AN ASSESSMENT OF THE HEALTH HAZARDS THAT EMPLOYEES FACE IN RELATION TO THE RECYCLING PROGRAMME AT A BEVERAGE COMPANY IN KWAZULU-NATAL

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Dissertation submitted in full compliance with the requirements for the Master's Degree in Health Sciences in the Faculty of Health Sciences at the Durban University of Technology

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DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

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Signature of student Date

Approved for final submission

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ABSTRACT

BACKGROUND

The foundational understanding of recycling in industry and the different waste streams that exist, together with the health hazards associated with these waste streams and how to manage them, is not clearly understood by all employees involved in the process. It is the duty of an organisation to provide training and information on this practice to adequately equip employees to function better in the workplace. Research suggests that not understanding the health hazards associated with recycling can lead to detrimental health consequences. However, could the lack of understanding of this practice result from a lack of poor implementation of the recycling programme, a behaviour or attitude issue linked to inadequate training or behaviours/challenges related to the training programmes?

AIM AND OBJECTIVES

The study aimed to assess the health hazards that employees were exposed to due to waste separation activities at a beverage company in KwaZulu Natal (KZN). The objectives of the study were to assess if the current recycling programme had been adequately implemented. In addition, the study addressed factors associated with health hazards and varying levels of awareness, staff perceptions, challenges, and attitudes within the organisation. Health hazards related to these factors, implementation of the programme and the effectiveness of the monitoring of the programme were also addressed.

METHODOLOGY

A quantitative study using the stratified random sampling method was used to collect data from 136 participants. Data from the questionnaires were statistically analysed using the Statistical Package for the Social Sciences Software (SPSS Version 26) with a *p*-value of ≤ 0.05 indicating statistical significance. The data presents the descriptive statistics using graphs, figures, cross-tabulations, and tables. The inferential statistics used were the chi-square test and correlations values and were interpreted using the *p*-values.

RESULTS

Biographical data of respondents reported a ratio of 3:1 (p<0.001) males to females in the organisation. A post-school qualification was held by 50%. From an awareness perspective, it could be seen that awareness was evident in a few respondents. Most respondents exhibited the correct attitude to the recycling programme and had positive perceptions towards the programmes.

CONCLUSION

Recycling is of concern both in South Africa and internationally, therefore, the need for this research was necessary. This study found that the existing programmes are inadequate to meet the training needs of the employees due to various barriers. There is an action plan in place to address the concerns of this programme. Recycling programmes share many similarities and differences with those of other sustainability programmes. It is for this reason that the training and implementation processes should be reviewed and assessed to derive best practices that can be incorporated into current recycling programmes.

DEDICATION

I dedicate this dissertation to my beloved family, particularly my son, Aaron Reddy, my husband Kreasen Reddy and my parents, Radha and Anand Naidoo. I want to thank you all, for your never-ending support, encouragement, and endless love you showed me during this time. This dissertation would not be possible without you.

I owe this honour to you, my family.

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To my Lord and Saviour: Thank YOU for always giving me the strength when times got tough. YOU have taught me to hold on, despite the odds and to never give up: HAVE FAITH AND BELIEVE!!!!

To my dear husband, Kreasen: Thank you for pushing me when I did not have the energy and felt overwhelmed, for assisting me and being my biggest pillar of support.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

GLOSSARY OF TERMS

Aspect

One part of a situation, problem, subject

Assessment

The action of assessing someone or something.

Biodegradable

Being decomposed by bacteria or other living organisms and thereby avoiding pollution.

Carbo nanotubes

Carbon is used to make tubes; its diameter is typically measured in nanometres. Often referred to as single-wall carbon nanotubes (SWCNTs) with diameters in the range of a nanometre.

Disposal

The action or process of getting rid of something

End-of-waste

After the waste treatment process is concluded, materials that are no longer considered waste, if they meet certain conditions are known as 'end-of-waste criteria'.

Environmental

Refers to the natural world and the impact of human activity on its condition.

Exposure

The state of having no protection from something harmful.

Hazard

Something that is dangerous and likely to cause damage

Hazardous waste

Hazardous waste is generated from many sources and appears in many states, albeit – liquid, gaseous, or sludges. Its properties make it harmful to both humans and the environment.

Impact

The reaction of one object coming into contact with another.

Incineration

The destruction of something, especially waste material, by burning.

Landfill

Disposing of waste material by burying it.

Lifecycle

The series of changes in the life of an organism including reproduction.

Microplastics

Small pieces of plastic debris, resulting from the breakdown of consumer products and industrial waste.

Nano plastics

Breakdown of plastic products resulting in small pieces or particles of plastic, polluting the marine environment.

Non-degradable

Incapable of being chemically degra**ded.**

Pollution

The introduction of a harmful substance into the environment.

Programme

A set of related measures or activities with a particular long-term aim.

Recycling

An alternative to "conventional" waste disposal. The aim is to prevent the waste of useful materials, reduce pollution in the form of air, water pollution, reduce greenhouse gas emissions as well as save energy.

Regulation

To control something, especially by making it work in a particular way.

Risk

A situation involving exposure to danger.

Safety

The state of being safe; freedom from the occurrence or risk of injury, danger, or loss.

Waste

A material substance that is eliminated after completion of a process, that is no longer useful.

LIST OF ACRONYMS

BPA	:	Bisphenol A
$C0_2$	:	Carbon dioxide
DSW	:	Durban Solid Waste
EDC	:	Endocrine disrupting chemicals
EPCPD	:	Environmental Planning Climate Protection Department
EU	:	European Union
GHG	:	Green House Gas
HDPE	:	High- density polyethylene
HP	:	Hewlett Packard
IT	:	Information Technology
LCA	:	Life Cycle Assessment
LDPE	:	Low density polyethylene
LLDPE	:	Linear low-density polyethylene
MSDS	:	Material Safety Data Sheets
NIAS	:	Non- intentionally added substances
PBT	:	Persistent bio accumulative toxic
PET	:	Polyethylene terephthalate
POP	:	Persistent organic pollutants
PP	:	Polypropylene
PPE	:	Personal Protective Equipment

SPSS	:	Statistical Package for the Social Sciences Software
UV	:	Ultraviolet
vPvB	:	Very bio accumulative
WHO	:	World Health Organisation

CHAPTER ONE
OVERVIEW OF THE STUDY

1.1 BACKGROUND OF THE STUDY

In the history of Occupational Health and Safety together with the Occupational Safety and Health Act No. 85 of 1993, employees have a right to know all health and safety laws relating to them (South Africa 1993). This implies that it is the responsibility of the employer to protect the employees, by ensuring that they are informed of the possible health hazards surrounding them in the workplace (Rosner and Markowitz 2016). As highlighted by Rosner and Markowitz (2016), in society today, it is taken for granted that all workers should know about the dangers of their jobs. Many social media platforms are available to inform employees about the use of hazardous materials. Human beings do not experience environmental changes but experience the effect of such in terms of climate changes. To ensure a sustainable planet, everyone should be held accountable to solve or reduce these problems, “this is our responsibility towards future generations” (Zhu 2016:1).

According to Groh *et al.* (2019), there is an increase in the use of plastic packaging and there is a need to reduce food waste as a result of the demand due to the population's increased growth and market growth. North and Halden (2013) as cited in Groh *et al.* (2019) also state that there are apprehensions about the detrimental effects on the environment, and in turn on human health including their endocrine-disrupting properties and the long-term pollution they pose. These concerns, as indicated by Groh *et al.* (2019), include the accumulation of non-degradable plastics as well as littering. Furthermore, hazardous chemicals are released during the manufacturing and the generation of secondary micro-plastics and nano-plastics. Landfilling, incineration or unsuitable disposal methods also lead to pollution of the environment (Franchini *et al.* 2004).

Groh *et al.* (2019) suggest that to drastically diminish environmental effects, initiatives to improve packaging percentage recycling rates should be undertaken. The numerous chemicals used in the packaging plastics manufacturing process are extremely hazardous (Lithner, 2011). Groh *et al.* (2019) highlight the substantial danger for occupational health and safety. Hahladakis *et al.* (2018) state that

throughout the successive use, recycling and dumping, chemicals located in plastic packaging may contaminate cosmetics or food and even the environment through their packaging. As indicated by Biryol *et al.* (2017) cited in Groh *et al.* (2019), plastic packaging is more than likely to cause chemical exposures to the human population and the environment.

Geueke, Groh and Muncke (2018) point out that recycling may also cause the accumulation of hazardous chemicals in secondary materials, having a negative effect on their retail cost and further implications downstream in the process. Groh *et al.* (2018) indicate that a detailed evaluation of the chemicals that are associated with plastic packaging must be conducted. Omran, Mahmoud, Abdul and Robinson (2009) state that many people consider recycling as a norm, in which all individuals participate in a move to a healthier lifestyle and for a sustainable future. Recycling is important for the environment, as the re-use of waste materials rather than creating new ones, will reduce the burden on landfill sites and provide an avenue of endless positive opportunities.

A major concern that people often overlook is the negative impact recycling programmes can have on the workforce in direct contact with the different waste streams. In their article, Omran *et al.* (2009), conclude that many recycling programmes have been implemented and the effectiveness of this is rarely seen in the industry, especially that of the beverage industry. This could be a result of the process used to implement such a programme, the lack of knowledge around recycling and what the specific outcomes should be or perhaps a lack of funds to ensure sustainability of such programmes. Employees aware unaware of the negative effects related to not handling waste correctly.

According to Rushton (2003), there is a large labour force employed in the collection of waste, sorting and disposal especially in the beverage industry. Workers in comparison to the general population may face similar potential hazards, although the levels of risk and exposure may vary. The kind of work with regards to waste management options varies, with most jobs, for example, incineration and landfilling, which are far more automated as opposed to the other processes, such as collecting, sorting and recycling waste.

Gupta, Goel and Rupa (2016) point out that waste that is not effectively managed, poses a concerning health hazard and will lead to the rise of transmittable infectious diseases. Exposed waste left to accumulate attracts insects and other creatures that can spread infectious diseases. In general, wet waste releases a bad odour when it decomposes, known to be created by bacteria that are present. This then leads to an unhygienic environment and a rise in health problems.

Therefore, it is important that all employees handling waste are aware of the impact, hazards and risk factors involved. They can then foresee the seriousness of not handling waste as per the prescribed methods. By understanding the associated health hazards of waste handling, both employers and employees are then able to protect themselves from contracting severe illnesses. This also enables them to share this knowledge with the surrounding community.

1.2 AIM OF THE STUDY

The aim of the study was to assess the health hazards that employees are exposed to due to waste separation activities at a Beverage company in KZN.

1.3 OBJECTIVES OF THE STUDY

- To assess if the current recycling programme has been adequately implemented at a Beverage company in KZN
- To determine levels of awareness, staff perceptions, challenges, and attitudes in relation to the existing recycling programme at a Beverage company in KZN
- To evaluate the implementation and effectiveness of the recycling programme at a Beverage company in KZN

1.4 RATIONALE FOR THE STUDY

Municipal waste is a collection of waste liquid and materials that serve as a breeding ground for microbial organisms. Individuals involved in the management of this waste could be exposed to high concentrations of these biological organisms.

The World Health Annual Report Charter (1986) states that promoting a health programme, enables individuals to assume responsibility for their health. The basics required to maintain one's health is knowledge, education, and the availability of basic sustainable resources to promote well-being. Hernando, Mezcua, Fernández-Alba and Barceló (2006) proposed the importance of a secure foundation, availability of information, and knowledge for making healthy choices. Individuals can attain their fullest health potential by taking control of those things which determine their health and to improve occupational health.

According to Yu *et al.* (2017), the employees' understanding of the relationship between their health and work status was mostly limited. The study shows that employees did not realise that their work played an adverse part in their health conditions. There exists a limited level of knowledge amongst the employees on the hazards that are related to their work. This means that there are implications for their acceptance of skills to safeguard themselves and the environment from contamination. It is important that for any intervention one must reflect on the existing limited level of knowledge and workers must be educated to increase their awareness level, so they can gain further knowledge and key skills for future employment in other avenues.

1.5 FLOW OF THE DISSERTATION

Chapter One is an introduction to the study and provides information on the background as well as the rationale for the study. This chapter provides a brief overview of the health hazards associated with recycling and justifies the need for the study. The aims and objectives are included in this chapter.

Chapter Two provides a review of the current literature available. This chapter used the literature on recycling and waste management to acquire the relevant information needed to build a profile of health hazards associated with recycling and how recycling programmes can be improved, together with other information that can be compared to the data obtained from the research topic upon completion.

Chapter Three details the methodology used. This chapter covers in detail the process of this study and how it was conducted. The chapter further provides information

regarding the design of the research undertaken, the methods that were implemented and the research tools that were used to accumulate the relevant data for this study.

Chapter Four details the results of the study. The data is presented in the forms of graphs, tables and charts. A brief description of the data that are shown in various forms is provided to better comprehend the information provided.

Chapter Five delivers an overview of the data obtained in relation to current literature. The results of chapter four are compared to the literature of chapter two and the results are then discussed in correlation to the aims and objectives of the study.

Chapter Six provides a conclusion along with any limitations related to the study and makes recommendations for further research.

1.6 SUMMARY OF THE CHAPTER

An overview of the study was presented in this chapter and the objectives of the study together with the problem statement and rationale were outlined. In the next chapter, the relevant literature sources on the literature on recycling and waste management, health hazards associated with recycling and how recycling programmes can be improved.

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

Materials have been reused and refashioned into needed items for many thousands of years, indirectly implying that recycling as we know it today, has been in existence all along through the ages (Palliser 2011). According to Hershkowitz (1998), recycling is a worldwide phenomenon, an industrious arena with varied supporters, contributing to significant benefits across the world. These benefits are in relation to the environment, economic and social way of life. Thus, recycling should be the order of the day to be serious about the quality of life (Latif *et al.* 2012).

Hargreaves (2011) points out that it is becoming clear that uncontrollable patterns of human activity cause major environmental challenges, such as climate change. This will call on significant changes to daily life across all sectors of society. History tells us that industries have impacted climate change a great deal by releasing toxic fumes into the atmosphere and dumping large amounts of waste into rivers and streams, ultimately leading to the ocean, and causing the death of millions of sea creatures. All of this is due to the lack of understanding of the basic concepts of recycling.

Goosen (2012) suggests that a comprehensive method is required to resolve environmental issues. Many organisations believe that sustainable development is the typical model to follow. For example, a rising number of organisations currently base their performance in environmental, economic, and social areas.

2.2 THE CONCEPT OF WASTE

As described by Rushton (2003), waste is any material that is discarded. Hence, waste can be a composition of several different substances, of which, many are hazardous to health. The probable effects of waste management on health have been the topic of an immense form of research. Waste can be classified as either controlled or uncontrolled with industrial waste falling under the category of controlled waste. Due to its inherent characteristics, specific types of waste are defined as hazardous.

Jerie (2016) states that protecting the environment and human health is a great challenge facing emerging and developed countries. However, humans produce material residues that would overload the capacity of natural recycling processes, implying that these wastes must be managed correctly to reduce their effect on our health or the environment.

2.2.1 Generation of various waste streams in industrial organisations – Beverage Companies

According to Arvanitoyannis (2010), the continuously growing human population has caused a huge demand for packaged food. Food manufacturing has moved to a considerable decrease in non-renewable resources. Huge quantities of air, water, fuel, and electricity are being consumed every day to assist in food manufacture, preservation and transportation purposes. These processes impacted the quality of the environment negatively, which has declined quickly over the last 30–40 years. Despite agreements specified in the Montreal and Kyoto protocols and ballots cast in the Green and White Bible, the fact of the matter is, that there is a rapidly deteriorating trend seen in the environment, particularly the accumulation of waste in landfills. The key to this problem is recycling, however, processes like landfilling, composting, and incineration are the most widely employed processes.

Pipatti *et al.* (2006) state that industrial waste generation and composition vary depending on the type of industry and processes/technologies. The manufacturing process can be complex. Raw materials are obtained from various sources and involves a variety of processes. Each of these processes has an impact on the environment. A lifecycle analysis must be conducted to understand the impact of the product on the environment and take account of the process inputs and outputs throughout the lifecycle of a product, up until its disposal.

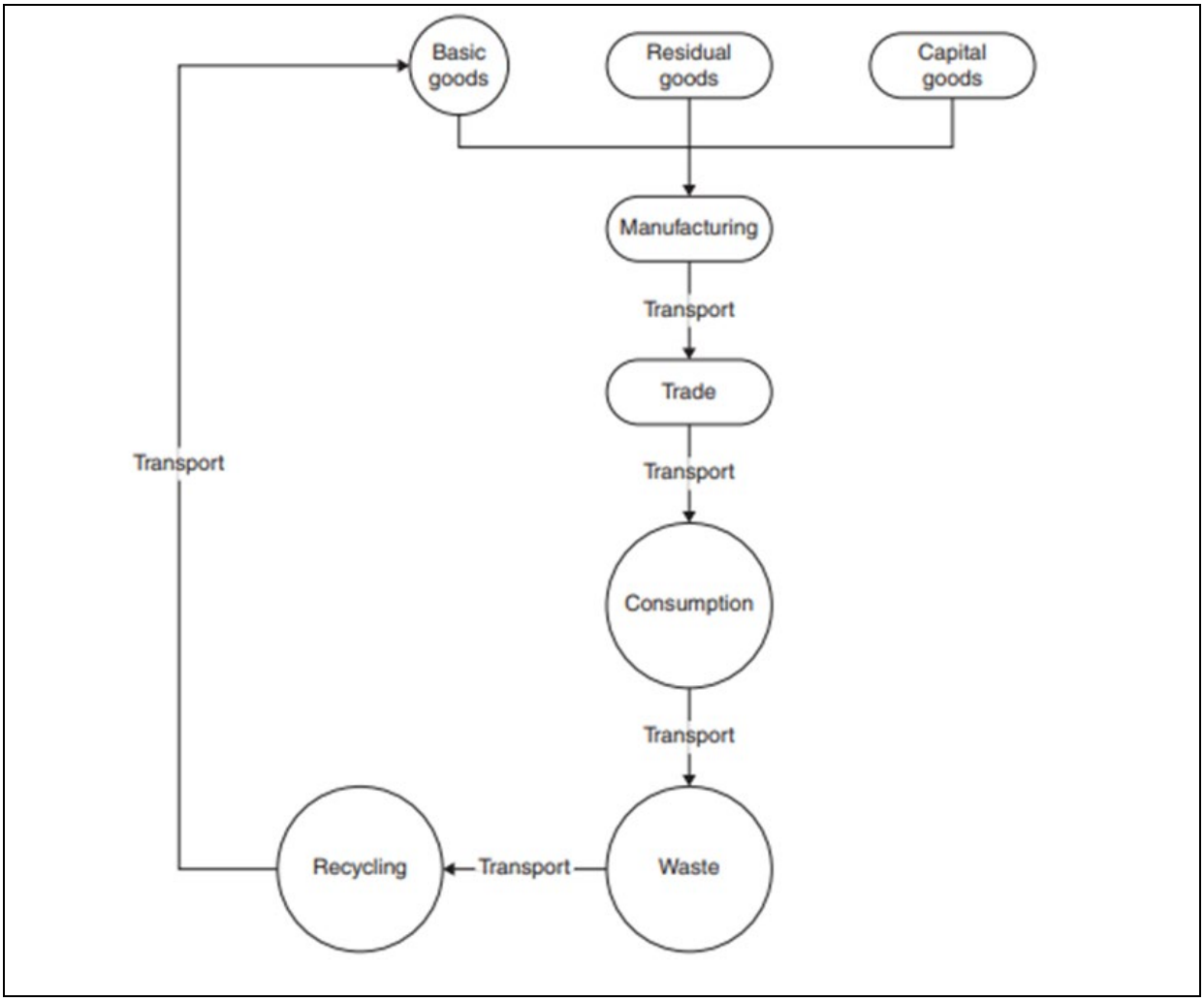

Figure 2.1: Lifecycle of a basic product used in the IO-EA process method

Source :(Godin and Kok 1996)

Bourguignon (2015) points out that any form of waste generates waste streams, which starts from its source through to recovery, recycling, or its final disposal. Waste streams can be separated into two types: metals or plastics or streams of certain electronic waste, which require detailed treatment. Bourguignon (2015) went on to say that every waste stream possesses its own precise characteristics and appropriate legislation, including treatment method terms, hazardousness, practical recovery and recycling possibilities. Bourguignon (2015) sums up the basics of understanding different waste streams and concludes that several principles apply across waste streams. There are two categories that waste streams can be separated into streams related to materials that include glass; metals; plastics; paper and cardboard; wood; bio-waste and streams related to final products including packaging; electronic waste;

batteries, mining, construction waste. Numerous facets must be well-thought-out when evaluating various waste streams: for instance, what will be the origins of waste that need treatment and what will the treated waste be used for; what will be the appropriate recovery and recycling procedure; and are there any prospects and challenges related to recycling?

It is imperative that everyone involved in the handling of waste understand the terminology associated with the concept of waste and recycling (Bourguignon 2015).

- End-of-waste: At the end of the waste treatment process, materials are no longer referred to as waste but need to meet 'end-of-waste criteria'.
- Extended producer responsibility: The producer’s responsibility lasts long after the consumer has used the product.
- Recyclable waste: This can be paper, plastic, rubber, be it hazardous or non-hazardous.
- Waste stream: From either a domestic or industrial source which is the total flow of waste to either the recovery, recycling, or disposal stage.
- Hazardous waste: Has properties that make it capable of having a detrimental effect on human health and the environment. Hazardous waste can appear in many forms and is derived from many sources.
- Recycling: A modern-day approach to the traditional way of disposal. Known to reduce greenhouse gas emissions and prevent the waste of useful materials.
- Landfilling: Area in which solid waste is buried between layers of dirt.
- Incineration: The destruction of something, especially waste material, by burning.

2.3 HEALTH HAZARDS ASSOCIATED WITH DIFFERENT TYPES OF WASTE STREAMS IN VARIOUS INDUSTRIES.

The World Health Organisation [WHO] (2007) reports that there have always been many dangers that exist for humans in this world. Numerous diseases are associated with poor practices both on land and in water. Hazardous substances can be man-

made and natural, both of which can be harmful and a risk of exposure at certain levels. For example, respiratory distress can be caused by airborne particles and nearly all heavy metals can exhibit properties of neurotoxins at specific levels.

One of the aims of this study was to identify hazards and evaluate the level of risk at varying levels of concentration exposure. In most cases, substances that are used to reduce exposure to one hazard is later discovered to possess an inherent risk itself. Asbestos is a good example, known to save lives on ships by reducing fires at sea and was later found to possess a health risk, amongst workers in direct contact with the substance. One cannot expect a world without risk; however, it is possible to lessen the exposure once the hazard risk is known. The latest and most accurate monitoring equipment has given scientists the ability to recognise exposures to substances at low levels, which were unidentified in humans. New methods are often required.

According to Bulmer (1935), there is a concern regarding any condition that will shorten one's life. Where the relationship is clear, something must be done about it. Those conditions which shorten life abruptly, such as accidents or acute diseases, are recognised by all classes. There, however, are other factors that shorten life whose influence is not so apparent, such as the personal habits of the individual and the nature of the environment under which they live and work. During the working period of life, man is exposed to conditions that are beyond control. These conditions may result in accidents, poisoning and infection from materials handled or from other workers. On the other hand, conditions in the factory may be considerably better than in the home and be uplifting both mentally and physically to the worker. Of special interest are those diseases that workers contract due to their industrial employment. Some of these diseases are the same kind that affects the general population and others are specific to the industry. Very often the terminal illness is of a type suffered by the whole population superimposed on an industrial disease.

A particularly important factor always to be taken into consideration in evaluating the hazard of a job is the amount of physical labour performed by the worker exposed. From a practical viewpoint, industrial diseases are air-borne. Any factor which increases the amount of air breathed increases also the dose of injurious substances entering the body. The effect of muscular exercise on pulmonic ventilation is well

known. Heavy work might easily increase pulmonary ventilation four to five times more than that required for sedentary work (WHO 2007).

Lee *et al.* (2013) describe in their article, the use of technological convergence used in the printed electronics industry. There is an additional health and safety concern in relation to printed electronics, compared to those experienced in the old-style printing industry. In Lee *et al*.'s (2013) study, based on an on-the-ground survey, two printed electronics workplaces were surveyed. A clean room was used for all printed electronics operations. Evidence indicates that there was no exposure to excessive carbon nanotubes (CNTs) or silver nanoparticles. However, there lacked engineering controls in place, for example, the correct enclosure, duct connections and local exhaust ventilation. Based on the study, there is a lack of evidence of employees wearing personal protective equipment. Chemicals found in air samples taken were not defined in the safety data sheets (SDSs), adding to the severity of the lack of PPE. Additionally, the residual waste was not disposed of correctly. The used waste material was left in bins, that were not closed properly.

As stated by Hahladakis *et al.* (2018), waste material be it flammable, corrosive, reactive, or toxic in nature, presenting itself either in the form of a solid, liquid, or gas, is defined as hazardous waste. Hazardous wastes are products used daily, such as paint, used motor oil, batteries, shoe polish and even laundry detergent. Many of the items that are in daily use generate hazardous waste during their production. Plastic's characteristic nature is that of being inexpensive and durable. Plastic production has increased over the last 60 years. The increase in plastic production and its materials, brings with it many challenges, especially that of wastage. Additives used in plastic production, also possess the ability to contaminate soil, air, water and food. Plastics release these additives from the various recovery and recycling processes. It is important that recycling be performed in such a way, to ensure that emission and contamination of substances from recycled products are avoided, ensuring that both the environment and human health is always protected, as shown in Figure 2.2 below.

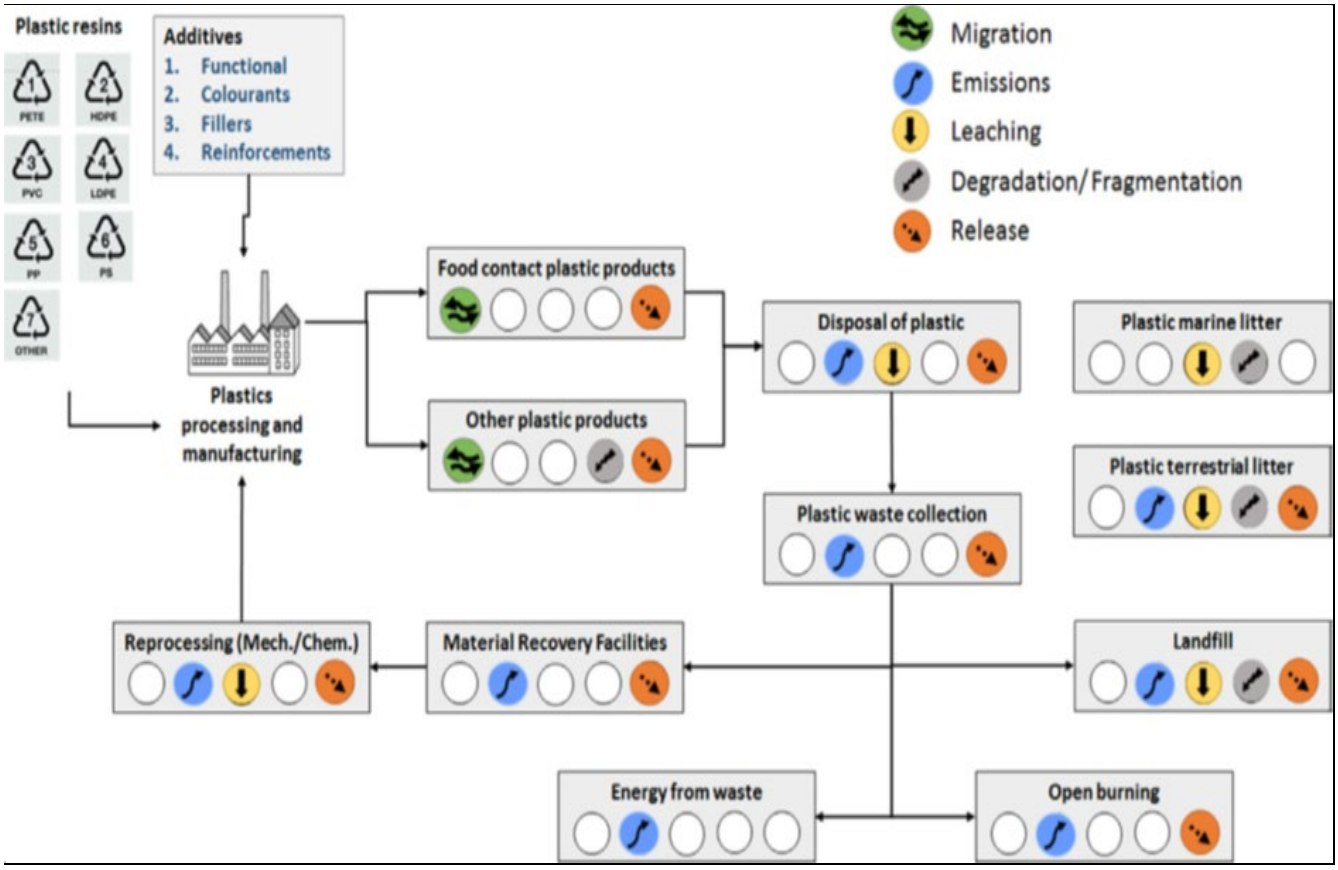

Figure 2.2: Graphical Abstract that outlines the chemical additives in plastics: migration, release, fate and environmental impact during their use, disposal and recycling

Source : (Hahladakis *et al.* 2018)

According to Hahladakis *et al.* (2018), during the 1940s and the 1950s, the production of plastic increased drastically, especially on an industrial scale. The global annual production of plastics has doubled over the last 15 years, reaching approximately 300 million tonnes in 2013.

Globally, plastic is split between many types of thermoplastics:

- 21 % Polypropylene (PP)
- 18 % Low and linear low- density polyethylene (LDPE and LLDPE)
- 17 % Polyvinyl chloride (PVC)
- 15 % High-density polyethylene (HDPE)

- 8% Polystyrene (PS) is another plastic type of high demand and expandable PS, polyethylene terephthalate (PET) 7%.

Plastics play an important role in society as they provide a variety of benefits for both humans and the environment. For instance, plastic packaging is needed to protect food and other items from contamination or perishing, thus saving resources. The light-weighting of plastic in the packaging has the added benefit of saving fuel and a decrease in emissions when transporting goods. Clean water can be provided from plastic storage containers. Plastic materials of low density assist in saving fuel and decreasing emissions by being used as replacements for metals in cars and aircraft. Safety equipment and protective clothing, made from plastic are known to prevent injuries. Plastic products produced for medical purposes contribute to improved health (for example, blood pouches, tubing, disposable syringes, prosthesis). A diverse consumption leads to a diverse waste steam. Plastic products have a short lifespan and large quantities of plastic are generated (research points out that roughly 40% of plastic products have a shelf life of fewer than one month). This huge quantity of waste produces serious environmental management issues. Figure 2.3 below indicates the lifecycle of plastic, from its production, and used until its end of life. Hahladakis *et al.* (2018) focus on the migration of numerous additives existing in food plastic materials.

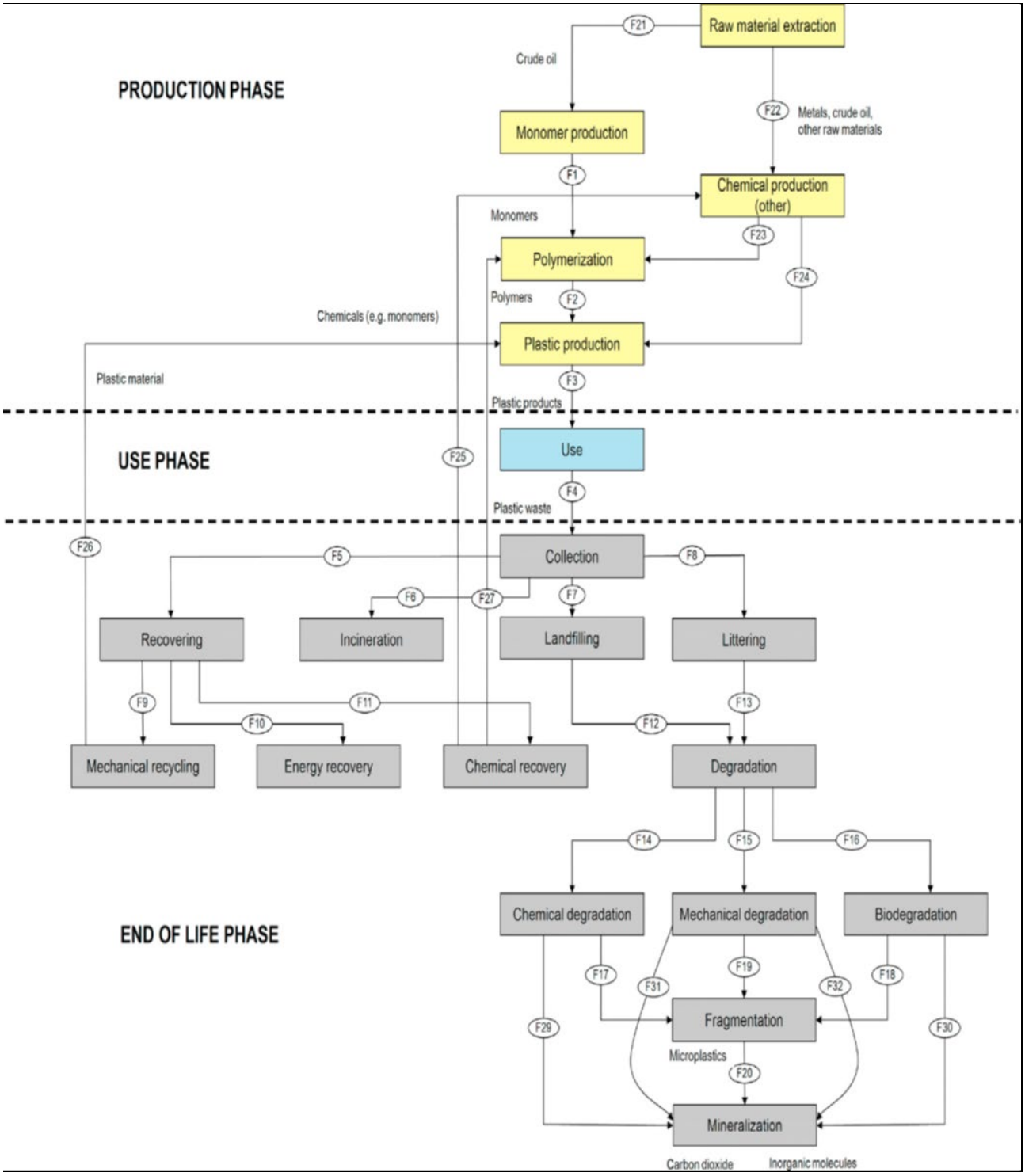

Figure 2.3: The life cycle of plastic products excluding energy input and emissions

Source : (Hahladakis *et al.* 2018)

Plastic packaging varies and is made up of numerous additives and polymers, additional components like coatings and adhesives. In addition to this, residual substances used during manufacturing can be found in packaging, for example,

impurities, along with non-intentionally added substances (NIAS), solvents and degradation products, according to Groh *et al.* (2018).

Groh *et al.* (2018) point out that there is a total of 906 chemicals connected to plastic packaging. Of these, 63 are among the highest for human health hazards and 68 for environmental hazards. In addition to this, seven of the 906 substances have been classed in the European Union (EU) as persistent bio-accumulative toxic (PBT) and bio- accumulative or very persistent, very bio - accumulative (vPvB), and 15 as endocrine disrupting chemicals (EDC). The United Nations Environment Programme identified 34 chemicals as EDC. These dangerous chemicals are input into the manufacturing process of plastics in the form of plasticisers, biocides and colourants amongst other functions.

According to Bang *et al.* (2012), EDCs are known to be present in synthetic resins associated with plastics, a concern, particularly in Korea. Plastic manufacture has increased every year since 1950's, increasing the safety concerns around plastics. Potential health concerns exist amongst Phthalates and has received a great deal of attention as EDC's. To increase the flexibility of PVC in food contact materials, Phthalates are used as plasticisers in this process. Phthalates which are part of the EDCs group are known to contaminate food from plastic food containers. This is dependent on the present environmental condition the food is in, such as ultraviolet (UV) light, pH, temperature, microwave, and mechanical stress for an adequate period. Many safety concerns surrounding food packaging have been raised (Petersen and Jensen 2010).

Most food and beverage containers, dental sealants, and the lining of metal cans consist of Bisphenol A (BPA) and is also an additive in a variety of other products (Vandenberg *et al.* 2007). The production of BPA in the EU was estimated to be 1150000 tons in 2005 (Oehlmann, Oetken and Schulte-Oehlmann 2008).

Analysis from animal experiments show that developmental disorders, reproductive toxicity and endocrine disruption are produced from some phthalates. Studies performed on animals in the laboratory suggest hormone dysregulation is induced by phthalates, which results in reproductive malformations and reduced androgen-dependent organ weight.

A comparison was done regarding occupational accidents among waste collection workers in relation to the general workforce. This was found to be higher than that of the general workforce. From a waste exposure perspective, there are several health concerns associated with waste collection, such as a high number of musculoskeletal problems, work-related respiratory gastrointestinal and skin problems due to increased exposure to bio-aerosols and volatile compounds. Studies conducted on both the waste sorting and recycling processes as well as landfill sites have seen similar health problems to those of waste collectors which are work-related.

By understanding these health hazards in the various industries, employers are assisted in taking the necessary steps to ensure that their employees are aware of the associated risk involved with handling various waste streams. It also guides employers to make a concerted effort to ensure that all waste is disposed of appropriately, eliminating risk to the employees directly involved and the environment.

2.4 WASTE MANAGEMENT

A report by the WHO (2015) indicates the main findings, which state that the effects of waste disposal on health can be considerable due to poor management of waste practices. Unlawful disposal of waste can have detrimental effects on the public health and the environment in surrounding areas. These negative practices of disposal can result in water, air and soil pollution. Other annoyances caused by mismanaged or uncontrolled waste disposal may affect people undesirably and will impact the landscape negatively.

It is a known fact that due to plastics degrading gradually over the years, globally, the key tool for treating plastic waste is now recycling. Worldwide recycling of plastic waste includes four treatment methods:

- Energy recovery (incineration),
- Chemical recycling (cracking, gasification, hydrogenation, and pyrolysis),
- Material recycling,
- Landfilling (Antelava *et al.* 2019).

It is important to note that various recycling methods can have diverse effects in the environment. These recovery processes can emit exhaust gases, which is difficult and expensive to treat according to Antelava *et al.* (2019).

According to Huang *et al.* (2013), the availability of suitable sites and capacity for landfilling of municipal solid waste is becoming a problem in many countries, and can be depleted over the years to come. Recycling has been in practice for many years with the use of -post-manufacturing waste. High levels of polymers exist in waste, resulting from the recycling of used plastics. The level of contamination during the recycling process is unknown. In the recycling treatment of plastic, the melting temperatures can release harmful gases into the air. It is important to determine the pollution characteristics to control the emissions.

Energy recovery and chemical recycling are not supported by the government in China due to fears of environmental pollution produced by inadequate recycling processes. At present, there are approximately 25,000 individuals employed in the recycling sector and roughly greater than 5000 tons of plastic can be produced per day. These recycling plants have no control over their emissions and no treatment methods when released into the atmosphere. Unhealthy emissions can meaningfully affect the quality of life and environmental health (Tsai *et al.* 2009).

2.4.1 Storage

According to Lerena *et al.* (2013), energy carriers need to be supplied in huge quantities to meet the demands of a reliable and permanent supply of electricity. These energy carriers can be stored in the gaseous phase or large masses such as the solid or liquid phase. They have the potential to cause hazards, either resulting in a large-scale fire, unintended release or explosion. Waste also possesses similar hazards. Large quantities of solid waste exist, and a small portion is recycled.

Energy conversion can also use solid waste and the main gas emitted from this process is carbon dioxide (CO_2). The unintended release can pose a risk. It is therefore important to conduct a risk assessment before storage of waste and the following steps must be looked at:

- Understanding the behaviour of the stored material, namely, its reactivity and thermal nature

- Assessment of the storage site and it environmental conditions storage site
- Assessing its stability
- What are the safety distances?
- Assess the effects of an incident
- Develop a loss prevention plan

A study by Lerena *et al.* (2013) on the variety of storage processes was conducted to determine hazards with these various storage processes and implement a standard hazard assessment.

Consideration is given to the materials stored:

- Chemical reactivity
- Toxic potential
- Thermodynamic state

Consideration is given to:

- Thermodynamic properties of storage (pressure and temperature),
- Containment interaction,
- Environment sensitivity,
- Precautions are taken to avoid incidents,
- In case of incidents, emergency response.

Underground storage of wastes in France, as reported in Lerena *et al.* (2013), are construction wastes that largely consist of asbestos, and is stored in an underground facility. Despite asbestos being non-reactive, residues of reactive material, not identified initially, were found in the waste. Therefore, the stored material underwent exothermic reactions resulting in a fire due to self-ignition. Prior to the fire being noticed, there was a distinct odour and slurry that emanated from the storage sites. The fire extinction lasted for two months. Insufficient fire precautions were taken as the material was considered non-reactive. This undoubtedly proves that no proper risk assessment was conducted, before storing the asbestos waste.

The safety non-compliance resulting from this occurrence was:

- • Insufficient thermal stability testing was not done on the stored material.

- The emergency procedures were not adequately explained.
- Insufficient chemical analysis was conducted on the asbestos, implying that the waste containing asbestos may have contained unnoticed combustible materials.

Lessons learned from this and the consequences that followed were:

- This storage activity was halted.
- The area in which the fire occurred closed.
- Risks that were associated to combustibility and thermal instability and were known but overlooked.
- Corrective and preventative operating procedures were developed and improved to prevent the storage of self-heating and combustible materials.
- Emergency procedures were created, should a fire occur.

Figure 2.4: An example of underground waste storage (courtesy of BMG Engineering)

Source : (Lerena *et al.* 2013)

Above-ground storage of various waste deposits are kept in huge quantities for lengthy time frames, during this prolonged storage time, these waste deposits undergo chemical conversion, most of which are exothermal resulting in a temperature rise and is the initial point of a fire.

Waste deposits exist in the form of:

- Heaps stored loosely
- In confined boxes
- Heaps that are compressed mechanically
- Baled due to being compressed
- Accumulation of waste in confined underground caves(Lerena *et al.* (2013).

Waste deposits are stored in steel barrels or large bags so that the immediate area is compacted to at least the bare minimum. The main purpose of this method is to stabilise the rock strata. Not knowing the long-term chemical stability is the hazard of this process.

Figure 2.5: A characteristic intermediate deposit of recycling products in an open space heap storage with 110,000 tons capacity

Source : (Lerena *et al.* 2013)

Figure 2.5 shows approximately 110,000 tons of intermediate deposits of recycling products. Due to being declared provisional, these storage sites have no fire precautionary measures taken and can exist over several years (Lerena *et al*. 2013).

An assessment of the hazards that exist, such as unwanted chemical reactions should include the following two components:

- What are the characteristics of chemical stability and long-term thermal stability of the material that is stored?
- How long does this recycling material maintain its thermal stability.?

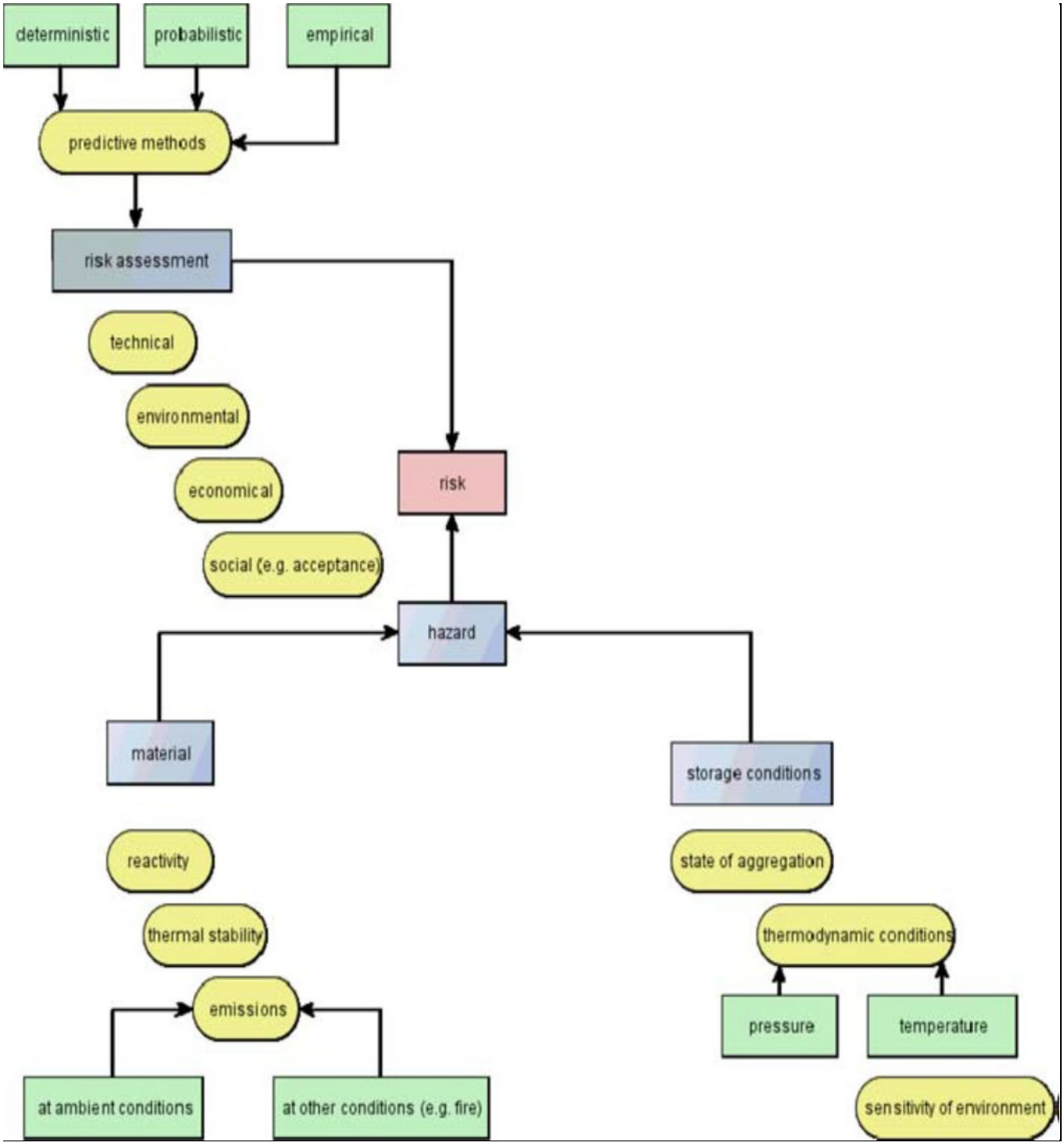

Figure 2.6: The layout of a risk assessment and hazard evaluation for storage processes

Source : (Lerena *et al.*2013)

A risk assessment is done when the hazards have been identified together with their effects. Calculations may be based on either empirical, probabilistic or deterministic methods as follows:

- Empirical: Estimate what is the accepted risk, how would society respond to hazard situations,
- Probabilistic: Predicting the occurrence of incidents or actions pointing to incidents.
- Deterministic**:** Predicting the possible effects of incidents for instance an explosion.

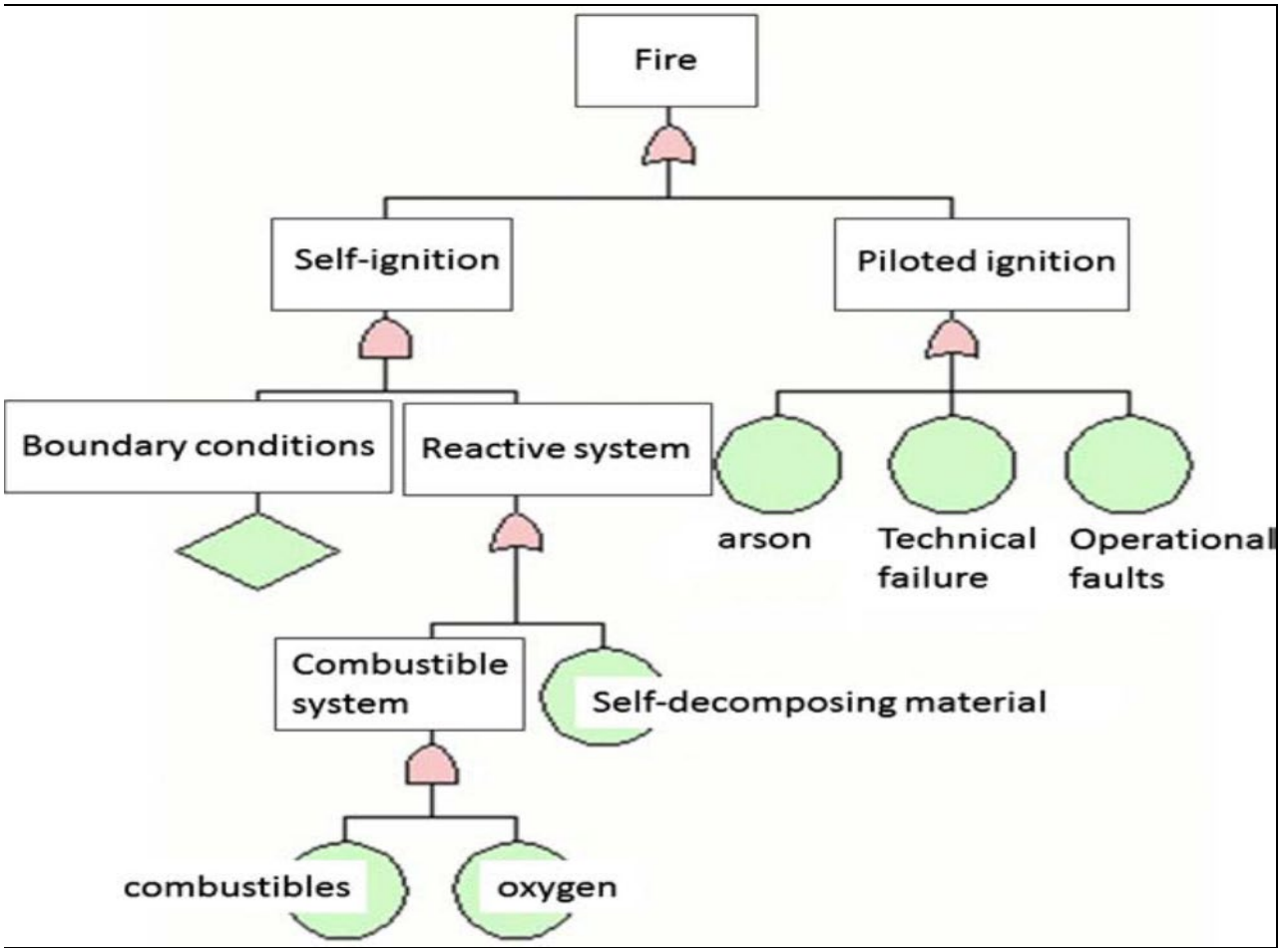

Figure 2. 7: The analysis of the fire hazard in stored solid material represented by a qualitative fault tree

Source : (Lerena *et al.* 2013).

The high energy density is one of the main hazards in storage processes. If released unintentionally, this may lead to fires, accidental releases or explosions. Excessive smoke emissions result from fires that contain toxic or harmful properties and pose a threat to people that are affected.

2.4.2 Disposal - landfilling and incineration

According to Rushton (2003), there is a huge workforce employed in waste management. They may be exposed to possible hazards and the amount of risk and exposure may vary. Waste management options can be more automated than others, such as landfills and incineration, unlike waste collection, sorting and recycling, which is a more hands-on task. The WHO had an assembly in Bilthoven in 1998, to assess accessible research information. Data presented suggests emissions from landfill could pose a risk to the population in the surrounding area.

Recommendations from the meeting included the following:

1. A cross-functional team should carry out an exposure assessment with the relevant expertise.

2. On -the- level -communication should exist at all stages of the investigation.

3. The evaluation of exposure should be undertaken in only five steps:

a. Use of existing information that is available, understand the characteristics of the site, describe the details of the site and the area surrounding it, including the current use of the land, establish what possible contaminants of concern are and recognising transport pathways up until the point of release.

b. By describing the population at possible risk of exposure by use of receptor characterisation.

c. Understand the possible complete exposure pathways, and what are they, that generate a way of exposure to a human population.

d. Analyse information and what are the contaminants that humans are in direct with, such as air, water, soil, and the concentration levels.

e. An exposure assessment must be conducted based on information on the concentration and the population at risk.

4. A two-stage approach for the collection of the levels of exposure and site information should be used:

a. Obtaining information from readily accessible sources

b. Conduct further evaluations of air, water, soil and food.

5. A risk assessment should be conducted, in the event of a site being reopened or the use of the site is changed.

6. When an investigation is conducted, it is imperative to be cautious on site and prevent contamination of environmental media.

7. Documentation indicating the intended use of the land in this instance, for a waste disposal site must be kept by the local administrator, together with land ownership documentation, this is to ensure that the site is not used inappropriately.

8. Standard operating procedures for conducting an assessment and analysis should be used to compare other sites.

9. Only once exposure pathways have been clearly established, then only epidemiological investigations should be considered.

10. Instead of using health risk assessments, health surveillance and health impact assessments, there are alternatives to the epidemiological investigation that can be considered.

11. After the consideration of the toxicological profile of the substances of concern is conducted, an appropriate health outcome for the study should be chosen.

12. The main purpose of the study should be reflected in the design of an epidemiological study.

13. When choosing the appropriate design for an epidemiological study, the quality of the information found and the confounding factors should be considered such as the varying levels and timing of exposures, latent period, and population structure.

14. From a biomonitoring perspective it is preferred that biomarkers of both effects and exposure should be carefully chosen when detecting early signs of health disorders and exposure.

Figure 2.8 below refers to steps of exposure in a landfill site.

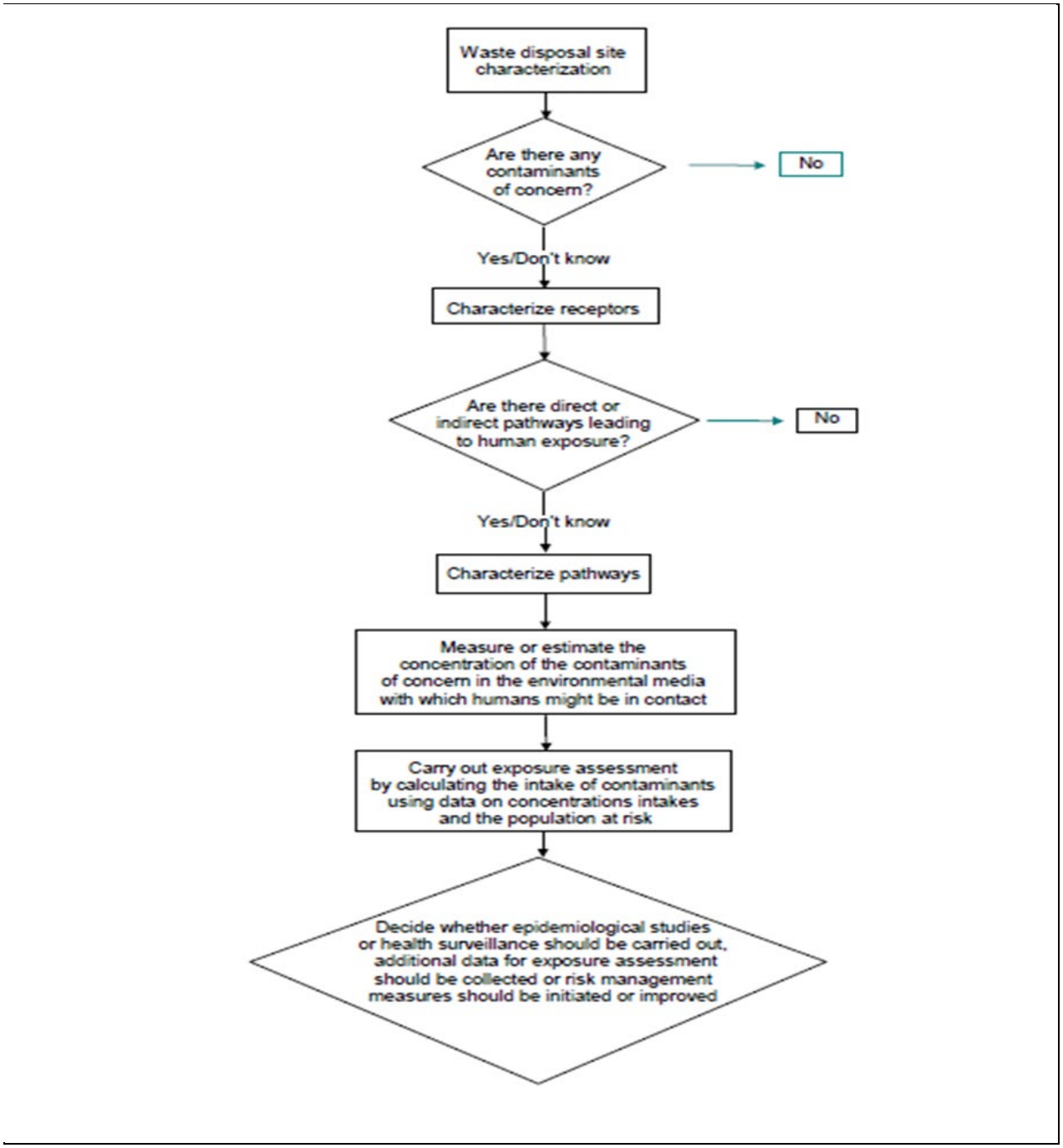

Figure 2.8: Process steps in the assessment of exposures at waste disposal sites

Source : (Rushton, 2003)

Plastic bags are now found almost everywhere on the planet, if not serving their intended use. Many developing countries have littering and trash laws in place and have significantly reduced the amount of improperly disposed waste. Many of these developing countries have fewer waste handling practices and programmes to handle the increasing amount of waste (Zhu 2016).

2.5. RECYCLING PROGRAMMES IN INDUSTRY AND ADEQUATE IMPLEMENTATION OF RECYCLING PROGRAMS

According to Dahlén and Lagerkvist (2010), the key to understanding how the quantity of waste processed is affected by recycling programmes, namely. collected and sorted. It is imperative to first know how to analyse waste flow data from collection systems and which factors are important in the results of recycling programmes. A group of waste flow indicators is projected, which together with generic system descriptions can enable comparisons of different waste collection systems. The assessment of these waste collection systems is dependent on system boundaries and will always be site-specific to a certain extent. Many varying factors are key during this process of waste management, for example, operating costs, types of recyclable materials collected, environmental objectives, technical specifications of the operation, drop-off systems, collection, economic incentives, residential structure, and social codes as well as information strategies.

Forty-three decisive factors are listed and discussed as per Dahlén and Lagerkvist (2010). Several researchers have evaluated recycling behaviors and what are the determinants in their participation in recycling activities. While questionnaires and interviews deliver a set of varying views of intriguing results, the willingness to sort waste and recycle must not be muddled up with the actual recycling rate. It is therefore important that when probing through critical factors in recycling behavior, the factual material output of waste collection should be known (Berg, 1993).

In industry, without proper guidelines entrenched, the output of waste collection will not be known and behaviors will not be established. Berg (1993) claims that waste flow information is necessary and is a true indication of the achievement or failure of a waste collection or recycling programmes. The following are gauges for the evaluation of source-sorting systems:

1. The quality of recyclables.
2. The quantity of recyclables collected.
3. The participation rate.
4. The recycling rate.
5. The eagerness of participants to participate.

6. The level of fulfillment from inhabitants.

Household waste composition is impacted by various factors presented in Table 2.1. Studies(Jenkins *et al.* 2003) have shown that the factors be it a mandatory/voluntary programme and socioeconomic status are irrelevant. Similarly, these aspects as indicated in the table below, serve as a good indication of the factors associated with those in the industry.

Table 2.1: Factors influencing the output of source programs in households waste collections systems

Factors that can be controlled by local/regional waste management strategies	Factors that can be controlled by national waste management strategies	Factors that are beyond the control of waste management strategies
Accepted level of operating costs	Level and type of financing that is accepted and legal	Production and consumption rate (GDP)
Waste management objectives	Legislation (*e.g.* producer responsibility)	Household economy; employment status of adults
Technical design of collection equipment and vehicles	National economic incentives (*e.g.* waste taxes)	Residential structure: • household size • property type (*e.g.* single-family, multi-family, size and type of yards, *etc.*) • tenure • urban/suburban/rural areas • heating system (solid fuel used for private heating) • stability and networking in the neighbourhood
Types of waste materials collected separately	Environmental objectives (*e.g.* recycling targets)	
Mandatory or voluntary recycling program	Levels of public education and awareness of waste issues	
Design of collection charges; economic incentives		
Information strategies and clarity of sorting instructions		
Education program (*e.g.* school programs, media)		Family life cycle; age of household members, number of household members at home daytime, number of males/females
Provision of indoor equipment for sorting (*e.g.* bins under the kitchen sink), and if so, types of equipment		
Encouragement of private composting (*e.g.* providing composting equipment and/or instructions)		
Types of waste material collected close to property (kerbside) • Convenience and simplicity of collection schedules • Types of bins and/or sacks • Provision of waste bins/sacks • Ownership of and cleaning responsibility for bins		Frequency of small-scale businesses in homes Weight and frequency of newspapers in the region Frequency of pet ownership Frequency of car ownership
Types of waste material collected with bring system (drop-off collection) • Convenience of location of drop-off points (natural thoroughfares, distance from homes) • Function and attractiveness of drop-off points		Frequency of freezer ownership Other cultural and socio-economic differences People's varying behaviour when all other factors are identical
Availability of alternative places for discharge (*e.g.* recycling centres)		Seasonal variations (*e.g.* tourism)
Administrative management of the collection systems (*e.g.* co-ordination in the region, operator ownership)		Climate

Source:(Jenkins *et al.* 2003)

The rate of waste generated is essential to planning the operation of waste management processes and is useful in describing the quantity of waste generated per person per year. An understanding of this useful piece of information can assist in implementing adequate recycling programmes that will ultimately aim at driving an increase in recycling rates and thus the reduction of waste to landfills.

According to Folz (1991), the recycling of solid waste is an effective strategy since it has the likelihood to conserve the existing landfill capacity, reduce disposal costs., and additionally support the objectives of resource and energy conservation, be it in an organisation, community or on a national level. It also proves to be a popular option among citizens. Folz (1991) states that success came about solely based on public participation and their involvement during the planning and design phase. The creation of a democratic design choice process invokes interest into the programme and enhances reliability and improves the predictions for personal commitment to a constant change in the behaviour of waste disposal. Education and communication are key when implementing a recycling programme and is a continuous effort for sustainability.

According to Degher (2002), the focus now points to equipment used in Information Technology (IT) and initiatives used in recycling are growing ever so greatly in environmental legislation. Businesses and governments are establishing procurement guidelines from a green perspective. These insist that businesses make use of recycled goods and purchase from companies that have take-back programmes for their products that prove no longer useful. Furthermore, laws are in place for creating awareness around implementing take-back programmes for electronic supplies and businesses must have processes in place to take electronic equipment back and recycle them. Hewlett Packard (HP) is being environmentally responsible and taking an active step. HP has established processes for returning and recycling HP LaserJet cartridges, any electronics hardware equipment and inkjet cartridges. HP has discovered that partnering with government agencies makes recycling programmes easier to implement, which is ultimately better for the environment.

It is said that organisational culture is made up of a shared belief system and collective assumptions that deliver suitable answer and actions for numerous incidences (Ravasi and Schultz 2006). This also regulates the character and confidence of a group regarding a definite subject matter, and it differentiates the members of one group from another (Hofstede 1997). Organisational cultures shape the way people and groups react with one another. Be it the external or internal community, it is either taught formally or informally (Sharifirad and Ataei 2012).

2.6 IMPORTANCE AND BENEFIT OF RECYCLING PROGRAMMES

It has become obvious that there is a need to rethink the throw-away mentality (Antelava *et al.* 2019). One needs to question more deeply as to who they are and who do they want to be, both as individuals and civilisation. The waste crisis enables see actions and answer these questions Considering the things that are disposable, does the same belief exist towards humans (Antelava *et al.* 2019). It is important for any programme to understand both the pros and cons pertaining to it. Recycling is perhaps the best option to decrease waste as an output but the effect on the environment is not good. Recycling may decrease air and water pollution, consumption of raw materials, and energy usage, but still, possess its problems as stated in Future of Working (2020). The disadvantages are listed below.

2.6.1 Disadvantages of recycling

a) More pollution and energy consumption

Tons of waste need to be cleaned, transported, and processed in their own process-equipped factories. These processes require a huge supply of energy, and its' residual products are known to pollute the soil, water and air. Therefore, it is evident that more trucks collecting waste will inadvertently increase air pollution. In 2009, 179 000 waste collection vehicles had three dozen types of airborne toxins found in their exhausts.

b) Result in pollutants

Pollutants resulting from the breakdown of waste materials form a chemical solution and damage the environment. The final recycled product could potentially consist of toxins and impurities, and it may take years until it is realised that the recycled products used, were contaminated. For the last 12 years, buildings in Taiwan have been experiencing gamma radiation from the use of recycled steel in the building process.

c) Low quality jobs and increased processing cost

The cost of recycling as opposed to landfilling waste is exorbitant. Recycling is thought of as being labour- intensive and cost inefficient. It is a poorly paying occupation that can lead to low morale and poor quality of life.

d) Require stricter and more stringent implementation

Recycling, if not done properly, can harm the environment and health. Inadequate handling of waste can contaminate the environment, air and land. Therefore, it is imperative that stringent implementation must be followed. Abandoned dump sites with waste left lying around can affect the environment negatively.

e) Valued products are not guaranteed

Not every product that is recycled is of high quality and safe to use. Recycled paper, for example, uses a harsh chemical like bleach in its process, which is damaging to the environment and health. Hence, one must understand the chemical make–up of products prior to recycling, as they may contain toxic chemicals.

e) Generally ineffective

Results indicate that recycling brings about an increase in pollution, energy consumption, and is not cost-efficient, implying that it is not as effective as everyone thinks. Recycling fails to meet the supply-demand. An example is aluminium, where every year the demands increase by 10%, but the supply of recycled aluminium does not meet this demand, hence the mining of aluminium is still necessary. (Future of Working 2008).

As observed by Geyer, Kuczenski, Zink and Henderson (2016), at the heart of the industrial ecology metaphor lies the recycling of material resources. The knowledge of the industrial ecosystem is inspired by learning from natural ecosystems how to “close the loop.” Recycling forms part of daily life. The misconceptions from the public and industrial community have unfortunately misguided policies, environmental assessments, and actions that deal with recycling and therefore demoralise the environmental potential it possesses. These misconceptions arise from assumptions regarding recycled material and the fact that it can displace primary production. There exist many misconceptions, such as there is an advantage in recycling materials several times or at best in a closed loop. The final misconception states that the difference between closed and open recycling loops is normally useful.

According to Hershkowitz (1998), recycling at present is considered a worldwide phenomenon, a huge business with various supporters supplying significant benefits to millions of individuals worldwide.

2.6.2 Advantages of recycling

- Recycling conserves natural resources
- Guard and develop manufacturing.
- Protects energy consumption.
- Avoids pollution caused by virgin resources.
- Recycling diminishes the necessity for incineration and landfilling and assists in preventing pollution formed by these processes.
- Decreases releases from greenhouse gases that add to worldwide climate change.
- A sense of responsibility and community togetherness is created.
- Assists in creating a sustainable environment for generations to come(Hershkowitz 1998).

Despite recycling being shaped out of empirical and scientific economics, it is established in confidence that people worldwide are co-dependent, however secluded they may feel (Hershkowitz 1998).

Hershkowitz (1998) argues that water and air pollution is prevented using recycled materials naturally activated by processing plants that depend on virgin raw materials that are unprocessed. Using recycled materials far exceeds the need to proceed to refine, extract, and transport the timber essential for virgin-based plastics, glass. and paper. The toxic air emissions, solid wastes and effluents, that are produced from these manufacturing processes, are reduced through recycling. The most apparent and well-known advantage of recycling is that it leads to less waste being buried in landfills.

In a study by Palliser (2011), it is evident that from the rise of manufacturing and recycling industries, roughly more than $100 billion in revenue is generated and has created one million manufacturing jobs. The key to long-term economic growth is innovation in the recycling process. Recycling also promotes community development.

Miranda Carreño and Blanco Suárez (2010) go on to say that for any recycling scheme to be a success, the citizens' participation is of utmost importance.

2.6.3 Reduction of waste in landfill

Hershkowitz (1998) states that landfill operations are an expensive setup and complex design which is not environmentally safe. Hazardous air emissions, which are uncontrolled, are released from landfills as well as leachate emanating from waste contaminates groundwater and surface water supplies. Evidence indicates that landfills worldwide have contaminated streams, aquifers and wetlands. Hazardous pollutants found in landfills are cyanide, dioxins, mercury, volatile and non-methane organic compounds, greenhouse gases, hydrochloric acid, sulphuric acid lead and many others. Hershkowitz (1998) mentions that years of research have led to the fact that municipal landfills significantly endanger public health and welfare by contributing to pollution in these areas.

Powell, Townsend and Zimmerman (2016) indicate that the largest worldwide methane emission source is that of municipal solid waste disposal at landfills. Data of gas collection systems in the United States were analysed from approximately 850 landfills. Data analysed showed that landfills that are openly receiving waste have a substantial gas collection system in contrast to closed landfill gas collections. This information now demonstrates the clear need to target open landfills to achieve significant methane emission reductions. Powell, Townsend and Zimmerman (2016) find that municipal waste, when managed effectively, does not pose an immediate threat to human health or the environment.

With reference to Ajayi *et al.* (2016), improved sustainability has been the topic of concern for the construction industry. It is the biggest contributor of landfill wastes and consumes about half of mineral resources excavated from nature. Despite implementing many waste management strategies, waste reduction remains a challenge.

According to Moodley, Wright, Payne and Winn (2019), in South Africa, an increase in the generation of waste due to resulting pressures, places an increased strain on the present waste management systems. Despite having modern waste management systems in place, South Africa’s most reliable option remains landfilling. Landfills

cannot be removed from the waste management system in its entirety, as there will always be a need to treat waste.

Moodley and Ethekweni Municipality South Africa (2016) reports that present-day landfill sites resemble large earthwork sites. Figure 2.8 describes the daily activity on a landfill site. Landfill sites make use of bulldozers and compactors to compact waste (Figure 2.9). This is done to minimise leachate generation, maximise airspace, improve stability and ensure that there is no excessive moisture ingress (increase run-off). In addition, the landfill process uses equipment such as water tankers to suppress dust.

Figure 2.9: Landfill site – large earthworks
Source : (Moodley *et al.* 2019)

Figure 2.10: Bull dozer compacting waste

Source : (Moodley *et al.* 2019)

Figure 2.11: Overview of landfill site

Source : (Moodley *et al.* 2019)

The study by Moodley *et al.* (2016) found that the problems associated with landfills include the degradation of organic matter which breaks down into liquid and gaseous

emissions. Leachate creates the potential for groundwater pollution, explosion, fire hazards, and greenhouse gas emissions from landfill gas, which is a combination of methane emission and carbon dioxide. Figure 2.11 depicts landfill gas as the by-product of waste degradation as it rises. Its components are carbon dioxide and methane, and several trace components. This results from changes in the composition of gas over a period of time in order of the decomposition of waste.

Figure 2.12: Landfill degradation process – landfill gas

Source: (Moodley *et al.* 2019)

According to Ajayi *et al.* (2016), landfill space is depleting. Many solutions exist which can be used to avoid disposing of waste at landfill sites.

2.6.4 Environmental aspects and impacts

An important tool to alleviate the environmental impact of increasing production demands is recycling (Geyer *et al.* 2016). The key to a sustainable environment is to understand what aspects exist and their impact on the environment and health care.

According to Valerio (2010), several studies that were conducted according to the life-cycle assessment, reported that the least environmental impact is obtained through biological treatments such as composting, anaerobic fermentation and recycling. Energy recovery of biogas due to mechanical treatments may be inherently safer than incinerators.

Noda, Komatsu,Sumi, and Kasakura (2001) state that the concept of zero emissions focuses on a creation of a sustainable society with minimal disposal of resources. The recycling process needs to be looked at as an aspect should the impact of zero emission be focused on. When virgin material is used during the production process they give off reduced $C0_2$ emissions in relation to the impact of recycling. Campolina *et al.* (2017) concur that by recycling there is a considerable reduction in the $C0_2$ emissions.

Waste, resulting from the accumulation of plastic bags, has a negative effect on the environment, causing pollution (Adane and Muleta 2011). Plastic bags were introduced in the 1970's(Williamson 2003) and became popular amongst retailers and consumers. Globally around 500 billion plastic bags are used (Spokas 2008). Plastic bags have the potential to last up to 1000 years withstanding decomposition by microorganisms or sunlight (Stevens 2002). The natural beauty of an environment can be severely damaged as a result of plastic waste accumulation (Das, Bhattacharyya and Das 2014). Accumulation of these plastics in drains and sewers causes obstruction of sewerage systems which is a problem in developing towns and cities globally. Obstruction of the sewer systems create favourable conditions in which mosquitoes, other insects and animals spread many diseases such as malaria or encephalitis (Ellis *et al.* 2005).

2.6.5 Carbon footprint

The measurement of human activities' impact on the environment is analysed by looking at the carbon footprint, which is the number of greenhouse gases formed (Sridevi, Shreejith and Ramachandra 2014). The carbon footprint has become the popular buzz word used across the media, especially in the United Kingdom. Calculating carbon footprint is in great demand, especially now that climate change is a priority on the global political agenda according to Wiedmann and Minx (2008).

Muthu (2014) has indicated that there is a high level of focus on carbon footprint which is growing daily in all sectors. All countries are trying to decrease their carbon footprint to the minimum, especially in the manufacturing industries. The concept of carbon footprint has proven to be contagious, and consumers are in search of products with low carbon emissions.

Pandey, Agrawal and Pandey define the concept of carbon footprint as the area of land required to integrate the total CO_2 formed by humankind during its generation. Over time global warming became a hot topic on the environmental global agenda (East 2008). Carbon foot printing is known as an indicator of the life cycle impact by humans and the potential cause of global warming (Finkbeiner 2009).

Pandey, Agrawal and Pandey (2011) point out that the ever-increasing concentration of greenhouse gases will bring about disturbing consequences to the environment and global warming. Carbon footprint calculation is an important tool in which to manage greenhouse gas. Disagreements exist in the range of gases and the directive of emissions that need to be covered in calculating the carbon footprint. To guide verification and emission cuts, carbon foot printing is proposed as a tool, that must be standardised globally.

Quantifying emissions leads to the identification and prioritisation of the efficiencies of in reducing sources of emissions. This is a chance to enhance environmental cost reductions and efficiencies. As part of the legislative requirement, carbon footprints must be disclosed to the public or third party and is part of a company's social responsibility (Pandey, Agrawal and Pandey 2011).

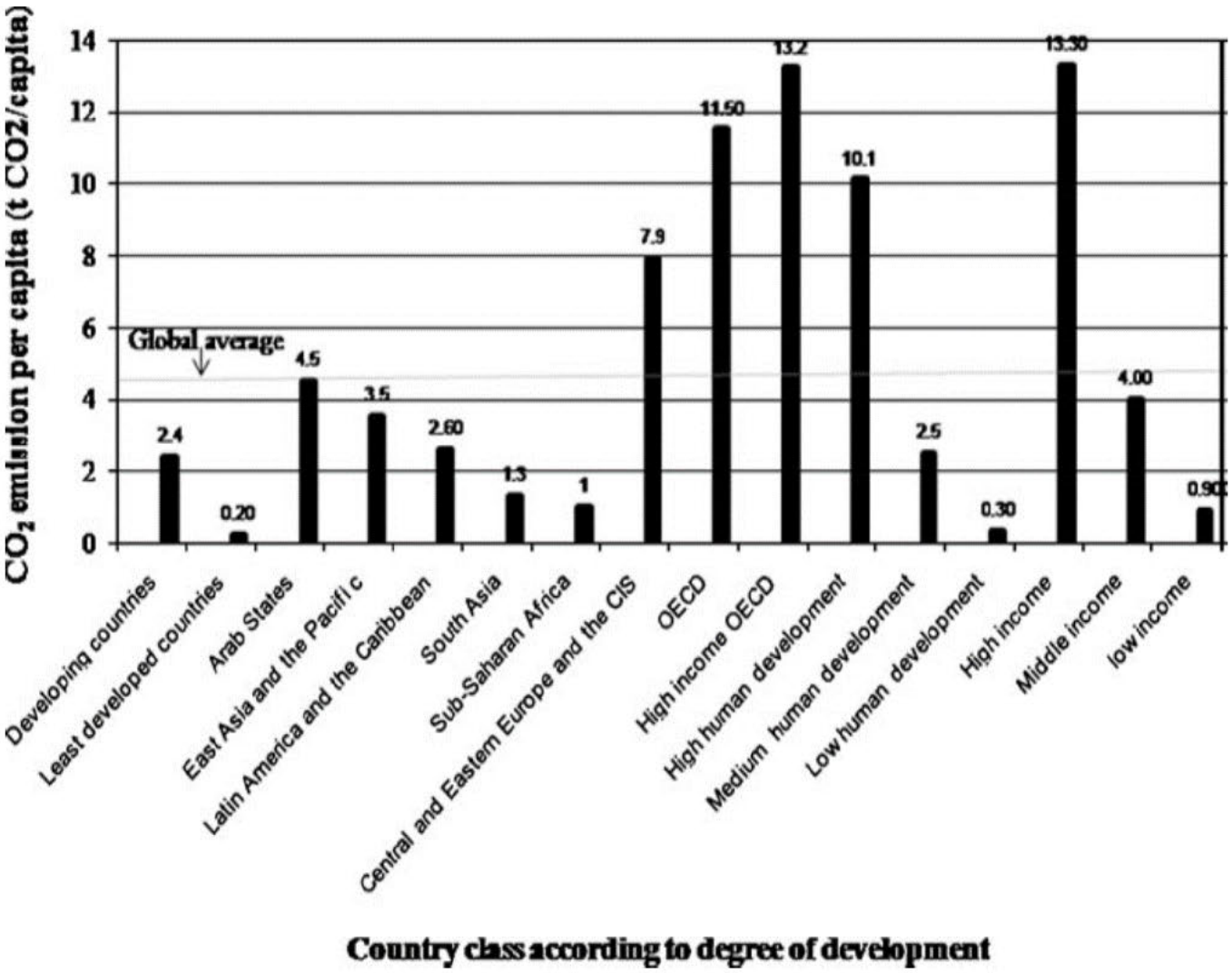

Figure 2.13: Carbon footprint per capita in different classes on countries based on degree of development

Source: (Pandey, Agrawal and Pandey 2011)

2.6.6 Cost implications

According to Palliser (2011), recycling and manufacturing industries produce over one million jobs and generate a considerable sum in revenue. Recycling activities also promote community development. Massarutto, de Carli and Graffi (2011) state that a detailed and cost-effective waste programme is necessitated by a rise in urban waste generation and a decrease in current resources. From a cost perspective, recycling is an expensive waste management approach in comparison to incineration and landfilling for most municipalities.

According to Lakhan (2015), both the private and public sectors can face further costs which result in added tariffs for waste management or an increase in the process for goods. The recycling process is complex, and its logistics component is just as equally complex. To ensure an effective system, the infrastructure for collecting, sorting as well as added transportation costs must be in place. Certainly, there are environmental impacts in the process (Ettehadieh 2011).

Recycling can be the foundation of high-tech modernisation and the creation of jobs. Industries use recycling as a catalytic agent to reflect on the impacts of their activities from a social and environmental perspective. In the end, if one can search for the optimum recycling rates, it may be probable to attain a lesser total economic cost (Highfill and McAsey 2001).

2.7 RECYCLING IN ACTION

According to MacBride (2011), a moment in history when the action taken was to challenge industrial production and its challenges with materials as well as the increase in consumption that have gathered over the earlier periods. The unintentional effect of misuse of natural supplies is making its path into the lives of people. Actions and concerns take on many forms, such as international conventions to mainstreaming business models. People find themselves in a throwaway society and need to practice the art or repairing and reusing items that they would usually discard, purchase item consciously and reduce the consumption of goods. Global organisations include environmental activities and performance in their financial reporting. There needs to be improved methods of communication surrounding green issues. This will, in turn, create awareness amongst management of environmental concerns which need to be actioned.

2.7.1 Key potential drivers

One can identify environmental problems and provide solutions and improvements to target areas of concern by means of a scorecard. It can also formulate applicable and attainable environmental performances (Goosen, 2012). Goosen (2012) goes on to say that the commitment to developing people lies in establishing sustainable organisations. Organisations have been assessed for their performance as well as

their attitude as global residents. To provide an atmosphere of transparency, organisations have become responsible and report on social and environmental aspects.

2.7.2 International initiatives

“Keep America Beautiful” (2020) reports that their main aim is to educate people to act responsibly every day. They provide the necessary tools to improve recycling and beautify American communities. They have also set aside a day dedicated to promoting and celebrating recycling, America Recycles Day® (ARD). Plogging, a term used by The Keep America Beautiful® Trash Dash™, was formed to get individuals to pick up litter whilst jogging, in an effort to decrease littering (Keep America Beautiful 2020).

Suzuki, Subramanian, Watanabe and Hasegawa (2008) recognise electronic waste or “e-waste” as an increasingly serious environmental issue. Large volumes of e-waste are dumped in municipal landfills. Some components of e-waste are highly hazardous and toxic, and some are highly valuable. This, in turn, can bring a source of income. This can cause environmental degradation and health problems in the communities. Despite having come up with a good solution to this problem, a valuable lesson was learned.

The programme requires robust commitment and the ability to communicate with the government. To successfully implement a programme of this nature, key managers must demonstrate leadership, which is a determining factor in implementation. Morgan (2012) describes recycling initiatives from around the globe by taking simple ideas and converging them into extraordinary initiatives.

a) Recycling cooking oil in Barcelona

In an attempt to recover used cooking oil, Barcelona is using oil pots. This assists in preventing contamination of local water. The oil pots are free and handed out to the public. This initiative aids in reclaiming much of the used cooking oil. Any type of oil will be accepted by the city. The oil pot has a resounding feature in that it has a filter that separates leftover food from the oil.

Figure 2.14: Olipot

Source : (Morgan 2012)

b) Composting is mandatory in San Francisco

Due to proper waste management practices in place, 72% of waste is diverted from landfills. There is a further commitment by the city to reduce waste by the introduction of the country's first mandatory composting law (Morgan 2012). Residents of San Francisco have become well acquainted with the green recycling bins found across the city.

Figure 2.15: Mandatory composting

Source : (Morgan 2012)

c) Stylised trash in Argentina

Argentinian designer, Manu Rapoport wanted people to know that waste is valuable. He created works of art in a park in Córdoba, Argentina, using impeccably clean recyclable materials such as tins, plastic and paper. Tetris-shaped outdoor furniture was commissioned by a recycling company called C.Re.S.E., the idea is to provide waste with a fresh style. Subsequently, 30% of the residents of the city have joined the recycling initiatives since the company opened.

Figure 2. 16: Stylised trash

Source :(Morgan 2012)

d) Recycling becomes illuminating in Warsaw

Many households in Warsaw Poland, have not taken an affinity for recycling. Luz interruptus was responsible for setting up an illuminating intervention. “Recycling Sunday” was set up by the group, to bring about awareness of recycling in the community. Different coloured bags were strewn about in the plaza, each bag tailored with a light bulb on the inside.

Figure 2.17: Illuminating plastic

Source : (Morgan 2012)

e) Reverse vending pays recyclers in United States of America

The use of technology in driving recycling in the correct direction is moving rapidly. The concept of a new sort of vending kiosk called the Dream Machine, in contrast to the conventional concept of a vending machine, provides prizes and points in exchange for an empty can or bottle. The expectation is that individuals will now use these machines when there is no access to a recycling bin. This was a partnership between Pepsi, Keep America Beautiful, and was produced by GreenOps. This was distributed across Carolina.

Figure 2. 18: Reverse vending

Source : (Morgan 2012)

f) Waste-water park in Germany

This water-recycling park treatment process found in the western state of Germany, is on display for consumers and gives them a sense of comfort and no fear. There is colourful construction and an impressive set of eco-features. Constructed rain – water harvesting roof and a wetland is used to treat the liquid and there is a garden onsite that benefits from the treatment park.

Figure 2.19: Wastewater park in Germany

Source : (Morgan 2012)

g) Local initiatives

With reference to Moodley *et al.* (2019),the first ever landfill conservancy in Africa was awarded to the eThekwini Municipality's Department of Cleaning and Solid Waste (DSW) for their Mariannhill Landfill Site in 2002. The drive was then placed on improving newer landfills. The partnership between the Environmental Planning and Climate Protection Department (EPCPD) and the DSW of the eThekwini municipality, looked at and focused on a ground-breaking initiative, to steer away from outdated engineering to more sustainable solutions related to green engineering.

As outlined in Pikitup (2015), there are many South African waste inventiveness. The latest waste management strategy and policy looks at minimising waste entering landfills, whilst removing most of its value from the waste stream during all stages of recycling.

h) Separation@Source

Pikitup, a local enterprise, has a household recycling programme called Separation at Source, the community are provided with recycling bags weekly which is then collected. Alternatively, waste can be dropped off at a Pikitup site.

Figure 2.20: Separation at source

Source: (Pikitup 2015)

i) Waste to gas

The City of Johannesburg generates 6000 tons of waste daily. Pikitup has designed a system in which to extract gas from waste generated, the aim of this system is to develop an alternate source of energy in the form of electricity. Methane, oxygen, and carbon dioxide are the main components of landfill gas, and the most harmful of them all is methane, which impacts the ozone layer.

Figure 2. 21: Landfill site Johannesburg

Source : (Pikitup 2015)

j) Bulky waste service

Bulky Waste Service was started in 2015, in the City of Johannesburg. This initiative looks at removing considerable pieces of household waste monthly, with no charge. The initiative was set up to deter recyclable waste (old furniture, mattresses, electronic appliances) from landfill sites to ensure life expectancy of landfill sites are preserved for longer.

Figure 2.22: Bulky Waste

Source : (Pikitup 2015)

k) E-Waste

Pikitup has a wide portfolio and one of which deals with E-waste. Approximately 1.4 million tons of waste is collected in Johannesburg annually, 10 percent of this consists of e-waste and 70 percent of this E-waste is considered toxic and most of which ends up in landfill sites, which have a negative impact on the environment. Residents are asked to dispose of old, damaged electronic devices and gadgets at the Pikitup facility.

Figure 2.23: Landfill site Johannesburg

Source::(Pikitup 2015)

l) Builders rubble

Certain Pikitup landfills accept building rubble and soil from building contractors at no additional cost. This diverts rubble from landfill facilities, ensuring an extended lifespan to the landfill site. Also prevents illegal dumping.

Figure 2. 24: Builders rubble

Source : (Pikitup 2015)

m) Oil recycling

Pikitup, in partnership with the Rose Foundation, facilitates the recycling, collection, and storage of used lubricating oil in South Africa. This has sparked the interest of the industry as it assists in the removal of old oil.

n) Illegal dumping

One of the biggest problems the City of Johannesburg faces is illegal dumping. Pikitup has partnered with the Environmental Health Department and the City's Metropolitan Police Department to contest Illegal dumping. This initiative has decreased the incidence of illegal dumping and littering in the City and has minimised waste entering landfills.

Figure 2.25: Prevention of illegal dumping – landfill site in Johannesburg

Source : (Pikitup 2015)

o) Recycling buy back centres

Pikitups has successfully established buy-back centres as part of its waste management strategies. This initiative provides entrepreneurial prospects as well as job opportunities to the surrounding communities.

Figure 2. 26: Buyback centres

Source : (Pikitup 2015)

p) Waste awareness and clean-up campaigns

Pikitup has embarked on cleaning up Johannesburg and preventing illegal dumping. It has embarked on numerous clean-up campaigns. Many individuals have joined in these campaigns, thereby increasing the amount of waste removed in these areas. This is a good indicator that Pikitup is stern in its approach against crime as well as saving the environment.

These were worthwhile initiatives and do not take place in other South African cities. Hence the need to have programmes of this nature in place.

2.8 KNOWLEDGE, AWARENESS, ATTITUDES, BEHAVIOURS AND PERCEPTIONS IN A CHANGING SOCIETY

Miranda Carreño and Blanco Suárez (2010) state that research in recycling suggests that participation and the intent to recycle, is determined by a combination of perceived behaviour control and personal attitudes. The biggest influencers of attitudes toward recycling are knowledge, convenience, facilities and appropriate opportunities. Protecting the environment is the main reason why people recycle: this activity is a tangible action that contributes to a healthier environment.

According to Hershkowitz (1998), teaching children the value of recycling assists in creating an awareness of an individual's relationship with other people and their

responsibilities to them. Hence, individuals can still do what is right and efficient from a recycling viewpoint. Research shows that people who are familiar with recycling practices and environmental issues will probably want to participate in recycling behaviours.

Schwartz's Norm Activation model (1970,1977) endeavoured to clarify the theory behind pro-environmental behaviours and recycling activities and the theories of planned behaviour and reason (Ajzen 1991). The concept of planned behaviour undertakes through the mediation of behavioural intention, attitudes have an unintentional influence on behaviours (Godin and Kok 1996). Individuals could possibly want to recycle and could be controlled by suitable use of punishments and rewards (Singhirunnusorn, Donlakorn and Kaewhanin 2012).

Countless academics have fixated on the break between environmental action and environmental values, similarly, known as the "value-action gap", from an environmental psychological viewpoint. The gap is reliant on external factors and attitudes. Environmental concerns can be outweighed by barriers like lack of interest or laziness. Physical barriers such as storage space for recyclables or lack of time might limit personal physical restrictions to recycle(Singhirunnusorn, Donlakorn and Kaewhanin 2012). Convenience plays an important part in defining recycling behaviour and probability to partake in recycling programmes. Demographic and socio-economic factors display varied outcomes. Males are less likely to recycle than females. A household with many family members and a high-income household shows a higher recycling rate. The extent of tertiary education and familiarity with recycling was found to be positively connected with recycling behaviour (Nixon and Saphores 2009 cited in Singhirunnusorn, Donlakorn and Kaewhanin 2012). We live in a stage of development of mounting environmental awareness, in which recycling happens at a growing scale and in practically every area of society (Miranda Carreño and Blanco Suárez 2010).

Recovery of recyclables can be promoted by environmental awareness, but then again recycling overall can be established at a basic level by education and consumer information. Individual-centred approaches to recycling are promoted by legislation and recycling policies, and the key determinant is public education which will increase public partaking (Miranda Carreño and Blanco Suárez 2010). As per the European

Union 6th Environment Action Programme, assisting individuals to make the right environmentally friendly choice, whilst assuming greener regimes, is one of the key methods for achieving triumph in the conservation of waste management and natural resources (Miranda Carreño and Blanco Suárez 2010). All young people should undergo sustainable education, this is the catalyst available for cultural deviations essential for continuous existence (Goosen 2012).

Jerie (2016) points out that there are risks at all stages in the recycling process. Large quantities of waste are generated by the informal sectors, that could possibly be dangerous to the employees as well as the environment. Numerous fears have been raised about the possible impairment of waste to the general public and environment, but the consequent cost and risks of occupational hazards in the properties of solid waste that have been used to evaluate whether the waste is hazardous or not are related to questions of safety. This includes the corrosiveness of waste materials: are they flammable, do they react with other waste materials and from a health point of view are these waste materials carcinogenic or cause irritability to individuals in direct contact with these waste materials?

Informal sectors that generate hazardous products, similar to those created in the industrial and domestic sectors, incur a threat to the environment and human health in their disposal and use. Jerie (2016) suggests that the workers are exposed to a variety of occupational health and safety hazards. In Gweru, waste workers experienced numerous health and safety effects, such as viral hepatitis, restrictive respiratory disorders, diarrhoea, skin diseases and jaundice.

A study by Jerie (2016), in the informal sector of Gweru, shows that many employees suffered from skeletal and muscular disorders such as low back pain and wrist pain, which rise from the tedious movements of hands and arms when disposing of waste. Waste collectors also faced common mechanical hazards which included being cut with piercing items such as glass, metal pieces and razor blades.

According to Jerie (2016), since the waste management model is made up of integrated components such as safety, health, and environmental management systems, it is imperative to conduct a risk assessment to determine and evaluate the risks that the waste workers face. It is important to establish if this could this cause harm or injury, can they be eliminated or prevented and what protective measures can

be put in place to protect the work force. This then increases the social welfare of workers.

Misra and Pandey (2005) find that the industry forms part of modern society and waste production is inevitable. When a material is disposed of, it is converted to waste, without expecting compensation for its value. When not managed properly, these wastes are potential hazards to the environment or human health. Managing waste that is hazardous, including their disposal in an environmentally friendly and economical way, is very important. Awareness needs to be created amongst employees, regarding the consequences of dealing with hazardous waste and the impact on the environment.

Rector (2014) describes the classic instance of deskilling, as the separation of mental from manual labor in place of work supervised by scientific managers. One aspect of deskilling is its impact on the workers knowledge of occupational hazards and their control over it. Industrial hygiene found that the gap between experts and workers regarding occupational hazard knowledge grew wider. The unions contended that employees needed to urge employers to make their plants safe for those who do the work. Changing cultural and behavioural mind-set of employees will not only have a positive impact on waste management practices but will also have an impact of the effectiveness of strategies

2.8.1 Training practices

Jabbour (2013) brings to attention that researchers and practitioners have been attracted to environmental training. Yet, there is an absence of research on organisational environmental training. Environmental training is fundamental to any successful activity of environmental management

Training affords employees the attitudes, knowledge, and skills to assist them in implementing their missions and visions in their organisations (Jabbour and Santos, 2008). Employees are taken through environmental training to ensure that they take the necessary action from an environmental perspective(Daily and Huang2001).

Environmental training is becoming more prevalent since it leans towards the human resource preparation that most efficiently supports environmental management. Organisations with complex environmental management systems need to more

stringent in their environmental training (Ángel del Brío, Junquera and Ordiz 2008). The growth of environmental issues within organisations grows with environmental training (Teixeira, Jabbour, and de Sousa Jabbour 2012). This is due to the fact that organisations with different environmental requirements, dependent on their processes, may require various types of environmental training (Hale 1995). Merely introducing hi-tech initiatives is not adequate to progress the environmental performance of organisations (Venselaar 1995). Environmental training is imperative for “greening” organisations in numerous areas.

According to Jabbour (2013),both employees and managers detailed that environmental performance was influenced largely by environmental training more than environmental empowerment. Govindan, Kannan and Shankar (2015) state that adopting cleaner production necessitates mobilising an extensive assortment of organisational resources. This can only be understood through providing adequate training to employees.

Environmental training has attracted the most attention from researchers and practitioners (Jabbour, Teixeira, Oliveira and Soubihia 2010). Environmental training in organisations has now become a priority and organisations need this in order to contribute to sustainable development(United Nations Department of Public Information 1992). Environmental training is key to conservation and recycling of resources and building the foundation of sound environmental practices. According to Hershkowitz (1998), educating children on the importance of recycling cultivates mindfulness of one’s association to others and one’s duty to the environment. Educating children, the worth of recycling as done annually by parents and schools, cultivates and mindfulness of one’s association to others and one’s duty to the environment. People can do what is right through efficient recycling systems and only need to make slight modifications in the way they gather and handle waste and how they toss out waste or select daily essentials.

Aguilar-Jurado *et al.* (2019) describe how environmental education, including recycling programmes, play a vital part in developing attitudes, pro-environmental knowledge and behaviours. This is an educational process where fundamentals are established in childhood. Children, who have not yet developed environmental habits, can still have environmental awareness instilled in them. Hence, it is important that the primary

school curriculum include environmental education programmes that encourage the progress of constructive environmental behaviours and attitudes.

Daily, Bishop and Steiner (2007) engaged in a survey of an organisation in the US airline industry. A total of 437 employees were assessed. It was determined that environmental training was not viewed by the employees as directly impacting environmental performance. However, the training was completely correlated with teamwork. This indicated that collaboration absolutely influenced environmental performance, thereby implying that environmental performance was improved by environmental training. Ultimately environmental training must be linked to attaining specific goals in the organisation. These goals can vary depending on the primary objectives(Jabbour 2013). It is imperative that organisational goals are understood prior to conducting environmental training. The organisational goals include:

a) Reinforcing another human resource practice: Collaborative outcomes among GHRM and training could be anticipated (Daily *et al.* 2012; Govindarajulu and Daily, 2004; Jabbour *et al*. 2010b). A crucial component of human resource management is training: By reinforcing this practice, the foundation of GHRM can be entrenched ensuring that recycling targets inevitably are met.
b) Improving the training process: Understanding gaps in training and closing these gaps, will ensure a smooth training process (Shaw, Dingle and Annandale1999).
c) Improving awareness: Individuals are held back due to fear. Providing information will enable employees to make conscious decisions regarding recycling and ultimately saving the environment(Jackson and Seo 2010)
d) Development of environmental skills to decrease employee environmental impact (Jackson and Seo 2010). Employees need the necessary skills to practice recycling. Understanding how to separate different waste streams and the impact it has on the environment is important. From this, employees gain the skill of reducing waste create an environment of reduce, re-use, recycle
e) Improving environmental performance by reducing the organisation's environmental impact (Unnikrishnan and Hegde 2007). By understanding the

concept of recycling, re-use and reduce, employees have the ability of improving environment performance, by improving on percentage recycled, reducing waste to landfill.

f) Improving organisational performance: A company's performance can be impacted positively by environmental training (del Brío, Fernandez and Junquera 2007). The scope of the training should always be understood and established. According to Jabbour (2013) , ISO10015 is a significant framework used to advance training processes worldwide. Although it is valuable for any kind of training, this is applicable for refining environmental training, which has been a new matter for organisations (Teixeira, Jabbour and de Sousa Jabbour 2012). Whatever training system is implemented it is always good to develop the framework and determine the effectiveness which are:

- Definition of training needs. At this point the training needs of each employee are assessed and established and the necessary framework needed is established. The aim is to recognise the skills that training should grow.
- Training design and planning. This stage is all about roles, and responsibilities of the environmental training process. Establishing a training programme and offering the programme to all the organisation's employees.
- Training implementation. A choice must be made about whether environmental training will be conducted externally or in-house. Who will provide this training namely, subject matter experts? How will this training be implemented and by who?
- Evaluation of training results. Evaluating the competence of the trainee. Did the training provide adequate? Based on the results, will the recycling program be sustainable?

2.9 SUMMARY OF THE CHAPTER

The various concepts of waste management and recycling as well as hazards, aligned to the study aims and objectives were highlighted. In the next chapter, the research methodology is discussed.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the methodology that was used to perform the study. Methodology is defined as the systematic, theoretical analysis of the procedures or techniques used to identify, select, process and analyse information relating to a specific topic (Saunders, Lewis and Thornhill 2016). The research design, location, study population, sampling method, data collection tool, data analysis methods and ethical considerations for this study are explained.

3.2 RESEARCH DESIGN

A research design is a framework of methods and techniques used to perform a research study; it is the 'how' to conduct research using a particular methodology. A research design is selected depending on what type of research needs to be conducted. This study was guided by a quantitative, descriptive research design as it allowed the researcher to determine the relationship between variables (Babbie 2019).

3.2.1 Quantitative research

Quantitative research focuses on measurable aspects of human behaviour (Brink, van der Walt and van Rensburg 2018). Quantitative research emphasises objective measures and statistical, mathematical, or numerical analysis of data collected through, polls, questionnaires or surveys. It allows the researcher to determine relationships between an independent variable and a dependent variable within a population. A quantitative study was used for this study to gain employees perceptions on the health hazards that they were exposed to due to waste separation activities at a beverage company in KZN.

3.2.2 Descriptive research

A descriptive design, as stated by Brink, van der Walt and van Rensburg (2018), allows the relationship between variables to be examined, with no attempt to determine a cause-and-effect relationship. It also allows the researcher to obtain information about characteristics within a certain field of study (Gray, Grove and Sutherland 2016). Furthermore, Gray, Grove and Sutherland (2016) highlight that this design is important when obtaining knowledge in an area that has limited research. The descriptive design for this research was appropriate, as it allowed the researcher to gain information regarding health hazards that employees were exposed to due to waste separation activities at a beverage company in KZN

3.3 RESEARCH PARADIGM

A research paradigm is a fundamental model used to organize the observations and reasoning when performing research (Babbie 2010). A paradigm is a set of assumptions about the basic varieties of entities in the world and how these entities interact, and the methods used for constructing and testing theories of these entities (Brink, van der Walt and van Rensburg 2018). The two main paradigmatic approaches relevant to science are positivism and interpretivism (Brink, van der Walt and van Rensburg 2018):

3.3.1 Positivist paradigm

The positivist worldview is based on physical science and employs a systematic scientific research technique. To detect phenomena, positivist research uses numerical measurements and statistical analysis of measurements. The goal of positivist research is to discover, explain, assess, predict, and test theories.

The positivist approach is based on the gathering of empirical data, or facts or information acquired through observation or experiment. As a result, it is possible to

conclude that this paradigm lends itself to quantitative technique (Mukerji and Albon 2014).

Data is used to test theories in quantitative research, which is related with a deductive approach to theory creation (Saunders, Lewis and Thornhill 2016).

3.2 3. Interpretivist paradigm

The concept of interpretivism is concerned with people's actions and how they make sense of the world by sharing their experiences with others via the use of language. The world is socially produced, according to phenomenology, and science is driven by human behaviour and interests. It also contends that the researcher, as a subjective entity, is a part of the observed universe (Cooper and Schindler 2014). The advantages of qualitative, interpretive research are that the findings often have better validity and less artificiality since the phenomena are observed in genuine, real-life contexts, allowing researchers to obtain a more accurate knowledge of the phenomena.

As a result, a strong qualitative study exposes a deeper depth of knowledge and richness of information. However, conducting research guided by a phenomenological philosophy might be hampered by the researcher's subjectivity and the findings' lack of trustworthiness, as two researchers may reach different conclusions based on observations of the same phenomenon at the same time (Cooper and Schindler 2014).

The positivist research paradigm was employed in this study as this is applied to the quantitative research approach. This paradigm was chosen to gain a complete overview of the research objectives at hand from the participants in the study and through large scale questionnaires to obtain the participants views and perspectives.

3.4 SETTING

The research study was conducted at a Beverage company in KwaZulu Natal.

3.5 STUDY POPULATION

A study population is a set of people or objects that possess some common characteristics that interests the researcher (Brink, Van der Walt and van Rensburg 2018). The population for this study included all employees from the beverage company which consists of many departments. Each department has a minimum of 10 to 30 employees inclusive of team leaders and unit managers. The population size was 584 employees, including both permanent and non-permanent employees (contractors and temporary staff).

3.6 SAMPLING PROCESS

Sampling is defined as the process of selecting the sample from a certain population to obtain information regarding a phenomenon in a way that represents the study population (Brink, van der Walt and van Rensburg 2018). The sample was selected from the total population of the 584 employees. All employees that met the study criteria were invited to participate by means of an information session to enlighten them of the study and to answer any questions or concerns they had.

Stratified random sampling technique was applied in this study as the researcher had the details or number of employees available from the study population. All employees had an equal chance of being selected to participate in the study. In stratified sampling, the total population is divided into sub-groups according to a variable so that each variable belongs to one subgroup. Subsequently, within each subgroup, random sampling occurs, either using simple or interval sampling (Brink, van der Walt and van Rensburg 2018). The researcher invited all departments to participate in the study. In consultation with the statistician, the sample size was determined to be 200 employees. A total sample of 230 employees were selected. Thirty participants were used in the pilot study. A total of 200 questionnaires were distributed and only 136 were retrieved which gave a 58% response rate. Hence, the final sample size was 136 participants.

3.6.1 Inclusion criteria

- Employees working in the various departments of the beverage company
- Employees over the age of 18 years

3.6.2 **Exclusion criteria**

- Employees under the age of 18 years

3.7 DATA COLLECTION

Data collection describes how the researcher plans to answer the research question. It provides a plan on how the data will be collected, how the results will be derived as well as the rationale for the method selected (Maree 2016).

3.7.1 Data collection process

An information session was organised with the employees to explain the purpose of the study and to ask for their permission to participate in the study. Due to the Covid 19 pandemic, electronic surveys were used to reach out to the participants.

3.7.2 Questionnaire

The electronic questionnaire highlighted and addressed important questions regarding the recycling programme. This questionnaire included open and closed ended questions related to the aim and objectives of the study. The questionnaire consisted of the letter of information which included the title of the research study, a brief introduction of the summary and who the researcher and supervisors were. Then followed the consent form, which was completed by the participant – and indicates their agreement to join in the research study. The questionnaire consisted of 4 sections:

- Section A: Demographic profile of respondents.
- Section B: Awareness and education in relation to the recycling programme.
- Section C: Attitudes and perceptions exhibited towards the programme.
- Section D: How can the programme be continuously improved.

3.7.3 Pilot study

A pilot study is a small-scale trial run of the actual research study that will be conducted (Brink, van der Walt and van Rensburg 2018). It is when a statistically small number of participants conduct the proposed study. This allows the researcher to recognise and address any issues that arise from the pilot study (Brink, van der Walt and van Rensburg 2018). A self-administered electronic questionnaire was completed by the participants. Prior to submitting the questionnaire to the participants, it underwent the pilot process. The questionnaire was reviewed by a group of 30 employees from various departments, pilot testing commenced thereafter. This ensured that the questionnaire was tested before it was given to the research participants. These results validated the research questionnaire that was used in the research study. On completion of the pilot study, it was concluded that no corrections were needed to the electronic questionnaire.

3.7.4 Administration and collection of questionnaires

Questionnaires were sent electronically to all participants, via Google Forms as an assessment. All responses from participants were gathered from this platform.

3.8 DATA ANALYSIS

Data derived from the electronic questionnaires were used for the analysis. All variables were looked at such as cost, behaviours, adequacy of the recycling programme resourced, adequacy of training and awareness, as well as the challenges experienced. Theme trends and relationships were viewed. Data was transferred into the Statistical Package for Social Sciences Software (SPSS) version 26.0 for analysis and statistical testing.

3.9 ETHICAL CONSIDERATIONS

3.9.1 Permission to conduct the study

Before the commencement of the study, ethical clearance was obtained from the Institutional Research Ethics Committee (IREC) (Appendix 1). Gatekeeper permission was sought and obtained from the form the Heads of Department (Manufacturing Manager and HR Director) were sent prior to commencing with the

collection of data (Appendix 1) The following principles of ethics were adhered to informed consent, beneficence and non-maleficence, anonymity and privacy.

3.9.2 Informed consent

Informed consent is a major ethical issue when conducting research as it ensures that the participant knowingly, voluntarily and intelligently gives consent to participate in the research study (Fouka and Mantzorou 2011: 4). In order for a participant to give consent, the researcher must adequately inform the participant what the research entails, including the possible benefits and risks, any invasion of privacy and/or if the participant would be compensated. In this study, participants completed a written consent to participate after the researcher had adequately informed the participants of what the research involved by means of the information letter (Appendix 2a) and presentation prior to the completion of the questionnaire.

3.9.3 Beneficence and non-maleficence

The principle of beneficence is a moral obligation to act for the benefit of others (Jahn 2011). This includes protecting the rights of others, preventing harm and/or removing conditions that could harm. This was achieved by ensuring that the participants of the research were not harmed nor subjected to questions that could lead to psychological and social risks. There were no other foreseeable harm or risks to participants.

Non-maleficence states that the researcher has an obligation not to cause harm to the subjects (Jahn 2011). This entails to not cause pain, suffering, to not offend or cause any incapacities during the research. The researcher in this study ensured that the principle of non-maleficence was maintained as there were no predictable areas that could harm the participant. The questions asked did not cause any embarrassment among participants and they were not forced to divulge information, which could result in anxiety or fear.

3.9.5 Anonymity

The researcher must ensure that the data collected from participants is anonymous; the researcher must therefore not be able to link the identity of the participant with the responses provided (Fouka and Mantzorou 2011). To ensure anonymity in this study, all participant information would remain anonymous and confidential, as they were not required to provide any information that could identify themselves. All data was stored and secured on google drive and would be protected with a two-step verification requiring a password and a mobile device to log into the account. All participants had the right to withdraw from the study should they wish to do so.

3.9.6 Privacy

According to Fouka and Mantzorou (2011), privacy is the freedom an individual has to determine the time, extent and general circumstances under which private information will be shared with or withheld from others. The researcher ensured that the participants' privacy is maintained as no personal information was used in this study without prior consent of the participant. All participants were requested to sign a written consent form (Appendix 3).

3.10 RESEARCH RIGOUR

Gray, Grove and Sutherland (2017) define rigour as striving for excellence in research. This means a systematic approach to research design, and awareness of the importance of interpretation must be ensured (Brink, van der Walt and van Rensburg 2018). In order to ensure rigour of the study, validity and reliability was ensured.

3.10.1.1 Validity

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure (Brink, van der Walt and van Rensburg 2018). The content validity and construct validity of the questionnaire have been assessed. An expert in the field of waste management has judged the extent to which the content of the questionnaire appeared logical and covered the scope of the research. Validity and reliability of the study was enhanced by the inclusion of all employees in the study and the participation of

employees who met the study criteria. The willingness of the researcher to address queries, the assistance given to participants provided consistency and further enhanced the validity of the study

3.10.2 Reliability

Pilot testing was done with the necessary cautions and measures in order to achieve a high level of validity and reliability. The survey's reliability was assured by pilot testing it prior to data collection. The questionnaire was issued under the same conditions for all employees. The inter-rater reliability was measured by having the research instrument assessed by the research coordinator and research supervisor to ensure that the questionnaire measures the research objectives and provides insight to the research questions in the study.

3.11 SUMMARY OF THE CHAPTER

This section of the study explained the study's research methodology, target population, and sample and sampling procedure. In particular, the chapter outlined and justified the research paradigm and research design. The data collection and analysis procedures and techniques have also been discussed and justified. The following chapter four shows the results of the completed questionnaire survey. The data was displayed in graphs.

CHAPTER FOUR
RESULTS

4.1 INTRODUCTION

In this chapter, the findings and results attained during the study is discussed. The questionnaire was the main tool used to collect data that was distributed to participants. SPSS version 26.0 was used to analyse the data retrieved. Descriptive data will be represented in the form of cross tabulations, and graphs. Inferential techniques included the use of chi square test values and correlations, which are interpreted by using the p-values. A statement of statistical significance was used to report a result. A test statistic generates a p-value and the significant result is shown by $p < 0.05$.

4.2 RATE OF PARTICIPATION

Data collection took place during production hours. Employees were requested to complete the survey in their spare time. A target population of 200 was calculated from a total of 584 participants. The target population included male and female employees who were 18 years and older A total of 200 questionnaires were circulated and 136 were retrieved which gave a 58% response rate.

4.3 RESEARCH INSTRUMENT

There were 41 items that made up the research instrument. The level of measurement was either at an ordinal or nominal level. The research instrument used was the questionnaire, this was separated into four segments measuring numerous themes as shown below:

A Biographical information

B Awareness an education in relation to the recycling programme

C Attitudes and perceptions exhibited towards the programme

D Continual Improvement

4.3.1 Reliability Statistics

To calculate reliability, several measurements on the same subjects are taken. For a recently established construct, a reliability coefficient of 0.60 or greater is regarded as "acceptable"

Table 4.1: Cronbach's alpha score for all items that created the questionnaire

	Section	Number of Items	Cronbach's Alpha
B	Awareness and education in relation to the recycling programme	18	0.916
C	Attitudes and perceptions exhibited towards the programme	7	0.681

The recommended Cronbach's alpha value was exceeded by the reliability scores for all sections. This shows a degree of reliable scoring that is acceptable, for each of these sections in the research.

Table 4.1 reflects the results of Kaiser – Meyer – Olkin (KMO) and Bartlett's Test conducted during the analysis of the results. The prerequisite is that Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be more than 0.50 and Bartlett's Test of Sphericity less than 0.05.

Table 4.2: KMO and Bartlett's Test

	Section	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
			Approx. Chi-Square	df	Sig.
B	Awareness and education in relation to the recycling programme	0.845	2766.301	120	< 0.001
C	Attitudes and perceptions exhibited towards the programme	0.594	250.343	21	< 0.001

Factor analysis was accomplished only for the Likert scale items. Specific components were separated into finer components. This is described below in the rotated component matrix, as per table 4.3 below:

The extraction method used was the principal component analysis, the rotation method was Varimax with Kaiser Normalization. Variables that have high loading on each factor is minimised by the orthogonal rotation method. The interpretation of factors is simplified.

Questions that are loaded in the same way suggest that measurement was conducted along a comparable factor. An inspection of the content of items loading at or above 0.5, successfully measured along the various components.

Table 2.3: Rotated Component Matrix

B	Component		
	Communication	Awareness	Perception
Sufficient training was conducted regarding health hazards associated with recycling	0.070	0.838	-0.228
Health hazards exist	0.941	0.040	0.136
Health hazards communicated	0.958	0.129	0.045
Health hazards are known	0.958	0.102	0.072
Aware of waste streams that are generated	0.075	0.841	0.064
Hazards exist and will they affect you	0.916	-0.014	0.083
We need to recycle	0.054	0.136	0.895
Impacts/consequences are associated with health hazards	0.953	0.096	0.071
Recycling trends/numbers vary	0.084	0.643	0.151
The increase or decrease in trends is evident	0.958	0.072	0.090
Key indicators remain constant	0.963	0.030	0.068
Personal Protective Equipment (PPE) needs to be used when dealing with waste	0.169	0.003	0.887
Awareness of current health hazards associated with recycling	0.042	0.848	-0.001
Waste management practices are clear and concise	0.940	0.154	-0.019
Waste management is a shared responsibility	0.962	0.108	0.099
Recycling practices are displayed on site	0.101	0.659	0.415

C	Component		
	Communication	Awareness	Perception
This programme is beneficial to you	0.066	0.882	0.100
This recycling programme can be implemented at home	0.153	0.873	-0.040
This recycling programme is of benefit to me	0.688	0.141	0.423
Team members contribute to this initiative	0.838	0.019	-0.380
It should be a priority to recycle waste	0.030	0.111	0.934
When we recycle we are heading in the right direction	0.871	0.180	0.127
Waste separation at source is the correct thing to do	0.069	0.585	0.114

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Variables that formed part of Sections B and C loaded along three components (sub-themes). This indicates that respondents identified different trends in this section. Based on this we can see awareness levels decrease and is narrowed down to only three variables:

1. We need to recycle.
2. PPE needs to be used when dealing with waste.
3. It should be a priority to recycle waste.

4.4 BIOGRAPHICAL DATA

The demographics in this study consisted, gender and age. A total of five age groups were identified during the study.

Table 4.4: Description of the total gender distribution by age

Age group (years)		Gender		Total
		Female	Male	
18 - 20	Count	0	3	3
	% within Age group	0.0	100.0	100.0
	% within Gender	0.0	2.9	2.2
	% of Total	0.0	2.2	2.2
21 - 30	Count	10	24	34
	% within Age group	29.4	70.6	100.0
	% within Gender	34.5	22.9	25.4
	% of Total	7.5	17.9	25.4
31 - 40	Count	7	24	31
	% within Age group	22.6	77.4	100.0
	% within Gender	24.1	22.9	23.1
	% of Total	5.	17.9	23.1
41 - 50	Count	6	34	40
	% within Age group	15.0	85.0	100.0
	% within Gender	20.7	32.	29.9
	% of Total	4.5	25.4	29.9
51 - 60	Count	5	19	24
	% within Age group	20.8	79.2	100.0
	% within Gender	17.2	18.1	17.9
	% of Total	3.7	14.2	17.9
61 - 65	Count	1	1	2
	% within Age group	50.0	50.0	100.0
	% within Gender	3.4	1.0	1.5
	% of Total	0.7	0.7	1.5
Total	Count	29	105	134
	% within Age group	21.6	78.4	100.0
	% within Gender	100.0	100.0	100.0
	% of Total	21.6	78.4	100.0

The total ratio of females to males is roughly 3:1 (78.4%: 21.6%) ($p < 0.001$).

In the age category of 21 to 30 years, 70.6% were male. Within the category of males (only), 29.4% were between the ages of 21 to 30 years. Males who were between the ages of 21 to 30 years formed 17.9% of the total sample.

When comparing the number of males in the organisation, females within the category of 21-30 years, equated to 29.4% and within the category of females (only) was 34.5%. This was the only category in terms of age and gender that showed a significant number of females.

There were more participants older than 40 years ($p < 0.001$), the age distributions were not similar.

The figure below represents the level of education of the participants.

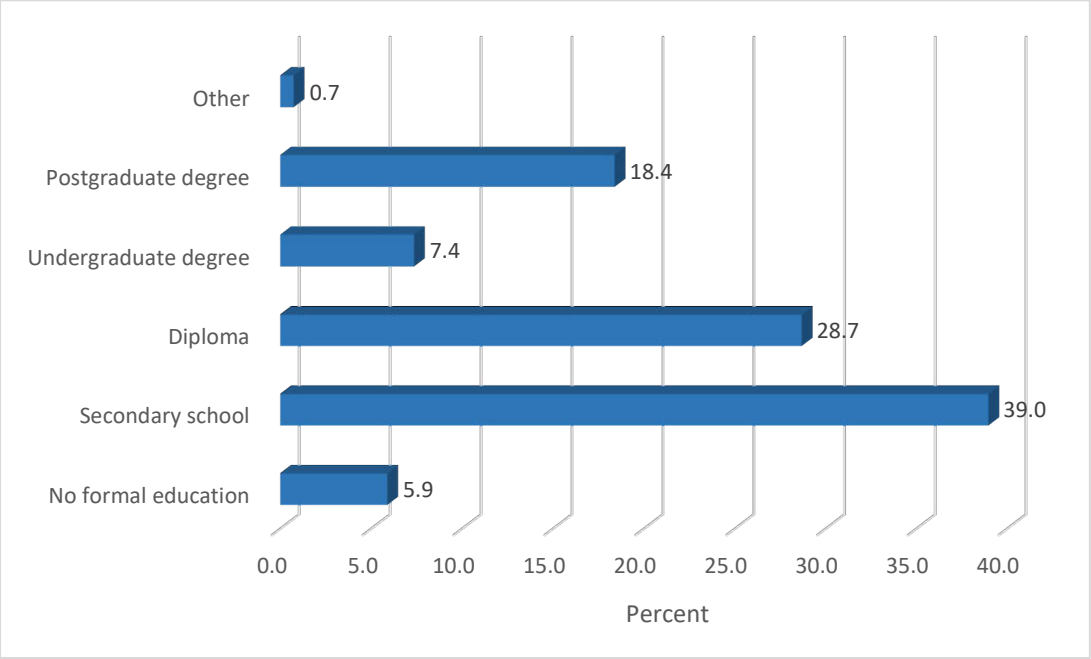

Figure 4.1: The education levels of the respondents

More than half of respondents (55.1%) had a post school qualification ($p < 0.001$). Roughly one-fifth of the participants (18.4%) held a degree at post graduate level; 28.7% had a diploma; 7.4% had completed an undergraduate degree. It was interesting to observe that the majority of the workforce – (39%), only possessed a matriculation qualification and 5.9% had no formal education.

This then shows, that a reasonable amount of the participants possesses a higher qualification which addressed their level of understanding and awareness of the recycling programme. This is a direct reflection of the age category of males between 41-50 years old. In this category not many individuals due to socio- economic circumstances had the opportunity to gain formal education. This shows that the information collected would have been from a knowledgeable source.

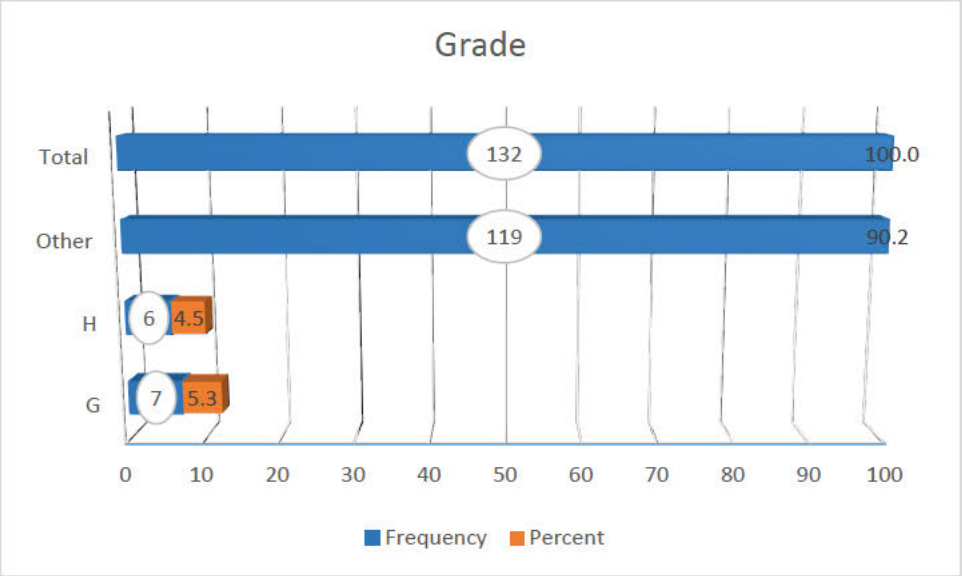

Figure 4.2: The grades of the respondents

The organisation has a hierarchal grading system. This grading system reflects the skill set required for all positions in the organisation, thereby indicating the level of knowledge needed to participate in the recycling programme.

Most of the respondents belong to grades that are below the G grade, which is a total of 87.5%. These respondents are in non – managerial positions. Less than 6% belong to the entry level G grade on the hierarchy and is made up of team leaders and other specialist roles, which is followed by the H grade, which are senior management.

Employees below the grade G do not require many skills or qualifications in comparison to employees in the grades above. Some individuals with only a matriculation qualification and many years of service, understand the business processes that have been entrenched and deliver against these with a sense of ease.

This level of qualifications can be seen particularly in the age groups between 41-50 and 61-65, depicted in the table below.

Table 4.5: Highest level of education by age

		No formal education	Secondary school	Diploma	Undergraduate degree	Postgraduate degree	Other	
18 - 20	Count	1	2	0	0	0	0	3
	% within Age group	33,3	66,7	0,0	0,0	0,0	0,0	100,0
	% within Highest level of education	12,5	3,8	0,0	0,0	0,0	0,0	2,2
	% of Total	0,7	1,5	0,0	0,0	0,0	0,0	2,2
21 - 30	Count	1	23	5	4	2	0	35
	% within Age group	2,9	65,7	14,3	11,4	5,7	0,0	100,0
	% within Highest level of education	12,5	43,4	12,8	40,0	8,3	0,0	25,9
	% of Total	0,7	17,0	3,7	3,0	1,5	0,0	25,9
31 - 40	Count	0	13	11	1	6	0	31
	% within Age group	0,0	41,9	35,5	3,2	19,4	0,0	100,0
	% within Highest level of education	0,0	24,5	28,2	10,0	25,0	0,0	23,0
	% of Total	0,0	9,6	8,1	0,7	4,4	0,0	23,0
41 - 50	Count	6	5	17	3	9	0	40
	% within Age group	15,0	12,5	42,5	7,5	22,5	0,0	100,0
	% within Highest level of education	75,0	9,4	43,6	30,0	37,5	0,0	29,6
	% of Total	4,4	3,7	12,6	2,2	6,7	0,0	29,6
51 - 60	Count	0	10	5	2	6	1	24
	% within Age group	0,0	41,7	20,8	8,3	25,0	4,2	100,0
	% within Highest level of education	0,0	18,9	12,8	20,0	25,0	100,0	17,8
	% of Total	0,0	7,4	3,7	1,5	4,4	0,7	17,8
61 - 65	Count	0	0	1	0	1	0	2
	% within Age group	0,0	0,0	50,0	0,0	50,0	0,0	100,0
	% within Highest level of education	0,0	0,0	2,6	0,0	4,2	0,0	1,5
	% of Total	0,0	0,0	0,7	0,0	0,7	0,0	1,5
	Count	8	53	39	10	24	1	135
	% within Age group	5,9	39,3	28,9	7,4	17,8	0,7	100,0
	% within Highest level of education	100,0	100,0	100,0	100,0	100,0	100,0	100,0
	% of Total	5,9	39,3	28,9	7,4	17,8	0,7	100,0

4.5 AWARENESS AND EDUCATION IN RELATION TO THE RECYCLING PROGRAMME

The table 4.6 below evaluates the scoring patterns of the participants for each variable. The results are presented using summarised proportions for the variables that make up each section. Results obtained were then analysed as per the importance of the statements.

Table 4.6 Scoring patterns of the respondents per variable per section

		Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree		Chi Square
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	*p*-value
Sufficient training was conducted regarding health hazards associated with recycling	B2	3	2.2	13	9.7	8	6.0	82	61.2	28	20.9	**< 0.001**
Health hazards exist	B3	5	3.7	67	49.3	13	9.6	36	26.5	15	11.0	**< 0.001**
Health hazards communicated	B4	4	2.9	69	50.7	12	8.8	40	29.4	11	8.1	**< 0.001**
Health hazards are known	B5	4	3.0	68	50.4	12	8.9	41	30.4	10	7.4	**< 0.001**
Aware of waste streams that are generated	B6	0	0.0	11	8.1	6	4.4	90	66.7	28	20.7	**< 0.001**
Hazards exist and will they affect you	B7	5	3.7	68	50.0	15	11.0	33	24.3	15	11.0	**< 0.001**
We need to recycle	B8	0	0.0	0	0.0	0	0.0	63	46.3	73	53.7	**0.391**
Impacts/consequences are associated with health hazards	B9	5	3.7	66	48.5	13	9.6	38	27.9	14	10.3	**< 0.001**
Recycling trends/numbers vary	B10	1	0.7	9	6.7	12	8.9	83	61.5	30	22.2	**< 0.001**
The increase or decrease in trends is evident	B11	4	2.9	67	49.3	14	10.3	42	30.9	9	6.6	**< 0.001**
Key indicators remain constant	B12	4	3.0	67	49.6	14	10.4	46	34.1	4	3.0	**< 0.001**
Personal Protective Equipment (PPE) needs to be used when dealing with waste	B13	0	0.0	2	1.5	0	0.0	63	47.7	67	50.8	**< 0.001**
Awareness of current health hazards associated with recycling	B14	5	3.7	11	8.1	6	4.4	84	62.2	29	21.5	**< 0.001**
Waste management practices are clear and concise	B15	4	2.9	64	47.1	13	9.6	44	32.4	11	8.1	**< 0.001**
Waste management is a shared responsibility	B16	4	3.0	66	48.9	11	8.1	37	27.4	17	12.6	**< 0.001**
Recycling practices are displayed on site	B17	1	0.7	1	0.7	3	2.2	81	60.0	49	36.3	**< 0.001**
Reduce, reuse and recycle is the right thing to do (This applies to water, energy, effluent and waste management)	B18	0	0.0	3	2.2	4	2.9	39	28.7	90	66.2	**< 0.001**
There are major concerns regarding this programme	B19	0	0.0	12	8.9	32	23.7	67	49.6	24	17.8	**< 0.001**

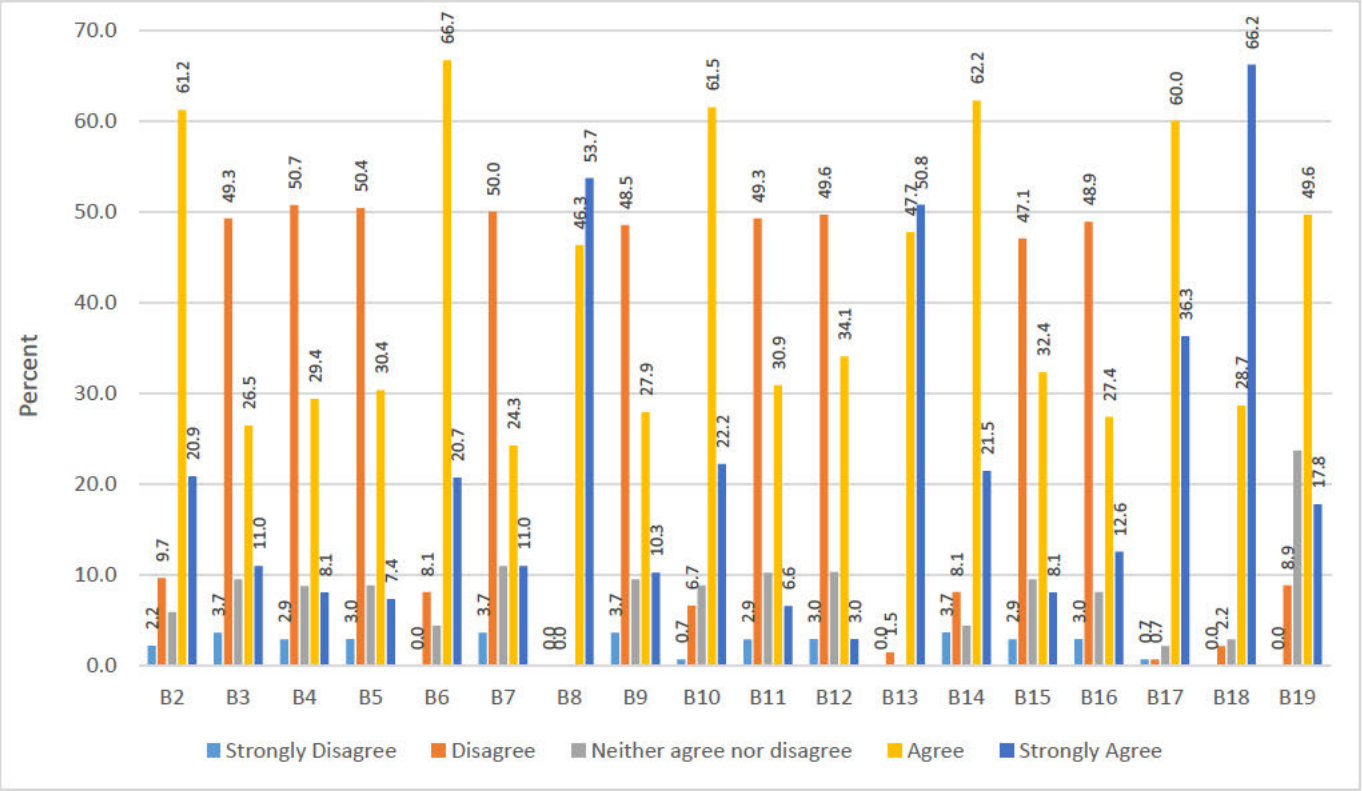

Figure 4.3 Scoring patterns for the variables that constitue each section

The following patterns were detected:

- Higher levels of agreement are seen in some statements, whereas additional agreement levels are lower.
- There are a total of nine statements that refer to higher levels of disagreement and this is specificallly in relation to the awareness of the programme and what it entails and majority of the respondents are unaware of the hazards associated with the recycling programme.
- The significance of the modifications is tested and referred to below in table 4.6.

The two statements below form a sub-theme as seen by Factor analysis:

“We need to recycle” and “Personal Protective Equipment (PPE) needs to be used when dealing with waste”

In relation to this sub-theme perceptions, there are high levels of agreement (97%) . Participants now possess the knowledge of what it means to recycle and the use of Personal Protective Equipment (PPE).

Some individuals believe that the company should be doing more towards raising the levels of awareness. On the contrary, 61.2% of people agreed that they have been trained and 49.3% say they are not aware of health hazards; 50.7% comment that health hazards are not communicated; 50.4% disagree that health hazards are known implying that the training provided by the organisation is not impactful in creating awareness.

Those that are aware of the waste streams generated in the organisation totalled 66.7%, from this 46.3% agreed that we need to recycle. This therefore implies that the programme was adequately implemented and has had a positive impact on a few of the respondents.

However, 48.5% of the respondents disagree that there are no negative impacts associated with health hazards, thereby implying that the training provided was in-effective or employees could not grasp the recycling concept, the impacts and consequences associated with it.

Recycling key indicators communicated to the organisation remain constant at 49.65%, implying that these recycling numbers are not communicated often, leaving employees in the dark on the company's performance from a recycling perspective. This renders them unable to drive the program in a positive direction if performance is not communicated. Employees (47.1%) have the perception that waste management practices are not clear and concise, whilst 48.9 % believe that waste management is not a shared responsibility. This directly shows the inadequate implementation of the recycling programme and a focus area in which to improve.

Awareness of the recycling programme is evident in the respondents. Implying that not enough training has been conducted. This could be a behaviour-based issue in which employees find this exercise time consuming and do not show any affinity for the programme.

To determine whether the scoring patterns per statement were meaningfully different per option, a chi square goodness-of-fit test was conducted. The null hypothesis

claims that comparable numbers of participants scored across each option for each statement (one statement at a time). The alternative suggests that there is a substantial difference among the levels of agreement and disagreement.

The information is shown in the table 4.6 above.

The emphasised sig. values (p-values) are less than 0.05 (the level of significance). This suggests that the distributions were not alike. That is, the differences between the way participants scored (agree, neither agree nor disagree, disagree) were significant.

4.6 ATTITUDES AND PERCEPTIONS EXHIBITED TOWARDS THE PROGRAMME

The table below evaluates the scoring patterns of the participants for each variable for each section. The information is represented using summarised percentages for the variables that make up each section. Results are then analysed further conferring to the rank of the statements.

Table 4.7: Scoring patterns of the respondents per variable per section

		Strongly Disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree	Chi Square	
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	*p*-value
This programme is beneficial to you	C1	0	0.0	0	0.0	4	3.0	93	69.9	36	27.1	**< 0.001**
This recycling programme can be implemented at home	C2	0	0.0	0	0.0	4	3.0	63	46.7	68	50.4	**< 0.001**
This recycling programme is of benefit to me	C3	0	0.0	1	0.8	5	3.8	82	62.1	44	33.3	**< 0.001**
Team members contribute to this initiative	C4	0	0.0	2	1.5	3	2.3	71	53.8	56	42.4	**< 0.001**
There challenges of implementing a programme of this nature	C5	9	6.8	20	15.2	15	11.4	68	51.5	20	15.2	**< 0.001**
It should be a priority to recycle waste	C6	0	0.0	5	3.8	0	0.0	113	86.9	12	9.2	**< 0.001**
When we recycle we are heading in the right direction	C7	0	0.0	0	0.0	0	0.0	71	53.4	62	46.6	0.435
Waste separation at source is the correct thing to do	C8	0	0.0	0	0.0	0	0.0	67	50.8	65	49.2	0.862

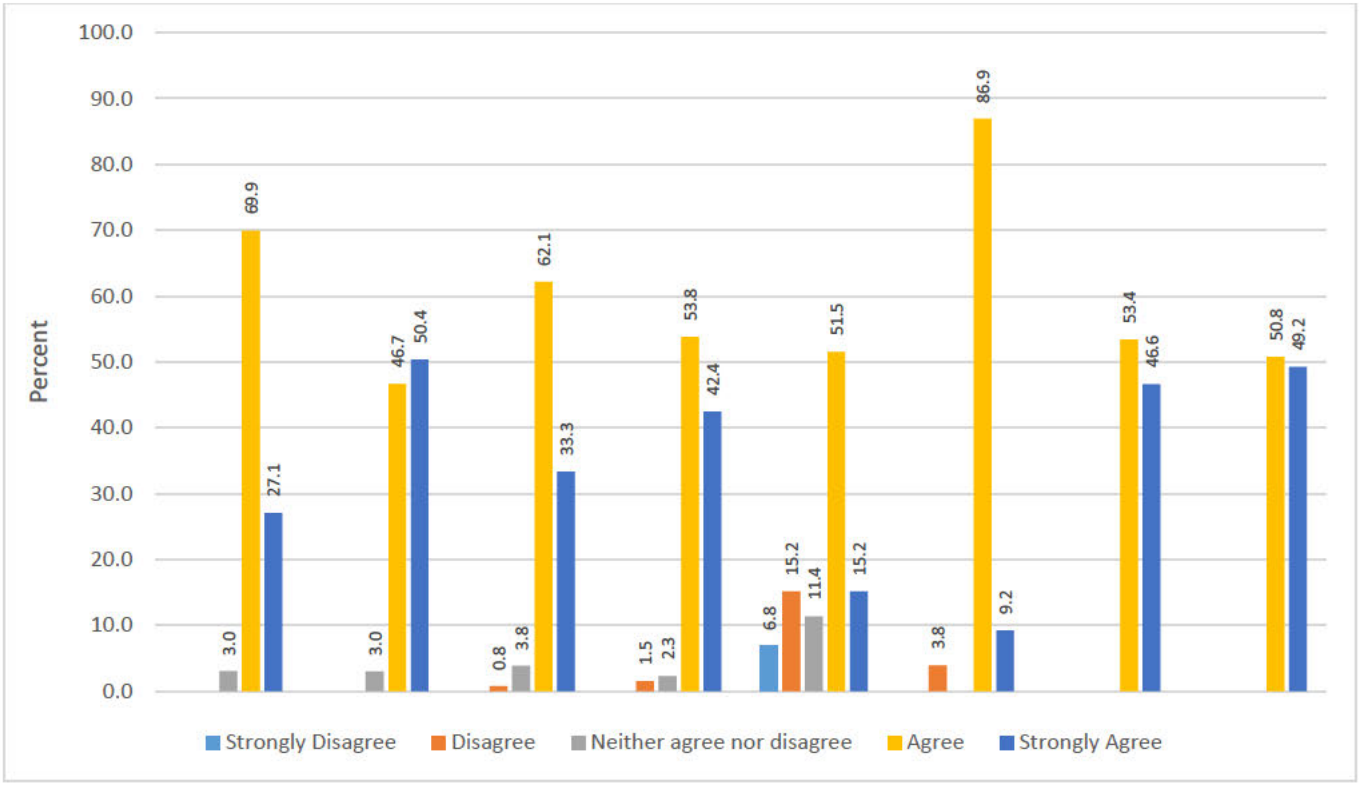

Figure 4.4: Scoring patterns of the respondents per variable per section

The following patterns are observed:

- All results show high levels of agreement.
- The last two are not significant in relation to each other, but significantly more agreed.
- This implies that most respondents exhibit acceptable attitude and have positive perceptions towards the programme.

Less than 25 % disagree that there are challenges of implementing a programme of this nature. Analysis of data reveals that the percentage contribution arises out of the automotive, sales and distribution departments. Further analysis reveals that this group belong to the non-graded employees some of whom do not possess a matriculation or post matriculation qualification. This group falls in the age categories above 41-50 years of age. This could then mean that these employees feel that due to their experience, setting a programme up of this nature posed no challenges and could be done easily. Alternatively, it could also be a lack of awareness of the programme that brings this about this view or a perception of the programme which is not clear.

The analysis revealed a small portion of respondents who were borderline in terms of their responses, implying that they may not necessarily perceive the programme to be of use to them or they did not display an acceptable attitude towards this programme. Another possibility might be that these individuals might not have received sufficient awareness around this programme and do not believe in its value to them.

On the other hand, it was pleasing to see a large group of respondents per variable, greater than 50% for each variable, who both strongly agree and agree, displaying acceptable attitudes and perceptions towards the programme, indicating that the awareness of this programme exists and is real.

4.7 CROSS TABULATIONS

A Chi square test of independence was finished to understand whether there was a statistically important relationship among the variables (rows vs columns).

The null hypothesis confirms that there is no relation between the two. The alternate hypothesis shows that there is a relationship.

The table below is a summary of the chi square test of independence *p*-values between the biographical variables and the section statements.

Table4.8: Results of the Chi square tests

	Department	Grade	Highest level of education	Age group	Gender
Sufficient training was conducted regarding health hazards associated with recycling	0,469	0,322	0,058	0,089	0,258
Health hazards exist	.022*	.000*	.025*	0,059	.004*
Health hazards communicated	.001*	0,059	.047*	.035*	.032*
Health hazards are known	.004*	.005*	.008*	0,273	.018*
Aware of waste streams that are generated	0,287	0,175	.000*	0,064	0,535
Hazards exist and will they affect you	.002*	.001*	.008*	0,345	0,065
We need to recycle	.003*	.042*	0,09	0,352	0,52
Impacts/consequences are associated with health hazards	.001*	.000*	.033*	.032*	.008*
Recycling trends/numbers vary	0,435	0,126	.009*	0,331	0,496
The increase or decrease in trends is evident	.000*	.000*	0,096	.008*	0,163
Key indicators remain constant	.000*	.045*	.028*	.024*	0,218
Personal Protective Equipment (PPE) needs to be used when dealing with waste	.000*	.042*	.000*	0,736	0,305
Awareness of current health hazards associated with recycling	0,086	.005*	.008*	0,052	0,388
Waste management practices are clear and concise	.003*	.012*	.026*	.033*	.020*
Waste management is a shared responsibility	.000*	.000*	.015*	.020*	.013*
Recycling practices are displayed on site	.004*	0,999	0,417	0,823	0,531
Reduce, reuse and recycle is the right thing to do (This applies to water, energy, effluent and waste management)	0,884	0,917	.000*	0,681	0,253
There are major concerns regarding this programme	0,556	0,202	0,489	0,179	0,158
This programme is beneficial to you	0,209	.038*	0,762	0,411	0,516
This recycling programme can be implemented at home	0,696	0,422	0,853	0,327	0,243
This recycling programme is of benefit to me	0,501	0,563	0,115	0,176	0,194
Team members contribute to this initiative	.002*	.037*	0,138	0,845	0,593
There challenges of implementing a programme of this nature	.005*	0,143	.004*	0,153	0,458
It should be a priority to recycle waste	0,811	.000*	0,172	0,902	.008*
When we recycle, we are heading in the right direction	.005*	.027*	.045*	0,426	0,561
Waste separation at source is the correct thing to do	.019*	0,532	.040*	0,307	0,573
Do you feel that the programme should be improved?	.003*	0,638	.045*	0,617	0,196
The current set up of the recycling facility is apt for its intended purpose and to avoid health hazards	.016*	0,344	0,075	0,379	0,42
Do you think we should receive additional training regarding the health hazards associated with waste separation?	0,075	0,218	0,093	.009*	0,370
Are you aware of global best practices?	.021*	.013*	0,935	0,327	0,100

All values with a * are significant

The *p*-value between “Grade” and “Health hazards exist” is < 0.001. This implies that there is a significant association among the variables. That is, the grade of the participant did play a significant role in terms of how participants observed the presence of health hazards. This is evident in, Table 4.9. Significantly fewer respondents in “Other” categories agreed with this statement, whilst more in G and H agreed.

Table 3: Grade cross tabulation

			Grade			Total
			G	H	Other	
Health hazards exist	Strongly Disagree	Count	0	0	5	5
		% within Grade	0,0	0,0	4,2	3,8
	Disagree	Count	0	2	65	67
		% within Grade	0,0	33,3	54,6	50,8
	Neither agree nor disagree	Count	2	0	11	13
		% within Grade	28,6	0,0	9,2	9,8
	Agree	Count	1	4	28	33
		% within Grade	14,3	66,7	23,5	25,0
	Strongly Agree	Count	4	0	10	14
		% within Grade	57,1	0,0	8,4	10,6
Total		Count	7	6	119	132
		% within Grade	100,0	100,0	100,0	100,0

Analysis of table 4.9 indicates that the following p-values do have an important relationship:

The *p*-value between department, grade, highest level of education and gender, in relation to how respondents viewed the existence of known health hazards - is less than 0.05, showing a significant relationship. That is, the biographical variables of respondents did play a significant role in terms of how respondents viewed the existence of known health hazards, the effects of hazards, the impacts and consequences associated with the hazards, evidence of the increase or decrease in trends, the needs of PPE to be used when dealing with waste, the clear and concise practices of management and the responsibility of management.

Another significant relationship can be seen in the p-value between grade and health hazards exist. It should be a priority to recycle, this therefore implies that there is a considerable association among the grade and gender. The grade and gender of the participant did show a substantial portion in relation to how the participants observed the existence of whether it should be a priority to recycle.

The *p*- value between the grade, department and highest level of education and when we recycle are we heading in the right direction, is < 0.001, indicating a significant relationship between these variables. That is, they did play a significant role in how the respondents viewed the direction in which recycling is heading

4.8 CORRELATIONS

A bivariate correlation was similarly completed on the (ordinal) data. The information analysed show the subsequent patterns.

Positive values points to a directly proportional association among the variables that exist and a negative value point to an inverse relationship.

The correlation value between “Health hazards communicated” and “Health hazards are known” is 0.974. This is proportionally related. Participants indicate that the improved the hazards are communicated, the more easily the hazards are known and vice versa.

The correlation value between “aware of waste streams generated” and “sufficient training provided” is 0.685. This is a directly related proportionality. Participants could indicate that the more they are aware of waste streams generated. This implies that insufficient training was conducted regarding health hazards associated with recycling. As a result of this there exists a correlation between impacts and consequences are associated with health hazards.

The correlation value between “Personal Protective Equipment (PPE) needs to be used when dealing with waste” and “we need to recycle” is 0.743. This is a directly correlated proportionality. Respondents indicate that to recycle, PPE is key in completing the task.

There was a distinct correlation between “it should be a priority to recycle” and all variables listed in Section B and Section of the survey. Positive values reflect a directly proportional relationship thereby implying that respondents display a keen sense of wanting to recycle and to understand its importance.

As much as there are positive values, there also exist negative values. A negative value is indicative of an inverse relationship, which suggests that the variables have a contradictory outcome on each other, as one increases, the other decreases.

The correlation value among “Hazards exist and will they affect you” and “There are major concerns regarding this programme” is -0.174. That is, the more tasks hazards affect a person, the less time a person would spend on the concerns associated with the programme.

The correlation value between “There are major concerns regarding this programme” and “This recycling programme can be implemented at home” is -0.134. That is, the more concerns a person has, the less likely they are to value the recycling programme and to implement this at home.

The correlation value between “Team members contribute to this initiative” and “Waste management is a shared responsibility” and is 0.174. That is, if respondents believe that recycling is a team effort, if this is not evident, the recycling responsibilities will not be shared.

4.9 SUMMARY OF THE CHAPTER

This chapter discussed the findings of the study. The data was presented in tables and graphs. The next chapter will discuss the best practices found and the conclusions drawn from the findings of the interviews conducted. The recommendations and limitations of the study will be further discussed.

CHAPTER FIVE
DISCUSSION

5.1 INTRODUCTION

This chapter, which focuses on the discussion, is the culmination of responses gathered from the survey and comparisons made to Chapter 2 – the literature review.

The discussion covers the biographical data produced during the study as well as assessing if the current recycling programme has been adequately implemented coupled with examining the levels of awareness, attitudes and perceptions exhibited towards the programme and their relevance to the aim and objectives

5.2 BIOGRAPHICAL DATA

Demographics other than gender (age, education, management experience) emerge as more significant influences. As this provides more information surrounding the awareness and attitudes to the recycling programme.

5.2.1 Gender distribution by age

According to Kunze, Boehm and Bruch (2011), age diversity is an inevitable fact of life in many organisations and this can be seen in this study. A total of five age groups were analysed during the study. Analysis of gender distribution by age revealed that there was a fewer number of females in the organisation in comparison to males. The overall percentage of males to females was roughly around 3:1 (78.4%: 21.6%) / (p<0.001). Due to the nature of the business, males dominate the operation side of the beverage industry, which speaks to this small representation of female. Analysing age distribution in turn will also help understand and show a correlation between age and education levels in the organisation.

5.2.2 Male age categories

In the age group ranging between 18-20 years of age, only three males participated in the survey. As the first category in the series, this reveals that these respondents are just starting off in industry and do not possess the necessary skills. The categories of these age groups that follow which are 21-30, 31-40, 41-50 – show a total of 82 males who participated in the survey. This information reveals that this age group has a long

tenure in the company and learnt adequate skills with which to perform their jobs. In the age group category 51-60, 61-65, only a total of 20 males participated in this category. This revealed that as age groups increase in the organisation, the pool of people within these groups reduces. This could be because of retirement; employees are tired or not satisfied. The results of the later age group, concur with Rožman *et al.* (2017), who goes on to say that older employees are more motivated in the workplace by flexibility, autonomy at work, work at their own space and are satisfied with interpersonal relationships at work, working hours and distribution of obligations. The organisation should take this into consideration and cater for older employees in the future.

5.2.3 Female age categories

The female age categories revealed the following information. In the age group ranging between 18-20, there were no females in this group. This could be due to females in this age group pursuing their studies or employed in other sectors .Lovely (2016) states that Maria Klawe, president of Harvey Mudd College in Claremont, California compiled new research. She discovered that women do not choose “dirty” careers because they do not find them interesting. Additional reasons they do not pursue such work include the belief that they would not be good at it, and their concerns about feeling comfortable working with their coworkers. Because women contribute a vital component of success, different ways are being explored in Phoenix, America ,to recruit them. One method is a new apprenticeship opportunity for 18 to 24 year olds who need a foot in the door. The problem is that once they know about opportunities in solid waste, many women still are not interested. Lovely (2016) cites that 63% of teens have never considered a career in garbage and that even after learning of the personal economic benefits and the global impact of a job in solid waste, only 74% would consider it as a career.

A total of 10 females, in the age group 21-30, participated in the survey. This indicates that these females have completed higher education qualifications and are establishing themselves in industry, which shows a promising growth pattern. This is also dependent on which department or grade they find themselves in the organisation.

Interestingly, in comparison to the males, the female age groups that follow show a decrease in each category. This shows that females receive the necessary skills and move on to other careers outside of the organisation or move up in the organisation. This also indicates that since some of them would have studied after grade 12, they are more career orientated and not stable in the jobs they hold. In the age group 51-60 – a total of five females participated in the survey, indicating that these could possibly be the individuals who may not possess higher qualifications and are forced to stay due to job security and financial stability. According to Ciocirlan and Pettersson (2012), women and younger people have more positive environmental attitudes than other groups, hence the fact that the younger female age group is smaller due to them having a positive outlook and wanting more out of their careers.

5.2.4 Education levels

Educating employees in the recycling programme and what the expectations are is key. Education as a subcategory, was reviewed to assess the awareness levels, perceptions, and attitudes. It also provided an overview of varying levels of education in the organisation. The number of respondents who participated in the survey was 137. In a cross tabulation done of age group verses highest level of education, it showed that a post school qualification was held by more than half of the respondents. Analysis of education levels revealed that out of this pool as per table below:

Table 5.1: Analysis of education levels

			No formal education	Secondary school	Diploma	Undergraduate degree	Postgraduate degree
Age group	18 - 20	Count	1	2	0	0	0
	21 - 30	Count	1	23	5	4	2
	31 - 40	Count	0	13	11	1	6
	41 - 50	Count	6	5	17	3	9
	51 - 60	Count	0	10	5	2	6
	61 - 65	Count	0	0	1	0	1
Total		Count	8	53	39	10	24

- A total of eight, did not possess a qualification from a higher institution, implying that whatever skill they have, was attained during their working career.

- A total of 53 possessed a grade 12 qualification, meaning that with time they will grasp the necessary recycling concepts.
- By reference to age groups, 23 respondents fall in the 21-30 age group and 13 fall in the 31-40 age group. This strong number shows that respondents in these age groups could also be studying towards higher institution qualifications.
- A total of 73 individuals possess a qualification from a higher institution, implying that in this pool the concepts of recycling and health hazards can be easily grasped since they would have been exposed to external and internal factors as part of their formal education in some way or form.

Due to socio economic issues some individuals would not have had the opportunity to further their studies, hence their attainment of skills internally within the organisation. According to Rosner and Markowitz (2016), employees education is one of the most important foundation of safety in the work place.

Further analysis went on to show that many respondents possessed formal education in the quality assurance and packaging departments followed by engineering and warehouse, reflecting the total level of skill in each department, which will be necessitated to execute the recycling programme.

5.2.5 Grades

A grading system ranks employees in a hierarchical structure in the organisation.

Most respondents (87.5%) were below G-grade. These are employees who work on the shop floor and require a specific skill set in which to operate machinery. Employees belonging to the G and H grades are 5.3%, comprising of team leaders and specialist roles as well as senior management.

Reviewing grading systems provide an understanding of the critical skills that are needed. Creating awareness of the recycling programme and training must be provided to get buy in from all employees. However, cross tabulation of the highest level of education versus the grades shows that 28% respondents possess the highest education level in the form of diplomas. This indicates that if they are able to attain higher education qualifications, they do possess the ability to be taught new concepts, especially that of recycling.

From an age perspective versus grade, results showed that the age category 41-50 had the greatest number of respondents coming in at 25.2%, followed by the 21-30 age group coming in at 24.4%, revealing that the skill set does fall outside of the G grade and above category.

A review of the data revealed that language was a major barrier. Individuals did not understand English language concepts related to recycling. This points to the fact that training must also be conducted in isiZulu to describe recycling concepts, especially concepts of hazardous waste, since this is a crucial aspect of the programme.

5.3 ASSESSMENT OF THE AWARENESS OF THE RECYCLING PROGRAMME AND ITS IMPLEMENTATION

The survey conducted included a cross functional array of individuals from various departments, grades, educational levels, that made up the beverage company. The survey focused on the awareness and education of the employees in relation to the recycling programme. Assessing the recycling programme and its adequate implementation was cross tabulated across departments, highest level of education, grade, age and gender per variable statement in each section of the survey. This was done in such a manner to gather information to fully understand if this objective was achieved. Variable statements covered aspects such as understanding the health hazards that surrounded the recycling programme, what employees understood, and whether sufficient training had been conducted for staff.

Analysis showed that 61.2% (n=82) of respondents agreed that sufficient training was conducted, with the greatest number of respondents emanating from the quality assurance department 64.3% (n=27) and the least number of respondents from the processing department 50% (n=3). The high number from the quality department results from their confidence about their programme. According to Jabbour (2013), environmental training is fundamental to any successful activity of environmental management.

Of the respondents, 49.3% (n=67) disagreed that health hazards exist in the recycling programme, implying that they are not fully aware of what the programme is about, whereas 26.5% (n=36) of the respondents agreed that health hazards exist. Analysis

of cross tabulation reflects that most of the respondents came from the group with no formal education, 62.55 (n=5) followed by the post graduate degree group which had 60% (n=15). This implies that even though sufficient training was conducted, respondents are still uncertain of what the programme is about.

The number of respondents who disagreed that health hazards were communicated, 49.3% (n=67), those that disagreed that health hazards are known scored 50.4% (n=68) and 50% (n=68) disagreed that health hazards exist and will affect them; 48.5% (n=66) disagreed that impacts and consequences are associated with health hazards. This could imply that there was inadequate training pertaining to hazards that exist in relation to the recycling programme, or perhaps it was not understood clearly by the respondents. Participants could also feel also felt that the health hazards will not affect them, which goes back to the training not being comprehensive enough in detailing exactly what health hazards are. According to Shaw, Dingle and Annandale (1999), any process has gaps and by understanding these gaps and in putting systems in place to mitigate these, will strengthen the environmental training cycle in organisations.

On the other hand, 66.7% (n=90) of respondents were aware of the waste streams that were generated. This could be that the training in this regard could have been covered in sufficient detail enabling clear understanding. It could also relate to the fact that most of the employees have been in the organisation for a while and understand waste that is generated in their areas. According to Jackson and Seo (2010), the fear of the unknown holds individuals back instead of moving forward. Creating a knowledge base serves as a platform for employees to make conscious decisions regarding recycling and ultimately saving the environment.

Those respondents who strongly agreed to “we need to recycle”, scored 53.7% (n=73), followed by 46.3% (n=63) who agreed that we need to recycle. From this variable, 0% disagreed with this statement, showing that the programme has had a positive impact on a few of the respondents.

Further analysis of the scoring patterns revealed that 61.5% (n= 83) of respondents agreed and 22.25 % (n=30) strongly agreed, that recycling trends vary. This is a good sign, implying that these respondents spend time going over this information and that they can understand and appreciate what it means when recycling trends vary. Further

investigation revealed that these numbers are spoken of in SHE committee forums and discussed monthly and are also displayed outside of the organisation on notice boards. In the same breath, 49.3% (n=67) of respondents disagreed that trends of the recycling programme increase or decrease. Though employees may have no formal education or have postgraduate qualifications, adequate training, which is the foundation, will empower them to use and apply the information given to them. Environmental training could possibly have a positive impact on other aspects of a company's performance for example profit an innovation according to del Brío *et al.* (2007).

It was encouraging to note that 47.7% (n=63) of the respondents and 50.8% (n=67) strongly agreed and agreed to personal protective equipment wear that needs to be used when dealing with waste. This implies that from a safety perspective, employees are aware of what they need to protect themselves. To a certain extent, deep down they know that waste can be dangerous. Having said this, it contradicts their understanding of health hazards that exist and are known and the implication and consequences.

Of the respondents ,47.1% (n=64) disagreed, that waste management practices are clear and concise, implying that they lack understanding of the expectations. A total of 48.9% (n=66) respondents disagree that waste management is a shared responsibility. A cross tabulation perspective revealed that respondents with no formal education scored 57% (n=4) followed by 56% (n=14) with a postgraduate qualification, indicating that the training does detailing this especially important responsibility or attitude.

Of the respondents, 60.0% (n=81) agreed that recycling practices are displayed on site, and this can be seen through the recycling displays that are evident in the form of recycling stations across the organisation.

Of the respondents, 49.6% (n= 67) agreed that there are major concerns regarding the recycling programmes followed by 23.7% (n=32) who neither agreed nor disagreed, leaving a grey area and room for concern. It goes back to the question of the foundation being clear enough and merely an attitude.

Bivariate correlations performed on ordinal data showed a correlation value between “Health Hazards communicated” and “Health Hazards are known” is 0.947. Respondents indicated that the better the hazards are communicated, the more easily the hazards are known and vice-versa.

5.4 EXAMINING THE LEVELS OF ATTITUDES, BEHAVIOUR AND PERCEPTIONS EXHIBITED TOWARDS THE RECYCLING PROGRAMME.

This section of the survey focused on attitudes, behaviour and perceptions towards the recycling programme. Analysis showed that 69.9%(n=93) of the respondents agreed followed by 27.1% (n=36) who strongly agreed that the programme is beneficial to them. Respondents recognise the importance and benefits of this recycling programme. Having said that, 3.0% (n=4) respondents neither agreed nor disagreed with this statement. A minority, still have doubts as to what the programmes capability is.

Of the respondents, 50.4 % (n= 68) strongly agreed, 46.7% (n=63) agreed and 3.0% (n=4) neither agreed nor disagreed that this programme can be implemented at home. In relation to the first statement, a few respondents still have hurdles to overcome in terms of understanding or accepting the recycling programme.

Off the respondents who undertook the survey, 53.85 (n=71) agreed that it is a team initiative while 86.9% (n=113) respondents believe that it should be a priority to recycle.

All results obtained in this section of the survey show high levels of agreement. This implies that respondents exhibit the correct attitude and have positive perceptions to the recycling programme.

5.5 SUMMARY OF THE CHAPTER

A few statements showed higher levels of agreement and higher levels of disagreement, specifically in relation to the awareness of the recycling programme, what it entails and lack of awareness of the associated hazards of the recycling programme. There are a few individuals who feel that the company should be doing more towards raising the levels of awareness. The next chapter discusses the recommendations and conclusions.

CHAPTER SIX
RECOMMENDATIONS AND CONCLUSIONS

6.1 INTRODUCTION

This chapter will provide the recommendations and the conclusions of this study based on the results and discussion of chapters 4 and 5 on the “Assessment of the Health Hazards that employees face in relation to the Recycling Programme, at a Beverage company in KwaZulu-Natal.

The outline of the key findings of this study will be presented along with the strengths and limitations. There are recommendations outlined for future research studies on recycling programmes to achieve a better understanding of how to communicate health hazards and other important information through this programme.

6.2 KEY FINDINGS

- Bivariate correlation showed a significant association between “Health hazards communicated” and “Health hazards known”, of the respondents (*p*-value of 0.947) indicated that the better the hazards are communicated, the easier the hazards are known.
- A significant association between “Aware of waste streams generated and “sufficient training provided” (*p*-value of 0.685). This implies that the more they are aware of waste streams generated, implying that sufficient training was conducted regarding health hazards associated with the recycling programme.
- A significant correlation exists between “Personal Protective Equipment (PPE)” needs to be used when dealing with waste. PPE is key in order to complete the task, a response rate of (*p*-value of 0.743) indicates that PPE is key.
- Respondents display a keen sense of wanting to recycle and understand its importance.
- As much as positive values exist from the correlation, negative values also exist and is evident in the statement” Health hazards exist and will affect you” and “There are major concerns regarding this programme “p- value of -0.174. This implies that the more hazards that affect a person, the less time a person would

spend on the concerns associated with the programme, as they would not want to be impacted negatively by these health hazards.

- The correlation value between “there are major concerns regarding this programme” and “this recycling programme can be implemented at home” is *p*-value of -0.134. that is, the more concerns a person has, the less they would value the recycling programme and would not want to implement this at home.

6.3 STRENGTHS OF THE STUDY

- This is an original study in South Africa to capture the adequacy of implementation of a recycling programme.
- This is an original study in South Africa to capture the overview of a recycling programme in a Beverage industry.
- This is an original study in South Africa to look at attitudes, perceptions, awareness of the recycling programme in a beverage industry.

6.4 LIMITATIONS OF THIS STUDY

- Poor participation of respondents in the survey, resulted in a lack of the real issues relating to the recycling programme. The indication is that majority of staff are either not interested in the recycling programme, or alternatively, have little input in this regard.
- The survey should have focused more on biographical details, as this contributes to the adequacy of the recycling programme.
- The survey sent via Google forms, should have been in isiZulu. Language could have been a barrier.
- Information from the survey proved to be inconclusive, the results did not leave much room to understand if the recycling programme really working.

6.5 RECOMMENDATIONS FOR FUTURE STUDIES ON RECYCLING PROGRAMMES

- This study revealed that to roll out programmes especially that of recycling, an in-depth review of what is going to be communicated via training, needs to be understood. The following questions should be asked: Who are our audience? What do we want them to know? What are we training them for? Will it be beneficial? If so, how will this be ascertained?
- After training is conducted, assessments should be done on employees to gauge their level of understanding regarding the recycling programme and to show where improvements need to be made regarding the training material used.
- Continuous educational programmes, mentoring and coaching should be reinforced to ensure appropriate training.
- Recycling information should be used in surveys to gauge if respondents clearly understand the programme.
- Effective awareness campaigns surrounding recycling programmes must be developed.

6.6 CONCLUSION

The research aim that underpinned this study was an assessment of the health hazards that employees face in relation to the recycling programme at a Beverage company.

Recycling is a growing topic of concern across South Africa as well as internationally, therefore the need for literature pertaining to recycling programmes is necessary. Recycling programmes share many similarities and differences with that of other sustainability programmes. For that reason, the training and implementation processes of other programmes should be reviewed and assessed to derive learnings which can be incorporated into the current recycling programme.

The existing training programmes have barriers and inadequate in meeting the expectations of the employees. However, there is now an understanding of what such programmes lack, and an action plan is currently underway to address these concerns.

The Beverage Company is certified with the ISO 14001 Environmental Management Standard and is committed to environmental education and leadership and continuous improvement of the system.

REFERENCES

Adane, L. and Muleta, D. 2011. Survey on the usage of plastic bags, their disposal and adverse impacts on the environment: A case study in Jimma City, Southwestern Ethiopia. *Toxicology and Environmental Health Sciences*, 3 (8): 234-248.

Aguilar-Jurado, M. Á., Gil-Madrona, P., Ortega-Dato, J. F. and Zamorano-García, D. 2019. Effects of an educational glass recycling program against environmental pollution in Spain. *International Journal of Environmental Research and Public Health*, 16 (24): 5108.

Ajayi, S. O., Oyedele, L. O., Akinade, O. O., Bilal, M., Owolabi, H. A., Alaka, H. A. and Kadiri, K. O. 2016. Reducing waste to landfill: A need for cultural change in the UK construction industry. *Journal of Building Engineering*, 5: 185-193.

Ajzen, I. 1991. The theory of planned behavior. *Organisational Behavior and Human Decision Processes*, 50 (2): 179-211.

Ángel del Brío, J., Junquera, B. and Ordiz, M. 2008. Human resources in advanced environmental approaches: a case analysis. *International Journal of Production Research*, 46 (21): 6029-6053.

Antelava, A., Damilos, S., Hafeez, S., Manos, G., Al-Salem, S. M., Sharma, B. K., Kohli, K. and Constantinou, A. 2019. Plastic Solid Waste (PSW) in the context of Life Cycle Assessment (LCA) and sustainable management. *Environmental Management*, 64 (2): 230-244.

Arvanitoyannis, I. S. 2010. *Waste management for the food industries*. Amsterdam :Elsevier Academic Press.

Babbie, E.R. 2019. *The basic of social research*. Belmont, CA: Wadsworth Cengage Learning.

Bang, D. Y., Kyung, M., Kim, M. J., Jung, B. Y., Cho, M. C., Choi, S. M., Kim, Y. W., Lim, S. K., Lim, D. S. and Won, A. J. 2012. Human risk assessment of endocrine-disrupting chemicals derived from plastic food containers. *Comprehensive Reviews in Food Science and Food Safety*, 11 (5): 453-470.

Berg, P.E.O., 1993. *Source sorting. Theory, method and implementation*. Doctoral thesis. Chalmers University of Technology, Sweden . Available : https://scholar.google.co.th/citations?user=iEkhmDAAAAAJ&hl=de(Accessed: 20 July 2021).

Biryol, D., Nicolas, C. I., Wambaugh, J., Phillips, K. and Isaacs, K. 2017. High-throughput dietary exposure predictions for chemical migrants from food contact substances for use in chemical prioritization. *Environment International*, 108: 185-194.

Bourguignon, D. 2015. *Safeguarding biological diversity-EU Policy and international agreements*: Brussels: European Union. Available : http://www. europarl. europa. eu/RegData/etudes (Accessed:20 July 2021).

Brink, H., Van Der Walt, C. and Van Rensburg, G. 2018. *Fundamentals of research methodology for healthcare professionals*. 4th ed. Cape Town: Juta and Co (Pty) Ltd.

Bulmer, F. M. R. 1935. Evaluation of health hazards in industry. *Canadian Public Health Journal*, 26 (7): 321-328.

Campolina, J. M., Sigrist, C. S. L., de Paiva, J. M. F., Nunes, A. O. and da Silva Moris, V. A. 2017. A study on the environmental aspects of WEEE plastic recycling in a Brazilian company. *The International Journal of Life Cycle Assessment*, 22 (12): 1957-1968.

Charter, O. 1986. *Ottawa Charter for Health Promotion : First International Conference on Health Promotion, Ottawa, 21 November 1986-WHO*. HPR/HEP/95.1 Available: http://www. who. int/hpr/NPH/docs (Accessed :20 July 2021).

Ciocirlan, C. and Pettersson, C. 2012. Does workforce diversity matter in the fight against climate change? An analysis of Fortune 500 companies. *Corporate Social Responsibility and Environmental Management*, 19 (1): 47-62.

Cooper and Schindler. (2014). *Business research methods*. 12th ed. London: Sage Publishers.

Council, C. 2002. EPHC.

Dahlén, L. and Lagerkvist, A. 2010. Evaluation of recycling programmes in household waste collection systems. *Waste Management & Research*, 28 (7): 577-586.

Daily, B. F., Bishop, J. W. and Steiner, R. 2007. The mediating role of EMS teamwork as it pertains to HR factors and perceived environmental performance. *Journal of Applied Business Research (JABR)*, 23 (1):1-11.

Daily, B. F. and Huang, S. C. 2001. Achieving sustainability through attention to human resource factors in environmental management. *International Journal of Operations & Production Management*, 21:1539-1552.

Das, P. K., Bhattacharyya, S. and Das, E. 2014. A study work conducted on behalf of Swasthya Bhabna Welfare Society on the bad effects of plastic wastes among the citizens of municipal areas. *EXCEL International Journal of Multidisciplinary Management Studies*, 4 (1): 117-124.

Degher, A. 2002. HP's worldwide take back and recycling programs: Lessons on improving program implementation. In: Proceedings of *Conference Record 2002 IEEE International Symposium on Electronics and the Environment (Cat. No. 02CH37273)*. IEEE, 224-227.

del Brío, J. Á., Fernandez, E. and Junquera, B. 2007. Management and employee involvement in achieving an environmental action-based competitive advantage: an empirical study. *The International Journal of Human Resource Management*, 18 (4): 491-522.

East, A. J. 2008. What is a carbon footprint? An overview of definitions and methodologies. In: Proceedings of *Vegetable industry carbon footprint scoping study—Discussion papers and workshop, 26 September 2008*. Available : https://www.daf.qld.gov.au/__data/assets/pdf_file/0003/59025/Hort-Fruit-Drought-Carbon-Report1.pdf(Accessed: 21 June 2021).

Elena, H. and Rawert, D. 2012. Biographical research. *Intercultural Communication in Action*, 2: 49.

Ellis, S., Kantner, S., Saab, A., Watson, M. and Kadonaga, L. 2005. Plastic grocery bags: the ecological footprint. *Environmental changes are spreading infectious diseases-UN study, Victoria*: 1-19. Available : https://www.yumpu.com/en/document/read/35448984/plastic-grocery-bags-the-ecological-footprint-vipirg(Accessed: 21 June 2021).

Ettehadieh, D. 2011. Cost-benefit analysis of recycling in the United States: Is recycling worth it. University of Maryland, EUA. Available : https://english.umd.edu/research-innovation/journals/interpolations/interpolations-spring-2011/cost-benefit-analysis(Accessed : 21 June 2021)

Finkbeiner, M. 2009. *Carbon footprinting—opportunities and threats*. *International Journal of Life Cycle Assessment* , 14:91–94.

Folz, D. H. 1991. Recycling program design, management, and participation: a national survey of municipal experience. *Public Administration Revie*w, 51: 222-231.

Fouka, G. and Mantzorou, M. 2011. What are the major ethical issues in conducting research? Is there a conflict between the research ethics and the nature of nursing? *Health Science Journal*, 5(1): 3-14.

Franchini, M., Rial, M., Buiatti, E. and Bianchi, F. 2004. Health effects of exposure to waste incinerator emissions: a review of epidemiological studies. *Annali Dell'istituto Superiore Di Sanità*, 40 (1): 101-115.

Future of Working. 2020. *13 Advantages and disadvantages of recycling*. Available: https://futureofworking.com/13-advantages-and-disadvantages-of-recycling/ (Accessed 21 July 2021).

Geueke, B., Groh, K. and Muncke, J. 2018. Food packaging in the circular economy: Overview of chemical safety aspects for commonly used materials. *Journal of Cleaner Production*, 193: 491-505.

Geyer, R., Kuczenski, B., Zink, T. and Henderson, A. 2016. Common misconceptions about recycling. *Journal of Industrial Ecology*, 20 (5): 1010-1017.

Goddard, H. C. 1995. The benefits and costs of alternative solid waste management policies. *Resources, Conservation and Recycling*, 13 (3-4): 183-213.

Godin, G. and Kok, G. 1996. The theory of planned behavior: a review of its applications to health-related behaviors. *AmericanJournal of Health Promotion*, 11 (2): 87-98.

Goosen, M. F. 2012. Environmental management and sustainable development. *Procedia Engineering*, 33: 6-13.

Govindan, K., Kannan, D. and Shankar, M. 2015. Evaluation of green manufacturing practices using a hybrid MCDM model combining DANP with PROMETHEE. *International Journal of Production Research*, 53 (21): 6344-6371.

Govindarajulu, N. and Daily, B.F. 2004. Motivating employees for environmental improvement. *Industrial Management & Data Systems*, 104(4): 364-372.

Gray, J.R., Grove, S.K. and Sutherland, S. 2017. *The practice of nursing research: appraisal, synthesis and generation of evidence.* St. Louis: Elsevier.

Groh, K. J., Backhaus, T., Carney-Almroth, B., Geueke, B., Inostroza, P. A., Lennquist, A., Leslie, H. A., Maffini, M., Slunge, D. and Trasande, L. 2019. Overview of known plastic packaging-associated chemicals and their hazards. *Science of the Total Environment*, 651: 3253-3268.

Groh, K. J., Backhaus, T., Carney-Almroth, B., Geueke, B., Inostroza, P. A., Lennquist, A., Maffini, M., Leslie, H. A., Slunge, D. and Trasande, L. 2018. Chemicals associated with plastic packaging: Inventory and hazards. *PeerJ Preprints*, 6: e27036 .

Gupta, V., Goel, S. and Rupa, T. 2016. Good governance and solid waste management: an overview of legislative regulations in India. *Journal of Business Management Studies,* 2: 1-9.

Hahladakis, J. N., Velis, C. A., Weber, R., Iacovidou, E. and Purnell, P. 2018. An overview of chemical additives present in plastics: migration, release, fate and environmental impact during their use, disposal and recycling. *Journal of Hazardous Materials*, 344: 179-199.

Hale, M. 1995. Training for environmental technologies and environmental management. *Journal of Cleaner Production*, 3 (1-2): 19-23.

Hargreaves, T. 2011. Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture*, 11 (1): 79-99.

Hernando, M. D., Mezcua, M., Fernández-Alba, A. R. and Barceló, D. 2006. Environmental risk assessment of pharmaceutical residues in wastewater effluents, surface waters and sediments. *Talanta*, 69 (2): 334-342.

Hershkowitz, A. 1998. In defense of recycling. *Social Research*, 65 (1) :141-218.

Highfill, J. and McAsey, M. 2001. Landfilling versus``backstop"recycling when income is growing. *Environmental and Resource Economics*, 19 (1): 37-52.

Hofstede, G. 1997. Organisation culture. *The IBM handbook of organisational behavior*: 193-210. Available :https://2012books.lardbucket.org/pdfs/an-introduction-to-organizational-behavior-v1.1.pdf(Accessed 21 July 2021).

Huang, D.-Y., Zhou, S.-G., Hong, W., Feng, W.-F. and Tao, L. 2013. Pollution characteristics of volatile organic compounds, polycyclic aromatic hydrocarbons and phthalate esters emitted from plastic wastes recycling granulation plants in Xingtan Town, South China. *Atmospheric Environment*, 71: 327-334.

Jabbour, C. J. C. 2011. How green are HRM practices, organisational culture, learning and teamwork? A Brazilian study *Industrial and Commercial Training*, 43(2):98-105.

Jabbour, C. J. C. 2013. Environmental training in organisations: From a literature review to a framework for future research. *Resources, Conservation and Recycling*, 74: 144-155.

Jabbour, C. J. C. and Santos, F. C. A. 2008. Relationships between human resource dimensions and environmental management in companies: proposal of a model. *Journal of Cleaner Production*, 16 (1): 51-58.

Jabbour, C. J. C., Teixeira, A. A., Oliveira, J. H. C. d. and Soubihia, D. F. 2010. Managing environmental training in organisations: Theoretical review and proposal of a model. *Management of Environmental Quality: An International Journal*, 21 (6): 830-844.

Jackson, S. E. and Seo, J. 2010. The greening of strategic HRM scholarship. *Organisation Management Journal*, 7 (4): 278-290.

Jenkins, R. R., Martinez, S. A., Palmer, K. and Podolsky, M. J. 2003. The determinants of household recycling: a material-specific analysis of recycling program features and unit pricing. *Journal of Environmental Economics and Management*, 45 (2): 294-318.

Jerie, S. 2016. Occupational risks associated with solid waste management in the informal sector of Gweru, Zimbabwe. *Journal of Environmental and Public Health*, 2016 : 1-14.

Keep America Beautiful. 2020. *Programs and initiatives . Keep America Beautiful*. Available: https://kab.org/programs/ (Accessed: 27 July 2021).

Kunze, F., Boehm, S. A. and Bruch, H. 2011. Age diversity, age discrimination climate and performance consequences—a cross organisational study. *Journal of Organisational Behavior*, 32 (2): 264-290.

Lakhan, C. 2015. A comparison of single and multi-stream recycling systems in Ontario, Canada. *Resources*, 4 (2): 384-397.

Latif, S. A., Omar, M. S., Bidin, Y. H. and Awang, Z. 2012. Environmental problems and quality of life: situational factor as a predictor of recycling behaviour. *Procedia-Social and Behavioral Sciences*, 35: 682-688.

Lee, J. H., Sohn, E. K., Ahn, J. S., Ahn, K., Kim, K. S., Lee, J. H., Lee, T. M. and Yu, I. J. 2013. Exposure assessment of workers in printed electronics workplace. *Inhalation Toxicology*, 25 (8): 426-434.

Lerena, P., Auerkari, P., Knaust, C., Vela, I. and Krause, U. 2013. Approaches towards a generic methodology for storage of hazardous energy carriers and waste products. *Journal of Risk Research*, 16 (3-4): 433-445.

Lithner, D. 2011. E*nvironmental and health hazards of chemicals in plastic polymers and products*. Available : https://www.econologie.com/fichiers/partager2/1306197604nGZivg.pdf(Accessed :27 July 2021).

Lovely, L. (2021) . Women in waste . Available : https://www.mswmanagement.com/collection/article/13024952/women-in-waste (Accessed : 20 July 2022).

MacBride, S. 2011. *Recycling reconsidered: the present failure and future promise of environmental action in the United States*.United States : Mit Press.

Maree, K. ed. 2016. *First steps in research*. 2nd edition. Pretoria: Van Schaik.

Massarutto, A , de Carli , A and Graffi, M. 2011. Material and energy recovery in integrated waste management systems: A life-cycle costing approach. *Waste Management*, 31 (9-10): 2102-2111.

Maystre, L. and Viret, F. 1995. A goal-oriented characterization of urban waste. *Waste Management & Research*, 13 (3): 207-218.

Miranda Carreño, R. and Blanco Suárez, Á. 2010. Environmental awareness and paper recycling. *Cellulose Chemistry and Technology*, 44 (10): 431-449.

Misra, V. and Pandey, S. 2005. Hazardous waste, impact on health and environment for development of better waste management strategies in future in India. *Environment International*, 31 (3): 417-431.

Moodley, L. and Ethekweni Municipality South Africa. 2016. *Overview of Landfill Operations*. Available: https://www.environment.gov.za/sites/default/files/docs/dsw_landfill_operations2.pdf (Accessed :27 July 2021).

Moodley, L., Wright, M., Payne, G. and Winn, R. 2019. Radical landfill transformation: landfills. *ReSource*, 21 (1): 20-23.

Morgan, H. 2012. *Top 6 recycling and reuse initiatives from around the globe*. Available: https://inhabitat.com/top-6-recycling-and-reuse-initiatives-from-around-the-globe/ (Accessed: 28 July 2021).

Mukerji, P. and Albon, D. (2014). *Research methods in early childhood: An introductory guide*. London : SAGE Publications Inc.

Muthu, S. S. 2014. *Assessment of carbon footprint in different industrial sectors*. Singapore : Springer.

Nixon, H. and Saphores, J.-D. M. 2009. Information and the decision to recycle: results from a survey of US households. *Journal of Environmental Planning and Management*, 52 (2): 257-277.

Noda, R., Komatsu, M., Sumi, E. and Kasakura, T. 2001. Evaluation of material recycling for plastics: environmental aspects. *Journal of Material Cycles and Waste Management*, 3 (2): 118-125.

Oehlmann, J., Oetken, M. and Schulte-Oehlmann, U. 2008. A critical evaluation of the environmental risk assessment for plasticizers in the freshwater environment in Europe, with special emphasis on bisphenol A and endocrine disruption. *Environmental Research*, 108 (2): 140-149.

Omran, A., Mahmoud, A., Abdul, A. H. and Robinson, G. 2009. Investigating households attitude toward recycling of solid waste in Malaysia: a case study. *International Journal of Environmental Research, 3(2): 278-288.*

Palliser, J. 2011. Revisiting recyling. *Science Scope*, 35 (3): 14.

Pandey, D., Agrawal, M. and Pandey, J. S. 2011. Carbon footprint: current methods of estimation. *Environmental Monitoring and Assessment*, 178 (1-4): 135-160.

Petersen, J. H. and Jensen, L. K. 2010. Phthalates and food-contact materials: enforcing the 2008 European Union plastics legislation. *Food Additives and Contaminants*, 27 (11): 1608-1616.

Pikitup. 2015. *Waste minimisation initiatives*. Available: http://www.pikitup.co.za/waste-minimisation-initiatives/ (Accessed : 27 July 2021).

Pipatti, R., Sharma, C., Yamada, M., Alves, J., Gao, Q., Guendehou, G., Koch, M., Cabrera, C., Mareckova, K. and Oonk, H. 2006. Waste generation, composition and management data. *Eggleston, S., Buendia, L., Miwa, K., Ngara, T., Tanabe, K.(Eds.)*,

Powell, J. T., Townsend, T. G. and Zimmerman, J. B. 2016. Estimates of solid waste disposal rates and reduction targets for landfill gas emissions. *Nature Climate Change*, 6 (2): 162-165.

Ravasi, D. and Schultz, M. 2006. Responding to organisational identity threats: Exploring the role of organisational culture. *Academy of Management Journal*, 49 (3): 433-458.

Rector, J. 2014. Environmental justice at work: the UAW, the war on cancer, and the right to equal protection from toxic hazards in postwar America. *The Journal of American History*, 101 (2): 480-502.

Rosner, D. and Markowitz, G. 2016. Educate the individual to a sane appreciation of the risk. a history of industry's responsibility to warn of job dangers before the occupational safety and health administration. *American Journal of Public Health*, 106 (1): 28-35.

Rožman, M., Treven, S. and Čančer, V. 2017. Motivation and satisfaction of employees in the workplace. *Business Systems Research: International journal of the Society for Advancing Innovation and Research in Economy*, 8 (2): 14-25.

Rushton, L. 2003. Health hazards and waste management. *British Medical Bulletin*, 68 (1): 183-197.

Saunders, M, Lewis, P and Thornhill, A. 2016. *Research methods for business students*. (7th Ed.). England: Pearson Education.

Sharifirad, M. S. and Ataei, V. 2012. Organisational culture and innovation culture: exploring the relationships between constructs. *Leadership & Organisation Development Journal*, 33(5) : 494-517.

Shaw, L., Dingle, P. and Annandale, D. 1999. Improving the design and implementation of environmental training programmes. *Eco-Management and Auditing: The Journal of Corporate Environmental Management*, 6 (3): 140-147.

Singhirunnusorn, W., Donlakorn, K. and Kaewhanin, W. 2012. Contextual factors influencing household recycling behaviours: a case of waste bank project in Mahasarakham municipality. *Procedia-Social and Behavioral Sciences*, 36: 688-697.

South Africa.(1993). *Occupational Health and Safety Act, No 85 of 1993.* Pretoria :Government Printers .

Spokas, K. 2008. Plastics-still young, but having a mature impact. *Waste Management*, 28 (3): 473-474.

Sridevi, H., Shreejith, K. and Ramachandra, T. 2014. Comparative analysis of greenhouse gas emissions from major cities of India. *International Journal of Renewable Energy and Environmental Engineering*, 2 (1): 1-6.

Stevens, E. S. 2002. *Green plastics: an introduction to the new science of biodegradable plastics*. Princeton University Press.

Suzuki, M., Subramanian, L., Watanabe, T. and Hasegawa, H. 2008. The application of the International Resource Recycling System (IRRS) to encouragement of Electronic Waste Recycling- the case of Fuji Xerox Paper presented at the *2008 IEEE International Symposium on Electronics and the Environment*. Washington, IEEE Computer Society,

Teixeira, A. A., Jabbour, C. J. C. and de Sousa Jabbour, A. B. L. 2012. Relationship between green management and environmental training in companies located in Brazil: A theoretical framework and case studies. *International Journal of Production Economics*, 140 (1): 318-329.

Tsai, C.-J., Chen, M.-L., Chang, K.-F., Chang, F.-K. and Mao, I.-F. 2009. The pollution characteristics of odor, volatile organochlorinated compounds and polycyclic aromatic hydrocarbons emitted from plastic waste recycling plants. *Chemosphere*, 74 (8): 1104-1110.

United Nations Department of Public Information. 1992. *Earth Summit: Press Summary of Agenda 21*. Department of Public Information, United Nations.Available : https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf(Accessed: 20 July 2021).

Unnikrishnan, S. and Hegde, D. 2007. Environmental training and cleaner production in Indian industry—A micro-level study. *Resources, Conservation and Recycling*, 50 (4): 427-441.

Valerio, F. 2010. Environmental impacts of post-consumer material managements: Recycling, biological treatments, incineration. *Waste Management*, 30 (11): 2354-2361.

Vandenberg, L. N., Hauser, R., Marcus, M., Olea, N. and Welshons, W. V. 2007. Human exposure to Bisphenol A (BPA). *Reproductive Toxicology*, 24 (2): 139-177.

Venselaar, J. 1995. Environmental training: industrial needs. *Journal of Cleaner Production*, 3 (1-2): 9-12.

Wiedmann, T. and Minx, J. 2008. A definition of ‘carbon footprint’. *Ecological Economics Research Trends*, 1: 1-11.

Williamson, L. 2003. It's Not my bag, baby! *On Earth*, 25 (2): 32-34.

World Health Organisation. 2007. *Everybody's business--strengthening health systems to improve health outcomes: WHO's framework for action*.Geneva: WHO.

Yu, E. A., Akormedi, M., Asampong, E., Meyer, C. G. and Fobil, J. N. 2017. Informal processing of electronic waste at Agbogbloshie, Ghana: workers’ knowledge about

associated health hazards and alternative livelihoods. *Global Health Promotion*, 24 (4): 90-98.

Zhu, T. 2016. *Analysis on plastic grocery bag policy in China.* Masters Thesis of Engineering and Public Policy, McMaster University: China. Available : https://www.eng.mcmaster.ca/sites/default/files/uploads/booth/thesis_mepp_tingting_zhu.pdf(Accessed: 20 July 2021).

Appendix 1: University ethics clearance certificate

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

24 June 2019

Mrs I Reddy
7 Nutplam Place
Palmview
Phoenix

Dear Mrs Reddy

An Assessment of the Health Hazards that employees face due to the Recycling Programme at a Beverage company in KwaZulu-Natal
Ethical Clearance number IREC 021/19

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tools for review.

We are pleased to inform you that the data collection tools have been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Dr M A Sathar
Deputy Chairperson: IREC

Appendix 2 : Letter requesting permission to conduct the study(English)

Ms/Mrs Vasu Moodley
Manufacturing Manager

Re: Permission to recruit subjects

Title of the Research Study: An Assessment of the Health Hazards that employees face due to the Recycling Programme at a Beverage Company in KwaZulu-Natal
Principle researcher: Inderia Reddy
Co-Investigator/s/supervisor/s: Supervisor: Prof J K Adam& S Ghuman

I am currently registered as a Masters student in Health Sciences. I am interested in performing an Assessment of the Health Hazards that employees face due to the Recycling Programme which includes waste separation activities at source and secondary level of containment and disposal methods, undertaken at a Beverage Factory in Kwa-Zulu Natal (KZN). Participation is purely voluntary and participants may withdraw from the study at any given time. All procedures shall be kept in order to ensure complete patient confidentiality and no names will be revealed in the publication of the results.

In light of the above-mentioned, I would like to request permission to recruit participants from your institution for the above-mentioned study.

Yours Sincerely
Inderia Reddy
(Masters Health student researcher)

Appendix 3 : Letter requesting permission to conduct the study(isiZulu)

Nukes / Nks. Vasu Moodley
ukukhiqiza Wokukhiqiza

Re: Imvume yokuthola izifundo

Isihloko socwaningo lokucwaninga: Ukuhlolwa kwezingozi zezempilo abasebenzi ababhekana nazo
Ukuhlobana nohlelo lokubuyisela kabusha kuNkampani yokuPhepha KwaZulu-Natali
Umcwaningi oyinhloko: Inderia Reddy

Co-Ivestigator / s / umphathi / s: Umqondisi: Prof J K Adam S Ghuman

Ngamanje ngibhaliswe njengomfundi weMasters ku-Health Sciences. Nginesasasa ekwenzeni Ukuhlolwa Kwezingozi Zempilo abasebenzi abhekene nazo ngokuphathelene noHlelo Lokuhlukanisa imfucuza, kufaka phakathi imisebenzi yokuhlukanisa imfucuza lapho osebenzela Kona kanye nomkhakha wesibili wokuqukatha nokulahlwa
Izindlela, ezenziwa eCoca Cola Beverages South Africa (CCBSA) KwaZulu-Natal Natal (KZN).

Ukubamba iqhaza kuvele ngokuzithandela futhi ababambiqhaza bangahoxisa isifundo nganoma yisiphi isikhathi. Zonke izinqubo zizogcinwa ukuze kuqinisekiswe ukugcinwa kwemfihlo ephelele futhi akukho amagama azoba khona yembula ekushicileleni kwemiphumela.
Ngenxa yalokhu okushiwo ngenhla, ngingathanda ukucela imvume kuwe yalabo abazobamba iqhaza ekuhlanganyeleni nathi kulolucwanungo.

Ozithobayo
Inderia Reddy
(Umcwaningi womfundi weMasters Health)

Appendix 4: Approval letter from the Beverage Company

RE: Memo | Surveys and Research Proposals for employee study purposes

Reply | Reply All | Forward | ...

TV

Thilo Venkatesan
To Inderia Reddy
Cc Thobeka Makaula; Mkuseli Dlikilili

Tue 2019/10/01 13:25

You replied to this message on 2019/10/01 13:28.
Please treat this as Confidential.

Dear Inderia

I have spoken to Group Legal and Mkuseli. Mkuseli is comfortable provided no mention of CCBA – SA and that the document is not published externally as per guidelines in memo as well especially given the topical nature of your thesis. Best wishes with your studies.

Thanks ,

Kind regards,

Coca-Cola Beverages South Africa

Thilo Venkatesan
Human Resources Business Partner: Coastal
CCBSA
15 Axle Drive
Olifantsfontein
Midrand
TVenkatesan@ccbagroup.com
O +27(0) 31 508 3234
M +27(0) 83 796 9552
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Appendix 5 : Letter of information for participants (English)

LETTER OF INFORMATION

Title of the Research Study: An Assessment of the Health Hazards that employees face due to the Recycling Programme at a Beverage Company in KwaZulu-Natal
Principal Investigator/s/researcher: Inderia Reddy (Honours: Environmental Management)
Co-Investigator/s/supervisor/s: Supervisor: Prof JK Adam (DTech: Clinical Technology)
Co-Supervisor: Mrs. Shanaz Ghuman (Master's Degree in Public Health)

Brief Introduction and Purpose of the Study: Welcome and thank you for being a part of my study. My name is Inderia Reddy and I am studying for a Master's degree at the Durban University of Technology. Many workers are affected by handling waste. Majority of these individuals are unaware of the health hazards that are associated with handling of these different waste streams. The purpose of this study is to understand the level of awareness and perceptions that employees have regarding this pertinent issue. Has the program been adequately implemented to ensure that all associated health hazards have been identified and communicated to the work force?
Upon completion of this research, the researcher will obtain a Masters Qualification.

Benefits: This can in turn aid employees in foreseeing dangerous situations and prevent them from harming themselves and risking their lives and that of their loved ones.

Reason/s why the Participant May Be Withdrawn from the Study: Your participation in this research is completely voluntary. You may withdraw at any time and this will not affect your treatment.

Remuneration: There will be no form of remuneration. Participation is voluntary.

Costs of the Study: You will not be asked to cover any cost relating to the study.

Confidentiality: All the information collected will be kept confidential. You will be allocated a number and all your details will be recorded under that number. This means that anyone who looks at my records will not be able to trace it to you. This is done to protect your privacy. In addition, a statement of confidentiality will be signed by both my supervisors and me.

Research-related Injury: There will be no research-related injury as there will be no alterations made to your treatment

Persons to Contact in the Event of Any Problems or Queries:
Please contact the Researcher (Inderia–071 3530673), Supervisor (Professor J.K Adam - 031 373 3093) internal Supervisor (Mrs Shanaz Ghuman – 031 373 2807) or DUT ethics administrator (031 373 2375) or Prof C. Napier Acting Director: Postgraduate and Research support (031 373 2326 or carinn@dut).

Appendix 6 : Letter of information for participants (isiZulu)

LETHA LOKWAZI

Isihloko seSifundo Sezocwaningo; Ukuhlolwa Kwezingozi Zempilo abasebenzi ababhekana nazo ukuhlobana nohlelo le Recycling Programme kwiZinkaphani Zonenemathi KwaZulu-Natali
Umphenyi oyinhloko / s / umcwaningi: Inderia Reddy (Ukuhlonipha; Ukuphathwa Kwemvelo)
Co-Ivestigator / s / umphathi / s: Umqondisi: .Prof JK Adam (DTech: _Clinical Technology)
Co-Supervisor: Nksz. Shanaz Ghuman (Isiqu se-Master in Public.Health)

Isingeniso esifushane nenhloso yesifundo: Siyakwamukela futhi ngiyabonga ngokuba yingxenye yesifundo Sami.
Igama lami ngu-Inderia Reddy futhi ngifundela i-Master's degree Edurban University of Technology (ubuchwepheshe)...Abasebenzi abaningi bathinteka ngokusingatha imfucuza. Abaningi balaba Bantu abazi lutho ngezingozi zezempilo ezihlobene nokusingatha lezi zimfucuza ezihlukene zemfucuza. Injongo kulolu cwaningo ukuqonda izinga lokuqwashisa kanye nemibono abasebenzi abayenayo
Le nkinga efanele. Ingabe lolu hlelo lusetshenziswe ngokwanele ukuqinisekisa ukuthi konke okuhlobene nezingozi zezempilo zone zadalulwa futhi zatshelwa kubasebenzi?

Izinzuzo: Lokhu kuzosiza abasebenzi ukuthi babone izimo eziyingozi futh bazivikele ekuzilimazeni noma ukulimala nokubeka impilo yabo engcupheni kanye nezalabo abathandiweyo babo.

Isizathu / ukuthi kungani Umhlanganyeli Angahle Akhishwe Esifundweni: Ukuhlanganyela kwakho kulokhu ucwaningo uvolontiya ngokuphelele. Uncases uhoxise noma nini futhi lokhu ngeke kuthinte ukwelashwa kwakho.

Imali: Ngeke kube khona uhlobo lomholo. Ukubamba iqhaza kukuzithandela.
Izindleko Zocwaningo: Ngeke ucelwe ukuba uhlanganise nanoma yiziphi izindleko eziphathelene nesifundo.
Ukuyimfihlo: Yonke imininingwane eqoqwe kulogcaningo izogcinwa iyimfihlo. Uzonikezwa inombolo Futhi yonke imininingwane yakho izorekhodwa ngaphansi kwaleyo nombolo. Lokhu kusho ukuthi noma ubani obuka amarekhodi ngeke akwazi ukukulandelela. Lokhu kwenziwa ukuvikela ubumfihlo yakho. Ngaphezu kwalokho, isitatimende semfihlo sizosayinwa abaphathi bami ababili Kanye nami.
Ukulimala okuhlobene nocwaningo: Ngeke kube khona ukulimala okuhlobene nokucwaninga imininingwane yakho-

Abantu abazoxhumana nabo emcimbini wezinkinga noma imibuzo:
Sicela uxhumane noMcwaningi; Inderia-071 3530673), uSupervisor (Profrofesa J.K Adam - 031 373 3093) Umqondisi wangaphakathi (uNksz Shanaz Ghuman - 031 373 28071 noma umphathi we-DUT ethics
<031 373 2375. Noma uMfundisi C. Napier Actinc Director: Ukwesekwa kwePostraduate and Research (031 373 2326)
Noma carinn @ dut).

Appendix 7 : Consent form (English)

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Inderia Reddy about the nature, conduct, benefits and risks of this study.
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

Appendix 8 : Consent form (isiZulu)

KULUNGILE
Isitatimende Sesivumelwane Sokubamba iqhaza Esifundweni Sokucwaninga:

• Ngiyaqinisekisa ukuthi ngitshelwe umcwaningi, u-Inderia Reddy. Ngokuqondene nemvelo, ukuziphatha, izinzuzo kanye nezingozi zalolu cwaningo.
• Ngithole futhi, ngafunda futhi ngiyaqonda imininingwane ebhaliwe ngenhla (I-Letter Participant of Ulwazi) mayelana nokucwaninga.
• Ngiyazi ukuthi imiphumela yocwaningo, kufaka phakathi imininingwane yomuntu mayelana nobulili bami, ubudala,
usuku lokuzalwa, ukuqala kanye nokuxilongwa kuzokwaziswa ngokungaziwa Embikweni wokutadisha.
• Ngokubheka izidingo zocwaningo, ngiyavuma ukuthi idatha eqoqwe phakathi nalolu cwaningo ingakwazi
kusetshenziswe ohlelweni lwekhompyutha ngumcwaningi.
• Ngingakwazi, nganoma yisiphi isigaba, ngaphandle kokubandlulula, ngihoxise imvume yami nokuhlanganyela kulolu cwaningo.
• Nginethuba elanele lokubuza imibuzo futhi (ngokuzithandela kwami siqu) ngizibikezele ulungele ukuhlanganyela kulolu cwaningo.
• Ngiyaqonda ukuthi iziphumo ezintsha ezibalulekile zithuthukile phakathi nalolu cwaningo kungase kuhlobene nokuhlanganyela kwami kuzokwenziwa kimi.

_____	_____	_____	_____
Igama eliphelele lomhla	wokubamba	iqhaza	Usukulsignesha

Mina, _____(igama lomcwaningi) ngalokhu kuqinisekisa ukuthi umhlanganyeli ongenhla ugcwele
ukwaziswa ngesimo, ukuziphatha kanye nezingozi zesifundo esingenhla

_____	_____	_____
Igama eliphelele lomcwaningi	wokubamba	Usukulsiginesha

_____	_____	_____
Igama eliphelele loFakazi (uma likhona)	wokubamba	Usukulsiginesha

Appendix 9 : Questionnaire (English)

QUESTIONNAIRE

SCHOOL OF HEALTH SCIENCES

An Assessment of the Health Hazards that employees face due to the Recycling Programme at a Beverage Company in KwaZulu-Natal

INDUSTRY SURVEY

Section A: Demographic profile of respondents

A1. Please indicate your department:

- Automotive Sales and distribution
- Warehouse
- Quality assurance
- Engineering
- Projects
- Packaging
- Water treatment
- Processing
- Canteen

A2.Please indicate your grade:

- G grade
- H grade
- I grade
- Other Specify……

A3. Please indicate your highest level of education completed:

- No formal education
- Primary school
- Secondary school
- Diploma
- Undergraduate degree
- Postgraduate degree
- Adult Based Education (ABED)
- Other specify …….

A4. What is your age group?

- 18-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61-65

A5. What is your gender?

- Female
- Male

Section B: Awareness and education in relation to the recycling programme

B1. What is your understanding of this programme?

_____
_____
_____
_____

B2. Sufficient training was conducted regarding health hazards associated with recycling

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	

B3. Health hazards exist

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B4. Health hazards communicated

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B5. Health hazards are known

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B6. Aware of waste streams that are generated

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B7. Do hazards exist and will they affect you

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B8.We need to recycle

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B9. Impacts/consequences are associated with health hazards

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B10. Recycling trends/numbers vary

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B11. The increase or decrease in trends is evident

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B12.Key indicators remain constant

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B13. Personal Protective Equipment (PPE) needs to be used when dealing with waste

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B14.Awareness of current health hazards associated with recycling

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B15.Waste management practices are clear and concise

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B16.Waste management is a shared responsibility

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B17. Recycling practices are displayed on site

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B18. Reduce, reuse and recycle is the right thing to do (This applies to water, energy, effluent and waste management)

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

B19.There are major concerns regarding this programme

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

Section C: Attitudes and perceptions exhibited towards the programme

C1.This programme is beneficial to you

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C2.This recycling programme can be implemented at home

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C3.This recycling programme is of benefit to me

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C4. Team members contribute to this initiative

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C5. There challenges of implementing a programme of this nature.

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C6. It should be a priority to recycle waste

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C7.When we recycle we are heading in the right direction

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

C8.Waste separation at source is the correct thing to do

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

Section D: How can the programme be continuously improved

D1.Do you feel that the programme should be improved?

Yes	No

D2.What are your suggestions on improving the programme

_____
_____
_____
_____
_____
_____
_____

D3.The current set up of the recycling facility is apt for its intended purpose and to avoid health hazards

Strongly Disagree	Agree	Neither agree nor disagree	Disagree	Strongly Agree

D4. Do you think we should receive additional training regarding the health hazards associated with waste separation

Yes	No

D5. What are the barriers preventing you from continuously improving this system

_____
_____
_____
_____
_____
_____
_____

D6. What motivates you to want to make this programme work and ensure it's sustainable for the future

_____
_____
_____
_____
_____
_____

D7.How do we protect ourselves on site every day in relation to waste separation

_____
_____
_____
_____
_____
_____

D8. Are you aware of global best practices

Yes	No

D9. Can you suggest ways to reduce waste being recycled

_____
_____
_____
_____
_____
_____

#

Appendix 10 : Questionnaire (isiZulu)

ISITHOMBE 4
UMBUZO
ISIKOLO SESIKHATHI SEMPILO
Ukuhlolwa Kwezingozi Zempilo abasebenzi ababhekana nazo ngokuphathelene nokusetshenziswa kabusha
Uhlelo lwenkampanini ye-Beverage KwaZulu-Natal
INDUSTRY SURVEY

Isigaba A: Iphrofayli yezenhlalakahle zabaphenduli

A1.
Sicela ubonise umnyango wakho:
Ukuthengiswa kwezimoto nokusabalalisa
Indawo yokugcina impahla
Ukuqinisekisa ikhwalithi
Ubunjiniyela
Amaphrojekthi
Ukupakisha
Ukwelashwa kwamanzi
Iyacubungula
I-Canteen

A2.Pease ibonisa ibanga lakho:
G ibanga
H ibanga
N Ibanga
Okunye Cacisa …….

A3. Sicela ubonise izinga lakho eliphakeme lemfundo eliqediwe:
Ayikho imfundo ehlelekile
Isikole sebanga eliphansi
Isikole sebanga eliphezulu
I-Diploma
I-Undergraduate degree
I-postgraduate degree
Imfundo Eyisisekelo Yabantu Abadala (ABED)
Okunye ucacise……

A4. Iyini iqembu lakho leminyaka?
18-20
21-30
31-40
41-50
51-60
61-65

A5. Uyini ubulili bakho?

Owesifazane
Owesilisa

Isigaba B: Ukuqwashisa kanye nemfundo maqondana nohlelo

B1. Uyini ukuqonda kwakho lolu hlelo?

_____
_____
_____
_____
_____
_____

B2._ ^ ukuqeqeshwa okwanele kwenziwa mayelana ngezingozi zezempilo ezihlobene nokuvuselelwa kabusha

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B3. Izingozi zezempilo zikhona

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B4. Izingozi zezempilo zidaluliwe

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B5. Izingozi zezempilo ziyaziwa

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B6. Ukuqaphela Ukhamba kwemifucuza eyenziwa

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B7. Ingabe izingozi zikhona futhi azokuthinta

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu,

B8.Kudingeka senze kabusha (recycle)

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B9. Ama-Impact / iziphakamiso zihlotshaniswa nezingozi zezempilo

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B10. Ukusetshenziselwa kabusha kwe-trendsfnumbers kuyahlukahluka

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B11.Izinkomba eziyisikhombisa zihlala zimi ndawonye azijiki

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B12. Ukuvikelwa komuntu siqu:] ukuphulukiswa (PPE) kudinga ukusetshenziselwa lapho kusetshenziselwa udoti

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B13.Ukuqwashiswa kwezinhlekelele zempilo zamanje ezihlobene nokuvuselelwa kabusha

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B14.Ukuphathwa kwemfucuza kuyahlukaniswa ngokwezigaba

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

BI5 ^ Izindlela zokubuyisela kabusha zikhonjiswa enkaphanini

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B16. Ukunciphisa, ukuphinda phoned usebenzise kabusha futhi kuyinto efanele (Lokhu kusebenza emanzini, amandla, amafutha kanye nokuphathwa kwemfucuza)

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

B17.Kunalokho ukukhathazeka okukhulu mayelana nalolu hlelo Ngiyavuma kakhulu Ngiyavuma Ngiyavuma Angivumi kakhulu

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

SecUon C: Izingqondo nemibono evezwe ohlelweni

C1 .Lolu hlelo luzuzisa kuwe

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C2.Le nqubo yokuvuselela ingasetshenziswa ekhaya

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C3.Leli hlelo lokuphinda kabusha lizuzisa kimi

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C4. Amalungu eqembu ahlanganyela kulolu hlelo

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C5. Kukhona izinselele zokuqalisa uhlelo lwalolu hlobo.

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C6. I-shoud ibaluleke kakhulu ukubuyisela kabusha i-wjste

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C7. Uma siphinde sishintsha sihamba ngendlela efanele

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

C8.Ukuhlukanisa emthonjeni kuyinto efanele ukuyenza

Angivumi kakhulu	Angivumelani ’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

Isigaba D: Uhlelo lungenziwa kanjani ngcono ngokuqhubekayo

Dl. 0U inomuzwa wokuthi loluhlelo kufanele luvunyelwe?

Yebo	Cha Cha

D2. Ziyini iziphakamiso zakho ekuthuthukiseni uhlelo?

_____
_____
_____
_____
_____
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_____
_____
_____

D3.Ukusethwa kwamanje kwendawo yokubuyisela kabusha kuyisimo esifanele futhi kugwema izingozi zempilo

Angivumi kakhulu	Angivumelani’	Awuvumelani futhi awuphikisani	Ngiyavuma	Ngiyavuma kakhulu.

D4. Ucabanga ukuthi kufanele sithole ukuqeqeshwa okwengeziwe mayelana nezinhlekelele zempilo
Ehambisana nokuhlukaniswa kwenkunkuma

Yebo	Cha Cha

D5. Yiziphi izithiyo ezikuvimbela ekuthuthukiseni njalo lolu hlelo

_____
_____
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D6. Yini ekushukumisela ukuba ufune ukwenza lolu hlelo lusebenze futhi uqinisekise ukuthi luyinto
Ukusimama esikhathini esizayo

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_____
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D7.H0W sizivikela esizeni nsuku zonke maqondana nokuhlukaniswa kwemfucuza

_____
_____
_____
_____
_____
_____
_____

D8. Uyazi imikhuba emihle yomhlaba wonke

Yebo '	Cha Cha

D9. Ungasikisela izindlela zokunciphisa imfucuza yokuvuselelwa kabusha

_____
_____
_____
_____
_____
_____

Appendix 11: Certificate from the professional editor

EDITING / PROOFREADING CERTIFICATE

Editor details

DR NELLIE NARANJEE
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Masters Dissertation : An assessment of the health hazards that employees face in relation to the recycling programme at a Beverage company in Kwazulu-Natal

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Student number :

This is to certify that the above manuscript has been proofread and edited for English language grammar, punctuation, spelling, writing style, clarity, sentence structure and layout. The document is formatted according to the institutions requirements and guidelines. The logical presentation of ideas and the structure of the paper were also checked during the editing process. Neither the research content nor the author's intentions were altered in any way during the editing process.

I am a freelance editor specialising in proofreading and editing academic documents. All amendments were tracked with the Microsoft Word " Track Changes " feature and the document was returned to the author.The author has the option of accepting or rejecting each change individually. The author remains responsible for the correct application of the changes in the text and references.

I wish the authors all the best.

_____ 29 July 2022

DR NELLIE NARANJEE **DATE**

Appendix 12: Turnitin report

An Assessment of the Health Hazards that employees face in relation to the Recycling Programme at a Beverage company in KwaZulu-Natal

ORIGINALITY REPORT

9%	8%	6%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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