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ENVIRONMENTAL IMPACT ASSESSMENT FOR AN INDUSTRIAL SOLID WASTE DEPOSIT LOCATED IN CONSTANŢA HARBOUR

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Abstract: Indiscriminate industrial waste disposal in developing countries raises significant environmental and health hazards. This study aimed at quantifying the potential threats for humans and the environment induced by an industrial waste disposal located in a sensitive area nearby a maritime Romanian harbor. Waste characterisation involved an assessment of the soil, including site history, to identify which contaminants require analysis to determine the hazard category. Surveys for household residents and site operator, field investigations, on site waste sampling followed by laboratory measurements, quantification and characterization were driven. These results were further used to determine the hazard category of the industrial solid waste, based on the upper limits for each category of waste. This systematic approach facilitates the site classification, allowing further enhancement of sustainable industrial waste disposal, public awareness, funding, expertise, equipment and other facilities, currently lacking, provision. The operations performed on site have induced a significant negative impact on soil parameters; we estimate that, with closure and execution of recovery (physical treatment) / greening operations accomplished within the industrial landfill perimeter, these parameters will fall within the limits imposed by national legal requirements.
Keywords: disposal, environmental impact assessment, industrial solid waste, spectrophotometry

1. INTRODUCTION

European Union (EU) legislation requires the competent authority in each Member State to draw up one or more waste management plans in accordance with relevant EU directives (EU, 1991, 1999, 2006). To apply the principles of these directives when implementing a national waste management system is the responsibility of each individual Member State. As such, waste management planning has become a permanent element in public planning efforts in all EU Member States, including Romania. During 2000 - 2007 were introduced by law, government decisions, ministerial orders, etc., several elements of different types of waste management, was developed a strategy and National Waste Management Plan approved by GD no. 1470/2004, were developed regional waste management plans, plans for the implementation of EU directives in Romania, with or without application of transitional periods, etc., and therefore the minimum content of the waste management plan was amended (Romanian Government, 2001a, 2001b).

Development of local waste management plans are established by GEO. 78/2000 on waste in Romania (approved with modifications by Law no. 426/2001 and Government Ordinance no. 61/2006 amending and supplementing Ordinance No. 78/2000 on waste, approved with modifications of Law no. 27/2007), in Article 8, paragraph 2.

Environmental impact assessment is automatically required for plans and programmes which are prepared for town and country planning, land use, transport, energy, waste management, water management, industry, telecommunications, agriculture, forestry, fisheries and tourism, as recently outlined by Vorovencii (2011). Parikh et al. (1998) and USEPA (1991) have shown that in reducing to comprehensible terms the vast spectrum of residues of resource utilization which comprise solid waste, it is necessary to resort to some scheme of classification. Although there is a certain logic in classifying solid wastes as municipal, agricultural and industrial, the logic breaks down when control of industrial wastes is the problem of concern, as highlighted by Wehry and Orlescu (2002).

There are, however, types of activity which generate broad types of industrial solid waste problems, each amenable to some typical approach although not a universal solution (Omran and Read, 2008). Rapid increase in volume and types of solid and hazardous waste as a result of continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste Pearce and Walter (1977) have stated this already three decades ago. Currently, in Romania there are 1133 registered landfills: 846 industrial waste deposits and 287 municipal waste deposits. All deposits occupies over 12,700 ha, of which 11,000 ha are affected by industrial landfills, and 1,168 ha are urban landfills. Most of the industrial waste deposits (308) are simple (usually concrete platforms), but there are a number of mining dumps (216) and ponds / pits (196). Also included are 83 industrial landfills for hazardous waste in 30 counties, covering an area of approximately 450 ha (Antonescu, 1988; Bularda et al, 1992; Bold and Mărăcineanu, 2003).

During 2010, the amount of waste generated by mining, energy and manufacturing was 159 million tons, of which most (88%) waste resulting from mining activities (140 million tonnes) and 19 million tons are generated from energy and waste processing.

This research aimed at quantifying the potential threats for humans and the environment induced by an industrial waste disposal located in a sensitive area nearby Constanța harbour, facility being operated by S.C. COMVEX S.A. Constanța. The facility „Industrial solid waste dump" resulted through disposal of unsalable mining products by the afore-mentioned operator which performs port operations covering:

- loading / unloading of ships and bulk storage of goods (coal, ore, bauxite, etc.);
- international shipping and consulting in port activities;
- inspections of barns, supply, cargo evacuation and handling.

The storage of industrial solid waste is often one of the most neglected areas of operation of a firm. Attaining environmental objectives which call for clean air, pure water, freedom from nuisance and affront to the aesthetic sensibilities of man, and a healthy ecological balance in nature are perhaps the major concern of public agencies in relation to industrial solid wastes.

2. PRELIMINARY SITE DESCRIPTION

2.1. General situation analysis

The industrial mineral waste disposal is located near the port of Constanța. This site, located in South - East Constanta, climatologically falls under the characteristic parameters of the municipality area. For the analysis there can be used weather data from multi-annual data from Constanța weather station ($\varphi = 44^o11'$ N, $\lambda = 28^o40'$ E). This region's climate, due to geographical position, is temperate - maritime, determined during the cold season by the East - European anticyclone and in the rest of the year by the Mediterranean baric formations.

Statistics on the period 1941 - 2011 shows that on an annual basis, prevailing winds are from the Northern sector (N + NE + NV) totalling a frequency of 37.9% compared to only 28.1% from the Southern sector (S + SE + SV). In one direction, the highest average annual frequencies are N = 15.8%, V = 15.6%, N = 11.7%, S = 11.2%. Seasonal and monthly wind development has distinct features. Thus, the months with higher frequency then the annual one in the Northern direction are: January, February, March, October, November and December, so the winter months, and on South the other months. Annual average air temperature (1961 - 2010) is 11.6°C. In the interval considered, annual averages ranged between in 1987 and 1966. Air humidity usually exceeds 9 g water / m^3 air. In winter due to lower temperature, air contains lower amounts of water vapour and absolute humidity drops to 4 g water / m^{3}air. On the contrary, in summer, when evaporation is more intense, absolute humidity can reach up to 14 - 16 g water / m^3 air. Above the coast, fall the smallest quantities of water from rainfall throughout the country: 379 mm in Constanța. They are most common in late spring and / or early summer and lower in winter (C.C.E.P.A., 2010)).

2.2. On-site operations inventory

The main activity of SC COMVEX SA, owner of the industrial solid waste storage facility, is unloading / loading and temporary storage of bulk goods. Unloading and loading bulk goods from / into barns of ships / barges is done through two unloaders / loaders bridges of 50 tons. Discharge capacity is 2,000 t / h. Storage of bulk goods in the first phase, is carried out in stockpiles. According to berth number, the following sorts of goods are stored:

- berth 80: ore stored on a length of 220 m;
- berth 81: coking coal is stored on a length of 280 m;
- berths 82 and 83: ore stored on a length of 360 m;
- berths 84 and 85: ore and coking coal stored on a length of 259 m;

Maximum storage capacity of bulk cargo per berth is: ore 63,700 tons and 33,600 tons coal. Then, goods are shipped with 2 main belt conveyors, a distance of 1,600 m along the quay. Between the main the conveyors and deposit conveyors, there are 6 auxiliary conveyors, each with a length of 80 m. Goods are taken over from the operational conveyors with multitask machines, operating about 4,000 tons/hour. A turning radius of 35 m al lows the storage of goods in dumps (stockpiles) over a width of 60 m, the length being 850 m. Maximum storage capacity of a landfill is as it follows: for ore 753,000 tons and 461,000 tons coal. Landfilled goods are shipped to pier river basin to be loaded on barges, with nine other conveyors of different lengths, between 123 and 366 m. The total amount of freight handled per year ranges from 8 to 13,000,000 tons. Following these activities, the industrial landfill was formed, resulting from degradation of mining products (mining concentrates) and mining concentrated iron, bauxite (aluminium ore) and coke.

2.3. Current land use

COMVEX SA company is located in the southern side of Constanta port platform, within the perimeter of berths 80-84. It borders on the harbour and river basin with other companies on same platform. The land is located the considered site (see Figure 1), including the area for industrial landfill, belongs to Constanta Port Administration and is accomplished by clay filling.

Access to the society for basic work is done at sea, namely the Constanta port basin and also on the Danube - Black Sea navigation channel. Access for personnel, supplies and current operation is done by any of the six gates of the port entrance. The company owns a total area of 308,386 square meters occupied for the usages outlined in Table 1.

Figure 1. General vue of the industrial solid waste dump

Table 1. Current land use at COMVEX SA site

Crt. nr.	Land use	Surface area, m^2
1.	Ore storage platforms	43,476
2.	Berth platforms	52,992
3.	Ore dump 1 and 2	124,020
4.	Ore dump 3	34,821
5.	Buildings and facilities ore deposit	24,500
6.	Ore barge loading facility	12,366
7.	Areas related to the operating belt conveyors	15,941

3. MATERIAL AND METHODS

3.1. Geotechnical study

From the geotechnical study conducted by IPTANA SA Bucharest it results that the land on which industrial landfill is located consists of filling (C.C.E.P.A., 2009). It contains clay and clay dust on heights comprised between 8.30 and 12.80 m and is located on the old sea bottom, consisting of a layer of clay dust, dark, oozy, or fine sand layer whose thickness is between 0.20 and 4.20 m. Under these formations at depths between 12.8 and 13.0 m is the limestone foundation. Based on drilling. the presence of water in the filling was determined and sometimes as infiltrations in the body filler. The degree of compaction of the fill is about 89-94%.

The solid wastes stored in the existing dump, about 250,000 tons, consisting of a mixture of concentrated iron, bauxite and coke, are arising from transportation operation and the "cleaning" of conveyor belts. It also contains appreciable quantities of waste from the decommissioning / demolition of concrete construction, masonry, wood, iron, etc. and amounts of plant debris. There are few data on seismic activity of the Dobrogea region, because there is less seismic risk. The catalogue of strong earthquakes mentioned one special event for the period 1091 - 2005, with intensity V, magnitude 5.2. The epicentre, located in shallow area, and Tulcea was the only locality strongly affected. Movements of this kind are also possible in the southern region.

3.2. Environmental factors sensitivity analysis

The presence of industrial waste landfill creates the potential significant damage of the environmental factors, respectively:

- harbour basin water (sea and river), rainwater and groundwater, due to the action of Aeolians currents (wind) the training by rainwater.
- soil, while industrial waste disposal by its specific framework paved the morphological and topographical changes
- air, by the action of wind on-site storage

Some of the above actions have permanent effect, and others are involved with cumulative effect, at random patterns (wind, rain).

3.2.1. Soil

Soil related factors that have obvious effect on the accessibility of heavy metals plants are texture, soil reaction (pH), organic matter content, cation exchange capacity and drainage (Tchobanoglous et al, 1991).

Texture, i.e. clay content has a direct influence in retaining heavy metals, making the clay soils to have a lower risk for plants to absorb excessive amounts of heavy metals. Soils with high absorption capacity, i.e. with high clay and organic matter content, may retain these elements, especially in upper horizons. Such properties are characteristics for carbonate soils and soils with neutral reaction. In these soils, the amount of toxic compounds that can be leached into groundwater and can be taken over by plants is much lower than in acidic and sandy soils. However, there is a risk of increased concentration, and therefore toxicity, caused by heavy metals, causing imbalances in physical, chemical and biological soil. Heavy metals retained by the organic and colloidal soil substantially limits biological activity in the soil, resulting in inhibition of nitrification process, which is one of the essential conditions of soil fertility.

Soil reaction (pH): for a metal to be absorbed by the root system of a plant, it must be in soluble form. Heavy metal hydroxides and carbonates are relatively insoluble and as higher pH, as higher the possibility of insoluble hydroxides and carbonates formation is greater.

Content of organic matter: metals can form compounds with soil organic matter, resulting in soil with high organic matter, metals are less available for plant uptake.

Cation exchange capacity, depends both on the content and the mineralogical nature of the soil clay fraction, and on the organic matter content within the soil. The higher it is, the ground has a greater capacity to retain some heavy metals, thus avoiding them to get to the plants in toxic concentrations for the food chain.

Soil drainage: excessive soil water favours the presence of soluble forms of metals with lower valence.

3.2.2. Underground and surface water

There aren't underground or surface water flows on site, but the storage facility is neighbouring with the Constanța harbour basin, which is affected by the company's operations. The main negative effect of the industrial landfill is determined by introducing into sea water of dusts resulting by entrainment of mineral airborne particles. Most of these particles, given the particular local hydrodynamic regime, settles in the harbour basin, exerting impacts especially on sea bottom life. The adverse effect magnitude is greater in the context of cumulative impact caused by the presence of other pollutants, given the specific activities of the port basin. The storage facility operation did not raise special problems, because it met not aquifers, the land reserve being protected from flooding. During operations there was not registered superficial or deep aquifer layers pollution. Regarding the discharge of rainwater collected from the land surface, which follows its natural flow regime, without being provided special technical works for the collection and/or deviation for discharge of surface waters.

Since the dump was located near the port of Constanta, over time, when heavy rainfall was recorded, some low amounts of sterile material were trained hydro-gravitationally in the sea water. Presently and also during the recovery/closure/greening of industrial landfill perimeter operations, there will not be discharged into the aquatic environment from industrial waste water discharges and/or waste from the site, so the issue of flow of water treatment plants is not to be considered.

3.2.3. Atmospheric emissions and air quality

The main source of air pollution from the landfill is considered the bulk cargo handling operations, outdoors, frequently in the presence of wind. In the absence of wind, dust releases are due to vibrations that occur when passing over pulley tape drives, to the relative velocity between dust particles from the surface layer material and air floated above it. Added to this is the dust release from transhipment points, i.e. places of loading / unloading the conveyor belts. Wind action is exerted both on the dust stored in open air, and during the loading / unloading respectively haulage through the conveyor belts.

3.3. Waste characterization. Sampling and analysis

Waste characterisation involves an assessment of the soil, including site history, to identify which contaminants require analysis to determine the hazard category. The assessment must be for all chemical substances known and reasonably expected to be present in the waste. Solid waste streams should be characterized by their sources, by the types of wastes produced, as well as by generation rates and composition. Accurate information in these three areas is necessary in order to monitor and control existing waste management systems and to make regulatory, financial, and institutional decisions. In the context of this paper, waste is defined as any unwanted material intentionally thrown away for disposal.

However, certain wastes may eventually become resources valuable to others once they are removed from the waste stream. Knowledge of the sources and types of waste in an area is required in order to design and operate appropriate solid waste management systems. The final outcome of a characterisation study will be an understanding of the contaminants, their concentrations and leachability for the entire waste stream. The waste must be assessed for all chemical substances known and/or reasonably expected to be present in the waste. Waste characterisation will involve identification of contaminants likely to be present in the waste, as well as sampling and analysis for each of the contaminants. Documented evidence to support the categorisation must include the results of a sampling and analysis program (Gervasoni, 1991).

The nature of the waste characterisation study will vary, depending on factors such as the process that generated the waste. For example, solid wastes from processes with variable inputs will require more regular testing than waste streams where the inputs and processes are consistent and repeatable results can be demonstrated. Each study must, therefore, be tailored specifically for the waste that is to be characterised. The waste characterisation study may be integrated into existing environmental management systems or environment improvement plans implemented by waste generators and waste treaters. Once each of the potential contaminants have been identified, a set of samples should be taken and sent for analysis.

In order to examine possibilities for recovery of the industrial waste and thereby reduce the significant negative impact on the environment three samples were collected (see Figure 2) from the solid waste dump (each one weighing 40 kg) and two samples (each one weighing 25 kg) collected on the dump surface and then the samples were submitted to analysis in the accredited laboratories within the University of Petroşani.

Figure 2. Sampling on site

From on-site views, especially from the analysis of samples collected, it was found that during time storage of concentrated ores was random, so that the dump area is a highly physical - chemical heterogeneous. Therefore, we proceeded to mix the sample on site, employing the cone - ring method. After successive reductions, we obtained a representative sample of the entire material stuck on the landfill, which was subjected to fundamental analysis.

Table 2. Particle size grading analysis results

Granulometric classes, mm	Amounts, %	Cumulated amounts, %
20 -15	2.06	2.06
15 -10	13.58	15.64
10 – 6.3	21.58	37.22
6.3 - 4	11.39	48.61
4 – 3.15	6.55	55.16
3.15 – 2.5	6.06	61.22
2.5 – 1.25	15.03	76.25
1.25 – 0.8	5.82	82.07
0.8 – 0.63	3.64	85.71
0.63 – 0.315	4.61	90.31
0.315 – 0.125	4.85	95.16
0.125 - 0	4.83	10.,00
Total	100.0	-

4. RESULTS AND DISCUSSION

4.1. Particle size grading

After drying in an oven at 105°C, about 20 kg of representative sample was subjected to sieve analysis, using a Fritsch electromagnetic bolter, the results being presented in Table 2.

The following findings were emphasized:

- the coarse-grained performed on 15 mm sieve is about 2%; larger sized material was subject to breakage and re-introduced in the sample;
- the cumulative refusals curve shape indicates that share of small material n relation to the coarser one is more important;
- the moisture content of the representative ore concentrate sample, employed in separation tests, was 12.3% (assessed through drying until constant weight);
- the sieves chosen for particle grading purposes proved in accordance to grading scale volumetric coefficient ($\sqrt{2}$), but some values are selected according to the available site;
- within the small classes predominates easily dissociable bulk minerals, coal and bauxite.

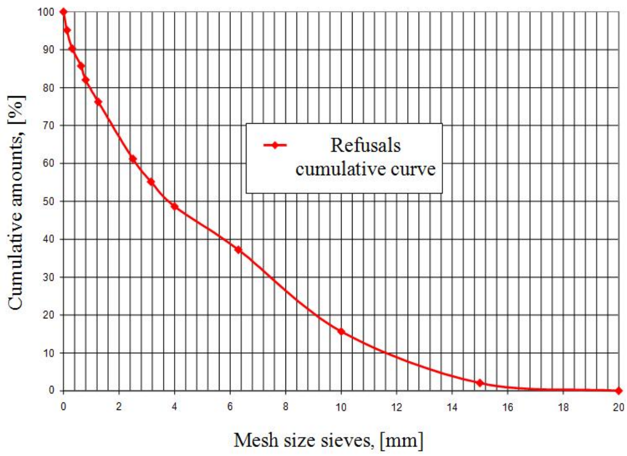

Figure 3. Refusals cumulative curve of the analyzed material

4.2. Chemical and mineralogical analysis

The representative samples were subjected to chemical analysis using the spectrophotometer from the „Mineral Resource Processing" Laboratory, within the University of Petroşani, according to legal requirements.

Considering the weights of the main elements found after chemical and mineralogical analysis (given in Table 3), we highlight the following findings:

- the main Al_2O_3 bearing minerals are diaspore and böehmite, at a rate of about 54%;
- the relatively high proportion of iron minerals imposes their reduction through processing (magnetic separation), so that in the next stage to separate bauxite from coke.

Table 3. Spectrophotometry chemical analysis results

Metal oxides and other chemical compounds	Contents in the average sample, %
SiO_2	6.50
Al_2O_3	22.35
FeO	0.50
Fe_2O_3	46.0
CaO	1.50
Other chemical compounds	23.15

At his turn, the mineralogical analysis allowed the description of the mineralization existing in the industrial waste , as given bellow.

Diaspore ($Al_2O_3 H_2O$), contains 85.02% Al_2O_3 and 14.98% H_2O. It is found in significant quantities as scaly aggregates in exogenous deposits of bauxite, mixed with boehmite. Often, it is also found in metamorphic rocks associated with corundum and other minerals. Sometimes it is an essential mineral of crystalline schists, kyanite and other minerals.

Boehmite (Al OOH), contains 84.97% Al2O3. It was not met otherwise than linked to exogenous bauxite deposits. Generally it was observed that boehmite is a component of so - called karst bauxite. Some of the red bauxites consist almost exclusively in boehmite.

Brown iron ore, is an iron mineral having the characteristics of a gel, with water content and variable properties. As oxide, it contains 85.5% Fe_2O_3 şi 14.5% H_2O. It is a very common mineral and is generally the product of decomposition of other iron minerals such as iron carbonate, pyrite, etc. It is available in the form of deposits in limestone cracks, as decay product of water loaded with iron oxides that have circulated through those cracks.

Quartz ($Si O_2$), contains 46.7% Si and 53.3% O_2. It is considered a sterile mineral, being present in all non-metal concentrates, except coal (coke is a raw coal processed in washeries).

Calcite (limespar- $CaCO_3$), contains 56% CaO and 44% CO_2. It is one of the most common minerals, formed in various conditions and geological formations. It has both the shape of well individualized crystals with different aspects and colors and in association with other minerals.

The study revealed that calcium oxide from bauxite is related to three mineral groups, in variable proportions:

- phosphate related lime is contained in the bauxite up to the limit of 0.1%;
- silicate related lime is present as impurities in chlorite, kaolinite leptochlorite, being intimately associated with components of bauxite minerals. Under this form, the calcium oxide content recorded up to 0.7 to 0.8%;
- carbonate related lime.

These results are further used to determine the hazard category of the industrial solid waste, based on the upper limits for each category of waste. Specific categorisation requirements for soil and solid industrial waste can be found in the National Industrial Waste Resource Guidelines, according to Bold and Mărăcineanu (2003). A hazard characteristic assessment is used to determine whether a waste displays any of the specific hazard characteristics.

Accordingly, we can state that the studied industrial landfill is actually a dump which consists exclusively by filing and subsequent alteration, under the influence of weathering, of the mineral materials imported, as well as from various demolition/dismantling operations carried in various industrial and / or civil entities. The industrial solid waste dump is characterized by a good technical condition and is within 4.4 hazard group classification of dumps, in respect to its nature and stability. According to Technical Prescriptions P.T-M33, cited in Căpățână and Racoceanu (2003), the investigated waste storage facility fall into the following classification groups: 1.1.1. Dumps; 1.2.2. Hard rock and substances waste dump; 1.3.1. Nonflammable material dump; 1.4.1. Low-level radioactive waste dump; 2.1.1. One-bench dump; 2.2.2. Low height dump($\leq$ 5 m); 2.3.2. Horizontal land located; 3.1.2.Dustiness potential; 3.2.6. Landfills located near water courses; 4.2.1. dumps formed by transport in dry state on conveyor belts (assimilated).

4.3. Health effects

Air quality in the analyzed company is affected by the presence of powdery material containing Al, Pb, Cd, Cu, Fe, Mn, coke, etc. The atmospheric dispersion of these pollutants is local (12.4% during the year) and extends to the surrounding area during the presence of wind, depending on its direction and intensity.

In terms of air pollution impact on health action distinguish direct and indirect effects resulting from actions on humans and environment. The direct effects are divided into immediate and long term ones. Immediate effects are felt only by company employees. They are due to high pollutant concentrations and are represented generally by significant increases in morbidity or mortality, case not encountered in the analyzed company. The only immediate effect is found are eye and respiratory irritation phenomena represented by the discomfort caused by irritation. Long-term effects are characterized by the emergence of pathological phenomena, following prolonged exposure to airborne pollutants. Significant changes occur in an exposure over 10 to 15 years for ore dust particulate matters exceeding the maximum allowable concentration. Therefore, health is endangered for a part of employees in certain work places with high pollution level. The Regional As highlighted by the Romanian Marine Research Institute, (1997) the Centre for Preventive Medicine Constanta standard pulmonary radiographs, laboratory tests and pulmonary function tests to working personnel exposed to ore dust and identified the following issues:

- radiological signs of bilateral pulmonary fibrosis in 66 workers, which is 12.3%, of which 50 people have a seniority comprised between 5 and 10 years;
- decreased vital capacity and lower maximum expiratory volume per second to 5.5% of the exposed workers;
- adverse changes in para-clinical tests, 12% of them.

On-site noise and vibration are generated by the operation of conveyor belts, bridge unloaders, engine - gears assemblies and other equipments. According to the analysis report prepared by Regional Center for Preventive Medicine Constanta (C.C.E.P.A., 2009), the effect of noise and vibration is local and is exceeded in the following situations: the engine room R / M Amaradia: 100 dB to 90 dB (TLV: Treshold Limit Value), control cabin R / M Amaradia: 75 dB to 60 dB (TLV), Penguin boat engine room: 100 dB to 90 dB (TLV: Treshold Limit Value) , control cabin on boat Penguin: 95 dB to 60 dB (TLV)), floating crane: 100 dB to 90 dB. Their net effect is felt on the comfort of staff involved. No effect is registered on neighborhoods, at the shortest distance of the company's headquarters.

5. CONCLUSIONS

Land-based waste management units in general can release some contaminants, which may or may not approach levels of concern for human health and the environment. As a result of the company operations, two categories of waste are generated:

- household waste and waste issued from the technical base operation (mainly scrap metal and carbide sludge). These wastes are stored in containers and bimonthly are transported into the landfill from Constanta port gate 6;
- waste generated by the basic operations of the company, consisting of some recoverable wastes (coal for use in their boiler operation) and a second part, consisting of mixtures of minerals, stored temporarily in the river quay, The industrial solid wastes resulting from degradation of mining concentrates imported (250,000 tons) are stored in a dump.

Clearly, updated information on the frequency of pollution controls and monitoring, and on their relationship to site- and waste-specific conditions, is needed. On the basis of the information and analyses of the current situation, it should be possible to evaluate the performance of the current system. Hence, the administrative level and the political decision-makers have a platform for identifying which problems need special attention in the future and which objectives are realistic and achievable within the timeframe of the waste management plan.

Basically, it was concluded that the studied industrial landfill is actually a dump which consist exclusively by filing and subsequent alteration, under the influence of weathering, of the mineral materials imported, as well as from various demolition/dismantling operations carried in various industrial and / or civil entities. The industrial solid waste dump is characterized by a good technical condition and falls within 4.4 hazard group classification of dumps, in respect to its nature and stability. According to the national standards, the investigated waste storage facilities fall into the following classification groups:

- 1.1.1. Dumps;
- 1.2.2. Hard rock and substances waste dump;
- 1.3.1. Nonflammable material dump;
- 1.4.1. Low-level radioactive waste dump;
- 2.1.1. One-bench dump;
- 2.2.2. Low height dump($\leq$ 5 m);
- 2.3.2. Horizontal land located;
- 3.1.2.Dustiness potential;
- 3.2.6. Landfills located near water courses;
- 4.2.1. dumps formed by transport in dry state on conveyor belts (assimilated).

The situation recorded in industrial landfill perimeter reveals that there will be no flow of wastewater discharged and the conclusion there will be no surface water likely to be affected so as not to be within limits.

The operations performed on site have induced a major negative impact on soil parameters; we estimate that, with closure and execution of recovery (physical treatment) / greening operations accomplished within the industrial landfill perimeter, these parameters will fall within the limits imposed by national legal requirements.

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