Hazardous Waste Management in Kenya

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About Kenya: Socio Economic Status

It is important to appreciate the role of people in generation and sustainable management of hazardous wastes. For Kenya, in 40 years population has risen from 8.6 million in 1963 to present 28.7millions.

- Majority of the population is dependent on immediate environment for their social economic needs.
- 44% of population is <15 years old and therefore we are at a critical time to inculcate sound waste management philosophy.
- 54% is 15-64 years and active in generating waste
- 2% over 65 years. contributes little to waste generation

Therefore the problem of waste management for Kenya is also a developmental issue

Population Distribution

The where and how much and the type of waste is dependent on the population distribution. FOR Kenya,

- 70% of the population live in Rural Areas and 60% are involved in agriculture
- 27% Urban and almost 60% live in informal settlements and engage in the informal sector employment characterized by small streams of highly toxic and hazardous wastes
- Growth is currently 8% due to industrialisation and provision of services. Net effect is generation of waste sold liquid, gases.

Nairobi,Thika, Mombasa,Nakuru, Kisumu Eldoret and Mavoko have the highest populations and the highest incidences of environmental pollution.

Municipal Waste

- Includes both Industrial and Domestic Waste.
- Complex due to socio-economic changes.
- Now wastes contain larger positions of non degradable types of Waste.
- Typical Wastes includes plastic, scrap metals, clinical wastes.
- Per capital generation currently estimated at 66 kg per day.
- Therefore Nairobi with estimated population of 3 million now generates 1980 tons i.e..
- Estimated 272 7 ton lorry load.

Public Awareness of HazWaste Issues

- People understand and experience the toxic and the hazardous nature of wastes. Anything that smells, fumes, causing dermal and skin effects or kills livestock is automatically labelled hazardous and toxic
- Unless these effects are manifested, people are not concerned.

Sources of Hazardous Wastes

Typical steams of hazardous waste are as defined under Basel and Bamako convention annexes which have been used also to develop regulations and guidelines for the sector. They include:

- Industrial Areas 21%
- Residential Areas 61%
- Agricultural Waste 10%
- Clinical Waste 8%
- Services(not quantified)
- The informal business sector(not quantified)

Composition of Municipal Waste

Types of Waste	%	Mode of Disposal
Food Waste	51%	Dumping
Paper (recyclable)	17.30	Recycling
Plastics	11.80	Recycling
Textiles	2.60	Dumping/Open burning
Bones	0.70	Dumping
Metal (Containers & Others)	2.30	Informal fabrication
Grass Wood	6.11	Open burning
Rubber	0.30	Dumping
Leather	1.39	Dumping
Others	3.4	Dumping

Liquid Waste

It is estimated that the bulk of hazardous and toxic waste enter the environment as liquid wastes.

- Most liquid waste containing hazardous waste is discharged into rivers or carried by runoff eventually ending in rivers and ground waster.
- Of the 172 local authorities only 32 have some form of sewage treatment and disposal.
- 2 Local Authorities(Nairobi and Kisumu) with Conventional treatment
- 30 have oxidation lagoons which can only treat organic waste and not possible to treat persistent chemicals.
- Much hazardous waste sludge from these treatment works end up running off.

Hazardous Waste Regulatory Regime

- After enactment of EMCA, efforts have been made to make a national definition of Hazardous Waste (HazWaste).
- Regulations guidelines and standards in the process of formulation by the Standards and Enforcement Review Committee (SERC) under EMCA.
- Local authorities now required to make by-laws that address the local disposal methodologies and sites;
- Enterprises increasingly encouraged to use less hazardous raw materials
- The insurance industry active in addressing risk management issues as a determinant to the level of annual insurance premiums and circumstances for compensation in case of accidents occasioned by hazardous .

Guidelines

Kenya is following the definitions under Multilateral Environmental Agreements, (MEAs) on Chemicals and Waste namely: -

- The Montreal Protocol on Substances that Deplete the Ozone Layer.
- The Basel Convention on the Transboundary Movement of Hazardous Wastes and then Disposal.
- The Stockholm Convention on Persistent Organic Pollutants.
- Marpol
- Local by-laws

Quantifying HazWaste Wastes

Wastes as Defined by Basel Convention Category
1 further classified as follows:-
•Industrial waste
•Obsolete pesticides
•Clinical wastes Sewage Sludge
-Agrochemical Wastes
-POPs contaminated waste
It is requirement now for major generators of what can be termed as HazWaste to carry out an environmental impact assessment and environmental audit from which we can assess the level of generation of wastes

Industrial Waste

Sources of Industrial HazWaste
14 tanneries processing 920,000 hides, 6.5m skins per year.

- 1 Pulp and Paper with 145,000 tons per year from 1000.
- Petrochemical Industries especially tetraethyl lead and waste oil.
- Chemical based Industries.
- Pesticide Industry.
- Plastics Industry.
- Iron and Steel Scrap refining.
- Non ferrous Metals refining.
- PCBS = 10 tons identified.

Obsolete Pesticides

- They represents an obvious hazardous aspect because of poor management.
- 10,000 tons Estimated nationwide.
- 2,000 tons already qualified.
- 2,000 tons waiting disposal.
  Most of the absolute waste are in a state of mismanagement perhaps due to lack of guidance which is now nema's major concern and priority activity

Clinical Waste

Each District hospital generates 15 tons per year i.e.. 30 District Hospitals generate
450 tons per 8 Provincial Hospitals at
350 i.e.. 2800 tons.

Hospitals – Aga Khan 180 tons
Nairobi 180 tons
Pandya 180 tons
Small Hospitals 10 tons

i.e. Estimates of nationwide generation
6,685 tons per year.

Incineration as a mode of Disposal

Many facilities have in the past disposed clinical waste with other municipal waste with disastrous results of recycling. So they turned to open open burning in pits at corners which besides being against the Stockholm convention is also very unsanitary
•Established hospitals have "incinerators" which are just burners.
•District hospitals being equipped with incinerators under the Kenya Immunization Program(KEPI).

National Legislation

- It is the role of the Standards and Enforcement Review Committee under EMCA
- It is to identify materials and processes that are dangerous to human health and the environment.
- EMCA has detailed provisions regarding hazardous waste as
- detailed below.

On Transboundary Transport

Section 91 Subsection 3 says on Import; No person shall import into Kenya any hazardous waste.

On Export of Hazwastes

Section 91 Subsection 4

- No hazardous waste shall be exported to any country from Kenya without a valid permit granted by NEMA and a Written Consent given by a competent authority of a receiving country.

Transit Wastes

Section 91 Subsection 5

- "No HazWaste Waste shall be transported within or through Kenya without a valid permit granted by NEMA".
- Many requests to France, Netherlands and Britain.

Penalty

- Jail term of Less than 2 years.
- Fine of not less than 1 million Kenya Shillings. App. US$12,000.
- Responsibility of the removal from Kenya to be borne by the guilty party.

Environment and Health Impacts

- There is increasing evidence of contaminated ground water especially downstream of the Athi River Basin
- Proliferation of water weeds such as the water hyacinth in Lake Victoria and *Sylvania molesta* in Lake Naivasha is an indicator of impacts

Health Impacts

- Frequent cases of livestock deaths near places with identified HazWaste
- Sporadic flamingo deaths alleged because of toxic waste streams from identified HazWaste sources
- A number of reported diarrhoeal and cholera symptom cases due to drinking polluted water from factories dealing with chemicals that lead to HazWaste

Industry efforts to Minimize Waste

- Many initiatives by industry to control waste include:
- Traditional pollution control, measures
- Implementation of Environmental Management Systems especially ISO14000EMS Certification
- Many now on cleaner production programs
- Kenya has company of the year Wards(COYA) in which environmental performance is considered.

Cleaner production

- Initiatives for cleaner production were started in 1998 by MENR/UNIDO/FKE/WHO for food sector and were successful as people could identify business opportunities, cost savings and compliance with national legislation

CP cont.

- The Kenya National Cleaner Production was started in 2000 by the Kenya Industrial research and Development Institute;
- Typically 2 months are spent in identifying cleaner production opportunities
- 4 months are allocated for implementation
- By December 2003, a total of 22 companies had completed waste minimization projects.

Impacts of CP Programs

- According to KNPC , 50 pollution prevention measures have been identified
- Total annual savings realized approximate US$698,000
- Reduction of toxic chemicals in those enterprises estimated at 200MT
- Reduction of possible waste materials estimated at 300MT

Landfills and Contaminated Sites

- Nearly every local authority has a designated dumping site which is erroneously called a landfill.
- These landfills are usually abandoned quarries
- there is currently no sanitary landfill though one is planned for;

Generally all past and present dump sites are regarded as contaminated. They include: -

- Dandora Dumping Site over 1 million tons.
- Kangoki Dumping Site in Thika which serve a large number of chemical and leather industries. Approximately 500 tons of Haz resides.
- Many of abandoned factory sites.

HAZARDOUS WASTE MANAGEMENT IN THE REPUBLIC OF MAURITIUS

BY PRIYA DURSHINI THAUNO AND CHARLENE SANDRINE SEENYEN

1.0 MAURITIUS... AT A GLANCE

1.1 GEOGRAPHICAL LOCATION

The Republic of Mauritius consists of the main island, Mauritius located in the Western Indian Ocean to the east of Madagascar by latitude 20.17°S and longitude 57.33°E and a group of small islands namely: Rodrigues, the Cargados Carajos, Agaléga, Tromelin and the Chagos Archipelago. The total land area is 2040 km^2 whilst the marine exclusive economic zone covers an area of about 1.9 million km^2.

Figure 1: Mauritius and its location in the Indian Ocean

The main island, Mauritius is 1865 km^2 in area, volcanic in origin and consists of an irregular central plateau, surrounded by mountain ranges and plains.

1.2 CLIMATE

Mauritius enjoys a mild maritime climate, with summer extending from October to April and winter from May to September. On average, one cyclone passes within 100 km of Mauritius each year. Mauritius receives an average of 2100 mm annual rainfall with 70% occurring in summer.

1.3 POPULATION

Mauritius has been successively a Dutch, French and English colony. Various waves of settlers and immigrants produced a pluralistic society in terms of ethnicity and religion. 68% of the population are of Indian origin, 29% from Africa and neighboring islands, 3% of Chinese origin and about 2% of European origin. As a December 2001, the population was estimated to be 1.2 million.

1.4 ECONOMIC BACKGROUND

At its independence in March 1968, Mauritius inherited an economy which was highly dependent on sugar cane. Imports were very high with little growth in per capita income. However, over the last 2 decades, the economic record has been impressive and Mauritius has been referred to as "an economic miracle". This has been achieved by the sound economic management characterized by an increasing liberalized trade regime, incentives for foreign and private investment, sound public expenditure and indebtedness policy, prudent credit expansion and good governance.

This remarkable economic performance was sustained by 4 main pillars namely: agriculture, manufacturing (Export Processing Zone), up-market tourism and financial services (development of a dynamic Offshore Financial Services Centre and the Freeport). Per capita, GDP progresses steadily from US $ 2500 in 1990 to US $ 4500 in 2003.

2.0 MANAGEMENT OF WASTES

The rapid economic growth which Mauritius has known during the recent years has been achieved through widespread industrialization and urbanization. These have in

turn resulted in a change in output levels and consumption patterns. The volume and composition of wastes generated by the various sectors of the economy have therefore changed considerably.

The first National Solid Waste Management Plan was produced in 1994. This was to form a basis for future planning and action. The main priority of the projects undertaken under the plan has been the elimination of haphazard, uncontrolled waste disposal indulged a decade ago.

2.1 PRESENT STATUS

It is estimated that the amount of solid waste produced is close to 1200 tonnes per day. Each Mauritian generates around 0.7 kg of solid wastes daily and this is expected to go to 0.9 kg by 2010.

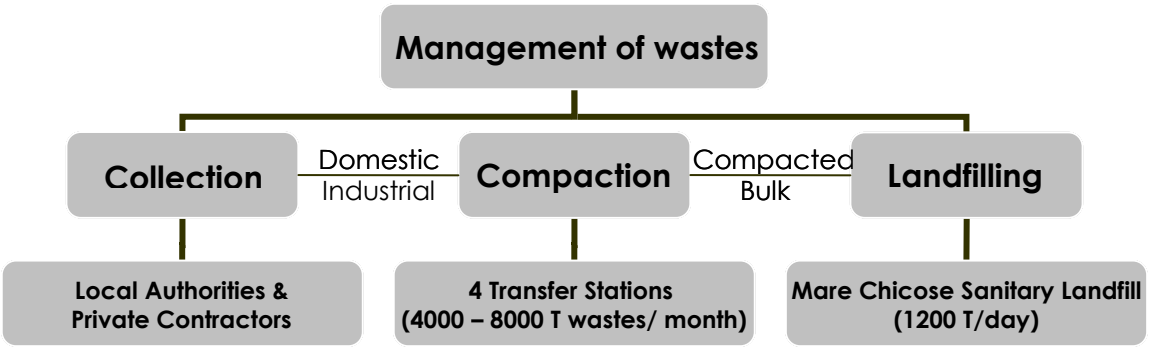

Figure 2: Waste Management Scenario

The Ministry of Local Government and Solid Waste Management is the regulatory body responsible for collection and transportation of household and commercial wastes. The wastes collected are brought either directly or through the 4 transfer stations to the only disposal site at Mare Chicose Sanitary Landfill. The transfer stations only carry out compaction and no sorting or composting facility is available.

The Mare Chicose Landfill which was originally planned to receive 300 tonnes of waste daily is now receiving about 1000 tonnes. Therefore, the lifespan of the Landfill has been dramatically reduced from 19 years to 9 years, i.e. up to 2005.

Box 1: Mare Chicose Landfill

Mare-Chicose landfill is situated in a small village, in the south-east of Mauritius. It first began operation in November 1997, and since that time, the landfill has been accepting solid wastes from all over the island. The Mare-Chicose landfill site occupies 20 hectares of land and the total volume available for waste containment is about 2.9 million m^3.

The site is developed and operated by the private company STAM Ltée under a 6 years contract with the Ministry of Local Government and Solid Waste Management. The site has 2 storage ponds and a leachate treatment plant, which has stopped its operation in September 2001. Landfill gas is collected and flared.

2.2 OVERVIEW OF GENERATED WASTES

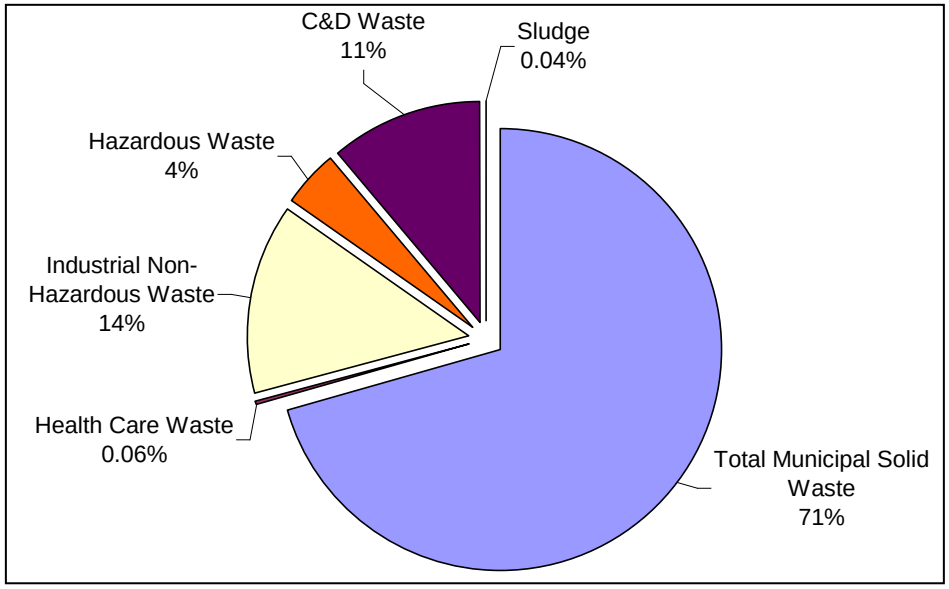

Figure 3: Generated Wastes

3.0 GENERATION & MANAGEMENT OF HAZARDOUS WASTES

3.1 CURRENT HAZARDOUS WASTE MANAGEMENT PRACTICES

Under the Environment Protection (Standards for Hazardous Wastes) Regulations 2001, the responsibility for storage and collection of hazardous wastes generated by industrial and commercial units lies with the generators. .

A number of different practices are currently in place in Mauritius such as:

- Solid hazardous wastes are not collected separately but discharged with non-hazardous wastes;
- Liquid hazardous waste is discharged with the sewage water or disposed of to the environment;
- Some hazardous waste is stored at the premises of the industry due to the lack of disposal facilities;
- In hospitals, hazardous waste is collected separately and incinerated;
- Internal collection systems of waste generators do not meet the requirements for safe handling and disposal of hazardous waste
- A very small quantity of hazardous waste is disposed of at the hazardous waste cell at the Mare Chicose Sanitary Landfill

3.2 HAZARDOUS WASTE MAINSTREAMS

- Textile industry
- Paint manufacturing
- Electroplating
- Galvanizing units
- Battery assembly
- Disposal of used batteries
- Pharmaceutical products
- Soaps and detergents
- Fertilizers
- Oil refineries
- Leather tanning
- Hospitals & health care centers

3.3 HAZARDOUS WASTE TYPES AND QUANTITIES

A number of projects and informal studies have been carried out in the local context to have an indication of hazardous waste generated in Mauritius. A national survey was carried out in 1999 by Fichtner, whereby it was indicated that the amounts of hazardous waste generated could represent as much as 5 – 6% of the total amount of waste generated.

Table 1: Hazardous Waste reported (Fichtner, 1999)

Source / type of Hazardous Waste	Quantities (1999)
Industrial Waste	
▪ Liquids	200 m^3/annum
▪ Sludge	200 m^3/annum
▪ Solids	500 t/annum
▪ Used oil waste	3,600 t/annum
Harbour waste, contaminated liquids	13,000 t/annum
Clinical waste	192 t/annum
▪ From Mauritius	184 t/annum
▪ From Rodrigues	8 t/annum
Problematic waste from households, commercial & tourist areas (total)	1,100 t/annum
Collected quantities (approximately 50% of total quantities)	500 t/annum

A **Hazardous Waste Management Information System** is currently being developed, whereby a database of hazardous waste generators with corresponding waste streams and quantities will be established. However, the data available is very limited and the quantities of hazardous waste currently registered, very small.

The amount of accumulated waste is expected to be very small and only small quantities are reported by the industry

3.4 HAZARDOUS WASTE DISPOSAL AT MARE CHICOSE LANDFILL

The only existing possibility for hazardous waste disposal is offered at the dedicated landfill cell at Mare Chicose landfill. Hazardous wastes that could lead to leaching of toxic components are not accepted at the landfill without pre-treatment. For instance, expired solid products are only accepted if encapsulated in impermeable material. Liquid hazardous wastes with water content higher than 70% as well as acids, pesticides, biocides, chemical and petroleum wastes are not accepted at the landfill site.

Box 2: Hazardous Waste Cell at Mare Chicose

The hazardous waste cell at Mare Chicose is equipped with a double composite liner consisting of HDPE and clay liners and the cell has a volume of around 7,500 m^3.

3.5 HAZARDOUS WASTE RECEIVED AT MARE CHICOSE LANDFILL

Table 2: hazardous and asbestos waste received at Mare Chicose

	Oct 99 – Sep 00 (t)	Oct 00 – Sep 01 (t)	Oct 01 – Sep 02 (t)
Hazardous waste	No information	7 drums estimated to contain 1.2 tonnes	0.44
Asbestos waste	1.66	No information	71.86

Information retrieved from the Ministry of Local Government and Solid Waste Management only 8.5 tonnes of hazardous wastes were disposed of at the hazardous waste landfill cell in the period January 2002 to March 2003.

3.6 HAZARDOUS WASTE IMPORT/EXPORT

There is no record of any hazardous waste import or export for Mauritius.

4.0 INSTITUTIONAL FRAMEWORK

The Ministry of Environment promulgated the Environment Protection (Standards for hazardous wastes) Regulations 2001, aiming at defining hazardous waste, minimizing its generation; banning importation and controlling exportation of such wastes. This regulation has come into force on 01 April 2002.

Under the present EPA 2002, the Ministry of Local Government and Solid Waste Management is the regulatory body (enforcing agency) charged with the responsibilities for setting policy and practice of hazardous waste management. This Ministry is responsible for:

- Implementing the hazardous waste regulations 2001
- The collection and disposal of waste
- Operation and management of waste management sites
- Making arrangements to ensure compliance with standards

Other key players in hazardous waste management include:

- The Ministry of Health and Quality of Life – for chemicals with potential adverse effect on health
- The Ministry of Agriculture, Food Technology and Natural Resources – for activities that utilize land and natural resources as well as the quality of food. This includes monitoring and assessment of pesticides
- The Ministry of Commerce and Co-operatives – for the control of import of products subject to import permits, mainly for health and environmental purposes
- The Ministry of Public Infrastructure and Land Transport – for regulating transport and shipping activites

5.0 REGULATORY FRAMEWORK

5.1 EXISTING LAWS AND REGUALTIONS

- Environment Protection Act 2002

Article 42. Standards for Hazardous Wastes

(1) The Minister may by regualtions declare what wastes are to be considered as hazardous wastes.

(2) In determining what wastes shall be declared hazardous, the Minister shall have regard to such special circumstances as he considers appropriate, including quantity, location and climatic conditions, relating to discharges.

(3) The Minister shall prescribe standards for hazardous wastes to control pollution of the environment and to promote public health and welfare.

(4) The Minister may make regulation for –

(a) The control of the import, export, collection, movement, transportation and disposal of hazardous wastes;

(b) The licensing of waste disposal sites, waste management systems and other facilities relating to the disposal of hazardous wastes in an environmentally sound manner.

- Environment Protection (Standards for Hazardous Wastes) Regulations 2001

The main provisions of the regulations require generators of hazardous waste to:

(1) Prepare an inventory of the hazardous waste that they generate as per the regulations;
(2) Report on the above inventory on a quarterly basis to the Ministry of Local Government & Solid Waste Management
(3) Seek approval from the Ministry of Local Government & Solid Waste Management for the use of any store, warehouse or other premises for the storage of a container or package containing hazardous wastes
(4) Classify, pack and label hazardous wastes as prescribed in the schedules
(5) Complete consignment notes whenever the hazardous waste generated leave the premises
(6) Offences and penalties:

(i.) 1st offence is liable to a fine not exceeding 15, 000 MUR and imprisonment not exceeding 2 years
(ii.) 2nd or subsequent offence relating to an environmental law is liable to a fine not exceeding 100,000 MUR and imprisonment not exceeding 5 years.

60 HAZARDOUS WASTE MANAGEMENT IN THE MAURITIAN INDUSTRIAL SECTOR

6.1 BACKGROUND OF INDUSTRIAL SECTOR IN MAURITIUS

According to the Digest of Labour Statistics, March 2003, the number of industries operating in Mauritius and Rodrigues, creating employment all over the island amounts to 2410.

These industries can be categorised into product groups such as:

- Agricultural, Forestry and Fishing
- Mining and Quarrying
- Manufacturing
- Electricity, gas and water
- Construction
- Wholesale, retail trade and repair m/vehicles, motorcycles, personal and household goods
- Hotels and Restaurants
- Transport, Storage and Communication
- Financial Intermediation
- Real Estate, renting and business activities
- Public Administration & Defence; Compulsory Social Security
- Education
- Health and Social Work
- Other Community, Social and Personal Services

Out of the industrial category, 792 industries have been rated as being hazardous waste generators. The waste stream is as follows:

Table 3: Waste Streams

Cat.	***Waste Stream***	***No.***
1	Batteries and accumulators	**12**
2	Electronic Industry, Coolant, Foams/Aerosol propellants, Solvent and coolant, survey	**12**
3	Human or Animal Health care and research related to such health care	**166**
4A	Textile Industries	**288**
4B	Leather industries	**7**
5	Manufacture, formulation, supply and use of adhesive and sealants (including waterproof products)	**7**
6	• Manufacture, formulation, supply and use of biocides and phytochemicals • Manufacture, formulation, supply and use of pharmaceuticals	**26**
7	Manufacture, formulation, supply and use of organic dyes and pigments	**9**
	• Manufacture, formulation, supply and use of organic solvents and	**38**

8A	chemical products other than those specified in items 6 and 7 • Manufacture, formulation, supply and use of fats, grease, soaps, detergents, disinfectants and cosmetics	
8B	Manufacture, formulation, supply and use of plastics, synthetic rubber, and man-made fibre	**44**
9	Manufacture, formulation, supply and use of paint and varnish	**21**
10	Manufacture, formulation, supply and use of printing inks	**107**
11	Metal surface treatment such as etching, cleaning, degreasing and hot dip galvanizing	**14**
12	Miscellaneous sources	**-**
13	Photographic industry	**24**
14	Wood preservation waste	**17**
TOTAL		**792**

Source: Ministry of Local Government

Therefore, potential hazardous wastes generators account for about one-third of the total number of industries in Mauritius.

6.2 INVESTIGATION ON MAURITIUS HAZARDOUS WASTE GENERATION

During the period September 17th to September 30th 2003, the Consultant (Carl Bro) visited a number of companies to investigate the actual amount of hazardous waste generated. The purpose was to obtain a better understanding of the hazardous waste situation in Mauritius and the amount that may be expected. (*Environmental Solid Waste Management Project, Pg 46-Cark Bro Report, October 2003)*

The hazardous wastes streams generated by industries amount to a minimum of 4,400 tonnes/year, an average of 8,500 tonnes/year and a maximum of 22,600 tonnes/year. The study estimated the hazardous generation as indicated in the table below.

Table 4: Data from Visit to Hazardous Waste Generators

Type of Company/ Institution/Industry	*Type of Waste*	*Waste Amount Min/Average/Max (Tonnes /year)*	*Number of Staff*	*Expected Treatment Method*
Agriculture	Pesticides, Laboratory waste	70 0.1/0.3/0.5	30	Incineration
Chemicals and Detergents	Sewage from WWTP	5 /8 /12	89	Incineration
Port Activities	Oil Sludge, lubricating oil and slops	1,000/2,000/3,000	500	Incineration
Paint Industry	Sludge from WWTP	2 /10 /12	8	Incineration
Electronic Industry	Electronic scrap, flux	0.1 /0.2 /0.3	55	Incineration
Laboratories	Laboratory waste, contaminated water	1 /3 /6	24	Physico-Chemical Treatment
Pharmaceutical Industry	Contaminated packaging, laboratory waste, cleaning water	10 /20 /25[1] (1 tonne of solids)	50	Incineration
Dry Cleaning Industry	Waste from dry cleaning (containing per-and trichlor)	7 /12 /15	60	Incineration
Metal Surface Industry	HCL containing Iron, rinse water containing HCL and Iron	3,500/4,500/5,000 (420 tonnes of sludge)	18	Physico-Chemical Treatment (landfilling)
Agriculture	Herbicides packaging	0.5 /1 /1.5	1,200	Incineration
Chemicals	Import, distribution of raw base chemicals	15 (obsolete) 0.1 /0.2 /0.3	16	Physico-Chemical Treatment
Leather Industry	Wastewater from tanning operation, chromium liquids	300 /400/1,000[1] (0.5 tonnes sludge)	18	Physico-Chemical Treatment (landfilling)
Textile Industry	Obsolete dye chemicals	0.5 /1 /1.3	550	Incineration
Photographic Industry	Photochemicals	100 /120 /150	75	Incineration
Oil Industry	Lubricating oil (excluding ships)	2,000/2,900/4,800	-	Incineration
Landfill	Asbestos waste	50/200/3,000	-	Landfill
Hazardous waste included in household waste		500/2400/3600	-	Incineration
TOTAL		**4,400/8,500/22,600**	**2,800**	

Source: Extract from Carl Bro Report, Oct 2003-Pg 47

Note: [1)] The quantities are likely to decrease when the hazardous waste facility is constructed due to changes in the present waste management procedures, which can easily be introduced by the companies

6.3 CURRENT MANAGEMENT PRACTICES IN INDUSTRIES

The responsibility for storage and collection of hazardous wastes generated by industrial and commercial units lies with the generators. A number of different practices are currently in place in Mauritius such as:

(i) Solid hazardous wastes are not collected separately but discharged with non-hazardous wastes

(ii) Liquid hazardous waste is discharged with the sewage water into the sewage system where it exists (only about 20% of the island is sewered) or disposed of to the environment

(iii) Some hazardous wastes are stored at the premises of the industry due to the lack of disposal facilities

(iv) In hospital, hazardous waste is stored on the premises due to lack of disposal facilities

(v) Internal collection systems of waste generators do not meet the requirements for safe handling and disposal of hazardous waste

(vi) A very small quantity of hazardous waste is disposed of at the hazardous waste cell at the Municipal Solid Waste landfill at Mare Chicose

A Hazardous Waste Management Information System is currently being developed at Ministry of Local Government whereby a database of hazardous waste generators with corresponding waste streams and quantities will be established. Although some communication with the industry has taken place, the data available are limited and the quantities of hazardous waste currently registered are very small. There is not the impression that the industry complies with the legal requirement for quarterly reporting and this hampers of course the development of the database. (*Environmental Solid Waste Management Project, Pg 43Carl Bro Report Oct 2003*).

Indeed, given that only solid hazardous wastes are permitted at the Mare Chicose Landfill, this leads to the liquid hazardous wastes being discharged into the sewer or being illegally dumped in the environment, for example, dumping of used oil in the environment is common.

Plate 1: Illegal dumping of oil drum

The overall impression from a series of visits to waste generators is that the most common method for disposal of hazardous waste is to dilute it in the wastewater or discharge the waste to drains and soil. (*Environmental Solid Waste Management Project, Carl Bro Report, October 2003*).

6.4 INDUSTRY EFFORT IN MINIMIZATION OF WASTES

At the level of the industries, some of them have recognised that application of Cleaner Production could result in a win-win strategy so as to decrease the waste stream, hence improve industrial efficiency, increase productivity and bring financial benefits to the enterprise.

Cleaner Production has been implemented mostly in food –manufacturing industries namely Britannia Sugar Factory, Moroil, Maurilait Production Ltée, but few have been successful due to lack of management commitment, perception of risks and not willing to invest.

Among the hazardous waste generator industries, Cleaner Production has been implemented in only one chemical-producing industry with the aim of reducing the water consumption. The option of recycling, re-using or recovering the hazardous wastes was not on the agenda of the management.

6.5 PUBLIC AWARENESS OF HAZARDOUS WASTES ISSUES

In 2003, following a gas leakage of a chlorine gas cylinder dumped into the environment, resulting in gaseous fumes emanation in the residential zone of Albion, killing one person, it has been realised that public awareness about hazardous issues is inexistent.

At national level, no elaborate campaign has ever been launched except for a national action plan on asbestos, which has been issued, by the Ministry of Health and Quality of Life.

6.5.1 Campaign on Asbestos

Following concern raised in different quarters over the possible health risks associated with the use of asbestos and the presence of asbestos- containing materials in buildings, EDC houses and factories, an Interministerial Committee chaired by the Deputy Prime Minister and Minister of Finance was set up in June 2001 to look into the health dimension of asbestos in Mauritius. The Interministerial Committee met all the stakeholders including members of the "Committee for the Ban of Asbestos". It was agreed that due to the complexity of the problem and the absence of local expertise, the services of a consultant from the Commonwealth Fund for Technical Co-operation, Commonwealth Secretariat, be sought (*National Action Plan on Asbestos, Oct 2002-Ministry of Health and Quality of Life).*

An action plan has been submitted to the committee by each stakeholder with a time frame for immediate, short term and long term implementation. It contains action already taken and measures proposed by members in their respective areas of responsibility (*National Action Plan on Asbestos, Oct 2002-Ministry of Health and Quality of Life).*

In the light of the Action Plan, the Ministry of Health & Quality of Life has set up a Secretariat at the Occupational Health Unit to coordinate all activities concerning asbestos and to collect, prepare and disseminate information. The Occupational Health Unit screened a first group of 52 inhabitants of EDC houses (houses built in asbestos board) in June 2002. No health effects related to asbestos were detected in this small sample (*National Action Plan on Asbestos, Oct 2002-Ministry of Health and Quality of Life)*.

A sensitisation campaign was launched among the EDC residents by health care workers prior to the screening exercise to encourage residents to come forward in view of the poor response (*National Action Plan on Asbestos, Oct 2002-Ministry of Health and Quality of Life)*.

Furthermore, with the collaboration of the Ministry of Health and Quality of Life, Ministry of Labour and Industrial Relations, the Mauritius Employers Federation (MEF) organised a workshop for health and safety officers on asbestos. A training programme for the supervisors, managers and human resource personnel was also proposed (*National Action Plan on Asbestos, Oct 2002-Ministry of Health and Quality of Life)*.

6.6 PROJECTS ON RECYCLING AND REUSE OF HAZARDOUS WASTE

There are plans to operate two recycling installations for oily waste in Mauritius. As these installations are not yet in place, barely any used recycling activity of oil takes place. The common practice is to burn the waste oil mixed with bagasse in the sugar industry, in other small industrial boilers or to discharge the waste oils to the ground as it has been reported to the Ministry of Environment at several occasions.

Photo chemicals are collected and sent to South Africa for recycling. The collection system covers the entire island and installation of equipment for extraction of the silver in Mauritius is now planned. This process will result in generation of hazardous waste, as the liquid residue is unlikely to be accepted at the municipal wastewater treatment plant due to high concentrations of chemicals (*Environmental Solid Waste Management Project, Carl Bro Report, October 2003*).

7.0 NATIONAL NEEDS FOR ACHIEVING ENVIRONMENTALLY SOUND MANAGEMENT OF HAZARDOUS WASTES

1. **Construction of pre-treatment facilities** for stabilization, solidification, interim storage facilities and incineration facilities for wastes that cannot be landfilled
    - A feasibility study has been undertaken by government to identify a site for the construction of the above-mentioned waste complex

2. Strengthening of the legal and institutional framework

- Hazardous waste management is still in its infancy. It is therefore imperative that capacities be strengthened and expertise sought to better enforce the current regulations. Poor enforcement is directly linked to the lack of participation of the Industry in abiding by the Regulation.
- Hazardous Waste Audits
- Contingency plans for hazardous waste
- Public awareness campaigns

3. Cleaner Production at Industry Level

- Encourage industries to adopt cleaner production technologies for the environmentally sound management of hazardous wastes as well as in waste minimization

4. Capacity building/training/equipment - for emergency response

- Regional agreements to lower transportation costs during the export of hazardous wastes
- Setting up an Information Network at Regional Level since most African Developing Countries face similar constraints.

HAZARDOUS WASTE MANAGEMENT IN NIGERIA

BY THEODORE M. NWAOKWE

1 BACKGROUND INFORMATION

Nigeria is a tropical West African country with a landmass of 928,768.64 sq km. It shares boundaries with the Republic of Niger in the North, the Atlantic Ocean in the South; the Republic of Cameroon in the East and the Republic of Benin in the West.

Nigeria's population is about 115 million with an annual growth rate of 3.05%. There are thirty six (36) states in Nigeria. Abuja is the Federal Capital of Nigeria. The national currency is the Naira (₦) with an exchange rate of appropriately N139 to 1 US dollar.

There are two principal seasons in Nigeria namely: Rainy season (April - September) and Dry season (October – March). The vegetation ranges from the mangrove swamp forest in the south, through guinea savannah in the Middle Belt to the Sahel Savannah in the North.

1.1 2. MAJOR ENVIRONMENTAL ISSUES IN NIGERIA

Analysis of current environmental issues in Nigeria presents a picture of a developing country suffering the worst of both worlds; that is, a mixture of environmental problems resulting from poverty, over-population and under development as well those from rapid industrialization. These problems include those of water and sanitation, solid waste management, environmental pollution, desert encroachment, flood and erosion, exotic weed menace, industrial and hazardous waste management, and problems arising from petroleum exploration and exploitation and mining activities.

3. **Sources of Hazardous Wastes:**

Wastes	Sources
• Industrial wastewater with toxic substances (e.g. heavy metals, cyanides, phenols)	Electroplating, metal finishing, manufacture of batteries
• Solvents	Metal finishing, printing, paints, varnishes, inks
• Oil	Motor vehicle workshops, petrol service stations, ship repairs, petroleum exploration/refining, oil processing
• Acids and Alkalis	Manufacture of batteries, industrial chemicals
• Photographic wastes	Printing, publishing, photo studios
• Electronic and electrical wastes	Manufacture of electronic and electrical components, servicing/repairs of electronic and electrical equipment/gadgets

4. Quantities/Generation of Hazardous Wastes

Industries with a high potential for generating hazardous wastes are mainly: inorganic and organic chemicals, petroleum refining, iron & steel, non-ferrous metals (smelting & refining), leather tanning and finishing, paint and coatings, electroplating and metal finishing.

In Nigeria, reliable information on the generation, storage, transport, use and disposal of hazardous substances and wastes is often not available. The Federal Ministry of Environment has the overall responsibility for policy formulation in the area of environmental protection and natural resources conservation and therefore provides the policy framework for the various States Ministries of Environment and States Environmental Protection Agencies in their efforts to control and manage hazardous wastes. The Ministry has considered the problem of hazardous wastes as very serious and is at present conducting inventories and studies to determine the sources, types, and quantities of hazardous wastes generated in Nigeria. The on-going inventories/studies include the National Dioxin and Furan Inventory; Inventory of Persistent Organic Pollutants; and Inventory of Healthcare Wastes.
It is very likely that some institutions might have carried out inventories of certain categories of hazardous wastes but the results of such inventories may not have been circulated widely for reference purposes. Considering the number and type of industries operating in Nigeria, it can be unarguably stated that several tonnes of hazardous wastes are generated annually in Nigeria.

5. Current Management Practices

Nigeria's current hazardous wastes management practices are as follows:

- Characterization of hazardous wastes: The waste streams of industries operating in Nigeria have been characterized. One study showed that most of the hazardous wastes are generated by the following industries: steel works, metal fabrication, textiles, pharmaceuticals, tanneries, refineries, industrial chemicals and food processing.

- Separation and segregation of hazardous wastes: The Environmental Education and Awareness Unit of the Ministry and some environmental non-governmental organizations (ENGOs) are creating awareness of the need to separate paper, glass, metals and plastics from other waste.

- Waste audits: Healthcare establishments undertake waste audits, which help to identify wastes that can be re-used, recycled or disposed. Waste auditors are also being trained and accredited by the Federal Ministry of Environment.

- Recycling: Various types of hazardous wastes are collected and stored annually. They are recycled either locally or abroad. Such wastes include batteries, metal parts, glass, tyres, plastics and paper. The sources of these wastes are mostly unserviceable vehicles, old electronic and electrical appliances, drinks containers, packaging materials, house hold appliances, broken down gadgets and machinery, toys, musical instruments and accessories.

  The ferrous and non-ferrous metals, copper and aluminum components of wastes are sorted by scrap material and scrap metal dealers and sent to steel works at

home or abroad. Plastic materials are sent to plastics industries for recycling or reprocessing while papers are sent to paper converters.

- Incineration: The Government of Nigeria has provided and commissioned hospital waste incinerators at the National Orthopedic Hospitals in Kano, Lagos and Enugu; the National Hospital, Abuja; and the National Institute for Medical Research, Lagos. There are also oily waste incinerators owned and operated by the private sector companies, for example, the Shell Petroleum Development Company, Mobil Producing Nigeria, Chevron-Texaco, International Tools and Supply Nigeria Ltd., and Titan Project Nig. Ltd.

- Open air burning: It is the most widely practiced hazardous waste management method in Nigeria. It may not be environmentally friendly but it has served to reduce the mountains of wastes in our urban centers. It is also favoured because the country at present lacks the technology and fund to landfill or treat some of these hazardous wastes.

- Compliance Monitoring and Enforcement: The country has trained officers to monitor the activities of industries and also enforce regulations. The States Environmental Protection Agencies (SEPAs) have been provided laboratory kits/apparatuses and vehicles to strengthen their compliance and monitoring capacity. Many environmental consultants and waste managers have also been accredited to complement the efforts of the regulatory bodies.

- Chemical tracking and hazardous waste dump watch

The programme aims at the following:

- Inspection of goods at the ports for banned, expired and hazardous chemicals and wastes
- Permitting facilities to store, export or import recyclable waste
- Toxic waste surveillance
- Implementing the prior informed consent procedure
- Monitoring persistent organic pollutants
- Inspecting warehouses
- Registering chemicals and pesticides
- Licensing retail and distribution outlets

Some of the achievements of chemical tracking and hazardous waste dump watch programme include

- Occasional interception of expired pharmaceuticals, banned chemicals and pesticides
- Interception of camouflaged hazardous wastes
- Implementation of permitting scheme for importation of green wastes
- Installation of waste treatment facilities by some industries.

6. Environmental & Health Impacts of Hazardous Wastes

Nigeria as a developing country is faced with a myriad of hazardous waste management problems. Most industries discharge solid, liquid and gaseous wastes directly into the environment without treatment and this poses serious public health and environmental threat. Air pollution, water pollution and soil contamination are the various forms of environmental pollution experienced in Nigeria.

Air pollution is brought about by vehicular emissions, emission of fumes from industrial processes, gas flaring, cement dusts, burning of municipal wastes as well as emissions of fumes from use of generators in private houses, commercial and industrial set-ups. The influx of used vehicles (in various states of disrepair) from abroad as well as reliance on outdated machines for industrial processes have compounded the problems of air pollution in Nigeria today.

Pollution of inland waters is a nation-wide problem brought about by leaching of pesticides and fertilizers; discharge of untreated effluent from industries using or producing chemicals; accidental discharge of waste water from these industries; off-label use of chemical products and leachates/run offs.

In the coastal areas, marine pollution is brought about by discharge of untreated industrial effluents into marine water; run off from land sources; direct oil spills and discharge of untreated sewage. Ground water pollution is also a nation-wide problem brought about by leaking underground chemical tanks; discharge of untreated effluent into the soil; leaking of chemicals/pesticides and run off of pesticides and fertilizers.

The adverse health effects in the population living near hazardous wastes generation and disposal sites may involve any organ of the body or any of the vital physiological functions. The effects would depend upon the specific chemical, the characteristics of the individual such as age, sex and genetic make-up, the metabolism of the chemical and the operation on confounding variables such as personal habits and prevalence of other diseases. Of primary concern are cancer, genetic defects, congenital anomalies, reproductive abnormalities, and alterations of immune status and disorders of the central nervous system. No wonder nowadays, there is a high incidence of strange and sometimes incurable diseases afflicting thousands of Nigerians and which are erroneously attributed to witches and wizards.

1.2 7. HAZARDOUS WASTES CONTAMINATED SITES/REMEDIATION ACTIVITIES

One of the most serious environmental problems in Nigeria is the residual contamination brought about through petroleum exploration/exploitation and mining activities.

Frequent oil spills have devastating effects on marine fauna and flora and are a major cause of loss of biodiversity in the Niger Delta and oil producing areas. Gas flaring in addition to contributing to the global warming and acid rain phenomenon also has psychological impact on the inhabitants of those areas. Frequent fire outbreaks resulting from vandalization of oil pipes by restive youths have also contaminated the soil and farmlands of oil producing areas.

The search for precious stones and minerals in some parts of the country is associated with certain environmental problems. The prospecting of minerals have degraded and rendered several acres of lands useless for farming or other uses. The contamination of soil by mining wastes also renders farmlands useless.

In many cases, the mined out pits have been used as dumps and as receptacles for the disposal of hazardous wastes and contaminated wastewater. The Government of Nigeria has created the Niger Delta Development Commission to tackle the problems of environmental degradation and poor infrastructural development in the region. The

Government is developing plans to identify and remediate all the contaminated mining sites nationwide and also fill out these mining pits.

8. National Institutional and Regulatory Framework for Hazardous Wastes Management.

The first major attempt by Nigeria to tackle hazardous waste problems was the establishment of the Federal Environmental Protection Agency in 1988 following the detection of a toxic waste dump in a small riverine town of Koko in Delta State. Furthermore, the Federal Ministry of Environment was created in 1999 by a Presidential directive which authorized that the federal departments and agencies relating to forestry, environmental health and sanitation, oil and gas pollution control, coastal erosion, environmental assessment, soil and flood be released to the Federal Ministry of Environment.

For the reduction and/or elimination of hazardous wastes generation in Nigeria, the Government has put in place the following legislations, regulations and guidelines:

- FEPA Harmful Wastes Provisions Decree 42 (1988)
- National Guidelines and Standards on Environmental Pollution Control in Nigeria (1990)
- National Effluent Limitations Regulations, S.I. 8 (1988)
- National Pollution Abatement in Industries and Facilities Generating Wastes Regulations, S.I. 9 (1991)
- National Environmental Protection Management of Solid and Hazardous Wastes Regulations, S. 1. 15 (1991)
- FEPA (Amendment) Decree No. 59 (1991)
- Environmental Impact Assessment Decree No. 86 (1992)
- National Guidelines and Standards on Water Quality
- National Guidelines and Standards on Waste Disposal Through Underground Injection.
- National Guidelines on Spilled Oil Fingering
- National Guidelines on Registration of Environmentally Friendly Products and Eco-labeling
- Guidelines on Hazardous Chemicals Management
- Guidelines on Pesticide Management
- The Blueprint on Waste Management in Nigeria

The Government of Nigeria has ratified the following Conventions/Protocols relating to chemicals and hazardous wastes management.

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer.
- United Nations Framework Convention on Climate Change including the Kyoto Protocol
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
- Stockholm Convention on Persistent Organic Pollutants

1.3 9. INDUSTRY EFFORTS IN MINIMIZATION OF HAZARDOUS WASTES

Many industries operating in Nigeria might have made reasonable efforts in minimizing the generation of hazardous wastes by modifying the industrial processes or introducing low-waste technologies. The following companies have recorded achievements in waste recycling and reuse:

- Super Engineering Company Limited, Lagos - plastic waste recycling
- Star Paper Mills Limited, Aba - waste paper recycling
- Chellco Industries Limited, Kaduna – textile yarn recycling
- Taewoo Floor Covering Company Limited, Lagos – plastic wastes recycling
- BOSKEL, Nig Ltd, Port Harcourt, a wholly indigenous company actively involved in thermal processing engineering and environmental management has designed and installed BOSKEL smokeless flare system in Shell Petroleum Development Company Stations in the Niger Delta for the efficient disposal of excess gases produced at oil and gas installations. The company also has developed and commercialized a range of incinerators for effective disposal of hazardous, industrial, medical and municipal wastes. The types are: High-temperature solid waste incinerator, high-temperature liquid wastes incinerator, low-and high-temperature thermal de-sorption unit and high-temperature, low-pressure drum washing facility.

1.4 10. PUBLIC AWARENESS OF HAZARDOUS WASTES ISSUES

The populace is increasingly being made aware of dangers posed by hazardous wastes. They are taught the basic waste management techniques of sorting and segregation. Hospitals, industries, commercial ventures and households are regularly reminded to collect and dump their wastes at designated areas. The Government in the year 2000 organized three National Workshops on Environment friendly use of Pesticides in three Nigerian cities. In the year 2001, the Government in conjunction with UNIDO, FAO and SBC organized Awareness-raising Seminar on Hazardous Waste Management. Annually, Nigeria marks the World Environment Day and takes the opportunity to create awareness of local and international environmental issues including the problems of hazardous wastes.

11. National Needs for Achieving Environmentally Sound Management of Hazardous Wastes

- Provision of Industrial Waste Management Facilities: The private sector and the government should provide hazardous waste disposal facilities and more treatment facilities. At present, Nigeria does not have a functional sanitary landfill.

- Capacity Building/Training. The country has few well-trained and specialized personnel in hazardous waste management. There is need for specialized training of waste managers. There is also the need for the provision of analytical equipment and monitoring gadgets.

- Strengthening Legal and Regulatory Framework: There is a need for review of existing laws and regulations on hazardous wastes management with a view to harmonizing them with the provisions of the ratified international conventions

- Funding Inventory of Hazardous Wastes: The nation needs financial assistance in inventory of hazardous wastes and the establishment of databases.

- Enforcement of Regulations: Regulations and laws concerning hazardous wastes are poorly enforced in Nigeria. There is a need for specialized training in enforcement of laws and regulations.

- Awareness: The level of awareness of harmful effects of hazardous wastes is low. The nation needs assistance in organizing awareness-raising workshops and seminars on the environmentally sound management of hazardous wastes.

12. Conclusion

The problems of unsound management of hazardous wastes in Nigeria, today, are enormous but the first crucial step has been taken which is the setting up of a full-fledged Ministry of Environment. In its commitments to the resolution of these problems, the Ministry has put in place legal, administrative and enforcement mechanisms/procedures to monitor and tackle the problems in order to protect human lives and the environment from the deleterious effects of hazardous wastes and to ensure sustainable development.

HAZARDOUS WASTE MANAGEMENT IN SENEGAL
BY MR. MOUSSA DIOP

INTRODUCTION

Le Sénégal a signé et ratifié un certain nombre d'instruments internationaux relatifs aux déchets dangereux (Bâle, Bamako, Rotterdam, Stockholm).

Les dispositions pertinentes contenues dans ces conventions ont commencé à être prises en compte dans la législation nationale.

Au point de vue du partenariat, le Sénégal abrite le Centre Sous-Régional Francophone de Formation et de Transfert de Technologie, le Secrétariat intérimaire du volet Environnement/NEPAD.

Avec la coopération néerlandaise, le Sénégal a procédé à l'enlèvement, pour traitement en Europe d'importantes quantités de pesticides obsolètes.

Pour le secteur privé et avec l'aide des bailleurs, il développe un programme de mise à niveau des entreprises.

I LES DECHETS : SOURCES/PRODUCTION

Type de déchets chimiques	**Origine**	**Production**	**Exportation (tonnes/an)**	**Importation (tonnes/an)**
White spirit (solvant non halogéné)	METABOX - CARNAUD	600 litres/an	-	-
Trichloréthane (solvant halogéné)	METABOX - CARNAUD	150 litres/an	-	-
Vernis	METABOX - CARNAUD	300 litres /an	-	-
Organochlorés et organophosphorés dans du cyclohexane	SENCHIM	20 000 litres/an	-	-
Organochlorés et organophorés dans un caustique	SENCHIM	9 600 litres/an	-	-
Phosphogypse	ICS - Mbao	1 500 l/an	-	-
Acide fluosilicique	ICS - Mbao	43 800 m^3/jour	-	-
Pentoxyde de vanadium	ICS - Mbao	2000 m^3	-	-
Soude caustique à 2/%	SPIA - Louga	3 000 /litre/an	-	-
50 000 piles (AAR-6)	SIGELEC -Pout	300 kg/an de zinc	-	-
250 000 piles (R-20)	SIGELEC - Pout	5tm/an de zinc	-	-

	Origine	**Production (tonnes métriques/an)**	**Exportation (tonnes/an)**	**Importation (tonnes/an)**
Terre activée à l'acide	SEIB - Diourbel (SONACOS)	12 tm/mois	-	-
Type de déchets chimiques	SEIB - Diourbel (SONACOS)	10 000 m3/an	-	-
Huile minérale	SEIB - Diourbel (SONACOS)	10 tm/an	-	-
Huile végétale	SEIB - Diourbel (SONACOS)	43 tm/an	-	-
Soude caustique	SEIB - Diourbel (SONACOS)	75	-	-
Soude caustique	SIEB - Diourbel (KAOLACK)	100	-	-
Plomb tétraéthyle et plomb tetraméthyle	SAR - DAKAR	70	-	-
Boues pétrolières	SAR - DAKAR	95 m3/an	FRANCE	-
Catalyseurs divers	SAR - DAKAR	14	-	-
Goudron acide (brai) contenant des métaux lourds, des sels et des hydrocarbures)	SRH (Société de régénération des huiles	160	-	-
Terre activée contenant de l'huile (moins de 5 %)	SRH - (Société de raffinage des huiles usées	100	-	-
Caoutchouc	SAFCAC - DAKAR	33	-	-
Cendres à valeur fertilisante	SONACOS - ZIGUINCHOR	120	-	-

1.4.1.1 Types de déchets générés	1.4.1.2 Origine	1.4.1.3 Production estimée	1.4.1.4 Exportation	1.4.1.5 Importation
DECHETS INDUSTRIELS				
Pesticides obsolètes Eau de lavage Sang Boues de filtration Boues d'épuration Huile usée Perte d'hexane Imbrules solides	Agriculture et production alimentaire	510 t 2 000 t/an 24 000 t/an 2.4 t/an 300 t/an 100 t/an		
Organochlores et Organophosphores Soude caustique 2% Hydrocarbure et matières grasses Acides fluosiliciques	Exploitation minière	20 000 t/an 3 000 l/an 60 t/an 43 800 m^3/j		
Boue de plomb Boue pétrolière Goudron acide Métaux lourds Terres activées Boue de purge de réservoir PCB plus contenants contaminés	Production d'énergie	70 tm/an 150 tm/an 160 tm/an 100 tm/an 100 tm/an 249 t/an 110 422 t	France	
Chute d'acier Rebut de fil de fer Huile de lubrification	Industrie de l'affinage des métaux	15 t/an 40 t/an 1 t/an		
Poussière	Industries de l'affinage des minéraux non métalliques	1 à 3 t/j		
Contenant plastique et métalliques Pneus Cendres et fils de fer Solution d'organochlorées Matières premières	Industries chimiques et connexes	500 à 800 unité/an 100 kg/j 300 m^3 20 000 l/an 45 t/an		
Déchets chimiques Sachets plastiques Eaux usées Cartons d'emballage	Industries de papier, Imprimeries et Editions	300 m^3/an 52 m^3/an 334 m^3/an		
Animaux de laboratoires Œufs infectés Sang Objets acérés et rebut Eléments radioactifs Déchets anatomiques Lames et lamelles Tubes de prélèvements	Services médicaux et de santé	 2.52 m^3/semaine en moyenne et par structure de recherche médicale 1.31 m^3/semaine et par centre de santé 8.84 m^3/semaine et par hôpital en moyenne		
Cartons d'emballage Solvants Solvants halogènes Chiffons imbibés de solvants halogènes Vernis :phase lourde décantée Piles Retailles métalliques	Industries de transformation des métaux	416 m^3/an 600 l/an 150 l/an 1 m^3/an 300 l/an 50 000 unités/an (5tm de Zinc) 300 tm/an		
Effluents liquides Ordures de tissus Matières stercoraires Eaux usées plus arsenic	Industries de textiles, cuir, peaux et bois d'oeuvre	208 406 m^3/an 2 685 t/an 63 540 m^3/an 10 890 m^3/an		

II LES TECHNOLOGIES UTILISEES

Différentes méthodes de traitement sont utilisées pour la gestion des déchets dangereux :

Il s'agit :

- de l'enfouissement : déchets ;
- du recyclage : plastique, métaux, huiles usées ;
- de la régénération : composés huileux ;
- de la valorisation : coques d'arachides comme combustibles ;
- de l'incinération : déchets biomédicaux et huiles dans les centrales électriques.

Les technologies utilisées sont principalement :

- l'enfouissement simple par dragage ;
- la Régénération des huiles : technique de séparation et le dopage ;
- le recyclage :
    - Fusion des métaux
    - Transformations industrielles du plastique
- l'incinération :
    - Séparation des composés huileux et de l'eau
    - Combustion
    - Incinération dans des fours à haute température
    - Brûlage des déchets.

III LES IMPACTS

Les impacts des déchets dangereux sur la santé et l'environnement sont divers :

a) Sur la santé

- Transmission de maladies à la suite d'accident par les instruments médicaux souillés
- Accroissement des infections
- Augmentation des résistances
- Réémergence de certaines pathologies (choléra, typhoïde, tuberculose, fièvre jaune, etc.)
- Propagation de maladies émergentes (SIDA, Ebola, etc.).

b) Sur l'Environnement

- Pollution des sols, des eaux et de l'air
- Contamination ambiante
- Dégradation de l'esthétique et encombrement ;
- Accumulation dans la chaîne alimentaire de pesticides

IV SITES CONTAMINES

Il existe quelques sites particuliers contaminés par les déchets au Sénégal. Il s'agit :

- des sols à Richard Toll et à Dakar contaminés par les pesticides
- des eaux au niveau de la baie de Hann à Dakar où se concentre l'essentiel du tissu industriel

  - Pour les sols : les solutions sont à l'étude

  - Pour la baie de Hann : la solution consiste :

    - à caractériser tous les rejets
    - à proposer des technologies pour le traitement des rejets

V CADRE INSTITUTIONNEL ET LEGISLATIF POUR LA GESTION DES DECHETS DANGEREUX

1) Cadre institutionnel

Le cadre institutionnel est constitué par :

a. Les structures administratives

- le Ministère de l'Environnement et de la Protection de la Nature qui est l'autorité compétente pour les déchets dangereux et le traitement de tous les déchets en général
- le Ministère de la Prévention, de l'Assainissement et de l'Hygiène Publique qui assure la gestion des eaux usées
- les collectivités locales qui assurent la gestion des déchets ménagers dans la limite de leur territoire
- l'Agence pour la Propreté de Dakar qui est maître d'œuvre délégué pour la gestion des déchets ménagers à Dakar
- la Commission nationale sur les produits chimiques
- le Comité national pour les déchets dangereux
- les points focaux des Conventions de Bâle, Bamako, Rotterdam, Stock ohm : Direction Environnement.

b. Le secteur privé ex SPIDS

c. Les Organisations non gouvernementales ex IAGU - CFTT

2) Le Cadre législatif et réglementaire

De nombreux textes juridiques traitent de la gestion des déchets. On peut citer :

a. Les textes législatifs

- Loi 2001-01 du 15/01/02 portant Code de l'Environnement
- Loi 83-71 du 05/07/83 portant Code de l'Hygiène
- Loi 64-46 du 17/06/64 relative au domaine national
- Loi 81-13 du 04/03/81 portant Code de l'Eau
- Loi 88-06 du 26/08/88 portant Code minier
- Loi 96-07 du 22/03/96 portant transfert de compétences aux collectivités locales modifié
- Loi 86-13 du 14/04/86 portant Code pétrolier
- Loi 84-14 du 02/02/84 relative à l'homologation et au contrôle des pesticides et aux sanctions

b. Les textes réglementaires

- Circulaire n°01307 du 22/02/90 sur la gestion des pesticides agricoles
- Décret 2001-262 du 12 avril portant application du Code de l'Environnement
- Arrêté n°0852 du 08/02/2002 portant création de la Commission Nationale de Gestion des Produits Chimiques
- Arrêté n°7780 du 19/07/90 portant composition du dossier d'homologation
- Norme NS-05-061 de juillet 2001 sur les normes de rejet des eaux usées.

VII EFFORTS DU SECTEUR PRIVE POUR REDUIRE LES DECHETS DANGEREUX

Ces efforts sont multiples et portent sur :

- le recours à des technologies propres dans certaines unités industrielles : ex NESTLE ;
- l'incitation et la motivation : un concours annuel fondé sur le respect des consignes de gestion des déchets est organisé pour récompenser le meilleur agent ;
- la sensibilisation et la communication avec la création d'un livret environnement, la formation annuelle des agents, le fonctionnement d'un journal interne et d'un livret HSE ;
- l'adoption de normes de management environnemental : ISO 14001 ;
- l'accroissement des investissements pour réduire les rejets.
-

VIII SENSIBILISATION DU PUBLIC

Les actions de sensibilisation menées portent essentiellement sur :

- La diffusion d'émissions à la radio et à la télévision
- L'organisation d'ateliers de sensibilisation
- Les visites ciblées à certaines entreprises
- La signature de protocoles d'accord pour le suivi de certaines questions spécifiques ;
- Echanges de vues sur des méthodes de gestion des déchets par le biais de l'intranet ;

- Organisation de séminaires de restitution des travaux d'experts en environnement.

IX BESOINS NATIONAUX POUR UNE GESTION RATIONNELLE DES DECHETS DANGEREUX

Les besoins sont divers :

1. **Le renforcement des capacités** :

    - Appui à l'implantation d'un centre de récupération et d'élimination de certains déchets très spécifiques
    - Appui technique pour caractériser les déchets
    - Appui pour renforcer la réglementation et application des conventions internationales (Bâle, Rotterdam, Stock ohm, etc.)
    - Appui pour l'établissement d'un circuit clair pour le stockage, la récupération et le traitement
    - Appui pour renforcement du centre sous-régional francophone de Dakar.
    - Création de veille réglementaire chargée de favoriser l'alerte ;
    - Formation des experts des cellules du SPIDS ;
    - Renforcement du centre de formation et de perfectionnement du SPIDS.

2. **le transfert de technologies efficaces**

3. **L'appui financier pour la formation, la sensibilisation**