

**HAZARDOUS WASTE MANAGEMENT AT UNIVERSITY OF LIMPOPO  
(TURFLOOP CAMPUS): IS IT MANAGED ACCORDING TO LEGAL  
STANDARDS?**

by

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## **DECLARATION**

I declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Masters of Philosophy: Environmental Law and Management has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged

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## **ACRONYMS AND ABBREVIATIONS**

BAN	Basel Action Network
BCRC	Basel Convention Regional Centre
DWAF	Department of Water Affairs and Forestry
ECA	Environmental Conservation Act 73 of 1989
HWM	Hazardous Waste Management
IDP	Integrated Development Plan
Limpopo DEAT	Limpopo Department of Environmental Affairs (Integrated Pollution and Waste Management Unit)
LWI	Limpopo Water Initiative
MEC	Member of (Provincial) Executive Council
MRHCDHW, 1998	Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste, 2 <sup>nd</sup> Edition (Department of Water Affairs and Forestry)
NEMA	National Environmental Management Act 108 of 1998
OHSA	Occupational Health and Safety Act 181 of 1993
SA	South Africa
SABS	South African Bureau of Standards
SoC	Solvents of concern
The Constitution	Constitution of the Republic of South Africa Act, 1996
UL	University of Limpopo (Turfloop Campus)
UNEP	United States Environmental Programme
US /USA	United States of America

## **GLOSSARY OF TERMS**

Carcinogenics	:	Substances that can cause cancer.
Fumehoods	:	a large piece of scientific equipment common to chemistry laboratories designed to limit a person's exposure to hazardous fumes
Green Scorpions	:	South Africa's highly specialised Environmental Management Inspectors ensuring that no deliberate and selfish degradation of the environment takes place and that the health and well being of residents is not compromised.
Greenpeace	:	A global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace.
Hazard Rating	:	A system used to classify and rank hazardous waste according to degree of hazard the present on humans, ecology and the environment.
Mutagens	:	Substances that can cause genetic mutations.
Lachrymator	:	A chemical substance that causes the shedding of tears.
Narcotic	:	A substance that causes stiffness or numbness.
Pathogens	:	A pathogen or infectious agent is a biological agent that causes disease or illness to its host.
Teratogens	:	Substances that can cause birth defects.
Solvents of concern	:	Solvents that can diffuse through clay even in low amounts. These solvents should be restricted to landfill and the amounts to be disposed should not exceed the listed amounts as in the MRHCDHW

## **ABSTRACT**

In this study hazardous waste is defined as well as its classes. The current status of hazardous waste management, available legislation, enforcement and minimum requirements are discussed. Hazardous waste chemicals produced at University of Limpopo (Turffloep Campus), their amounts and their management were determined. They are compared to minimum requirements from Department of Water Affairs and Forestry. Other Universities hazardous waste management programmes were looked at.

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## **CHAPTER ONE**

### **BACKGROUND**

Hazardous waste is defined as organic or inorganic matter that requires technical control as not to cause harm to human health or the environment because of its toxicity, chemical or physical properties. It can be generated from a wide range of commercial, industrial, agricultural or domestic activities; and may be in a form of liquid, solid or sludge. Furthermore, hazardous waste can be defined as waste that directly or indirectly represents a threat to human health or the environment by introducing one or more of the following risks:

- explosion or fire;
- infections or pathogens;
- chemical instability, reactions or corrosion;
- acute or chronic toxicity;
- cancer, mutation, birth and growth defects;
- toxicity or damage to the ecosystems or natural resources; and
- accumulation in biological food chain.<sup>1</sup>

The aim of this research is to determine if hazardous waste is being managed according to legal requirements at University of Limpopo (Turffloop Campus). Waste produced in the laboratories is toxic and if not properly managed poses a risk to human health and damage to the environment. Hazardous waste from chemical and pharmaceutical processes produced at Turffloop Campus is not managed according to legal requirements, as it is not separated at source, neither stored nor disposed of properly. This study will come up with ways of storing and disposing of hazardous waste from these sources as required by

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<sup>1</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry), 2<sup>nd</sup> Edition (1998) s 2.4

legislation; and to minimize the amounts and toxicity of waste by treatment before disposal.

Waste can only be managed properly if its properties and the risk it poses to human health and the environment are known. The industrial group which the waste emanates from should then be identified and then the waste be classified according to the SABS Code 0228 hazardous waste classification tables. According to MRHCDHW hazardous waste can be classified into 4 hazard ratings:

- Hazard Rating 1 which poses an extreme risk
- Hazard Rating 2 which poses a high risk
- Hazard Rating 3 which poses moderate risk
- Hazard Rating 4 which poses low risk.

These hazard ratings determine how harmful the waste is and determine the different landfills at which a type of waste should be disposed of. The waste can then be classified according to the risk it poses to the environment or human health. This could be done by testing and analysing the waste to determine its nature, chemical and biological composition.<sup>2</sup> Most of the chemicals used in industries these days have been tested by the manufacturers and come with this information. That is why it is of crucial importance that the generator knows the composition of the waste produced as this makes it easier and cheaper to dispose it.

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<sup>2</sup> Draft Hazardous Waste Management, Limpopo Water Initiative 2006

Hazardous waste can be classified into nine classes.<sup>3</sup>

1. Explosives: A substance or mixture of substances which by chemical reaction is capable of producing gas at such a temperature, pressure or speed as to cause damage to the surroundings. These substances can produce an effect by heat, light, sound, gas or smoke.
2. Gases (compressed, liquefied or dissolved under pressure): Many gases in this class even at low concentrations may be highly poisonous when involved in a fire.
3. Flammable liquids: A liquid or mixture of liquids that may cause or contribute to fire at 61°C or low. This is called a flash point and this test can be performed for flammable chemical substances but again knowing the composition of waste is important as this information is readily available from the suppliers.
4. Flammable solids or substances: Solids or substances that can be easily ignited by sources like sparks or flames to cause or contribute to fire. Some of them may evolve toxic or flammable gases when heated, involved in a fire, wetted by water or in contact with moist air.
5. Oxidising substances and organic peroxide: Oxidising substances are substances that may increase the risk and intensity of fire when they come in contact with other materials. Organic

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<sup>3</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry), 2<sup>nd</sup> Edition (1998) Appendix 6.1

peroxides are sensitive to heat and friction; and give off toxic and flammable gases.

6. Poisonous and infectious substances: Poisonous substances may cause death, serious injury or endanger human health if swallowed, inhaled or come to contact with the skin. Infectious substances contain micro-organisms or toxins which cause disease in animals or humans.
7. Radioactive substances: Very dangerous substances, not allowed to be disposed of directly on a landfill site as they emit invisible radiation which may damage body tissue.
8. Corrosive substances: Substances that cause damage to the living tissue, and are irritant to the nose and the eyes when they evolve vapour. If they are swallowed, penetrate the skin or when vapour is inhaled they result to poisoning. These substances also cause damage to metals and textiles.
9. Miscellaneous dangerous substances: These substances are difficult to classify according to other classes and are a threat to the environment. In this case DWAF should be notified of such substances.

**(See Appendix 1 for hazard signs)**

All of the above classes of hazardous waste are found on the Campus except for the radioactive substances (class 7).

According to South African environmental legislation the generator of waste has the responsibility to ensure that waste is handled, stored,

transported and disposed of in an environmentally sound and responsible manner.<sup>4</sup> Persons causing pollution are liable for costs to clean up or rehabilitate its effects.<sup>5</sup> Even though the polluter may not always be the generator but a transporter or a disposal site operator, the generator is always one of the parties held accountable for the pollution caused. This means that the generator must always prove that all the necessary steps were taken for transferral of management of waste to another party. The generator should have necessary information documented to prove the hazard rating of his waste. The Department of Environmental Affairs and Tourism under Environmental Conservation Act 73 of 1989 (ECA) has a legal mandate over the safe disposal of waste.<sup>6</sup>

Waste may have detrimental effects on the environment and to human health if it is not properly managed. Proper management means classification according to the different classes as in the SABS Code 0228 hazardous waste classification tables.<sup>7</sup> This is the generators responsibility and if the waste causes harm to the environment or human health the generator is held responsible for costs of prevention and remediation of thereof.

Hazardous substances are not pollutants but can become so if not properly managed ending up polluting our resources; be it land, water or air. Outbreaks such as cholera and typhoid fever have increased with an increase in pollution. Water pollution usually occurs because hazardous waste can easily be disposed of in water resources like dams, lakes, rivers and the sea<sup>8</sup> as it is seen in the case where the USA company

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<sup>4</sup> National Environmental Management Act 107 of 1998 (NEMA) s 28 (1)

<sup>5</sup> NEMA s 2 (4) (p)

<sup>6</sup> ECA s 24 (h)

<sup>7</sup> Fn 3

<sup>8</sup> L. Hugo 'Environmental Utilisation in South Africa' (2004) 179

dumped waste in Haiti Beaches and waters of other countries. The Hartbeespoort Dam, one of the major dams providing water to Gauteng is the most polluted urban dam in the world. The water from the Vaal River is declared as unfit for human use. There was a spill in 1989 at SAPPI's Ngodwana paper mill in Mpumalanga that caused damage to Elands and Crocodile rivers where large quantities of fish were killed and irrigation water was contaminated. The Grootvlei-Blesbokspruit wetland, a Ramsar site in Gauteng was placed on the Montreux blacklist in 1995 because it was contaminated by the water that was pumped from the gold mines in the area for prevention of flooding from seepage of groundwater.<sup>9</sup> During practical sessions liquid waste is often discarded via the normal drainage system and this may end up contaminating the underground water.

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<sup>9</sup> J. Glazewski 'Pollution of Freshwater' (2005) 617

**CHAPTER TWO**  
**HAZARDOUS WASTE MANAGEMENT AT**  
**UNIVERSITY OF LIMPOPO (TURFLOOP CAMPUS)**

There are a number of sources that generate hazardous waste at University of Limpopo (Turfloop Campus) such as research laboratories, medical centre and laboratories for students' practicals. For the purposes of this paper two chemical and one pharmaceutical waste generators were looked at. In these laboratories, hazardous waste in the form of liquid and solid is generated daily during students' practical sessions. In the pharmaceutical laboratory tablets and medicines are manufactured and in the two chemical laboratories organic waste is produced from chemical synthesis. The study was done to determine which hazardous wastes are being produced; their amounts; their effects on human health and the environment; and how are they being managed in these laboratories.

These three laboratories have no standard operating procedures in place for handling, storage and disposal of these wastes. Students do not know how harmful these substances are and most of the time they discard the liquid chemical waste down the drains without prior treatment and this may lead to eventual pollution of water sources. Some of the equipment used for protection is no longer in good working conditions such as the fume hoods. Students often discard solid waste in the general waste bins and this waste might end up in the wrong hands or in the municipal dumping sites which are not meant for such wastes. When the waste is stored for disposal, different types are often mixed together which might lead to chemical reactions taking place and emissions of very toxic fumes. Students and some of the staff members are not trained on handling and use of these toxic chemicals; and do not

know how to handle them during spillages. Those members of staff that know how to handle the chemical waste often do not do so properly.

## RESEARCH METHODOLOGY

The table below shows the types of waste produced at University of Limpopo (Turfloop Campus); the approximate amounts produced per year; their classes which determine how harmful the chemical is, the hazard rating to determine the class of Hazardous Waste Landfill at which the waste may be disposed according to the Minimum Requirements prescribed by the Department of Water Affairs and Forestry; and the effects they have on human health and the environment.

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Acetonitrile	3: Toxic & Flammable	4	10L	6	Toxic by inhalation, ingestion or skin absorption. Irritant. May cause serious damage to the eyes.
Acetic anhydride	6: Corrosive & Toxic	4	2L	54	Causes severe burns. Harmful if swallowed or inhaled. Causes severe respiratory irritation. Eye contact may cause serious irritation or burns.
Aniline	6: Toxic & dangerous to the environment	4	500mL	70	Possible** carcinogen. Possible mutagen. Possible sensitizer. Readily absorbed through the skin and causes blueness or lividness of the skin
Acetone ( SoC)	3: Highly flammable	4	10L	-18	Danger, extremely flammable liquid and vapor. May cause flash fire. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system (CNS).
Ammonia	8: Corrosive, Dangerous to the environment & toxic	1	3L	n/a	Toxic by inhalation or skin contact - may be fatal if inhaled. 500 ppm is immediately dangerous to life or health. May cause serious burns. Extremely harmful to the eyes. Respiratory irritant.
Acetic acid	8: toxic and corrosive	3	10L	40	This material is strongly corrosive and causes serious burns. Very harmful if swallowed.

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Arsenic	6: Toxic & dangerous to the environment	1	200mL	n/a	May be fatal if inhaled, swallowed or absorbed through the skin. This is a known human carcinogen*. May cause reproductive disorders.
Ammonium Chloride	9: toxic	4	2L	n/a	Harmful if swallowed. May be harmful by inhalation. Skin, eye and respiratory irritant.
Amyl alcohol	6: toxic	4	500mL	45	Harmful if inhaled. Respiratory, skin and eye irritant. Direct eye contact may cause severe corneal injury.
Bromobenzene	8: Irritant & dangerous to the environment	2	1L	51	Harmful if inhaled. May be harmful if swallowed or absorbed through the skin. Severe irritant
Bromine	8: Toxic and corrosive	2	1L	n/a	May be fatal if inhaled. Highly toxic by inhalation, ingestion or skin contact. Causes severe burns.
Benzaldehyde	6: Irritant and toxic	2	2L	63	Eye irritant. Harmful by inhalation or ingestion. May be harmful by skin contact. May cause allergic reaction. Narcotic in high concentration
Benzene	3: Toxic and flammable	2	1L	-11	Carcinogen*. Short-term exposure may cause a variety of effects, including nausea, vomiting, dizziness, narcosis, reduction in blood pressure. Skin contact may lead to dermatitis. Long-term exposure may lead to irreversible effects. Severe eye irritant. Skin and respiratory irritant
Benzoyl chloride	8: Toxic and corrosive	3	3L	72	May be fatal if inhaled. Possible**carcinogen. Harmful if swallowed. Causes severe burns. Vapour is very irritating. Capable of causing tumours by skin contact. Skin, eye and respiratory irritant
Benzyl chloride	6: Toxic	1	3L	67	Toxic. Probable*** human carcinogen. Contact with the eyes may cause permanent damage. Harmful by inhalation, ingestion and through skin contact. Corrosive - causes burns

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Cyclohexane	3: Highly flammable & danger to the environment	3	5L	-20	Harmful if swallowed or inhaled, and through skin contact. Respiratory, eye and skin irritant
Chloroform	6: toxic & danger to the environment	1	10L	n/a	Possible** human carcinogen. Inhalation and ingestion are harmful and may be fatal. May cause reproductive damage. Irritant. Exposure to alcohol may increase toxic effects. Prolonged or repeated skin contact may cause dermatitis
Carbon tetrachloride (SoC)	6: toxic and danger to the environment	2	1L	n/a	Possible** carcinogen. Inhalation and ingestion are harmful, and may be fatal. Irritant. Skin contact may lead to dermatitis. Long-term exposure may lead to kidney or liver damage, CNS disturbance, cancer and damage to eyes, skin and lungs. Destroys the ozone layer.
Diethyl ether	3: Toxic & highly flammable	4	10L	-40	Harmful by ingestion, inhalation or through skin contact. May cause intoxication. May cause allergic reaction. Skin, eye and respiratory system irritant.
Dichloroethane	3: toxic & flammable	4	2L	15	Possible** human carcinogen. Causes liver damage. Mutagen, toxic. Narcotic. Regarded as a priority pollutant in many countries. Skin irritant
Hydranal	8: Irritant	2	1L	n/a	May irritate skin or eyes.
Hydrochloric acid	8: Corrosive, toxic & danger to the environment	3	10L	n/a	Extremely corrosive. Inhalation of vapour can cause serious injury. Ingestion may be fatal. Liquid can cause severe damage to skin and eyes

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Iodine	3: Corrosive & toxic	3	2kg	n/a	May be fatal if swallowed or inhaled. Causes burns. Harmful by inhalation and through skin absorption. Readily absorbed through skin. Very destructive of mucous membranes and upper respiratory tract, eyes and skin. Severe irritant. Sublimes at room temperature to yield dangerous levels of vapour. May cause sensitization. May cause damage to the unborn child.
Methanol (SoC)	3: Toxic & flammable	2	10L	11	Toxic by inhalation, ingestion or skin absorption. May be a reproductive hazard. Ingestion may be fatal. Risk of very serious, irreversible damage if swallowed. Exposure may cause eye, kidney, heart and liver damage. Chronic or substantial acute exposure may cause serious eye damage, including blindness. Irritant. Narcotic
Nitrobenzene (SoC)	6: toxic & danger to the environment	3	5L	88	Highly toxic. May be fatal if inhaled, swallowed, or absorbed through skin. Possible carcinogen. May cause reproductive disorders. Skin and respiratory irritant.
Nitric acid	8: Toxic, corrosive & oxidizing	3	10L	n/a	May be fatal if swallowed or inhaled. Extremely corrosive. Contact with skin or eyes may cause severe burns and permanent damage
N,N dimethylaniline	6: Toxic	3	1L	15	Highly toxic even at low concentrations. May be fatal if inhaled, swallowed or if absorbed through the skin. May cause serious eye damage. Possible**carcinogen. Danger of cumulative effects. Skin and respiratory irritant.
Nitromethane	8:Corrosive & toxic	2	1L	35	Harmful if swallowed, inhaled or absorbed through skin. Irritant. May cause cyanosis, which can be delayed up to 4hrs.
Pyridine (SoC)	8: toxic & corrosive	4	500mL	19	Harmful by ingestion, inhalation and if absorbed through skin. May affect fertility. May cause irreversible effects. Severe eye and skin irritant - may cause burns. Long-term exposure may cause liver, kidney or CNS damage
Potassium cyanide	6: toxic & corrosive	1	500g	n/a	May be fatal if inhaled, swallowed or absorbed through skin. Extremely destructive of mucous membranes. Causes burns.

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Petroleum ether	3: highly flammable & toxic	3	5L	-18	Inhalation may cause headache, nausea or vomiting
Potassium hydroxide	8: toxic & corrosive	3	5kg	n/a	May cause serious burns. Harmful by ingestion, inhalation and in contact with skin. If the solid or solution comes into contact with the eyes, serious eye damage may result
Potassium permanganate	8: toxic, irritant & danger to the environment	2	3kg	n/a	Harmful if swallowed. Irritant. Readily absorbed through skin
Saccharin sodium	6: toxic	2	2kg	n/a	Possible** carcinogenic. May cause eye, skin or respiratory irritation.
Disodium phosphate	9: irritant & toxic	4	3kg	n/a	Eye and skin irritant. May be harmful if ingested in quantity.
Sodium hydroxide	8: toxic & corrosive	3	5kg	n/a	Causes severe burns. May cause serious permanent eye damage. Very harmful by ingestion. Harmful by skin contact or by inhalation of dust
Resorcinol	6: harmful & danger to the environment	3	500g	n/a	Harmful if swallowed. Skin and respiratory irritant. Eye contact may lead to serious damage
Orcinol	8 Irritant	4	200g	n/a	Eye, skin and respiratory irritant. Readily absorbed through the skin
Silver nitrate	5 Oxidising, corrosive & toxic	1	5L	n/a	Causes burns. Long-term exposure can cause permanent blue-grey staining of eyes, mouth, throat and skin, (argyria) and may cause eye damage. Short contact can lead to deposition of black silver stains on the skin. Very destructive of mucous membranes. Skin and eye irritant. A tumorigenic agent.
Toluene (SoC)	3highly flammable & toxic	3	5L	4	Toxic by inhalation, ingestion or by absorption through skin. Serious irritant. Experimental teratogen

Chemical	Class	HR	Approximate amount generated at a time	Flashpoint (°C)	Effects on human health or environment
Tetrahydrofuran	3 Toxic & highly flammable	3	2L	-14	May be harmful by inhalation, ingestion or skin absorption. Skin contact may cause dermatitis. Long-term exposure may lead to kidney or liver damage. Irritant. May cause narcotic effects
Sulphuric acid	8 toxic & corrosive	4	10L	n/a	Causes serious burns. Highly toxic. Harmful by inhalation, ingestion and through skin contact. Ingestion may be fatal. Skin contact can lead to extensive and severe burns. Chronic exposure may result in lung damage and possibly cancer
Sodium carbonate	8: Irritant	4	3kg	n/a	Eye and respiratory irritant.
Zinc	8: Irritant & toxic	2	500g	n/a	Harmful if swallowed or inhaled. Irritant.

Carcinogenic\* - Clinically proven in humans

Possible carcinogenic\*\* - Proven without doubt in animals

Probable carcinogenic\*\*\* - Limited evidence in animals

## **Consultation with the municipality and Limpopo Department of Environmental Affairs and Tourism**

Polokwane municipality was contacted<sup>10</sup> to check the by laws they have in place for hazardous waste management as the University is under their jurisdiction. There was nothing concrete that was found from the officers interviewed except that there is no provincial and local legislation in place and that Limpopo Department of Environmental Affairs and Tourism (Limpopo DEAT) was busy working on policies regarding hazardous waste management. Limpopo DEAT was contacted<sup>11</sup> and these are the findings resulting from the inquiry:

- The Hazardous Waste Unit started operating in 2005 and is busy working on some documents for hazardous waste management.
- So far they have teamed with Limpopo Water Initiative which submitted a Draft Hazardous Waste Management Plan and this document was approved but only a few hazardous waste generators know about this document.
- The Department is working on two documents which are guidelines for minimization and recycling of hazardous waste.
- The first Draft has been submitted to the MEC's office and the Department is expecting feedback by end of November. If these documents are approved, they will be available to all hazardous waste generators.
- There is currently no hazardous waste landfill site in Polokwane but Limpopo DEAT is busy with research on the matter.
- Limpopo DEAT has a form they use to carry out audits in companies that are generating hazardous waste. **(See appendix 2)**

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<sup>10</sup> An interview with an officer at the Waste Management Section

<sup>11</sup> An interview with an Environmental Officer at Limpopo Department of Environmental Affairs (Integrated Pollution and Waste Management Unit)

**Comparison between minimum requirements for management of hazardous waste by Department of Water Affairs and Forestry, and hazardous waste management at University of Limpopo (Turfloop Campus) [UL]**

<b>Minimum Requirements<sup>12</sup></b>	<b>University of Limpopo (Turfloop Campus)</b>
<p>1. Personnel involved in handling and transportation of hazardous waste must be trained on this to a certain extent.</p>	<p>There was no formal training for personnel on handling of the waste, those that know how to handle hazardous waste know this from their previous jobs or by looking up information only when the accident or spillage occurs. Transportation personnel have never been asked to produce documentation that shows if they know how to handle this waste.</p>
<p>2. Waste must not be mixed with other wastes of different nature or composition as mixing will result in severe reactions.</p>	<p>Waste is often mixed together as there is only one waste container in one chemistry laboratory, one in the pharmaceutical laboratory and none in one chemical laboratory. Liquid waste is often poured down the drains and solid waste is discarded in general waste bins which are emptied by general cleaners who might be burnt or inhale toxic fumes from this waste</p>

<sup>12</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 2<sup>nd</sup> Edition (1998) s 10

<b>Minimum Requirements</b>	<b>University of Limpopo (Turfloop Campus)</b>
3. Waste must be stored in a suitable container, be marked clearly before temporary storage to prevent risk of wrong identification.	Waste is mixed in one container without proper labelling. This container has the same labelling in both laboratories even though they generate different kinds of waste.
4. The temporary storage area must have a waterproof base, an effective drainage system leading to a waterproof spillage area where if there is a spillage, it can be contained and treated.	There is no temporary storage area, the waste to be collected for disposal is kept in the laboratories.
5. Flammable wastes should be stored separately from others	Waste is mixed in one container
6. Each container or tank should be marked clearly "Hazardous Waste"	There is one bin in each of the two laboratories and they are marked. <b>(See Appendix 3)</b>
7. The transporter must be provided with accurate information about the nature and properties of the load	Since waste is not being separated, it is difficult to do this. The transporter comes and collect the waste without this information being provided to them

## **CHAPTER THREE**

### **THE PROBLEM IN THE INTERNATIONAL AND NATIONAL CONTEXT**

Waste is being produced by a variety of human activities. The volume, characteristics of this waste and a society's approach to generation, handling, treatment and disposal are the consequences of choices and decisions made by government, waste generators and citizens in general. A society through its choices can produce more or less waste and either ignore its consequences to the environment and health of its citizens; or seek to protect the environment and its citizens from the impacts of waste.

The nature of environmental problem is such that it cannot be contained by geographical boundaries as it is said that "environmental problems know no boundaries". For example, the Trail Smelter Arbitration case<sup>13</sup> where crops, pasture land, trees and livestock of the US farmers were damaged when fumes generated by the privately owned Canadian Smelting plant drifted across the border. International environmental norms and standards is one of the fastest developing areas of international law and the subject is now recognised as a distinct branch of environmental law.<sup>14</sup>

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<sup>13</sup> United States v Canada, 1941

<sup>14</sup> J. Glazewski 'International Environmental Law (2000) 37

The following is a brief overview of the international law position.

### **International Treaties dealing with hazardous waste**

#### **Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998 (Rotterdam Convention)**

The Convention came into effect in 1998 but has not been signed or ratified by South Africa. It promotes shared responsibilities and co-operative efforts amongst Parties in international trade of hazardous chemicals so that they do not harm human health and the environment.<sup>15</sup> This is done by exchanging information on characteristics of these chemicals between States helping governments to make decisions to import or export.<sup>16</sup>

#### **Convention on Persistent Organic Pollutants, 2001 (Stockholm Convention)**

The aim of this Convention is to take measure to prevent effects of hazardous waste known as Persistent Organic Pollutants (POPs) to humans. These POPs are chemical by-products from industries that do not decompose easily and end up on the food chain. The Convention was adopted in 2001 and SA became a party in September 2002.<sup>17</sup> Parties to the Convention develop and use alternative environmentally sound processes and chemicals.<sup>18</sup> A document by the United States

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<sup>15</sup> J. Glazewski 'International Environmental Law' (2005) 46

<sup>16</sup> <<http://www.groundwork.org/>>

<sup>17</sup> J. Glazewski 'International Environmental Law' (2005) 46

<sup>18</sup> L. Ecoignard 'Hazardous Waste Management in English-speaking Africa' (2005)

Environmental Programme (UNEP) on innovative and promising technologies for use in developing countries was published in 2004.<sup>19</sup>

**The Convention on Transboundary Movements of Hazardous Wastes and their Disposal, 1989 (Basel Convention)**

The Convention came into force in 1992 and came into effect in SA on August 1994. It regulates the international transportation and disposal of hazardous and other wastes. Its aim is to protect human health and the environment from dangers of waste.<sup>20</sup> The problem with transboundary movement of waste is the search for cheaper and easier disposal of waste that lead to profitable but scandalous international commerce in hazardous waste. This involves export of hazardous waste from industrialized countries where the waste can no longer be economically disposed of safely into developing countries which are in desperate need of hard currency with little knowledge of the hazardous nature of the waste and no capacity to treat or dispose it (See the Thor Chemicals mercury disaster below).

The Convention does not ban transboundary movement of waste but imposes duties on transportation and disposal of waste in the country of origin; and takes into consideration the rights of countries to prohibit waste being imported into their countries. These wastes include hazardous wastes, household wastes and residues from incineration.<sup>21</sup> Waste disposal has further been complicated by practice of manufacturers keeping the information about the nature of wastes generated in their production processes often in the name of trade and business secrets. Similarly, traders in toxic wastes conceal the nature of

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<sup>19</sup> <<http://www.unep.org> //>

<sup>20</sup> J. Glazewski 'International Environmental Law' (2005) 47

<sup>21</sup> J. Glazewski 'International Environmental Law' (2005) 47

wastes they handle especially waste they export. This makes it even more difficult for the recipient countries to take reasonable and appropriate measures to handle and dispose of the waste safely.

Principles of this Convention includes generation of hazardous waste reduced to a minimum; pollution from such waste prevented; import and export of such waste prohibited if it is believed that the waste will not be managed in an environmentally friendly manner. The Convention also states that export and import of waste must be prohibited to and from the States that are not party to the Convention unless international agreements which do not deviate from the Convention's provision of sound management of wastes are met. It is also important that prior to movement the exporting State must notify the State of import and all States of transit.<sup>22</sup>

### **Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes (Cairo Guidelines)**<sup>23</sup>

These guidelines were developed by UNEP and addressed to governments to assist them in developing national policies and measures for environmentally sound management and disposal of hazardous waste. This was conceived after it was seen that there had been more incidents of exports of hazardous wastes from developed to developing countries where waste was disposed of inappropriately and creating adverse environmental problems.

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<sup>22</sup> <<http://www.basel.int/>>

<sup>23</sup> <<http://www.ban.org/>>

**Protocol on Liability and Compensation for Damage resulting from Transboundary Movement of Hazardous Waste and their Disposal, 1999 (The Basel Protocol)**

The Basel Protocol provides liability and compensation for damage resulting from transboundary waste movements including illegal traffic of waste. Damage does not only refer to loss of life or injury to a person or property but also income loss due to environmental impairment. The Protocol imposes strict liability on person providing notification of the proposed transboundary movement and the disposer of waste. South Africa has not yet signed the Protocol.<sup>24</sup>

A case of illegal traffic of waste is the USA ship that was loaded with 14 000 tons of incineration ash in 1986. The ship dumped some of the waste in Haiti beach and in waters of five other continents over a 27 month period changing its name several times. The Greenpeace alerted all the likely ports, the ship was repeatedly turned away and suspected of finally dumping the remainder of its waste in the Indian Ocean.<sup>25</sup>

**The Convention on the Ban of Import of Hazardous Waste into Africa, 1991 (Bamako)**

The Bamako Convention was adopted under the Organization of African Unity and is an African agreement which prohibits hazardous waste from being imported into Africa but allows for regulated movement of such waste within African States. It came into force in 1998, considers importation of waste as a criminal act and SA has no signed or acceded to it.<sup>26</sup>

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<sup>24</sup> J. Glazewski 'International Environmental Law' (2005) 48

<sup>25</sup> <<http://www.ban.org/>>

<sup>26</sup> J. Glazewski 'International Environmental Law' (2005) 48

Prior to the Stockholm Convention there were incidents that showed a need for the States to engage in control of hazardous waste.<sup>27</sup> The **Minamata disease** (neurological disease) found in the 50s in populations in Japan as a result of eating fish contaminated with methyl mercury waste which was discharged from a chemical factory into the sea. The **Love Canal incident** in the USA where homes were built on a former hazardous waste dumping site containing pesticides and chemicals used in the plastic making process. Rain water percolated into the ground resulting into liquid waste that contaminated the environment, killing birds and other organisms; causing seizures and learning disabilities among the residents.

In 1987, an Italian businessman sent 8 000 drums of hazardous waste to Nigeria and these drums were sent back to Italy leaving many Nigerians hospitalized with severe burns, nausea, vomiting blood and partial paralysis.<sup>28</sup> Five years later, the US Company from North Carolina sold more than 3 000 tons of lead and cadmium contaminated fertiliser to Bangladesh government which sold it through the country and ended up spreading on the farms.<sup>29</sup> There was an international fury in 1998 when many people died after handling mercury contaminated waste that was illegally dumped by a chemical company from Taiwan in a village in Cambodia.<sup>30</sup>

Internationally, there have been a number incidents relating to hazardous waste management. In July 2007, ammonia and nitrogen leaked from a chemical plant into a river in Eastern China halting water supply to 200 000 residents. These residents had to be provided with water from unpolluted wells. China is one of the countries that are

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<sup>27</sup> <<http://www.groundwork.org/>>

<sup>28</sup> <<http://www.ban.org/>>

<sup>29</sup> <<http://www.bcrcretoria.org/>>

<sup>30</sup> <<http://www.ban.org/>>

racing into economic prosperity with little regard to the environment causing bad pollution to air and water, eventually affecting human health. In 2006, about seven main river systems were polluted, regarded unfit for human contact and about nine major lakes had equally bad pollution. According to the World Bank study, about 460 000 Chinese die prematurely each year because of breathing polluted air and drinking dirty water. This year six cities and five industrial parks were identified for polluting four major rivers and SEPA (State Environment Protection Administration) decided not to approve any proposed projects by these polluters other than treatment or recycling projects.<sup>31</sup>

In France, rivers are contaminated with polychlorinated biphenyls (PCB) which have been outlawed since 1987 and are very difficult to eliminate. Fishing was banned in one of their rivers, River Rhone as scientists said that it contained high levels of this contaminant. PCBs cause fertility, growth and cancer problems in humans. These were highly used since 1930s in industries and it was said that cleaning up would not be easy as pollution has been long standing. There are also great amounts of sedimentation; and it would be technically and economically difficult to clean up the whole river which is about 810km.<sup>32</sup>

In Nairobi there is one of Africa's largest waste dumps which is a threat to health of children in nearby communities and the environment. Lead and cadmium were found in the blood of the children who were suffering from respiratory diseases such as bronchitis and asthma. Dumping at the site is unrestricted and different kinds of hazardous waste were found on the site by United Nations Environmental Programme (UNEP). People scavenge at the site for food, recyclables and other valuables they can sell as a source of income. Exposures to lead damage the nervous

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<sup>31</sup> 'China chemical spill halts water supply to two hundred thousand' *Reuters* (04 July 2007)

<sup>32</sup> 'Many French rivers polluted by banned chemical' *Reuters* (10 October 2007)

system and cadmium damage the kidneys and causes cancer. UNEP is willing to assist local and national authorities in the search for waste management systems and strategies including generation of sustainable and healthier jobs in waste handling and recycling sectors. Soil and water samples showed high levels of lead and cadmium (a thousand times more than acceptable levels). The Nairobi River showed mercury levels ten times higher than the acceptable levels of 2ppm and this river is used by the communities for irrigation and in their homes. In Nairobi about 4.7 million children die annually due to environmental related illnesses.<sup>33</sup>

Other States are developing laws opting for cleaner production such as the European Union which stopped the sale and use of mercury containing devices such as thermometers to end this highly toxic substance from being used as it has harmful effects on humans, ecosystem and the wildlife.<sup>34</sup> Exposure to mercury can cause damage to the brain, spinal cord, kidneys and liver; and is more harmful to a developing foetus. It also causes developmental problems in children. The European Union suggests that safer alternatives exist for almost all instruments using mercury and this ban will lead to reduction of mercury emissions as most of it is from thermometers alone.

Mercury poisoning was also seen in the Thor Chemicals mercury disaster<sup>35</sup>, one of the world's worst results of hazardous waste mismanagement and transboundary movement to a developing country with no capacity to treat the waste. Mercury waste was imported from the United States of America and European countries to their Cato Ridge plant in KwaZulu-Natal with the intention to recycle the waste and

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<sup>33</sup> 'Giant Waste Dump Poisoning Nairobi Children' *Environmental News Service* (09 October 2007)

<sup>34</sup> 'European Union bans sale of toxic mercury thermometers' *CBC News* (11 July 2007)

<sup>35</sup> <<http://www.groundwork.org/>>

reclaim mercury even though they did not have scientific or technological information to recycle the waste. The company employed only casual workers, mostly uneducated; their urine was found to have high levels of mercury and most of them were ill due to mercury poisoning and once they were unable to work they were laid off and their illness not addressed. A number of workers died; surrounding land and streams were contaminated; and livestock grazing around the Thor site died due to exposure of this waste. The Department of Environmental Affairs and Tourism (DEAT) initiated a clean up campaign for this pollution but even now there is still tons of mercury waste on site as there has not been appropriate technology to recycle or dispose of this waste.

The Basel Convention which South Africa is a party to requires that generation of hazardous waste to be reduced to a minimum and pollution from it be prevented. According to the Basel Protocol, the University would have been held liable to damage caused by illegal management of its hazardous waste.

### **The position in South Africa**

In South Africa hazardous waste management is a problem as there is no legislation that specifically deals with it and most generators are still ignorant about the issue. Mittal Steel Company in Vereeniging was identified as the air pollution hotspot by DEAT Minister Marthinus van Schalkwyk in 2006.<sup>36</sup> In July 2007 inspectors from DEAT found pollution of the surface and groundwater with phenols, oil and fluoride by this company. Mittal also carried activities on the site without proper environmental authorisation which included dumping of hazardous waste on their site even though they were instructed to stop; and

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<sup>36</sup> 'Mittal dumping waste without permit' *Business Report* (19 July 2007)

emissions in the air that caused significant pollution of the environment. The Gauteng DEAT intended on taking steps against the company at the time including criminal investigation into the dumping of this waste. Chief Executive of Mittal argued that the company spent a lot of money between 2005/6 on environmental projects and allocated about a billion rand over the next four years to improve the environmental standards.<sup>37</sup> Then on October, 23 2007 the Green Scorpions<sup>38</sup> shut down Mittal's operations at the Vaal waste site as the company failed to comply with environmental standards. A notice was issued by DEAT for Mittal to stop operating at the site, to make representations about the cases of non-compliance and to remove about 100 000 tons of magnetite dumped on that site. The company has been given until December 2008 to remedy the serious pollution it has caused.<sup>39</sup>

In Durban, the Ethekwini Metro in 2004 discovered yellow water while digging trenches in the area of the Bayer factory in Merebank. After testing it was found that this water consisted of an unknown amount of hexavalent chromium which Bayer uses to produce leather tanning salts. Bayer-Lanxess planned to spend up to R50 million for removal of this toxic chemical from the groundwater by early 2007. The company maintained that the neighbouring community's health was not at risk because the poison in the water and soil was about 2 to 10 metres below the ground even though hexavalent chromium is known as the cancer causing substance.<sup>40</sup>

The Green Scorpions inspected the Highveld Steel vanadium plant Vanchem in August this year and discovered that they were emitting

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<sup>37</sup> 'Mittal dumping waste without permit' *Business Report* (19 July 2007)

<sup>38</sup> South Africa's highly specialized Environmental Management Inspectors ensuring that no deliberate and selfish degradation of the environment takes place; and that the health and well being of residents is not compromised

<sup>39</sup> 'Green Scorpions shut down ArcelorMittel operations' *SABC News* (23 October 2007)

<sup>40</sup> 'Chemical firms to detoxify Durban water' *The Mercury* (15 June 2006)

about 40 to 60 tons of sulphur dioxide a day and found a significant contamination of groundwater which is a criminal offence in terms of the Water Act<sup>41</sup>. This groundwater contamination was due to illegal dumping of hazardous waste on site and lack of separation of storm and process water. It was also found that the emission of ammonia and dust were 15 and 27 times higher than the acceptable levels respectively. Highveld, which has been recently acquired by a Russian Company was disposing its VanChem plant to fulfill conditions set by the authorities on the merger.<sup>42</sup>

In Potchefstroom near Mooi River drums that once contained highly toxic chemicals were found in July 2007. These drums were spotted by police while conducting an investigation in the area and believed to have contained chemicals that were used in rubber and tyre manufacturing. An investigation based on laws relating to dumping of toxic waste was opened.<sup>43</sup>

University of Stellenbosch has a manual<sup>44</sup>, Hazardous Waste Management Guide which provides in detail how to minimize, store, handle and dispose of chemical waste generated in different laboratories according to applicable government legislation. Stellenbosch University co-ordinates with off-site waste management contractors for pick-up and disposal of waste. They also have a fact sheet on their website on 101 ways to reduce hazardous waste in the laboratories.

Rhodes University has an environmental policy with a goal of creating an environmentally sustainable future. This includes the reduction of waste in the campus and adoption of a purchase policy sensitive to the

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<sup>41</sup> National Water Act 36 of 1998 s 151 (1) (i)

<sup>42</sup> 'Pollution Hazards Alleged at Highveld' *Business Day* (05 October 2007)

<sup>43</sup> 'Chemical drums found near Potch river' *The Mercury* (12 July 2007)

<sup>44</sup> Stellenbosch University's Hazardous Waste Management Guide (2002)

environmental factors. They do so by involving students in the policy implementation.<sup>45</sup>

In view of the above it is clear that hazardous waste management is an international concern. There are a number of recent disasters that harmed the environment and human health due to this. Even though there are a number of treaties in international law that regulate hazardous waste, generators of hazardous waste are still ignorant about the issue. This is due to them not wanting to spend money on appropriate technology to manage the waste. Unfortunately the developing countries, uneducated people end up suffering as they seek money without knowing the consequences that this waste has if not properly managed. Some of the companies that are disposing hazardous waste illegally are caught out by environmental law enforcers such as the Green Scorpions and the Greenpeace.<sup>46</sup> Even so, SA and the world have a long way to go as some of these generators still get away with their law-breaking activities. South Africa has no single law that specifically deals with waste management but each and every generator has to be responsible for legal management of its own waste so that the environment is protected and conserved for the future generations.

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<sup>45</sup> Rhodes University Environmental Policy (2004)

<sup>46</sup> A global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace

## **CHAPTER FOUR**

### **LEGAL FRAMEWORK**

As mentioned above there is no national law focusing specifically on waste management, a variety of National Acts, regulations and policy documents must be analysed to understand the responsibilities of local and district municipalities for waste management and how required initiatives should fit into the broader national strategy for sustainable development and environmental management.

#### **National Legislation and Policies**

Section 24 of the Constitution of the Republic of South Africa compels the government to pass reasonable legislation to protect the environment and prevent pollution; and guarantees everyone an environment that is not harmful to their health. Schedule 4 and 5 mandate municipalities to be responsible for refuse removal, refuse dumps, solid waste disposal and cleansing.

The Municipal Structures Act states that local government is responsible for refuse removals<sup>47</sup> and solid waste disposal.<sup>48</sup>

The Municipal Systems Act 32 of 2000 requires all municipalities to undertake Integrated Spatial Planning processes and produce an Integrated Strategic Plan. These plans must include a sector plan for Integrated Waste Management.<sup>49</sup>

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<sup>47</sup> Municipal Structures Act 117 of 1998 (MSA) s 83 (1)

<sup>48</sup> MSA s 84 (1) (e)

<sup>49</sup> Municipal Systems Act s 23 (1) (a)

The National Environmental Management Act 107 1998 (NEMA) does not deal specifically with waste management, but sets out some important provisions where sustainable development requires that pollution and degradation of the environment be minimised or remedied; waste be avoided, minimised and reused or recycled and disposed in a responsible manner.<sup>50</sup> There is a duty of care which states that the landowner and the person in control must take reasonable measures to prevent pollution and degradation of the environment from occurring, continuing or recurring.<sup>51</sup> Environmental management principles are a cornerstone of NEMA and they are all pollution related.<sup>52</sup> They include:

- The **precautionary principle**<sup>53</sup> states that caution is to be applied which takes into account the limits of current knowledge about consequences of decisions and actions. It also states that a project cannot proceed unless it can be shown that it will not cause environmental degradation.

Draft Hazardous Waste Management Policy, 1994 incorporated this principle stating that waste of unknown composition or toxicity must be classified and treated as most hazardous class. This protects human health and the environment; and encourages generators, transporters and disposers of waste to determine composition of their waste stream and to avoid paying more than it is necessary to dispose of waste.

- The **polluter pays principle**<sup>54</sup> has been adopted in a number of policy documents such as the White Paper on Environmental Management in South Africa. It states that those responsible for

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<sup>50</sup> NEMA s 2 (4) (a) (iv)

<sup>51</sup> NEMA s 28 (i)

<sup>52</sup> NEMA s 2

<sup>53</sup> NEMA s 2 (4) (a) (vii)

<sup>54</sup> NEMA s 2 (4) (p)

harming the environment or causing adverse health effects must pay the costs of preventing or remedying such harm.

- The **preventative principle**<sup>55</sup> prohibits activities that cause environmental pollution and where these activities cannot be completely avoided be minimised and remedied.

According to the **Environmental Conservation Act** a person performing an activity which may damage the environment or human health may be asked by the competent authority to cease such activity or take necessary steps to prevent, reduce or eliminate such harm.<sup>56</sup> No one may operate or establish a disposal site without a permit issued by the Minister of Water Affairs and Forestry.<sup>57</sup> Waste may not be discarded or disposed of in any manner other than the one prescribed by the Minister in the permit.<sup>58</sup>

**National Water Act 36 of 1998 (NWA)** requires the user of the land to take reasonable measures to prevent water pollution.<sup>59</sup>

**Hazardous Substances Act 15 of 1973 (HSA)**'s objective is to control hazardous substances by defining its categories<sup>60</sup> and regulating their importation<sup>61</sup> and disposal.<sup>62</sup> Corrosive, irritant, toxic, strongly sensitizing, flammable and substances that cause death or injury are Group I and Group II hazardous substances.<sup>63</sup> The disposer of the

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<sup>55</sup> NEMA s 2 (4) (a) (ii)

<sup>56</sup> ECA s 31A (1)

<sup>57</sup> ECA s 20 (1)

<sup>58</sup> ECA s 20 (6) (a)

<sup>59</sup> NWA s 19 (1)

<sup>60</sup> HSA s 2 (1)

<sup>61</sup> HSA s 12 (1)

<sup>62</sup> HSA s 12 (3) (d)

<sup>63</sup> HSA s 2 (a)

hazardous waste should obtain the license for disposal from the Director-General of the Department of Health. <sup>64</sup>

**The Health Act 63 of 1977 (HA)** gives responsibility to the Department of Health to promote a safe and healthy environment.<sup>65</sup> It also imposes a duty to local municipalities to prevent pollution of water to be used in their districts.<sup>66</sup>

The **Occupational Health and Safety Act 181 of 1993 (OHSA)**'s objective is to provide for health and safety of persons at work and to protect persons other than those at work against hazards to health and safety arising out of or in connection with the activities of persons at work. The employer should provide and maintain a safe working environment without risk to the health of his employees.<sup>67</sup> The Act states that the employer should also ensure that persons other than those at work who may be directly affected by his activities are not exposed to hazards to their health and safety.<sup>68</sup> The employees should also take care of their health and safety and other persons who may be affected by his acts or omissions.<sup>69</sup>

**The Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste** is a document that provides a basic national framework for waste management in South Africa. It sets out a systematic framework for identifying a hazardous waste and classifying it in accordance with the degree of risk that it poses.<sup>70</sup> This is done

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<sup>64</sup> HAS s 4 (i)

<sup>65</sup> HA s 14 (c)

<sup>66</sup> HA s 20 (1) (c)

<sup>67</sup> OHSA s 8 (1)

<sup>68</sup> OHSA s 9 (1)

<sup>69</sup> OHSA s 14

<sup>70</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry), 2<sup>nd</sup> Edition (1998) Appendix 6.1 & Appendix 9.2

according to the SABS Code 0228 which classifies the waste according to danger groups, hazard ratings, the environmental risk it poses and the preferred technology for disposal.

**The White Paper on Integrated Pollution and Waste Management**<sup>71</sup> sets out the principles that underpin the National Waste Management Strategy which translates the policy principles into strategic plans and actions. It also sets forth responsibilities for municipalities to compile general and hazardous waste management plans; and to promote and implement initiatives for waste minimisation. It also promotes reduction of waste volumes to be disposed through cleaner production, recycling and treatment.

**The Polokwane Declaration**<sup>72</sup> adopted the vision of a waste free South Africa by 2022. The Declaration signed by national, provincial and local government representatives as well as the representatives from business and civil society; recognised the urgent need for cleaner production and recycling to protect the environment and human health. The goals to reduce waste generation by 50% and disposal by 25% by 2012; and to develop a plan for zero waste by 2022 were adopted.

The Limpopo State of the Environment Report's <sup>73</sup> purpose is to provide the condition of the environment in the Limpopo Province. With regards to hazardous waste management, the types and amounts of waste generated in the Province and their disposal methods are not monitored. There are no hazardous waste disposal or treatment facilities in the

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<sup>71</sup> Integrated Pollution and Waste Management White Paper, Gazette 20978, Notice 227, 17 March 2000 (1.8 National Waste Management Strategy)

<sup>72</sup> The Polokwane Declaration On Waste Management, 2001

<sup>73</sup> Limpopo State of the Environment Report Phase II , 2006

Limpopo Province.<sup>74</sup> A study by Limpopo Water Initiative (LWI)<sup>75</sup> found it difficult to obtain data on types and quantities of hazardous waste generated; and their methods of disposal as the generators are ignorant about the matter and do not keep records of their hazardous waste management. LWI also found that hazardous waste was being dumped illegally in the Province either on land or in the general waste landfill. Even though some of the generators are disposing their waste illegally, others are legally disposing of their hazardous waste in disposing sites outside the Province. If the development of the hazardous waste disposal site succeeds, the site should be operated according to the Minimum Requirements for Waste Disposal by Landfill prescribed by the Department of Water Affairs and Forestry.

Limpopo government has promoted and funded District municipalities to prepare Integrated Waste Management Plans for each district and their component local municipalities. At that time, the Province intends to consolidate all of these studies into a provincial Integrated Waste Management Plan as called for in the National Waste Management Strategy. The Capricorn District Municipality is set out to have an Integrated Waste Management Plan, Policy and Strategy in place by March 2008.<sup>76</sup>

Legislation and policy do not clearly demarcate responsibilities between District and Local Municipalities.

- The Municipal Structures Act<sup>77</sup> states that the District Municipality is responsible for solid waste disposal sites insofar as

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<sup>74</sup> See also Chapter 5.2 (Consultation with Polokwane Municipality)

<sup>75</sup> An environmental consulting company in Polokwane

<sup>76</sup> Integrated Development Plan 2007-2008 (Capricorn District Municipality)

<sup>77</sup> Municipal Structures Act s 84 (1)

- it relates to: determination of a waste disposal strategy; regulation of waste disposal and establishment, operation and control of waste disposal sites, bulk waste transfer facilities and waste disposal facilities for more than one local municipality in the district.
- The Municipal Structures Act<sup>78</sup> assigns to Local Municipalities: municipal planning; municipal health services; refuse removal and solid waste disposal.

Even though these terms are not clearly defined the District and Local Municipalities are required to work together to maximise effective service delivery and to engage in consultations to ensure effective division of responsibilities and areas of co-operation within the parameters set forth in legislation and national policy.

The District should set forth a clear policy for waste management and encourage adoption of by-laws that will support implementation of an Integrated Waste Management System.

The District should coordinate and ensure that all municipalities engage in Integrated Development Planning and that these Integrated Development Plans (IDPs) are aligned with the Provincial Strategy for growth and development and the National Spatial Development Perspective. The District should coordinate relations with the province and national governments to ensure that the work of all line departments is aligned with the local IDPs.

In the local hospitals the pharmaceutical waste is incinerated in house and some is collected for disposal in the landfills in Gauteng. This is done according to the legislative measures, however the Department of

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<sup>78</sup> Municipal structures Act s 84 (2)

Health does not regulate the hazardous waste management at the University but promote health and safety of the environment.

On Campus, there are no waste management policies in place at the moment. The University is under the Polokwane Municipality which also does not have any by-laws for hazardous waste management. According to NEMA's environmental principles the University should reduce the amount of waste that it produces and prohibit any activities that will cause harm to the environment and human health. Pouring of waste down the drain is a criminal offence according to the Water Act as it end up contaminating underground water. <sup>79</sup>

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<sup>79</sup> National Water Act s 151 (1) (i)

## **CHAPTER FIVE**

### **CONCLUSION, DISCUSSION AND RECOMMENDATIONS**

Waste and especially hazardous waste may have detrimental effects on the environment and to human health if it is not properly managed. Proper management means classification according to the different classes as in the SABS Code 0228 hazardous waste classification tables.<sup>80</sup> This is the generators' responsibility and if the waste causes harm to the environment or human health the generator is held responsible for costs of prevention and remediation of thereof.

Hazardous waste management is also an international concern. There are a number of recent disasters that harmed the environment and human health due to this. Even though there are a number of international treaties that regulate hazardous waste, generators of hazardous waste are still ignorant about the issue. This is due to them not wanting to spend money on appropriate technology to manage the waste. Unfortunately the developing countries and uneducated people end up suffering as they seek money without knowing the consequences that this waste has if not properly managed. Some of the companies that are disposing hazardous waste illegally are caught out by environmental law enforcers such as the Green Scorpions and the Greenpeace. Even so, South Africa and the world have a long way to go as some of these generators still get away with their law-breaking activities. South Africa has no single law that specifically deals with waste management but each and every generator has to be responsible for legal management of

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<sup>80</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry), 2<sup>nd</sup> Edition (1998) Appendix 9.2

its own waste so that the environment is protected and conserved for the future generations.

In South Africa, the majority of people consider waste as a bad thing that has to be dumped as far away from them as possible but some people have changed the ways in which they manage waste. Improper disposal of waste not only visually degrades the environment but may also lead to water, soil and air pollution; and poor health or even death to humans.

The easiest and most cost effective way to manage waste is simply by not producing waste at all but because it is impossible to do so certain hazardous waste production can be avoided, recycled or even minimised. Hazardous waste can also be prevented by using cleaner production processes and good practices.<sup>81</sup>

Current and future environmental regulations encourage waste minimisation with more stringent control of hazardous waste being discharged to air and water surfaces. Waste avoidance and minimization should be key components of any comprehensive waste management programme for economic, environmental and regulatory reasons. Such program should take a multimedia approach so that the waste material is actually reduced and not just transferred from one medium to another.

## **Findings**

At University of Limpopo (Turffloep Campus), this study has shown that hazardous waste is not being managed properly. In the previous chapter the types of wastes produced, their hazard rating, and the approximate amount produced at a time are shown. Some of this waste ends up in

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<sup>81</sup> M. Freeman 'Waste Minimisation and Recycling' (1988) 5.3-5.36

municipal dumping site, some down the drain and some of it at the hazardous waste site, if at all. The waste that is “supposedly” disposed of at the landfill site is not proven that it ends up at the relevant landfill as there is no documentation that supports this. The concern is how does the disposer (a contracted private company) dispose or even treat this waste as it has not been classified properly, its nature and composition is not known.

According to the National Environmental Management Act the generator of waste is held accountable for the pollution caused even by the transporter of disposer if he cannot prove that the transferal of waste management was a responsible action. There is no documentation from the disposer<sup>82</sup> showing that the waste is disposed in a legal manner, if it happens that the contracted company disposes waste illegally and it is traced back to the University<sup>83</sup>, the University will be the one to remedy the situation. According to the Minimum Requirements prescribed by the Department of Water Affairs and Forestry, there is a certain amount of a waste substance to be disposed that cannot be exceeded. This is the kind of information that should be made available to the generator by the disposer. Some of the chemicals can be disposed of in an environment but need treatment prior to disposal. The university can save a lot of money if they can treat some of the waste and not send it to the disposer as the disposer charges per amount of waste collected. The University is therefore at risk of being found to be a non-compliant organization in terms of South African law.

Some of the generated waste is in very small quantities but even so it has been seen that some wastes are very toxic even at very low concentrations. The university’s laboratories personnel should be

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<sup>82</sup> A privately contracted waste management company

<sup>83</sup> University of Limpopo (Turloop Campus)

trained on how to handle hazardous substances and a temporary waste storage facility should be organized. These laboratories have taken the first step of contracting a company that disposes of hazardous waste. Now, the university should get relevant papers from this company which show that it is authorized to do such a job. This will include a certificate from DWAF, documents showing that the personnel are trained on handling of the waste. Transportation requirements<sup>84</sup> include:

- the packaging and containerisation of the waste
- labelling of containers
- vehicle requirement and its licensing
- driver training, licensing and responsibilities
- loading of the vehicle and securing of load
- placarding of the vehicle and transport documents
- knowledge of treatment of spillage in case one occurs.

All of the above requirements must further, in addition to environmental laws not be in contravention of the National Road and Traffic Act; the Hazardous Substances Act; and the Occupational Health and Safety Act.

### **Recommendations**

In conclusion, it is therefore recommended that the University in order to become fully legal compliant must:

1. train the personnel on how to handle and separate hazardous waste.
2. have standard operating procedures (SOPs) for hazardous waste management in place and these should be made available to the students as well.

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<sup>84</sup> Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry), 2<sup>nd</sup> Edition (1998) s 10.5.2

3. look at legislation such as Environment Conservation Act 73 of 1989; National Environmental Management Act 107 of 1998; Hazardous Substances Act 15 of 1973; National Water Act 36 of 1998; Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 2<sup>nd</sup> Edition (1998); and Occupational Health and Safety Act 85 of 1993 for management of hazardous waste management.
4. make the students aware of the chemical hazards of the chemicals to be used for the practicals, their handling and disposal.
5. service fume hoods in the laboratories so that they can be in the good working conditions.
6. look at the treatment of certain wastes and reduction of volumes as this can save the university a lot of money.
7. look at how the University of Stellenbosch and Rhodes University are managing their waste as they are having good procedures in place.
8. contract an accredited hazardous waste disposer as prescribed by the Department of Water Affairs and Forestry (DWAF). This disposer should then provide the University with the relevant documentation and storage containers as per Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste by DWAF.

## **CHAPTER SIX**

### **REFERENCES**

#### **6.1 Books**

Freeman, M. 1988. Standard Handbook of Hazardous Waste Treatment and Disposal (McGraw-Hill Inc, United State of America)

Glazewski, J. 2005 Environmental Law in South Africa 2<sup>nd</sup> Edition (Butterworths)

Hugo, M.L. 2004 Environmental Management: An ecological guide to sustainable living in the Southern Africa (Ecoplan cc)

#### **6.2 National legislation and policies**

Constitution of the Republic of South Africa Act, 1996

Environment Conservation Act 73 of 1989

Hazardous Substances Act 15 of 1973

The Health Act 63 Of 1977

Integrated Development Plan 2007-2008 (Capricorn District Municipality)

National Environmental Management Act 107 of 1998

Integrated Pollution and Waste Management White Paper, Gazette 20978, Notice 227, 17 March 2000

Limpopo State of the Environment Report Phase II, 2006

Municipal Structures Act 117 of 1998

Municipal Systems Act [No. 32 of 2000

National Water Act 36 of 1998

Occupational Health and Safety Act 85 of 1993

The White Paper on Environmental Management Policy, 28 July 1997

Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 2<sup>nd</sup> Edition (1998)

The Polokwane Declaration On Waste Management, 2001

### **6.3 Websites**

[<http://www.alertnet.org/>](http://www.alertnet.org/)

[<http://allafrica.com/>](http://allafrica.com/)

[<http://www.ban.org/>](http://www.ban.org/)

[<http://www.basel.int/>](http://www.basel.int/)

[<http://www.busrep.co.za/>](http://www.busrep.co.za/)

[<http://www.cbc.ca/>](http://www.cbc.ca/)

[<http://www.ens-newswire.com/>](http://www.ens-newswire.com/)

[<http://www.environment.gov.za/>](http://www.environment.gov.za/)

[<http://www.groundwork.org.za/>](http://www.groundwork.org.za/)

[<http://www.iol.co.za/>](http://www.iol.co.za/)

[<http://www.mpu.agric.za/>](http://www.mpu.agric.za/)

[<http://physchem.ox.ac.uk/>](http://physchem.ox.ac.uk/)

[<http://www.reuters.com/>](http://www.reuters.com/)

[<http://www.sabcnews.com/>](http://www.sabcnews.com/)

[<http://admin.sun.ac.za/usbd/>](http://admin.sun.ac.za/usbd/)

[<http://www.themercury.co.za/>](http://www.themercury.co.za/)

#### **6.4 Newspapers and other documents**

'Chemical firms to detoxify Durban water' *The Mercury* (15 June 2006)

'Chemical drums found near Potch river' *The Mercury* (12 July 2006)

'China chemical spill halts water supply to two hundred thousand'  
*Reuters* (04 July 2007)

'European Union bans sale of toxic mercury thermometers' *CBC News*  
(11 July 2007)

'Mittal dumping waste without permit' *Business Report* (19 July 2007)

'Pollution Hazards Alleged at Highveld' *Business Day* (05 October 2007)

'Giant Waste Dump Poisoning Nairobi Children' *Environmental News Service*  
(09 October 2007)

'Many French rivers polluted by banned chemical' *Reuters* (10 October 2007)

'Green Scorpions shut down ArcelorMittel operations' *SABC News* (23 October 2007)

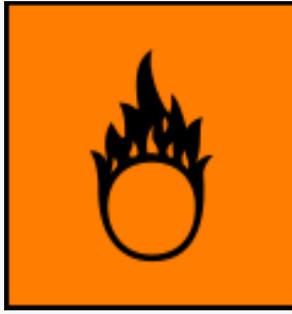
Rhodes University Environmental Policy (2004)

Stellenbosch University's Hazardous Waste Management Guide (2002)

## Appendix 1



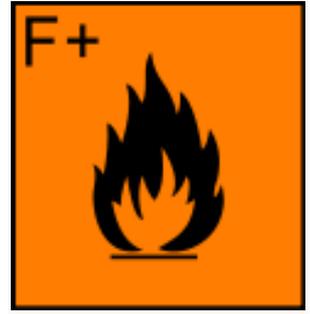
*Explosive (E)*



*Oxidizing agent (O)*



*Highly flammable (F)*



*Extremely flammable (F+)*



*Toxic (T)*



*Very toxic (T+)*



*Harmful (Xn)*



*Irritant (Xi)*



*Corrosive (C)*



*Dangerous for the environment (N)*



*Radiation*

**Appendix 2**



**LIMPOPO**  
PROVINCIAL GOVERNMENT  
REPUBLIC OF SOUTH AFRICA

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**DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT AND TOURISM**

**CHECKLIST FOR INDUSTRIAL WASTE**

**DIRECTORATE : INTEGRATED POLLUTION AND  
WASTE MANAGEMENT**

**SUB-DIRECTORATE : HAZARDOUS AND CHEMICAL  
WASTE MANAGEMENT**

Cnr Suid and Dorp Streets, POLOKWANE, 0700, Private Bag X9484, POLOKWANE, 0700  
Tel: (015) 293 9302, Fax: (015) 295 5015 Website: <http://www.limpopo.gov.za>

***The heartland of Southern Africa - development is about people!***

**1. GENERAL INFORMATION**

**1.1 NAME OF INDUSTRY** : \_\_\_\_\_

**1.2 CONTACT PERSON** : \_\_\_\_\_

**1.3 DESIGNATION** : \_\_\_\_\_

**1.4 TELEPHONE (WORK)** : 

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**1.5 CELLPHONE** : 

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**1.6 FAX** : 

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**1.7 E-MAIL ADDRESS** : \_\_\_\_\_

**1.8 STREET ADDRESS** : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**1.9 POSTAL ADDRESS** : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ *Code:* \_\_\_\_\_

**1.10 LOCAL MUNICIPALITY** : \_\_\_\_\_

**1.11 ABSOLUTE LOCATION** : \_\_\_\_\_

**1.12 DATE OF EVALUATION** : \_\_\_\_\_

## 2. PRODUCTION PLANT

2.1 *RAW MATERIAL USED* : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2.2 *TYPE OF PROCESS* : 

DRY		WET	
-----	--	-----	--

2.2.1 *BRIEF EXPLANATION* : \_\_\_\_\_  
\_\_\_\_\_

2.3 *DESIRED PRODUCT* : \_\_\_\_\_  
\_\_\_\_\_

2.4 *BY-PRODUCT* : \_\_\_\_\_  
\_\_\_\_\_

2.5 *HOUSEKEEPING* : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### 3. HAZARDOUS WASTE GENERATED

Type of waste	Waste recovery method	Quantities of waste generated	Characteristics of waste			Treatment of waste	
			Physical properties	Classification	Hazardous ratings	Types	Quantities left

Cnr Suid and Dorp Streets, POLOKWANE, 0700, Private Bag X9484, POLOKWANE, 0700  
 Tel: (015) 293 9302, Fax: (015) 295 5015 Website: <http://www.limpopo.gov.za>

**The heartland of Southern Africa - development is about people!**

#### 4. STORAGE FACILITIES

4.1 IS THERE ANY WASTE STORE ON SITE?

YES		NO	
-----	--	----	--

4.2 IF YES, WHICH TYPES OF WASTE STREAMS STORED ON SITE

---

4.3 FOR HOW LONG IS THE WASTE STORED ON SITE? :

---

---

4.4 TYPE OF PERMIT/LICENCE :

---

4.5 HOUSEKEEPING :

---

---

---

#### 5. COLLECTION AND DISPOSAL

5.1 NAME OF COMPANY RESPONSIBLE FOR WASTE COLLECTION:

---

---

5.2 HOW OFTEN IS THE WASTE COLLECTED? :

---

5.3 QUANTITY OF WASTE COLLECTED :

---

---

5.4 DOES THE INDUSTRY HAVE A SAFE DISPOSAL CERTIFICATE?

YES		NO	
-----	--	----	--

5.5 NAME OF DISPOSAL FACILITY :

---

## 6. WASTE MANAGEMENT PLAN

6.1 *DOES YOUR INDUSTRY HAVE WASTE MANAGEMENT PLAN?*

YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

6.3 *ANY FORM/S OF NON-COMPLIANCE* : \_\_\_\_\_

\_\_\_\_\_

## 7. OTHERS ISSUES OF CORNCERN

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## 8. COMMENTS

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

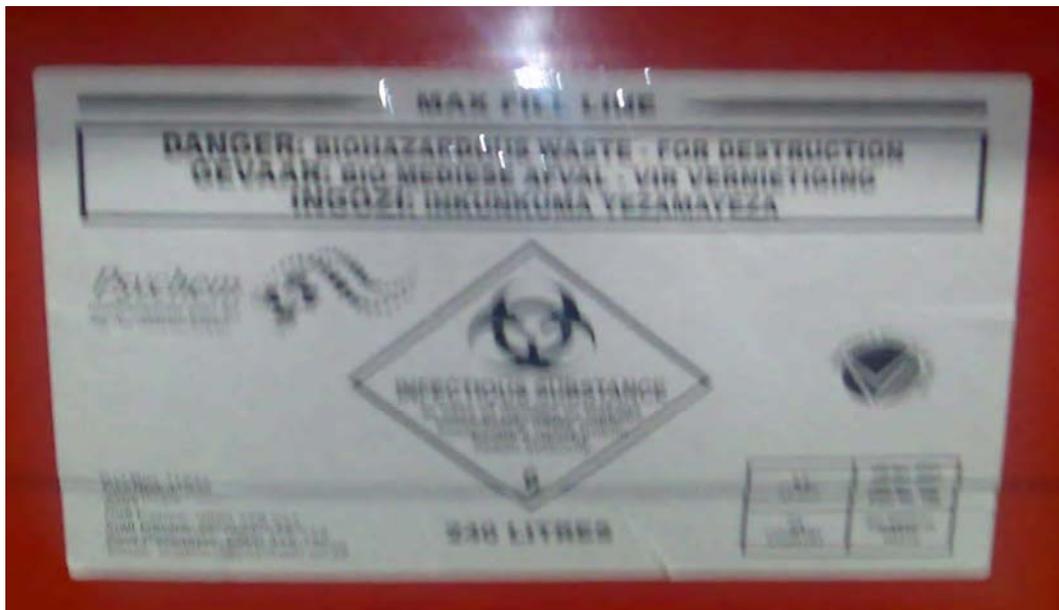
NAME OF OFFICER : \_\_\_\_\_

SIGNATURE : \_\_\_\_\_

DATE : \_\_\_\_\_

### Appendix 3

#### 3.1 Label on a bin in the chemistry laboratory



#### 3.2 Label on a bin in the pharmaceutical laboratory

