Chapter 2

Hazardous Waste Quantities

2. Hazardous Waste Quantities

2.1 Estimated Hazardous Waste Generation Quantity

It is estimated that hazardous waste generation quantity in Romania in 2002 is 1.2 million approximately. Waste oil shares about one half of the total quantity. The second largest is metal waste 30% approximately. Third is sludge (non-specified) 9 %. Table below shows hazardous waste generation quantity by category.

Per capita hazardous waste generation rate is estimated to be 54 kg/capita in 2002. Corresponding rates were 252 kg/capita in 1995, and 103 kg/capita in 1999. Those rates are smaller than average hazardous waste generation rates in Central and Eastern European Countries (CEEC), i.e. Bulgaria, Czech republic, Estonia, Hungary, Lithuania, Poland, Romania, and Slovenia. CEEC's average rates were 283 kg/capita in 1995, and 183 kg/capita in 1999. (Source: Draft Waste Strategy; English draft May 2002, MWEP/ICIM) Major reason for the substantial decrease in the hazardous waste generation rates is considered to be the drop in industrial outputs over the period rather than improvement in production technology.

Table 2.1.1 Estimated Hazardous Waste Generation Quantity in Romania by Waste Category in 2002

Category of hazardous Waste	Generation Quantity (ton/year)	%
1. Oil	582,723	48.37%
2. Metal	353,328	29.33%
3. Sludge (non-specified)	105,576	8.76%
4. Chemical	40,937	3.40%
5. Asbestos	25,463	2.11%
6. Other inorganic chemicals	20,515	1.70%
7. Waste water treatment sludge	18,523	1.54%
8. Hexavalent chromium	18,363	1.52%
9.Infectious	16,750	1.39%
10. Lead battery	12,775	1.06%
11. Halogens	7,045	0.58%
12. Organic solvents	1,725	0.14%
13. PCB (transformer)	510	0.042%
14. Other organic chemicals	355	0.029%
15. Cyanidic Waste	56	0.005%
16. Acid	40	0.003%
17. Explosive	40	0.003%
Total	1,204,722	100.00%

Source: JICA Study Team

Romania has the following economic regions:

1. Center
2. South
3. North-East
4. North-West
5. Bucharest (Municipality)
6. South-East
7. West
8. South-West
9. Bucharest (Ilfov)

Hazardous waste generation quantity by region is shown in the following table. Hazardous waste is generated in all regions, share of each region in terms of generation quantity ranges between 9% – 16%. (Bucharest municipality and Ilfov together are considered as one region.)

Table 2.1.2 Estimated Hazardous Waste Generation Quantity in Romania by Region in 2002

Region Name	Region Code	Generation Quantity (ton/year)	%
1. Center	7	192,185	16.0%
2. South	3	171,429	14.2%
3. North-East	1	167,034	13.9%
4. North-West	6	159,349	13.2%
5. Bucharest (Municipality)	9	136,769	11.4%
6. South-East	2	134,007	11.1%
7. West	5	124,872	10.4%
8. South-West	4	105,200	8.7%
9. Bucharest (Ilfov)	8	13,878	1.2%
Romania Total		1,204,722	100.0%

Source: JICA Study Team

Table 2.1.3 shows estimated hazardous waste generation quantity in Romania by waste category and region in 2002.

Table 2.1.4 shows estimated hazardous waste generation quantity in Romania by county in 2002.

Table 2.1.5 shows estimated hazardous waste generation quantity in Romania by waste category and by county in 2002

Table 2.1.6 shows types of industries that generate hazardous waste in 2002.

Table 2.1.3 Estimated Hazardous Waste Generation Quantity in Romania by Waste Category and Region in 2002

Unit: ton/year

Hazardous Waste	Romania Total	Romania Total	North-East	South-East	South	South-West	West	North-West	Center	Bucharest (Ilfov)	Bucharest (Municipality)
			a	b	c	d	e	f	g	h	I
1. Oil	582,723	48.37%	79,197	64,965	83,282	55,208	62,966	75,836	88,058	6,401	66,810
2. Metal	353,328	29.33%	49,961	39,007	50,279	27,878	35,121	47,735	59,783	4,311	39,255
3. Sludge (nonspecified)	105,576	8.76%	14,928	11,656	15,023	8,330	10,494	14,263	17,863	1,288	11,729
4. Chemical	40,937	3.40%	5,789	4,519	5,825	3,230	4,069	5,531	6,927	499	4,548
5. Asbestos	25,463	2.11%	3,600	2,812	3,623	2,013	2,531	3,438	4,306	310	2,830
6. Other inorganic chemicals	20,515	1.70%	2,901	2,265	2,919	1,619	2,039	2,772	3,471	250	2,279
7. Waste Water Treatment Sludge	18,523	1.54%	2,619	2,045	2,636	1,461	1,841	2,502	3,134	226	2,058
8. Hexavalent chromium	18,363	1.52%	2,597	2,027	2,613	1,449	1,825	2,481	3,107	224	2,040
9. Infectious	16,750	1.39%	2,287	2,078	2,131	2,142	1,747	1,851	2,059	94	2,361
10. Lead battery	12,775	1.06%	1,774	1,554	1,708	1,101	1,267	1,621	1,824	155	1,772
11. Halogens	7,045	0.58%	996	778	1,002	556	700	952	1,192	86	783
12. Organic solvents	1,725	0.14%	244	190	245	136	171	233	292	21	192
13. PCB (transformer)	510	0.042%	72	56	73	40	51	69	86	6	57
14. Other organic chemicals	355	0.029%	50	39	51	28	35	48	60	4	39
15. Cyanidic Waste	56	0.005%	8	6	8	4	6	8	9	1	6
16. Acid	40	0.003%	6	4	6	3	4	5	7	0	4
17. Explosive	40	0.003%	6	4	6	3	4	5	7	0	4
TOTAL QUANTITY	1,204,722	100.00%	167,034	134,007	171,429	105,200	124,872	159,349	192,185	13,878	136,769

Source: JICA Study Team

Table 2.1.4 Estimated Hazardous Waste Generation Quantity in Romania by County in 2002

County	ton/year	Region Name	Region Code
1. Bucharest Municipality	136,769	Bucharest (Municipality)	9
2. Arges	57,598	South	3
3. Brasov	52,326	Center	7
4. Prahova	50,782	South	3
5.Timis	47,599	West	5
6. Cluji	44,985	North-West	6
7. Iasi	41,596	North-East	1
8. Bihor	40,933	North-West	6
9. Bacau	38,712	North-East	1
10. Mures	36,760	Center	7
11. Galati	36,701	South-East	2
12. Sibiu	36,650	Center	7
13. Hunedoara	33,076	West	5
14. Dolj	31,005	South-West	4
15. Constanta	29,343	South-East	2
16. Alba	29,126	Center	7
17. Neamt	26,773	North-East	1
18. Suceava	26,283	North-East	1
19. Arad	25,927	West	5
20. Maramures	25,051	North-West	6
21. Dambovita	24,869	South	3
22. Harghita	22,580	Center	7
23. Satu Mare	22,360	North-West	6
24. Gorj	21,918	South-West	4
25. Buzau	21,165	South-East	2
26. Olt	20,916	South-West	4
27. Valcea	19,113	South-West	4
28. Braila	18,664	South-East	2
29. Vaslui	18,602	North-East	1
30. Caras-Severin	18,270	West	5
31. Vrancea	16,509	South-East	2
32. Teleorman	16,317	South	3
33. Botosani	15,068	North-East	1
34. Covasna	14,743	Center	7
35. Ilfov	13,878	Bucharest (Ilfov)	8
36. Salaj	13,560	North-West	6
37. Bistrita-Nasaud	12,459	North-West	6
38. Mehedinti	12,247	South-West	4
39. Tulcea	11,625	South-East	2
40. Calarasi	10,050	South	3
41. Ialomita	6,951	South	3
42. Giurgiu	4,861	South	3
TOTAL	1,204,722		

Source: JICA Study Team

Table 2.1.5 Estimated Hazardous Waste Generation Quantity in Romania by Waste Category and by County in 2002

Unit; ton/yea

Region Name	Region Code	County	TOTAL QUANTITY	Acid	Alkali	Asbestos	Chemical	Cyanidic Waste	Explosive	Halogens	Hexavalent chromium	Infectious	Lead battery	Metal	Oil	Organic solvents	Other inorganic chemicals	Other organic chemicals	PCB (transformer)	Sludge (nonspecified)	WWT Sludge
North-East	1	Bacau	38,712	1	0	802	1,290	2	1	222	578	513	377	11,130	19,158	54	646	11	16	3,326	583
North-East	1	Botosani	15,068	1	0	326	524	1	1	90	235	235	166	4,523	7,083	22	263	5	7	1,351	237
North-East	1	Iasi	41,596	1	0	907	1,457	2	1	251	654	621	469	12,578	19,414	61	730	13	18	3,759	659
North-East	1	Neamt	26,773	1	0	596	958	1	1	165	430	328	283	8,268	12,298	40	480	8	12	2,470	433
North-East	1	Suceava	26,283	1	0	547	880	1	1	151	395	382	293	7,597	12,870	37	441	8	11	2,270	398
North-East	1	Vaslui	18,602	1	0	422	680	1	1	117	305	208	187	5,865	8,373	29	341	6	8	1,753	307
South-East	2	Braila	18,664	1	0	397	639	1	1	110	286	295	202	5,512	8,925	27	320	6	8	1,647	289
South-East	2	Buzau	21,165	1	0	456	733	1	1	126	329	243	218	6,325	10,098	31	367	6	9	1,890	332
South-East	2	Constanta	29,343	1	0	536	860	1	1	148	386	737	437	7,420	15,726	36	431	7	11	2,217	389
South-East	2	Galati	36,701	1	0	807	1,298	2	1	223	582	481	389	11,200	17,049	55	650	11	16	3,347	587
South-East	2	Tulcea	11,625	0	0	247	397	1	0	68	178	134	135	3,427	5,610	17	199	3	5	1,024	180
South-East	2	Vrancea	16,509	1	0	369	594	1	1	102	266	188	173	5,123	7,557	25	297	5	7	1,531	269
South	3	Arges	57,598	2	0	1,303	2,096	3	2	361	940	563	493	18,090	26,209	88	1,050	18	26	5,405	948
South	3	Calarasi	10,050	0	0	209	336	0	0	58	151	165	129	2,897	4,898	14	168	3	4	866	152
South	3	Dambovita	24,869	1	0	507	815	1	1	140	365	328	233	7,031	12,519	34	408	7	10	2,101	369
South	3	Giurgiu	4,861	0	0	67	106	0	0	18	48	160	82	919	3,078	4	53	1	1	274	48
South	3	Ialomita	6,951	0	0	133	213	0	0	37	95	150	105	1,837	3,615	9	107	2	3	549	96
South	3	Prahova	50,782	2	0	1,089	1,752	2	2	302	786	579	493	15,122	24,353	74	878	15	22	4,519	793
South	3	Teleorman	16,317	0	0	316	508	1	0	87	228	187	173	4,381	8,611	21	254	4	6	1,309	230
South-West	4	Dolj	31,005	1	0	645	1,036	1	1	178	465	628	353	8,939	15,034	44	519	9	13	2,671	469
South-West	4	Gorj	21,918	0	0	294	471	1	0	81	211	550	186	4,063	14,367	20	236	4	6	1,214	213
South-West	4	Mehedinti	12,247	0	0	245	393	1	0	68	176	310	132	3,392	6,117	17	197	3	5	1,014	178
South-West	4	Olt	20,916	1	0	453	729	1	1	125	327	251	212	6,289	9,907	31	365	6	9	1,879	330
South-West	4	Valcea	19,113	1	0	375	602	1	1	104	270	403	217	5,194	9,784	25	302	5	8	1,552	272
West	5	Arad	25,927	1	0	547	880	1	1	151	395	324	298	7,597	12,567	37	441	8	11	2,270	398
West	5	Caras-Severin	18,270	1	0	379	610	1	1	105	274	242	189	5,265	9,011	26	306	5	8	1,573	276
West	5	Hunedoara	33,076	1	0	544	872	1	1	150	391	643	293	7,526	19,519	37	437	8	11	2,249	395
West	5	Timis	47,599	2	0	1,061	1,707	2	2	294	766	537	486	14,734	21,869	72	855	15	21	4,403	772
North-West	6	Bihor	40,933	1	0	888	1,429	2	1	246	641	492	411	12,331	19,353	60	716	12	18	3,685	646
North-West	6	Bistrita-Nasaud	12,459	0	0	267	430	1	0	74	193	168	133	3,710	5,937	18	215	4	5	1,109	194
North-West	6	Cluj	44,985	2	0	980	1,576	2	2	271	707	591	482	13,603	21,103	66	790	14	20	4,065	713
North-West	6	Maramures	25,051	1	0	496	798	1	1	137	358	253	253	6,890	12,992	34	400	7	10	2,059	361
North-West	6	Salaj	13,560	0	0	293	471	1	0	81	211	161	130	4,063	6,456	20	236	4	6	1,214	213
North-West	6	Satu Mare	22,360	1	0	514	827	1	1	142	371	187	211	7,137	9,995	35	414	7	10	2,133	374
Center	7	Alba	29,126	1	0	641	1,032	1	1	178	463	319	259	8,904	13,618	43	517	9	13	2,661	467
Center	7	Brasov	52,326	2	0	1,198	1,928	3	2	332	865	520	499	16,642	23,402	81	966	17	24	4,973	872
Center	7	Covasna	14,743	1	0	323	520	1	1	89	233	147	147	4,487	6,924	22	261	5	6	1,341	235
Center	7	Harghita	22,580	1	0	498	802	1	1	138	360	169	217	6,925	10,582	34	402	7	10	2,069	363
Center	7	Mures	36,760	1	0	802	1,290	2	1	222	578	543	363	11,130	17,191	54	646	11	16	3,326	583
Center	7	Sibiu	36,650	1	0	842	1,355	2	1	233	608	361	338	11,695	16,341	57	679	12	17	3,495	613
Bucharest (Ilfov)	8	Ilfov	13,878	0	0	310	499	1	0	86	224	94	155	4,311	6,401	21	250	4	6	1,288	226
Bucharest (Municipality)	9	Bucharest Municipality	136,769	4	0	2,830	4,548	6	4	783	2,040	2,361	1,772	39,255	66,810	192	2,279	39	57	11,729	2,058
		TOTAL	1,204,722	40	0	25,463	40,937	56	40	7,045	18,363	16,750	12,775	353,328	582,723	1,725	20,515	355	510	105,576	18,523

Source: JICA Study Team

Table 2.1.6 Industries Generating Hazardous Waste

Waste Category	Quantity (ton/year, 2002)	Waste Types	Quantity (ton/year 2002)	Major Generating Industry (Numbers indicated are NACE codes)
Oil	582,771	Acid tar	1,797	23 Oil Refinery
		Emulsion	44,903	29 Machinery and equipment, 40,41 Energy and water supply
		Machine oil	256	29 Machinery and equipment, 28 Fabricated metal products (except for machinery and equipment)
		Oil	30,421	11 Extraction of crude oil, 23 Oil refinery
		Oil (Engine or gear oil)	453,507	60 Transport and storage, 31 Electrical machinery and apparatus
		Oil (Engine or gear oil) chlorinated	16	40,41 Energy and water supply
		Oil (Hydraulic oil)	6,085	26 Other non-metallic mineral products, 11 Extraction of crude oil, 31 Electrical machinery and apparatus
		Oil (Hydraulic oil) chlorinated	1	23 Oil refinery
		Oil medium	1,295	40,41 Energy and water supply, 34,35 Transport equipment
		Oil sludge	27	50 Trade
		Oily water	140	50 Trade, 34,35 Transport equipment
		Still bottoms	7,417	24 Chemical products
		Tank bottom sludge	26,341	11 Extraction of crude oil, 23 Oil refinery
		Tar	10,564	23 Oil refinery
Metal	353,328	Al dross	6,239	27 Metallurgy (basic metal)
		Al dust	30,400	27 Metallurgy (basic metal)
		Boiler dust	52	24 Chemical products
		Copper dust	304	27 Metallurgy (basic metal)
		Copper slag	164,766	27 Metallurgy (basic metal)
		Lead	13	24 Chemical products
		Lead dross	14,573	27 Metallurgy (basic metal)
		Lead dust	9,375	27 Metallurgy (basic metal), 28 Fabricated metal products (except for machinery and equipment)
		Lead slag	107,045	27 Metallurgy (basic metal)
		Metal sludge	13,160	28 Fabricated metal products (except for machinery and equipment), 27 Metallurgy (basic metal),
		Other non-ferrous dross	13	31 Electrical machinery and apparatus
		Sludge (Metal sludge)	834	24 Chemical products
		Zn dross	3,729	28 Fabricated metal products (except for machinery and equipment), 27 Metallurgy (basic metal)
		Zn dust	308	27 Metallurgy (basic metal), 24 Chemical products
		Zn slag	2,517	28 Fabricated metal products (except for machinery and equipment), 27 Metallurgy (basic metal)
Sludge (nonspecified)	105,576	Sludge	105,576	28 Fabricated metal products (except for machinery and equipment)
Chemical	40,937	Sludge containing chemicals	22,467	29 Machinery and equipment
		Waste water containing chemicals	18,471	24 Chemical products, 36 Furniture
Asbestos	25,463	Asbestos	25,463	26 Other non-metallic mineral products
Other inorganic chemicals	20,515	Casting sand	19,932	34,35 Transport equipment, 27 Metallurgy (basic metal)
		Catalyst	39	23 Oil refinery
		Filter clays	502	23 Oil refinery, 24 Chemical products
		Photo fix	10	28 Fabricated metal products (except for machinery and equipment)
		Scale	32	29 Machinery and equipment
WWT Sludge	18,523	Sludge (Waste water treatment)	18,523	24 Chemical products, 23 Oil refinery
Hexavalent chromium	18,363	Cyanide-free liquid waste containing chromium	18,363	29 Machinery and equipment, 28 Fabricated metal products (except for machinery and equipment), 31 Electrical machinery and apparatus

Waste Category	Quantity (ton/year, 2002)	Waste Types	Quantity (ton/year 2002)	Major Generating Industry (Numbers indicated are NACE codes)
Infectious	16,750	Infectious	16,750	40,41 Energy and water supply
Lead battery	12,777	Lead battery	12,777	60 Transport and storage, 25 Rubber and plastics, 36 Furniture, 34,35 Transport equipment
Halogens	7,045	Halogen wastewater	4	31 Electrical machinery and apparatus
		Halogenated sludge	2,591	28 Fabricated metal products (except for machinery and equipment)
		Sludge (Halogenated sludge)	4,385	24 Chemical products
		Sludge containing halogenated solvents	64	29 Machinery and equipment, 24 Chemical products
Organic solvents	1,725	Org solvents	1,693	24 Chemical products, 25 Rubber and plastics
		Paint without halogen solvent	32	36 Furniture
PCB (transformer)	513	Transformer containing PCB	513	29 Machinery and equipment, 34,35 Transport equipment
Other organic chemicals	357	Machine emulsion	331	36 Furniture
		Organic chemicals	2	24 Chemical products
		Pesticide packaging	25	24 Chemical products
Cyanidic Waste	56	Cyan alkaline containing heavy metals other than chromium	47	28 Fabricated metal products (except for machinery and equipment), 29 Machinery and equipment
		Cyanide	9	31 Electrical machinery and apparatus
Acid	40	Acid	40	27 Metallurgy (basic metal), 28 Fabricated metal products
Explosive	40	Explosive	40	24 Chemical products
Alkali	0	Alkali HM no chrome	0	
	1,204,778			

Source: JICA Study Team

NACE Code:
11 Extraction of crude oil
13 Mining of mineral ores
23 Oil refinery
24 Chemical products
25 Rubber and plastics
26 Other non-metallic mineral products
27 Metallyrgy (basic metal)
28 Fabricated metal products (except for machinery and equipment)
29 Machinery and equipment
31 Electrical machinery and apparatus
32 Radio, TV and communication equipment
34,35 Transport equipment
36 Furniture
37 Recycling
40,41 Energy and water supply
50 Trade
60 Transport and storage

It is worth noting that waste engine oil or waste gear oil alone amounts to as much as 453,000 ton/year.

2.2 Method of Estimation of Hazardous Waste Generation Quantity

2.2.1 Date and Assumptions Used

Hazardous waste (hw) quantities presented in the previous section have been estimated by extrapolating the base quantity obtained from 80 factories visiting survey through the following data processing and assumptions:

1) 80 factories visited were classified into industrial sub-sectors based on NACE code.
2) Using the hw generation quantity data obtained from 80 factories visiting survey, we have obtained hw generation quantity, within 80 factories, for each hw category within each industrial sub-sector. (ton/waste category for each industrial sub-sector, within the 80 factories)
3) Using the 600 factories questionnaire survey data, we have obtained number of employees belonging to each industrial sub-sector (employees/industrial sub-sector, within the 80 factories)
4) Using the above data 2) and 3), we have calculated unit hw generation rate of the year 2001 for each category of hw within each industrial sub-sector. (ton/waste category/employee/year for each industrial sub-sector, within the 80 factories)
5) Using data of Romanian National Statistic office, we have obtained year 2002 number of employees for each industrial sub-sector in Romania. (employees/industrial sub-sector)
6) Considering the fact that significant portion of employees registered in the statistics office actually do not come to work, while this is not the case with the visited 80 factories, we have arbitrary assumed that (1) employees who actually come to work in Romanian factories are 60% of employees recorded in the statistics, while (2) corresponding rate is 95% for the visited 80 factories. (To use numbers of employees shown in the statistics as they are implies that we are assuming that 100% of employees in the statistics come to work.)
7) We have assumed that that unit generation rates per employee per year in 2002 would remain same as those of 2001.
8) Using the above data 4) and 5), and assumptions 6) and 7), we have extrapolated national level generation quantity as presented in Section 2.1
9) Concerning total infectious (medical) waste generation quantity, we have used date from the Flemish government funded hospital waste project and Public Health Institute of Romania. We have also used JICA Study Team's survey data with respect to distribution of generation quantity by county.

It is theoretically possible to use unit generation rate per product (instead of employee). However, we could not possibly obtain complete information on products produced by both 80 factories and at national level.

2.2.2 Factories Surveys Conducted

As indicated above, the JICA Study Team has conducted 1) 600 factories questionnaire survey and 2) 80 factories by visiting. JICA Study Team contracted those two surveys to ICIM.

1) 600 Factories Survey by Questionnaire

Based on JICA Study Team's guidance and ICIM database, ICIM has selected 600 factories. ICIM has sent to 600 enterprises a questionnaire that consists of the following sheets:

Sheet 1- Company and Product Information

Sheet 2- Materials and Facilities

Sheet 3- Hazardous Waste Generation

Sheet 4- Environmental Management

ICIM sent the questionnaire to the enterprises by post in April in 2002, and received answers in May 2002. Of the 600 enterprises, 263 enterprises (44%) gave back effective answers to the questionnaire.

2) 80 Factories Survey by Visiting

ICIM has selected 80 factories among the 600 enterprises that expressed their willingness to accept a visiting survey team. The 80 factories cover variety of industrial sub-sectors. In general, they are relatively large enterprises with good business performance.

ICIM has conducted this survey during June to August 2002. ICIM surveyors have studied the 600 factories questionnaire answers before making a visit to each enterprise. During the visits, ICIM surveyors asked questions, and recorded answers using the following sheets:

Sheet 1	General Information
Sheet 2	Products
Sheet 3	Raw Material
Sheet 4	List of Process
Sheet 5	Process using Hazardous Substance
Sheet 6	Chemical Synthesis Process
Sheet 7	Washing Process
Sheet 8	Heating/ Combustion Process
Sheet 9	Wastewater Treatment Process
Sheet 10	Data on each Hazardous Waste

Results of the two surveys are summarized in the following two tables respectively.

Table 2.2.1 Result of 600 Factories Questionnaire Survey for Hazardous Waste Generation

No.	Waste Code	Waste type description	Number of factories	Quantity in tons	Quantity in CM	Quantity in pieces	Quantity Total (ton)	Share	Cummula-tive share
1	060901	Phosphor gypsum	1	71,100			71,100	15.8	15.8
2	110105	Acidic pickling solutions	8	2,936	54002		56,938	12.6	28.4
3	100501	Slag (first and second smelting) from zinc thermal metallurgy	4	48,179			48,179	10.7	39.1
4	190803	Grease and oil mixture from oil/water separation of WWTP	7	45,312			45,312	10	49.1
5	100401	Slag (first and second smelting) from lead thermal metallurgy	2	38,171			38,171	8.5	57.6
6	110103	Cyanide-free wastes containing chromium	29	910	31440		32,350	7.2	64.8
7	190104	Boiler dust from incineration of waste	1	21,632			21,632	4.8	69.6
8	050105	Oil spills from petroleum industry	8	20,171	620		20,791	4.6	74.2
9	110107	Alkalis not otherwise specified	2	1	20400		20,401	4.5	78.7
10	050103	Tank bottom sludge from petroleum industry	16	13,483			13,483	3	81.7
11	100506	Solid waste from gas treatment from zinc thermal metallurgy	1	13,068			13,068	2.9	84.6
12	100502	Dross and skimming (first and second smelting) from zinc thermal metallurgy	3	12,399			12,399	2.7	87.3
13	050601	Acid tars from petroleum refining	2	360	10000		10,360	2.3	89.6
14	100901	Casting cores and moulds containing organic binders which have not undergone pouring	3	9,495			9,495	2.1	91.7
15	110102	Cyanic (alkaline) wastes containing heavy metals other than chromium	6	14	7200		7,214	1.6	93.3
16	100402	Dross and skimming (first and second smelting) from lead thermal metallurgy	1	4,968			4,968	1.1	94.4
17	130202	Non-chlorinated engine, gear, lubricating oils	18	4,899	3		4,902	1.1	95.5
18	100406	Solid waste from gas treatment from lead thermal metallurgy	1	2,244			2,244	0.5	96
19	070107	Halogenated still bottoms and reaction residues	3	2,104			2,104	0.5	96.5
20	050603	Other tars from the pyrolytic treatment of coal (not acid tars nor asphalt)	1	2,000			2,000	0.4	96.9
21	120111	Ferrous metal fillings and turnings from metal shaping and surface treatment	5	1,682			1,682	0.4	97.3

No.	Waste Code	Waste type description	Number of factories	Quantity in tons	Quantity in CM	Quantity in pieces	Quantity Total (ton)	Share	Cummula-tive share
22	050104	Acid alkyl sludge from petroleum industry	1	1,240			1,240	0.3	97.6
23	070510	Other filter cakes, spent absorbents from pharmaceutical manufacturing	3	1,107			11,07	0.2	97.8
24	060200	Waste alkaline solutions (not specified) from inorganic chemical processes	1	1,000			1,000	0.2	98
25	100303	Inorganic skimming from thermal processes	1	1,000			1,000	0.2	98.2
26	070404	Other (non-hlogenalted) solvents, washing liquids and mother liquors from organic pesticides manufacturing	1	795			795	0.2	98.4
27	120109	Waste machining emulsions free of halogens	9	720	10		730	0.2	98.6
28	100304	Primary smelting slag/white dross from aluminum thermal metallurgy	4	719			719	0.2	98.8
29	070108	Other (non-halogenated) still bottoms and reaction residues from organic chemical processes	4	682			682	0.2	99
30	050401	Spent filter clays from petroleum industry	1	500			500	0.1	99.1
31	130203	Other engine, gear and lubricating oils	48	486	0		487	0.1	99.2
32	070110	Other (non-halogenated) filter cakes, spent absorbents from organic chemical processes	2	434			434	0.1	99.3
33	160601	Lead batteries	74	390		141	390	0.1	99.4
34	100407	Sludges from gas treatment from lead thermal metallurgy	1	320			320	0.1	99.5
35	060101	Sulphuric acid and sulphurous acid	4	263			263	0.1	99.6
36	130401	Bilge oils from inland navigation	2	254			254	0.1	99.7
37	100405	Other particulates and dust from lead thermal metallurgy	1	205			205	0	99.7
38	100902	Casting cores and moulds containing organic binders which have undergone pouring	1	200			200	0	99.7
39	050107	Acid tars from Petroleum industry	1	190			190	0	99.7
40	130106	Hydraulic oils containing only mineral oil	14	160			160	0	99.7
		Others					1,800		
		Total					451,268		100.0
		TOTAL excluding phosphor gypsum and acidic pickling solution					323,230		

Source: JICA Study Team

Table 2.2.2 Result of 80 Factories Visiting Survey for Hazardous Waste Generation

No.	Type of activity	NACE code	Total declared waste quantity		Quantity of:		
					Hazardous waste		Non-hazardous waste
			(ton/y and m3/y)	(pieces/y)	(ton/y and m3/y)	(pieces/y)	(ton/y)
1	raw material extraction	11, 13	22,768.47 t + 1,500,000 m3	64	8,555.47 t + 1,500,000 m3	64	14,213t
2	crude oil processing and refining	23	24,886.81t	0	10,344.81	0	14,542t
3	chemical industry	24	16,9331.33 t + 11,776 m3	0	164,657.87 t + 11,733 m3	0	4,673.46 t + 43 m3
4	manufacturing of rubber and plastic materials	25	306.4t	0	306.4t	0	0
5	manufacturing of non-metallic products	26	875.84t	0	125.84t	0	750t
6	metallurgy	27	315,787.22 t + 36,000 m3	98	49,846.22 t + 36,000 m3	98	265,941t
7	iron works	28	9,639.24t	0	9,633.04	0	6.2t
8	manufacturing of machinery and equipment	29	3,006t	0	3,006t	0	0t
9	manufacturing of electrical and optical equipment	31, 32	58.892t	0	57.392t	0	1.5t
10	manufacturing of transport means	34, 35	1,983.84t	1,767	253.84t	1,767	1,730t
11	other industrial activities	36, 37	168.05t	0	168.05t	0	0t
12	energy and water	40, 41	1,262.915t	3	1,262.915t	3	0t
13	trade activities	50	104.02t	0	104.02t	0	0t
14	transport and storage activities	60	1,9937.67t	54638	19,937.67t	54,638	0t
		TOTAL	**570,117 t + 1,547,776 m3**	**56,570**	**268,260 t + 1,547,733 m3**	**56,570**	**301,857 t + 43 m3**

Source: JICA Study Team

2.3 Needs for Improvement of Waste Quantity Data Quality

In Romania, it is very difficult to obtain reliable date on hazardous waste generation. As result of the waste generation surveys we have conducted, we would like to make the following observations and recommendations.

1. Deficient Capacity of Waste Generators and EPIs in Hazardous Waste Identification and Classification

   Being asked if they know how to identify and classify hazardous waste, most Romanian waste generators (enterprises) generally say "Yes". Through the surveys, we found many cases where hazardous waste is not identified as hazardous waste, and many other cases where non-hazardous waste is classified as hazardous one. There was an oil refinery company that classified waste oil as non-hazardous.

   It is important that waste generators (enterprises) and EPIs should strengthen their ability to identify and classify hazardous waste. Strengthening of such capacity is not easy, and will take years. Any sophisticated waste data system would fail if waste generators do not have this capacity.

   Changing Definition of Hazardous Waste:

   Romania intends to apply new EU Integrated Waste List soon. Unfortunately, it would add confusion to waste generators for some years to come. It is said that hazardous waste classified according to the new list will double reported hazardous waste generation quantity.

   Recommendation:

   MWEP should deliver to all EPIs and waste generating enterprises "Guidance Note for Hazardous Waste Identification and Classification" that was drafted by JICA Study and ICIM through the Pilot Project 4.

2. Judgement on Certain Particular Waste

   There are some specific wastes of which generation quantities are huge. Aggregate hazardous waste generation quantity in Romania can be estimated very differently depending on whether or not such waste is considered as hazardous. Examples include:

   a. Waste water containing Calcium Chloride of very high pH (pH12.5) discharged from a soda ash production company in Govora (3 million m3/year)

   b. Cyanidic (alkaline) waste, containing heavy metals other than chromium (1,500,000 m3/) in 2001 discharged by a mining company

   c. Red mud from aluminium production (220,000 ton in 2001)

   d. Phosphor gypsum waste (71,000 ton) that is a little radioactive.

We have considered that the above wastes are legally not hazardous waste based on the hazardous waste definition shown in the Law 426.

Needless to mention, legal judgement and scientific judgement are two different things. For the above listed waste, MWEP/EPIs should show the relevant enterprises and local citizens its judgement based on scientific legal investigation.

3. Waste Quantity – Stock Quantity and Flow Quantity

It is quite common that Romanian enterprises have stock of waste inside company premises. According to ICIM data, such stock of industrial waste is estimated to be over 10 million ton. Needless to mention, flow quantity of waste (ton/year) should not be mixed with stock quantity of waste (ton) to maintain data accuracy. From environmental viewpoint, it is strongly advised that EPIs will require companies to estimate stock quantity of waste, and annually report it to EPIs.

4. On-site Recycled Waste

According to ICIM data, it is estimated that about 20% of hazardous waste generated in Romania is internally recycled by waste generators themselves. In Romania, waste generators generally record such on-site recycled waste as “generated waste”, while such waste is not recorded as “generated waste” in many other countries. If waste is recycled on site and absorbed in products, it should not be recorded as “generated waste”. But if it is internally stored for future disposal, it should be recorded as “generated waste”.

5. Desirable Increase of Solid Hazardous Waste Generation due to Application of Air and Water Pollution Control Measures

It is natural and may be desirable that waste in sold form would increase as result of application of gas emission control or effluent treatment, which lead to generation of dust or treatment sludge. Dusts trapped and effluent sludge generated are more visible and monitorable.

Recommendation:

EPIs should assess not only waste discharged in sold form, but also waste emitted in gas and liquid form. Gas and waste water emission control should be regulated not only in terms of level of concentration but also amount of hazardous substances discharged. The law should provide enterprises with an appropriate incentive to induce them to invest in gas emission control and effluent treatment.

2.4 Latest Available Data

The annual industrial hazardous waste survey data from ICIM for 2002 indicates that the total waste generation is in the region of 2.5 million tons (see Table 2.4.1). At first glance this figure is far higher than that identified by earlier surveys, including the surveys undertaken by this project.

An initial review of this data indicates that by far the largest waste category is now hazardous waste from mining activities (010307 and 010304) which alone amounts to more than 1.6M tons. This was excluded from the scope of the JICA study, so in reality the total reported quantities are not that different. This has come about because enterprises were asked to resubmit their waste reports for 2002 in accord with GD 856/2002. This legislation introduces the new EU Integrated Waste List.

There will be annual variations in waste quantities generated for various reasons, but from past experience one of the most significant causes of variations is that caused from changing the definition. In addition, industries in Romania are still getting used to hazardous waste data collection, the new waste list, and reporting and are becoming more adept at this. These factors have affected all data collection activities and are likely to continue to do so until an improved data collection system is established and industry becomes fully accustomed to the reporting; data quality should progressively improve. It should be borne in mind that these issues do not impact significantly on the proposed hazardous waste plan.

Improved reporting of the generation of certain hazardous wastes in 2002 has been demonstrated. Most notably, there has been improved reporting of halogenated solvent wastes and acid wastes as shown in the table below.

Waste type	*JICA Survey*	*ICIM 2002*
Acids	40	16,081
Halogenated solvents	7,045	15,258

In addition, there are 57,000 tons per annum of phosphorous and phosphoric acids reported although these may be very dilute wastes. The categories still do not easily facilitate identification of alkaline wastes. However, typically these are generated in larger quantities than acidic wastes typically double the quantity. The increasing quantities of acids being reported supports the projects recommendations for development of regional physical / chemical waste treatment facilities.

Table 2.4.1 - Principal Types of Hazardous Wastes Generated in 2002

(tone)

Denumire deseu	Cod deseu*	Cantitate generata	Cantitate valorificata	Cantitate eliminata
alte reziduuri cu continut de subst peric de la proces min metalif	**010307**	1,563,444	0	1,563,444
reziduuri acide de la proces. min. cu S	**010304**	179,191	0	179,191
des cu cont de subst peric de la tratarea min nemetalif	**010407**	143,918	14	143,904
acid fosforic si acid fosforos	**060104**	57,300	0	57,300
deseuri cu continut de alte metale grele	**060405**	48,128	48,126	2
slamuri din rezervoare	**050103**	39,653	137	39,517
zguri de la topirea primara si secundara	**100401**	39,525	29,956	9,568
lichide apoase de spalare cu continut de substante periculoase	**110111**	36,900	0	36,900
scorii negre de la topirea secundara	**100309**	33,028	21,709	11,319
deseuri solide de la epurarea gazelor	**100505**	31,315	27,882	3,433
uleiuri de motor, de transmisie si de ungere usor biodegradabile	**130207**	23,442	23,414	28
alti combustibili (inclusiv amestecuri)	**130703**	22,122	22,063	59
hidroxid de calciu	**060201**	18,682	2,863	15,818
noroaie de foraj si alte des de forare cu cont de subst peric	**010506**	17,658	2,929	14,729
namoluri cu cont de subst peric de la epurarea biol a apelor reziduale ind	**190811**	16,296	0	16,296
reziduuri halogenate din blazul coloanelor de distilare si reactie	**070107**	15,258	7,048	8,210
deseuri de la spalarea combustibililor cu baze	**050111**	14,960	14,820	140
rumegus, talas, furnir cu cont de subst peric	**030104**	14,455	12,595	1,860
uleiuri de santina din navigatia pe apele interioare	**130401**	13,161	1,893	11,268
uleiuri de santina din alte tipuri de navigatie	**130403**	10,469	8	10,461
namoluri de la tratarea fizico-chimica cu continut de substante periculoase	**190205**	9,983	9,268	715
uleiuri izolante si de transmitere a caldurii cu continut de PCB	**130301**	9,687	11	9,677
deseuri de materiale de sablare cu continut de subst peric	**120116**	9,539	0	9,539
namoluri de la masini-unelte cu continut de substante periculoase	**120114**	8,936	43	8,893
slamuri de la desalinizare	**050102**	8,906	4,373	4,534
namoluri de la epurarea efluentilor proprii cu cont de subst peric	**050109**	8,264	683	7,581
acid sulfuric si acid sulfuros	**060101**	7,554	7,441	113
acizi de decapare	**110105**	7,527	228	7,298
filtre de ulei	**160107**	7,502	7,361	141
miezuri si forme de turnare folos la turnare cu cont de subst peric	**100907**	7,410	41	7,369
deseuri solide de la remedierea solului cu continut de substante periculoase	**191301**	6,607	0	6,607
deseuri de la fabricarea azbesto-cimenturilor, cu continut de azbest	**101309**	5,742	201	5,541
vehicule scoase din uz	**160104**	5,113	5,055	58
emulsii si solutii de ungere uzate fara halogeni	**120109**	3,869	703	3,165
scorii si cruste de la topirea primara si secundara	**100402**	3,780	3,780	0
uleiuri minerale neclorurate de motor, de transmisie si de ungere	**130205**	3,510	2,543	967
zguri de la topirea primara	**100304**	3,438	1,001	2,437
des de vopsele si lacuri cu cont de solv org sau alte subst peric	**080111**	3,297	3,225	72
uleiuri minerale hidraulice neclorinate	**130110**	3,254	3,247	6
deseuri cu continut de titei	**160708**	3,050	137	2,913
baterii cu plumb	**160601**	2,860	2,684	175
namoluri si turte de filtrare cu continut de substante periculoase	**110109**	2,608	42	2,566
reziduuri uleioase	**050105**	2,428	15	2,413
deseuri solide de la epurarea gazelor	**100406**	2,317	2,317	0
namoluri de la epurarea efluentilor proprii cu cont de subst peric	**060502**	2,309	1	2,307
alte deseuri cu continut de substante periculoase	**190211**	2,267	2,266	1
alte reziduuri din blazul coloanelor de distilare si reactie	**070108**	2,076	1,816	260
mat de captusire/refractare din proc ne-metalurgice, cu cont de subst peric	**161105**	1,997	1,997	0
zguri saline de la topirea secundara	**100308**	1,890	1,883	8
praf din gazul de ardere cu continut de substante periculoase	**100909**	1,788	13	1,775
alte gudroane	**050603**	1,782	738	1,044
alte uleiuri de motor, de transmisie si de ungere	**130208**	1,725	1,589	136
alte turte de filtrare si absorbanti epuizati	**070510**	1,637	0	1,637
namoluri metalice (de la maruntire, honuire, lepuire) cu continut de ulei	**120118**	1,532	0	1,532
namoluri cu cont de subst peric prov din alte proc de epur a apelor rezid ind	**190813**	1,475	31	1,443
emulsii neclorurate	**130105**	1,421	1,159	261
	TOTAL	2,497,979	281,345	2,216,629

* conform HG 856/2002, Anexa 2

Source: Data from ICIM 2002 Hazardous Waste Questionnaire.