

An assessment of environmental awareness in a South African steel plant

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Abstract

During the 21st century, there has been a world-wide increase in the number of regional, national and global environmental challenges (Simsekli, 2015:222), therefore the topic of environmental sustainability has attracted considerable attention during the last decade (Paille & Raineri, 2015:2404). Many governments and stock exchanges now require organisations to provide some level of sustainability reporting. This has resulted in the so called “triple bottom line” reporting which focuses on economic prosperity, environmental quality and social justice.

Active participation from employees is impossible without having an understanding of how to contribute towards improving the organisation’s environmental performance. Therefore it is important for employees to be informed and/or trained on how they can contribute to the efforts of sustainability endorsed by the organisation (Perron, Côte & Duffy 2006:553).

The problem is that although many organisations provide environmental awareness training to employees, the outcome of such training is seldom assessed.

The aim of the research was to investigate what the level of environmental awareness is in a South African steel plant. A structured survey-based research study was conducted among the permanent employees of a selected department. This included literature review and the distribution of questionnaires to the employees in the selected department.

The aim of the research has been achieved and all the research sub-questions were answered. The study concludes that although the level of environmental awareness among employees is generally high there are actions that can be investigated and implemented to raise the level of environmental awareness even higher.

Keywords: Environmental awareness, environmental literacy, environmental challenges, steel industry, general induction

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List of Abbreviations

CO₂:	Carbon Dioxide
EMS:	Environmental Management System
KEIs:	Key Environmental Indicators
Kℓs:	Kilolitres
MTP:	Main Treatment Plant
MWh:	Megawatt Hour
TLS:	Tonne of liquid steel
ZED:	Zero Effluent Discharge

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CHAPTER 1: NATURE AND SCOPE OF THE STUDY

1.1 Introduction

This chapter introduces the research by presenting the background, problem statement and the main objectives of the study. The chapter concludes by describing the structure of the mini-dissertation.

In the 21st century there has been a world-wide increase in the number of global and national environmental problems and for this reason the topic of environmental sustainability and awareness has attracted considerable attention in the last ten years (Paille & Raineri, 2015:2404; Simsekli, 2015:222). All the current global and national environmental changes taking place and challenges faced by organisations and society as a whole, must be addressed with urgency, therefore, the importance of environmental education cannot be underestimated (Simsekli, 2015).

In today's world individuals and businesses are a lot more environmentally conscious. Therefore organisations can no longer afford to consider the environment in which they operate and the resources the organisation extracts from the environment as an externality to which no price can be attached. According to the World Health Organisation there is a direct relationship between human activities and the surrounding environment humans have the potential to either deteriorate or improve environmental health (Amin, Mahandi, Ibrahim, Yaacob, & Nasir, 2012:78).

One key aspect or necessary condition for a successful environmental management effort by any organisation is the presence of an effective environmental education and awareness training initiative (Perron, Côte & Duffy, 2006:551,554). By providing employees with information and training regarding the potential impacts the organisation's activities may have on the environment, employees will be in a position to play a more active role in the protection of the environment (Altin et al., 2014:1208; Saladié & Santos-Lacueva, 2016:54).

Paille and Raineri (2015:2404) cited in current research that human resource policies, corporate environmental policies, job attitudes, leadership experience, environmental stressors and environmental values are all drivers that lead individuals to perform the eco-friendly behaviour in the workplace. Therefore based on the reasons above organisations should seriously consider the implementation of an environmental awareness training programme. Such an environmental awareness training programme should be aimed at communicating to the organisations' employees lasting knowledge regarding the organisations' environmental management plan, environmental management policies and the potential impacts which the operations of the organisation may have on the surrounding environment (Perron *et al.*, 2006:551,554).

Saladié and Santos-Lacueva (2016:49) concluded in their research that the individual's behaviour towards environmental challenges (waste management as investigated in their study) should rather be changed by increasing their individual environmental awareness and not by compulsory regulations. The objective of an awareness campaign is to change human behaviour towards a certain aspect and that the existence of an awareness campaign may likely be the reason why individuals make environmental improvements (e.g. better waste separation); however, the existence of such an awareness campaign does not guarantee any improvements.

1.2 Background

Steel is the world's most used and recycled material and has been used by mankind for thousands of years. Several global indicators predicts that the world's steel consumption will increase from current consumption levels of 1,500 million tonnes to 2,500 million tonnes per annum up to the year 2050 (Sperle *et al.*, 2013:8). The projected increase in the global demand for steel and steel products will require increased steel production from the world's steel producing nations.

Globally the iron and steel industry consumes large volumes of natural resources, as part of the steel production process, including but not limited to iron ore, coal, dolomite and natural gas. The extraction of these natural resources used in the production of

steel through the use of mechanised equipment and methods results in various forms of environmental contamination including atmospheric pollution, water pollution, land pollution and land degradation (Zhao et al., 2015:247). The further processing and refinement of these primary input materials in steel producing plants results in additional environmental pollution and contamination in conjunction with the environmental pollution and degradation already caused through the extraction of the required raw input materials.

Currently, South Africa is an upper middle-income country and is the largest economy on the African continent (BusinessTech, 2016). Data from the World steel association places South Africa 23rd with a combined domestic crude steel production capacity of 6.4 million tonnes during 2015 (World steel association:2015:10). Furthermore, the World steel association attributes 0.4% of the global steel production to South African manufacturers of which ArcelorMittal South Africa is by far the biggest contributor (Centre for environmental rights (2015:8).

ArcelorMittal South Africa is part of the ArcelorMittal group, the world's largest steel producing company with industrial sites located in more than 20 countries globally and a presence in more than 60 countries. During 2015 ArcelorMittal ranked first in the world producing 97.1 million metric tonnes of steel, or 6 percent of global steel production, followed by Hesteel Group in second place with 47.7 million metric tonnes of steel produced (International trade administration, 2016:5). ArcelorMittal South Africa as a group is committed to minimising its operational impact on the surrounding environments through the identification of environmental compliance as one of the organisation's core values while driving to meet the requirements of compliance to increasingly stringent environmental legislation (ArcelorMittal, 2016:21).

Legislation regulating the operational activities and impacts of the organisation in South Africa includes the National Environmental Management Act No 107 of 1998 (SA, 1998); the National Environmental Management Air Quality Act No 39 of 2004 (SA, 2004); the National Water Act No 36 of 1998 (SA, 1998) and the National Environmental

Management Waste Act No 59 of 2008 (SA, 2008), all of which is fully or partially applicable to the organisation's operational activities.

ArcelorMittal South Africa Vanderbijlpark Works, located in Vanderbijlpark, Gauteng province, produces different steel products through an integrated process and is one of the world's largest inland steel mills, and the largest supplier of flat steel products in sub-Saharan Africa. The Vanderbijlpark Works are ISO 9002, and ISO 14001 accredited and employs approximately 4500 permanent staff (ArcelorMittal South Africa, 2014:4).

Vanderbijlpark Works encourage environmental awareness and provide training to employees regarding environmental awareness aspects through the use of different media such as physical classroom training sessions, powerpoint presentations and plant-specific inductions. For the year of 2016 ArcelorMittal South Africa as a group spent over 519 000 hours on employee training throughout its various plants, part of this training focused on plant specific inductions where environmental awareness aspects applicable to the organisation is discussed and covered, at a cost of R184 million (ArcelorMittal South Africa, 2016:6) .

In addition to the amount of formal training provided by the organisation during 2016, the organisation also spent in excess of R180 million on mitigating the company's environmental impacts. This financial expense included the installation an off-gas boiler at Vanderbijlpark Works at a cost of R138 million that will have a direct impact on reducing the organisation's emissions of carbon dioxide (CO₂) as a direct result of the steel making process; furthermore the Main Treatment Plant (MTP), treating process water, was also upgraded at a cost of R42 million. The upgrade to the Vanderbijlpark Works MTP plant will enable the business unit to reach and maintain a Zero Effluent Discharge (ZED) status (ArcelorMittal South Africa, 2016:49, 51).

It is important for developing countries, such as South Africa, to ensure sustainability and protect the environment while at the same time growing its economy (Smith and Dikgwatlhe, 2015:115). The evaluation of ArcelorMittal South Africa's environmental

performance as a group and Vanderbijlpark Works will become more significant as societies all over the world including South Africa strive to use natural resources more responsibly and become more environmentally sustainable. Society demands responsible environmental behaviour from both government and business (industries) by growing ever more aware of the degradation caused to the earth's ecosystems (Smith and Dikgwatlhe, 2015:115).

1.3 Problem statement

Globally the iron and steel industry consumes large volumes of natural resources which often results in severe environmental contamination (Zhao *et al.*, 2015:247). This is also the case in South Africa where the production of steel from raw materials results in environmental pollution, contamination and generation of various waste streams including general and hazardous waste.

ArcelorMittal South Africa as a company spends millions of Rands each year to training, retrain and refresh employees to work safely on the shop floor. While the content of general induction courses and plant specific inductions, mostly induction videos and class presentations followed by a formative assessment (tests on the content discussed and covered in the video and presentation), are primarily safety orientated. The most prominent aspects of "acceptable" environmental behaviour in the company's opinion is also included and covered during such inductions sessions.

The main objective of this study is to assess the environmental awareness of the waste and fleet department's employees employed permanently by ArcelorMittal South Africa Vanderbijlpark Works. Secondly, the study will make a recommendation based on the analysis of the results from the questionnaires completed by permanent employees in the waste and fleet department on possible methods the company can investigate implementing to raise the level of employee environmental awareness. Through evaluating the level of environmental awareness of the waste and fleet department's employees the company can assess if the current methods it employs, in an attempt to

raise the employees' level of environmental awareness on the most prominent aspects of acceptable environmental behaviour, is sufficient.

1.4 Objectives

1.4.1 Primary objective

The primary objective of the study is to assess the level of environmental awareness of the employees employed permanently in the waste and fleet department of ArcelorMittal South Africa, Vanderbijlpark Works and secondly to make recommendations to ArcelorMittal South Africa Vanderbijlpark Works on possible methods the company can investigate in order to raise the level of employee environmental awareness.

1.4.2 Secondary objectives

Secondary objectives have been set in addition to the primary objective of the study. The secondary objective can be divided into two parts namely: Secondary literature objectives and secondary empirical objectives.

Secondary literature objectives include:

- To define the concept of Environmental Awareness by conducting a literature study,
- Investigate the origin and development of environmental awareness;
- Investigate the importance of environmental awareness; and
- Seek in literature methods or ways to increase environmental awareness.

Secondary empirical objectives include:

- The construction of a questionnaire to assess what the current level of environmental awareness is among the permanent employees of the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works;
- To make conclusions and recommendation based on the literature study and empirical study on how ArcelorMittal South Africa Vanderbijlpark Works can proceed to possibly increase the level of environmental awareness among the waste and fleet department's employees.

1.5 Scope of the study

1.5.1 Field of the study

The study will only focus on permanent employees of ArcelorMittal South Africa employed in the waste and fleet department of the company. The waste and fleet department is a separate department which forms part of the Engineering Transport division of ArcelorMittal South Africa Vanderbijlpark Works.

The employees of the waste and fleet department were selected for the study based on the following reasons:

- The employees of the waste and fleet department are responsible that all waste generated on site (process waste, general waste and hazardous waste streams) is handled safely and disposed of correctly,
- Occasionally the employees of the waste and fleet department are required to guide employees from another department concerning waste management activities on site,
- Access of the researcher to the selected study population through engaging with various employees of the waste and fleet department on a daily and continues basis and,
- The personal working relationship the researcher has with the selected study population.

Figure 1.1 below provides a graphic illustration of the current Engineering Transport division and the seven departments which it entails.

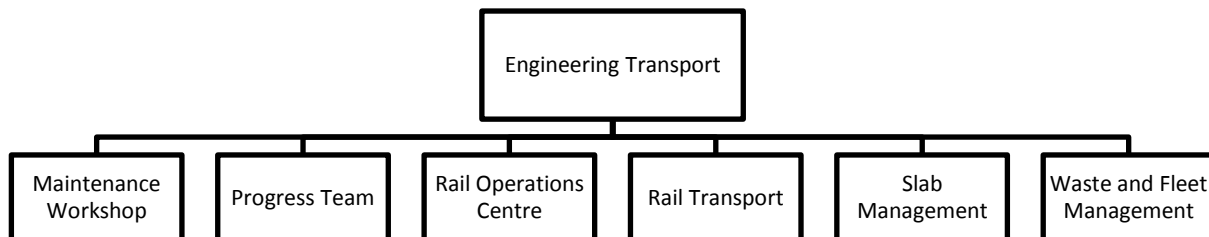


Figure 1.1: Organisational structure of the Engineering Transport department

1.5.2 Geographical demarcation

The study focused on ArcelorMittal South Africa Vanderbijlpark Works and the permanent employees of the waste and fleet department. ArcelorMittal South Africa Vanderbijlpark Works is located in the Gauteng province of South Africa. ArcelorMittal South Africa Vanderbijlpark Works GPS coordinates: E 27° 48' 19.6" S 26° 40' 22.3" (Integrated annual report, 2015:106).

Figure 1.2 below provides an aerial overview of the ArcelorMittal South Africa Vanderbijlpark Works. The orange line indicates the current operations border.



Figure 1.2: Aerial overview of the ArcelorMittal South Africa Vanderbijlpark Works

Source: ArcelorMittal South Africa (2015).

1.6 Research methodology

The study will be performed in two phases. The first phase will entail a literature review on the topic of environmental awareness in general, while the second phase will deal with an empirical study to investigate what the level of environmental awareness is among the permanent employees of the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works.

1.6.1 Literature review

To ensure the topic of environmental awareness were sufficiently covered a range of sources were consulted. The sources included published articles, scientific journals, textbooks and electronic sources from websites and search engines.

1.6.2 Empirical study

The empirical study will be conducted using a self-developed questionnaire. The questionnaire will be distributed to the permanent employees of ArcelorMittal South Africa Vanderbijlpark Works employed in the waste and fleet department.

The results of the questionnaires will be statistically analysed and will be used to arrive at conclusions on the different levels of environmental awareness among employees. Possible correlations between employee gender, highest qualification, current employment level and a number of years work experience, and the level of environmental awareness will be measured.

1.6.3 Sample population

The study focused only on the permanent employees of ArcelorMittal South Africa Vanderbijlpark Works employed in the waste and fleet department. The waste and fleet department currently employs 60 full time employees. The 60 full time employees are representative of both male and female employees of various ages, years of work experience and job level within the department. Both managerial and operational personnel were included in the study. Managerial personnel included: operational

managers, safety managers and area managers. Operational personnel included: support and administrative staff, safety officers, weighbridge operators and heavy equipment operators.

The researcher made use a non-random sampling method for the undertaking of the study. The non-probability sample type namely convenience sampling was selected due to the accessibility of the targeted study group to the researcher and the time limitation placed on the study (Bryman et al., 2016:178).

1.6.4 Construction of the questionnaire

The questionnaire used in the study was broken down into three sections.

- The first section of the questionnaire consisted of 4 (four) questions and dealt with the demographic information of the respondents. Questions in this section included the respondent's gender, age, population group, highest qualification, current employment level and years of working experience in ArcelorMittal South Africa Vanderbijlpark Works.
- The second section of the questionnaire consisted of 7 (seven) questions and focused on the respondents' awareness of the company's environmental policy, targets and objectives.
- The third section of the questionnaire consisted of 12 (twelve) questions and focused on the respondents' awareness regarding personal health and linked to company operational activities.

1.6.5 Data collection method

Eighty (80) self-developed questionnaires were distributed to the permanent employees of ArcelorMittal South Africa Vanderbijlpark Works employed in the waste and fleet department. The questionnaires were delivered to respondents either physically in hard copy or electronically using an e-mail. The method selected to distribute the questionnaires to respondents was based primarily on the individual's access to a company computer enabled with e-mail. All respondents were expected to physically fill

out the questionnaires where after a set cut-off date the researcher collected all the completed and returned questionnaires personally from respondents.

A letter printed on an official company letterhead, providing a short overview of the planned study, which was signed by the general manager of Vanderbijlpark Works and the works manager of the waste and fleet department was also included at the end of the distributed questionnaires. This letter confirmed to respondents that the questionnaires distributed had the required approval and support from the respective company managers.

1.6.6 Statistical analysis

The Statistical Consultation Services at the North-West University used Statistical Package for Social Sciences (SPSS version 24), SPSS Statistics. Frequency Tables, Descriptive statistics and T-Tests analysis was completed for the data.

1.7 Limitations of the study

The following aspects have been identified as limitations to the study. The study aimed at evaluating the level of environmental awareness in a South Africa steel plant. However, the study only focused on one specific steel plant in South Africa. Furthermore the study only focused on one specific department of the entire company. This is a limitation because the findings of the study cannot be taken as a general representation of the level of environmental awareness of the entire company.

1.8 Layout of the study

The study is divided into 4 (four) chapters. Figure 1.3 below provides a the graphical layout of the study.

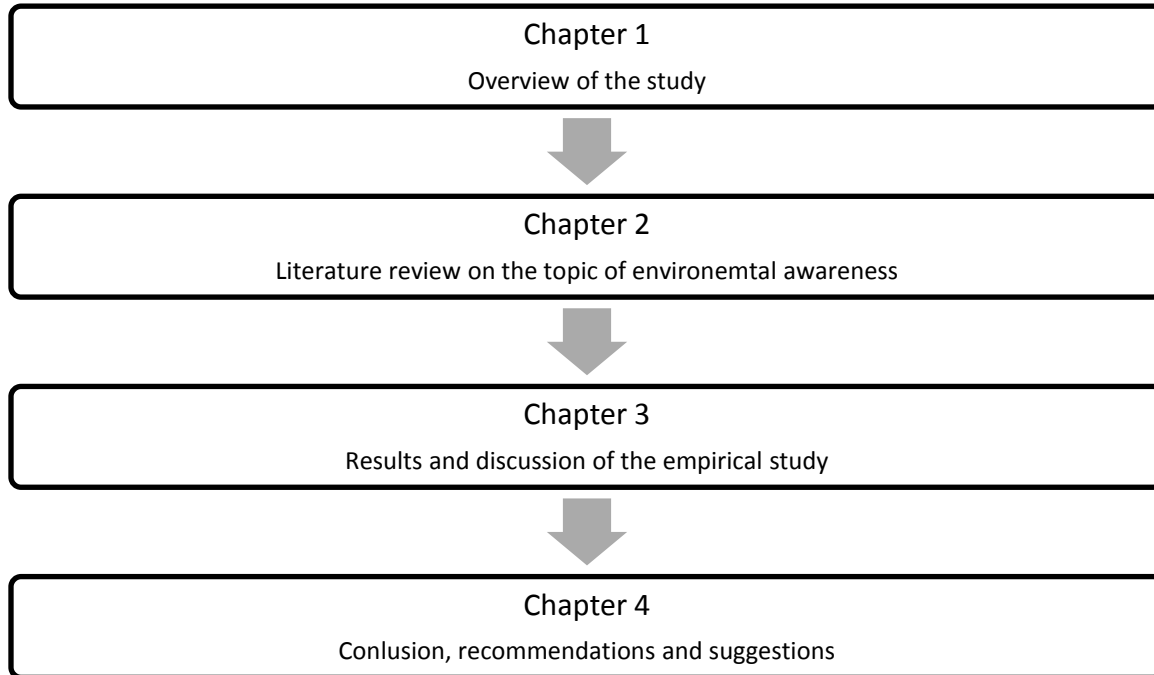


Figure 1.3: Layout of the study

Chapter 1 dealt with the introduction, background, problem statement, objectives, scope, research methodology and limitations of the study. In chapter 2 a literature review will be conducted that will cover the history of environmental awareness, why environmental awareness is important and how to increase environmental awareness. Furthermore, academic literature conducted on the subject of environmental awareness and findings of such studies will be discussed. Chapter 3 will cover and present the results of the empirical study including discussions of the results. Chapter 4 will include the conclusion of the study, and also cover recommendations to ArcelorMittal South Africa Vanderbijlpark Works on possible options that the company can investigate and use to possibly increase the level of environmental awareness in the company. The achievement of the study objectives and suggestions for future research will also be discussed.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides an introduction to environmental awareness and environmental literacy. Findings from the literature reviewed on the topic of environmental awareness are also presented in this chapter. The chapter concludes by providing an overview of the steel producing company on which the study focused including the most significant environmental impacts caused by the company's operations.

The environment includes all living and non-living objects. We as humans live in the environment and make use of environmental resources including air, land and water to meet our basic survival requirements (Camp & Heath-Camp, 2009:38). Environmental degradation caused by various anthropogenic factors to meet our human needs including air pollution, water pollution, waste generation and disposal poses a serious risk to man's survival. Environmental degradation is the deterioration of the environment through the depletion of resources such as air, water, soil, the destruction of ecosystems and the extinction of wild life. It can be defined as any change or disturbance to the environment perceived to be undesirable (Gwangndi, Muhammad & Tagi, 2016:487). Therefore the conservation and protection of the environment is vital for the survival and well-being of mankind. Natural resources such as land, air and water have to be used wisely and sustainably, as a trust, to ensure a healthy environment for the present and future generations (Ekins, 2002:72).

In the 21st century, there has been a world-wide increase in the number of regional, national and global environmental challenges (Simsekli, 2015:222). Table 2.1 below provides a summary of the most significant (although not all) environmental challenges that the world will face during the 21st Century and the associated impacts on the environment (Flower, 2015:249-252):

Table 2.1: Most significant environmental challenges for the 21st Century

Aspect	Associated environmental pressure/impact
Population Growth	Increased population growth and urbanisation results in increased energy demand, economic expansion and waste generation.
Pollution (air and water)	Increased number of automobiles in the world, lacking infrastructure (water and sewage treatment plants etc.) to support rapid population and industrial growth.
Energy	Environmental spills, topsoil degradation, acid mine drainage and freshwater pollution are all linked with the extraction of energy sources such as oil, gas, coal and mineral deposits.
Loss of biodiversity	Loss of key supporting ecosystems regulating the health of the planet through mining, deforestation and land conversion.
Global warming	Increased level of Green House Gases levels in the atmosphere resulting in changing weather patterns, more powerful natural storms and rising sea levels.

Source: Flower, 2015 (249-252)

Due to the reasons above relating to the most significant environmental challenges humanity will have to deal with in the 21st Century the topic of environmental sustainability has attracted considerable attention during the last decade (Paille & Raineri, 2015:2404). All of the current global environmental changes taking place must be addressed with urgency, and therefore the importance of environmental awareness cannot be underestimated (Simsekli, 2015).

2.1.1 Environmental awareness

To define the concept of environmental awareness, it is important first to understand the environmentalist movement. Environmentalism is an ideology aimed at reminding

humans of the importance of protecting their natural environment from anthropogenic impacts caused by humans themselves (Pachamama Alliance, 2017). According to the World Health Organization there exists a direct relationship between human activities and the surrounding environment, humans have the potential to either deteriorate, worsen the state of the environment through their actions, or improve environmental health (Amin *et al.*, 2012:78).

To better comprehend the topic of environmental awareness, the word awareness first needs to be defined. Awareness can be defined as a state or ability to perceive, to feel, or to be conscious of events, objects, or sensory patterns. In this level of consciousness, sense data can be confirmed by an observer without necessarily implying an understanding (Oxford Dictionary of English, 2013). Based on the definition of awareness above, environmental awareness can thus be described as an understanding of the fragility of our natural environment and the importance of protecting it.

An individual's level of environmental awareness can be raised by increasing an individual's environmental literacy.

2.1.2 Environmental literacy

The concept of literacy does not only focus on an individual's ability to read and write however it now includes the ability of an individual to understand, make informed decisions and to act accordingly in order to address some of the complex issues of modern society (Ibitz, 2017:4).

Environmental literacy therefore entails educating the population to view and use the environment in a responsible manner including behaving in such a manner which allows the population to leave an environment of the same and/or even better quality for future generations (Van Rooyen & Viljoen, 2003:15). Allers (1997:5) described environmental literacy as an individual's capacity to receive and interpret the relative health of their surrounding environment including the ability of the individual to make appropriate

decisions and take appropriate actions where required to restore, maintain and improve the health of their surrounding environment.

Environmental literacy can be raised through environmental education. Environmental education should not be limited to only formalised education, in other words, school education; however, the aim of environmental education should be able to reach a wider population which can be achieved through the use of informal education. Informal education can be defined as “organised education without formal schooling or institutionalisation, in which knowledge, skills and values are taught by relatives, peers or other community members” (Ibrahim, Osman & Bachok, 2011:3). Informal education includes planned and organised education including workshops and seminars conducted by organisations.

Through providing individuals and groups with environmental education the following benefits may be realised including:

➤ **An improved understanding of the environment**

Through the undertaking of environmental education, the targeted population (individuals being trained) will have improved knowledge regarding the specific environmental topic(s) covered during the educational session. The exposed population will have an improved understanding of the relationship between humans and the environment through the education provided.

➤ **Raise awareness on the topic of environment**

The exposed population will become familiar with the challenges facing nature and the environment, and through such exposure, individuals will be provided with potential ideas on how they can contribute towards the protection and perseverance of the environment.

➤ **Formation of an ethical society**

The exposed population will be trained to look at the impacts of human actions on the environment including how the environment influences their daily lives. This will potentially foster a discipline among the trained population and assist them to be

environmentally ethical, think more sustainably and make appropriate decisions to protect the environment (Ibrahimet al., 2011:3).

In organisations' participation of employees, to improve the environmental performance of the organisation depends on the utilisation of knowledge related to the topic of environmental awareness. Active participation from employees is impossible without them having an understanding of how they can contribute towards improving the organisation's environmental performance. The many small actions and decisions that all members of an organisation can make in their everyday work to improve the environmental performance of the organisation can cumulate to large improvements for the organisation. Therefore it is important for employees to be informed and/or trained on how they can contribute to the efforts of sustainability endorsed by the organisation (Perron, Côte & Duffy 2006:553)

According to Arny (2011:8) "A man who is environmental literate can discuss environmental problems and actively implement the required skills, to improve his surroundings". Increased environmental literacy should, therefore, promote increased environmental awareness among individuals.

2.2 Raising environmental awareness

According to Young *et al.* (2015:694) environmental awareness can be split into procedural knowledge and informational interventions. Procedural knowledge is knowledge an individual has regarding certain environmental approaches followed by their organisations. Examples of procedural knowledge include the knowledge an individual might have regarding the recycling of certain materials and the different methods that can be used to recycle such materials. On the other hand informational interventions refer to a combination of training in conjunction with visual aids, such as posters or stickers, to increase the individual's levels of environmental awareness. An example of a visual aid can be a poster or sticker serving as a reminder for individuals to switch off the office lights, air conditioners and their computers when clocking off work for the day.

Conradie (2003:129) stated that humans are well aware of the fact that many of their current practices will not be sustainable going into the future and that human well-being is dependent on the well-being of the surrounding natural environment. The researcher also stated that individuals' environmental awareness cannot be taken for granted but instead it must be fostered, nurtured and developed. Kollmuss and Agyeman (2002:256) concluded in their research that many individuals may be perfectly willing to change their behaviour to become more environmentally aware however this change does not realise due to a lack of persistence when it comes to the practising of the new behaviour until such behaviour has become a habit.

Law, Hills and Hau (2017:85) stated that the level of commitment employees has towards their employers can be enhanced by educating employees on the challenges faced by the business related to environmental ethics. The better the education (training) provided to employees, the stronger the relationship between environmental commitments and performance on sustainability.

Research by Altin *et al.* (2014) found that increased environmental literacy, raised through formal education, does not necessarily result in active environmental participation or a positive environmental attitude. The study investigated the correlation between environmental education in secondary schools and the environmental attitudes exhibited by students in three separate secondary schools in Balikesir City, Turkey. 62.2% of the participants were of the opinion that they would never or very seldom make use of environmental education learned and acquired in school. The research concluded that environmental awareness could not be taken for granted; instead environmental awareness needs to be nurtured and developed on a continuous basis (Altin *et al.*, 2014).

Perron *et al.* (2006) investigated if organisational employees' levels of environmental literacy were higher, following environmental management education and awareness training provided by their employer. The researchers focused on two international companies both operating in the Canadian electricity industry. Company A provided

employees with environmental management education and awareness training, while company B did not provide employees with similar training. The study found that employees from company A, who was exposed to environmental awareness training, had the same level of environmental knowledge when compared to employees from company B, who were not exposed to environmental awareness training. A recommendation was made by the researchers that organisations need to evaluate the outcome of their various training programmes, including environmental awareness training programmes, to assess the level of environmental literacy among employees following such training.

Perron *et al.* (2006) furthermore established during their study that different strata, in other words, different employment levels within an organisation, do not have the same level of environmental literacy or awareness. The researchers observed that one stratum might not be as well equipped, concerning their level of environmental literacy, to integrate information provided during environmental awareness training sessions when compared to other strata groups in the organisation. The researchers suggested that differences in the individual pre-training information base, namely the strata's current level of environmental literacy and awareness, should be taken into consideration when environmental awareness training is provided to employees. Perron *et al.* (2006) suggested that for organisations and organisational employees to benefit the most from environmental awareness training and exhibit increased levels of environmental literacy, training material of the organisation should be structured to best fit the level of environmental literacy exhibited by the specific organisational stratum group to be trained.

The following points can be used to shape the behaviour of individuals or groups of people to have more practical environmental awareness (Ibrahim *et al.*, 2011:3):

➤ **Individuals effort towards being more environmentally friendly**

Environmentally conscious behaviour starts with making small changes in an individual's daily routine. Such small actions which can be encouraged include:

using water more sparingly, improve separation and recycling of waste, turning off electrical appliances when not in use to mention a few examples.

➤ **Environmental awareness campaign**

Building on the point above, mass media can be used by organisations to increase the level of environmental awareness within the organisation. Mass media includes, information posters displaying environmentally friendly behaviour in the workplace, distribution of general communication to the workforce for example information flyers or mass communication (e-mails) and formal educational information sessions like compulsory training sessions.

There is substantial proof that feedback provided to employees on specific environmental related behaviours has a direct influence on their behaviour. Various studies have been conducted to support the above statement. A study by Staats *et al.* (2000) where a 6% reduction in office heating gas consumption observed was due to information and feedback being provided to employees including instructions on how to alter office thermostats. In addition to the instructions, the feedback included collective and individual feedback. Furthermore, a study by Schwartz *et al.* (2010) found that the provision of feedback on power consumption, in conjunction with supporting workshops resulted in reduced power consumption. Important was that results from power monitoring programmes should be presented in such a manner that employees can make practical sense of the data results and link the results to their behaviour regarding energy uses. Interestingly Schwartz *et al.* (2010) also noted that when feedback and support provided to employees stopped, employees reverted to their previous behaviours and the behavioural change that was being “installed” in employee began to fade.

A key component required by society to enable the transition into a low carbon economy in which natural resources are used sustainably is the development of what is commonly referred to as ‘green skills’. Green skills according to the Organisation for Economic Co-operation and Development (OECD) are the abilities, values and attitudes individuals require to build and support a sustainable and resource-efficient society

(OECD, 2013:3). One method that can be used to foster, nurture and develop individuals' environmental awareness is through education. Education plays a critical role when it comes to the raising of awareness related to different environmental challenges faced by society (Burns & Kovacs, 2014).

Environmental awareness does not only entail individuals having scientific knowledge regarding the environmental challenges modern society faces but also to be able to trade off immediate gains for long-term gains. To be able to achieve this level of intellectual capacity education systems will need to create critical thinkers who are in a position to connect their daily decisions to potential long-term consequences, not just for themselves, however, but for society as a collective (OECD, 2013:8).

2.3 ISO 14001 and Environmental awareness

ISO is the global federation of international standards. The ISO 14000 series is comprised of 20 separate standards ranging from environmental management systems to the assessments of products life-cycles (Tyira, 2012:14). The ISO 14001 Environmental Management System (EMS) is an internationally recognised standard developed by the ISO organisation. ISO 14001 is a management tool that enables an organisation of any size or type to identify and control the environmental impact of its activities, products or services, and furthermore to improve the organisation's environmental performance on a continuous basis (NSF, 2015:3).

To achieve improved environmental performance on an organisational level, ISO 14001 requires of the organisation to establish, implement, maintain and continually improve its environmental management system (EMS). Under point 7, subheading 7.3, of the ISO 14001:2015 EMS standard, the topic of (environmental) awareness is clearly set out and discussed. Under this subheading the following is stated: The organisation shall ensure that individuals doing work under the organisation's control are aware of:

- a) The organisation's environmental policy,
- b) The significant environmental aspects and related actual or potential environmental impacts associated with their work,

- c) The employees' contribution to the effectiveness of the environmental management system, including the benefits of enhanced environmental performance and,
- d) The implications of not conforming to the environmental management system requirements, including not fulfilling the organisation's compliance obligations.

From the above extract taken directly from the ISO14001:2015 EMS standard it is clear that any organisation wanting to achieve or which has achieved ISO 14001 EMS accreditation is required to spend a significant amount of time, financial resources and managerial talent to ensure that all individuals working under the organisation's control are aware of the role they play in the organisation including the potential impacts which employees' actions can have on the environment. Therefore the question that might arise is why do organisations want to become ISO 14001 accredited?

2.2.1 ISO 14001 and potential advantages for the organisation

There are various reasons why an organisation should strategically strive towards improving its environmental performance. Previous organisations which made use of the ISO14001 EMS standard reported the following business advantages following the implementing of the standard (ISO, 2015:3):

- Demonstrate compliance with current and future statutory and regulatory requirements and legislation,
- Increase the involvement of organisation leaders and increased engagement of organisation employees,
- Improvement in the reputation of the organisation and stakeholder confidence in the organisation through strategic communication,
- Achieve strategic business aims through the incorporation of environmental challenges into the business management process,
- Providing of a competitive and financial advantage through improved efficiencies and reduced costs and,
- Encourage better environmental performance of suppliers by integrating suppliers into the organisation business systems.

Furthermore Yin and Schmeidler (2009:482) concluded in their research that organisations that included performance management elements into the organisations' ISO14001 EMS standard were more likely to report greater environmental performance improvements and also more likely to report that ISO 14001 certification contributed towards the improvement in environmental performance when compared to an organisation who did not include performance measurements as part of their ISO 14001 standard.

2.4 The Steel industry

Organisations can no longer afford to consider the environment and the resources it extracts from the environment as an externality to which no price need be attached. The evaluation of an organisation's environmental performance will become more significant as societies all over the world strive to use natural resources more responsibly and sustainably. ArcelorMittal South Africa has made substantial financial investments on various fronts within the organisation with the aim of reducing operational impacts on the surrounding environment, using natural resources more sustainably and maintaining the organisation's license to operate.

Organisations operating in the manufacturing sector of a country are of significant interest when it comes to environmental impacts. Manufacturing organisations generally consume large amounts of energy like electricity and natural gas and have high levels of pollution outputs (Whitehead, 2013:8). The iron and steel industry is no different and is the world's largest energy consuming manufacturing industry (Olmez et al., 2016:195). Globally the processes involved in the production of steel uses large quantities of natural resources as input materials to arrive at the final products as illustrated in figure 2.1 below (Burchart-Korol, 2013:235).

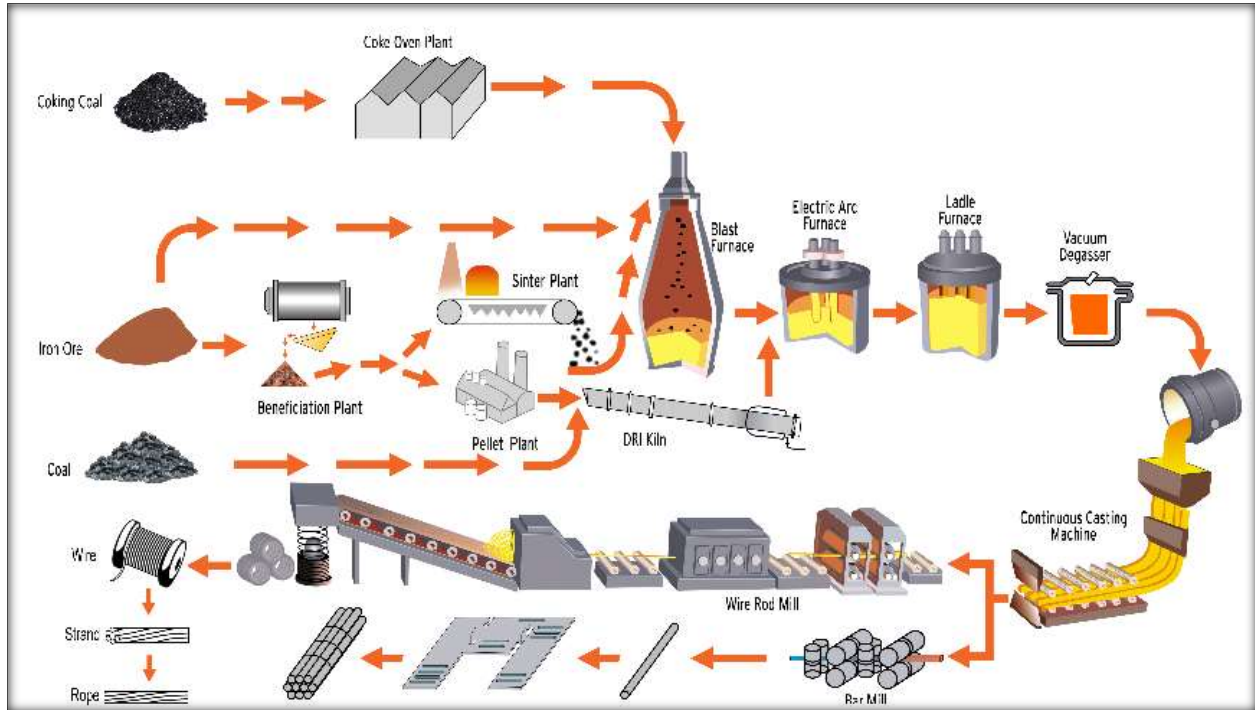


Figure 2.1: Schematic overview of an integrated steelmaking process

Source: Usha martin (2015).

A manufacturing organisation does not necessarily require a formal environmental management system (EMS) to act in an environmentally responsible and sustainable manner. Environmental responsibility can be attributed to any organisation which seeks to limit or prevent environmental degradation or take specific actions with the purpose of improving the existing environment. Environmental responsibility displayed by organisations can be in many forms form waste minimisation, energy efficiency, reductions in water consumption, reduction in direct and indirect emissions or the adaptation of a formal environmental policy such as ISO 14001 (Whitehead, 2013:9).

2.4.1 ArcelorMittal South Africa

ArcelorMittal South Africa as a group is the largest steel producer on the African continent with a production capacity of 6.1 million tonnes of liquid steel per annum, and after compensating for various yield, factors can produce approximately 5.2 million tonnes of saleable steel products per annum.

During 2016 the most material environmental challenges identified and faced by ArcelorMittal South Africa resulting directly from the organisation's activities were:

- Fresh water management
- Emissions to air
- Energy efficiency
- By-product utilisation

Material environmental challenges specifically for ArcelorMittal South Africa, refer to different impacts on the environment, as a result of the company's operation, which the company can measure and quantify. An example, as already mentioned above, is freshwater management. ArcelorMittal South Africa can accurately and consciously measure the amount of fresh water it extracts from the surrounding environment. The measurement approach is also applicable to the other material environmental challenges mentioned above.

Description of selected environmental challenges faced by ArcelorMittal South Africa:

Emissions to air. Emissions to air, also known as atmospheric emissions, include both point pollution and diffuse pollution. Point sources of pollution include stacks located at various plants emitting process gases from the production processes into the atmosphere. Diffuse sources of pollution include dust generated by the handling of raw materials used in the steel production process. Dust generated by the travelling of heavy equipment and medium vehicles on dirt roads and exhaust emissions of various operational and personal vehicles use on site.

Freshwater management. Fresh water is a non-renewable natural resource. Freshwater can be wasted and contaminated in some ways. Wastage of fresh water on site includes the unnecessary leaking of taps and toilets, leaking pipelines transporting fresh water to various plants and ageing and poorly maintained fresh water infrastructure such as piping networks. Contamination of fresh water occurs when fresh water, from a rain event, comes into contact with process water due to poor stormwater

runoff management on site and the improper disposal of hazardous chemicals such as paint into domestic water drainage systems.

Energy efficiency: Electricity is wasted primarily during production delays or plant breakdowns. It has been found that in many instances the entire plant, especially the production machinery downstream was still running, ready to process upstream material. However, at such time there was no material to be processed due to a breakdown or material shortage earlier in the production process. This results in large amounts of electric wasted by the unnecessarily idling of plants and equipment. Also office-bound personnel also contributed towards energy inefficiency by not switching off office lights, air conditioners and computers when vacating offices at the end of the working day.

By-product utilisation: Not all byproducts have alternative uses at the end of the specific process and therefore becomes waste streams which are disposed of.

The organisation has established Key Environmental Indicators (KEIs) to assist it in the measurement of progress made towards producing steel in the most environmentally friendly and sustainable manner. The organisation's KEIs corresponds with the key environmental challenges identified by the organisation and includes the measurement of emissions to air, fresh water intake and the percentage of by-products not utilised. The percentage of by-products not utilised includes by-products which cannot be sold for other purposes or uses and need to be landfilled (Integrated annual report ArcelorMittal South Africa, 2016:29)

The organisation as a collective consumed large quantities of non-renewable natural resources as part of the integrated steel production process. During 2016 the organisation consumed 6 604 kilotons of iron ore, 4 014 kilotons of coal, 684 kilotons of scrap and 1 733 kilotons of fluxes, which includes dolomite and lime. Figure 2.1 below depicts the annual consumption of primary raw materials at ArcelorMittal South Africa's operations over the past three (3) years (2014-2017).

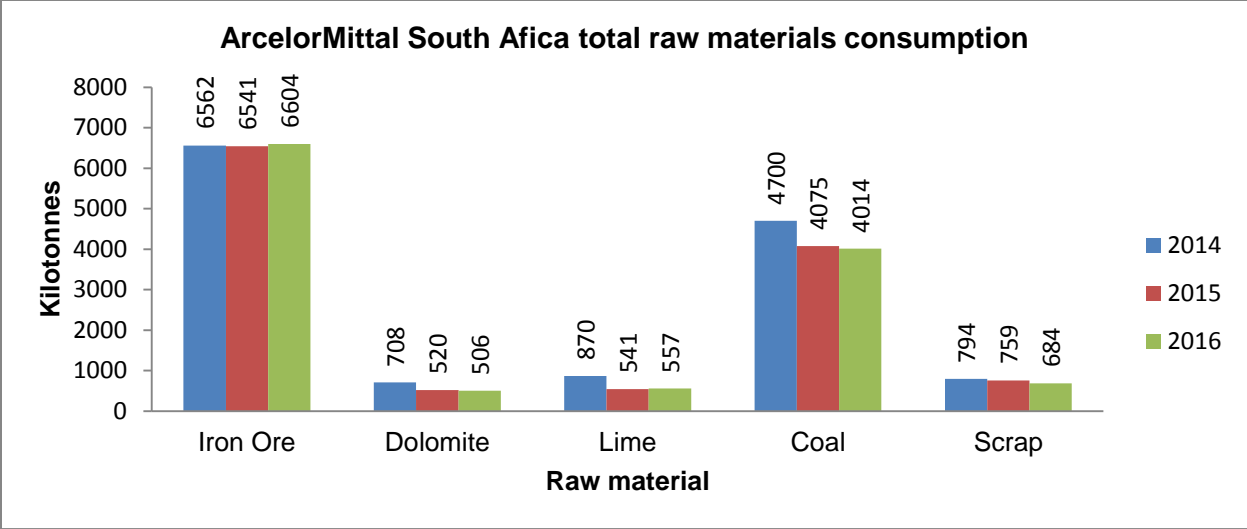


Figure 2.2: ArcelorMittal South Africa raw material consumption over the past three years

In addition to the primary raw materials required for the production of steel, water is also a key resource. Currently (2016) at ArcelorMittal South Africa fresh water intake is 3.24 kilolitres per tonne of liquid steel. The organisation has made exceptional progress with regards to fresh water management during the course of the last decade. At 15 475 311kℓ (kilolitres) the organisation’s total fresh water intake for 2016 was 16% lower than the 18,418,173kℓ consumed during 2015. Comparing the 2016 annual fresh water abstraction statistics with the 2005 fresh water abstraction statistics, the organisation’s overall absolute water abstraction declined with 54% over an 11 year period. This 54% reduction in fresh water abstraction is a clear indication that the organisation is committed to producing steel more sustainably while at the same time limiting the exhaustion of natural resources (Integrated annual report ArcelorMittal South Africa, 2016:50).

The reduction in overall fresh water intake for the organisation was achieved through substantial investments including an R42 million investment in the Vanderbijlpark Works business unit to return the business unit to zero effluent discharge (ZED) status. The achievement of ZED status allowed the Vanderbijlpark business unit to increase the quantity of process water reuse within the works and subsequently decreasing the

quantity for freshwater abstracted from the environment (Integrated annual report ArcelorMittal South Africa, 2016:51).

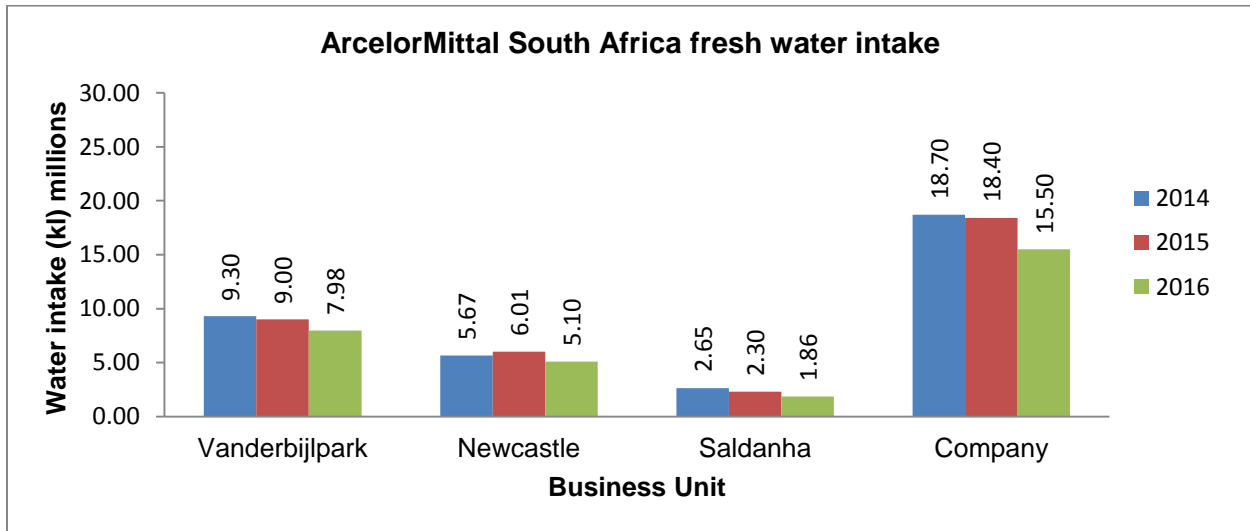


Figure 2.3: ArcelorMittal South Africa freshwater consumption over the past three years

ArcelorMittal South Africa furthermore consumes large quantities of electricity. Although figure 2.4 below depicts a reduction in electricity consumption over a 3-year period of 2014 to 2016, measured in megawatt hour (MWh) per tonne of liquid steel (TLS) produced, the reduction in electricity consumption can be linked back to several external factors not directly in the organisation’s control. Weakened domestic and international demand for steel products, increased steel imports specifically from China and lack of government spending on infrastructure projects are also some factors contributing to towards lower production outputs and resulting in decreased electricity consumptions (Integrated annual report ArcelorMittal South Africa, 2016:10).

In addition to the factors mentioned above the organisation proceeded to invested R138 million in the installation of an off-gas boiler at its Vanderbijlpark Works business unit which will allow the organisation to generate 10 MW (megawatt hours) of in-house electricity annually, through utilising production off-gases and thereby becoming more energy efficient, while at the same time reducing the organisation’s direct CO₂ emissions into the environment.

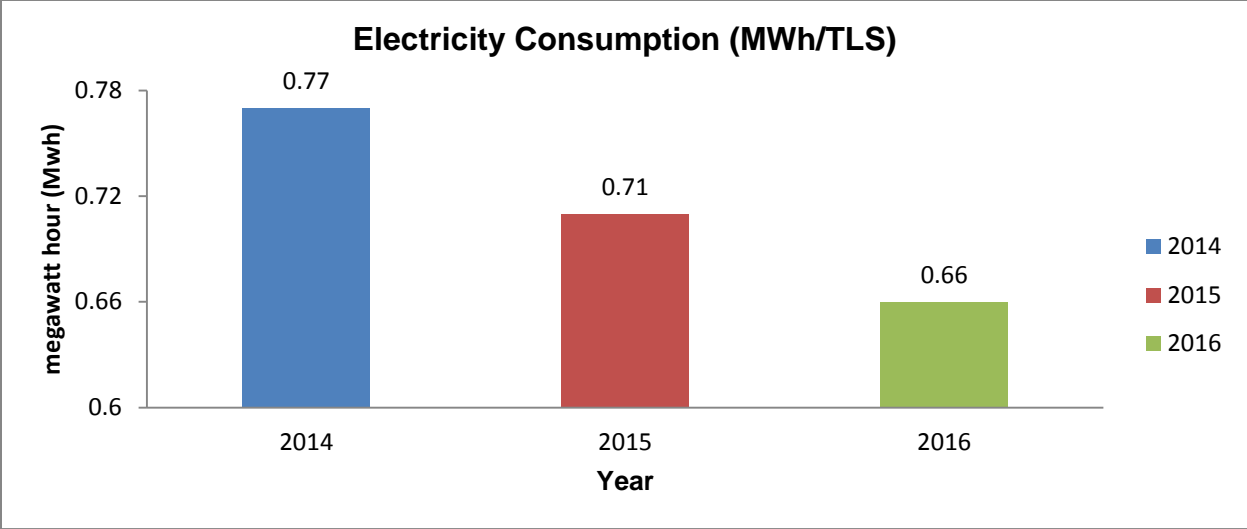


Figure 2.4: ArcelorMittal South Africa electricity consumption over the past three years

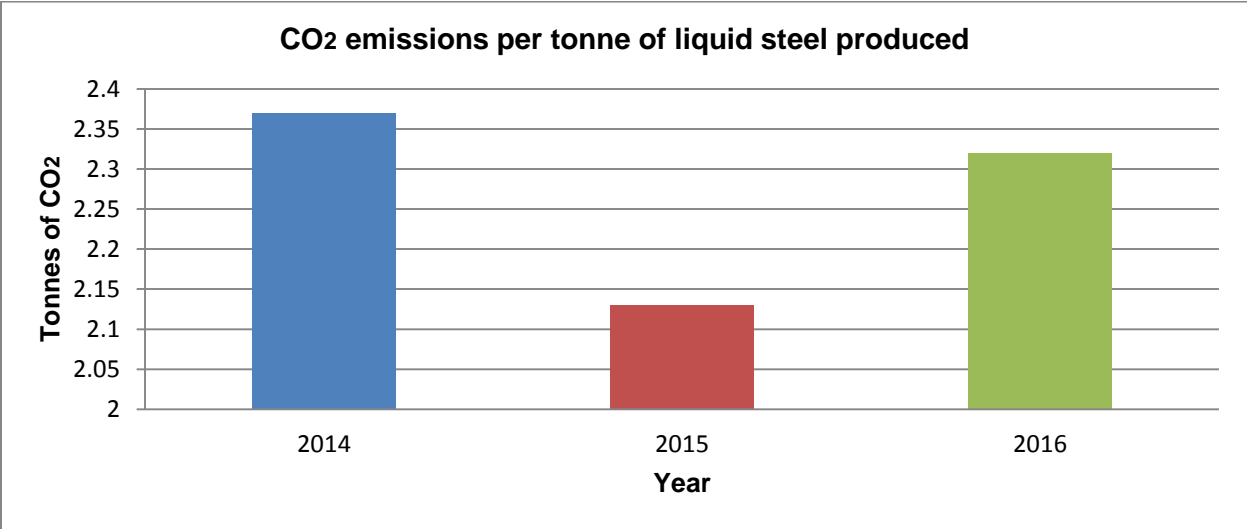


Figure 2.5: ArcelorMittal South Africa CO2 emissions per tonnes of liquid steel produced for the past three years

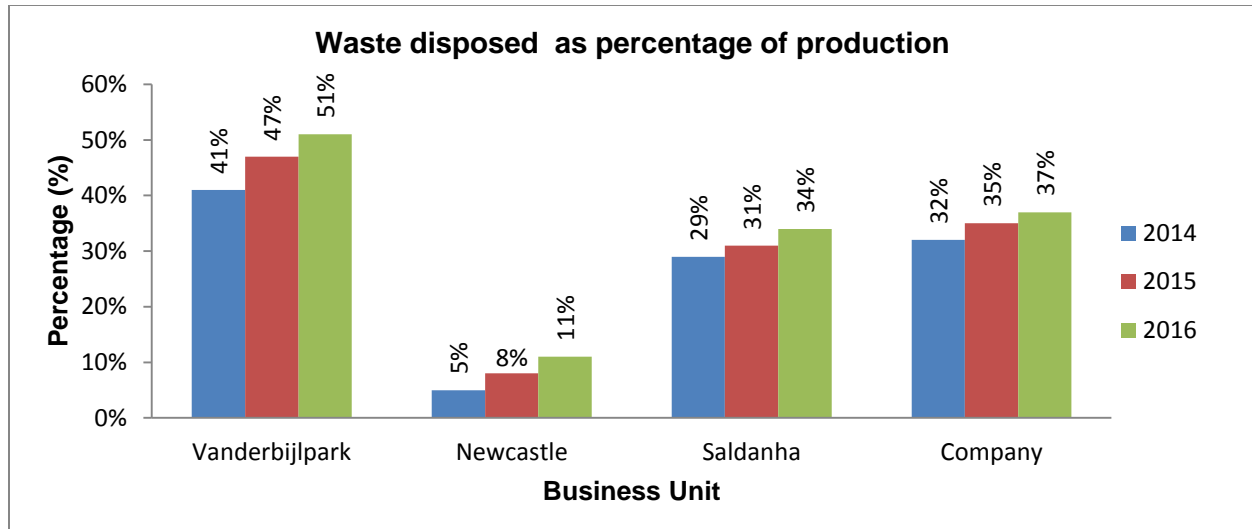


Figure 2.6: ArcelorMittal South Africa waste disposal as percentage of production for the past three years

Producing steel from raw materials does impact the environment on various fronts. ArcelorMittal South Africa is aware of its operational impacts on the surrounding environment and has therefore proceeded to invest in technologies to assist the organisation in lowering such impacts while simultaneously increasing the long-term sustainability of the steelmaking processes and industry. In conjunction with the direct financial investments, the company is making to improve its environmental performance the company is also investing in their employees. Employees receive continuous training, in the form of inductions and classroom training, on mostly safety-related matters which the company deems important. However, during inductions and classroom training session's important aspects of acceptable environmental behaviour, in the company's opinion, is also covered.

Specific environmental challenges faced by the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works includes the following:

- Employees not following selected work procedures
- Employees disposing waste incorrectly
- Employees not being aware of the company's environmental targets and objectives

Summary

Environmental awareness is developing on an international scale. However, this awareness is not always visible in the environmental behaviour of organisations. Communities all over the world are forcing organisations to become more environmentally responsible. This includes organisations implementing the necessary actions to minimise the impact of operational activities on the natural environment.

ArcelorMittal South Africa as an organisation is committed to minimising its operational impact on the surrounding environments while fulfilling the requirements of compliance with increasingly stringent legislation enforced on the company and its operations. One aspect in which the organisation can invest with the aim of bettering its environmental performance is in its workforce.

Raised levels of environmental awareness should enable the workforce to understand that certain actions can either directly or indirectly negatively impact the surrounding environment. Negative impacts on the surrounding environment can be the results of various actions. The impact of these actions does not only hold potential negative consequences for the organisation, however it may also impact on society as a whole.

Various actions can be implemented within organisations to raise the workforce's level of environmental awareness. Selected actions which can be implemented includes providing the workforce with regular feedback on the environmental performance of the organisation, implementation of an environmental awareness campaign within the organisation and providing training to the workforce on the topic of environmental awareness.

CHAPTER 3: Results and discussions

3.1 Introduction

The empirical study focuses on the environmental awareness of the waste and fleet department employees at ArcelorMittal South Africa Vanderbijlpark Works. The chapter provides the outline of the research design, data analysis and the methodology of execution. The results of the empirical study will also be presented and discussed.

3.2 Ethical considerations

The confidentiality of participants who responded to the questionnaires was assured. There is no way that any of the respondents to the study can be identified on an individual basis given the structure of the questionnaire. The individual findings of the questionnaires will be treated confidentially, and any issues raised by individual respondents will only be discussed with that particular respondent in an instance if the need for further discussion exists. Respondents were informed as to the purpose of the study. The participation of all the respondents to the study was voluntary.

3.3 Constraints and limitations

The following aspects have been identified as limitations to the study. The study aimed at evaluating the level of environmental awareness in a South Africa steel plant. However, the study only focused on one specific steel plant in South Africa. Furthermore the study also focused on only one specific department of the entire company. Selected respondents who participated in the study did not answer all the questions posed by the questionnaire.

The above mentioned points are therefore limitations to the study because the findings of the study cannot be taken as a general representation for the level of environmental awareness for the entire company.

3.4 Questionnaire design

The questionnaire used in the study was a self-developed questionnaire. The questionnaire was designed to assess the level of environmental awareness currently experience by permanent employees of ArcelorMittal South Africa Vanderbijlpark Works employed in the waste and fleet department. The questionnaire was divided into three sections with each section addressing different aspects. The questionnaire was sent to the Statistical Consultation Services at the North-West University for a review regarding face validity before it was sent out to the targeted sample group. The general section layout of the questionnaire is presented in Table 3.1 below. A copy of the questionnaire is attached as Appendix A.

Table 3.1: Questionnaire sections and purpose of each section

Section	Purpose of the section
Section A	Demographic information: Section A of the questionnaire gathered data regarding the demographics of the respondents. Questions in this section included the respondents' gender, age, population group, highest qualification level, current employment level and years of work experience within the company.
Section B	Induction knowledge: Section B of the questionnaire focused on respondents' knowledge regarding selected environmental aspects including, awareness of the company's environmental policy, awareness of the company's environmental performance targets, objectives and level of satisfaction with the content and understandability of the general induction material.
Section C	Environmental awareness information: This section assessed the degree to which respondents believe the company's operations have an effect on their health and the natural environment.

3.5 Study population and sample size

The targeted study population of the study was the permanent employees of ArcelorMittal South Africa employed in the waste and fleet department of the company. The researcher targeted 80 employees however only 54 employees responded resulting in a 67.5% response rate. The convenient sampling method was preferred because of the access and personal relationship of the researcher with the targeted study population.

3.6 Statistical analysis of the data

The data obtained from the 54 questionnaires returned was sent to the Statistical Consultation Service (SCS) of the North-West University via an MS Excel spreadsheet for analysis purposes. The programme used by SCS to analyse the data was IBM Statistical Package for Social Sciences (SPSS version 24), SPSS Statistics. Frequency Tables, Descriptive statistics and T-Tests analysis was conducted on the data.

3.7 Demographic information

The results are based on the responses obtained from the returned questionnaires distributed to the permanent employees of the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works. This section represents the gender, age, population group, highest qualification, current employment level and years of work experience with the company.

3.7.1 Gender of the respondents

Table 3.2 below presents the gender distribution of the respondents. 49 respondents were male (90.7%) and only five respondents were female (9.3%). The results come as no surprise as the steel industry is a male-dominated industry.

Table 3.2: Gender distribution

Gender	Frequency (n)	Percent (%)
Male	49	90.7

Female	5	9.3
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3.7.2 Age of the respondents

Table 3.3 below presents an overview of the age distribution of the respondents. Eleven (20.4%) of the respondents were between 45-49 years of age, followed by nine (16.7%) of respondent falling in the age group of 30-34 years of age and eight (14.8%) falling within the 40-44 years of age group.

Table 3.3: Age distribution

Age	Frequency (n)	Percent (%)
18-24	2	3.7
25-29	5	9.3
30-34	9	16.7
35-39	6	11.1
40-44	8	14.8
45-49	11	20.4
50-54	7	13.0
55-59	5	9.3
60-64	1	1.9

3.7.3 Population group of respondents

Thirty-four (34, 63%) of the respondents were African, and twenty (20, 37%) respondents were White as shown in Table 3.4 below.

Table 3.4: Population group distribution

Population group	Frequency (n)	Percent (%)
African	34	63.0
White	20	37.0

3.7.4 Highest qualification level of the respondents

Twenty four (44.4%) respondents had not completed Grade 12, while twenty-five (46.3%) respondents completed Grade 12. Three (5.6%) respondents held a diploma, only one (1.9%) respondent had a degree, and another one (1.9%) had an honours

degree. Table 3.5 below represents an overview of the respondents' highest qualification breakdown. The percentage of respondents who had not finished Grade 12 came as a surprise. This may result in some respondents having limited written comprehension skills.

Table 3.5: Highest qualification

Highest qualification	Frequency (n)	Percent (%)
< Grade 12	24	44.4
Grade 12	25	46.3
Diploma	3	5.6
Degree	1	1.9
Honours	1	1.9

3.7.5 Current employment level of the respondents

From Table 3.6 below, twenty four (46.2%) respondents are employed as equipment operators, nine (17.3%) respondents specific job titles was not included in the options provided and they were classified as other and seven (13.5%) respondents are employed with the job title supervisor/foreman. The result that the majority of respondents are employed as equipment operators comes as no surprise as the primary function of the waste and fleet department is delivering waste related services including operational equipment used in waste management activities.

Table 3.6: Current employment level

Current employment level	Frequency (n)	Percent (%)
General worker	4	7.7
Equipment operator	24	46.2
Supervisor or foreman	7	13.5
Specialist	6	11.5
Senior management	2	3.8
Other	9	17.3

3.7.6 Respondents years' of working experience at the company

Fourteen (26.9%) respondents had between 0-3 years of work experience, thirteen (25.0%) respondents had between 6 - 10 years of work experience and eight (15.4%) respondents had between 4 - 5 years and 11 - 15 years of work experience. Table 3.7 below provides an overview of respondents' work experience distribution.

Table 3.7: Years of work experience

Years of work experience	Frequency (n)	Percent (%)
0 – 3	14	26.9
4 – 5	8	15.4
6 – 10	13	25.0
11 – 15	8	15.4
16 – 20	3	5.8
21 +	6	11.5

3.8 Induction knowledge

The main aim of section B of the questionnaire was to determine respondents' knowledge and awareness regarding selected company related environmental aspects including, awareness of the company's environmental policy, awareness of the company's environmental performance targets and objectives and the information provided in general induction regarding environmental responsible behaviour in the workplace and the ease to understand this information.

3.8.1 Respondents' awareness of the company's environmental policy

As can be seen from Figure 3.1 thirty-one (57.4%) respondents agreed that they are aware of the company's environmental policy while sixteen (29.6%) respondents strongly agreed. The calculated mean was 4.09 (SD = 0.853), indicating that respondents on average agreed with this statement.

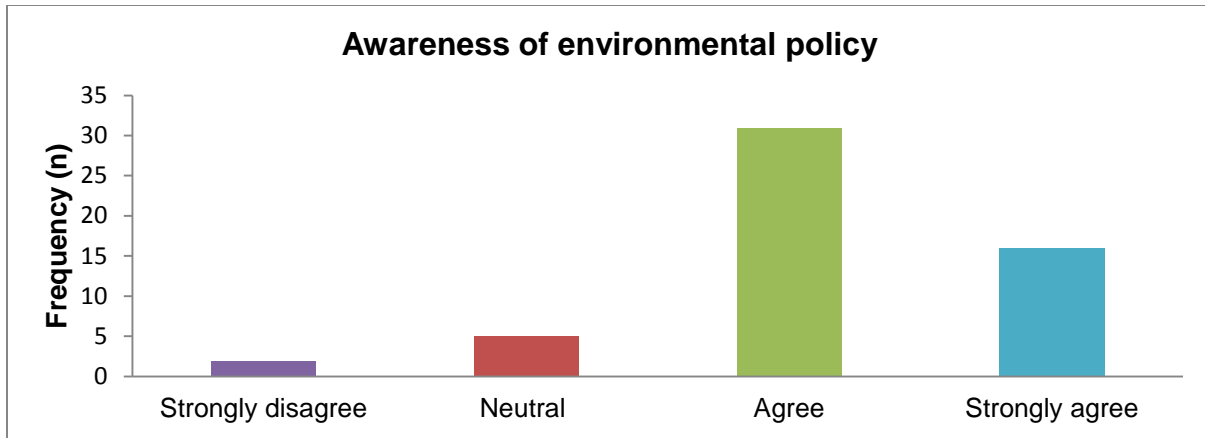


Figure 3.1: Awareness of environmental policy

3.8.2 Internal communication of the company’s environmental policy

Fifty-two (96.3%) respondents stated that the company’s environmental policy is communicated within the company while only two (3.7%) respondents stated the environmental policy is not communicated as shown in Figure 3.2 below.

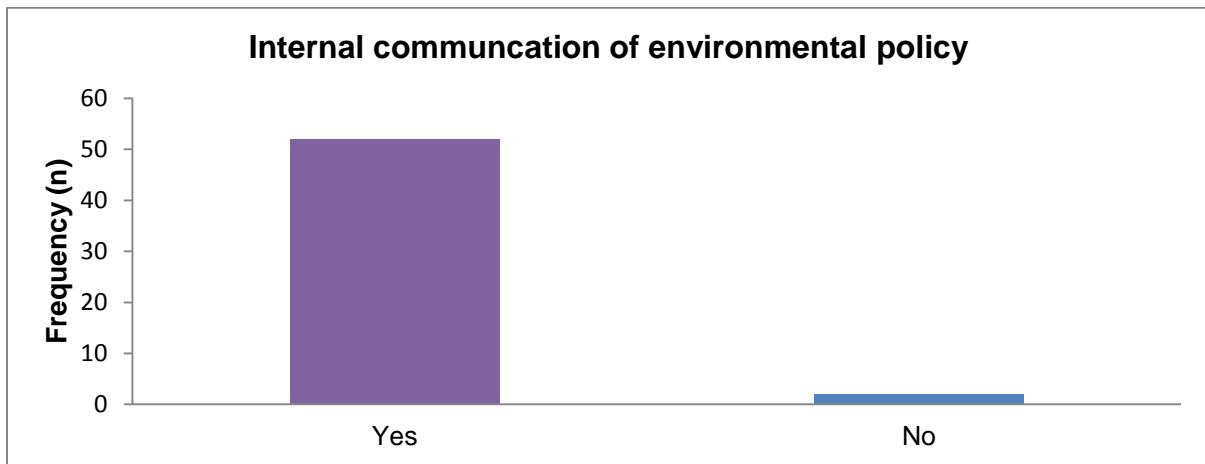


Figure 3.2: Internal communication of environmental policy

3.8.3 Awareness of the company’s environmental performance targets and objectives

Figure 3.3 below, nineteen (35.2%) respondents agreed that they are aware of the company’s environmental performance targets and objectives while sixteen (29.6%)

respondents disagreed with the statement. The calculated mean was 3.24 (SD = 1.196), indicating that respondents on average were neutral about this statement.

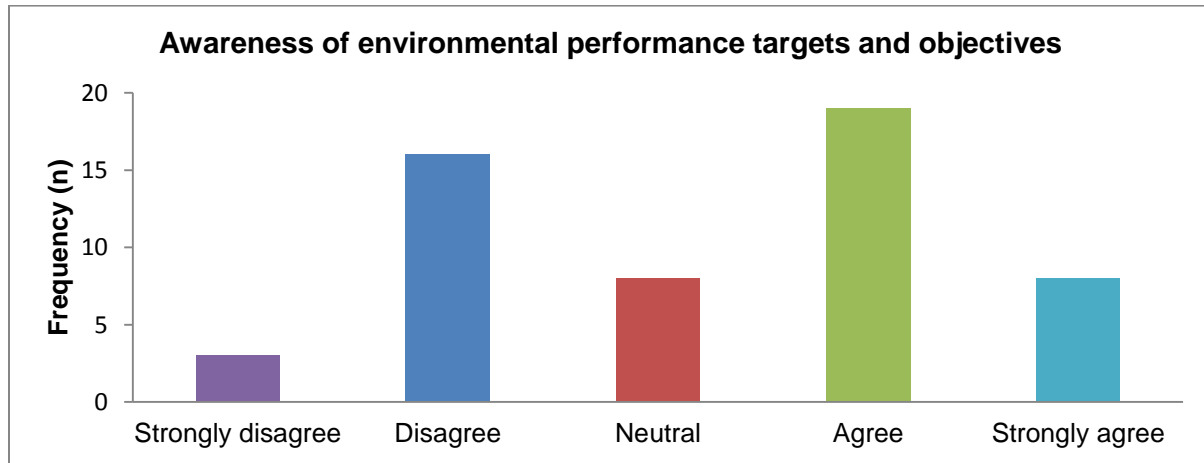


Figure 3.3: Awareness of environmental performance targets and objectives

3.8.4 Active measurement of the company's progress towards achieving set environmental targets and objectives

Thirty-one (57.4%) respondents agreed, and ten (18.5%) respondents strongly agreed that the company is actively measuring progress made towards the achievement of set environmental performance targets and objectives, while nine (16.7%) respondents felt neutral neither agreeing nor disagreeing. Figure 3.4 below displays the results. The calculated mean was 3.87 (SD = 0.802), indicating that respondents on average agreed with this statement.

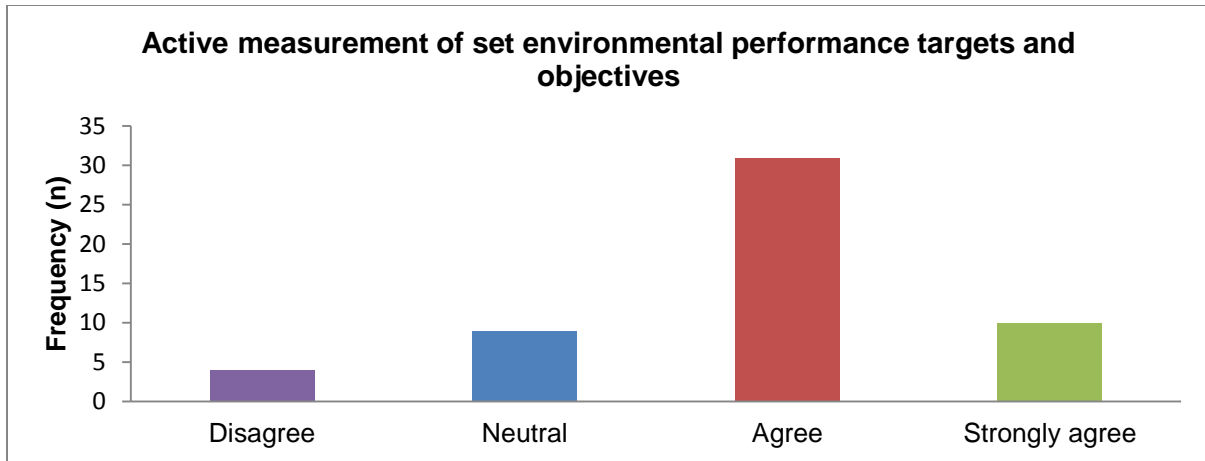


Figure 3.4: Active measurement of set environmental performance targets and objectives

3.8.5 Feedback regarding the company’s performance against set environmental targets and objectives

In Figure 3.5 below seventeen (31.5%) respondents disagreed, and sixteen (29.6%) respondents agreed that they received regular feedback on how the company is performing against set environmental performance targets and objectives. The calculated mean was 2.83 (SD = 1.342), indicating that respondents on average felt neutral about this statement.

It is interesting to note that the company’s employees are aware of the environmental policy and the environmental policy is effectively communicated internally. However many respondents felt neutral about the level of feedback provided relating to the company’s performance against the set environmental targets and objectives is provided.

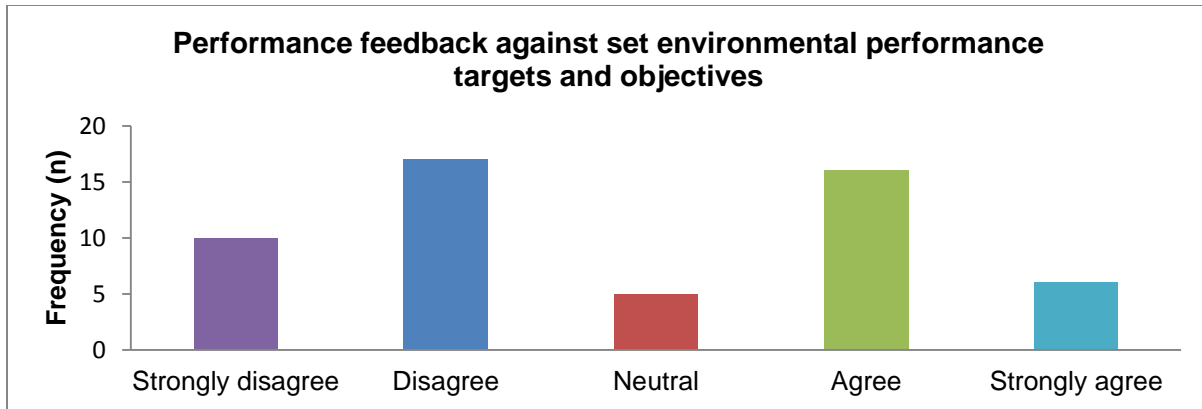


Figure 3.5: Performance feedback against set environmental performance targets and objectives

3.8.6 Sufficiency of information provided in general induction regarding environmental responsible behaviour in the workplace

Thirty two (59.3%) respondents agreed and fifteen (27.8%) respondents strongly agreed that the information provided in the general induction regarding responsible environmental behaviour in the workplace is sufficient as per Figure 3.6 below. The calculated mean was 4.07 (SD = 0.821), indicating that respondents on average agreed with this statement.

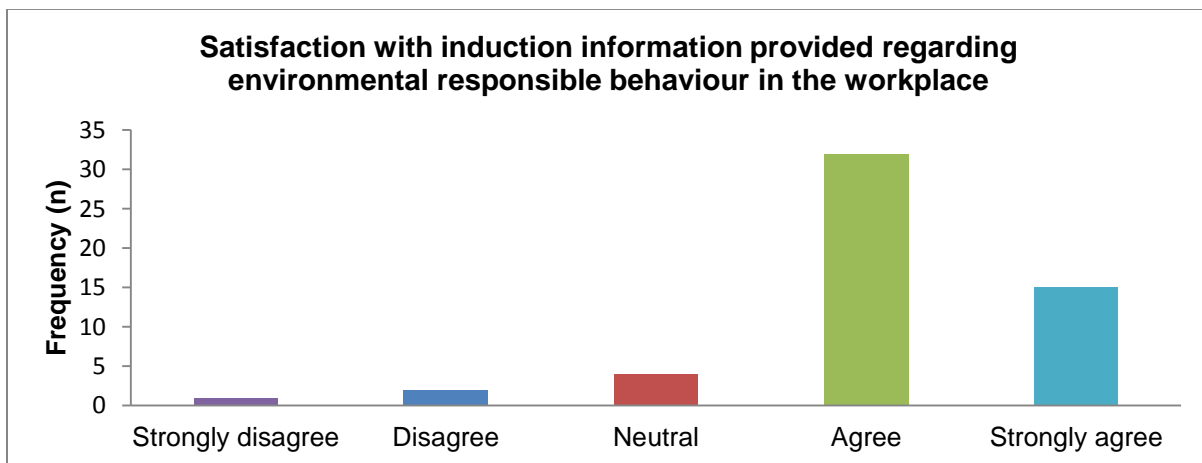


Figure 3.6: Satisfaction with induction information provided regarding responsible environmental behaviour in the workplace

3.8.7 The understandability of acceptable environmental behaviour in the workplace as covered in the general induction

Thirty-four (63.0%) respondents agreed, and eighteen (33.3%) respondents strongly agreed that the information provided in the general induction regarding responsible environmental behaviour in the workplace is easily understandable. The results are displayed in Figure 3.7 below. The mean of 4.30 (SD = 0.537) also indicates a general agreement.

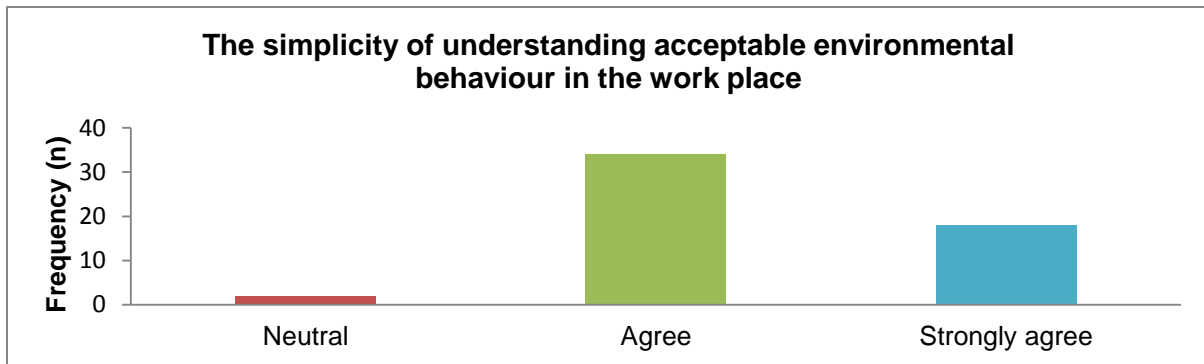


Figure 3.7: The simplicity of understanding acceptable environmental behaviour in the workplace

3.9 Environmental awareness

The main aim of section C of the questionnaire was to determine the degree to which respondents believe the company's operations have an effect on their health and the natural environment.

3.9.1 Link between individual health and the surrounding environment

Thirty (55.6%) respondents agreed, and twenty one (38.9%) respondents strongly agreed that there exists a link between an individual's health and their surrounding environment as per Figure 3.8 below. The calculated mean was 4.31 (SD = 0.639), indicating that respondents on average agreed with this statement.

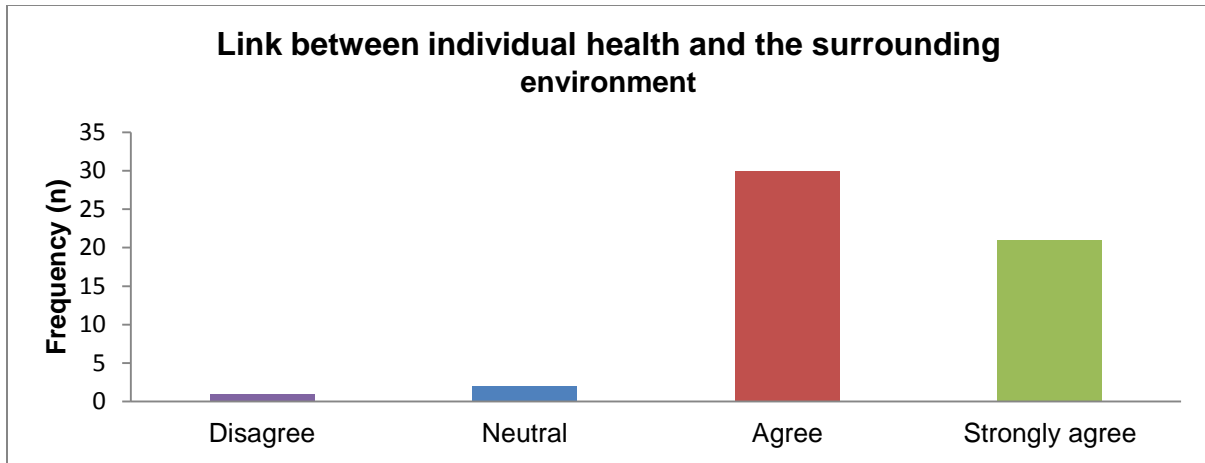


Figure 3.8: Link between individual health and the surrounding environment

3.9.2 Awareness of the links between individual health and the surrounding environment

In Figure 3.9 below thirty-six (66.7%) respondents agreed, and seventeen (31.5%) respondents strongly agreed that individuals should be aware of the links between their health and the surrounding environment.

The calculated mean was 4.30 (SD = 0.500), indicating that respondents on average agreed with this statement.

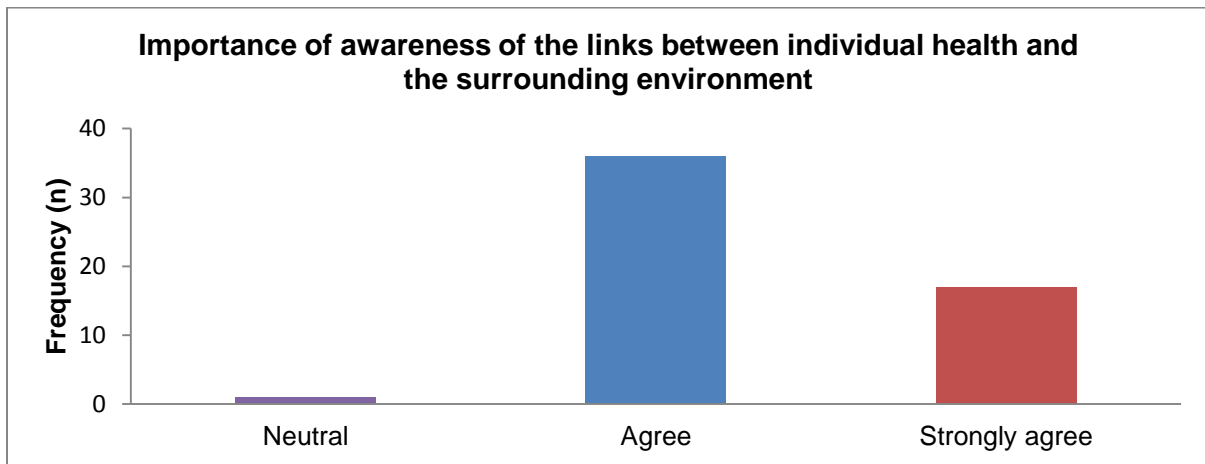


Figure 3.9: Importance of awareness of the links between individual health and the surrounding environment

3.9.3 Main source of air pollution and poor air quality at work

Thirty-six (70.6%) respondents selected smoke from factories as the main source of air pollution and poor air quality at work, while eleven (21.6%) respondents selected motor vehicle exhausts and four (7.8%) respondents selected burning of garbage/waste. Results are displayed in Figure 3.10 below.

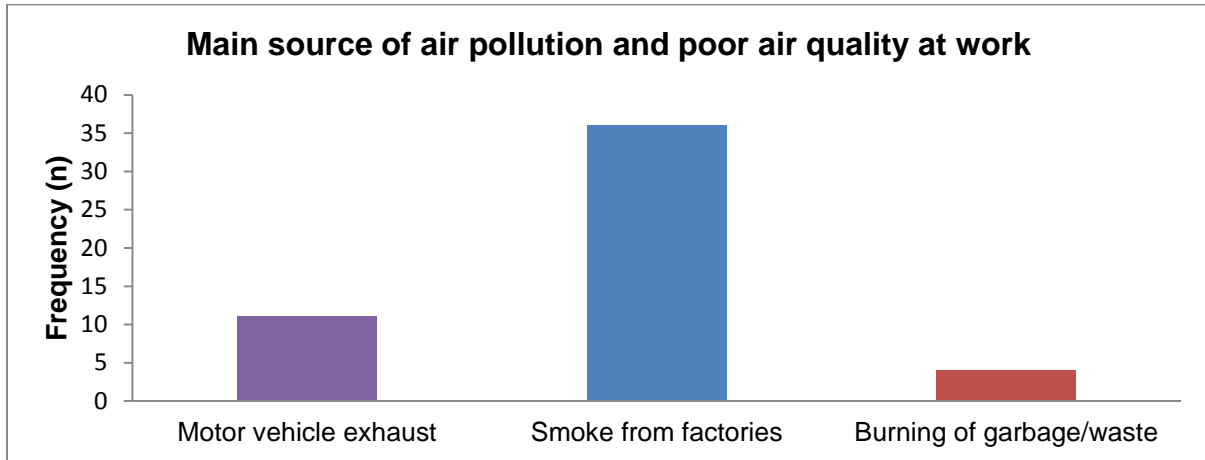


Figure 3.10: Main source of air pollution and poor air quality at work

3.9.4 Impact on the environment caused by air pollution

From Figure 3.11 below, twenty-nine (56.9%) respondents selected global warming, eight (15.7%) respondents ozone depletion, seven (13.7%) respondents weather extremes and six (11.8%) respondents acid rain as the respective impacts on the environment caused by air pollution.

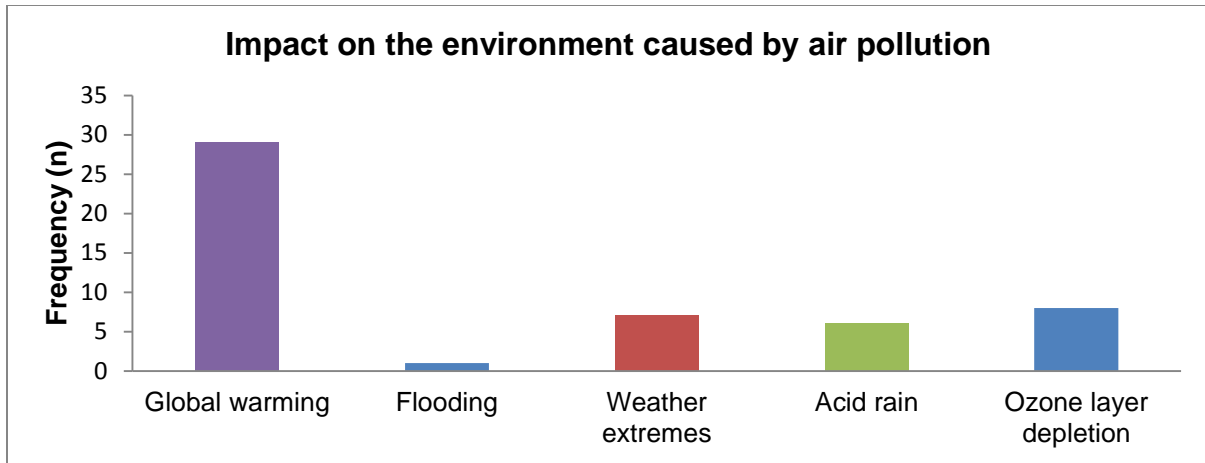


Figure 3.11: Impact on the environment caused by air pollution

3.9.5 Impact on personal health as a result of poor air quality

Thirty-one (64.6%) respondents selected lung and bronchial cancer, ten (20.8%) respondents' respiratory diseases and six (12.5%) respondents' sinusitis as the respective impacts on personal health as a result of poor air quality, as can be seen from Figure 3.12 below.

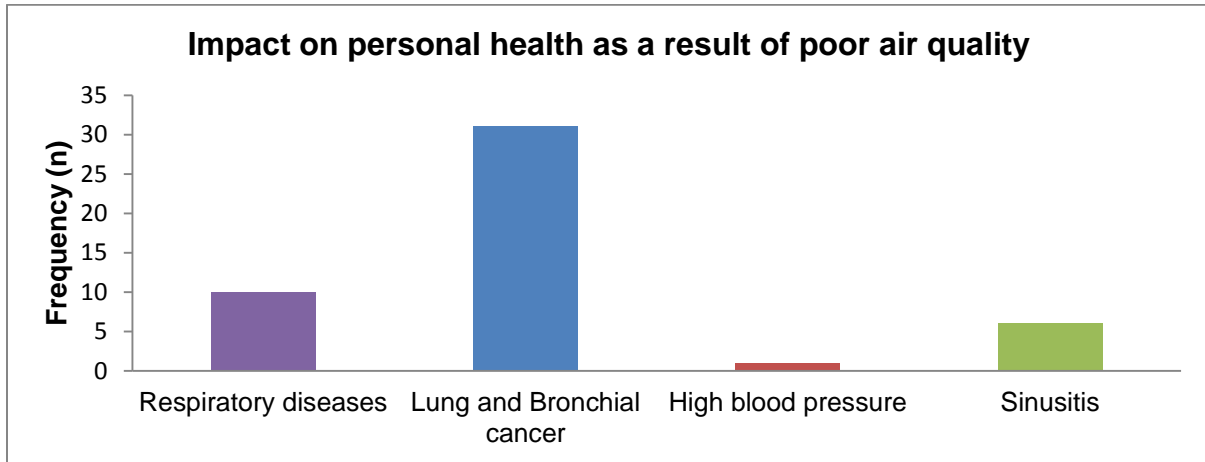


Figure 3.12: Impact on personal health as a result of poor air quality

3.9.6 Potential impact of poor waste management on the company's future

Thirty-nine (76.5%) respondents stated the poor waste management by the company has the potential to impact the company's future negatively. Contradictory to the

potential negative impact in the future, ten (19.6%) respondents stated that the impact of poor waste management by the company can impact the company's future positively. The results are displayed in Figure 3.13 below.



Figure 3.13: Potential impact of poor waste management on the company's future

3.9.7 Impact on personal health associated with industrial waste pollution

Thirty-three (67.3%) respondents selected asthma as the impact on personal health associated with industrial waste pollution as displayed in Figure 3.14 below.

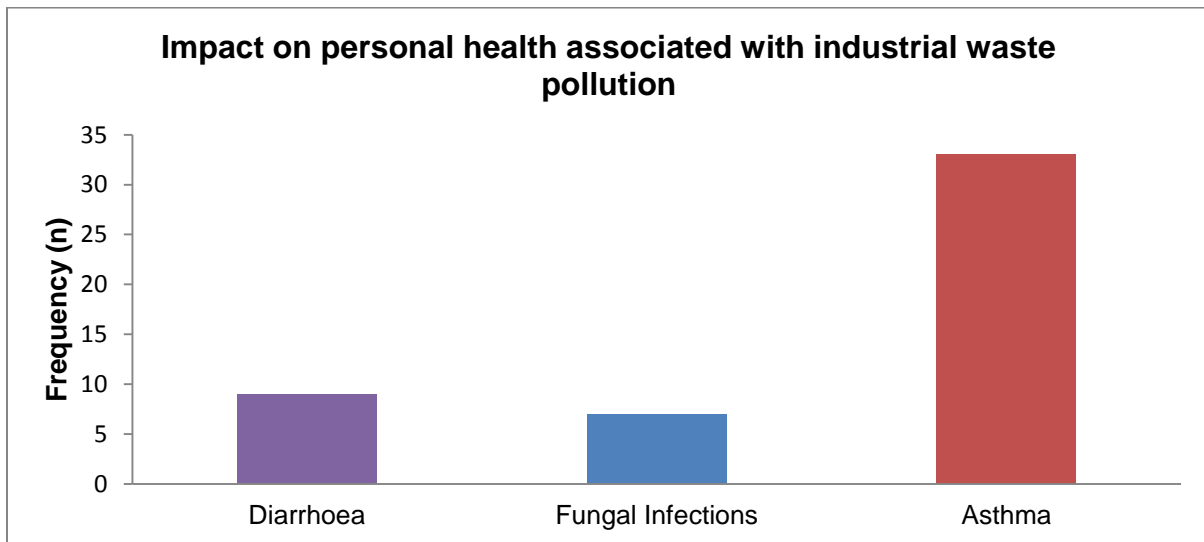


Figure 3.14: Impact on personal health associated with industrial waste pollution

3.9.8 Effects of improper waste disposal on the environment

For this specific question, respondents were instructed to select all the options applicably. A total of three options were provided. Respondents selected contamination of water thirty-nine times, contamination of soil thirty-two times and contamination of atmosphere nineteen times respectively as the effects of improper waste disposal on the environment. Figure 3.15 graphically displays the results.

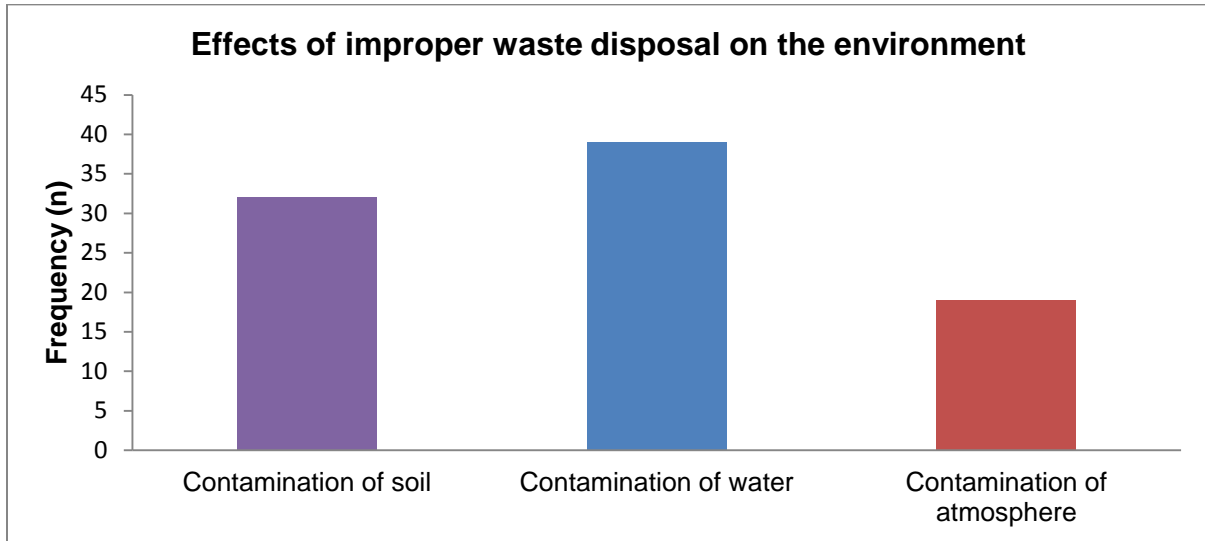


Figure 3.15: Effects of improper waste disposal on the environment

3.9.9 Primary source of information about waste and waste management within the company

Fifteen (34.9%) respondents indicated their primary source of information about waste and waste management in the company as posters in their place of work, followed by fourteen (32.6%) respondents selecting general inductions as their primary source of information and eight (18.6%) respondents selected caucus meetings as their primary source of waste related information. The results are displayed in Figure 3.16 below.



Figure 3.16: Primary source of information about waste and waste management in the company

3.9.10 Hazardous waste should be disposed of into certain colour FIDA/waste bin

Fourty nine (90.7%) respondents selected a green waste bin as the option for the disposal of hazardous waste as displayed in Figure 3.17 below. The result does not come as a surprise as the company have waste management posters throughout the plant visually illustrating which waste type needs to be disposed into which colour waste bin.

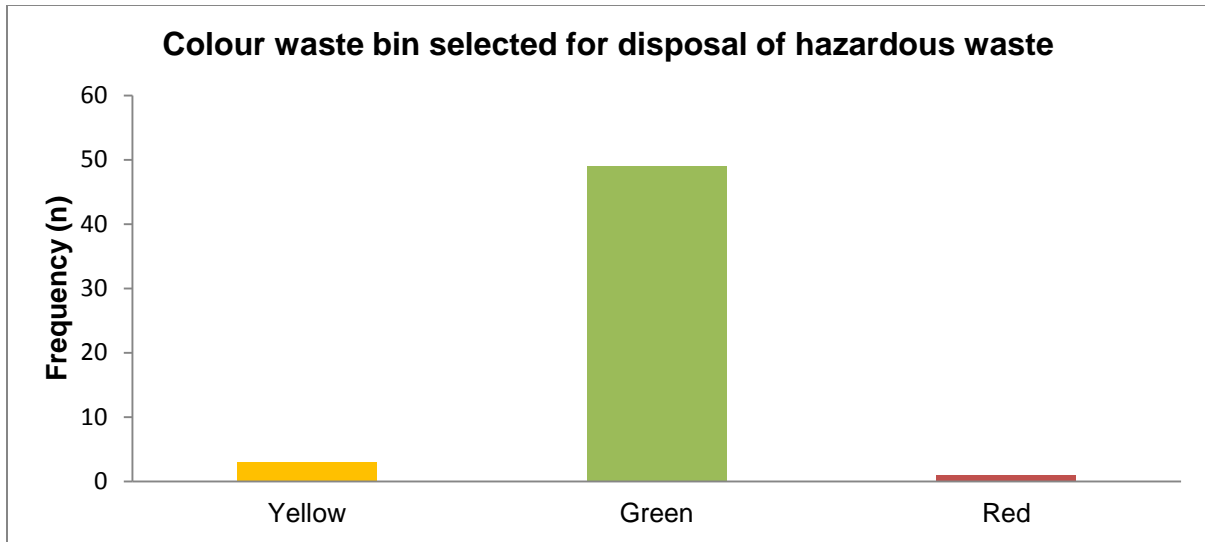


Figure 3.17: Hazardous waste should be disposed of into certain colour FIDA/waste bin

3.9.11 Office paper, for recycling purposes, must be disposed of into which colour wheelie bin

Thirty-seven (68.5%) respondents selected a white wheelie bin, while seventeen (31.5%) respondents selected a yellow wheelie bin for the disposal of office paper to be recycled. The results are displayed in Figure 3.18 below. The result does not come as a surprise. Currently, the company is experiencing challenges with regards to the disposal of office paper to be recycled into the “correct” colour wheelie bin. The challenge is that some employees view office paper as general waste and therefore dispose office paper into yellow wheelie bins which are designated for general waste instead of white coloured wheelie bins which is designated only for paper disposal.

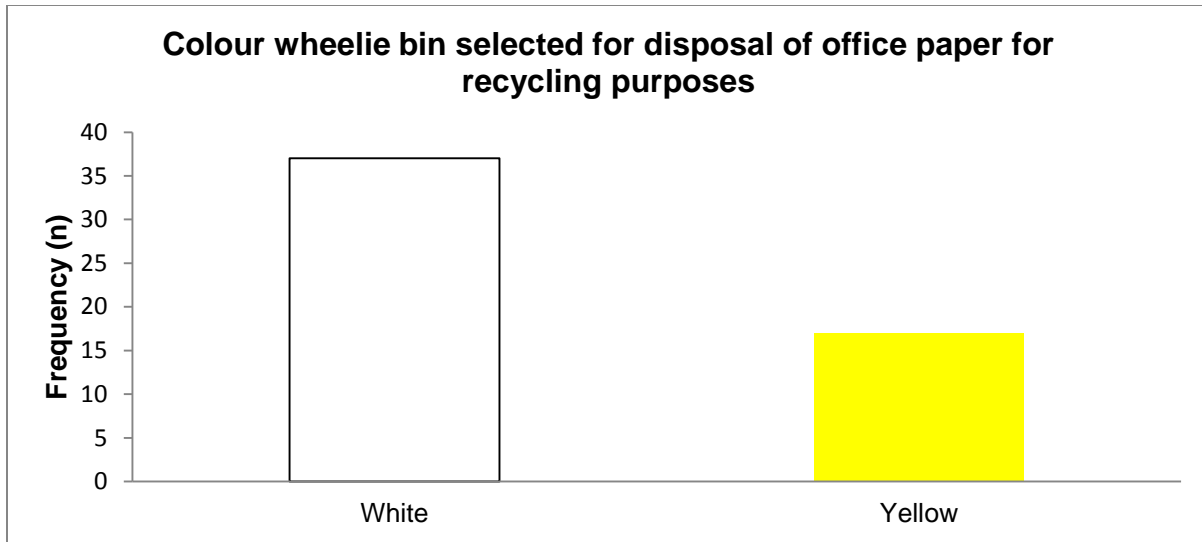


Figure 3.18: Colour wheelie bin selected for disposal of office paper for recycling purposes

3.9.12 What is a material safety data sheet (MSDS).

Fifty-one (94.4%) respondents selected the option that an MSDS is a document that contains details of the hazards associated with a chemical, and gives information on its safe use. The results are displayed in Figure 3.19 below. The results come as no surprise as all chemicals used and stored in the waste and fleet department must be accompanied by an MSDS.

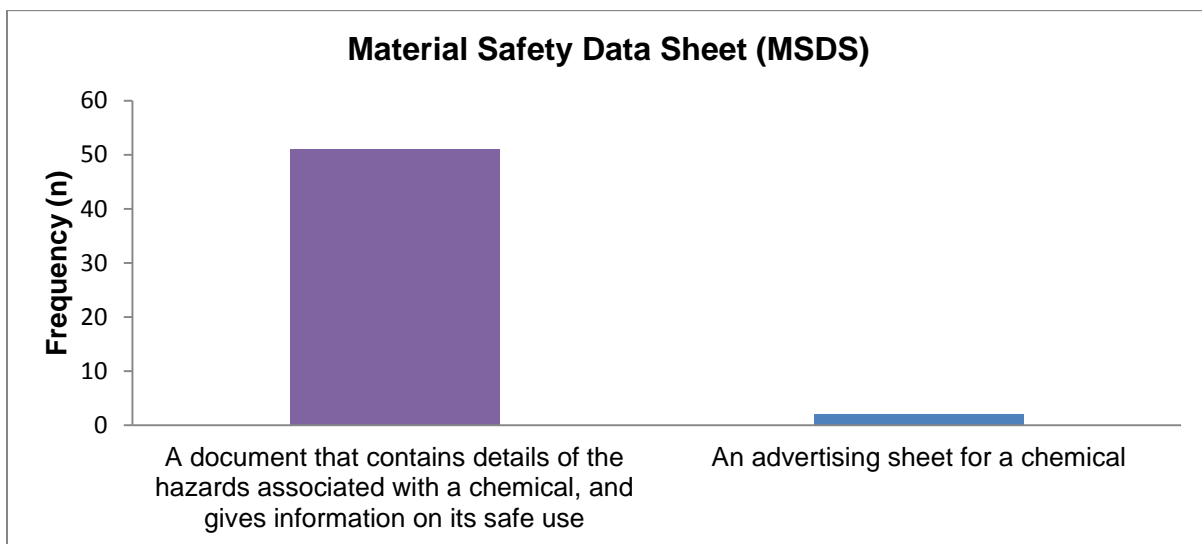


Figure 3.19: What is a material safety data sheet (MSDS)

3.10 The t-Test analysis

A t-test indicates if there is a significant difference between the measured means of two groups. A p-value of < 0.05 , is an indication of a significant statistical difference between the means (Field, 2014). Note: For all the analysis presented below, under the heading t-test analysis, the p-values are only reported for completeness sake. However the p-values will not be interpreted since a convenience sample instead of a random sample was used.

As a result of this Cohen's d will be calculated as effect sizes. An effect size indicates the practical significance of the difference between two means (Ellis & Steyn, 2003). Effect sizes of the data for which t-test analysis was conducted are interpreted as per Table 3.8 below.

Table 3.8: Effect size description

Effect size	Measurement classification	Practical significance
0.2	Small	No practically significant difference
0.5	Medium	Practically visible difference
0.8	Large	Practically significant difference

Source: Ellis & Steyn (2003)

Statement numbers instead of the complete statement will be indicated in the results; these are displayed in Table 3.9. The t-test was performed for four different demographical groups: Age (18 – 39 vs. 40+), Highest qualification (< Grade 12 vs. Grade 12 and Higher), Current employment level (General workers and Equipment operators vs. Other) as well as Years of working experience in the company (0 – 5 vs. 6+).

Table 3.9: T-test statement number and description

Statement number	Statement description
B1	Are you aware of the company's environmental policy
B3	The company has environmental performance targets and objective of which I am aware
B4	The company actively measure progress made towards achieving the set environmental performance targets and objectives
B5	Do you receive regular feedback on how the company is performing against the set environmental performance targets and objectives
B6	Is sufficient information regarding responsible environmental behaviour in the workplace provided during the general induction
B7	The information provided during the general induction regarding acceptable environmental behaviour in the workplace, is easily understandable
C1	There is a link between your health and the environment in which you live and work
C2	Every person should have an awareness of links between their environment and health

3.11 Results of t-Tests: Age

T-test results between respondents' age grouping and the eight questions are presented in Table 3.10 below.

Table 3.10: Results of the t-tests for age groups

Statement	Age Group	Frequency (n)	Mean	Std. Deviation	p-value	Effect size
B1	18 - 39	22	3.77	0.813	0.021	0.66
	40+	32	4.31	0.821		

B3	18 - 39	22	2.91	1.065	0.083	0.45
	40+	32	3.47	1.244		
B4	18 - 39	22	3.73	0.767	0.275	0.29
	40+	32	3.97	0.822		
B5	18 - 39	22	2.77	1.110	0.774	0.07
	40+	32	2.88	1.497		
B6	18 - 39	22	3.91	0.684	0.202	0.31
	40+	32	4.19	0.896		
B7	18 - 39	22	4.23	0.528	0.436	0.21
	40+	32	4.34	0.545		
C1	18 - 39	22	4.27	0.550	0.679	0.10
	40+	32	4.34	0.701		
C2	18 - 39	22	4.27	0.550	0.784	0.07
	40+	32	4.31	0.471		

A medium to large effect size (0.66) was reported for statement B1 (Are you aware of the company's environmental policy). A mean of 3.77 (SD = 0.813) was measured for respondents falling in the age group of 18-39, and a mean of 4.31 (SD = 0.821) was reported for the 40+ age group's respondents. This indicates that both these groups on average agreed with the statement. However the younger group leaned somewhat towards neutral and the older group leaned somewhat towards strongly agree.

3.12 Results of t-Tests: Highest qualification

The results of the t-test results for the highest qualification groups are presented in Table 3.11 below.

Table 3.11: Results of t-tests for highest qualification

Statement	Highest qualification	Frequency (n)	Mean	Std. Deviation	p-value	Effect size
B1	< Grade 12	24	4.25	0.944	0.240	0.30

	Grade 12 and Higher	30	3.97	0.765		
B3	< Grade 12	24	3.42	1.248	0.343	0.25
	Grade 12 and Higher	30	3.10	1.155		
B4	< Grade 12	24	4.00	0.834	0.297	0.28
	Grade 12 and Higher	30	3.77	0.774		
B5	< Grade 12	24	2.92	1.558	0.697	0.10
	Grade 12 and Higher	30	2.77	1.165		
B6	< Grade 12	24	4.38	0.647	0.012	0.62
	Grade 12 and Higher	30	3.83	0.874		
B7	< Grade 12	24	4.38	0.495	0.332	0.25
	Grade 12 and Higher	30	4.23	0.568		
C1	< Grade 12	24	4.33	0.702	0.854	0.05
	Grade 12 and Higher	30	4.30	0.596		
C2	< Grade 12	24	4.21	0.415	0.237	0.28
	Grade 12 and Higher	30	4.37	0.556		

A medium to large effect size (0.62) was reported for statement B6 (Is sufficient information regarding responsible environmental behaviour in the workplace provided during the general induction). A mean of 4.38 (SD = 0.647) was measured for respondents having a qualification below the level of Grade 12 and a mean of 3.83 (SD

= 3.83) was measured for respondents qualifying for Grade 12 and higher. This indicates that both these groups agreed with the statement. However the less qualified group leaned towards agreeing and the more qualified group leaned somewhat towards neutral.

The researcher suspects that individuals qualifying for the level of Grade 12 may want more comprehensive information regarding responsible environmental behaviour in the workplace. While respondents with a qualification below Grade 12 are satisfied with the information provided regarding responsible environmental behaviour in the workplace.

3.13 Results of the t-Tests: Employment level

The results of the t-test for current employment level are presented in Table 3.12 below.

Table 3.12: Results of the t-tests for employment level

Statement	Employment level	Frequency (n)	Mean	Std. Deviation	p-value	Effect size
B1	General workers and Equipment operators	28	4.21	0.833	0.298	0.28
	Other	24	3.96	0.908		
B3	General workers and Equipment operators	28	3.07	1.359	0.362	0.22
	Other	24	3.38	1.013		
B4	General workers and Equipment operators	28	4.07	0.813	0.048	0.55
	Other	24	3.63	0.770		

B5	General workers and Equipment operators	28	2.57	1.425	0.208	0.33
	Other	24	3.04	1.233		
B6	General workers and Equipment operators	28	4.11	0.956	0.776	0.07
	Other	24	4.04	0.690		
B7	General workers and Equipment operators	28	4.36	0.559	0.482	0.19
	Other	24	4.25	0.532		
C1	General workers and Equipment operators	28	4.36	0.678	0.551	0.16
	Other	24	4.25	0.608		
C2	General workers and Equipment operators	28	4.29	0.460	0.967	0.01
	Other	24	4.29	0.550		

A medium effect size (0.55) was reported for statement B4 (The company actively measures progress made towards achieving the set environmental performance targets and objectives). A mean of 4.07 (SD = 0.813) was measured for respondents with the job title general workers and equipment operators, and a mean of 3.63 (0.770) was

reported for respondents not having the job title general workers and equipment operators (labelled as Other). This indicates that both these groups on average agreed with the statement, general workers and equipment operators leaned somewhat towards strongly agree and the other group leaned towards neutral.

The researcher suspects that general workers and equipment operators do not display the same level of interest when compared to the other group concerning the company actively measuring the progress made towards the achievement of the set environmental performance targets and objectives. The researcher is of the opinion that the execution of work duties does not allow general workers and equipment operators to be exposed to the progress the company has made in achieving its environmental goals. Performance progress is primarily communicated via electronic distribution channel within the company which general workers and equipment operators do not have access to.

3.14 Results of t-Tests: Years' work experience

The t-test results for years of work experience in ArcelorMittal South Africa Vanderbijlpark Works with regards to awareness of the company's environmental policy (statement B1) is first discussed. Secondly, the t-test results for the receiving of regular feedback on how the company is performing against set environmental performance targets and objectives (statement B5) are discussed. Thirdly the t-test results for satisfaction with the information regarding responsible environmental behaviour in the workplace provided in the general induction (statement B6) is discussed. Results are presented in Table 3.13 below.

Table 3.13: Results of the t-tests for years of work experience

Statement	Years of work experience	Frequency (n)	Mean	Std. Deviation	p-value	Effect size
B1	0-5	22	3.73	1.120	0.019	0.57
	6+	30	4.37	0.490		
B3	0-5	22	3.05	1.174	0.398	0.23

	6+	30	3.33	1.241		
B4	0-5	22	3.68	0.894	0.181	0.36
	6+	30	4.00	0.743		
B5	0-5	22	2.41	1.297	0.081	0.49
	6+	30	3.07	1.337		
B6	0-5	22	3.73	1.032	0.018	0.59
	6+	30	4.33	0.547		
B7	0-5	22	4.27	0.550	0.696	0.11
	6+	30	4.33	0.547		
C1	0-5	22	4.27	0.767	0.754	0.08
	6+	30	4.33	0.547		
C2	0-5	22	4.36	0.581	0.380	0.22
	6+	30	4.23	0.430		

A medium to large effect size (0.57) was reported for statement B1 (Are you aware of the company's environmental policy) for the different groups of work experience groups too. A mean of 3.73 (SD = 1.120) was reported for respondents having between 0-5 years of work experience in the company, and a mean of 4.37 (SD = 0.490) was reported for respondents having more than five years' work experience in the company. This indicates that both these groups on average agreed with the statement. However the group with less work experience leaned somewhat towards neutral, and the group with more work experience leaned somewhat towards strongly agree. These results are similar to those of the different age groups; this may be because the younger employees will in general also have the lesser amount of work experience and vice versa.

As the number of years of work experience within the company increases so does the level of awareness increase relating to company policies (Spearman's rho = 0.408, p-value = 0.003). Therefore it is suspected that the group with less work experienced does not share the same level of awareness regarding the company's environmental policy

as displayed by the group with more work experience mainly due to the limited number of years they have spent working for the company to date.

A small to medium effect size (0.49) was reported for statement B5 (Do you receive regular feedback on how the company is performing against the set environmental performance targets and objective). A mean of 2.41 (SD = 1.297) was reported, respondents having between 0-5 years of work experience in the company and a mean of 3.07 (SD = 1.337) was reported for respondents having more than five years' work experience in the company. This indicates that both these groups on average were neutral about the statement, however the group with less work experience leaned somewhat towards disagree and the group with more work experience leaned somewhat towards agree.

A medium to large effect size (0.59) was reported for statement B6 (Is sufficient information regarding responsible environmental behaviour in the workplace provided during the general induction). A mean of 3.73 (SD = 1.032) was measured for respondents having between 0-5 years of work experience in the company, and a mean of 4.33 (SD = 0.547) was reported for respondents having more than five years' work experience in the company. This indicates that both these groups on average agreed with the statement. However the group with less work experience leaned towards neutral and the group with more work experience leaned somewhat to agree strongly.

The researcher suspects that as the number of years of work experience within a single company increases so does the level of satisfaction increase with regards to the information provided during the general induction relating to environmentally responsible behaviour in the workplace. Furthermore, the researcher also suspects that as the number of times individuals undergo general induction training increases so does their level of satisfaction with the training material increases. This may be due to individuals with more work experience having been previously already exposed to similar training material.

Therefore, it is suspected that the group with less work experienced does not share the same level of satisfaction with the induction material related to environmentally responsible behaviour in the workplace when compared to the group with more work experience. Both as a result of not being employed by the company for a long time (6 years and more) and having limited exposure to general induction material.

CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

4.1 Introduction

This chapter provides the final conclusions drawn and recommendations made with reference to the main aim of the study introduced in Chapter 1.

The primary objective of the study was to assess the level of environmental awareness of the employees employed permanently in the waste and fleet department of ArcelorMittal South Africa, Vanderbijlpark Works and secondly to make recommendations to ArcelorMittal South Africa Vanderbijlpark Works on possible methods the company can investigate in order to raise the level of employee environmental awareness

4.2 Conclusions on the empirical study

An empirical study was conducted and entailed 54 individuals permanently employed in the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works. The following conclusions were made following the analysis and description of the questionnaires completed by the participants of this study:

4.2.1 Conclusions based on the demographic information

- Qualification level of the waste and fleet department employees: The qualification level of the respondents was very surprising. The majority employees either never completed formal schooling (< Grade 12) or only completed formal schooling (Grade 12) and has no other form of further education. This can be a serious challenge when it comes to the individual's level of literacy (reading and writing skills).
- Race group of the waste and fleet department employees: The majority of the respondents were classified as Africans. In South Africa the majority of the populations complete formal schooling in their home language. The challenges therefore may be that some employees have a limited English literacy. Furthermore

English is the official language of communication used by the organisation and therefore all training material is only presented in English.

- Employment level of the waste and fleet department employees: Majority of the employees are employed as equipment operators and spend most of their working day outside and having no access to sources of information such as personal computers or the company's internal intranet where additional environmental awareness information can be accessed.

4.2.2 Conclusions based on the induction knowledge

The majority of employees agree to strongly agree that they are aware of the company's environmental policy and that the environmental policy is communicated internally within the company. Employees also agree that the company does measure its environmental performance, however not all employees were aware of what the exact environmental performance targets and objectives of the company is. Furthermore many of the employees felt that the company does not provide feedback on how it is performing against the set environmental targets and objectives.

4.2.3 Conclusions based on the environmental awareness information

Employees recognised that a link exists between the individual's health and the surrounding environment and also found it important that individuals should be aware of this link. Employees were also aware that if the company does not performing certain operational actions in an environmentally responsible and acceptable manner, such as following the correct and responsible waste disposal procedures, it can potentially have a negative impact for the company's future.

Information relating to responsible environmental behaviour in the workplace was obtained by employees from various different sources within the company. Sources included visual aids in the workplace such as posters, the material covered during the general induction and the topics covered every morning during the caucus meetings. Therefore formal company training, such as the general induction, is not the only way

employees gain knowledge regarding acceptable environmental behaviour in the work place. Posters and causes meetings are also different approaches which raises the individual's environmental awareness levels.

4.3 Recommendations

The recommendations made below are based on the findings of the literature study and the empirical study. The recommendations are specifically made for the management team of ArcelorMittal South Africa. However other organisations in South Africa, whether big or small and not limited to operation in the steel industry wanting to improve their environmental performance, can study the recommendation and potentially implement all or part therefore.

4.3.1 Recommendations to ArcelorMittal South Africa Vanderbijlpark Works

- Employees in the organisation employed in different employment levels (different strata) do not all have the same level of current environmental literacy and awareness. Therefore when training material is developed, the targeted group to be trained current level of environmental literacy and awareness should be taken into consideration when environmental awareness training is developed and presented to the employees.
- Environmental awareness training material should be translated to accommodate employees who may have a difficulty in reading, writing and understanding English. The training material will remain exactly the same however it will just be translated and presented in the targeted group's home language. This may aid employees to better understand and comprehend what responsible environmental behaviour entails and increase their level of environmental awareness.
- The company should in the same manner as it displays the environmental policy, display the specific set environmental targets and objectives for the year. This will enable all levels of employees to be fully aware of what the company aims to achieve and potentially increase the level of support towards the achievement of the set environmental targets and goals.

- The company should focus to provide all levels of employees with sufficient information on how it is performing against the set environmental targets and objectives on frequent and regular basis, environmental performance feedback. Such communication should not only be limited to formal performance review letters and figures but instead it should also be presented visually to ease interpretation by employees with limited literacy skills. These results should also be displayed at various locations throughout the company.

4.4 Evaluation of this study

The measurement of this study is based upon the achievement of the primary and secondary objectives, as introduced in Chapter 1 of this study.

4.4.1 Primary objective

The primary objective of the study was to assess the level of environmental awareness of the employees employed permanently in the waste and fleet department of ArcelorMittal South Africa, Vanderbijlpark Works. And secondly to make recommendations to ArcelorMittal South Africa Vanderbijlpark Works on possible methods the company can investigate in order to raise the level of employee environmental awareness.

The objective was achieved by means of a self-developed questionnaire that was administered to the permanent employees of the waste and fleet department. The results from the returned questionnaires are presented in Chapter 3 of this study and the recommendations are made in Chapter 4 of this study.

4.4.2 Secondary objective

The secondary objectives of the study are presented in Chapter 1 of this study, specifically point 1.4.2. The secondary objective was divided into two parts namely: secondary literature objectives and secondary empirical objectives.

Secondary literature objectives include:

- To define the concept of Environmental Awareness by conducting a literature study,
- Investigate the origin and development of environmental awareness;
- Investigate the importance of environmental awareness and;
- Seek in literature methods or ways to increase environmental awareness.

Secondary empirical objectives include:

- The construction of a questionnaire to assess what the current level of environmental awareness is among the permanent employees of the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works;
- To make conclusions and recommendation based on the literature study and empirical study on how ArcelorMittal South Africa Vanderbijlpark Works can proceed to possibly increase the level of environmental awareness among the waste and fleet department's employees.

The first secondary literature objective was achieved through the definitions of Environmental Awareness in section 2.1.1.

The second secondary literature objective was to investigate the origin and development of environmental awareness. This objective was achieved through the literature study which is contained in sections 2.1 focusing on the major environmental challenges faced by mankind and why these challenges must be address, in a way through increased levels of environmental awareness.

The third secondary literature objective was to investigate the importance of environmental awareness. This objective was achieved through the literature study which is contained in section 2.1.2 focusing in the potential benefits that can be realised through providing individuals with environmental education with the purpose of raising their level of environmental awareness.

The fourth secondary literature objective was to seek in literature methods or ways to increase environmental awareness. This objective was achieved through the literature

study which is contained in section 2.2 of this study specifically describing the findings of previous literature on the topic of raising the individuals level of environmental awareness.

The first secondary empirical objectives was to construct a questionnaire to assess what the current level of environmental awareness is among the permanent employees of the waste and fleet department of ArcelorMittal South Africa Vanderbijlpark Works. This objective was achieved by means of a self-developed questionnaire that was administered to the permanent employees of the waste and fleet department. The results from the returned questionnaires are presented in Chapter 3 of this study. The administered questionnaire is attached to this study as Appendix A.

The second secondary empirical objectives of this study was to make conclusions and recommendation based on the literature study and empirical study on possible actions ArcelorMittal South Africa Vanderbijlpark Works can investigate to potentially increase the level of environmental awareness among the waste and fleet department's employees. This objective was achieved section 4.2 and 4.3 respectively of this study.

4.5 Suggestions for future research

- A future study can be done to determine if there is a direct link between an individual's qualification level and their level of understanding related to environmental awareness information. The research question may be does higher levels of formal training result in individuals having increased levels of environmental awareness in the steel industry.
- Due to the many official languages in South Africa a study can be done to assess if an individual's level of environmental awareness is higher when asked to answer an environmental awareness questionnaire in their home language versus answering an environmental awareness questionnaire in any other second language such as English. A controlled group can be used whereby each participant received the same questionnaire in their preferred language versus a non control group where all

the participants, irrespective of their home language receives the same questionnaire is only one language such as English.

- A study can be done to investigate if there is a difference in the level of environmental awareness displayed by different racial groups. Such a study can furthermore attempt to identify potential aspects which may result in individuals having different levels of environmental awareness.
- A study can be done to investigate if the level of environmental performance increases as the frequency of feedback relating to environmental performance measurements increases. Does individual environmental behaviour corresponds with the environmental performance of the company.

4.6 Conclusion

Natural resources such as land, air and water have to be used wisely and sustainably, as a trust, to ensure a healthy environment exists for the present and future generations (Ekins, 2002:72). Organisations can no longer afford to consider the environment and the resources it extracts from the environment as an externality to which no price need be attached. The evaluation of an organisations environmental performance will become more significant as societies all over the world strive to use natural resources more responsibly and sustainably.

To support organisations to achieve their environmental performance targets and objective the level of environmental awareness among employees should be raise. Increased levels of environmental awareness can directly contribute in the organisation achieving the set environmental targets and objectives. Organisations should take the diversity of their workforce into consideration and come to the realisation that not all employees exhibits the same level of environmental awareness across the board.

The raising of individuals level of environmental awareness can be done in various ways. Organisations should look at their current practises used to raise environmental awareness and engage employees to identify possible shortcomings and also to identify alternative approaches which can be perused.

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APPENDIX A

AN ASSESSMENT OF ENVIRONMENTAL AWARENESS IN A SOUTH AFRICAN STEEL PLANT



Dear participant

My name is Tiaan van den Berg. I am a final year MBA student at the North West University (NWU) School of Business and Governance.

The purpose of this questionnaire is to assess the environmental awareness among the employees involved in the waste management activities of ArcelorMittal South Africa Vanderbijlpark Works.

Completing the questionnaire will take approximately 10 minutes. Your participation in this survey is totally voluntary and all information collected will be kept strictly confidential. Thank you in advance for your assistance in this research project.

Kind regards
Tiaan van den Berg

Email: Tiaan.vandenberg@Arcelormittal.com
Cell Phone: 060-989-0159

Dear participant, thank you for sparing your precious time to complete this questionnaire. I appreciate your help in providing this important information.

Section A: Demographic information

Mark in the applicable block the option number most relevant to you with a cross (X). Please complete all the questions.

1.1 Gender

Male	1
Female	2

1.2 Age

18-24	1
25-29	2
30-34	3
35-39	4
40-44	5
45-49	6
50-54	7
55-59	8
60-64	9
65-69	10
70+	11

1.3 Population group

African	1
Coloured	2
Indian/Asian	3
White	4

1.4 Highest qualification

< Grade 12	1
Grade 12	2
Diploma	3
Degree	4
Honours	5
Master	6
PhD	7

1.5 Current employment level

General worker	1
Equipment operator	2
Supervisor or foreman	3
Specialist	4
Middle management	5
Senior management	6
Other	7

1.6 Years of work experience in ArcelorMittal South Africa Vanderbijlpark Works

0-3	1
4-5	2
6 – 10	3
11 – 15	4
16 – 20	5
21 +	6

Section B: Induction knowledge

Mark in the applicable block the option number most relevant with a cross (X). Please complete all the questions.
'The company' refers to ArcelorMittal South Africa Vanderbijlpark Works

1. Are you aware of the company's environmental policy?

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

2. Is this environmental policy communicated within the company?

Yes	1
No	2

3. The company has environmental performance targets and objective of which I am aware.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

4. The company actively measure progress made towards achieving the set environmental performance targets and objectives.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

5. Do you receive regular feedback on how the company is performing against the set environmental performance targets and objective?

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

6. Is sufficient information regarding responsible environmental behaviour in the workplace provided during the general induction.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

7. The information provided during the general induction regarding acceptable environmental behaviour in the work place is easily understandable.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Section C: Environmental awareness information

Mark in the applicable block the most relevant (except stated otherwise) option with a cross (X). Please complete all the questions.

1. There is a link between your health and the environment in which you live and work.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

2. Every person should have an awareness of links between their environment and health.

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

3. The main source of air pollution and poor air quality in your place of work is.

Motor vehicle exhaust	1
Smoke from factories	2
Burning of garbage/waste	3

4. The most significant impact on the environment caused by air pollution is.

Global warming	1
Rise in sea levels	2
Flooding	3
Weather extremes	4
Acid rain	5
Ozone layer depletion	6

5. The most significant impact on personal health as a consequence of poor air quality is.

Respiratory diseases	1
Lung and Bronchial cancer	2
High blood pressure	3
Sinusitis	4

6. Poor waste management can impact the future of the company.

It can impact the company's future positively	1
It can impact the company's future negatively	2
Neutral	3
It will not impact the company's future at all	4

7. The most significant impact on personal health associated with industrial waste pollution is.

Diarrhoea	1
Fungal Infections	2
Asthma	3

8. What are the effects of improper waste disposal on the environment? Please choose all applicable.

Contamination of soil	1
Contamination of water	2
Contamination of atmosphere	3

9. Where do you hear the most frequently about Waste and Waste Management within the company?

General Inductions	1
Plant-specific inductions	2
Information from work colleagues	3
Newspapers/Magazines	4
Poster in your place of work	5
Caucus meetings at work	6
Other	7

10. Hazardous waste should be disposed of into which colour FIDA/waste bin.

A	B	C	D
Yellow	Green	Red	Orange

11. Into which, color wheelie bin should office paper be disposed of for recycling purposes.

A	B	C	D
White	Yellow	Blue	Black

12. What is a material safety data sheet (MSDS)?

A document that contains details of the hazards associated with a chemical, and gives information on its safe use	1
A form that is not necessary in laboratories	2
A statistical analysis of a material's safety features	3
An advertising sheet for a chemical	4

APPENDIX B



To Whom it may concern,

I am currently a final year Master of Business Administration (MBA) student at the North-West University School of Business and Governance.

As part of the partial fulfilment of the requirements for the degree I need to conduct research and produce a mini-dissertation.

I would at this moment kindly request approval to make use of ArcelorMittal South Africa information for the writing and completion of my mini-dissertation.

Mini-dissertation Topic: An assessment of environmental awareness in a South African steel plant.

How information that will be used in the study will be obtained: Information will be obtained by issuing a closed questionnaire to the permanent employees of ArcelorMittal South Africa employed in the waste and fleet department.

Participation in the study is voluntary and all information collected will be handled and kept strictly confidential. Furthermore, the questionnaire is set up in such a manner that no individual respondent can be identified. Employees are not requested to provide any personal information.

Lastly, a confidentiality agreement exists between the student and the University whereby the University is not allowed to publish or make public the name of the company where the study was conducted, except where written approval is obtained from the respective ArcelorMittal South Africa representative.

Your approval of the above request would be highly appreciated

Sincerely,

Tiaan van den Berg

Specialist: Industrial products and Commodities

Procurement and Logistics

Chris van Dijk

Works Manager

Engineering and Services

Werner Venter

General Manager

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APPENDIX C



Dynamic Language &
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Sunday, 19 November 2017

To whom it may concern,

Re: Letter of confirmation of language editing

The dissertation *An assessment of environmental awareness in a South African steel plant* by CF Van den Berg 21636583 was language edited. The referencing and sources were checked as per NWU referencing guidelines. Final corrections remain the responsibility of the author.

Antoinette Bisschoff

Officially approved language editor of the NWU since 1998
Member of SA Translators Institute (no. 100181)

Precision ... to the last letter