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Research Report

Support study for the action plan for industrial waste landfilling in order to comply with EU legislation: Final report

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European Institute of Romania

Study no. 7

Support study for the Action Plan for industrial waste landfilling in order to comply with EU legislation

Final Report

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ACRONYMES

ACPM/ EPCA	Competent Authority for Environment
ANPM/ NEPA	National Agency for Environment Protection
APIWM	Action Plan for Industrial Waste Management
APM/ EPA	Environmental Protection Agency
ARPM/ REPA	Environmental Regional Agency
ATPM	Territorial Authority for Environment
BAT	Best Available Technique
BREF	Best Available Techniques Reference Documents
CAEN/ NCEA	Classification of the National Economic Activities
CSWTFD	Central Station for Waste Treatment and Final Disposal
HG/ GD	Government Decision
ICIM	National Institute for Research in the field of Environment
IER	European Institute in Romania
LLAW	Low Level Aqueous Waste
LLSW	Low Level Solid Waste
MEC	Ministry for Economy and Trade
MMGA/ MEWM	Ministry of Environment and Water Management
MoF/ OJ	Official Gazette (Official Journal)
NAAA	Nuclear Activities Autonomous Administration
NSWM	National Strategy for Waste Management
OUG/ EGO	Emergency Governmental Ordinance
PADDI	Action Plan for storage of the industrial waste
SCTDD	Main Station for Treating and Storing Waste
SNGD	National Strategy for Waste Management

INTRODUCTION

The issues of Romania's accession to the EU have been documented by many individual reports and studies as well as by comprehensive analyses in the EU Commission country reports on the progress of the accession process. In this context, there has arisen a need for new work that would provide an overview of the sector and propose solutions, not just approach specific issues from a strictly technical perspective. In response to this demand, in 2003 IER launched a new study project¹ of pre-accession policies and of the impact assessment of Romania's joining the EU, "*Pre-Accession Impact Studies II*" (PAIS II).

The work entitled "*Support Study for the Development of the Action Plan for Industrial Waste Landfilling in Compliance with European Legislation*" is the seventh of the PAIS II series. This work does not aim to replicate the efforts of those involved in developing negotiation documents but to provide support to these activities and better inform the decision makers on the efforts and extremely difficult problems that need to be solved over a very short period of time. The study reflects the good cooperation of waste management specialists with civil society, research institutes, and academic bodies keeping up an effective debate of the issues and proposed solutions.

General considerations

Transposition of the environmental Acquis Communautaire into national legislation and its implementation are one of the major challenges facing Romania in the EU accession process. In this context industrial waste is one of the important problems of environmental protection policy, requiring effort in approximating the national provision to those of the European Union.

Objectives of the study

The main goal of this study is to provide a clearer perspective on the issues of "industrial waste" and to assist the development of the *Action Plan concerning the landfilling of industrial waste in Romania with proposals and recommendations.*

Beneficiaries of the study

The institutions directly interested in the findings of this study include: the ministry of Economy and Trade, the Ministry of Agriculture, Forests, Waters, and the Environment (now Ministry of the Environment and Water Management), the Ministry of Transport, Construction and Tourism, RENAR – the Accreditation Association of Romania. The European Institute in Romania acts as coordinator of this program.

Relevant issues, according to the Terms of Reference

According to the Terms of Reference, this study aims to approach the following topics:

- the institutional and legislative framework of industrial waste management;
- defining industrial waste in the context of approximation of environmental protection legislation in Romania to EU legislation;
- industrial waste generated in Romania by branch of industry; types and quantities, structure;
- landfilling options for the industrial waste generated
- environmental impacts of industrial landfills;

¹ The 12 topics included in the research were previously agreed on by the Ministry of European Integration and IER

- classification of the existing industrial landfills under Directive 1999/31/EC;
- assessment of the structure of industrial landfills that meet the requirements of the IPPC Directive;
- situation of industrial landfills not meeting the requirements of Directive 1999/31/EC;
- national assessment of the significance of the main types of hazardous industrial waste;
- assuming responsibility in meeting the environmental requirements in the landfilling of industrial waste according to the implementation schedule of Directive 1999/31 EC and Directive 96/61;
- conclusions and recommendations;
- Annexes, maps and charts.

Methodology of the study

The study was developed based on the IER suggested methodology which involved covering several steps of documentation, drafting, consultation and discussion, reconsideration and redrafting of materials, etc.

The methodology assumed development of intermediate drafts of the study, which were discussed and reviewed by the ad hoc Interest (stakeholder) Group.

Thus, a relevant Interest Group was organized, to include representatives of the ministries and institutions with concerns in the industrial waste management area. The Interest Group included specialists of the Ministry of Economy and Trade, Ministry of the Environment and Water Management, Ministry of Transport, Construction and Tourism, Ministry of European Integration, research institutes (Institute for National Economy, ICIM etc.), representatives of industrial employers' associations (COGEN, FEPACIM, UniRomSider), universities, etc.

During the development of the study, two meetings of the Interest Group took place (one in January 2004 and one in May 2004) to discuss two intermediary drafts of the study. The meetings were extremely useful as they occasioned many suggestions for improvements and additions. All the suggestions and comments were reviewed and included in the final draft of the paper. The authors wish to express their thanks here to Mrs. Liliana Nichita (MET), Mrs. Nicoleta Chiriac (MEWM) and the other members of the Stakeholder Group for their real support in developing and completing this study.

The authors also want to thank the representatives of IER with whom they had direct contacts - dr. Gabriela Drăgan and Mr. Mihai Moia – for the professionalism and support granted during the development of this study.

1 Evolution of the Industrial Sector in Romania (1990-2002)

A long and painful industrial restructuring process was started in 1990 with a direct influence on the quantity of industrial waste generated in Romania, and on the content thereof. This section will briefly analyze the evolution of industrial production, and its correlation with the volume and quantity of waste it generates.

In Romania, as in other former socialist countries, centralized planning seriously restricted and distorted the function of markets. Control over costs and prices provided profit for the industrial enterprises, as there was no risk of their being replaced by less costly or more innovative competitors. Inefficient management and the operation of productive assets under the pressure of unachievable objectives sub led to fragmented operation of production and an inadequate management of resources, and contributed to excessive levels of pollution and to the generation of an impressive volume of industrial waste. Sustained development of heavy industries combined with the heavily subsidized energy and the unjustifiably low prices of raw materials led to a very low efficiency in energy use, extensive use of natural resources and generation of a vast amount of waste². In order to support local industrial development, high protection on imports was introduced, so external prices did not influence economic decision. Financial systems were underdeveloped, based on a domineering central bank that, as a governmental agent, allocated loans according to centralized plans.

Transition from central planning to market economy introduced complex macroeconomic reforms that generated positive change of the industrial structure with direct consequence on the reduction of the generated waste.

- i. *Reforms of the public sector* reduced the domination of public enterprises and the State intervention in the autonomy of public enterprises; large state monopolies started to be removed and competition was promoted which improves managerial practice and the use of resources;
- ii. *Monetary reforms* aimed to introduce better control on the monetary mass and interest was no longer subsidized; as a result, capital intensive industrial investment dropped, resources could be more realistically assessed and changes in the long term economic structure became possible (especially in the declining share of the heavy industry);
- iii. *Fiscal policy reforms* reduced subsidies and eliminated price control, which enabled a more efficient use of resources and the introduction of less polluting production practices;
- iv. *Reforms of the exchange rate* changed the external trade protective policy by eliminating the over evaluation of exchange rates and reducing trade restrictions; as a result, efficiency increased due to competition and pollution was reduced by the import of cleaner technologies.

Not all the effects of economic restructuring and macroeconomic changes in Romania are positive for the environment. The environmental effects of macroeconomic measures largely depend on the coherence of structural adjustment. Negative environmental impacts occur

² Note also that the drastic import reduction policy led to impressive recycling of reusable materials such as: paper, glass, feathers, textile waste, scrap tires, waste oils, scrap batteries, plastics, etc. Since not all collection and recycling activities were conducted on an economic basis, once subsidies were lifted, waste of negative economic value was no longer collected and recycled. Only waste of positive economic value continued to be recycled, including scrap iron, non-ferrous scrap, etc. where demand skyrocketed, especially for export.

when reforms are not fully coordinated³ and the dysfunctionalities of the market mechanism are not solved correctly – for example, clarification of ownership rights on natural resources such as forests, or fishing resources, etc.

1.1 Industrial Dynamics during 1990-2002

1.1.1 Evolution of the main industrial branches

Industrial production in Romania developed in stages. A review of the evolution of production value, in constant terms⁴, three different periods may be distinguished (see Annex 1 and Figure 1):

- sharp decline of industrial production during the first stage (1990 - 1992);
- slight recovery followed by production decline in the second stage (1993 - 1999);
- resumed ascending trend of industrial production in the third stage, (1999 - 2001).

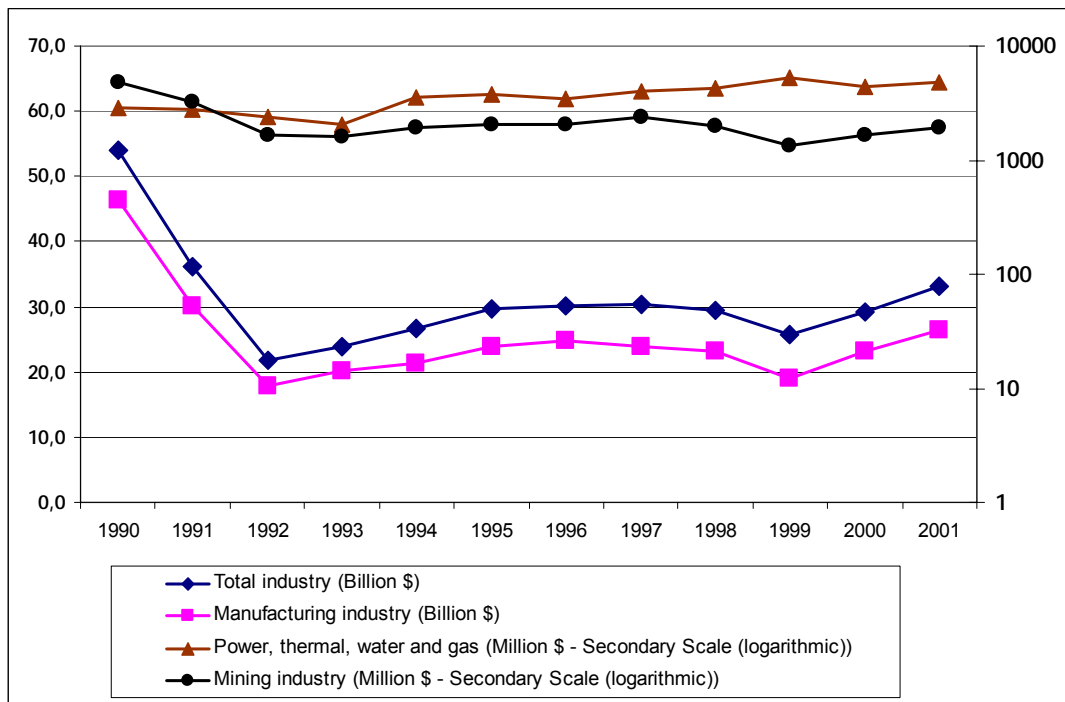


Figure 1-1: Evolution of industrial production in Romania

It is interesting to note that the trend of processing industries closely follows the general trend of industrial development, while mining production stabilized in terms of value, after registering a clear downward trend. On the other hand, electricity, heating, gas and water producing industries have shown a constant tendency to grow.

During the period under review, deep structural changes in Romanian industry had a direct impact on the generation of industrial waste. We shall see that the industrial branches have evolved differently, which should have influenced the volume of generated waste.

³ If subsidies are removed, e.g., for hydrocarbons, but not for coal, adverse effects on pollution and waste generation are possible.

⁴ Conversion into constant prices used US\$, as the EURO was only introduced in 2001. In 1989, the European coin was not yet in existence and then the name ECU was used for a long time (see Annex 2).

Thus, at the end of 2001, industrial production was only 62% of 1990 value, or a difference of 20 billion USD, in absolute values.

Extraction industry suffered the greatest drop (60%) while processing industries only registered a 43% reduction. The only branch that, as mentioned before, recorded constant growth is electricity and heating generation industry (2.02 billion \$ plus) (see Table 1-1 and Annex 1

In regard to staff, industry lost 1.945 million jobs, of which 1.862 jobs in processing. Extraction industry lost 126 thousand jobs, while electricity and heating generation created 43 thousand new jobs (see Table 1-1).

Table 1-1: Industrial production dynamics and the evolution of industrial jobs (1990-2001)

	Industrial output		Employment	
	%	Billion \$	%	Thou. persons
	2001/1990	Difference (2001-1990)	2001/1991	Difference (2001-1990)
Total industry, of which:	62	-20,69	49	-1945
Mining industry	40	-2,91	53	-126
Manufacturing industry	57	-19,80	46	-1862
Power, water and gas	171	2,02	134	43

Source: Data processing of Annex 1

1.1.2 Evolution of industries with high waste generation potential

As will be seen, some industries are responsible for the generation of most industrial waste. These include: minerals extraction and preparation, coal extraction and preparation, energy production, chemical industry, metallurgy, etc.

In extraction industry, the situation is different in each of the three major components for the period under review (see also Annex 1):

- for coal extraction and preparation, the value of production dropped only 19% but job loss was 55%;
- for petroleum and natural gas extraction, the value of production in 2001 was only 25% of that of 1990;
- other mining activities including ferrous and non-ferrous mineral extraction, registered a 34% production reduction.

In the processing industry, the following trends may be identified:

- crude preparation, coal coking and nuclear fuel treatment witness a very slight reduction of production (3% loss);
- chemical industry and synthetic and artificial fiber manufacturing reduced production by half and lost 38% of the jobs;
- rubber and plastic processing industry dropped production to 41% of 1990 levels and lost 63% of the jobs;
- metallurgy practically maintained the 1990 value of production in 2001, but with a much lower number of personnel (55%).

Analyses of the trend of production value and staff levels in industry should be paralleled with an analysis of physical production, as the latter has direct and most important implications on the volume and quality of generated waste.

A review of the main industrial products, of high waste generation potential, will reveal an uneven trend in the case of extracted coal while other products show a clear tendency to drop and stabilize at a lower level (see Figure 1-2 and Annex 3).

The main mineral extracted in Romania, from the point of view of quantity, is coal. The quantity of extracted coal dropped by more than 45% during 1989-1991, then started to recover. The maximum amount of coal was extracted in 1996 (44.77 million tons), after which it dropped to a minimum of 24.5 million tons in 1999, and then resumed growth.

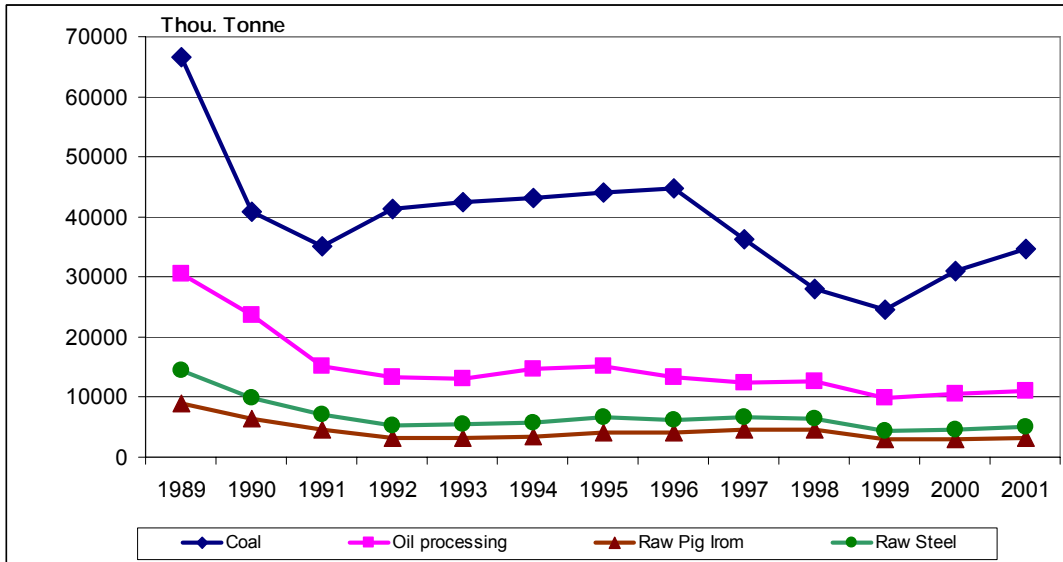


Figure 1-2: Evolution of physical production for some high waste generating industrial products

Source: Data processing of Annex 3

In the case of crude processing, quantity reduction was significant and constant. From 30 million tons in 1989, it dropped to a little over 10 million tons in 2001.

For industrial products involving generation of large amounts of waste, such as coking coal, pig iron and bulk steel, physical production shows an overall descending trend. These products show a tendency to stabilize at about 30% of 1989 levels.

From a theoretical point of view, the volume of industrial waste generated directly depends on the volume of physical production (and less on the value thereof). As we shall see, the quantities of industrial waste reported in various publications and studies does not correlate well to the physical volume of industrial production in Romania.

1.2 Dynamics of the industrial waste generation in Romania

The evolution of the amount of industrial waste generated in Romania is not easy to calculate or analyze. Several reasons may be mentioned, including, among the most important: lack of viable statistical data, existence of several data sources, changing definitions and classifications over time, etc. Therefore, we shall start with an analysis of the main data sources in order to identify trends and quantities of waste generated.

1. The paper *Industrial and Hazardous Waste Management in the Candidate Countries*⁵, shows a downward trend of industrial waste quantities (see Table 1-2). So, from nearly 342 million tons of industrial waste in 1995, only a quantity of 44.4 million tons was generated in 2000, i.e. a reduction by 297 million tons (87%). According to the study, the most important share is that of mining industry which, during 1995-2000 reduced the amount of generated waste by 289 million tons, or 93%. These levels seem rather implausible if we consider that, for example, the quantity of extracted coal was 43.98 million tons in 1995 and 30.1 million tons in 2000. A 31.5% drop in coal production (coal also holds the largest share of the total minerals extracted), will not trigger a 93% reduction of industrial waste generated even if we include the significant volume reduction of other extracted minerals.

Table 1-2: Evolution of industrial waste quantities generated in Romania (1995-2000)

	Thousands tonnes						2000/ 1995	Difference
	1995	1996	1997	1998	1999	2000	%	1000 tonne
manufacturing	15145	25607	19514	14485	11795	12596	83%	- 2549
Mining	310230	61099	171326	506111	48050	21214	7%	- 289016
Power sector	11573	16031	12485	7428	6811	4977	43%	- 6596
Other industries	5036	5834	3904	2592	5198	5622	112%	586
TOTAL industrial waste	341984	108571	207229	530616	71854	44409	13%	- 297575
<i>Dangerous waste</i>	<i>5710</i>	<i>3203</i>	<i>2757</i>	<i>2299</i>	<i>2174</i>	<i>897</i>	<i>16%</i>	<i>-4813</i>

Source: Hazardous and Industrial Waste Management in Accession Countries., PHARE The project was entrusted for execution to Land Statistical Information Systems g.e.i.e. ISBN 92-894-6220-5., © European Communities, 2003., www.europa.eu.int/comm/eurostat/

In the processing industry, the quantity of generated waste showed a downward trend that seems plausible (reduction by 17% in six years).

According to the above mentioned paper, hazardous industrial waste generated dropped from 5710 thousand tons to 897 thousand tons during 1995-2000. This level again raises some questions, as it is very difficult to reduce hazardous industrial waste by 84% without significant investment. It may be that the closure of certain industrial facilities might account for this reduction.

2. The paper *Environment in Romania*, published by the National Institute of Statistics contains a section on waste.

The 2001 issue of the paper *Environment in Romania* gives the following levels of industrial waste: 69 million tons industrial waste generated in 1999 (see Table 1-3). The total 69 million tons is close to that given in an earlier study (71.8 million tons). The only discrepancy is in waste from power plants where the levels are greater in the report of the National Institute of Statistics. In fact, this is the only category where comparison is possible.

A new issue of *Environment in Romania* was published in 2002. This new issue no longer gives details on the structure of industrial waste, just a mention of the quantity of de industrial waste generated in 2000. **This level is again 69 million tons, identical to that of 1999.** The paper does not explain this surprising coincidence.

⁵ Hazardous and Industrial Waste Management in Accession Countries., PHARE The project was entrusted for execution to Land Statistical Information Systems g.e.i.e. ISBN 92-894-6220-5., © European Communities, 2003., www.europa.eu.int/comm/eurostat/

Table 1-3: Quantity of industrial waste generated in Romania in 1999, by activity

Industry	Quantity (million tonnes)
Mining	48
Power and thermal industry	8,1
Metallurgy	3,6
Oil refining	2,2
Chemistry	2,1
Other industries	5,0
TOTAL	69

Source: Environment in Romania 2001, p. 72, published by the National Institute of Statistics

3. The State of the Environment Report⁶, for 2001 was developed in accordance with the provisions of art. 65, item j) of Law no.137/1995 on environmental protection, as amended, and aimed to inform public authorities, political and economic decision makers and the general public on a number of issues of the state of the environment of major economic, social and ecologic significance. This report mentions that the data on which it was based were the result of investigations and studies conducted under the national integrated environmental monitoring system, involving a large number of specialist institutions under the coordination of the Ministry of Waters and Environmental Protection.

The Report presents significant aspects regarding the state of ambient air, surface and ground waters, soils, forests, the environment in urban settlements, industrial and urban waste management, radioactivity, accidental pollution, critical areas, etc.

Chapter eight of the Report reviews the situation of **industrial waste**. The report shows that, **during 2001, the quantity of waste generated in industry, agriculture and constructions was 65.6 million tons, i.e. a reduction by 18.6 million tons compared to 1999**. Actually, no exact level is given for the quantity of industrial waste as the 65.6 million tons include two other branches besides industry: agriculture and constructions.

The Report mentions economic activities that generated the highest levels of waste in 2001 (see Table 1-4). Although no total value is given, the summing up of levels given in the MWEF report gives 49.2 million tons industrial waste, 20 million tons less compared to the quantities generated in 1999 or 2000 (according the National Institute of Statistics). By industrial branch, 2001 levels are close to those given in the National Institute of Statistics report for 1999.

Table 1-4: Quantity of industrial waste generated in Romania in 2001, by activity

Activity	Quantity (million tonnes)
Mining and preparation of ores	17,5
Extraction and preparation of coal	11,0
Power	8,7
Chemistry	7,0
Metallurgy	Over than 5
TOTAL	49,2

Source: State of the Environment Report for Romania, 2001, www.mappm.ro

⁶ Source: www.mappm.ro

It is unclear what the phrase “over 5” might mean in the case of metallurgy.

The decrease of industrial waste quantities in 2001 (- 20 million tons) is extremely surprising if we consider that, compared to 2000, the quantity of extracted coal increased by 3.8 million tons, the quantity of iron ore increased from 116 thousand tons to 221 thousand tons, the quantity of zinc in concentrates rose from 27.4 thousand tons to 46.6 thousand tons, the quantity of copper ore and concentrates rose from 16 thousand tons to 289 thousand tons. This upward dynamics of extractive industry should generate more waste, not less.

Based on these figures, it may be concluded that, as of 2000, there has been a stagnation, and even decrease of the total quantity of industrial waste generated as against a notable re-launching of industrial production.

4. The Draft National Waste Management Strategy (NWMS) was prepared by the Ministry of Agriculture, Forests, Waters and the Environment, in accordance to its responsibilities under transposed European waste management legislation and the provisions of Emergency Government Ordinance 78/2000 on the regime of waste, as amended and approved by Law 426/2001. The National Waste Management Strategy aims to create the necessary framework for the development and implementation of an integrated ecologically and economically efficient waste management system. This document will be approved by Governmental Decision and will be regularly updated.

NWMS provisions apply to all types of waste defined under Emergency Government Ordinance 78/2000 on the regime of waste, as amended and approved by Law 426/2001. The strategy considers **production waste defined as** all waste generated from industrial activities (except for mining, radioactive, etc.); there may be **non-hazardous** and **hazardous production waste**.

Based on the review and processing of the received questionnaire responses⁷, in 2002 a total **24.5 million tons of production waste**⁸ was generated (only the types of waste under the Framework Directive – as defined above). A quantity of 581.7 tons of hazardous waste was also estimated based on a questionnaire.

The data obtained from questionnaires are valuable, but there may be mistakes in the responses, due to misunderstanding of classification requirements or lack of training in the respondents.

Since 1999, collection and processing of information related to the types and quantities of waste has had to comply with the provisions of Government Decision 155/1999; this decision includes an obligation of the economic agents to maintain records of their waste, report them to the county environmental authorities (EPAs) and classify them under European classification requirements (the European Catalogue of Waste). In 2002, this decision was repealed by Government Decision 856/2002, which also introduced the List of waste, including hazardous waste. Also, since 1995, Romania has been reporting data related to the generated quantities of waste via the EUROSTAT reporting system and to the European Environmental Agency (via the EIONET network).

⁷ The quantities of production waste generated on an annual basis are recorded by the economic agents and reported, based on statistical survey questionnaires developed by the MWEF, together with the National Environmental Research and Development Institute– ICIM Bucharest (according to Government Decision 856/2002 on waste records and approving the list of waste, including hazardous waste). For 2002, a response rate of 86%, was recorded, of which 82% were waste generating facilities.

⁸ Source: Waste database - ICIM

* * *

From the above analyses, two important conclusions may be derived:

1. there is considerable discrepancy between the physical volume of industrial production and the quantity of industrial waste generated;
2. the reported quantities of industrial waste vary significantly from one study to another and from one year to the next, making it difficult to determine real levels.

Some reasons accounting for this include:

- there were changes in the activities of industrial companies that directly impacted on the quantities of industrial waste generated;
- there was a change of reporting methodology (recording or not recording tailings as mining waste) and a periodical change of survey questionnaires in view of improvement (especially in 2000 and 2002);
- there was a change in assessing reported quantities by each generator (weighing or volumetric estimation);
- low qualification of waste generators in collecting and reporting waste data;
- insufficient control, on the part of the local environmental authorities, on how legal obligations to collect and report data were met by the waste generators;

2 Institutional and Legislative Framework for Waste Management

2.1 Legislative Framework for Waste Management

The waste management legal framework has changed altogether in Romania over the past few years. Unlike other EU Member States who adapted their legislative framework in the course of over 20 years, Romania had to do it over a very short period of time.

Actually, the main EU waste directives were almost completely transposed during 2000 – 2003. As of 2004, Romania has had a modern legislative framework for waste management, adapted to the *Acquis communautaire*. The Table below shows the progress so far:

EU Directive	Transposition
Framework Waste Directive no. 75/442/EEC, amended by Directive no. 91/156/EEC	Law no. 426/2001 (M. Of. 411 of 25 July 2001) approving Emergency Ordinance no. 78/2000 on the regime of waste
	Government Decision 123/2003 approving the National Waste Management Plan – Phase National Plan (M. Of. 113 of 24 February 2003)
Directive no. 91/689/EEC on hazardous waste	Law no. 426/2001 (M. Of. 411 of 25 July 2001) approving Emergency Ordinance no. 78/2000 on waste management
Directive no. 75/439/EEC on waste oils, amended Directive no. 87/101/EEC and Directive no.91/692/EEC	Government Decision no. 662/2001 (M. Of. 446 of 8 August 2001) on waste oil management, as amended by Government Decision 441/2002 (M. Of. 325 of 16 May 2002) and GD 1159/2333 (MO 715/2003)
Directive no. 91/157/EEC on batteries containing certain hazardous waste and Directive no. 93/86/EC on battery labelling	GD no.1057 /2001 on the regime of batteries containing hazardous waste (M. Of. 700 of 5 November 2001)
Directive no. 99/31/EC on the landfilling of waste	Government Decision no. 162/2002 on the landfilling of waste (M. Of. 164 of 7 March 2002)
	Order of the Minister of Waters and Environmental Protection no. 867/2002 defining the criteria that waste must meet in order to be included on the specific landfill list and on the national list of acceptable waste for each class of landfills 2002 (M.Of. 848 of 25 November 2002)
	Order of the Minister of Waters and Environmental Protection no. 1147/2002 approving the Technical Norms for the landfilling of waste – construction, operation, monitoring and closure of landfills (M. Of. 150 of 7 March 2003)
Directive no. 2000/76/EC on waste incineration	Government Decision no.128/2002 on waste incineration (M. Of. 160 of 6 March 2002)
	Order of the Minister of Waters and Environmental Protection no.1215/2003 approving the Technical Norms for waste incineration – (M. Of. 150 of 7 March 2003)
Directive no. 94/62/EC on packaging and packaging waste	Government Decision no. 349/2002 on the management of packaging and packaging waste (M. Of. 269 of 23 April 2002);
	Order of the Minister of Waters and Environmental Protection no. 1190/2002 on the reporting procedure for packaging and packaging waste data (M. Of. 2 of 7 January 2003);
Directive no. 96/59/EC on the disposal of polychlorinated	Government Decision 173/2002 regulating the special management and control regime of polychlorinated biphenyls and other similar

EU Directive	Transposition
biphenyls and triphenyls (PCBs and PCTs)	compounds; MWEF Order no. 279/2002 establishing the Technical Secretariat for designated compound management and control within the Waste and Hazardous Chemical Substance Management Directorate (M. Of. 459 of 27 June 2002).
Decision no. 2000/532/CE, amended by Decision no. 2001/119 on the Waste List (replacing Decision no. 94/3/CE on the Waste List and Decision no. 94/904/CE on the list of hazardous waste).	Government Decision no. 856/2002 on waste management records and approving the list of waste, including hazardous waste (M. Of. 659 of 5 September 2002).
Regulation no. 259/93 on the control of waste shipments within, from and into the European Community	Government Decision no. 1357/2002 establishing the public authorities in charge of control and monitoring of waste import, export and transit (M. Of. 893 of 10 December 2002).

Source: P R O G R E S S R E P O R T in preparing for European Union Accession during September 2002 - June 2003., - GOVERNMENT OF ROMANIA., June 2003

Specific permitting requirements for landfills, provided by the Technical Norms, supplement the adopted regulations on environmental impact assessment and the issuing of environmental agreements. During 2004, the Position Paper for Chapter 22 is scheduled for completion alongside the completion of the implementation plans.

2.2 Institutional Capacity

Currently, the central authority in coordinating waste management is the Ministry of the Environment and Water Management (MEWM). It was established in 2004.

According to **Government Decision no. 408/2004 on the organization and operation of the MEWM** (M.Of. no. 285/31.03.2004), this ministry is a specialist body of the central public administration, with legal personality, subordinated to the Government of Romania. MEWM applies the governmental strategy and program in promoting its policies in the environmental and water management sector. MEWM implements the environmental policy on water management at the national level, drafts the specific strategy and regulations for the development and harmonization of these policies within the general governmental policy and coordinates the implementation of the governmental strategy in the respective sector, in the *role of a state authority, for synthesis, coordination and control in these areas*.

In the MEWM structure, *the Minister of the environment and water management* is assisted in his activity by *three Secretaries of State*, and *a General Secretary*. The three State Secretaries coordinate activities in the following areas:

- environmental protection;
- water management;
- European integration and international relations.

Personnel Structure

In Romania, the maximum number of positions at the central level of environmental protection, water management, and European integration for the environment is **270** (excluding the dignitary positions and the ministerial cabinet).

The State Secretary in charge of coordinating activities in environmental protection supervises the General Directorate for Environment and the Directorate for Waste and Hazardous Chemical Substances Management.

Under art. 11 of Government Decision no. 408/2004, the **Authority for the Implementation of Structural and Economic-Social Cohesion Funds for Environmental Infrastructure Projects** was created in the MEWM at the general directorate level, subordinated to the State Secretary for European integration. This unit will be operational as of 2004 and will work with 100 positions, of which 50 positions in 2004.

Under Art. 12, MEWM has the following units under its subordination, authority, or coordination:

Subordinated	<ul style="list-style-type: none"> - National Environmental Protection Agency - 8 Regional Environmental Protection Agencies - 34 County Environmental Protection Agencies - the Administration of the “Danube Delta” Biosphere Reserve – Tulcea - Project management Units (PMU) - Project Implementation Units (PIU)
Under its authority	<ul style="list-style-type: none"> - National Administration “Apele Române” - National Company “National Institute of Meteorology, Hydrology and Water Management” – SA
Under its coordination	<ul style="list-style-type: none"> - National Research & Development Institute for Environmental Protection – ICIM Bucharest - National Marine Research & Development Institute “Grigore Antipa” – INCDM Constanța - National Research & Development Institute “Danube Delta” – INCDDD Tulcea - The Environmental Fund Administration

BY GD no. 297/2003, on the establishment of the National Environmental Guard as a public legal person institution, once it took over the control of environmental legislation enforcement (including the associated personnel), the total number of positions in the EPA structure is **1486**, of which 1179 civil servants. According to GD no. 739/2003, the existing EPAs in every county and in Bucharest Municipality are public institutions fully funded by the State Budget, and subordinated to the MEWM.

Following the reorganization of the administrative structure of the Government, based on art. 16 para. 5 letter a) of Emergency Government Ordinance no. 64/2003, the **National Environmental Guard** was reorganized as specialist body of the central public administration, a legal person, that took over supervision of the Territorial Inspectorates for Forestry and Hunting – legal person institutions formerly subordinated to the Ministry of Agriculture, Food and Forests. Based on art.1 para.2 of GD no. 761/2003 on the reorganization and operation of the National Environmental Guard (M.Of. no. 499/10.07.2003), this is subordinated to the **National Control Authority**, funded by the State budget through the budget of the Authority, and has a maximum approved number of staff of **903 positions**, distributed as follows: 644 position in its own structures and 259 positions in the territorial forestry and hunting inspectorates subordinated to it.

According to the legislation in force, MEWM provides the coordination of the **Environmental Fund Administration**, a unit operating under its supervision, but funded out of its own resources. Currently, the Environmental Fund employs **14** people. Note that the first projects proposed for funding in early 2003 were in the waste management sector.

According to art.1, para. 1 letter n) of EGO no. 64/2003, **the National Commission for the Control of Nuclear Activities (CNCAN)** operates under the direct coordination of the Prime Minister, as a national interest public institution, a legal person, fully funded from its own resources. The total number of positions is **80** (not including the dignitary position).

In 2004, the National Environmental Protection Agency (currently in the process of organization) was created and eight of the local environmental agencies became regional agencies. The activity of the NEPA and of the eight REPAs is regulated by the following legal documents:

- GD 1625/2003 on the establishment, organization and operation of the NEPA;
- GD 1626/2003 on the establishment, organization and operation of the REPA.

Other institutions that have responsibilities in the waste management sector

The Ministry of Economy and Trade has the following structures dealing with waste management issues:

- The National Commission for the Recycling of Reusable Materials;
- The National Agency for Mineral Resources;
- The National Agency for Hazardous Chemical Substances;
- The National Agency for Radioactive Waste.

2.3 Waste Management Plans and Programs; progress recorded

According to Emergency Government Ordinance 78/2000, as approved and amended by Law 426/2001, the competent authority for waste management is the Ministry of Waters and Environmental Protection⁹. Other central public authorities with waste management responsibilities include the Ministry of Industry and Resources¹⁰ with the following main responsibilities in regard to industrial waste:

- develop sectoral strategies and programs for industrial waste management;
- participate in developing specific regulations for the management of various types of industrial waste;
- coordinate and supervise industrial waste recycling activities¹¹.

The above mentioned regulation also provides the obligation to develop a National Waste Management Plan, based on county plans. In their turn, county plans are drafted based on specific information and plans developed by the local councils (for municipal waste) and by waste generator economic agents (for production waste).

This was the legal framework for the development of the **National Waste Management Plan – Phase National Plan**, later approved by Government Decision 123/2003.

This national plan describes the existing situation in waste generation and management based on data and information collected and processed during 1995 – 2000 and contains important provisions regarding the management of production waste (and industrial waste, implicitly). These provisions include:

- identify the main existing problems in production waste management;

⁹ now Ministry of the Environment and Water Management

¹⁰ now Ministry of Economy and Trade

¹¹ In this case, the concept of industrial waste refers to waste that may be a source of raw materials for industry.

- forecast an increase of the production waste generated, approximately by 2010; then an expected decrease of specific quantities generated, following the introduction of cleaner technologies and management practices focused on avoiding waste generation and minimizing the quantities generated;
- indicate production waste recycling activities to be developed and the use of economic instruments in creating and supporting the secondary raw material markets;
- identify strategic general objectives in waste management and strategic objectives specific to certain waste flows (waste from heating energy production, waste oils and waste liquid fuels, industrial wastewater treatment sludge etc.).

The National Environmental Action Plan¹², updated in 2003, contains a number of provisions regarding waste management. These include:

- waste management objectives;
- planned waste management actions;
- priority projects that, in the industrial waste sector, are mainly focused on rehabilitating the existing treatment and disposal installations, the construction of regional facilities, improved material and energy recovery from waste, implementation of the best available techniques.

Two more documents related to waste management are currently being developed by a working group coordinated by the MEWM with technical assistance from the German Government under the PHARE RO 2001 “Institutional twinning project to further support Romania in transposing and implementing waste management legislation”:

- the National Waste Management Strategy;
- the National Waste Management Plan.

The two documents above were submitted to a public hearing in late March 2004 and, once the comments will be incorporated, they will be approved by Government Decision.

In industrial waste management, the draft **National Strategy**, and **National Waste Management Plan**, respectively, contain the following elements¹³:

- the principles underlying industrial waste management activities;
- industrial waste management options;
- general and specific strategic objectives;
- activities needed in order to meet the objectives.

It may be noted that the same PHARE RO 2001 “Institutional twinning project to further support Romania in transposing and implementing waste management legislation” is developing the Guidelines for the development of county waste management plans and Guidelines for the development of regional waste management plans.

In parallel, activity was started on the development of the Regional waste management plan for the Central Region.

The inventory of incineration¹⁴ and co-incineration facilities was finalized and it identifies the companies incinerating their own waste and those having waste incineration as the object of their activity, as well as companies permitted for co-incineration.

¹² MAWFE – National Environmental Action Plan, PHARE 2000 – RO 0006.14.02 Project, October 2003

¹³ MMGA – Draft national Strategy and Draft National Waste Management Plan

The implementation of Directive 75/439/EEC on waste oils, amended by Directive 87/101/EEC and Directive 91/692/EEC s-creates the basis for a waste oil collection for capitalization, monitored by each local EPA. Based on the reports sent by the EPAs, the quantity of collected and recycled waste oils was analyzed and the national list¹⁵ was developed for all waste oil collectors and recyclers.

The national inventory of equipment and materials containing PCB/PCT was prepared according to GD no. 173/2000 (MO no. 131/28.03.2000) transposing Directive 96/59/EC on the disposal of polychlorinated biphenyls and tri-phenyls (PCB and PCT); economic agents also prepared and sent to the EPAs the disposal plans for PCB containing equipment and materials.

Consultations were held in 2002 with the representatives of portable battery importers in order to establish a way to implement Directive 91/157/CEE on batteries containing certain hazardous substances. The national list¹⁶ of collectors and recyclers was also developed and sent to the EPAs and, based on the reports sent in by the inspectorates, the situation of waste car batteries was also developed.

During 2003-2004, a preliminary identification and classification of municipal and industrial landfills under *Directive 1999/31/EC on the landfilling of waste* was prepared, and it still needs to identify the landfills excepted from certain provisions of the Directive (remote settlements). Thus, at the national level, of the 265 identified municipal landfills:

- 3 municipal landfills (class b) comply with Directive 1999/31/EC;
- 11 municipal landfills (class b) will be in full compliance with Directive 1999/31/EC by the end of 2006;
- 251 municipal landfills are not and can not be in compliance with Directive 1999/31/EC and they will be phased out, as adequate disposal facilities become available.

An inventory was also made of the incineration/co-incineration facilities, to implement the requirements of *Directive 2000/76/EC on waste incineration*.

For the processing of data reported by the economic agents that place packaging and packaged goods on the market, a database was created both in the county Environmental Protection Agencies and in the Ministry of Agriculture, Forests, Waters and the Environment. For the implementation *Directive 94/62/CE on packaging and packaging waste* the estimated value is 242.9 million Euros. Cost assessment was done by the French Twinning Project (PHARE 2000).

¹⁴ In 2003, MWEP Order no. 1215/10.01.2003 on the Technical Norms for waste incineration was approved (MO no. 150/7.03.2003).

¹⁵ See Error! Reference source not found.

¹⁶ See Error! Reference source not found.

3 Industrial waste in the context of environmental legislation approximation in Romania with the EU directives; definitions and meanings

As it was presented in the previous chapters, the need for clear definitions and classification in the field of industrial waste is very important for Romania. Despite that, the term of industrial waste is not clearly defined in national or EU regulations. GD 162/2002 transposes the Directive 1999/31/EC defining various types of waste in Art. 6 and Annex 1:

- hazardous waste – are defined in Annex no. I C, I D and I E of GUO no. 78/2000, approved and amended by Law no. 426/2001 and meet the requirements of Annex no.3; hazardous waste includes both hazardous waste from manufacturing activities and households.
municipal waste- household waste and other waste that because of its nature or composition is similar to household waste, that are generated by human settlements;
- non-hazardous waste from any other source, is the waste that fulfil the acceptance criteria at non-hazardous waste landfill stated in Annex no. 3 and is not included in the hazardous waste in accordance with paragraph j) (Annex 1 mentioned above);
- hazardous stabilised waste, non-reactive waste, like solidified, vitrified waste, that has a leachability similar with those under paragraph b) and fulfil the relevant acceptance criteria stated in Annex nr. 3; these hazardous waste are not disposed into biodegradable non-hazardous waste cells but in separate cells;
- inert waste is, in accordance with Annex 1, the waste that does not undergo any significant physical, chemical or biological transformation, does not dissolve, burn or otherwise physically or chemically react biodegrade or adversely affect other matter which it comes into contact in a way likely to give rise to environmental pollution or to harm human health. The total leachability and the pollutant content of the waste, as well as the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater.

Government Decision no. 856 from the 16th of August 2002 regarding the evidence of waste management and for approval of the list of waste including hazardous, set up the categories of waste generated by various activities. In Art.8 hazardous waste are defined as „waste classified as hazardous – waste marked with asterisk (*)” which „display one or more of the hazardous properties listed Annex IE of OUG no. 78/2000, approved by Law no. 426/2001.”

The main industrial branches listed by Romanian Statistical Yearly Handbook as waste generators are :

- mining and quarrying industry (code CAEN: C) (National Classification of Economic Activities)
- manufacturing industry (code CAEN: D);
- electric and thermal power, gas and water (code CAEN: E);
- production, transport and distribution of electric and thermal energy, gas and hot water production (code CAEN: E 40);

- management of water resources, abstraction, treatment and distribution of water (code CAEN: E 41).

Waste generated by these industries, which has not the nature of municipal waste, can be considered industrial waste. Industrial waste position among other types of waste is summarized in Figure 3-1.

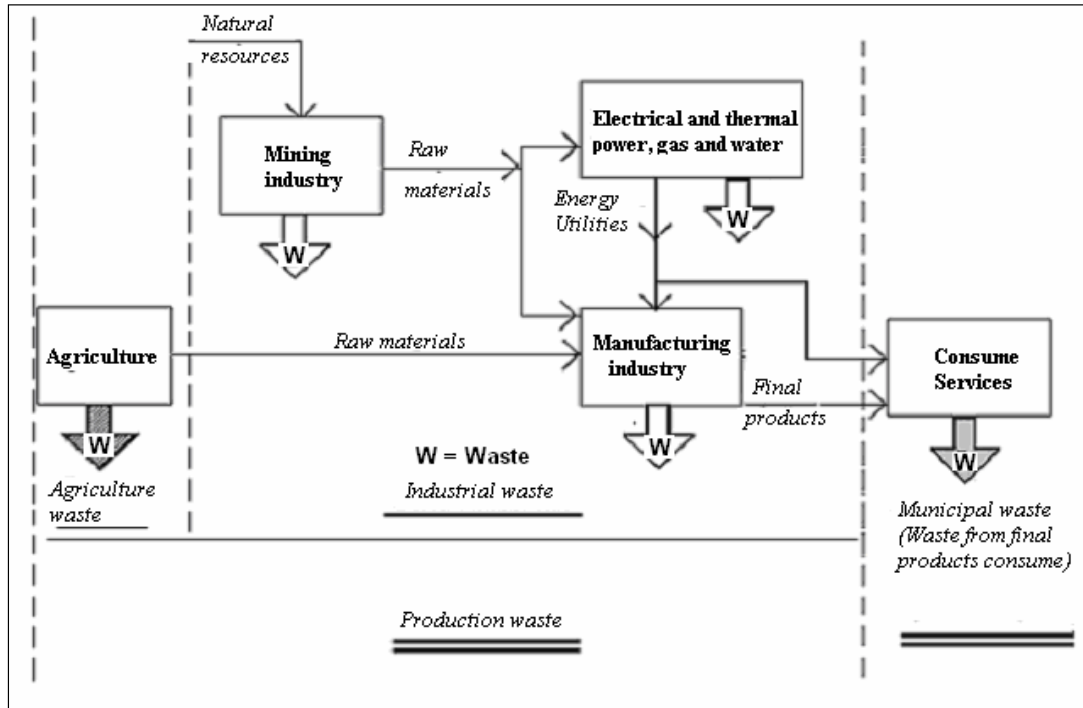


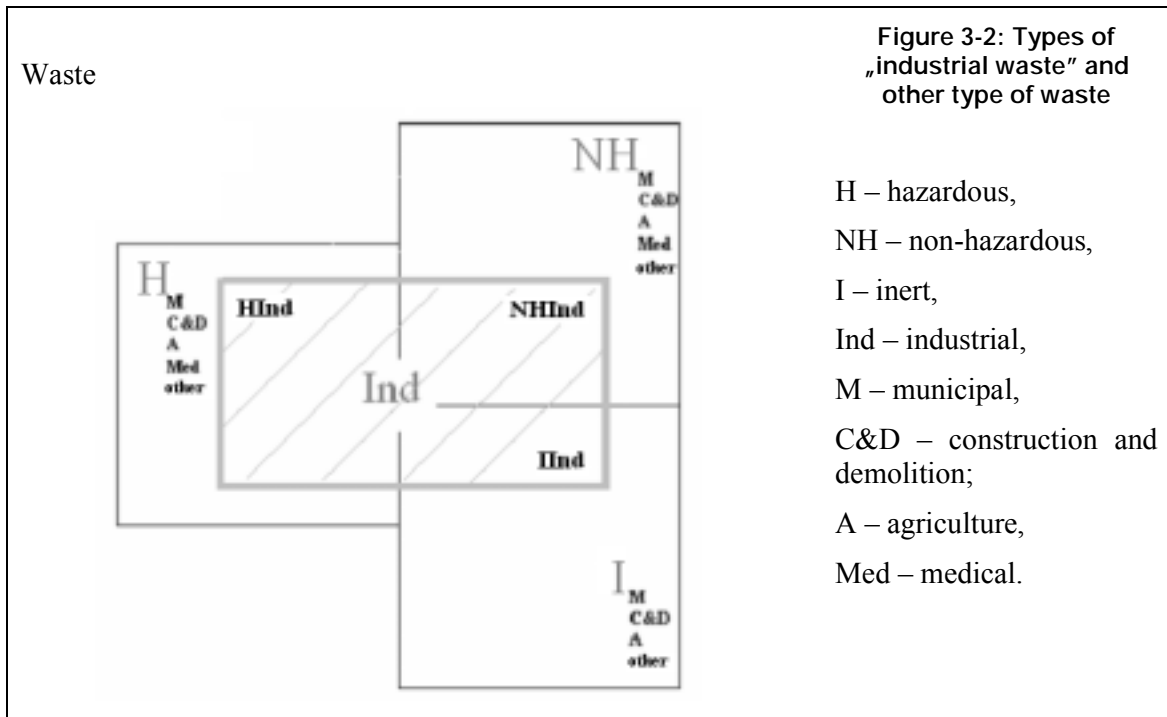
Figure 3-1: A scheme of waste classification in accordance with the main waste generator activities

The LIST of WASTE under Govern Decision no. 856 from the 16th of August 2002 regarding the evidence management of waste and for approval of the list of waste including hazardous, classifies waste in 20 categories where industrial waste are identified in the categories 01, 03-12, and partial 02, 13-15, 19 (see Annex 7).

Industrial process is defined in the brochure „CAEN REV.1, presentation, interpretation, guidance for utilization” as a "transformation process (physical, chemical, manual or of any other nature) used in production of new products (goods, commodities or investments), in used products processing or for delivering of industrial services, as they are defined in section C (Mining and quarrying industry), D (Manufacturing industry)), E (Electric and thermal energy, gas and water) and F (Construction)”. Considering this definition, it results that the construction waste are included in industrial waste category.

A clear classification of the types of industrial waste by source does not exist in Romanian legislation. Furthermore, the recyclable waste from consume and services are defined by Law no. 465/2001 for approval of "Emergency Governmental Ordinance (EGO) no. 16/2001 regarding management of recyclable industrial waste" as „recyclable industrial waste” even if it not generated by an industrial activity (ferrous and non-ferrous metals, paper, cardboard, glass, plastics, rubber, textiles). In this context, the term “industrial” refers to the fact that the waste could be used as raw material sources for industry.

Romanian legislation introduces with EGO. 78/2000 the terms of „hazardous waste” and „waste from production” without defining the last term. In accordance with UE directives, in Directive 75/442/EEC amended by Directive 91/156/EEC (transposed by L426/2002//OU 78/2000) the term of „waste from production” is not considered.



Position of industrial waste category among other types of waste is suggested in Figure 3-2; this scheme takes into account the landfill classification criteria form HG 162/2002 that transposes Directive 1999/31/EC: hazardous (H), non-hazardous (NH) and inert (I).

In accordance with "CAEN REV.1, presentation, interpretation, guidance for utilization" , production is defined as an „activity that generate a product", the term being used not only for agriculture, mining or manufacturing but also for services. In this context, even the waste generated by services could be considered as waste of production.

Industrial waste includes waste of production excluding agriculture, horticulture, aquaculture, forestry, hunting and fishing (partial category 02 of the LIST). In this study the industrial waste will be defined as waste of production generated by an industrial activity excepting those under Art.3 (2) Directive 1999/31/EC (Art. 3, HG 162/2002).

For the waste that does not present danger for the environment, the following activities are excepted from this directive:

- the spreading of sludge, including sewage sludge, and sludge resulting from dredging operations, and similar matter on the soil for the purposes of fertilisation or improvement;
- the use of inert waste which is suitable, in redevelopment/ restoration and filling-in work, or for construction purposes, in landfills;
- the deposit of non-hazardous dredging sludge alongside small waterways from where they have been dredged out or in surface water;

- the deposit of unpolluted soil or of non-hazardous inert waste resulting from prospecting and extraction, treatment, and storage of mineral resources as well as from the operation of quarries.

Management of the mining waste will be regulated in EU by a new directive that is, at this moment, at the proposal level.

4 Environmental impact aspects

The impact of waste landfills on environment consists mainly in emissions of some toxic chemical compounds existing or generated inside landfill, of dust and suspended solids generated during activities develop at landfill site.

(a) only waste that has been subject to treatment is landfilled. This provision may not apply to inert waste for which treatment is not technically feasible, nor to any other waste for which such treatment does not contribute to the objectives of this Directive, as set out in Article 1, by ;

In accordance with Art.6(a) Directive 1999/31/EC, the waste that will be landfilled have to be previously treated to reduce the quantity of the waste or the hazards to human health or the environment. Even in this conditions there is a risk of environment contamination due to toxic compound emissions in air from gases generated from landfill or treatment processes develop near landfill, or in soil and water (from underground and surface) through the leachate produced by the contact of precipitation and waste.

In many cases, worldwide, the landfills are placed inside a complex treatment and final disposal station designed to be used by more generators, and where exists various treatment installations that can generate pollutants into air by themselves.

From landfills, gases and volatile compounds escape into air due to:

- handling;
- ruptures in the cover;
- diffusion through covering membranes;
- solubilization in the leachate that leave the landfill for treatment;
- volatilization before closing;
- exhaustion through the ventilation system.

In case of industrial and municipal waste co-disposal, when accidental fires take place due to an improper operation of landfill, great quantities of „dioxins” could be generated (polychlorinated dibenzodioxine) and „furans” (polychlorinated dibenzofurans) which are bigger than the quantities that could be produced during the life time of an incinerator in normal operating conditions. Also in these fires high quantities of NO_x, dust, incomplete burning products are produced.

Volatile organic compounds emissions could take place during treatment and storage before final disposal, processes that occur generally in areas situated near the landfill.

The leachate produced into landfill is often treated inside landfill site to reduce organic compounds content by biological processes. In this process, volatile organic compounds existing or produced during treatment are released in atmosphere.

Many activities taking place near landfill release in air dust; that activities are: transport and handling, open landfills, treatment of contaminated soil, waste processing operations.

The unpaved roads generate high quantities of dust that can exceeded 1kg/km/vehicle (La Grega and others, 1994). Also, loading and unloading of uncontaminated soil requested by covering or on-site treated soil release high amounts of dust in air.

Estimation of quantities of dust released from site surface by wind (erosion) can be made using known data about wind and soil properties for that region.

Leachate is a result of the contact of rainfall water with the waste from landfill; it is collected from deposit and treated. If the landfill bottom liner is damaged, the leachate might infiltrate and contaminate the groundwater.

Meteoric water collected from the entire site (treatment-final disposal station) is separately treated from leachate. If its collection does not properly run, this water represents an important contamination source for surface and underground waters.

Noise produced by the equipment working on landfill site and waste transportation vehicles represents an environmental stress factor of great impact on neighbourhoods, and the high traffic produces an excessive deterioration of public access roads.

Near industrial waste landfills the existence of birds, parasites or insects are less probable than at landfills where industrial and municipal waste are co-disposed.

Due to complex activities taking place in a landfill, in case of an incorrect operation, a supplementary risk appears associated with aerosol generation, fires, explosions, earth slides.

In accordance with EGO 244/1999 a dam is defined as “any kind of hydrotechnical work having an existing or proposed structure, which is able to assure the accumulation, permanent or non-permanent, of water, liquid industrial waste or solids settled under water (from chemical industry, energetic industry, and settling ponds from mining industry), of which failure could produce uncontrolled spills of the accumulated content, with exceptional negative effects on social, economic and/or natural environment. Environment (Law 466/2001 for approval of EGO no. 244/2000 regarding dam safety). In this category are included both dams and dykes that surround industrial waste landfills.

The same ordinance classifies dams in one of the next categories of importance:

- A: dam of exceptional importance;
- B: dam of special importance;
- C: dam of normal importance;
- D: dam of low importance.

Dams and dykes border deposits for liquids or semisolids containment (sludge, slag, suspensions). Their design (settling ponds, tailing ponds) have to guarantee, in the first instance, the safety in operation even in critical conditions which could produce uncontrolled spills of the deposited liquids. In this respect, the condition for the bottom construction (building materials – rock, sediment; compaction degree etc.). An improper construction could produce:

- groundwater contamination due to infiltration;
- infiltration through dam walls;
- walls collapse.

To avoid this kind of accidents, the dam has to fulfil special requirements regarding the resistance and stability at static and dynamic efforts, including seismic activity. During dam life time, water seepage has to be reduced, infiltrated water through walls and low permeability bottom layers has to be collected and, also, overloading has to be avoided.

Besides impacts and risks mentioned above, can be considered also changes in landscape and visual discomfort produced by waste landfill presence, changing of soil fertility, changing in biocenoses composition from neighbouring areas, green house gases generation, changing the destination of land use (natural or economic).

Many of present practices for collecting, transport, treatment and final disposal of waste and lack of implementation of the principles of integrated waste management, and also the existence of "historical landfills" for industrial waste have a negative impact on human health; industrial waste itself represents because of its content a high risk for flora and fauna, affecting environment quality.

Aiming to reduce the negative impact of landfills for waste on environment and human health, HG 162/2002 stipulates in Annex 2 „General requirements for all classes of landfills" criteria that have to be considered for site selection, requirements for landfill design to reduce negative environmental impact (groundwater, soil, surface water, air), general requirements for environmental protection and control. Paragraph 2.6 of Annex 2 lays down the obligation of land restoration after landfill closure to reduce visual negative impact by creating a buffer green area and planting grass and other species resistant to pollutants on the top of landfill cover.

5 Classification of waste landfills according to Directive 1999/31/EC

In conformity with Art.2(g) of Directive 1999/31/EC 'landfill' means a waste disposal site for the deposit of the waste onto or into land (i.e. underground), including internal waste disposal sites and permanent site (i.e. more than one year) which is used for temporary storage of waste. Are excluded facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere, and storage of waste prior to recovery or treatment for a period less than three years as a general rule, or storage of waste prior to disposal for a period less than one year. Directive 1999/31/EC obliges member states to take action against illegal and uncontrolled dumping of waste.

Each landfill shall be classified in one of the following classes in accordance with Directive 1999/31/EC:

- a) landfill for hazardous waste;
- b) landfill for non-hazardous waste;
- c) landfill for inert waste.

Directive 1999/31/EC Art.6 (transposed by Art. 7(1) HG 162/2002) (a) only waste that has been subject to treatment is landfilled. This provision is one of the most important, representing the driving force of minimization of quantities of waste final disposed.

Industrial waste responsibility belongs to generator and could be transfer to an operator of a waste disposal facility. In this instance, landfills can be located „in situ” near the installation that produce the waste, owned by the waste generator, or „ex situ”, as a landfill belonging or not to a central station for waste treatment and final disposal (CSWTFD) used by more waste generators, the landfill being own by a dedicated operator. A central station for waste treatment and final disposal is a site that includes various waste disposal installations. Figure 5.1 presents a scheme of the main installations and activities from this kind of station.

Waste pre-treatment for reduction of volume, reactivity and other properties that could jeopardize the transport to CSWTFD, is made, usually, by the waste generator.

The capacity of a landfill depends mainly by quantities of waste that will be deposited and the life time. If the quantities produced by a generator are small, he will decide on „ex-situ” option for final disposal. In countries where does not exist a CSWTFD (e.g. Romania) the generator has to build its own landfill, for which location, investment, operation, closure and post-closure costs could go beyond its financial capability.

The landfills belonging to CSWTFD include specific areas and facilities like: reception zone, storage area, laboratory, utilities, transport vehicles, administrative offices. Inside CSWTFD can be place various installation for waste treatment or final disposal as: incinerator for hazardous and/or medical waste, composting station, waste oils processing installation, oil-water emulsion separation installation, etc.

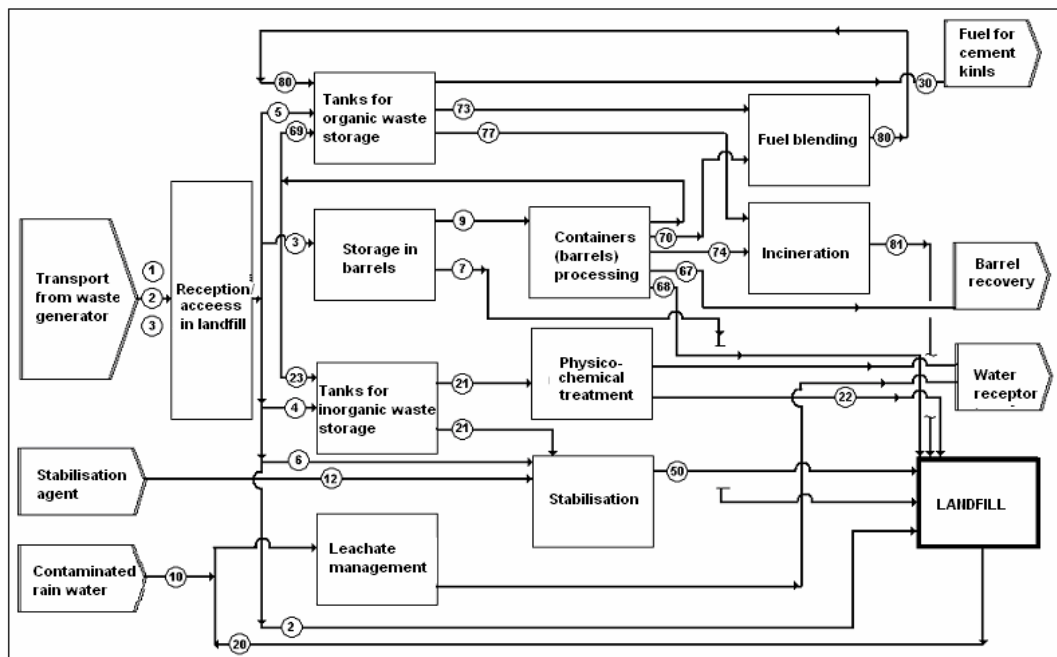


Figure 5-1: A scheme of the main installations and activities from a central station for industrial waste treatment and final disposal

Source: adapted after UNEP, Landfill of Hazardous Industrial Waste – A Training Manual, Technical Report No.17, 1993

Landfill owner can be the waste generator; this case is frequent mainly when the landfill is designed to be used exclusive by one industrial company and is located close to it.

In an industrial waste landfill may be disposed one or more types of waste. Classification of landfills will be made in this respect too.

Simple landfills	Mixed landfills
Landfill for a single hazardous waste;	Landfill for mixed hazardous waste;
Landfill for a single non-hazardous waste;	Landfill for mixed non-hazardous waste;
Landfill for a single inert waste.	Landfill for mixed inert waste.

The use of inert or non-hazardous waste for redevelopment/restoration or for construction purposes in landfill is considered by Directive 75/442/EEC as recovery operation not landfill. Specific waste (ashes, slags, etc.) may be used for construction purposes mixed with other materials.

Landfills has to be conformed with the general requirements of Annex I of Directive 1999/31/EC concerning: location, water control and leachate management, protection of soil and ground water, gas control, stability, safety systems (barriers).

Directive 1999/31/EC establish criteria and preliminary procedures for waste acceptance in the three types of landfills. Commission Decision 2000/532/EC (transposed by H.G. 856/2002) set up the list of waste including hazardous waste in accordance with Art.1(a) of Directive 75/442/EEC. This list represents the main tool for waste acceptance criteria in landfill.

In Romania, for the most industrial waste landfills can not be made a strict and correct classification in the landfill classes defined by Directive 1999/31/EC, these non-complying with Directive 1999/31/EC respectively HG 162/2002 requirements, both from construction and accepted waste point of view. Many of landfills contain mixtures of hazardous and/or non-hazardous and/or inert, being operated in a improper manner. Landfills containing mostly non-hazardous or inert waste, but in which was deposited also hazardous waste, in case that they will not be closed, will be classified as landfills of hazardous waste and the request for permit will be made accordingly.

Data about industrial waste landfills reported by companies are incomplete, reports following some reporting table including a terminology uncorrelated with Directive 1999/31/EC. The terminology used by HG 856/2002 is not correlated with that from L.426/2001 //OU no. 78/2000. In accordance with Art.1 of HG 856/2002 „the companies that generate waste have to keep an evidence of its management”. In conformity with Annex 1, Chapter II, in the fill-in form that have to be complete by the generator regarding “waste temporary storage , treatment and transport” are mentioned the treatment options, and the final destination of the waste could be:

- DO – garbage landfill of city/ commune
- HP – own landfill
- HC – common industrial landfill

In this decision appear terms that are not correlated with the landfill definition and classification from Directive 1999/31/EC (HG 162/2002). The processing of information form the fill-in forms does not offer pertinent data about the class of landfills as it is regulated by Directive 1999/31/EC.

Modifications in landfill classification arisen from new legislation, bring in unclear situations. Therefore, the report „State of environment in Romania in 2002”, produced by the Ministry of Waters, Forests and Environment in 2003, presents two sets of data to illustrate the state of industrial waste landfills, using a classification which is not in accordance with Landfill Directive (see Table 5-1). This situation occurs, probably, as a consequence of the reporting demands from HG 856/2002 and also from the old terms used for landfills classification.

Table 5-1: State of industrial waste landfills in Romania in 2002

Industrial landfills	Settling ponds	Sterile landfills	Slag and ash landfills	Simple landfills	Underground landfills	Total
Number	189 (209)	203 (251)	77	162 (354)	45	676
Covered area (ha)	1608	5409	3102	179	2	10300

Source: MWFE, „ State of environment in Romania in 2002”, 2003 (English version)

The biggest landfills are own by the greatest thermal power plants, chemical inorganic industrial platforms and metallurgical industry. (see Table 5-2).

Table 5-2: The largest industrial waste landfills, in Romania

Landfill	Area (ha)	Type of waste
Landfill for slag and ash CET I and II Isalnița	290	NHW
Landfill for slag and ash thermal power plant Turceni	250	NHW
Settling ponds UZINELE SODICE S.A. Govora	168	HW
Landfill for slag and ash thermopower plant Mintia Deva	101	NHW
Settling pond TRANSGOLD S.A. Baia Mare	93	HW
Iazuri de decantare UPSOM S.A. Ocna Mureș	92	HW
Landfill for slag SIDEX S.A. Galați	90	HW
Phosphogypsum landfill ROMFOSFOCHIM S.A. Valea Călugăreasca (after „State of Environment – 2002 Jud. Prahova” ¹⁷ ; Phosphogypsum landfills 52 ha and pyritic ash landfill 15,3 ha)	90	HW
Landfill for slag SIDERURGICA S.A. Hunedoara	80	HW
Phosphogypsum landfill TURNU S.A. Turnu Măgurele	64	HW
Phosphogypsum, pyritic ash and acid sludge landfill MARWAY-FERTILCHIM S.A. Năvodari	48	HW
Chemical sludge landfill AZOMURES S.A. Târgu Mureș	30	HW
Landfill of waste from non-ferrous metallurgical industry SC Sometra SA Copșa Mică	19.6	HW + IW
Settling ponds DOLJCHIM S.A. Craiova	15.8	HW

Source: MWFE, „State of environment in Romania in 2002”, 2003 (English version)

HW – hazardous waste

NHW – non-hazardous waste

IW – inert waste

To facilitate the reporting procedures by the waste generator and for a correct classification by competent authorities of landfill of waste existing in Romania, it is necessary a correlation of the terminology used by the legislation regarding waste and information dissemination to companies.

¹⁷ Starea mediului 2002– Județul Prahova

6 Industrial waste generated in Romania; types, quantities, structure

Types and quantities of waste generated by economic companies, as well as their management, are registered in the Waste Database. Annual update of this database is realised by ICIM Bucharest under the coordination of MEWM – Directorate for Waste Management and Hazardous Chemicals.

Between 1995 and 2001, waste classification has been done according to European Waste Catalogue; from 2002, GD 856/2002 has introduced the List of waste, including hazardous waste, by which the way of classifying hazardous waste has been changed.

GD 856/2002 provides that industrial companies must register generated waste and must send centralised data to local environmental protection authorities, annually. For year 2002, has been reported a total amount of 372.4 mil. tons of waste generated from industry and agriculture. From this total amount, 344.5 mil. tons represent waste from mining industry (mostly waste / inert waste from extraction of metallic and non-metallic minerals) (see Figure 6-1).

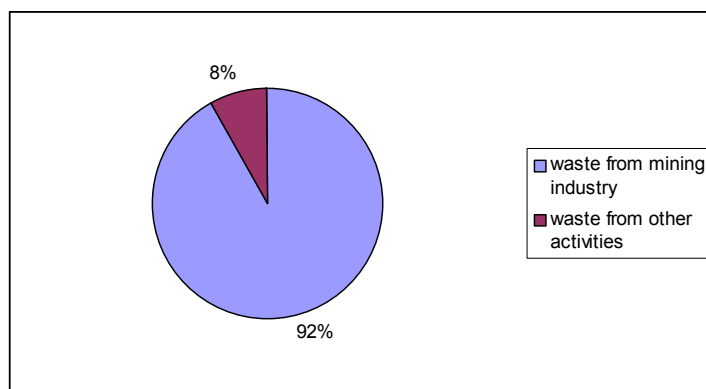


Figure 6-1: Structure of production waste, generated in 2002

Source: Draft of National Waste Management Strategy, January 2004

According to a previous chapter, production waste are generated from all fields of economic activity, as follows: agriculture and forestry, mining industry, energetic industry, processing industry, construction, trade, transport and storage.

Industrial waste is considered to be that generated from the following economic activities:

- mining industry;
- energetic industry;
- processing industry (food, textile, leather, wood and furniture, pulp and paper, chemistry and petrochemistry, rubber and plastics, non-metallic products, metallurgy, metallic construction, machinery and equipment, transport means, waste recovery);
- constructions¹⁸.

¹⁸ It must be mentioned that, according to NWMS and NWMP, construction waste is considered as municipal waste.

According to the above mentioned classification, it results that only 368 mil. tons can be considered industrial waste (Figure 6-2), out of which:

- 344.5 mil. tons waste from mining industry;
- 11.4 mil. tons waste from processing industry;
- 11.7 mil. tons waste from energetic industry;
- 0.4 mil. tons waste from construction activities.

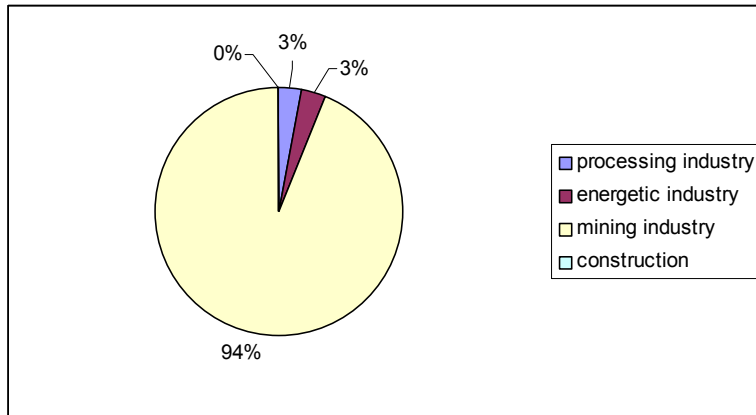


Figure 6-2: Structure of industrial waste generated in 2002

Source: Study on waste management at local and national level in 2002., ICIM Bucharest, 2003

Industrial activities that have generated (in 2002) the largest amounts of waste, excepting mining industry, are the following¹⁹:

- power industry 11.7 mil tons;
- metallurgy 4.8 mil tons;
- food industry 1.2 mil tons;
- chemical and petrochemical industry 1.1 mil tons.

In 2002 there have been generated about 2.5 mil. tons of hazardous waste from all industrial activities, including mining²⁰. Having in mind that agriculture and trade generate very small quantities of hazardous waste, it can be considered that all generated hazardous waste have been industrial waste.

At present, landfilling represents the main disposal method for industrial waste.

According to data registered for 2002, about 69% from the generated quantity (excluding mining waste) has been disposed of / landfilled, as follows²¹:

- about 38% of waste generated from processing industry is landfilled;
- almost the whole quantity of waste generated from energetic industry is landfilled.

¹⁹ Source: Draft of National Waste Management Strategy, www.mappm.ro

²⁰ Source: Draft of National Waste Management Strategy, www.mappm.ro

²¹ Source: Draft of National Waste Management Strategy, www.mappm.ro

It must be mentioned that, according to European statistical data, relative industrial waste quantities generated in Romania (Kg/inhabitant) are not significantly higher than in other countries from Central and Eastern Europe²² (see Annex 4). For example, the quantity reported for Romania is about 1979 Kg waste/inhabitant, value that is close to those for Poland (3204 kg/inhabitant) or Czech Republic (3333 kg/inhabitant); the quantity reported for Bulgaria is very different - 11003 kg/inhabitant. This situation is due to some specific characteristics of each country, as well as to the different ways of measuring and reporting the generated waste quantities²³. For example, in Romania:

- waste quantities reported by industrial companies are usually based on estimations and not on precise weighing or volume measurement;
- there are situations in which waste generated by the same industrial company are collected and landfilled together, without taking into account their different types;
- there are some deficiencies in the way of waste classification according to the List of waste.

The above mentioned issues have several causes, out of which the following have to be mentioned:

- legislation for waste management is not enough observed and applied;
- there are not used financial instruments (incentives and penalties) that could help legal norms enforcement;
- lack of campaigns for information and training.

At the moment of EU accession, this situation will change and the values will become similar.

Geographically speaking, landfills for industrial waste are located close to industrial areas, excavations, mines etc. (see Figure 6-3). For example, the largest quantities of generated waste (excluding mining waste, more than 1 mil. tons) have been registered in counties Galati, Gorj, Arad, Timis, Hunedoara, Valcea, Mures, Dolj. Industrial waste generated in these counties represents more than 50% from the total amount²⁴.

²² Source: National Waste Management Plan – preliminary, GD 123/2003

²³ For example, reported quantities are based on estimations, not on weighing or volume measurement.

²⁴ Source: Study on waste management at local and national level in 2002, ICIM Bucharest, June 2003



Figure 6-3: Geographical distribution of the main landfills for industrial waste in Romania in 2002

Source: Study on the Strategy for Hazardous Waste Management in Romania, JICA Project, 2003

7 Landfilling industrial waste

7.1 Existing industrial landfills

According to those mentioned in the previous chapter, landfilling represents the main disposal route for industrial waste in Romania.

Based on waste characteristics, landfilling is realised in two main ways:

- non-hazardous industrial waste is usually disposed of, based on a contract, on the landfills for municipal waste owned by local administration;
- hazardous industrial waste or that waste that is not accepted on municipal landfills is disposed of on landfills owned by the generating companies.

Until Directive 1999/31/EC transposition, landfills for industrial waste were classified as follows:

- i. dumps for mining waste – areas on which the material resulted from excavation of metallic and non-metallic minerals is deposited;
- ii. dumps for slag and ash – areas on which the material resulted from burning processes is deposited (burning of coal in power-plants, metallurgical processes);
- iii. ponds – excavated areas in which liquid waste is deposited; the word is used for hazardous waste from crude oil processing, as well as for sludge, waste from chemical industry, waste from animal breeding;
- iv. settlement ponds – excavated areas in which liquid waste with suspended matters is deposited, for their settlement; the word is used both for waste from mining industry, and for waste from chemical industry, food industry etc.;
- v. drying beds – represent facilities belonging to an industrial wastewater treatment plant, in which sludge is discharged for its natural drying;
- vi. industrial landfills – represent areas used for solid waste discharge;
- vii. underground storage – underground construction used for waste discharge.

In 2002, 687 landfills for industrial waste²⁵ have been registered to be in operation. More than 50 % represent dumps for mining waste, ponds and industrial landfills (see **Error! Reference source not found.**).

²⁵ Source: Draft for National Waste Management Plan, March 2004

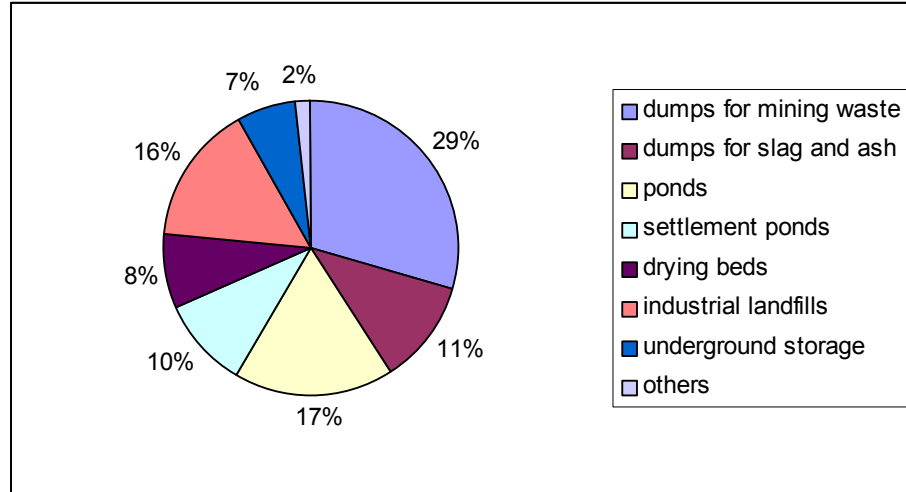


Figure 7-1: Structure of landfills – number - for industrial waste depending on their type (2002)

Source: Study on waste management at local and national level in 2002, ICIM Bucharest, June 2003

Total surface occupied by industrial landfills has been estimated at about 10300 ha, out of which about 50 % represents the surface occupied by dumps for mining waste²⁶ (see Figure 7.2).

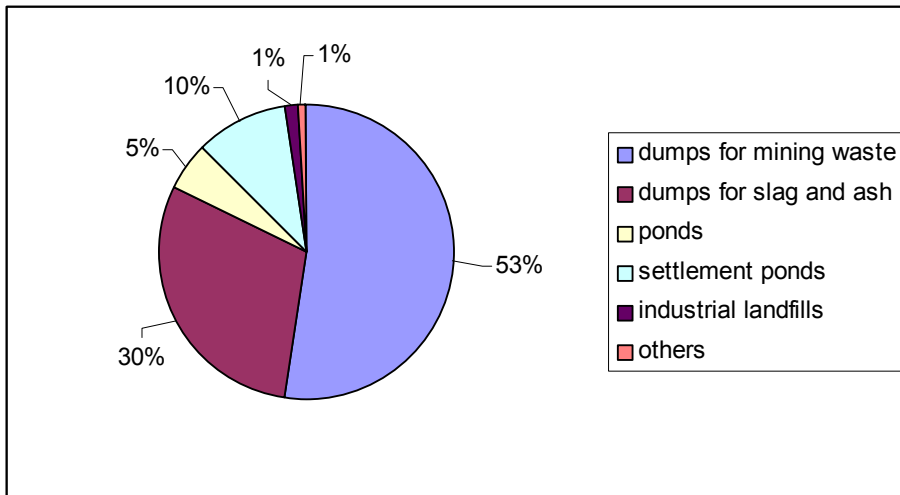


Figure 7-2: Structure of landfills' surface - for industrial waste depending on their type (2002)

Source: Study on waste management at local and national level in 2002, ICIM Bucharest, June 2003

Excluding the dumps for mining waste, the largest surfaces are occupied by dumps for slag and ash belonging to power-plants (Isalnita, Turceni, Mintia) and to metallurgical industry (Hunedoara, Galati) and by the landfills for waste generated by chemical industry (Govora, Tr. Magurele, Tg. Mures). These landfills represent 30% from the total surface occupied by landfills for industrial waste.

According to the information from MEWM, many of the existing landfills for industrial waste are not constructed and equipped in order to comply with EU requirements. Dumps for slag

²⁶ Source: Study on waste management at local and national level in 2002, ICIM Bucharest, June 2003

and ash from power-plants have some constructive and operation elements for environmental protection – base-sealing with clay, leachate collection system, stability dikes, wells for groundwater monitoring²⁷.

Directive 1999/31/EC, as well as GD 162/2002 on the landfill of waste, defines a landfill as a waste disposal site for the deposit of waste onto or into land and forbids the landfilling of liquid, explosive, not-treated hazardous waste etc. Underground storage is defined as a permanent waste storage facility in a deep geological cavity such as a salt or potassium mine.

According to these provisions, ponds, settlement ponds (others than those for mining waste) and drying beds can not be considered landfills as EU defines. These sites for waste disposal will be closed at the moment of Romania's accession and another management route will be found for the waste.

Underground storage sites registered in Romania are not as EU defines, but are underground constructions used mainly for the storage of certain types of waste for which the generator has not found yet another method for recovery or disposal.

At the beginning of year 2004, MEWM updated the inventory of industrial landfills that are covered by the provisions of Directive 1999/31/EC on the landfill of waste, in order to complete the implementation plan for this Directive. Information from local authorities has been analysed and it was noticed that some of the sites reported as landfills were actually other types of locations for storage of industrial waste before recovery or disposal (ex: concrete platforms, reservoirs etc.).

Updating of the above mentioned inventory did not contain information for waste disposal sites that are not subject to Directive 1999/31/EC – dumps and settlement ponds for mining waste.

The inventory registered 169 landfills for industrial waste that are subject to Directive 1999/31/EC²⁸, out of which:

- 66 landfills for solid waste;
- 52 dumps for slag and ash;
- 40 ponds (others than those for mining industry);
- 11 settlement ponds (others than those for mining industry).

The occupied surface is about 2765 ha.

As has been already mentioned, Directive 1999/31/EC classifies the landfills as follows:

- landfills for hazardous waste – class “a”;
- landfills for non-hazardous waste – class “b”;
- landfills for inert waste – class “c”.

Existing landfills for industrial waste have been classified according to EU provisions, taking into account the followings:

- activity type of the industrial company that owns the landfill;
- types and quantities of landfilled waste.

The highest ratio, both as number (108) and surface (2384 ha) is represented by landfills for non-hazardous waste - class “b”.

²⁷ Source: National Waste Management Plan – preliminary GD 123/2003

²⁸ Source: Study for the completion of implementation plan for Directive 1999/31/EC with information on industrial landfills, ICIM Bucharest, March 2004

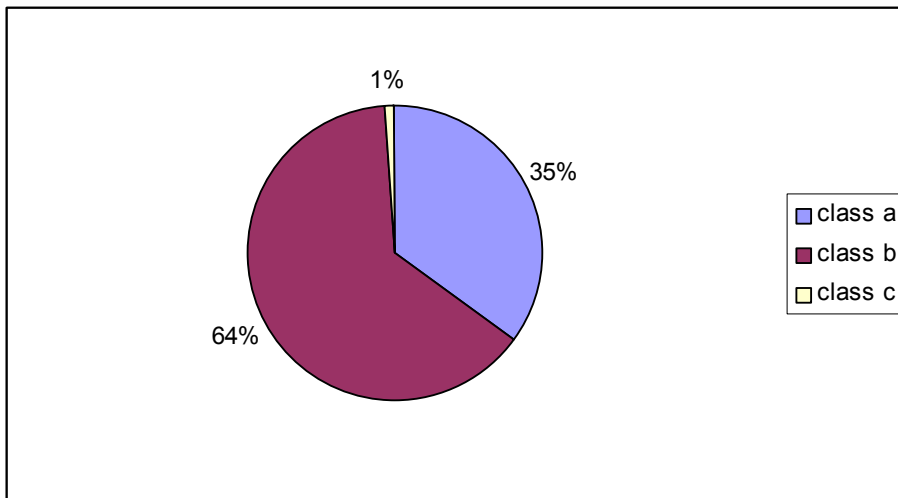


Figure 7-3: Structure of industrial landfills – number – depending on the type of waste

Source: Study for the completion of implementation plan for Directive 1999/31/EC with information on industrial landfills, ICIM Bucharest, March 2004

7.2 Legal situation of the landfills for industrial waste

All landfills for industrial waste that are in operation are owned by the industrial company that generates the waste.

Beside the landfills that were in operation in 2002, there is a number of landfills so called “closed”, that are no more used because they have no free capacity or because of the ceasing of the industrial activity. In most of the cases, the closure of these landfills has not been realised according to European and national norms.

The closure of the industrial landfills according to EU requirements needs a large amount of money. Profitable industrial companies will be obliged to invest in order to solve the problem of non-complying landfills. But in some cases, the situation is more complicate, because the responsibilities are not very clearly defined:

- some landfills for industrial waste have been owned and used by state owned companies that stopped their activity;
- some landfills for industrial waste which have no free capacity now, were used by companies that have been privatised, only that the new owner did not take over the environmental duties for the landfill;
- some landfills were abandoned or the owner has bankrupted.

In some cases, large landfills, with large amounts of waste (even hazardous waste), are in one of the above mentioned situations. **State must involve itself and must give some financial support in order to solve the legal situation of these landfills and to close them according to EU requirements.**



The following must be noticed regarding number and surface of industrial landfills in Romania:

- information provided by different sources is not uniform and indicates a wide variation from one year to another; because it is not possible for the landfills to be open and closed such frequently, the reason seems to be the way of data reporting and collecting;
- industrial companies do not know enough the existing legislation and there are also cases in which they do not have clear information about the landfills they manage;
- the lack of financial resources, as well as the insufficient personnel within environmental protection authorities do not allow periodically checking of the information, in order to have centralised data at national level as correct as possible.

8 Estimating the main types of industrial hazardous waste

As it has been already mentioned, hazardous waste is defined according to EGO 78/2000 on waste, approved and completed by Law 426/2001. Types of waste that are considered to be hazardous are listed in GD 856/2002 regarding waste management and for the approval of the List of waste, including hazardous waste.

According to available data, about 2.5 mil. tons of hazardous waste have been generated in 2002²⁹ (see Figure 8-1). Having in mind that agriculture, transport and trade generate only small quantities of hazardous waste, it can be considered that the whole quantity of hazardous waste represent industrial hazardous waste. Comparing to the previous years, a larger quantity has been registered in 2002 (0.9 mil. tons in 2000³⁰ - see also **Error! Reference source not found.**); this is due to the new List of waste, that replaced the European Waste Catalogue and has introduced a new type of hazardous waste from mining industry for which about 1.9 mil. tons have been generated in 2002. Making the difference, it results that about 600 thousand tons of hazardous waste have been generated in 2002 from energetic and processing industry.

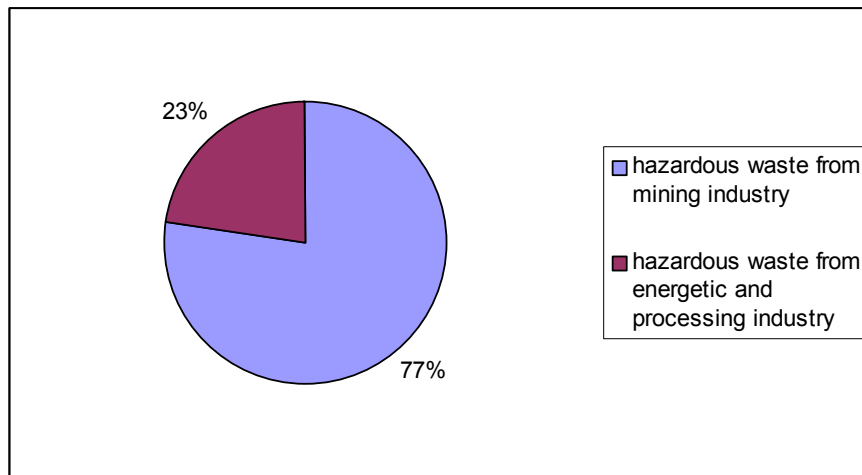


Figure 8-1: Hazardous industrial waste generated in 2002

Source: Study on waste management at local and national level in 2002 ICIM Bucharest, June 2003

Excluding mining industry, industrial activities that generate the largest amounts of hazardous waste are³¹:

- chemical and petrochemical industry (including crude oil processing);
- metallurgical industry;
- machinery industry;
- industry of electric and electronic equipment.

²⁹ MEWM – Draft of the National Waste Management Plan, January 2004

³⁰ National Waste Management Plan – preliminary GD 123/2003

³¹ National Waste Management Plan – preliminary GD 123/2003

The largest amounts of hazardous waste, excluding mining waste, are from the following types³²:

- waste from inorganic chemical industry;
- waste from crude oil processing, from petrochemical industry and from the treatment of wastewater with oil content;
- waste from organic chemical industry;
- waste from metallurgical industry;
- waste from the treatment of wastewater with heavy metals and / or cyanides.

The quantity of hazardous waste generated in Romania decreased continuously during the last years, mainly due to the activity ceasing of some large industrial companies³³.

Between 2002 – 2003, MEWM has got financial support from Japan International Cooperation Agency (JICA), for preparing a Study for Master Plan for Hazardous Waste Management in Romania. The study had as main result the Strategy and the Action Plan for Hazardous Waste Management in Romania, document that has been prepared by a team of Romanian and foreign experts.

The above mentioned study contains the following main chapters³⁴:

- Hazardous waste – characteristics, principles, management and definitions
- Hazardous waste quantities
- Waste prevention and recycling
- Hazardous waste collection and transport
- Hazardous waste treatment and disposal
- Management of contaminated areas
- Administrative, legal and institutional issues
- Economic issues
- Summary of the Strategy and of the Action Plan

Within the above mentioned study, quantities of hazardous waste generated in 2002 (excluding mining waste) have been estimated based on the following criteria:

- i. survey of 80 industrial companies with different activity profiles (company visit and the filling in of a questionnaire with information about number of employees, raw materials, products and generated waste, wastewater treatment facilities, facilities for air emissions control etc.; all the data have been analysed and processed in ICIM Bucharest);
- ii. survey of 600 industrial companies with different activity profiles (questionnaire sent by mail and filled in by the companies; data have been centralised and processed in ICIM Bucharest);
- iii. estimation of a specific generation rate for hazardous waste, taking into account the number of employees and the type of activity (it has been assumed that this kind of estimation is more relevant for Romania than that using the products quantity).

³² National Waste Management Plan – preliminary GD 123/2003

³³ EC, EUROSTAT – Hazardous and Industrial Waste Management in Accession Countries, 2003

³⁴ Study on Master Plan for Hazardous Waste Management in Romania, Final Report, August 2003

According to these estimations, the quantity of hazardous waste generated in Romania in 2002 is about 1.2 mil. tons³⁵, out of which 48 % represents oil waste (from crude oil processing, and from the use of industrial and engine oils). This value is twice greater than that registered for 2002, but it is recommended to be used as a base for the development of hazardous waste management system on short term (2007 – 2010), having in mind the following issues:

- a. privatisation of the large industrial companies will lead to the growth of industrial activity, thus to larger generated quantities of hazardous waste;
- b. technology improvements, that are meant to reduce the generated waste quantities, will be implemented only during a relative long period of time.

Generation of hazardous waste is almost uniform from the geographical point of view, in a range from 9% in Region South-West, to 16% in Region Center³⁶ (see Figure 8-2).

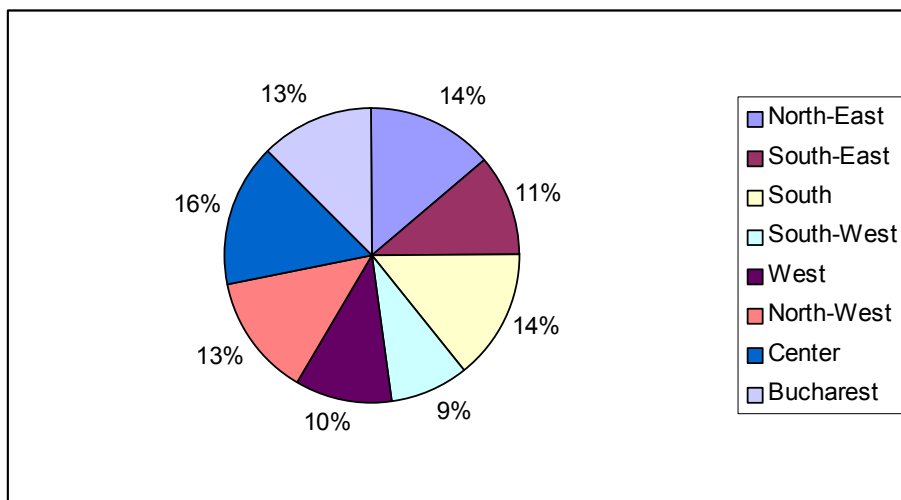


Figure 8-2: Regional distribution of hazardous waste generation in 2002

Source: Study on Master Plan for Hazardous Waste Management in Romania, Final Report, August 2003

Landfilling of hazardous waste has a strong environmental impact and long term risks. So it is obvious that the main objective must be the use of other methods of recovery / disposal of hazardous waste.

According to the results of the studies made by cement companies, two main types of waste can be co-incinerated in the cement kilns³⁷:

- i. combustible waste that can be partially used instead of traditional fuels – oil waste (including waste oils), organic compounds from chemical industry, sludge from industrial wastewater treatment plants, wood and paper contaminated with hazardous substances, plastics, waste solidification during storage etc.;
- ii. waste with mineral content similar to that of traditional raw materials (lime, gypsum, clay) – slag and ash from power-plants and from metallurgy, sand etc.

³⁵ Study on Master Plan for Hazardous Waste Management in Romania, Final Report, August 2003

³⁶ Study on Master Plan for Hazardous Waste Management in Romania, Final Report, August 2003

³⁷ Oana Dinu – Involvement of cement industry in waste management in Romania, Salubritatea nr. 3(7)/2003

Co-incineration in cement kilns seems to be the most appropriate disposal method for more than 50% from hazardous waste generated in Romania. There is the need to create legal, administrative, institutional and financial framework for:

- development of collection, transport and treatment system for hazardous waste in order to facilitate their recovery in cement kilns;
- changing / improvement of technologies for cement and other materials production, in order to create necessary conditions (from economic and environmental point of view) for co-incineration.

An efficient system for hazardous waste management must contain the following steps:

- i. training of the industrial companies in order to improve the waste databases (correct classification of generated waste according to GD 856/2002);
- ii. development of legal, administrative, institutional and financial framework for a network for collection, transport and treatment of hazardous waste;
- iii. treatment with material and / or energy recovery;
- iv. development of incineration capacities, complying to EU requirements, for those types of hazardous waste that can not be co-incinerated (ex: waste with PCB);
- v. development of landfilling capacities, complying to EU requirements, for those types of hazardous waste for which there is no other feasible method of treatment / recovery or treatment / disposal.

It will be necessary to construct landfilling capacities for the following types of hazardous waste: a) waste with asbestos and b) waste with inorganic chemical content (liquid waste with acids, alkalies, metals, cyanides, halogens etc.).

Establishment of the location / locations for the landfill for hazardous waste will be possible only after precise assessment, at regional and national level, of the followings:

- types and quantities of generated hazardous waste;
- treatment / recovery techniques that exist or that can be implemented in the future.

Undertaking these steps needs both involvement of industrial companies and a coordination from the authorities (economic and environmental), because the assurance of necessary capacities for treatment / disposal according to EU requirements can be approached only at regional level.

9 Estimation the structure of the industrial landfills under IPPC directive

In this chapter it will be assess the status and structure of industrial landfills which has to comply with IPPC Directive. This directive was transposed by the Govern Ordinance no. 34 from 21 March 2002 and approved by the Law 645/2002.

9.1 Legal frame

For setting up the legal frame for IPPC requirements implementation, more complementary legislation have been issued (see Annex 11). One of the most important secondary piece of legislation is the Order of the Ministry of Agriculture, Forests, Water and Environment no.818/2003 which creates the legal frame for permitting of installation covered by IPPC Directive.

In accordance with IPPC Directive, the waste disposal installations covered by IPPC Directive are mentioned in Annex I of Directive at Category 5. Waste Management, with the following components:

- 5.1. Installations for the *disposal* or recovery of hazardous waste as defined in the list referred to in Article 1 (4) of Directive 91/689/EEC, as defined in Annexes II A and II B (operations R1, R5, R6, R8 and R9) to Directive 75/442/EEC and in Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils (3), with a capacity exceeding 10 tonnes per day.
- 5.2. Installations for the incineration of municipal waste as defined in Council Directive 89/369/EEC of 8 June 1989 on the prevention of air pollution from new municipal waste incineration plants (4) and Council Directive 89/429/EEC of 21 June 1989 on the reduction of air pollution from existing municipal waste-incineration plants (5) with a capacity exceeding 3 tonnes per hour.
- 5.3. Installations for the disposal of non-hazardous waste as defined in Annex II A to Directive 75/442/EEC under headings D8 and D9, with a capacity exceeding 50 tonnes per day.
- 5.4. Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25000 tonnes, excluding landfills of inert waste.

In accordance with EGO 34/2002 that transpose IPPC Directive, the equivalent waste management activities are:

- 5.1. Installations for the *landfill* or recovery of hazardous waste with a capacity exceeding 10 tonnes per day.
- 5.2. Installations for the incineration of municipal waste with a capacity exceeding 3 tonnes per hour (in Romania does not exist incinerators for waste management, thus this category will be not discussed in this study).
- 5.3. Installations for the *landfill* of non-hazardous waste with a capacity exceeding 50 tonnes per day.
- 5.4. *Controlled landfills* receiving more than 10 tonnes per day or with a total capacity exceeding 25000 tonnes, excluding landfills of inert waste.

The authors of this study consider that OU 34/2002 interprets in a debatable manner the subcomponents of Category no.5. In the above presentation of subcomponents of Category no.5 of IPPC activities, it can be observed that the transposition of these activities was made partial and incomplete that arise important misunderstanding during the IPPC installation/landfill classification. Accordingly, the following aspects have to be mentioned:

1. for activities no. 5.1, the disposal installations for hazardous waste are equivalent only with landfills, without mentioning the types of disposal operations from EGO 78/2000 (*Annex II – Waste Disposal OPERATIONS*). As a result activities with an important impact on environment, like for example hazardous waste incineration, are excluded.
2. in addition, at category no. 5.1, the installations for *waste oils disposal and recovery* are not mentioned;
3. at category no.5.3, EGO 34/2002 stipulates *landfill* of non-hazardous waste while IPPC Directive lays down the disposal operations defined by Annex II of 75/442/EEC Directive *paragraphs D8 and D9*, meaning:
 - D8 Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are disposed of by means of any of the operations in this Annex
 - D9 Physical - chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are disposed of by means of any of the operations in this Annex (e.g. evaporation, drying, calcinations, etc.)
4. at category no.5.4, EGO 34/2002 stipulates "*controlled landfills*", term that is not defined in other regulations as in the GD 162/2002.

In the self classification process by the owner of the installation, confusing situations could appear. For a correct classification of waste management activities under EGO 34/2002 approved by L 645/2000, it is necessary the change of the definitions in accordance with the provisions of IPPC Directive.

It is important to point out that there are many important differences between IPPC landfills and the rest of industrial waste landfills. The most important differences with extreme important economic implications will be presented next.

IPPC landfills are assimilated with industrial installations and have to comply with a lot of other special conditions comparing with the other landfills. The most important condition is to get the integrated environmental permit which allows the installation to operate.

A second important difference is the classification of the landfills into two categories: existing landfills and new landfills. The existing landfills has to comply or otherwise to be closed, and the new landfills has to comply from the very beginning.

Because Romania requested in the Position Paper CONF-RO 37/01 the reconsideration of transition period , for IPPC Directive it was considered transition periods landfill by landfill until the 31st of December 2014. All waste landfill for which it is requested transition period are considered to be existing installation both from point of view of IPPC Directive requirements and national legislation transposing the directive, being started before 1999.

On the other hand, the competent authorities has to review the permits issued for new IPPC landfills that start operating between the 30th of October 1999 and 30 the date of coming into force of EGO 34/2002 transposing IPPC Directive.

From the first consulting meetings, EU Commission agreed the fact that no BREF will be elaborated for waste landfill because Annex 1 of the Directive 99/31/EC included all the needed technical requirements (DEFRA, 2001), but „*European Technical Adaptation Committee*” will amend the directive in accordance with the most recent advancement in technical and scientific field.

Landfills being used by more installations, shall be classified as activities under Category no.5 (Annex I 96/61/EC) (see Table 9.1). For an existing landfill that belongs to an IPPC installation including more activities, the integrated permit shall include also the landfill activity. If the installation is not under Directive 96/61/EC, the landfill shall apply for a permit in accordance with Landfill Directive.

Table 9-1: Industrial waste landfill classification in accordance with type of permit

Landfill type	Installation classification in accordance with Annex I 96/61/EC	Type of permit
Landfill as a part of an IPPC installation	installation category	Integrated Permit (IPPC)
Landfill as a part of an non-IPPC installation	5.1, 5.3, 5.4	Integrated Permit (IPPC)
	is not IPPC activity	Landfill
Landfill operating for more installations	5.1, 5.3, 5.4	Integrated Permit (IPPC)
	is not IPPC activity	Landfill

9.2 Landfills under IPPC Directive provisions (interim inventory)

Besides the requirements of Landfill Directive, the operators (including landfill under IPPC Directive as activity classified in Category no.5 of Annex 1 or a technical stationary installation, carrying on more activities including landfill, classified in another category of Annex 1) shall assure public information and participation in integrated permit procedure, in accordance with Art. 15 of Directive 96/61/EC. Also, in accordance with Annex III of the same directive, certain air and water (leachate) emission shall be monitored.

The permitting procedure, in general and implicitly for waste landfills, in accordance with Ministry Order no. 818/2003 and the General Technical Guide, started in 2004 and it is anticipated that until the deadline stipulated in EGO no. 34 from 21 March 2002 and approved by Law no. 645/2002, all IPPC landfills will start the permitting process, including landfills considered “new” installations defined in accordance with the Directive.

The deadlines for the finalisation of compliance program implementation, in accordance with the requirements of IPPC Directive, are presented in **Error! Reference source not found.**

After the deadline, the landfills that do not comply with the requirements of Law no. 645/2002 approving EGO nr. 34/2002 regarding integrated pollution prevention, reduction and control, will have stop their activities.

Table 9-2: Compliance deadlines for the waste landfills under IPPC Directive provisions, in accordance with Law 645/2002

Nr.	Landfill types	Compliance deadlines
1.	Existing landfill I (built before 30/10/1999)	before 30/10/2007 or established by negotiations
2.	Existing landfill II (built between 30/10/1999 and 03/04/2004)	before 31/12/2006
3.	New Landfill (built after 30/04/2002)	date of entrance in operation

In the compliance program for waste landfills shall be included the technical measures for reaching the provisions of art. 11 of Directive IPPC and specially the utilization of the best available techniques (BAT). After approval of compliance program by the central public authority for environmental protection, this become compulsory for the landfill operator.

Environmental permits for the landfills operating under an approved compliance program are issued with deadlines for each measure included in program.

Noncompliance with terms and measures included in compliance program shall entail the termination of environmental permit validity and the suspending of landfill activity until the measures accomplishment.

The last inventory³⁸ (March 2004) of industrial waste landfills elaborated by MMGA, emphasised the existence of 108 industrial waste landfills (out of 169) that are under IPPC Directive provisions, of which 67 request transition period for IPPC Directive compliance and 41 do not request transition period. Most of the landfills that do not request transition period (about 85%) shall be closed until 2007 (see Annex 12).

For a correct evaluation of the number of industrial waste landfills under the IPPC Directive provisions, Environmental Protection Agencies have to check the operators' declarations for their landfills based on declarations, field inspections, technological balances, and also to consider the waste storage on industrial sites.

³⁸ see Annex 12

10 Industrial waste / landfills for industrial waste that are not subject to Directive 1999/31/EC

Directive 1999/31/EC, transposed by GD 162/2002 on the landfill of waste is applied to all types of waste that are subject to Directive 75/442/EEC.

Emergency Governmental Ordinance no. 78/2000 on waste, changed and completed by Law 426/2001 (by which Directive 75/442/EEC has been transposed), does not cover the following types of waste:

- radioactive waste;
- waste resulted from prospecting, extraction, treatment and storage of mineral resources and the working of quarries;
- animal carcasses and the following agricultural waste: organic matters and other substances used in farming;
- waste waters, with the exception of waste in liquid form;
- gaseous effluents emitted into the atmosphere;
- waste of explosive substances.

Only mining waste and radioactive waste can be considered to be landfilled.

10.1 Waste from mining industry

10.1.1 Legal framework

It has to be mentioned from the beginning that neither existing European legislation, nor Romanian norms define very clear what “mining waste” means. Furthermore, the provision from Law 426/2001, Art. 2 regarding mining waste is very complicated and uses words that are not part of the specific vocabulary, although it tries to use the phrasing from Directive 75/442/EEC – “*Provisions of this norm are not applied for rocks and soil deposits, as well as for deposits of mineral resources resulted from drillings, prospecting and extraction of mineral resources, including surface quarries*”.

In the List of waste, including hazardous waste (introduced in the Romanian legislation by GD 856/2002), waste from mining industry is found at code 01 – Waste from mineral extraction and from minerals physical and chemical treatment, being classified as follows:

- 01 01 – waste from mineral extraction;
- 01 03 – waste from physical and chemical processing of metallic minerals;
- 01 04 – waste from physical and chemical processing of non-metallic minerals;
- 01 05 – sludge and other drilling waste.

Mining industry in Romania is regulated by the mining Law (law 85/2003). The main provisions of this norm refer to:

- general framework and definitions;
- access to land for mining activities;
- regime of minerals trading;
- rights and duties of the owner of the licence/permit for extraction/exploring;
- permitting procedure;

- taxes, mining royalties and tariffs;
- mines closure procedure;
- tasks of competent authority including the responsibilities of the central authority.

National Agency for Mineral Resources (NAMR) is the competent authority with tasks and responsibilities for applying Law 85/2003 provisions. NAMR will also transpose and implement European norms in this field to Romanian legislation.

At present, at European level there is a proposal for a Directive on the Management of Waste from the Extractive Industries - 2003/0107 (COD) - that is seen as a complementary norm for Directive 75/442/EEC on waste. This Directive covers the management of waste from the extractive industries (extractive waste) – waste resulting from the extraction, treatment and storage of mineral resources and the working of quarries. The following definitions are important for the scope of this study:

- mineral resource (mineral) – naturally occurring deposit in the earth’s crust of an organic or inorganic compound, such as oil, bituminous shale, coal, lignite, metal, stone, slate, clay, gravel or sand, including natural gas, but excluding water;
- treatment – mechanical, physical or chemical process or combination of processes carried out on mineral resources with a view to extracting the mineral, including size reduction, classification, separation and leaching, and the re-processing of previously discarded waste, but excluding thermal processes;
- heap – engineered facility for the disposal of solid waste on the surface;
- pond – natural or engineered facility for disposing of fine-grained waste, normally tailings, along with varying amounts of free water, resulting from the treatment of mineral resources and from the clearing and recycling of process water.

The proposal establishes minimum requirements that must be observed in order to prevent or minimise as much as possible any adverse effects on the environment and any resultant risks to human health, brought about as a result of the management of waste from the extractive industries. There are to be mentioned the following issues:

- facilities for mining waste management will be subject to a specific permitting procedure;
- public information and its participation in decision making;
- technical criteria for location, construction, operation, closure and after-care of the facilities for mining waste disposal.

Both Law 85/2003 and the Directive proposal provide the obligation of the titler to assure some activities related to environmental protection and waste management, such as:

- preparing of a waste management plan, and of a rehabilitation plan during operation and after closure;
- preparing of an emergency plan in case of accidents that may affect the environment;
- financial security for environment rehabilitation during operation and after closure.;
- development of a programme for monitoring after closure.

10.1.2 General information on mining activity³⁹ in Romania

Information from Ministry of Economy and Trade shows that the situation of mines from Romania in 2001 was according to that presented in Table 10.1.

At present, closure of about 340 mining objectives is approved. According to Law 85/2003 (Chapter 7, Art. 52, paragraph 3), closure of the mines and environment rehabilitation for the objectives with activity stopped before this norm enforcement (and which are not subject to a license) are financed from state budget.

For the mines which are subject to a license, the operator has the responsibility for closure. Stopping of activity must be approved by the competent authority and it is based on a technical programme of closure or preserving of the objective; this programme must include the monitoring programme after closure. Competent authority is responsible to control the implementation of the closure plan and the fulfilment of the operator’s obligations.

Table 10-1: Mineral extraction capacities in Romania (2001)

Mining sector	Mines number		
	In operation	In preservation	Closed (rehabilitated)
Coal	70	64	48 (7)
Metals (non-ferrous, ferrous, precious)	44	47	85 (6)
Salt	10	1	4 (0)
Uranium	3	8	12 (0)
Other minerals	22	5	22 (4)
TOTAL	149	125	171 (17)

Source: Environmental assessment of mining sector in Romania, September 2001 (Wardell Armstrong, IWACO)

10.1.3 Waste generated from mining industry; waste disposal

Waste generated from mining industry can be classified according to the scheme below. The scheme shows the potential effect of the future Directive for mining waste management, meaning that the way of classification of the waste from mining sector will be very important.

Material characteristic		MINING WASTE		
		←	Less hazardous	More hazardous →
Waste type	Materials that are not considered as waste	Inert waste	Non-hazardous and non-inert waste	Hazardous waste
Potential effects of the Directive on mining waste management	Can be excluded from the provisions of the Directive for mining waste Directive	Can be included under the provisions of the Directive for mining waste management		

Figure 10-1: Mining waste according to the proposed Directive on mining

³⁹ Excluding crude oil and natural gas extraction

In the waste database managed by MEWM there have been registered 344.5 mil. tons of mining waste generated in 2002⁴⁰. From this total quantity, the greatest part is represented by waste from minerals extraction.

Depending on their characteristics, mining waste is disposed of in specific ways, as follows:

- waste from metallic and non-metallic mineral extraction is disposed of in dumps and settlement ponds;
- waste from oil and gas extraction is disposed of in ponds.

Information regarding waste management in 2002⁴¹ shows that there are about 200 dumps and 70 settlement ponds in operation. As regards the number of ponds for mining waste from oil extraction, this can not be estimated within this study, because the word “pond” is used also for other disposal facilities – other types of waste.

Dumps

A dump can be defined as “the site for depositing and the deposit of inert material extracted from a mine or resulted after mechanical processing operations”⁴².

The material from the dumps contains a wide range of rocks and soil, depending on geology and on the mine type. Waste from a dump can be theoretically classified as follows:

1. inert material and rocks from surface quarries;
2. inert material and rocks from underground mines, very poor minerals that are not processed;
3. waste from the process – dry waste from initial processing, material from wet processing, other residues.

Quantity and quality of the waste from the dumps vary depending on mineral type and on type of extraction.

Usually, activity in surface quarries generates more waste than in underground mines, although these types of waste can be introduced back in the mine after its closure.

Disposed waste contains a wide range of rocks and materials – clay, sand, deposits, salts and other metallic compounds.

Mining waste disposal into dumps generates several forms of environmental impact, out of which the most important are:

- large land areas are occupied and can not be used in other purposes for a long period of time;
- soil, surface and groundwater pollution with different compounds dissolved from waste;
- in case of extraction of minerals with sulphide content, acid drainage is increased;
- visual impact.

One very important problem is the stability of the dumps, taking into account their construction characteristics and the type of disposed waste.

Environmental impact generated by mining waste disposal into dumps can be reduced by specific activities regarding location choosing, design, construction and operation, stability control etc.

⁴⁰ MEWM – Draft for National Waste Management Strategy, March 2004

⁴¹ Study on waste management at local and national level in 2002, ICIM Bucharest, June 2003

⁴² “Politehnic” Dictionary, Editura tehnică, București, 1967

Settlement ponds

Settlement ponds represent facilities at the ground surface (usually there is no need for an excavation, but the natural relief is used). These facilities are used for separation of suspended matters from water. After settlement, water is recycled or treated in order to be discharged. Waste disposed of in settlement ponds is mainly processing waste, but also drain water, water collected from other surfaces etc.

Quantity and quality of the waste from the settlement ponds vary depending on mineral type and on type of extraction. Solid part contains inert materials, salts and other metallic compounds; liquid part contains dissolved chemical substances - some of them are hazardous (cyanides from precious metals processing) or have negative effect on the environment (acid or alkaline pH, sulphate or carbonate content).

Mining waste disposal into settlement ponds generates several forms of environmental impact, out of which the most important are:

- large land areas are occupied and can not be used in other purposes for a long period of time;
- soil, surface and groundwater pollution with different compounds dissolved from waste;
- in case of extraction of minerals with sulphide content, acid drainage is increased;
- visual impact.

A very important issue is the risk of damage of different equipment from a pond, risk that can be increased by the occurrence of not-usual natural phenomena (earthquakes, flooding, and soil sliding).

Environmental impact generated by mining waste disposal into settlement ponds can be reduced by specific activities, such as:

- i. measures for waste prevention (use of clean technologies, waste treatment, use of another disposal route);
- ii. measures for location choosing, design, construction and operation, risk avoidance.

Final Report of the study Environmental Assessment of Mining Sector in Romania has as one of the conclusions, the fact that settlement ponds represent a major risk in Romania, both on short and long term, because of the lack of experience and of the low level of training and awareness.

Ponds for oil waste

Ponds represent facilities constructed for the disposal of waste from crude oil extraction. Usually, materials disposed of in ponds contain waste with water, waste with oil, waste with salts or hazardous substances.

Location, construction and operation of the existing ponds have impact on the environment, such as:

- soil and groundwater pollution with toxic compounds;
- surface water pollution with contaminated waters;
- air emissions of toxic organic compounds;
- visual impact.

One very important issue is the risk of fire (because of the specific character of the waste) and the risks of accidents caused by the entrance of non-authorized persons close to the disposal areas.

In the last years, some companies specialised in oil waste treatment have appeared; these companies collect both oil waste currently generated and that already disposed of, assuring their preliminary treatment, followed by co-incineration.

X X X

In 2001, Final Report of Environmental Assessment of Mining Sector in Romania has proposed an Environmental Action Plan for mining sector, containing actions and measures on short, medium and long term, in the following fields:

- i. **legal framework:** preparing of norms, procedures and technical guidelines;
- ii. **administrative and institutional framework:** training of the personnel from mining companies and environmental authority regarding BAT, environmental management systems, risk management etc.;
- iii. **implementation:** update and improvement of the existing databases, preparing of the procedures for environmental management systems, planning of investments and budgets for Action Plans for each mine, development of a Pilot Action Plan for each mining sector, environmental impact assessment for each mine, implementation of the action plans for environment.

The first need is to update and improve the system for data reporting and processing. According to statistical data⁴³, quantities of generated mining waste varied very much during the last years (from tens to hundreds millions tonnes). Since the production did not register such wide variations, it is obvious that the problem is the way of defining and classification of the waste, as well as the capacity of environmental authority to enforce the legislation at the level of industrial companies.

There is a need for cooperation between NAMR and environmental authority for transposition and implementation of European norms for mining waste management. Overall objectives and principles, established by the National Strategy for Waste Management are valid also for mining waste and they must be observed in order to develop an economically and environmentally sound management system.

10.2 Radioactive waste

10.2.1 Regulations and responsibilities concerning radioactive waste management

National development strategy on nuclear domain and Action Plan to implement this strategy (HG 1259/2002) sets up, as secondary objectives resulting from the chapter: “*Principles and conditions to develop the nuclear area*” the strategies related to “radioactive waste and used fuel management according to international requirements”:

- i. “national regulations requirements enforcement concerning radioactive waste and depleted fuel management until the final disposal;
- ii. disposal of low, respectively intermediary, radioactivity waste, resulted from CANDU reactor units operation and shutting down at the end of their working phase;
- iii. location selection for final disposal facility of depleted fuel;

⁴³ National Waste Management Plan – preliminary GD 123/2003

- iv. joining to international programmes focused on disposal facilities locations and security assessment;
- v. optimal solutions identifying and applying to implement advanced fuel cycles, which lead to a lower amount of depleted fuel discharge, related to the same power production“.

The action plan states both permanent and perspective actions related to radioactive waste management, taking into account that, after 2040, the final disposal of depleted fuel generated by nuclear reactors should be ensured.

Law no. 111/1996 republished (1998) on Safe Deployment of Nuclear Activities, regulates the safety of nuclear activities in peaceful purposes, involving a minimal risk, and by complying to international conventions and agreements signed by Romania, and appoints the National Commission for Nuclear Activities Control, under the Government control, as effective national authority in nuclear area.

Law no. 320/2003 to approve Emergency Government Ordinance no. 11/2003 related to nuclear depleted fuel and radioactive waste management, including final disposal, which regulates the responsibilities regarding nuclear depleted fuel and radioactive waste management, and their final disposal in safety conditions, defines in Article 5 some terms related to radioactive waste management, such as:

“c) **used nuclear fuel management** – all the activities regarding fuel handling, including effluents control, intermediary storage and/or final disposal;

d) **radioactive waste management** – all the activities, including the already closed ones, related to resulted effluents handling, pre-treatment, treatment, intermediary storage and/or final disposal, transportation and control;

f) **used nuclear fuel** - nuclear fuel irradiated inside a reactor and having been definitively removed;

“g) **radioactive waste** - radioactive materials, in gaseous, liquid or solid state, which cannot have any use, containing or being contaminated with radio-nuclides at higher levels than the exception ones;”

“i) **intermediary storage** – used nuclear fuel or radioactive waste storage inside a facility which ensures their isolation, control and monitoring, allowing their treatment in order to final disposal or directly their final disposal;

j) **final disposal** – ultimate storage of used nuclear fuel or radioactive waste inside an adequate nuclear facility;”

“m) **useful lifetime** – duration in which used nuclear fuel or radioactive waste management facility is used according to the purpose for which it has been designed; for a final disposal facility, it means the calculated duration from the used nuclear fuel or radioactive waste storage until its final closing and sealing;

n) **final disposal facility closure** – completion of all operations subsequent to used nuclear fuel or radioactive waste final disposal, which include the latest works or other required actions to ensure the long-term facility safety;”

“p) **used nuclear fuel and radioactive waste generator** - corporation which performs radioactive waste generating activities;”

“s) **national strategy** – the document which regulates the basics of used nuclear fuel and radioactive waste management, including final disposal and nuclear and radiological facilities closing”.

Article 9. (1) of Law no. 320/2003 establishes the national authority competent to co-ordinate, at a national level, the used nuclear fuel and radioactive waste safe management, including their final disposal. This is **National Agency for Radioactive Waste (ANDRAD)**. According to Article 15, paragraph f, ANDRAD “draws up procedures and specific technical regulations for all used nuclear fuel and radioactive waste management stages, including final disposal, and nuclear and radiological facilities closing”; also “g) co-ordinates feasibility and location studies drawing up and starting up of used nuclear fuel and radioactive waste final disposal facilities; h) co-ordinates all the nuclear and radiological facilities closing stages; i) ensures, directly or by third parts, physical protection of used nuclear fuel and radioactive waste final disposal facilities.” Article 21 of the above mentioned law requires that: “the direct responsibility for used nuclear fuel and radioactive waste, until their final disposal, belong to the authorised manager, for the entire useful lifetime, including the nuclear and radiological closing duration.”

Actually, in the EU does not exist a specific regulatory framework regarding radioactive waste storage and final disposal, and requirements concerning used radioactive sources disposal. The directive proposal (Euratom) presented by Commission, regarding used nuclear fuel and radioactive waste management, tries to create the necessary framework to ensure, inside all member states, long-term programmes for radioactive waste management, by complying to fundamental and international waste management principles. Some terms, such as “final disposal”, “radioactive waste management”, “storage” are also defined.

The directive proposal requires to member states (Art. 5, paragraph 2) to include in their radioactive waste management national programmes:

- release of permits for proper final disposal facilities until 2008;
- for final disposal facilities which store low disintegration duration radioactive isotopes and having a low and intermediary radiation levels, the operation permits will be released until 2013;
- for final disposal facilities which store high disintegration duration isotopes and having a high radiation level, the operation permits will be released until 2018.

The European regulations regarding radioactive waste storage and final disposal are:

- basic regulations for protection against radiation, which apply „Basic Safety Standards” – (96/29 Euratom);
- Directives 96/29/EURATOM, 92/3/EURATOM, 85/337/EEC, 97/11/EEC;
- Commission Recommendation regarding radioactive waste classifying system (SEC(1999) 1302 final, 1999/669/EC, Euratom).

Main radioactive waste indexes and definitions are presented in Annex 13.

10.2.2 Radioactive waste storage capacities

According to study “*EC Nuclear Safety and the Environment*” (1999) radioactive waste storage at **Nuclear Power Plant from Cernavodă CANDU** is performed into a temporary facility designed for 15 years of operating per reactor, which contains three storage systems and one in construction:

- solid waste intermediary storage (capacity 18 years per reactor for LILW waste);
- ion exchange resins storage (two tanks buried in concrete, having a 200 m³ capacity - enough for the facility lifetime - for resin storage in demineralised water);
- used fuel storage (storage tank, having a 49,000 bars – about 5,000 per year);

- used fuel dry storage, is planned to be put in place in 2005.

Inside the **Nuclear Activities Autonomous Administration (Regia Autonomă pentru Activități Nucleare - RAAN)**, the **Nuclear Research Institute – Pitești** possesses two TRIGA reactors, a pulse reactor and a stationary one, where the CANDU fuel is tested. The used fuel from TRIGA reactors is stored into a tank, which is located next to the reactor. RAAN takes over and stores the high radioactive used sources into secured cells. The Institute signed a contract, partially supported by the European Community, in order to take over, partially storage and final disposal of 10 old radiotherapy sources (each of them containing 700 kg depleted uranium), which will be replaced by new sources. To work out this task, RAAN has to draw up a storage and final disposal project for all 7,000 kg of depleted uranium.

Inside the **Institute of Physics and Nuclear Engineering „Horia Hulubei” (IFIN) – Măgurele** are stored radioactive waste from hospitals, agriculture, research, industry and from Institute's own research reactor. The radioactive waste storage capacities are:

- LLAW storage (capacity $2 \times 300 \text{ m}^3$, having a load degree of 60% in 1999);
- LLSW storage (capacity 20 m^3 , having a load degree of 25% in 1999);
- ILW storage (capacity 200 m^3 , secured containers, having a load degree of 15% in 1999);
- wet storage of used sources (capacity 3000 pieces, having a load degree of 16,7% in 1999);
- smoke detectors (storage capacity 100,000 pieces, cu having a load degree of 7.5% in 1999);
- neutron sources (storage capacity 100 pieces);
- treated waste storage (capacity 3000 containers⁴⁴, having a load degree of 26,7% in 1999).

Used sources are pre-treated at IFIN Măgurele for final disposal at DNDR Băița-Bihor. It has been estimated that, in April 2001, about 2,500 used sources have been sent for final disposal, while 20,634 used sources were temporarily stored at Măgurele⁴⁵. Liquid waste are treated with phosphates, hexacyanoferrate and ferric chloride, to result a precipitated ferric hydroxide having a low specific activity. This is stabilised by solidification with Portland cement and transported for final disposal at Băița-Bihor.

The **National Radioactive Waste Repository (Depozitul Național de Deșeuri Radioactive - DNDR) from Băița-Bihor** have been started up in 1985, having a storage capacity of about 20,000 containers (being 25 % loaded in 1999), which can be extended at about 150.000 - 200.000 containers⁴⁶. LLW and ILW are not separated in this facility.

The Băița-Bihor repository, a former uranium mine, is located at about 840 m below sea level, having 11 galleries (800 m) distributed at both sides of a main gallery. The all galleries entire volume is about $5,000 \text{ m}^3$ and is considered to be great enough for a 50 years disposal period for waste generated by industry and research. The facility capacity could be extended also to take over the medium and low radioactivity waste originated from Nuclear Power Plant Cernavodă⁴⁷.

⁴⁴ Source: EC Nuclear Safety and the Environment, 1999; EC Nuclear Safety and the Environment, 2003

⁴⁵ Source: EC Nuclear Safety and the Environment, 1999; EC Nuclear Safety and the Environment, 2003

⁴⁶ Source: EC Nuclear Safety and the Environment, 1999; EC Nuclear Safety and the Environment, 2003

⁴⁷ Source: S. Webster, 1999; EC Nuclear Safety and the Environment, 2003

The “National Strategy of Nuclear Area Development in Romania and Action Plan to Implement this Strategy” (HG 1259/2002) mentioned that, taking into account that first nuclear unit has been started up in 1996, “the Romanian state has another four decades to select a high radioactive waste final disposal solution”.

Radioactive waste resulted from mining are disposed next to the mining facilities.

11 Assuming responsibilities for compliance with environmental requirements regarding landfill of industrial waste⁴⁸

According to provisions of NSWM and NPWM, waste management activities must follow the hierarchy of priorities, as follows:

- prevention of generation – by using clean technologies;
- quantity reduction – by applying BAT in each activity field that generates waste;
- recovery – by recycling and energy recovery;
- disposal – by incineration and landfilling.

National Strategy for Waste Management contains specific objectives for industrial (including hazardous) waste management, synthesized into the following main issues:

- politics and legal framework;
- institutional and organisational framework (including development of a specific informational system to allow “tracking” of waste and hazardous waste from generation source to disposal point);
- human resources;
- prevention of waste generation and quantities reduction;
- material and energy recovery of waste and hazardous waste;
- waste collection and transport;
- waste treatment and disposal;
- management of the sites contaminated because of bad waste management;
- waste management system financing;
- raising awareness of waste generators, environmental authorities and public regarding the negative effects of bad waste management.

Responsibility of industrial waste management belongs to the generators. For the compliance with EU requirements, it will be the need of cooperation between industrial companies and professional associations in order to develop an appropriate management system for the generated waste.

In order to allow the development of a viable system, public authorities must involve themselves in the following activities:

- i. development and application of a coherent legal framework according to EU requirements;
- ii. creating of a national system for data reporting and analysing;
- iii. development of a financial framework (incentives and penalties) favorable for the waste management system and for development of a service market in this field;
- iv. management of those landfills that have no more owners (because of the bankruptcy of the owner or because of the change of the owner);
- v. raising awareness of waste and hazardous waste generators;

⁴⁸ According to the implementation timeschedule for Directive 1999/31/EC and Directive 96/61

- vi. raising public awareness regarding waste and hazardous waste management impact on environment and human health.

Responsibilities and obligations of the stakeholders, related to waste landfilling, are provided by GD 162/2002 and EGO 34/2002 approved by Law 645/2002; some of them are listed in Table 11.1 and Table 11.2.

Table 11-1: Obligations and responsibilities for industrial waste disposal, according to GD 162/2002

Waste generators and waste holders		
	Art. 9 – (1)	Finance landfill activities
Landfill operator		
<i>New landfills (complying)</i>	Art. 10	Within application for the environmental agreement must prove the financial security for good execution.
	Art. 11. - (1)	Must assure the Fund for closure and after-care.
	Art. 15. - (1)	Must apply waste acceptance procedures at the landfill: a) checking of the documents regarding waste type, quantity, source and characteristics (including test reports for hazardous waste and for municipal waste, if the case), as well as regarding identity of generator and / or holder; b) visual checking of waste at the entrance of the landfill and at the discharge point and, if the case, checking of compliance with the documents, according to procedure at Point 3, level 3 from Annex 3; c) keeping at least for 1 month of the samples taken for the checking according to point 3, level 1 or 2 from Annex 3, as well as the keeping of the results; d) keeping of a register with information regarding quantities and characteristics, source, nature, date of transport, identity of the generator / holder / collector / hauler and, for hazardous waste, precise location in the landfill (for regional landfills, an informatic system will be used).
	Art. 15. - (2)	Must give to the hauler a form filled in to confirm the accepted waste.
	Art. 16	Must prove that the waste is accepted according to the provisions of its environmental permit and according to criteria from Annex 3 for each class of landfill.
	Art. 17	Must achieve self-monitoring. Self-monitoring during operation contain: a) technological self-monitoring; b) self-monitoring of the quality of environment.
	Art. 20.	Must report to local EPA: a) twice a year – data resulted from self-monitoring (in order to prove compliance with the environmental permit, as well as the level of compliance programme achievement); b) within maximum 12 hours – any negative effects noticed as a result of self-monitoring programme.
	Art. 25. (1)	Is responsible for after-care, according to environmental permit.
	Art. 25. (3)	Must keep the results of monitoring programme during all after-care period.
	Art. 25. (4)	Must announce as soon as possible to the local EPA any significant negative impact noticed as a result of monitoring after closure and must observe the decision of competent authority regarding measures that must be taken.
<i>Existing landfills (non-complying)</i>	Art. 26. - (1)	Must: a) carry out environmental audit (level II) and, if the case, study of risk assessment, according to valid norms; b) submit to local EPA the compliance programme, including financing sources, if the conclusions of the assessments is that the landfill may continue operation.
	Art. 27.	After issuance of environmental permit, landfill operators must assure the Fund for closure and after-care.
<i>Existing landfills for hazardous</i>	Art. 30 – (1)a	Within 2 years from the date of GD 162/2002 enforcement, is forbidden to accept waste listed at Art. 5 and the operators must apply waste acceptance procedure, according to Art. 15 and Annex 3.

<i>waste</i>		
	Art. 30 – (1)b	Accepts for landfilling only treated hazardous waste, according to Art. 6 and 7, within max. 8 years from the date of GD 162/2002 enforcement.
	Art. 30 – (2)	Prepare a compliance programme, according to Art. 26 alin. (1) .
Local EPA		
	Art. 13	Checks the landfill before operation start, in order to establish the compliance with environmental agreement provisions and to issue the environmental agreement.
	Art. 14	At the request of National Statistics Institute, presents the information from environmental agreements of the landfills.
	Art. 21.	Decides measures for remediation that must be taken by operators.
<i>Old landfills</i>	Art. 26. - (2)	Approves the compliance programme, as well as the deadlines, and establishes the final deadline for implementing the measures.
	Art. 26. - (3)	Depending on the results of environmental assessments, announce to the public administration the decision of stopping or continuing operation of the landfill.
	Art. 28	Decides stopping of operation for those landfills that do not get environmental permit.
Local public administration		
	Art. 9 – (2)	Must assure that all the costs, including those for closure and after-care, are covered by the tax/price for the landfilled waste.
	Art. 11 – (7)	Checks the assurance and the use of the Fund for closure and after-care.
	Art. 11 – (8)	Assure that necessary information about the landfill (including costs) are public.
	Art. 28.	Must take measures for constructing a new landfill if the existing one does not get environmental permit.
	Art. 29.	Must take measures for constructing a new landfill if the existing one is about 75% full.
Local EPA and central environmental authority, local and central public authorities		
	Art.33	Contraventions and penalties

Table 11-2: Obligations and responsibilities for industrial waste installations resulted from Emergency Ordinance 34/2002 approved by Law 645/2002

Operator (in case of facilities at point 5 from Annex I, this is the owner or the operator of the landfill)	
Art. 10.	Must get, from design stage, <i>integrated environmental agreement</i> , for all the activities listed in Annex 1; must get <i>integrated environmental permit</i> for all activities that exist at the date of EGO 34/2002 enforcement;
Art. 11.	<ul style="list-style-type: none"> a) Must take all measures for an efficient pollution prevention, mainly by using BAT; b) Must take measures in order to assure that no important pollution will be caused; d) Must assure efficient energy use; e) Must take all measures for action in case of accident pollution and for limiting its effects; f) Must take measures in case of activity stopping, in order to avoid any pollution risk and to rehabilitate the site.
Art. 12. -	<ul style="list-style-type: none"> (1) applies for integrated agreement / permit when operation type is changed; (2) must inform competent authorities for environmental protection about any change intended to be done for changing the installation or the process.
Art. 13.	Must observe the conditions provided by integrated agreement / permit.
Art. 14.	Must inform competent authority, at the deadlines provided by integrated environmental permit, about results of monitoring; information about any accident that affects the environment must be sent within maximum 24 hours.
Art. 15.	Must present to the competent authority all necessary data during the checking of the installation and must assist it during sampling procedures.
Competent authority for environmental protection	
Art. 3. - (1)	<ul style="list-style-type: none"> a) Coordinates and controls the enforcement of EGO 34/2002 for issuance of integrated environmental agreement / permit; b) Prepares and, if the case, approves procedures and measures needed for uniform enforcement of EGO 34/2002 ; c) Coordinates preparing and update of the norms regarding integrated pollution and prevention control; d) Assures necessary measures for the integrated environmental agreement / permit to be issued according to EGO 34/2002 and all other valid norms; e) Assures all measures for information regarding BAT; f) Assures legal and institutional framework for access to information and for public participation in the permitting procedure; g) Makes public the results of monitoring programmes and the way of complying with the permit; h) Publishes annually the inventory of the main emissions and generating sources; i) Within bilateral relationships, announces certain information to neighbour countries, based on mutual relationship; j) Checks the compliance with legal norms; k) Checks if all needed measures have been taken in order to avoid a significant pollution; l) Checks all measures for waste recovery and disposal; m) Checks measures for efficient energy use; n) Checks all measures for accident prevention and limiting their effects; o) Checks if all necessary measures have been taken in order to avoid pollution risks and to rehabilitate the site after activity stopping.
Art. 5.	<p>Takes necessary measures for:</p> <ul style="list-style-type: none"> a) all new IPPC installations to start operation only if they get an integrated environmental permit; b) no significant pollution to appear; c) permitting of existing installations to be according to provisions of Art. 1 (3). d) observing of provisions of Art. 17, when applying compliance programme for existing installations.
Art. 6. - (1)	Issues integrated environmental agreement / permit, observing the integrated approach of environment elements.
Art. 7. - (1)	Periodically checks and updates if necessary, permitting conditions.
Art. 8. - (1)	Establishes all necessary measures for compliance with the permit.
Art. 9.	<p>Assures and guarantees free access to information and public participation in decision making, by:</p> <ul style="list-style-type: none"> a) making public all applications for permitting; b) making public the taken decision and all the necessary updates; c) making public the results of the monitoring programmes.

Responsibility for abandoned sites and for mine closure

In Romania, as in other European countries, there are many abandoned mining sites that have impact on environment and human health. Some documents show that there are 23 such hazardous sites from mining industry that are monitored and watched by the Governments of Hungary, Romania and Slovakia. This list does not include abandoned sites.

Furthermore, the problem will become more difficult in the future, when the existing mines will be out of stock and will be closed. It is a problem at European level that must be solved. This issue of permitting at opening has been taken into account, very serious, during the last years for the mines in Europe. For example, in Lisheen, Ireland, it has been opened one of the largest mines in the world; it produces annually 1,500,000 tons of minerals. The permit issued in 1997 provides for the development of an Environmental Management System, a Closure Plan and a Plan for Continuously Protection, as well as the undertaking of a research programme for finding the optimum closure solution. The operator had to assure 12.2 mil. € for financing Closure Plan and 1.7 mil. € for the Plan for Continuously Protection. The authors consider that in the future, the permits for minerals extraction will need to include also measures for closure and after-care.

As regards existing activities, that have not closure plans and financing, the authorities must take immediately necessary measures for assuring adequate systems for environmental protection, according to Polluter Pays Principle.

The real problem is represented by the sites on which all activities have stopped and where the “closure” (abandoned sites) have not been done according to the norms. It is a real problem of establishing the responsibilities for sites that are abandoned, “without owner” (from various reasons), or with an owner without financial capability. In such situations, the rehabilitation costs must be financed from other sources. The authors insist that it is an urgent need for clarifying these situations and identifying the possible solutions.

The main problem is who should has the responsibility and who should pay for the rehabilitation of these sites. First of all, an inventory of these sites is necessary, as well as a prioritisation depending on the risks on environment and human health, based on an uniform applied methodology.

The rehabilitation measures and the financing sources will be established correctly only after the inventory and the prioritisation list will exist.

12 Conclusions and Recommendations

12.1 Conclusions

A review of the data and information presented in the previous sections leads to the following conclusions.

1. After extraordinary efforts, in 2000 – 2004 the Acquis Communautaire on waste management has finally been fully transposed in Romania; currently, implementation plans are being developed;
2. As transposition was very fast, there is an important gap between the legal provisions and the actual implementation of legislation; fast transposition of Community documents also caused several regulations (government decisions, ordinances, etc.) to require several revisions and amendments, after publication;
3. The institutional structure is in place and of considerable size; new institutions have been created, such as the National Environmental Protection Agency, Regional Environmental Protection Agencies, the National Agency for Hazardous Chemical Substances; the National Agency for Radioactive Waste, etc.; these new institutions are supplemented by more experienced ones including the National Commission for the Capitalization of Reusable Waste; the National Agency for Mineral Resources, ICIM etc.; in this context, coordination between the existing structures is essential as coordination is still little visible to date;
4. Lack of qualified personnel at the central level is apparent; the MEWM – Waste and Hazardous Chemical Substances Management Directorate and the MET have a small number of employees. For example, the National Agency has started hiring personnel, but this will take time;
5. Low integration of environmental protection policy and other policies (industrial, agricultural, transport, etc.); a big problem that could not be solved is the capacity to formulate a coherent environmental policy and hence one for industrial waste management, in correlation with other policies, strategies, or programs (especially industrial policy, transport, agriculture policy, etc.). One of the biggest problems still facing environmental institutions in Romania is the difficulty of including environmental criteria and needs into other policies and strategies; the idea is still widely held that environmental issues have to be solved by the environmental authorities and the involvement of the other branches – industry, energy, agriculture, transport etc. – should be minimal.
6. The dynamics of the volume of industrial waste generated in Romania may not be established with any certainty due to the lack of a consistent database and the change of definitions; this is a very serious problem, as it does not allow a good estimation of the total volume of industrial waste generated; not knowing the trend of industrial waste quantities, in correlation with industrial dynamics, coherent policies will not be possible (objectives, criteria, measures, investment costs, etc.);
7. The definition of industrial waste is absent from national legislation, which determines divergent levels of quantities generated, depending on which institution reports; in the same context, also note the debatable transposition of some Community texts (Annex 1, Category 5 of the IPPC Directive) creating

important classification problems with significant effects on the measures provided in the implementation schedules;

8. In recent years, lesser and lesser quantities of industrial waste were reported, although industrial output has undergone an ascending trend; there is no longer a question of “*decoupling*” as in advanced economies, rather lack of correct information on the quantities of industrial waste generated;
9. The quantities of industrial waste generated annually are high, even though the total figure is not very precise; hundreds of millions of tons of industrial waste have been accumulating over time, largely inert waste, which seriously calls for reuse thereof in various areas, such as motorway building;
10. Industrial operators are not fully informed of the legislative developments and of the need to take timely measures to comply with the transposed legislation (lack of knowledge does not excuse lack of action) and have serious financial problems in implementing the necessary investments; discussions with the representatives of employers’ associations revealed the need for a financial instrument to support private investment in compliance with the new legislation;
11. The representatives of employers’ associations pointed to the absence of financial incentives for the recycling of industrial waste;
12. Extension of European legislation to include anew directive on mining waste will further complicate the existing situation, by imposing important expenses to mining operators;

12.2 Recommendations

The authors of this study are of opinion that, in developing the National Action Plan for the landfilling of industrial waste (PADDI), the following recommendations will need to be considered:

1. Measures for the expedient staffing of the existing institutions and adequate training of the new staff;
2. Creating a mechanism to coordinate among the many institutions and agencies with responsibilities in industrial waste management;
3. Revising and consolidating legislation on industrial waste, including revision of the translation of Community texts;
4. Clear definition of the term “*industrial waste*” and improvement of the data reporting, collection and processing systems;
5. Revision and remake of the industrial waste database;
6. Training/education of businesses, for the knowledge and observance of environmental protection legislation on:
 - i. obligation to reduce the quantities of landfilled waste;
 - ii. treatment of industrial waste to reduce the hazardous content down to an acceptable landfilling limit;
 - iii. phasing out of existing industrial landfills, and
 - iv. building landfills in compliance with the approximated European legislation;

- v. following closure of a large number of landfills due to non-compliance with the landfill or IPPC Directive, new landfills will need to be built for commissioning as the old ones are closed; clear and specific information is required for businesses in this situation, considering the long time required for all the procedural steps between design and completion of a landfill project.
7. Production of manuals and brochures with best recycling and reuse practices for industrial waste;
8. Professional training programs for the personnel involved in industrial waste management, especially at the county and municipal levels;
9. Creating a mechanism to integrate the requirements of the environmental Acquis Communautaire (regarding industrial waste) with the other sectoral policies and strategies (especially industrial policy and strategy);
10. Promoting funding mechanisms for the measures to reduce the quantities of industrial waste or recycling thereof; in this context, the operationalisation of the Environmental Fund in Romania would be beneficial;
11. Clarification of the legal situation of closed or abandoned industrial waste landfills, with unknown owners, and closure thereof in compliance with the EU requirements;
12. Measures for the closure of mining operations/landfills:
 - the titleholder of extraction rights must prepare and maintain a General Closure Plan, including rehabilitation and perpetual protection measures for the tailing dams;
 - the titleholder of extraction rights must demonstrate to the regulatory authority the validity and effectiveness of the proposed rehabilitation solutions;
 - the titleholder of extraction rights must provide a guarantee fund or title to ensure implementation of the mine and ore preparation installation/dam closure and rehabilitation measures;
 - the regulatory framework must be applied consistently from design to closure and provide post-closure measures.

Further recommendations for the development of the PADDI.

1. The objectives of the PADDI should be:
 - a. to stabilize or reduce the quantity of industrial waste for final disposal over a given period of time;
 - b. to improve the assessment procedures for the quantity of industrial waste generated to enable the statement of coherent policies to minimize the volume of waste by the use of economic and regulatory instruments;
2. PADDI should propose programs that reduce the quantity of waste generated, both in absolute and in relative terms (per capita);
3. Measures that should be included in the PADDI:
 - a. Management:
 - i. developing national R&D capacities for the use of cleaner technologies (with a direct impact in reducing the amount of industrial waste generated);

- ii. providing incentives to reduce production and consumption activities generating large quantities of industrial waste;
 - b. Data and information:
 - i. developing and implementing generated waste monitoring methodologies;
 - ii. establishing efficient mechanisms for data collection and analysis; tracking progress in meeting the proposed objectives;
 - iii. use of databases to estimate the efficiency of a industrial waste reduction policies and to propose corrective measures;
 - c. Encourage and support recycling through measures including:
 - i. development of a national industrial waste recycling and reuse system;
 - ii. providing information on technologies, instruments and policies to encourage recycling and reuse of industrial waste;
 - iii. reviewing economic efficiency of the industrial waste recycling and reuse programs;
4. Promoting industrial waste disposal technologies: the objective being safe disposal of industrial waste;
 - a. establish criteria for industrial waste storage and treatment and objectives and standards based on the capacity of the environment to absorb waste;
 - b. develop environmental and health impact monitoring capacities for industrial waste;
5. Develop institutional and policy/strategy development capacity
 - a. develop national policies and a incentives to reduce industrial waste;
 - b. decentralize measures at the regional, county and local level to allow the authorities to mobilize the necessary resources for the implementation of regional and county industrial waste management plans;
 - c. provide independence of the control and monitoring authorities;
 - d. provide the financial and administrative means required by the control and monitoring authorities in fulfilling their mandate;
6. Develop human resources; special training programs required to redirect the current industrial waste management, recycling and reuse practices:
 - a. include industrial waste management recycling and reuse techniques, into the current retraining programs for civil servants at the central and county/local level;
 - b. develop training programs in industrial waste monitoring and disposal or treatment technologies;
 - c. involve professional and branch associations in solving specific waste problems (information, training, promoting joint business investments for waste disposal, etc.).
7. Developing international cooperation:
 - a. develop regular analyses of the best techniques and methods applied in other countries;

- b. jointly review the effects of a industrial waste disposal on the environmental media (soil, groundwater, air);
 - c. provide grants for joint technological research and development programs, pilot programs, experience sharing, etc.;
8. Investigate options in building at least one central hazardous waste disposal facility that might take over and treat waste from small generators and include a high performance incinerator of the BAT-type (feasibility study).
9. Consider hazardous waste export for treatment as an alternative solution for the disposal of industrial waste.

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