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Industrial Hazardous Waste Management In Egypt- The Baseline Study: An Updated Review

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ABSTRACT

Increased industrialization over the past decades in Egypt has resulted in an increased and uncontrolled generation of industrial hazardous waste. This was not accompanied by any concerted efforts to control these wastes. Consequently, no system for handling or disposing of industrial wastes, in general, and industrial hazardous wastes, in specific, exists. In 1993, a baseline report was formulated to assess the overall problem of industrial hazardous waste management in Egypt. Consequently, recommendations for priority actions were identified and the main components of a national hazardous waste system under the provision of Law 4/ 1994 were presented. This paper provides an updated review of this report in light of the proposed technical, legal and institutional guidelines to help in the realization of such a needed waste management system in Egypt.

Key Words: Industrial Waste/ Hazardous Waste Management/ Environment

INTRODUCTION

Egypt, like several other developing nations, is undergoing an unprecedented process of designing and implementing environmental policies and strategies. In 1992, a national Environmental Action Plan (EAP, May 1992) was formulated by the Egyptian Environmental Affairs Agency (EEAA). This document was based upon the collaborative work of ten groups of national and international experts that addressed the status of environmental conditions in the country and evaluated the impacts of the various development activities (industrial, human, etc.) upon the available resources (water, land and air) as well as on the cultural and natural heritage. However, to realize its plan objectives, the Environmental Agency (EEAA) was faced with a number of constraints, the most important of which has been its lacking of a regulatory and law enforcing authority nationwide. To overcome this, the institutional role of the agency as well as its legislative capacity required more strengthening for an effective coordination of environmental activities. Thus, a more comprehensive Environmental Protection Law (Law 4/1994) and its executive regulations were formulated.

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INDUSTRIAL WASTE GENERATION IN EGYPT

1. Recent Status:

Undoubtedly, the increase in industrial activities over the past decades in Egypt has contributed significantly to the deterioration of environmental conditions in urban conglomerates and localities nationwide (**Fig. 1 and Table 1**). As anticipated, this increase in activity was accompanied by an increase in ambient pollutant levels and the generation of large amounts of waste. With the lack of a system to regulate the handling or disposal of the generated wastes, each industrial facility was left unchallenged to devise its own waste management procedures which, in turn, was to jeopardize the quality of the available water and land resources. According to the EAP, this industrial sector has an estimated water demand of around 4.6 billion m³/year of which only 549 million m³/year reach the municipal systems untreated. The EAP also indicated that the total amount of industrial waste generated (solid and sludge) from the various industrial activities in Egypt (hazardous and non-hazardous) to be between 0.2 - 1.0 million ton/year, with an approximate 50,000 ton/year being regarded as 'hazardous' in nature. Today, with the national industrial base reaching over 22,000 units and with the strict enforcement of air and wastewater treatment options, this amount is expected to increase dramatically.

Furthermore, by the signing the Basel Convention in 1989 (ratified in late 1992), Egypt was under an obligation to provide the appropriate legislation for the management and control of hazardous waste. However, with the shortage of information concerning the sources, quantities and types of hazardous waste produced within this dynamic sector, any devised legal /institutional waste controlling system would be rendered poor and ineffective. The absence of economic incentives for waste reduction (in general), recycling or production technology updating effectively discourages any investment within this field to an extent that simple enforcement of environmental legislation can be held as an impediment to the economic development of the industry. Moreover, with the current industrial practices and the irregularities observed in waste management on the local and national levels, the problem of hazardous waste management in Egypt (general and industrial) is becoming a rather complex issue. To tackle this problem systematically, the baseline report was formulated to provide a preliminary assessment of the industrial hazardous waste management situation within the current technical, legal and institutional framework.

2. Technical Considerations:

Technically, the first issue tackled was to provide a definition or legal term of what can be considered as 'hazardous'. The current applicable legal definition set by Law 4/1994 instates that hazardous wastes are :

' These wastes arising from the various activities and processes or their respective ashes (residues) retaining the same hazardous properties and do not have any subsequent main or alternative uses such as clinical waste arising form medical activities, waste from the manufacturing or production of any pharmaceuticals or medications, organic solvents, inks, dyes and paints.'

The above definition is rather very general and complicates the issue of waste versus product, i.e. if the waste can be recycled or reused in some other way, it is no longer

considered as a waste. On the other hand, if discrepancies are sighted through the application of this definition or any other applicable Egyptian definition, the list of characteristic and technical definitions provided by the Basel Convention of 1989 can easily compensate for that. Moreover, the ratified agreement can support the local waste management procedures with its provision of more technical and legal guidelines even on transboundary waste movement.

Eventhough the technical and legal definitions are made readily available, their applicability is limited by the extent of knowledge accumulated concerning the industrial activities and their production procedures. At this point, the information provided by the General Organization For Industrialization (GOFI), Ministry of Industry, concerning the various industrial sub-sector was comparatively studied with World Bank Schemes for waste categorization and activities prioritization. This produced a general classification scheme of industrial activities indicating the potential hazardous waste categories to be generated (Tables 2-7). Actual data compiled from the industries were reviewed in an annex within the study (Annex) for further use as an indicator in defining the magnitude of information requirement.. However, with the gaps in information being thus identified, this classification scheme finds a value of defining the magnitude of waste control measures required at individual operational unit within this sector.

3. Legal and Institutional Considerations:

With Law 4/1994 coming into force, the agency can see itself being provided with a central and coordinating role in environmental protection and resources management, accordingly. However, a look at the existing institutional and legislative setup indicates that within the prevailing governmental hierarchy, different levels of executive powers are ordained to the different line ministries. Thus , if no coordination is previously achieved, a line of action taken by one ministry is apt to be counteracted or even stopped by another if its is deemed to crossover the areas of individual sovereignty ordained. Add to this that since its establishment in 1983, the EEAA was provided with a marginal role in environmental matters nationwide. However, as matters progressed, the coming of a State Ministry for the Environment into force will provide the agency with the much needed foundations for a greater involvement in environmental protection efforts and the ministry with a national coordinating alongside other concerned ministries. Yet, to earn their respective roles, there is a strong need that this national environmental hierarchy should first concentrate upon the effective build-up of both its technical and regulatory capacities.

CONCLUSION AND RECOMMENDATIONS

Finally, in a developing country as Egypt, the more pressing question is how to implement an economic reform associated with the planned industrial development without compromising the environment and the lives of human beings. Eventually, this problem of industrial hazardous waste in Egypt does not represent only a major threat to the environment or public health, but in time, will affect the national economy by gradually degrading Egypt's cultural and natural heritage and hence tourism, one of the major sources of national revenue. Thus, when considering the implementation of an integrated system for hazardous waste control, the primary concern is to compare the future cost of

waste clean up versus the cost of stepwise introduction of waste control measures/ technologies at this industrial base. The planning and implementation of such an integrated control system should, therefore, require a number of priority actions to ensure its sustainable operations and optimum performance.

The establishment of a dynamic and integrated information and database for waste and materials to serve this growing sector is becoming a necessary requirement. The realization of such a system stems from the need to not only identify wastes generated (in general) but also to categorize the applied industrial processes and the raw materials used that would lead to the generation of hazardous wastes. As a long term objective, this informative system can provide the supportive grounds for future development within the industrial sector including the introduction of Clean Technology Options. On the short term basis, the actual survey of industrial activities nationwide will be instrumental in the application of pilot scale technical solutions for waste management and waste treatment per priority sectors as well as within priority areas. With respect to the national hazardous waste management system, the concurrent realization of both the short and long term initiatives stated above is regarded to provide the necessary foundations and infrastructure support much needed to sustain this national waste control system.

Two other equally important elements realized by this report is that for the success of such a national system to be realized, there is a need for a general consensus building and the increase of awareness levels where hazardous waste is concerned. It could be stated that the first component is provided for by Law 4/ 1994, however, what is legally ordained require a general consensus building from the higher ranking line ministries to the first level of responsibility at the industry level. This will not only serve in the better enforcement of the legislative aspects of environmental protection endeavors but will also open the channels between the industry and authorities to exchange vital information about the impacts of hazardous wastes generation. Thus, an increase in the level of awareness can be achieved to ensure the adoption of better waste management procedures locally.

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Table (1). Registered Industrial Establishments Distribution Classified by Location (1990)

Area/ Region	Total Number of Industrial Facilities
1. Cairo	6761
2. Alexandria	1906
3. Sharkiya	1849
4. Qalubya	1280
5. Giza	1214
6. Gharbia	1006
7. Dakahliya	739
8. Damietta	734
9. Behira	388
10. Assuit	283
11. Kafr El Sheikh	179
12. Menia	150
13. Menoufiya	138
14. Sohag	120
15. Port-Said	104
16. Qena	95
17. North Sinai	84
18. Aswan	76
19. Ismailia	65
20. Fayoum	64
21. Beni-Swaif	60
22. Suez	56
23. Red Sea	45
24. Marsa Matrouh	11
25. South Sinai	5
26. New Valley	1
Total	17 413

Table (2). Waste Categories - Metal and Steel Industry.

Industry Processes	Waste Categories		
	Wastewater	Sludge	Solid
1) Iron and Steel	<ul style="list-style-type: none"> -spent sulfuric acid -spent ferrous pickle liquor (steel pickling) -alkaline cleaning agents (metal degreasing) - spent brightener for stainless steel - spent acid strip solution & spent caustic baths (metal finishing) - spent pickle liquor (steel finishing operate) Cyanide Aqueous Waste - untreated rinse water - spent electroplating solutions - heat treatment wastes spent solutions of conc. & semi-conc. cyanide solutions 	<ul style="list-style-type: none"> - emission control sludge (steel prod) - high lead content sludge - metal working grinding and polishing residues with heavy metal content 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces
2) Lead Production	No waste	<ul style="list-style-type: none"> - heavy metal sludge and solutions with surface impoundment dredged solids - emission control sludge (smelting) 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces
3) Zinc Production	<ul style="list-style-type: none"> -wastewater from wet scrubbers and leaching units, acid plant blowdown (mostly with heavy metal content) 	<ul style="list-style-type: none"> - heavy metal sludge and solution and acid plant blowdown 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces
4) Copper	<ul style="list-style-type: none"> -spent pickle liquor and sludge - wastewaters from slag milling and granulation 	<ul style="list-style-type: none"> - wastewater treatment sludge - acid plant blowdown and slurry sludge 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces, scrubbers and scrap treatment
5) Tin	<ul style="list-style-type: none"> - wastewater from the emission control process with heavy metal content 	<ul style="list-style-type: none"> - heavy metal sludge 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces
6) Aluminum	<ul style="list-style-type: none"> - wastewater with fluoride content 	<ul style="list-style-type: none"> - a tar slurry with non-halogenated solvent content 	<ul style="list-style-type: none"> - residues and slag with heavy metal content from kilns and furnaces, scrubbers and scrap treatment

Table (3). Waste Categories - Chemical Industry.

Industrial Processes	Waste Categories		
	Wastewater	Sludge	Solid
1) Plastic and Rubber Production	- varnishes blends and solvents	- slurries of chlorinated rubber and rubber in carbon tetrachloride - heavy metal sludge from etching solutions - resin residue (biocide waste) - PCB plasticier residues (plastic processing) - phenol distillation tars	- residues with PVC with or without additives off cuts - wastes from machining of PTFE/ graphite products- - PVC granules from processing operations
2) Chlorine Production	- brine mud with heavy metal content (esp. Hg) with a high pH - condensation from cell gas contaminated with Cl	- lead containing sludge from diaphragm cell production - wastewaters treatment sludge (Hg cell) - brine purification mud (Hg cell) - heavy metal containing sludge	- asbestos diaphragms - residues from recovery process with Hg content
3) Dyes and Dyestuff Intermediates	- aqueous solution. With low conc. Of chlorinated benzene - waste stream with chlorinated hydrocarbons (10% Cl content)	- tarry residues with Chlorinated aromatic hydrocarbons - phenol decomposition products/ amine products	- still residues of hydrocarbons including oxidation products
4) Adhesive Manufacture	- special boiling point liquor with aliphatic hydrocarbons, toluene and methyl ethyl ketones - a mixture of highly flammable wastewaters	- No information	- residues from the production processes with halogenated content
5) Paint and Ink formulations	- paint stripping dichloromethane	- mixed heavy metal sludge <u>Biocide wastes</u> - coating material residues - paint & lacquer sludge - printing ink residues, resin and paint residues	- no information
6) Tanneries & Leather Manufacturing	- white spirits + kerosene - solutions of perchloroethylene & trichloroethylene solvents	- tanyard sludge (with heavy metal content Cr) - Halogenated Organic residues - residues of Propylene dichloride in admixture with lime slurry (propylene oxide and propylene glycol) - distillation residues containing 1-10% chlorinated hydrocarbons (ethers & aldehydes)	- lime contaminated with Cr and other heavy metal - leather and hide remains from the process of leather preparation

Cont'd Table (3). Waste Categories - Chemical Industry.

Industry Processes	Waste Categories		
	<i>Wastewater</i>	<i>Sludge</i>	<i>Solid</i>
7) Pesticides	- acidic spent reagents and solutions	- No Information	- contaminated containers
8) Pharmaceuticals & Fine Chemicals	<ul style="list-style-type: none"> - chlorinated hydrocarbons in admixture with toluene and dissolved solids (Cl 1%) - contaminated mixture of chlorinated solvents -solvents wastes with small content of methylene and alkyl chloride - aqueous. Streams with 0.1% Cl content and with 40 ppm chlorinated hydrocarbons - PCB wastes in the form of heat transfer fluids - liquid 70% toluene 67% chlorophenol (by-products) <p>Cyanide Wastes</p> <ul style="list-style-type: none"> - spent concentrates & semi-concentrate compounds during chemical synthesis - solutions containing spent reagents nitrating acids from organic synthesis <p>Research Wastes</p> <ul style="list-style-type: none"> - contaminated chlorinated solvents 		
9) Armaments / explosives/ chemical synthesis and manufacture of matches	<ul style="list-style-type: none"> - nitrated organic chemical wastes (explosive) - wastewater treatment sludge with a high explosive content 	- heavy metal sludge from untreated wastes	<ul style="list-style-type: none"> - waste munitions (explosives) - TNT, azides (explosives)

Table (4). Waste Categories - Refinery and Petrochemical Industry.

Industrial Process	Waste Categories	
	Wastewater	Sludge
- Oil Recovery , Cleaning and Refining	<ul style="list-style-type: none"> - spent caustic sludge and aqueous caustic soda solutions - distillation of aromatic hydrocarbons , plastic powder and water - contaminated fuels come from the cleaning of oil tanks and reservoirs 	<ul style="list-style-type: none"> - oily sludge and oily caustic sludge - liquid cyclopentadiene residues - still bottoms containing spent caustic alcohols from lube oil additive manufacturing and tar. emulsion

Table (5). Waste Categories - Manufacturing (Engineering) Industry.

Industrial Process	Waste Categories	
	Wastewater	Sludge
1) Electronics Manufacturing	<ul style="list-style-type: none"> - quaternary detergents - PCBs from scrap capacitors and scrap transformers 	<ul style="list-style-type: none"> - heavy metal sludge from spent reagents
2) Battery Production		<ul style="list-style-type: none"> - electrolytic anode sleeves and sludge - Cadmium plant leachate residue plus lead sludge
3) Engineering Industry	<ul style="list-style-type: none"> Organic waste solvents with kerosene & white spirits with significantly greater amounts of chlorinated hydrocarbon solvent - special boiling point hydrocarbons and esters - PCBs hydraulic fluids from hydraulic equipment - compressors condensates 	
4) Wood Preserving	<ul style="list-style-type: none"> - petroleum fractions of white spirit type (flammable) 	
5) Ship buildings and refitting	<ul style="list-style-type: none"> toluene , xylene, white spirit , cellosolves, alcohols and ketones (flammable) - Oily wastes : vehicle repairs shops - used oil wastes 	

Table (6). Waste Categories - Textile Industry.

Industrial Process	Waste Categories	
	<i>Wastewater</i>	<i>Sludge</i>
1) Textile Manufacturing	- acid waste oils and halogenated solvents of perchloroethylene and trichloroethylene	- sludge containing zinc and other heavy metals
2) Dyes and Dyestuff Intermediates	- aqueous liquid with low conc. Of chlorinated benzene - waste stream with chlorinated hydrocarbons (10% Cl content)	- tarry residues (chlorinated hydrocarbons) - still residues with hydrocarbons including oxidation products, phenol decomposition and amine products

Table (7).. Waste Categories - Food Industry.

Industrial Process	Waste Categories	
	<i>Wastewater</i>	<i>Sludge and Solids</i>
1) Food Production General	- wastewater with high BOD - Wastes or spoilt vegetable oils (discharged with sewage)	- animal wastes - fleshing and other boiling out residues - trash (usually disposed of with the municipal wastes) - esterified oil residues
2) Extractive Industries (oils, essential oils, etc.)	- solvents containing hexane and other alcohols - spent caustic liquid - inorganic acids	
3) Sugar Production	- wastewaters with high BOD and with a chemical content	- bagasse remains and brown mud

Annex

Description of Industrial Activities per Area for the Public Sector in Egypt

Data presented herewith are results of a survey conducted by the General Organization for Industrialization (GOI) Environmental and Construction Department in 1990 among the public sector industries. Categorization of industries per type was done according to the one adopted by the Ministry of Industry and GOI. Addition information as to the types of wastes produced was obtained from the World Bank report: the Safe Disposal of Hazardous Wastes (1989).

1) Area: Greater Cairo (Cairo, parts of Giza and Qaliubiya)

% of Industrial activities: 55 %

CHEMICAL INDUSTRY

<u>Name of Company</u>	<u>Type of Waste Generated</u>	<u>Quantity</u>
1) Abu Zaabal Co. For Fertilizers & Chemical Industries (Abu Zaabal)	- sludge/ dust containing heavy and toxic metals (Pb, Cd, Mn a& Cr) - spent reagents - Phosphogypskum sludge	
2) Middle East Co for Paper - SIMO (Mostorod)	- paper/ metal pins/ plastic & wood remains - special b.p liquid/ white spirits/ effluent treatment sludge	10 m ³ /day
3) Egypt Co. For Wood Manufacturing (Helwan)	petroleum fractions of white spirit types/ wastewater treatment sludge	
4) El Nasr Co. For Coke and Chemicals (El Tibeen)	- Carbon oxides/ sulfur oxides/ hydrocarbons - ammonia still lime sludge/ spent iron oxide oily sludge/ asbestos lagging materials/ acid tars/ tar residues reused as kiln fuels	
5) El Nasr Co. For Rubber Products (Shoubra El Khiema)	- solid residues/ petroleum hydrocarbons/ slurries of chlorinated rubber in carbon tetrachloride	
6) National Plastic Co. (Shoubra El Khiema)	- plastic remains recycled / phenol residues/ varnish blends and solvents/ plasticier resin residues (heavy metal content)/ etching solutions	
7) General Co for Batteries (Dar EL Salaam)	- metal fillings - batteries scrap and rejects - copper fillings - lead sludge/ electrolytic anode sleeves	80 tons/year 125 tons/year 90 tons/ year
8) Egyptian Co. For Leather Tanning (El Basateen)	- leather remains and Fibers (dumped in the desert)/ tanyard sludge/ white spirits halogenated solvents/ kerosene	
9) Co For Industrial Gases (Mostorod) oxygen and acetylene gases	- lead sludge/ residues from mercury cell process/ wastewater treatment sludge/ spent catalysts	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
10) Paints & Industrial Chemical Co. (Shoubra EL Khiema -Hawamdiyah)	- paste - trash (dumped with municipal wastes) - paint residues and sludge	120 tons/ year
11) El Nile Matches Co (Imbaba)	- sulfur / free silica/ phosphorous remains (corrosive)/ gelatinous remains vernis solutions (explosive) / heavy metal treatment sludge	
12) El Nasr Co. For Pens and Graphite Products (Madinet Nasr)	- lab remains/ industrial wastes (dumped outside or incinerated) / mixed heavy metal sludge (ink formulations)	

FOOD INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Egyptian Sugar and Refineries Co. (Hawamdiyah) - Sugar/ Molasses/ dry yeast/ alcohol/ essences/ glacial acetic acid	- pulp and fibers remains/ brown mud/ treatment wastewaters/ alcohol and hydrocarbon solvent wastes/ special boiling point solvents	
2) Cairo Co. For Oil and Soaps (2 Giza - 2 Cairo) - edible oil/ detergents/.and animal feed	- dust / corn remains (solid) - spoilt and waste vegetable oils - alcohol & boiling out residues	200 tons/year
3) El Nile Co. For Oil and Detergents (Bhateem/ Ghamra/ Hawamdiyah) - edible oil/ detergents	- spoilt and waste vegetable oils -alcohols & boiling out residues	
4) Alexandria Co. For Chocolates and Confectionery (Bhateem/ Ghamra/ Hawamdiyah)	- no information	
5) Eastern Tobacco Company (Giza)	- tobacco dust	
6) Egyptian Co. For Food Products- BiscoMisr (Al Amiryiah)	- expired products - spoilt and waste vegetable oils	
7) El Nasr Co. For Carbonated Beverages (Coca-Cola) (Dokki)	- wash water - broken glass	
8) Egyptian Co. For Beverages (Pepsi Cola) (El Haram / Heliopolis)	- wash water -broken glass	
9) Al Ahram Breweries (Stella) (Giza)	- wash water - broken glass	
10) El Nasr Co. For Preserved Foods - Kaha (El Badrasheen)	fibers and food remains	
11) Misr Co. For Milk and Food Products (El Amiryiah)	- spoilt vegetable oils - rancid products -sludge with Ni content	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
12) Egyptian Co for Starch and Glucose (Torrah/ Shoubra El Khiema)	- alcohol and hydrocarbon solutions	
-starch, glucose , sulfonated liq detergents		

TEXTILE INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Misr Helwan Co. For Spin & Weaving (Helwan)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	
2) ESCO Textiles (Shoubra El Khiema)	- Fibers/ halogenated solvents/ acid waste oils / zinc and heavy metal sludge	
3) Egyptian Co for Spin & Wool Weaving - WOOLTEX (Shoubra El Khiema)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	
4) El Nasr Co. For Spin & Weaving and Tricots - Shourbaghi (Imbaba)	- Fibers/ halogenated solvents/ acid waste oils / zinc and heavy metal sludge	
5) Cairo Co. For Clothing and Tricots - TRICONNA (Fum EL Khalig/ Abbasisa)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	
6) Cairo Co. For Dying and Preparations (Shoubra El Khiema)	- tarry residues and aqueous wastes with chlorinated hydrocarbons	
7) Cairo Co For Silk Textiles (Shoubra El Khiema)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	
8) Misr Co For Spinning & Weaving Machinery (Helwan)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge / oily sludge for metal treatment	
9) General Co For Jute Products (Shoubra El Khiema)	- Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	

ENGINEERING INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) El Nasr Car Company (Wadi Houf- Helwan)	- metal fillings - metal rejects - other metal remains (all are resold)	1251 tons/year 2180 tons/year 97 tons/ year
2) El Delta Industrials (Refig and Metal Prods) (Almaza/ Madinet Nasr/ Shoubra El Khiema)	- oily sludge from surface treatment - metal rejects and filings	
3) Egyptian Co for Electrical Cables (Mostorod)	- plastic remains/ metal filings - etching solutions form plastics plating	
4) Arab Co For Radio and Transistors (El Haram / El Talbiyah)	- metal rejects - wood remains - spent reagents and ammoniacal etchants	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
5) El Nasr TV Co. (Dar El Salaam)	- spent ammoniacal etchants - spent reagents	
6) General Co For Railroads Requirements - SEMAF (Helwan)	- metal body parts -Special b.p. solvents and hydraulic fluids	1076 t/year
7) Egyptian Co. For Light Weight Transport. (Wadi Houf/ Giza)	- metal rejects/ petroleum hydrocarbons/ solid residues - wastewaters with Ni and Cr content	
8) Egyptian Co for Mechanical Industries. (Mostorod/ Shoubra El Khiema)	- heavy metal sludge	
9) Engineering Projects Co-Steelco (2 Helwan/ 3 Cairo)	- iron remains (resold) - zinc dust	400 tons/year 150 tons/ year
10) Egyptian Co. For Metal Construction - Metalco (Shoubra El Mazalaat)	- scrape and iron remains	1421 tons/year
11) Co. For industrial Fixtures and Services (Madinet Nasr)	no information	
12) Cairo Co. For Metal Products (Shoubra El Khiema/ Imbaba/ Ghamra)	- metal rejects and filings	
13) El Nasr Co. For Engineering and Refrigeration (Giza)	- metal rejects / sludge /rejected casting	
14) Co. For Manufacturing Suspension and Transport Vehicles (Al Amiriyah)	- metal rejects/ sludge	
15) El Nasr Co for Steam Boilers (Giza)	- no information	
16) Misr Co for Engineering & Refrigeration (Mostorod/ Shoubra El Khiema)	- metal remains and rejected castings	

METAL INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Egyptian Iron and Steel Co. (Helwan)	- kin residues (sold to cement Ind.) - filter residues - transformer residues - spent reagents / conc. acids/ brighteners and pickle liquor/ heat treatment wastes (CN content)/ alkaline cleaning agents	8529 tons/year 63117 tons/year 198014 tons/ year
2) El Nasr Co. For Steel Pipes (Helwan)	- drilling and cutting emulsions - metal rejects and filings	
3) General Metals Co.(Helwan)	- dust containing lead oxides	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
4) El Delta Steel Mill (Abu Zabaal)	- kiln residues with heavy metal oxides (Pb, Mn, Cd, Cr) - spent reagents / conc. acids/ brighteners and pickle liquor - heat treatment wastes (CN content) - alkaline cleaning agents	
5) National Metal Industries (Shoubra EL Khiema)	- grinding and polishing residues - heavy metal sludge - drilling and cutting emulsions	
6) El Nasr Co For Dyecasting (El Tibeen)	- steel filing - grinding and polishing residues - drilling and cutting emulsions	1500 t/year
7) El Nasr Co. For Castings (Imbaba/ Giza)	- steel filing - grinding and polishing residues - drilling and cutting emulsions	

METALLURGY INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) General Co. For China and Ceramics(Mostorod)	- ceramic rejects - sludge with Pb content	1490 tons/year
2) El Nasr Co. For Refractories (Mostorod / EL Saaf)	- glass rejects - sludge with Pb content	
3) Egyptian Refectories Co (Helwan)	- refract remains recycled - sludge with Pb content	
4) El Nasr Co for Glass and X'tal Manufacturing (Mostorod/ Shoubra EL Khiema)	- glass remains- rejects - sludge with heavy and toxic metals (Pb, Cd, Cr and Mn) content	
5) Sinai Co for Manganese	- raw materials rejects - glass remains	
6) Misr Co for Phosphates	- ore remains	

II) Area: Alexandria Metropolitan Area

% of Industrial activities: 25-30 %

CHEMICAL INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Egyptian Co. For Timber Manufacturing (WOODCO)	- organic wood preservatives/ petroleum fractions of white spirit type/ wastewaters treatment sludge	
2) National Plastic Company (El Kabarry)	- plastic remains recycled - dust containing heavy and toxic metals (Pb, Cr, Mn and Cd) - phenol residues / varnish blend and solvent/ plasticier resin residues (heavy metal content) / etching solutions	21 ton/ year

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
3) Industrial Gases Company (3 factories)	- lead containing sludge/ residues from Hg cell process/ wastewater treatment sludge/ spent catalyst	
4) Paints & Chemicals Industry Co.	- paste / trash - paint residues and sludge	120 ton / year
5) Nile Matches Co. (2 factories)	- sulfur/ free silica/ phosphorous remains/ gelatinous/ remains and vernis solutions(explosive) - treatment sludge with heavy metal content	
6) Abu Qier Of. For Fertilizers and Chemical Industries	- urea dust - dust with heavy metal content/ Phosphogypskum sludge/ spent reagents	2.7 ton/ day
7) General Co for Paper (Rakta)	- metal remains - free silica - chlorine vapors & dust/ paper remains/ special bp solutions/ white spirit/ effluent treatment sludge	4380 tons/year 1095 tons/year
8) Moharam Bey Industrial Printers - 2 factories	- paper remains - metal pins/ plastic & wood remains - special bp sols/ effluent treatment sludge/ ink residues/ sludge with heavy metal content	4500 tons/ year
9) National Co. For Paper 2 factories	- sludge / free silica - dust/ paper remains - special bp solutions/ effluent treatment sludge	350 tons/ year
10) Verta Company for Paper Industrialization (2 factories)	- paper/ plastic remains - evaporating solvents and chromic acid vapors/ - slurry tar residues with halogen content	600 tons/ year
11) Misr Chemical Industry	- coke (fine) - limestone dust - asbestos diaphragms/ lead sludge/ residues from Hg cell/ spent catalyst - wastewater treatment sludge	3126 t/ year 61132 t/year
12) Transport & Engineering Co.	-Remains from car workshop - other related products - metal remains/ petroleum hydrocarbon residues	8710 t/year
13) Egyptian Co for Plastics and Electrical Products	- plastics PVC granules/ Styrofoam - lead particles & sludge/ etching sols/ gases form PVC production/ metal filings/ plasticiers residues/ varnish blends and solvents	488 t/ year
14) El Nasr Co. For Tanning Leather	- ammonia and leather remains & dust - sulfur gases/ special bp sols with aliphatic hydrocarbons/ tanyard sludge (Cr content) / white spirit & kerosene	480 t/year

FOOD INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Alexandria Co. For Chocolates and Confectionery (2 factories)	- no information	
2) Eastern Tobacco Company -2 factories	- tobacco dust	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
3) Egyptian Co. For Food Products- BiscoMisr - 2 factories	- expired products - spoilt and waste vegetable oils	
4) El Nasr Co. For Carbonated Beverages (Coca-Cola)	- wash water - broken glass	
5) Egyptian Co. For Beverages (Pepsi Cola) - 2 factories	- wash water -broken glass	
6) Al Ahram Breweries (Stella)	- wash water - broken glass	
7) El Nasr Co. For Preserved Foods - Kaha - 2 factories	fibers and food remains / trash	
8) Misr Co. For Milk and Food Products	- expired/ rancid products/ spoilt and waste vegetable oils/ waste sludge with Ni content	
9) Egyptian Salt and Soda Co 2 factories	- plastic - white spirit residue - metal filings - spent catalyst Ni	107 t/ year 270 t/year 387 t/y 15 t/y
10) Alexandria Co. For Oil and Soaps - 4 factories	- spoilt and wasted vegetable oils sludge with Ni content	
11) General Co. For Oil Extracts- 5 factories	- spoilt and wasted vegetable oils - sludge with Ni content	
12) Edfina Co. For Preserved Foods - 4 factories	- fibers and food remains / trash/ expired products	
13) Egyptian Co. For Starch, Yeast and Cleansing Agents -3 factories	- special bp solutions with alcohol content	

TEXTILE INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Arab Co. For Spin & Weaving	- metal filings - Fibers/ halogenated solvents/ acid waste oils/ zinc and heavy metal sludge	11 t/year
2) El Nasr Co. For Excellent Wools - STIYA - 3 factories	- same as in #1 - woolen fibers and remains	
3) Al Ahliya Spinning and Weaving Co - 2 factories	- same as in #1	
4) El Sharkiyah For Linen and Cotton Textiles - 3 factories	- plastic remains - same as in #1	
5) Arab Co. For Textiles and Carpets - 3 factories	- fibers / halogenated solvents / mixed metal sludge/ zinc and heavy metal sludge	
6) Alexandria Co for Spin and Weaving - 3 factories	- fibers / halogenated solvents / mixed metal sludge/ zinc and heavy metal sludge	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
7) El Nasr Co for Clothing and Textiles - KABO	- same as in #1	
8) Modern Textiles Co- 3 factories	- fibers / halogenated solvents / mixed metal sludge/ zinc and heavy metal sludge	
9) El Seyouf Co for Spin and Weaving - 4 factories	- same as in #1	

ENGINEERING INDUSTRY

<i>Name of Company (District)</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Alexandria Arsenal Company - Ship building	- used engine oils - scrap metals/ hydrocarbon solvents/ white spirit	
2) El Nasr Co for Electrical and Electronic Equipment- Philips	- PCB waste in transistors/ glass waste and rejects / etching solutions from plastic plating	
3) Alexandria Co for Metal Products - 5 sites	-metal sludge with CN content metal filings and rejects	

METAL INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Egyptian Cooper Factory	- acid plant blowdown slurry - sludge / waste water treatment sludge - spent pickle liquor - tar slurry	
2) El Nasr Co. For Dye Casting	- mixed metal sludge - rejects castings	
3) Alexandria Iron and steel Company	no information	

MINING & REFRACTORY INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) El Nasr Co. For Refractories	- mixed heavy metal sludge/ ceramic rejects - sludge with Pb content	
2) Egyptian Co. For Refractories	- glass rejects and refract remains/ plastic remains - sludge with mixed heavy metal content	
3) El Nasr Salt Co. - 3 factories	- salt (recycled)	7500 tons/year
4) El Nasr Co for Glass and X'tal Manufacturing	- glass remains- rejects - sludge with heavy and toxic metals (Pb, Cd, Cr and Mn) content	

III) Area: Remainder of 26 Governorates % of Industrial activities: 20 %

CHEMICAL INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Dying Materials and Chemicals Company -Beherah organic dyes and material, photo-radiant, detergents and pesticides	- Calcium salts (Carbonate and Sulfate) -gases special bp solvents/ spent reagents/ tarry residues and solutions of chlorinated halogens	88.8 t/year 57 mil m ³ / year
2) El Nasr Co for Fertilizers and Chemical Industries (Talkha-Dakahliya/ Suez)	- urea dust and Nitrogen oxides emitted - ammonia sludge/ spent activated carbon wastes/ Phosphogypskum sludge	
3) Egyptian Financial and Industrial Co (Kafr El Zayat / Beherah)	- Phosphogypskum sludge/ spent activated carbons wastes/ spent reagents	
4) Paper Manufacturing Co - Verta (Kafr El Zayat)	- paper & plastic remains -wood remains/ special bp solutions/ effluent treatment sludge/ kerosene and white spirits	600 t/year
5) El Nasr Co for Rubber Products (NAROBEEEM) (Gharbiyah)	- solid residues/ petroleum hydrocarbons/ slurries of chlorinated rubber in carbon tetrachloride	
6) Tanta Co for Linen and Oils (Gharbiyah)	- linen remains - waste oils	15665 t/year
7) Kafr El Zayat Co for Pesticides and Chemicals (Kafr El Zayat)	- spent reagents / Phosphogypskum sludge	
8) Egyptian Industrialized Chemical Co. KIMA- (Aswan)	- waste ammonia water/ spent nitrating acid/ tars containing polymerized hydrocarbons	
9) Industrialized Gases Co. (2 Aswan- Suez)	- lead sludge/ residues from mercury cell process/ wastewater treatment sludge/ spent catalysts	

FOOD INDUSTRY

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Extracted Oils and By-Products Co. (Damanhour)	- Soya bean remains - spoilt and waste vegetable oils	250 tons/year
2) Tanta Co. For Oil and Soaps (2 Benha - El Mahala)	- spoilt and waste vegetable oils - alcohol & boiling out residues - sludge with Ni content	
3) Edfina Co for Preserved Foods (Damietta/ Port Said)	- metal remains (Sn, Cu, Al) resold - paper waste / plastic/ scrap/ jute remains resold - fish and agricultural produce remains (dumped with MW)	7690 t/year
4) El Nasr Co For Preserved Foods KAHA (2 Beherah/ 2 Sharkiyah)	- same as # 3	

<i>Name of Company</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
5) Alexandria Co. For Oil and Soap (Kafr El Shiekh/ Kafr El Zayat)	- esterified oils -same as in # 2	
6) Misr Co. For Milk and Food Products (Dakahliyah/ Damietta/ Aswan/ Ismailia)	-sludge with Ni content -rancid products	
7) Misr Co. For Oil and Soap (3 Dakahliyah/ Sharkiyah/ Damietta)	-same as # 2	
8) El Nasr Co. For Carbonated Beverages (Coca-Cola) (2 Dakahliyah/ Sharkiyah/ Gharbiyah)	- wash water - broken glass	
9) Al Ahram Breweries (Stella) (2 Sharkiyah)	- wash water - broken glass	
10) Egyptian Slat and Soda Co. (Kafr El Zayat)	same as # 2	
11) Eastern Tobacco Company (2 Tanta)	- tobacco dust	
12) Egyptian Sugar and Refineries Co. (10 factories mostly Upper Egypt)	- brown mud/ alcohol solutions/ boiling out solutions/ sludge with heavy metal content	

TEXTILE INDUSTRY

<i>Name of Company (District)</i>	<i>Type of Waste Generated</i>	<i>Quantity</i>
1) Misr Co. For Spin & Weaving (Gharbiyah)	- Fibers remains - trash (used as fuel)/ waste treat residue/ Zinc and heavy metal sludge/ acid waste oils/ halogenated solvents	10934 t/year
2) Arab Co For Carpets and Textiles (3 Damanhour)	- wool fibers / dust - trash and same as #1	686 t/ year
3) Misr El Bidah Co for Dying (Kafr El Dawar)	- cotton and wool fibers/ - metal scrap / dust and trash/ same as in #1	882 t/year
4) Misr Co For Synthetic Silk (Misrayon) (Kafr El Dawar)	-fibers textile remains - sludge/ sulfates and trash/ same as in #1	3523 t/year
5) Misr Co for Spin and Fine Weaving (Kafr El Dawar)	- Fibers and textile remains	5845 t/year
6) El Nasr Co Spinning and Weaving (Kafr El Sheik/ Mahala)	- Fibers and textile remains	1184 t/year
7) Misr Shibeen El Kom Spin and Weaving (Shebeen El Kom)	- Fibers and textile remains	2502 t/year
8) El Delta for Spin and Fine Weaving (Damietta/ 2 Gharbiyah)	- Fibers and textile remains - same as in #1	2977 t/year
9) El Dakahliyah Spin and Weaving Co (4 factories)	- Fibers and textile remains - same as in #1	2687 t/year