of the characteristics exhibited by the non-excluded wastes prior to mixture. Further, for the purposes of applying the Toxicity Characteristic to such mixtures, the mixture is also a hazardous waste if it exceeds the maximum concentration for any contaminant listed in table I to Sec. 261.24 that would not have been exceeded by the excluded waste alone if the mixture had not occurred or if it continues to exceed the maximum concentration for any contaminant exceeded by the nonexempt waste prior to mixture.

(ii) It is listed in subpart D of this part and has not been excluded from the lists in subpart D of this part under Secs. 260.20 and 260.22 of this chapter.

(iii) It is a mixture of a solid waste and a hazardous waste that is listed in subpart D of this part solely because it exhibits one or more of the characteristics of hazardous waste identified in subpart C of this part, unless the resultant mixture no longer exhibits any characteristic of hazardous waste identified in subpart C of this part, or unless the solid waste is excluded from regulation under Sec. 261.4(b)(7) and the resultant mixture no longer exhibits any characteristic of hazardous waste identified in subpart C of this part for which the hazardous waste listed in subpart D of this part was listed. (However, nonwastewater mixtures are still subject to the requirements of part 268 of this chapter, even if they no longer exhibit a characteristic at the point of land disposal.)

(iv) It is a mixture of solid waste and one or more hazardous wastes listed in subpart D of this part and has not been excluded from paragraph (a)(2) of this section under Secs. 260.20 and 260.22 of this chapter; however, the following mixtures of solid wastes and hazardous wastes listed in subpart D of this part are not hazardous wastes (except by application of paragraph (a)(2) (i) or (ii) of this section) if the generator can demonstrate that the mixture consists of wastewater the discharge of which is subject to regulation under either section 402 or section 307(b) of the Clean Water Act (including wastewater at facilities which have eliminated the discharge of wastewater) and:

(A) One or more of the following solvents listed in Sec. 261.31 – carbon tetrachloride, tetrachloroethylene, trichloroethylene – provided, that the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pre-treatment system does not exceed 1 part per million; or

(B) One or more of the following spent solvents listed in Sec. 261.31 – methylene chloride, 1,1,1-trichloroethane, chlorobenzene, o-dichlorobenzene, cresols, cresylic acid, nitrobenzene, toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, spent chlorofluorocarbon solvents – provided that the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pre-treatment system does not exceed 25 parts per million; or

(C) One of the following wastes listed in Sec. 261.32, provided that the wastes are discharged to the refinery oil recovery sewer before primary oil/water/solids separation – heat exchanger bundle cleaning sludge from the petroleum refining industry (EPA Hazardous Waste No. K050), crude oil storage tank sediment from petroleum refining operations (EPA Hazardous Waste No. K169), clarified slurry oil tank sediment and/or in-line filter/separation solids from petroleum refining operations (EPA Hazardous Waste No. K170), spent hydrotreating catalyst (EPA Hazardous Waste No. K171), and spent hydrorefining catalyst (EPA Hazardous Waste No. K172); or

(D) A discarded commercial chemical product, or chemical intermediate listed in Sec. 261.33, arising from de minimis losses of these materials from manufacturing operations in which these materials are used as raw materials or are produced in the manufacturing process. For purposes of this paragraph (a)(2)(iv)(D), “de minimis” losses include those from normal material handling operations (e.g., spills from the unloading or transfer of materials from bins or other containers, leaks from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well maintained pump packings and seals; sample purgings; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; and reinstatement from empty containers or from containers that are rendered empty by that rinsing; or

(E) Wastewater resulting from laboratory operations containing toxic (T) wastes listed in subpart D of this part, Provided, That the annualized average flow of laboratory wastewater does not exceed one percent of total wastewater flow into the headworks of the facility’s wastewater treatment or pre-treatment system or provided the wastes, combined annualized average concentration does not exceed one part per million in the headworks of the facility’s wastewater treatment or pre-treatment facility. Toxic (T) wastes used in laboratories that are demonstrated not to be discharged to wastewater are not to be included in this calculation; or

(F) One or more of the following wastes listed in Sec. 261.32 – wastewaters from the production of carbamates and carbamoyl oximes (EPA Hazardous Waste No. K157) – Provided that the maximum weekly usage of formaldehyde, methyl chloride, methylene chloride, and triethylamine (including all amounts that can not be demonstrated to be reacted in the process, destroyed through treatment, or is recovered, i.e., what is discharged or volatilized) divided by the average weekly flow of process wastewater prior to any dilutions into the headworks of the facility’s wastewater treatment system does not exceed a total of 5 parts per million by weight; or

(G) Wastewaters derived from the treatment of one or more of the following wastes listed in Sec. 261.32 – organic waste (including heavy ends, still bottoms, light ends, spent solvents, filtrates, and decantates) from the production of carbamates and carbamoyl oximes (EPA Hazardous Waste No. K156) – Provided, that the maximum concentration of formaldehyde, methyl chloride, methylene chloride, and triethylamine prior to any dilutions into the headworks of the facility’s wastewater treatment system does not exceed a total of 5 milligrams per liter.

(v) Rebuttable presumption for used oil. Used oil containing more than 1000 ppm total halogens is presumed to be a hazardous waste because it has been mixed with halogenated hazardous waste listed in subpart D of part 261 of this chapter. Persons may rebut this presumption by demonstrating that the used oil does not contain hazardous waste

(for example, by using an analytical method from SW-846, Third Edition, to show that the used oil does not contain significant concentrations of halogenated hazardous constituents listed in Appendix VIII of part 261 of this chapter). EPA Publication SW-846, Third Edition, is available for the cost of \$110.00 from the Government Printing Office, Superintendent of Documents, PO Box 371954, Pittsburgh, PA 15250-7954. 202-512-1800 (document number 955-001-00000-1).

(A) The rebuttable presumption does not apply to metalworking oils/fluids containing chlorinated paraffins, if they are processed, through a tolling agreement, to reclaim metalworking oils/fluids. The presumption does apply to metalworking oils/fluids if such oils/fluids are recycled in any other manner, or disposed.

(B) The rebuttable presumption does not apply to used oils contaminated with chlorofluorocarbons (CFCs) removed from refrigeration units where the CFCs are destined for reclamation. The rebuttable presumption does apply to used oils contaminated with CFCs that have been mixed with used oil from sources other than refrigeration units.

(b) A solid waste which is not excluded from regulation under paragraph (a)(1) of this section becomes a hazardous waste when any of the following events occur:

(1) In the case of a waste listed in subpart D of this part, when the waste first meets the listing description set forth in subpart D of this part.

(2) In the case of a mixture of solid waste and one or more listed hazardous wastes, when a hazardous waste listed in subpart D is first added to the solid waste.

(3) In the case of any other waste (including a waste mixture), when the waste exhibits any of the characteristics identified in subpart C of this part.

(c) Unless and until it meets the criteria of paragraph (d) of this section:

(1) A hazardous waste will remain a hazardous waste.

(2)(i) Except as otherwise provided in paragraph (c)(2)(ii) of this section, any solid waste generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust, or leachate (but not including precipitation run-off) is a hazardous waste. (However, materials that are reclaimed from solid wastes and that are used beneficially are not solid wastes and hence are not hazardous wastes under this provision unless the reclaimed material is burned for energy recovery or used in a manner constituting disposal.)

(ii) The following solid wastes are not hazardous even though they are generated from the treatment, storage, or disposal of a hazardous waste, unless they exhibit one or more of the characteristics of hazardous waste:

(A) Waste pickle liquor sludge generated by lime stabilization of spent pickle liquor from the iron and steel industry (SIC Codes 331 and 332).

(B) Waste from burning any of the materials exempted from regulation by Sec. 261.6(a)(3)(iii) and (iv).

(C)(1) Nonwastewater residues, such as slag, resulting from high temperature metals recovery (HTMR) processing of K061, K062 or F006 waste, in units identified as rotary kilns, flame reactors, electric furnaces, plasma arc furnaces, slag reactors, rotary hearth furnace/electric furnace combinations or industrial furnaces (as defined in paragraphs (6), (7), and (13) of the definition for "Industrial furnace" in 40 CFR 260.10), that are disposed in subtitle D units, provided that these residues meet the generic exclusion levels identified in the tables in this paragraph for all constituents,

and exhibit no characteristics of hazardous waste. Testing requirements must be incorporated in a facility's waste analysis plan or a generator's self-implementing waste analysis plan; at a minimum, composite samples of residues must be collected and analyzed quarterly and/or when the process or operation generating the waste changes. Persons claiming this exclusion in an enforcement action will have the burden of proving by clear and convincing evidence that the material meets all of the exclusion requirements.

Constituent	Maximum for any single composite sample – TCLP (mg/l)
Generic exclusion levels for K061 and K062 non-wastewater HTMR residues	
Antimony...	0.10
Arsenic...	0.50
Barium...	7.6
Beryllium...	0.010
Cadmium...	0.050
Chromium (total)...	0.33
Lead...	0.15
Mercury...	0.009
Nickel...	1.0
Selenium...	0.16
Silver...	0.30
Thallium...	0.020
Zinc...	70
Generic exclusion levels for F006 non-wastewater HTMR residues	
Antimony...	0.10
Arsenic...	0.50
Barium...	7.6
Beryllium...	0.010
Cadmium...	0.050
Chromium (total)...	0.33
Cyanide (total) (mg/kg)...	1.8
Lead...	0.15
Mercury...	0.009
Nickel...	1.0
Selenium...	0.16
Silver...	0.30
Thallium...	0.020
Zinc...	70

(2) A one-time notification and certification must be placed in the facility's files and sent to the EPA region or authorized state for K061, K062 or F006 HTMR residues that meet the generic exclusion levels for all constituents and do not exhibit any characteristics that are sent to subtitle D units. The notification and certification that is placed in the

generators or treaters files must be updated if the process or operation generating the waste changes and/or if the subtitle D unit receiving the waste changes. However, the generator or treater need only notify the EPA region or an authorized state on an annual basis if such changes occur. Such notification and certification should be sent to the EPA region or authorized state by the end of the calendar year, but no later than December 31. The notification must include the following information: The name and address of the subtitle D unit receiving the waste shipments; the EPA Hazardous Waste Number(s) and treatability group(s) at the initial point of generation; and, the treatment standards applicable to the waste at the initial point of generation. The certification must be signed by an authorized representative and must state as follows: "I certify under penalty of law that the generic exclusion levels for all constituents have been met without impermissible dilution and that no characteristic of hazardous waste is exhibited. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine and imprisonment."

(D) Biological treatment sludge from the treatment of one of the following wastes listed in Sec. 261.32 – organic waste (including heavy ends, still bottoms, light ends, spent solvents, filtrates, and decantates) from the production of carbamates and carbamoyl oximes (EPA Hazardous Waste No. K156), and wastewaters from the production of carbamates and carbamoyl oximes (EPA Hazardous Waste No. K157).

(E) Catalyst inert support media separated from one of the following wastes listed in Sec. 261.32 – Spent hydrotreating catalyst (EPA Hazardous Waste No. K171), and Spent hydrotreating catalyst (EPA Hazardous Waste No. K172).

(d) Any solid waste described in paragraph (c) of this section is not a hazardous waste if it meets the following criteria:

(1) In the case of any solid waste, it does not exhibit any of the characteristics of hazardous waste identified in subpart C of this part. (However, wastes that exhibit a characteristic at the point of generation may still be subject to the requirements of part 268, even if they no longer exhibit a characteristic at the point of land disposal.)

(2) In the case of a waste which is a listed waste under subpart D of this part, contains a waste listed under subpart D of this part or is derived from a waste listed in subpart D of this part, it also has been excluded from paragraph (c) of this section under Secs. 260.20 and 260.22 of this chapter.

(e) [Reserved]

(f) Notwithstanding paragraphs (a) through (d) of this section and provided the debris as defined in part 268 of this chapter does not exhibit a characteristic identified at subpart C of this part, the following materials are not subject to regulation under 40 CFR parts 260, 261 to 266, 268, or 270:

(1) Hazardous debris as defined in part 268 of this chapter that has been treated using one of the required extraction or destruction technologies specified in Table 1 of Sec. 268.45 of this chapter; persons claiming this exclusion in an enforcement action will have the burden of proving by clear and convincing evidence that the material meets all of the exclusion requirements; or

(2) Debris as defined in part 268 of this chapter that the Regional Administrator, considering the extent of contamination, has determined is no longer contaminated with hazardous waste.

[57 FR 7632, Mar. 3, 1992; 57 FR 23063, June 1, 1992, as amended at 57 FR 37263, Aug. 18, 1992; 57 FR 41611, Sept. 10, 1992; 57 FR 49279, Oct. 30, 1992; 59 FR 38545, July 28, 1994; 60 FR 7848, Feb. 9, 1995; 63 FR 28637, May 26, 1998; 63 FR 42184, Aug. 6, 1998]

***Exclusions***

[Code of Federal Regulations]

[Title 40, Volume 18, Parts 260 to 265]

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[CITE: 40CFR261.4]

Title 40 – Protection of Environment Agency (continued)

Part 261 – Identification and Listing of Hazardous Waste – Table of Contents

Subpart A – General

Sec. 261.4 Exclusions.

(a) Materials which are not solid wastes. The following materials are not solid wastes for the purpose of this part:

(1)(i) Domestic sewage; and

(ii) Any mixture of domestic sewage and other wastes that passes through a sewer system to a publicly-owned treatment works for treatment. “Domestic sewage” means untreated sanitary wastes that pass through a sewer system.

(2) Industrial wastewater discharges that are point source discharges subject to regulation under section 402 of the Clean Water Act, as amended. [Comment: This exclusion applies only to the actual point source discharge. It does not exclude industrial wastewaters while they are being collected, stored or treated before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment.]

(3) Irrigation return flows.

(4) Source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq.

(5) Materials subjected to in-situ mining techniques, which are not removed from the ground as part of the extraction process.

(6) Pulping liquors (i.e., black liquor) that are reclaimed in a pulping liquor recovery furnace and then reused in the pulping process, unless it is accumulated speculatively as defined in Sec. 261.1(c) of this chapter.

(7) Spent sulfuric acid used to produce virgin sulfuric acid, unless it is accumulated speculatively as defined in Sec. 261.1(c) of this chapter.

(8) Secondary materials that are reclaimed and returned to the original process or processes in which they were generated where they are reused in the production process provided:

(i) Only tank storage is involved, and the entire process through completion of reclamation is closed by being entirely connected with pipes or other comparable enclosed means of conveyance;

(ii) Reclamation does not involve controlled flame combustion (such as occurs in boilers, industrial furnaces, or incinerators);

(iii) The secondary materials are never accumulated in such tanks for over twelve months without being reclaimed; and

(iv) The reclaimed material is not used to produce a fuel, or used to produce products that are used in a manner constituting disposal.

(9)(i) Spent wood preserving solutions that have been reclaimed and are reused for their original intended purpose; and

(ii) Wastewaters from the wood preserving process that have been reclaimed and are reused to treat wood.

(iii) Prior to reuse, the wood preserving wastewaters and spent wood preserving solutions described in paragraphs (a)(9)(i) and (a)(9)(ii) of this section, so long as they meet all of the following conditions:

(A) The wood preserving wastewaters and spent wood preserving solutions are reused on-site at water borne plants in the production process for their original intended purpose;

(B) Prior to reuse, the wastewaters and spent wood preserving solutions are managed to prevent release to either land or groundwater or both;

(C) Any unit used to manage wastewaters and/or spent wood preserving solutions prior to reuse can be visually or otherwise determined to prevent such releases;

(D) Any drip pad used to manage the wastewaters and/or spent wood preserving solutions prior to reuse complies with the standards in part 265, subpart W of this chapter, regardless of whether the plant generates a total of less than 100 kg/month of hazardous waste; and

(E) Prior to operating pursuant to this exclusion, the plant owner or operator submits to the appropriate Regional Administrator or State Director a one-time notification stating that the plant intends to claim the exclusion, giving the date on which the plant intends to begin operating under the exclusion, and containing the following language: "I have read the applicable regulation establishing an exclusion for wood preserving wastewaters and spent wood preserving solutions and understand it requires me to comply at all times with the conditions set out in the regulation." The plant must maintain a copy of that document in its on-site records for a period of no less than 3 years from the date specified in the notice. The exclusion applies only so long as the plant meets all of the conditions. If the plant goes out of compliance with any condition, it may apply to the appropriate Regional Administrator or State Director for reinstatement. The Regional Administrator or State Director may reinstate the exclusion upon finding that the plant has returned to compliance with all conditions and that violations are not likely to recur.

(10) EPA Hazardous Waste Nos. K060, K087, K141, K142, K143, K144, K145, K147, and K148, and any wastes from the coke by-products processes that are hazardous only because they exhibit the Toxicity Characteristic (TC) specified in section 261.24 of this part when, subsequent to generation, these materials are recycled to coke ovens, to the tar recovery process as a feedstock to produce coal tar, or mixed with coal tar prior to the tar's sale or refining. This exclusion is conditioned on there being no land disposal of the wastes from the point they are generated to the point they are recycled to coke ovens or tar recovery or refining processes, or mixed with coal tar.

(11) Nonwastewater splash condenser dross residue from the treatment of K061 in high temperature metals recovery units, provided it is shipped in drums (if shipped) and not land disposed before recovery.

(12)(i) Oil-bearing hazardous secondary materials (i.e., sludges, byproducts, or spent materials) that are generated at a petroleum refinery (SIC code 2911) and are inserted into the petroleum refining process (SIC code 2911 – including, but not limited to, distillation, catalytic cracking, fractionation, or thermal cracking units (i.e., cokers)) unless the material is placed on the land, or speculatively accumulated before being so recycled. Materials inserted into thermal cracking units are excluded under this paragraph, provided that the coke product also does not exhibit a characteristic of hazardous waste. Oil-bearing hazardous secondary materials may be inserted into the same petroleum refinery where they are generated, or sent directly to another petroleum refinery, and still be excluded under this provision. Except as provided in paragraph (a)(12)(ii) of this section, oil-bearing hazardous secondary materials generated elsewhere in the petroleum industry (i.e., from sources other than petroleum refineries) are not excluded under this section. Residuals generated from processing or recycling materials excluded under this paragraph (a)(12)(i), where such materials as generated would have otherwise met a listing under subpart D of this part, are designated as F037 listed wastes when disposed of or intended for disposal.

(ii) Recovered oil that is recycled in the same manner and with the same conditions as described in paragraph (a)(12)(i) of this section. Recovered oil is oil that has been reclaimed from secondary materials (including wastewater) generated from normal petroleum industry practices, including refining, exploration and production, bulk storage, and transportation incident thereto (SIC codes 1311, 1321, 1381, 1382, 1389, 2911, 4612, 4613, 4922, 4923, 4789, 5171, and 5172.) Recovered oil does not include oil-bearing hazardous wastes listed in subpart D of this part; however, oil recovered from such wastes may be considered recovered oil. Recovered oil does not include used oil as defined in 40 CFR 279.1.

(13) Excluded scrap metal (processed scrap metal, unprocessed home scrap metal, and unprocessed prompt scrap metal) being recycled.

(14) Shredded circuit boards being recycled provided that they are:

(i) Stored in containers sufficient to prevent a release to the environment prior to recovery; and

(ii) Free of mercury switches, mercury relays and nickel-cadmium batteries and lithium batteries.

(15) Condensates derived from the overhead gases from kraft mill steam strippers that are used to comply with 40 CFR 63.446(e). The exemption applies only to combustion at the mill generating the condensates.

(16) Comparable fuels or comparable syngas fuels (i.e., comparable/syngas fuels) that meet the requirements of Sec. 261.38.

(17) Secondary materials (i.e., sludges, by-products, and spent materials as defined in Sec. 261.1) (other than hazardous wastes listed in subpart D of this part) generated within the primary mineral processing industry from which minerals, acids, cyanide, water or other values are recovered by mineral processing or by beneficiation, provided that:

(i) The secondary material is legitimately recycled to recover minerals, acids, cyanide, water or other values;

(ii) The secondary material is not accumulated speculatively;

(iii) Except as provided in paragraph (a)(15)(iv) of this section, the secondary material is stored in tanks, containers, or buildings meeting the following minimum integrity standards: a building must be an engineered structure with a floor, walls, and

a roof all of which are made of non-earthen materials providing structural support (except smelter buildings may have partially earthen floors provided the secondary material is stored on the non-earthen portion), and have a roof suitable for diverting rainwater away from the foundation; a tank must be free standing, not be a surface impoundment (as defined in 40 CFR 260.10), and be manufactured of a material suitable for containment of its contents; a container must be free standing and be manufactured of a material suitable for containment of its contents. If tanks or containers contain any particulate which may be subject to wind dispersal, the owner/operator must operate these units in a manner which controls fugitive dust. Tanks, containers, and buildings must be designed, constructed and operated to prevent significant releases to the environment of these materials.

(iv) The Regional Administrator or the State Director may make a site-specific determination, after public review and comment, that only solid mineral processing secondary materials may be placed on pads, rather than in tanks, containers, or buildings. Solid mineral processing secondary materials do not contain any free liquid. The decision-maker must affirm that pads are designed, constructed and operated to prevent significant releases of the secondary material into the environment. Pads must provide the same degree of containment afforded by the non-RCRA tanks, containers and buildings eligible for exclusion.

(A) The decision-maker must also consider if storage on pads poses the potential for significant releases via groundwater, surface water, and air exposure pathways. Factors to be considered for assessing the groundwater, surface water, air exposure pathways are: the volume and physical and chemical properties of the secondary material, including its potential for migration off the pad; the potential for human or environmental exposure to hazardous constituents migrating from the pad via each exposure pathway, and the possibility and extent of harm to human and environmental receptors via each exposure pathway.

(B) Pads must meet the following minimum standards: be designed of non-earthen material that is compatible with the chemical nature of the mineral processing secondary material, capable of withstanding physical stresses associated with placement and removal, have run on/runoff controls, be operated in a manner which controls fugitive dust, and have integrity assurance through inspections and maintenance programs.

(C) Before making a determination under this paragraph, the Regional Administrator or State Director must provide notice and the opportunity for comment to all persons potentially interested in the determination. This can be accomplished by placing notice of this action in major local newspapers, or broadcasting notice over local radio stations.

(v) The owner or operator provides a notice to the Regional Administrator or State Director, identifying the following information: the types of materials to be recycled; the type and location of the storage units and recycling processes; and the annual quantities expected to be placed in non land-based units. This notification must be updated when there is a change in the type of materials recycled or the location of the recycling process.

(vi) For purposes of Sec. 261.4(b)(7), mineral processing secondary materials must be the result of mineral processing and may not include any listed hazardous wastes. Listed hazardous wastes and characteristic hazardous wastes generated by non-mineral processing industries are not eligible for the conditional exclusion from the definition of solid waste.

(18) Petrochemical recovered oil from an associated organic chemical manufacturing facility, where the oil is to be inserted into the petroleum refining process (SIC code 2911) along with normal petroleum refinery process streams, provided:

(i) The oil is hazardous only because it exhibits the characteristic of ignitability (as defined in Sec. 261.21) and/or toxicity for benzene (Sec. 261.24, waste code D018); and

(ii) The oil generated by the organic chemical manufacturing facility is not placed on the land, or speculatively accumulated before being recycled into the petroleum refining process. An “associated organic chemical manufacturing facility” is a facility where the primary SIC code is 2869, but where operations may also include SIC codes 2821, 2822, and 2865; and is physically co-located with a petroleum refinery; and where the petroleum refinery to which the oil being recycled is returned also provides hydrocarbon feedstocks to the organic chemical manufacturing facility. “Petrochemical recovered oil” is oil that has been reclaimed from secondary materials (i.e., sludges, byproducts, or spent materials, including wastewater) from normal organic chemical manufacturing operations, as well as oil recovered from organic chemical manufacturing processes.

(19) Spent caustic solutions from petroleum refining liquid treating processes used as a feedstock to produce cresylic or naphthenic acid unless the material is placed on the land, or accumulated speculatively as defined in Sec. 261.1(c).

(b) Solid wastes which are not hazardous wastes. The following solid wastes are not hazardous wastes:

(1) Household waste, including household waste that has been collected, transported, stored, treated, disposed, recovered (e.g., refuse-derived fuel) or reused. “Household waste” means any material (including garbage, trash and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas). A resource recovery facility managing MSW shall not be deemed to be treating, storing, disposing of, or otherwise managing hazardous wastes for the purposes of regulation under this subtitle, if such facility:

(i) Receives and burns only

(A) Household waste (from single and multiple dwellings, hotels, motels, and other residential sources) and

(B) Solid waste from commercial or industrial sources that does not contain hazardous waste; and

(ii) Such facility does not accept hazardous wastes and the owner or operator of such facility has established contractual requirements or other appropriate notification or inspection procedures to assure that hazardous wastes are not received at or burned in such facility.

(2) Solid wastes generated by any of the following and which are returned to the soils as fertilizers:

(i) The growing and harvesting of agricultural crops.

(ii) The raising of animals, including animal manures.

(3) Mining overburden returned to the mine site.

(4) Fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste, generated primarily from the combustion of coal or other fossil fuels, except as provided by Sec. 266.112 of this chapter for facilities that burn or process hazardous waste.

(5) Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy.

(6)(i) Wastes which fail the test for the Toxicity Characteristic because chromium is present or are listed in subpart D due to the presence of chromium, which do not fail the test for the Toxicity Characteristic for any other constituent or are not listed due to the presence of any other constituent, and which do not fail the test for any other characteristic, if it is shown by a waste generator or by waste generators that:

(A) The chromium in the waste is exclusively (or nearly exclusively) trivalent chromium; and

(B) The waste is generated from an industrial process which uses trivalent chromium exclusively (or nearly exclusively) and the process does not generate hexavalent chromium; and

(C) The waste is typically and frequently managed in non-oxidizing environments.

(ii) Specific waste which meet the standard in paragraphs (b)(6)(i) (A), (B), and (C) (so long as they do not fail the test for the toxicity characteristic for any other constituent, and do not exhibit any other characteristic) are:

(A) Chrome (blue) trimmings generated by the following subcategories of the leather tanning and finishing industry; hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(B) Chrome (blue) shavings generated by the following subcategories of the leather tanning and finishing industry: Hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(C) Buffing dust generated by the following subcategories of the leather tanning and finishing industry; hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue.

(D) Sewer screenings generated by the following subcategories of the leather tanning and finishing industry: Hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(E) Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: Hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(F) Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: Hair pulp/chrome tan/retan/wet finish; hair save/chrometan/retan/wet finish; and through-the-blue.

(G) Waste scrap leather from the leather tanning industry, the shoe manufacturing industry, and other leather product manufacturing industries.

(H) Wastewater treatment sludges from the production of  $\text{TiO}_2$  pigment using chromium-bearing ores by the chloride process.

(7) Solid waste from the extraction, beneficiation, and processing of ores and minerals (including coal, phosphate rock, and overburden from the mining of uranium ore), except as provided by Sec. 266.112 of this chapter for facilities that burn or process hazardous waste.

(i) For purposes of Sec. 261.4(b)(7) beneficiation of ores and minerals is restricted to the following activities; crushing; grinding; washing; dissolution; crystallization;

filtration; sorting; sizing; drying; sintering; pelletizing; briquetting; calcining to remove water and/or carbon dioxide; roasting, autoclaving, and/or chlorination in preparation for leaching (except where the roasting (and/or autoclaving and/or chlorination)/leaching sequence produces a final or intermediate product that does not undergo further beneficiation or processing); gravity concentration; magnetic separation; electrostatic separation; flotation; ion exchange; solvent extraction; electrowinning; precipitation; amalgamation; and heap, dump, vat, tank, and in situ leaching.

(ii) For the purposes of Sec. 261.4(b)(7), solid waste from the processing of ores and minerals includes only the following wastes as generated:

- (A) Slag from primary copper processing;
- (B) Slag from primary lead processing;
- (C) Red and brown muds from bauxite refining;
- (D) Phosphogypsum from phosphoric acid production;
- (E) Slag from elemental phosphorus production;
- (F) Gasifier ash from coal gasification;
- (G) Process wastewater from coal gasification;
- (H) Calcium sulfate wastewater treatment plant sludge from primary copper processing;
- (I) Slag tailings from primary copper processing;
- (J) Fluorogypsum from hydrofluoric acid production;
- (K) Process wastewater from hydrofluoric acid production;
- (L) Air pollution control dust/sludge from iron blast furnaces;
- (M) Iron blast furnace slag;
- (N) Treated residue from roasting/leaching of chrome ore;
- (O) Process wastewater from primary magnesium processing by the anhydrous process;
- (P) Process wastewater from phosphoric acid production;
- (Q) Basic oxygen furnace and open hearth furnace air pollution control dust/sludge from carbon steel production;
- (R) Basic oxygen furnace and open hearth furnace slag from carbon steel production;
- (S) Chloride process waste solids from titanium tetrachloride production;
- (T) Slag from primary zinc processing.

(iii) A residue derived from co-processing mineral processing secondary materials with normal beneficiation raw materials or with normal mineral processing raw materials remains excluded under paragraph (b) of this section if the owner or operator:

(A) Processes at least 50 percent by weight normal beneficiation raw materials or normal mineral processing raw materials; and,

(B) Legitimately reclaims the secondary mineral processing materials.

(8) Cement kiln dust waste, except as provided by Sec. 266.112 of this chapter for facilities that burn or process hazardous waste.

(9) Solid waste which consists of discarded arsenical-treated wood or wood products which fails the test for the Toxicity Characteristic for Hazardous Waste Codes D004 through D017 and which is not a hazardous waste for any other reason if the waste is generated by persons who utilize the arsenical-treated wood and wood product for these materials' intended end use.

(10) Petroleum-contaminated media and debris that fail the test for the Toxicity Characteristic of Sec. 261.24 (Hazardous Waste Codes D018 through D043 only) and are subject to the corrective action regulations under part 280 of this chapter.

(11) Injected groundwater that is hazardous only because it exhibits the Toxicity Characteristic (Hazardous Waste Codes D018 through D043 only) in Sec. 261.24 of this part that is reinjected through an underground injection well pursuant to free phase hydrocarbon recovery operations undertaken at petroleum refineries, petroleum marketing terminals, petroleum bulk plants, petroleum pipelines, and petroleum transportation spill sites until January 25, 1993. This extension applies to recovery operations in existence, or for which contracts have been issued, on or before March 25, 1991. For groundwater returned through infiltration galleries from such operations at petroleum refineries, marketing terminals, and bulk plants, until [insert date six months after publication]. New operations involving injection wells (beginning after March 25, 1991) will qualify for this compliance date extension (until January 25, 1993) only if:

(i) Operations are performed pursuant to a written state agreement that includes a provision to assess the groundwater and the need for further remediation once the free phase recovery is completed; and

(ii) A copy of the written agreement has been submitted to: Characteristics Section (OS-333), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

(12) Used chlorofluorocarbon refrigerants from totally enclosed heat transfer equipment, including mobile air conditioning systems, mobile refrigeration, and commercial and industrial air conditioning and refrigeration systems that use chlorofluorocarbons as the heat transfer fluid in a refrigeration cycle, provided the refrigerant is reclaimed for further use.

(13) Non-terne plated used oil filters that are not mixed with wastes listed in subpart D of this part if these oil filters have been gravity hot-drained using one of the following methods:

(i) Puncturing the filter anti-drain back valve or the filter dome end and hot-draining;

(ii) Hot-draining and crushing;

(iii) Dismantling and hot-draining; or

(iv) Any other equivalent hot-draining method that will remove used oil.

(14) Used oil re-refining distillation bottoms that are used as feedstock to manufacture asphalt products.

(15) Leachate or gas condensate collected from landfills where certain solid wastes have been disposed, provided that:

(i) The solid wastes disposed would meet one or more of the listing descriptions for Hazardous Waste Codes K169, K170, K171, and K172 if these wastes had been generated after the effective date of the listing (February 8, 1999);

(ii) The solid wastes described in paragraph (b)(15)(i) of this section were disposed prior to the effective date of the listing;

(iii) The leachate or gas condensate do not exhibit any characteristic of hazardous waste nor are derived from any other listed hazardous waste;

(iv) Discharge of the leachate or gas condensate, including leachate or gas condensate transferred from the landfill to a POTW by truck, rail, or dedicated pipe, is subject to regulation under sections 307(b) or 402 of the Clean Water Act.

(v) After February 13, 2001, leachate or gas condensate will no longer be exempt if it is stored or managed in a surface impoundment prior to discharge. There is one exception: if the surface impoundment is used to temporarily store leachate or gas condensate in response to an emergency situation (e.g., shutdown of wastewater treatment system), provided the impoundment has a double liner, and provided the leachate or gas condensate is removed from the impoundment and continues to be managed in compliance with the conditions of this paragraph after the emergency ends.

(c) Hazardous wastes which are exempted from certain regulations. A hazardous waste which is generated in a product or raw material storage tank, a product or raw material transport vehicle or vessel, a product or raw material pipeline, or in a manufacturing process unit or an associated non-waste-treatment-manufacturing unit, is not subject to regulation under parts 262 through 265, 268, 270, 271 and 124 of this chapter or to the notification requirements of section 3010 of RCRA until it exits the unit in which it was generated, unless the unit is a surface impoundment, or unless the hazardous waste remains in the unit more than 90 days after the unit ceases to be operated for manufacturing, or for storage or transportation of product or raw materials.

(d) Samples. (1) Except as provided in paragraph (d)(2) of this section, a sample of solid waste or a sample of water, soil, or air, which is collected for the sole purpose of testing to determine its characteristics or composition, is not subject to any requirements of this part or parts 262 through 268 or part 270 or part 124 of this chapter or to the notification requirements of section 3010 of RCRA, when:

- (i) The sample is being transported to a laboratory for the purpose of testing; or
- (ii) The sample is being transported back to the sample collector after testing; or
- (iii) The sample is being stored by the sample collector before transport to a laboratory for testing; or
- (iv) The sample is being stored in a laboratory before testing; or
- (v) The sample is being stored in a laboratory after testing but before it is returned to the sample collector; or
- (vi) The sample is being stored temporarily in the laboratory after testing for a specific purpose (for example, until conclusion of a court case or enforcement action where further testing of the sample may be necessary).

(2) In order to qualify for the exemption in paragraphs (d)(1) (i) and (ii) of this section, a sample collector shipping samples to a laboratory and a laboratory returning samples to a sample collector must:

- (i) Comply with U.S. Department of Transportation (DOT), U.S. Postal Service (USPS), or any other applicable shipping requirements; or
- (ii) Comply with the following requirements if the sample collector determines that DOT, USPS, or other shipping requirements do not apply to the shipment of the sample:
  - (A) Assure that the following information accompanies the sample:
    - (1) The sample collector's name, mailing address, and telephone number;
    - (2) The laboratory's name, mailing address, and telephone number;
    - (3) The quantity of the sample;
    - (4) The date of shipment; and
    - (5) A description of the sample.
  - (B) Package the sample so that it does not leak, spill, or vaporize from its packaging.

(3) This exemption does not apply if the laboratory determines that the waste is hazardous but the laboratory is no longer meeting any of the conditions stated in paragraph (d)(1) of this section.

(e) **Treatability Study Samples.** (1) Except as provided in paragraph (e)(2) of this section, persons who generate or collect samples for the purpose of conducting treatability studies as defined in section 260.10, are not subject to any requirement of parts 261 through 263 of this chapter or to the notification requirements of Section 3010 of RCRA, nor are such samples included in the quantity determinations of Sec. 261.5 and Sec. 262.34(d) when:

(i) The sample is being collected and prepared for transportation by the generator or sample collector; or

(ii) The sample is being accumulated or stored by the generator or sample collector prior to transportation to a laboratory or testing facility; or

(iii) The sample is being transported to the laboratory or testing facility for the purpose of conducting a treatability study.

(2) The exemption in paragraph (e)(1) of this section is applicable to samples of hazardous waste being collected and shipped for the purpose of conducting treatability studies provided that:

(i) The generator or sample collector uses (in "treatability studies") no more than 10,000 kg of media contaminated with non-acute hazardous waste, 1000 kg of non-acute hazardous waste other than contaminated media, 1 kg of acute hazardous waste, 2500 kg of media contaminated with acute hazardous waste for each process being evaluated for each generated waste stream; and

(ii) The mass of each sample shipment does not exceed 10,000 kg; the 10,000 kg quantity may be all media contaminated with non-acute hazardous waste, or may include 2500 kg of media contaminated with acute hazardous waste, 1000 kg of hazardous waste, and 1 kg of acute hazardous waste; and

(iii) The sample must be packaged so that it will not leak, spill, or vaporize from its packaging during shipment and the requirements of paragraph A or B of this subparagraph are met.

(A) The transportation of each sample shipment complies with U.S. Department of Transportation (DOT), U.S. Postal Service (USPS), or any other applicable shipping requirements; or

(B) If the DOT, USPS, or other shipping requirements do not apply to the shipment of the sample, the following information must accompany the sample:

(1) The name, mailing address, and telephone number of the originator of the sample;

(2) The name, address, and telephone number of the facility that will perform the treatability study;

(3) The quantity of the sample;

(4) The date of shipment; and

(5) A description of the sample, including its EPA Hazardous Waste Number.

(iv) The sample is shipped to a laboratory or testing facility which is exempt under Sec. 261.4(f) or has an appropriate RCRA permit or interim status.

(v) The generator or sample collector maintains the following records for a period ending 3 years after completion of the treatability study:

(A) Copies of the shipping documents;

- (B) A copy of the contract with the facility conducting the treatability study;
- (C) Documentation showing:
  - (1) The amount of waste shipped under this exemption;
  - (2) The name, address, and EPA identification number of the laboratory or testing facility that received the waste;
  - (3) The date the shipment was made; and
  - (4) Whether or not unused samples and residues were returned to the generator.
- (vi) The generator reports the information required under paragraph (e)(v)(C) of this section in its biennial report.

(3) The Regional Administrator may grant requests on a case-by-case basis for up to an additional two years for treatability studies involving bioremediation. The Regional Administrator may grant requests on a case-by-case basis for quantity limits in excess of those specified in paragraphs (e)(2) (i) and (ii) and (f)(4) of this section, for up to an additional 5000 kg of media contaminated with non-acute hazardous waste, 500 kg of non-acute hazardous waste, 2500 kg of media contaminated with acute hazardous waste and 1 kg of acute hazardous waste:

(i) In response to requests for authorization to ship, store and conduct treatability studies on additional quantities in advance of commencing treatability studies. Factors to be considered in reviewing such requests include the nature of the technology, the type of process (e.g., batch versus continuous), size of the unit undergoing testing (particularly in relation to scale-up considerations), the time/quantity of material required to reach steady state operating conditions, or test design considerations such as mass balance calculations.

(ii) In response to requests for authorization to ship, store and conduct treatability studies on additional quantities after initiation or completion of initial treatability studies, when: There has been an equipment or mechanical failure during the conduct of a treatability study; there is a need to verify the results of a previously conducted treatability study; there is a need to study and analyze alternative techniques within a previously evaluated treatment process; or there is a need to do further evaluation of an ongoing treatability study to determine final specifications for treatment.

(iii) The additional quantities and timeframes allowed in paragraph (e)(3) (i) and (ii) of this section are subject to all the provisions in paragraphs (e)(1) and (e)(2) (iii) through (vi) of this section. The generator or sample collector must apply to the Regional Administrator in the Region where the sample is collected and provide in writing the following information:

(A) The reason why the generator or sample collector requires additional time or quantity of sample for treatability study evaluation and the additional time or quantity needed;

(B) Documentation accounting for all samples of hazardous waste from the waste stream which have been sent for or undergone treatability studies including the date each previous sample from the waste stream was shipped, the quantity of each previous shipment, the laboratory or testing facility to which it was shipped, what treatability study processes were conducted on each sample shipped, and the available results on each treatability study;

(C) A description of the technical modifications or change in specifications which will be evaluated and the expected results;

(D) If such further study is being required due to equipment or mechanical failure, the applicant must include information regarding the reason for the failure or breakdown and also include what procedures or equipment improvements have been made to protect against further breakdowns; and

(E) Such other information that the Regional Administrator considers necessary.

(F) **Samples Undergoing Treatability Studies at Laboratories and Testing Facilities.** Samples undergoing treatability studies and the laboratory or testing facility conducting such treatability studies (to the extent such facilities are not otherwise subject to RCRA requirements) are not subject to any requirement of this part, part 124, parts 262-266, 268, and 270, or to the notification requirements of Section 3010 of RCRA provided that the conditions of paragraphs (f) (1) through (11) of this section are met. A mobile treatment unit (MTU) may qualify as a testing facility subject to paragraphs (f) (1) through (11) of this section. Where a group of MTUs are located at the same site, the limitations specified in (f) (1) through (11) of this section apply to the entire group of MTUs collectively as if the group were one MTU.

(1) No less than 45 days before conducting treatability studies, the facility notifies the Regional Administrator, or State Director (if located in an authorized State), in writing that it intends to conduct treatability studies under this paragraph.

(2) The laboratory or testing facility conducting the treatability study has an EPA identification number.

(3) No more than a total of 10,000 kg of “as received” media contaminated with non-acute hazardous waste, 2500 kg of media contaminated with acute hazardous waste or 250 kg of other “as received” hazardous waste is subject to initiation of treatment in all treatability studies in any single day.

“As received” waste refers to the waste as received in the shipment from the generator or sample collector.

(4) The quantity of “as received” hazardous waste stored at the facility for the purpose of evaluation in treatability studies does not exceed 10,000 kg, the total of which can include 10,000 kg of media contaminated with non-acute hazardous waste, 2500 kg of media contaminated with acute hazardous waste, 1000 kg of non-acute hazardous wastes other than contaminated media, and 1 kg of acute hazardous waste. This quantity limitation does not include treatment materials (including nonhazardous solid waste) added to “as received” hazardous waste.

(5) No more than 90 days have elapsed since the treatability study for the sample was completed, or no more than one year (two years for treatability studies involving bioremediation) have elapsed since the generator or sample collector shipped the sample to the laboratory or testing facility, whichever date first occurs. Up to 500 kg of treated material from a particular waste stream from treatability studies may be archived for future evaluation up to five years from the date of initial receipt. Quantities of materials archived are counted against the total storage limit for the facility.

(6) The treatability study does not involve the placement of hazardous waste on the land or open burning of hazardous waste.

(7) The facility maintains records for 3 years following completion of each study that show compliance with the treatment rate limits and the storage time and quantity limits. The following specific information must be included for each treatability study conducted:

(i) The name, address, and EPA identification number of the generator or sample collector of each waste sample;

(ii) The date the shipment was received;

(iii) The quantity of waste accepted;

(iv) The quantity of "as received" waste in storage each day;

(v) The date the treatment study was initiated and the amount of "as received" waste introduced to treatment each day;

(vi) The date the treatability study was concluded;

(vii) The date any unused sample or residues generated from the treatability study were returned to the generator or sample collector or, if sent to a designated facility, the name of the facility and the EPA identification number.

(8) The facility keeps, on-site, a copy of the treatability study contract and all shipping papers associated with the transport of treatability study samples to and from the facility for a period ending 3 years from the completion date of each treatability study.

(9) The facility prepares and submits a report to the Regional Administrator, or State Director (if located in an authorized State), by March 15 of each year that estimates the number of studies and the amount of waste expected to be used in treatability studies during the current year, and includes the following information for the previous calendar year:

(i) The name, address, and EPA identification number of the facility conducting the treatability studies;

(ii) The types (by process) of treatability studies conducted;

(iii) The names and addresses of persons for whom studies have been conducted (including their EPA identification numbers);

(iv) The total quantity of waste in storage each day;

(v) The quantity and types of waste subjected to treatability studies;

(vi) When each treatability study was conducted;

(vii) The final disposition of residues and unused sample from each treatability study.

(10) The facility determines whether any unused sample or residues generated by the treatability study are hazardous waste under Sec. 261.3 and, if so, are subject to parts 261 through 268, and part 270 of this chapter, unless the residues and unused samples are returned to the sample originator under the Sec. 261.4(e) exemption.

(11) The facility notifies the Regional Administrator, or State Director (if located in an authorized State), by letter when the facility is no longer planning to conduct any treatability studies at the site.

(g) Dredged material that is not a hazardous waste. Dredged material that is subject to the requirements of a permit that has been issued under 404 of the Federal Water Pollution Control Act (33 U.S.C.1344) or section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413) is not a hazardous waste. For this paragraph (g), the following definitions apply:

(1) The term dredged material has the same meaning as defined in 40 CFR 232.2;

(2) The term permit means:

(i) A permit issued by the U.S. Army Corps of Engineers (Corps) or an approved State under section 404 of the Federal Water Pollution Control Act (33 U.S.C. 1344);

(ii) A permit issued by the Corps under section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413); or

(iii) In the case of Corps civil works projects, the administrative equivalent of the permits referred to in paragraphs (g)(2)(i) and (ii) of this section, as provided for in Corps regulations (for example, see 33 CFR 336.1, 336.2, and 337.6).

[45 FR 33119, May 19, 1980]

Editorial Note: For Federal Register citations affecting Sec. 261.4, see the List of CFR Sections Affected in the Finding Aids section of this volume.

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### **Further reading**

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