ISO 14001 EMS in the renewable energy sector: Practices and perceptions in South Africa

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For my Dad.

ABSTRACT

Historically dependent on fossil fuels, the energy generation landscape in South Africa has begun and will continue to move towards renewable energy. The typical financing arrangements of renewable energy projects in South Africa is such that the sector is subject to environmental, social and governance management requirements. ISO 14001 has shown to improve environmental performance stakeholder and investor assurance, and regulatory compliance and has been the subject of a great deal of research, although less so in South Africa.

The objective of this study was to establish the practices and perceptions of ISO 14001 by independent renewable energy developer-operators in South Africa. The research sought to establish the real or perceived drivers for, and barriers against implementation, the benefits that were realised, and criticism of implementation, and finally, the perception and experiences of ISO 14001 certification.

Two research methods were employed: a literature review, and semi-structured interviews. Eight independent commercial wind or solar operations (developer-operators) who currently operate, or which will be operational within the next 12 months, were identified and their environmental representatives interviewed. Due to COVID-19 constraints, the interviews were conducted virtually.

The results found that organisations, particularly the larger organisations and organisations based in Europe, do implement the Standard, and are ISO 14001 certified. The main drivers for implementation were found to be financial drivers, as a result of lender requirements and shareholder assurance, with organisations benefiting from improved risk and compliance management, streamlined processes, and increased environmental awareness within the organisation. The perceived barriers against implementing ISO 14001 were found to be the administrative and financial implications. Criticism was directed at the ISO 14001 in general, whereby some respondents felt that the Standard was a duplication of existing requirements and offered no value to their organisations. Similarly, the perception and value of certification were generally negative, both as a result of the cost versus benefit of certification and the respondents' experience of symbolic certification.

Although the majority of respondents implemented, and are certified in, the Standard, their opinions and experiences are divided as to the benefits and value of the Standard. This division is further supported by the literature.

The study could have benefited from a larger sample size as interviews were only conducted from relatively narrow selection criteria. Ideally canvasing for such a study could be conducted at industry workshops or conferences which may improve the willingness of organisations to participate. Unfortunately, COVID-19 prevented such engagements. There would be value in conducting further research into the implementation and value of ISO 14001 in emerging renewable energy markets such as India, Brazil, Chile, and Kenya. Future investigation into the performance benefits of the Standard in the renewable energy sector and emerging markets would add be valuable. Additionally, further research into the overlap between lender requirements and ISO 14001 would add value to the body of literature on ISO 14001 going forward.

Keywords:

EMS, ISO14001, renewable energy, implementation, South Africa.

ABBREVIATIONS AND ACRONYMS

EMPr : Environmental Management Programs

EMS : Environmental Management System

EP : Equator Principals

EU : European Union

IFC : International Finance Corporation

ISO: International Standards Organisation

NGOs : Non-governmental organisations

SAREC : South African Renewable Energy Council

UNCED: United Nations Conference on Environment and Development

KEY DEFINITIONS

Global warming refers to the overall warming of the Earth, based on an average increase in temperature, measured across both land and ocean temperatures (Davis-Reddy & Vincent, 2017).

Energy availability factor is the percentage of time that an electricity generation plant is available to produce electricity at its maximum capacity (Eberhard & Mtepa, 2003).

Equator Principles are a risk management framework that has been adopted by various financial institutions. The framework is used for identifying, assessing, and managing environmental and social risk on projects. The framework provides the minimum standard for due diligence and monitoring to inform decision-makers (Equator Principles Association, 2020).

Greenhouse gases are gases that "absorb and reradiate infrared electromagnetic radiation" (Oxford Reference, 2020) and in so doing increase in the earth's temperature and lead to global warming (Republic of South Africa, 2003).

Greenwashing is the act of misleading stakeholders or consumers regarding the environmental practices of an organisation or the environmental benefits of a product or service (Delmas & Burbano, 2011).

IFC performance standards are the standards used by the International Finance Corporate to define the IFC clients' responsibilities for identifying and managing environmental and social risks (International Finance Corporation, 2020).

Load shedding is the implementation of systematic, controlled power outages in South Africa to protect the electricity power system from total collapse (Eskom, 2020).

The Standard for the purposes of this dissertation, refers to ISO14001.

Renewable Energy is the energy that is obtained from a source that is not depleted with use, and that occurs in the natural environment. It includes carbon-neutral technologies such as biomass and non-carbon technologies such as solar energy, concentrative photo-voltaic, hydropower, wind, tide and waves and geothermal heat (Renewable Energy, 2020; Verbruggen et al., 2010).

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CHAPTER 1 INTRODUCTION

1.1 Background

Historically, the electricity supply in South Africa has been heavily reliant on coal-based generation. Coal-related generation accounts for approximately 83% of South Africa's electricity, which has led to South Africa's per capita greenhouse emissions being the highest in Africa. Greenhouse gases are gases that "absorb and reradiate infrared electromagnetic radiation" (Oxford Reference, 2020) and in so doing increase in the earth's temperature and lead to global warming (Republic of South Africa, 2003). Global warming refers to the overall warming of the Earth, based on an average increase in temperature, measured across both land and ocean temperatures (Davis-Reddy & Vincent, 2017). The legacy of fossil fuels and associated by-product disposal has resulted in significant health and environmental degradation, with externality costs running into the billions of Rands (Jain & Jain, 2017; Republic of South Africa, 2019; Thopil & Pouris, 2015).

The Integrated Resources Plan (Republic of South Africa, 2019) concludes that Eskom's energy availability factor has as of January 2018, regressed below 70%. Lower than the planned average of 75%, and well below the energy availability factor of the preceding ten years, which resulted in load shedding (Eberhard & Mtepa, 2003; Republic of South Africa, 2019). Load shedding is the implementation of systematic, controlled power outages to protect the electricity power system in South Africa from total collapse (Eskom, 2020). The lack of energy availability has had and continues to have a severe negative effect on the South African economy and its growth potential.

Renewable energy was identified as a possible solution to increase energy availability, reduce carbon emissions (Aleixandre-Tudó *et al.*, 2019), create jobs, and in doing so stimulate the economy (Napier, 2017). Renewable energy refers to energy that is obtained from a source that is not depleted through use, and that occurs in the natural environment. It includes carbon-neutral technologies such as biomass and non-carbon neutral technologies such as solar energy, concentrative photo-voltaic, hydropower, wind, tide and waves and geothermal heat (Renewable Energy, 2020; Verbruggen *et al.*, 2010).

The South African government has set a target energy mix of approximately 34% renewable energy contribution to the total installed electricity capacity by 2030, a substantial increase from the 8.8% renewable energy contribution in 2018 (Republic of South Africa, 2019; USAID, 2019). These generation targets and the lack of energy availability have led to an actively developing renewable energy sector in South Africa.

1.2 Challenges to Renewable Energy Development

However, the rapid expansion of the renewable energy sector is not without its challenges; increased pressure on biodiversity, high capital investment requirements, and a challenging socio-political landscape to name a few (Longe *et al.*, 2019). Renewable energy projects in South Africa are financed through bank loans, private equity, and shareholder loans (Eberhard *et al.*, 2014; Kruger & Eberhard, 2018). These financing arrangements bring with them extensive governance objectives and reporting requirements, in the form of adherence to the Equator Principals (EP), or the International Finance Corporation (IFC) Performance Standards (Equator Principles Association, 2020; Ettmayr & Lloyd, 2017; International Finance Corporation, 2020; Jain & Jain, 2017).

Each development is mandated to include minimum ownership by black South Africans of 12 percent and minimum ownership by a local community of 2.5 percent. This approach is an attempt, by the government, to increase industrial development but has been criticised for contributing to inflated prices and negligible long-term benefits (Ettmayr & Lloyd, 2017; Leigland & Eberhard, 2018).

The environmental legislative framework in South Africa is such that the majority of renewable energy developments are required to undertake an environmental impact assessment process, numerous specialist studies, and engage in public participation. The outcome of this process may result in a multitude of monitoring, reporting and compliance obligations, during both construction and operation of the development (Boshoff, 2014; Republic of South Africa, 2014). The siting of such renewable energy projects in South Africa has frequently raised environmental management concerns. Large developments are often constructed near small rural communities, which may distort their visual landscape. In the case of wind energy, developments may threaten bird and bat populations (Slattery *et al.*, 2011); and in the case of solar energy, developments may result in the clearance of endangered flora and increased soil erosion (Mahajan, 2012; Topić *et al.*, 2014).

1.3 The Role of ISO 14001

Considering the challenges of renewable energy developments, the implementation of an environmental management system (EMS) to improve environmental performance would appear to be beneficial. An environmental management system is a framework that can assist an organisation to improve its environmental performance. An EMS typically consists of management procedures regarding the environmental aspects and impacts of the organisation's

operations, to achieve improvement in environmental performance. (Popoola, 2013; Zilahy, 2017). The reference standard for EMS's is the International Standards Organisation (ISO) 14001 (Boiral, 2011), hereafter referred to as 'the Standard'. The Standard has evolved from the initial release in 1996 to the 2004 update and, the current iteration which was issued in 2015. The approach of the Standard has shifted from a conformance-based focus to an updated (and seemingly improved) environmental performance-based focus (Ciravegna Martins da Fonseca, 2015; Ikram *et al.*, 2019; ISO Update, 2018; Nel, 2019).

Numerous researchers have found that the adoption of ISO 14001 has improved environmental performance, and provided assurance to organisations and their stakeholders and could, therefore, serve as a valuable tool in managing the various compliance, performance and investor obligations for renewable energy developer-operators (Anton *et al.*, 2004; Cole *et al.*, 2006; Dasgupta *et al.*, 2000; International Standards Organization, 2019b; Mazzi *et al.*, 2016; Singh *et al.*, 2015b).

However, the Standard is not without its criticisms. The increased resource and financial costs of implementation (Boiral, 2011; Zutshi & Sohal, 2004), and the difficulty in quantifying the benefits of implementation (Arimura *et al.*, 2015; Ferron *et al.*, 2012) are frequently occurring research findings. The cost of certification (Alberti *et al.*, 2000) and the actual value of certification (Ferrón Vílchez, 2017; Johnson, 2018; Latridis & Kesidou, 2018) are other highly debated issues.

The Standard has evolved from the initial release in 1996 to the 2004 update and, the current iteration which was issued in 2015. For the purposes of this research, I will not be differentiating between the various iterations of the Standard.

1.4 Problem Statement and Rationale for the Study

The renewable energy sector is an emerging and rapidly growing industrial sector in South Africa. As the costs of renewable energy technology continues to fall, and older power generating plants are decommissioned, the demand for renewable energy developments will increase. These developments are subject to a great deal of stakeholder scrutiny, as well as lender and legislative assurance and reporting requirements. For these reasons, the renewable energy sector is an interesting sector in which to explore the implementation of the Standard. I am not aware of any studies on the state of the Standard in the renewable energy sector in South Africa currently.

This research aims to establish the current practices and perceptions of the Standard's implementation amongst renewable energy developer-operators. The term 'practices' refers to establishing which organisations (and their basic profile) implement the Standard in order to provide a basis for the research The research then explores the practical and perceived reasons for implementing the Standard (drivers), the advantages and benefits that were realised from implementing the Standard and conversely, the real or perceived factors which prevent or discourage the implementation of the Standard (barriers) and the criticism or disadvantages realised from implementing the Standard. In the context of this dissertation, perception refers to factors that have not been measured or which may not have a factual basis, and are, therefore 'opinions' or 'feelings'.

1.5 Research Question

The research question of this study is: what are the practices and perceptions of ISO 14001 by independent renewable energy developer-operators in South Africa?

To fully answer the research question, the following sub-questions were posed:

1. Which independent renewable energy developer-operators in South Africa implement ISO 14001?
2. If the organisations do implement the Standard, then what are the drivers to implementation and what benefits, real or perceived, are derived?
3. If not, what barriers, real or perceived, deter the implementation of the Standard, and additionally what criticism do they have of the Standard?
4. And finally, regardless of their implementation of the standard or not, what are their perceptions and experiences of ISO 14001 certification?

1.6 Delineation of the Scope of the Study

The study focuses on eight organisations that are independent renewable energy developers, with current or pending (in the next twelve months), commercial wind or solar operations (developer-operators). Research sub-question one should be viewed as providing context with which to answer sub-questions two, three and four. Research sub-question one seeks to establish which organisations implement the Standard and the basic profile of the organisation i.e. whether the organisation has a local or international head office, the number of employees, the length of time operating in South Africa, the number of projects in operation or development, and the energy technology employed. Sub-questions two, three and four explores the specific experiences and perceptions of the organisations towards ISO 14001 implementation and certification.

The study was limited to developer-operators in order to exclude organisations that may provide services across a range of sectors, not limited to renewable energy, such as construction and manufacturing. This focus enabled the findings to be meaningfully compared across organisations.

The extent to which the Standard may be entrenched into the participating organisations was not explored, nor was the effectiveness of the Standard in terms environmental performance. To adequately establish this information an in-depth audit of the organisations would need to be performed, which falls outside the scope of this study and is appropriately conducted by an ISO accredited practitioner and not a researcher.

1.7 Structure and Outline of the Dissertation

This dissertation is divided into five parts. Following the introduction in Chapter 1, Chapter 2 provides an overview of the methodology used to conduct the research; the research design, data collection and data analysis methods and in the process justify the chosen methods and discuss how these methods were applied. Thereafter, in Chapter 3, the drivers, advantages, barriers, and criticisms of the Standard are explored, as well as a look at certification, as contained in literature. In Chapter 4, the data are presented and discussed. Chapter 5 provides the conclusions from the data analysis, and lastly in Chapter 6 recommendations are made for further research.

1.8 Chapter Summary

The introductory chapter provided an overview of the energy landscape in South Africa, the rapid move towards renewable energy, and highlights some of the challenges faced by developers. The Standard was introduced as tool that may be used to address these challenges. The problem statement, rationale for the study, and the scope of the study was delineated. An overview of the structure of the dissertation was provided. In Chapter 2 the research methodology and how it was used to achieve the objectives of the study will be described.

CHAPTER 2 METHODOLOGY

2.1 Introduction

This chapter presents an overview of the research design employed to gather the data necessary to answer the research questions posed. Firstly, the chapter outlines the research design and the data collection methods, followed by the ethical considerations, and finally, a brief discussion on the limitations of the methodology selected.

2.2 Research Design

The research was based on the collection and analysis of qualitative data collected through semi-structured interviews. The reason for choosing a qualitative method was that the research intended to ascertain opinions, perceptions, and feelings, which is the strength of qualitative data collection (Bradley *et al.*, 2007; Johnson, 2018; Queirós *et al.*, 2017).

The first step in preparing for the research was conducting a literature review to ensure a thorough understanding of the renewable energy sector and the advantages, disadvantages, and criticisms of the Standard. The literature review was conducted using published and unpublished works, online content, South African policies, and White papers. The literature was obtained by utilising Google Scholar, the NWU Library, EBSCOhost, Scopus, and the National ETD Portal by searching for the following keywords “South Africa”, “renewable energy”, “ISO 14001”, “EMS”. Following the literature review, an interview guide for the semi-structured interviews was prepared, as described in Section 2.4.

2.3 Interview Design

The interview method chosen was a semi-structured interview. Longhurst (2003:103) defines semi-structured interviews as “a verbal interchange where one person, the interviewer, attempts to elicit information from another person by asking questions”. Semi-structured interviews have a degree of predetermined questions but are conversational, more informal, and flexible than structured interviews. This interview structure encourages the interviewee to express their views and opinions in their own ‘voice’ which allows insight into their opinions, perceptions and feelings (Clifford *et al.*, 2010; Morrison-Saunders & Bailey, 2009; Rabionet, 2011).

The interviews were conducted via a MS Teams call. Adopting Longhurst’s (2003) methodology, the interviews were recorded (with the interviewees' consent), which allowed the interviewer to

give their full attention to the interviewee. Immediately following the interview, the general tone of the conversation and the key themes were noted. As soon as practically possible after the interview, the interview recording was transcribed. This method has an advantage in the sense that the interaction is fresh in the interviewer's mind. Once transcribed, the transcription was sent to the interviewee for review and approval.

The interview questionnaire was ‘piloted’ through test interviews with two environmental managers working within other industries who did not form part of the research sample. Feedback from the test interviewees led to minor amendments to the interview questions.

2.4 Description of Interview Questions

In developing the interview guide, three sources were utilised: literature review, the researcher's experience and knowledge of the subject matter, and initial informal work such as discussions with people in the renewable energy sector. The interview guide was not intended to be a static document and was meant to be developed further during the interviews. Questions were added, and the conversation could progress naturally. This approach allowed the exploration of topics which emerged which had not been anticipated by the researcher, and for the rephrasing of questions if interviewees struggled to provide meaningful responses. As the research was particularly interested in recording opinions and descriptions, it was important for the interview guide to be treated as a flexible document.

In preparation for the interview guide, the topic was explored through a literature review and a list of themes relevant to the research questions was prepared. A mix of closed and open-ended questions was used.

The interview guide (included as Appendix C) consisted of a total of 23 questions, which were divided into five sections from section A to section E. Section A, comprising of Questions 1 – 7, required the respondents to provide information about themselves and their company’s background. In section B, with Questions 8 – 13, the implementation and certification of the Standard were explored. Section C made up of Questions 14 – 19, gathered details regarding the drivers of implementation, the benefits that were and continue to be realised. Section D, questions 20 – 22, asked participants to expand on the barriers to implementation, and their perceived value of certification. Section E contained one question which solicited any other comments or feedback from the participants.

2.5 Sample Selection

The sampling criteria were organisations that are independent renewable energy developers with current or pending (in the next twelve months), commercial wind or solar operations (developer-operators). The South African Renewable Energy Council (SAREC) membership database was used to identify companies that met the selection criteria. The developer-operator status was the only criteria used to identify organisations, and factors such as organisation size, geographic location (within South Africa), status of ISO implementation etc. were not considered as selection criteria.

Thirteen organisations were identified, and due to the small population size, all thirteen were approached to participate in the study. Following the completion of each interview, the interviewee was asked for a referral to at least one contact at other suitable companies in an attempt to increase the sample size and gain access to non-responding organisations within the original population of thirteen. Unfortunately, no additional organisations were identified. This does however indicate that the SAREC database proved to be an effective database with which to identify suitable organisations.

The management representative responsible for environmental matters from each of the thirteen organisations was approached to be interviewed. Eight agreed to participate in the research, which represents 61,5% of the population size. Of the five that did not participate, one elected not to participate, while the remaining four did not respond to repeated email and telephonic communications.

All the organisations that participated are well established in South Africa and have at least one development in operation. The majority of organisations implement a combination of wind and solar technologies. An overview of the organisations that participated is shown in Table 2-1 below. Company names have been replaced by letters due to confidentiality commitments.

Table 2-1: Basic information about the participating organisations.

Company	Years operating in SA	Operational Projects	Projects under development	Technology Implemented
A	8	1	2	Wind, Solar
B	10	3	4	Wind, Solar
C	6	7	5+	Wind, Solar
D	9	6	Declined to answer	Solar
E	8	2	Declined to answer	Wind, Solar
F	9	4	4	Wind, Solar
G	9	5	28	Wind, Solar
H	8	2	Declined to answer	Wind

2.6 Data Analysis

The data on the profile of the organisations (section A of the interview guide) was divided into organisations that implement the Standard and those that do not. The results of this analysis were presented in a graphical format, and basic statistical analysis was conducted.

The data analysis relied on a deductive approach by evaluating the interview responses against predefined themes. Thematic analysis has the advantage of being flexible and allowing the researcher to analyse the data and determine commonalities and variables, which is particularly important for research which explores perceptions (Alhojailan, 2012; Bradley *et al.*, 2007; Miles & Huberman, 1994).

The development of themes was iterative and ongoing and began by defining initial themes and thereafter reviewing the data and updating the themes. The initial themes were based on the literature review and existing research. The data was reviewed, and keywords, sentences or phrases were coded by the researcher, and thereafter categorised into the themes where there was strong alignment (Bradley *et al.*, 2007; Miles & Huberman, 1994; Morse, 2015).

2.7 Ethical Considerations

The research proposal for this study was reviewed by the Scientific Committee of the Environmental Management Research Group in the Unit for Environmental Sciences and Management and was exempted from full review by the Faculty of Natural and Agricultural Science's Research Ethics Committee, because the methodology followed was considered to be a minimal ethical risk. Ethical clearance was obtained (ethics number: NWU-01199-20-A9).

Aside from the research topic and interviewee sensitivity, the two most important ethical issues when considering the potential ethical issues of semi-structured interviews are confidentiality and anonymity. Participants must be comfortable that the interview notes are protected from unauthorised access. With regards to anonymity, all interview participants were given the option to remain anonymous, and their preference wholly adhered to. Additionally, participants have the right to withdraw from the research at any time without the need to explain (Longhurst, 2003).

A research information sheet was sent to each potential participant in advance. The information sheet provided background on the researcher and the purpose of the study. The information sheet is included as Appendix A. A pre-interview discussion with interviewees explained the purpose of the research, confidentiality, and the right of withdrawal. Following the discussion, interviewees were required to sign a consent form. A sample of the consent form used for this study is included as Appendix B.

Upon completion of the dissertation, the participants will be provided with a summary of the research results, as well as access to the dissertation.

2.8 Methodological Limitations

Ochieng (2009) and Queirós *et al.* (2017) found that variables such as the physical setting for an interview, schedules, space, pay/reward, and the notions of norms, traditions, roles, and values may strongly influence human behaviour and, therefore, these variables must be considered when conducting interview-based research.

As this research was exploring perceptions and opinions, it was important for the interview to be personal. Initially, the interviews were planned to be conducted face-to-face; however, the travel limitations and social distancing requirements as a result of the COVID-19 pandemic and the South African National Lockdown prohibited this method. Telephonic and MS Teams interviews were the alternative methods used to conduct the interviews at a time convenient for the interviewee. The tone of the interview was kept conversational to encourage interviewees to be open in their communications.

Thematic analysis has a potential weakness in that researchers may force data into the pre-determined themes (Bradley *et al.*, 2007; Miles & Huberman, 1994). An external party reviewed

the anonymised interview transcripts, the results of the study and the rationale for assigning a particular phrase, keyword, or sentence to a particular theme.

The effects of COVID-19 and the associated nationwide lockdown provided a challenging set of circumstances. Candidates were difficult to contact, and responses to communications were much lower than anticipated.

2.9 Chapter Summary

This chapter presented an overview of the research design and the methodology that was used to undertake the research. It expanded on the sample selection and the instrument used in the research. The techniques used to collect the data and how the data analysis was conducted was described. Lastly, the chapter considered the ethical implications and limitations of the methodology.

In the following chapter, the literature review provides the background to the Standard, the drivers, and benefits of the implementation, as well as the barriers and criticisms of the Standard.

CHAPTER 3 LITERATURE REVIEW

3.1 Introduction

This chapter provides an overview of what was discovered in the literature to further understand the factors affecting the implementation of the Standard. The outcome of the literature review formed the basis of the interview guide, as well as the themes used in the data analysis. The chapter begins with exploring the history of the Standard, and the various sectors and countries leading its implementation. Thereafter the reasons for implementing the Standard the advantages and benefits of implementing the Standard, followed by the criticisms and barriers to implementation are discussed. Finally, the value and drivers of certification are explored.

3.2 The History of ISO 14001

Concern for the natural environment gathered momentum during the 1980's and organisations began to realise that in order to meet the increasing concerns of consumers and stakeholders and to meet the requirements of trade agreements, a more pro-active approach to environmental management was required (Mikulich, 2003; Zilahy, 2017). In 1987, the United Nations World Commission on Environment and Development published a report titled "Our Common Future", which formally introduced the term "sustainable development", and called on industry to develop effective environmental management systems (Mikulich, 2003; Zeng *et al.*, 2005). In the lead up to their 1992 conference in Rio De Janeiro, the United Nations Conference on Environment and Development (UNCED) requested that ISO draw up a set of environmental standards (Mikulich, 2003; Taylor, 1998). Established in 1946 and based in Geneva, Switzerland, ISO gained popularity with the widely adopted 9000 series of quality management system standards (Roht-Arriaza, 1996; Taylor, 1998; Zilahy, 2017). The success of the ISO 9000 series became the model for ISO to develop a set of standards for environmental management systems to be named the ISO 14000 series (Mikulich, 2003; Roht-Arriaza, 1996).

In 1993, ISO formed Technical Committee 207 with the task to draft the ISO 14000 series. The ISO 14000 series of standards were developed in order to provide organisations with assistance on the implementation of actions, one of which was environmental management systems, which were in support of sustainable development (Mikulich, 2003). The ISO 14000 series consists of 20 separate standards relating to environmental management. These standards were developed to assist organisations in establishing management processes for controlling and improving their environmental performance. The 14000 standards were developed to integrate with ISO 9000, and later revised to integrate into ISO1 25000 energy management systems and ISO 26000 social responsibilities (International Standards Organization, 2019b; Zilahy, 2017).

The most widely implemented standard of the ISO 14000 standards is the environmental management system standard, ISO 14001. ISO 14001 provides a framework for establishing and implementing an EMS and is the only standard in the ISO 14000 series that is certifiable (Babakri *et al.*, 2003; Matela, 2006).

The Standard was first published in 1996 and aimed to provide management processes for managing and improving environmental performance and reducing an organisations negative impacts on the environment whilst balancing socio-economic needs (Bravi *et al.*, 2020; International Standards Organization, 2019a; Mikulich, 2003; Murray, 1999).

The Standard requires that facilities establish environmental policy, create quantifiable goals to reduce their environmental impacts, and monitor their environmental progress through systematic auditing and management review (Coglianese and Nash 2001). The Standard is based on a continuous improvement model that directs firms to periodically revisit and update their environmental improvement goals to ensure that negative environmental impacts are minimised (Darnall and Edwards, 2006).

Organisations that implement the Standard may elect to obtain certification. This process involves passing an assessment conducted by an accredited independent third-party auditor. Certification can be used to signal to external stakeholders as to the legitimacy of the system, and of the organisations commitment to environmental responsibility. In some cases, organisations choose to implement the Standard and not to obtain external certification, and may simply follow the requirements of the Standard and self-declare that their EMS meets the requirements (Aravind & Christmann, 2011).

Since its inception, the Standard has grown to become the most successful environmental standard, with over 300,000 certifications worldwide (Bravi et al., 2020). European countries have experienced a significant increase in ISO 14001 adoptions: from 7,253 certified companies in 2000 to 119,754 in 2015 (ISO, 2016). Asia has moved from 5,234 certifications in 2000 to 173,324 in 2015, making the region the largest adopter of the Standard (Salim *et al.*, 2018) making up more than half of the total certified organisations worldwide. Over the same period (2000 to 2015) certifications in South Africa increased from 126 to 1192 (ISO, 2018).

The results of the ISO 2019 annual survey show that South Africa has a total number of 942 certifications (ISO, 2019). A summary showing the top 10 countries by certification, and South Africa is presents as Table 3-1.

Table 3-1: Top 10 countries by total number of certifications, and South Africa (ISO, 2019).

Country	Total No. of Certificates
China	134,926
Japan	18,026
Italy	17,386
Spain	12,871
United Kingdom of Great Britain and Northern Ireland	11,420
India	8,486
Germany	8,465
France	6,402
Korea (Republic of)	5,698
Romania	4,658
South Africa	942

The sectorial results of the survey revealed that, globally, the electricity supply sector has 1,953 certifications, while the survey recorded only two certifications in the electricity supply sector in South Africa (ISO, 2019). Unfortunately, the survey does not differentiate between fossil fuel or renewable energy electricity supply. A summary of the top ten most certified sectors and electricity supply is presented as Table 3-2. The low number of certifications for electricity supply in South Africa may be because of multi-national organisations being certified at their head office, which potentially falls outside of South Africa. Another consideration is that Eskom has held the monopoly on electricity supply for many years in South Africa.

Table 3-2: Top 10 certified sectors and electricity supply by total number of certifications, globally and in and South Africa (ISO, 2019).

Top 10 Certified Sectors & Electricity Supply	Number Globally	Number in South Africa
Construction	61,162	42
Trade, repairs of motor vehicles, motorcycles & personal & household goods	34,870	21
Basic metal & fabricated metal products	32,662	100
Electrical and optical equipment	31,162	33
Engineering services	21,683	30
Other Services	20,387	35
Machinery and equipment	19,855	35
Rubber and plastic products	15,886	25
Chemicals, chemical products & fibres	12,632	42
Information technology	12,255	4
Electricity supply	1,953	2

3.3 Drivers for Implementing ISO 14001

Drivers are those factors that 'push' or encourage an organisation to implement the Standard. These factors represent the anticipated or perceived benefits of implementing the Standard. Researchers have identified several drivers for implementing the Standard. According to Zutshi and Sohal (2004) and Sorooshian and Ting (2018), these reasons or drivers can be classified into four broad categories:

1. Market-based drivers,
2. Finance-based drivers,
3. Social-based drivers, and
4. Regulatory-based drivers.

3.3.1 Market-based Drivers

Market drivers are drivers that have a direct impact on the competitiveness of the organisation (Zutshi & Sohal, 2004). The rise of the 'green economy' and increased environmental awareness among consumers has increased the impetus for organisations to implement the Standard (Ikram *et al.*, 2020; Latridis & Kesidou, 2018; Qi *et al.*, 2011; Raciu & Mortan, 2014). Clients or customers increasingly prefer organisations that are deemed to be 'environmentally friendly' and are actively turning away from companies that cause environmental degradation (Ikram *et al.*, 2020; Singh *et al.*, 2015b; Sorooshian & Ting, 2018).

The iterative nature of the Standard to meet and improve on targets and objects encourages operational innovation (Salim *et al.*, 2018; Zilahy, 2017). The early adoption of the Standard differentiates the organisation from competitors, enhances the organisation's image, and strengthens its reputation (Johnstone, 2020; Sorooshian & Ting, 2018; Valdez-Juárez *et al.*, 2019).

3.3.2 Finance-based Drivers

Closely linked to market drivers, financial drivers are as a result of pressures from financial intuitions, lenders, and insurance companies (Zutshi & Sohal, 2004). The implementation of the Standard assures that environmental and regulatory factors are being systematically managed, therefore decreasing financial risk exposure for their stakeholder (Heras-Saizarbitoria *et al.*, 2011b; Murmura *et al.*, 2018). As such, stakeholders are encouraging or requiring compliance with the Standard before funding or insurance policies are extended to the organisations

(Murmura *et al.*, 2018; Sorooshian & Ting, 2018). A more direct financial driver is the likely reduction of financial penalties as a result of avoiding fines (Berry & Rondinelli, 1998), work stoppages and operating losses as imposed by regulatory bodies due to non-compliance (Sorooshian & Ting, 2018; Zutshi & Sohal, 2004).

3.3.3 Social-based Drivers

Social drivers include pressure from interest groups, employees, community organisations, and non-governmental organisations (NGOs) (Heras-Saizarbitoria & Boiral, 2013; Latridis & Kesidou, 2018; Murray, 1999). This pressure may be direct or indirect. Direct pressure stems from actions by the groups mentioned above to the organisation themselves, for example, avoiding the procurement of certain products or the organisation entirely, or through the court of public opinion in traditional or social media (Bravi *et al.*, 2020). Indirect pressure may come about from actions taken by stakeholders toward the organisations' clients, or the regulatory authorities, which in turn exert pressure on the organisation (Castka & Prajogo, 2013; Heras-Saizarbitoria & Boiral, 2013), for example boycotting a company due to their support of another entity. The Standard provides a way for an organisation to publish its legitimacy amongst its stakeholders (Qi *et al.*; Truong *et al.*, 2020), and directs the organisation to actively engage and communicate with its stakeholders to mitigate social pressure (Boiral, 2002; Singh *et al.*, 2015b).

3.3.4 Regulatory-based Drivers

Regulatory drivers have increased over the years as international, and national legislation continues to become more stringent. Additional regulatory drivers may include public disclosure agreements, norms and standards, industry regulations, and area-specific by-laws (Campos *et al.*, 2015). The Standard contains provisions in numerous areas aimed at addressing the fulfilment of compliance obligations (Balzarova & Castka, 2008; International Standards Organization, 2015). While regulatory pressures are not the main reason for implementing the Standard, they remain a significant driver (Campos *et al.*, 2015; Reis *et al.*, 2018; Sorooshian *et al.*, 2018).

In summary, the drivers for implementing the Standard vary and are generally related to factors such as the organisation's image, market and financial-related advantages, the demands of the market and customers, improved stakeholder communication and achieving higher levels of compliance (Campos *et al.*, 2015; Franchetti, 2011; Singh *et al.*, 2015a). Increasingly companies are adhering to a triple bottom line approach to performance management, i.e. profit, environmental quality (the planet) and social justice (the people), and the successful

implementation of the Standard provides a suitable system to improve performance in all three arenas (Prajogo *et al.*, 2012).

An indirect driver or enabling factor is the interrelationship between quality ISO 9001 and the Standard. Organisations that are ISO 9001 certified are more inclined to implement the Standard (Darnall, 2003; Mijatovic *et al.*, 2019), and that ISO 9001 is a facilitator or precursor to the implementation of the Standard (Bernardo *et al.*, 2015; Carrillo-Labella *et al.*, 2020; Daddi *et al.*, 2016).

3.4 Benefits of ISO 14001

The benefits of the Standard are the positive factors which have been realised from the implementation of the Standard. They are typically more practical and quantifiable than drivers. The increased adoption and success of the Standard can be attributed to numerous benefits (Bravi *et al.*, 2020; Ciravegna Martins da Fonseca, 2015). Where the drivers to implementation are often intangible and idealistic, the benefits of implementing the Standard are typically more practical and quantifiable (Heras-Saizarbitoria *et al.*, 2011a). Hillary (2004) proposed grouping the benefits of implementing the Standard into two categories, internal benefits, and external benefits.

Internal benefits are those that directly relate to the operations of the organisation. Hillary (2004) goes on to provide three sub-categories of internal benefits:

1. Organisational benefits,
2. Financial benefits, and
3. People related benefits.

3.4.1 Organisational Benefits

The organisation benefits come in the form of operational efficiencies and improved quality of systems (Heras-Saizarbitoria *et al.*, 2011a; Jiang & Bansal, 2003; Waxin *et al.*, 2019). Additional benefits may be increased training and general investment in the human resources of the organisation, and an increase in management participation and accountability (Heras-Saizarbitoria *et al.*, 2011a; Nguyen & Hens, 2015). The Standard can enhance the image and reputation of the organisation (Poksinska *et al.*, 2003; Reis *et al.*, 2018; Tan, 2005; Zeng *et al.*, 2005), and improve regularity compliance (Fura, 2013; Waxin *et al.*, 2019). Innovation is

encouraged which can lead to further operational efficiencies (Murmura *et al.*, 2018; Neumayer & Perkins, 2004), promotional opportunities, and a culture of innovation and operational excellence within the organisation (Hillary, 2004; Salim *et al.*, 2018).

3.4.2 Financial Benefits

Financially, the implementation of the Standard can reduce the costs of raw materials, reduce resource usages such as electricity and water, and reduce waste production which ultimately reduces the cost base (Bravi *et al.*, 2020; Mungai *et al.*, 2020). Costs can be further reduced by streamlining the efficiency of running processes (including the appropriate maintenance of machinery and devices) and implementing new, more effective processes. Improvements to the design of services and products may further limit resource consumption, save time, and improve quality (Matuszak-Flejszman, 2009; Reis *et al.*, 2018).

The Standard provides an increased level of assurance which can be used as leverage to reduce insurance premiums and could be a pre-requisite to access or increase funding (Poksinska *et al.*, 2003; Qi *et al.*, 2011). Increasingly, financial institutions are more willing to invest in environmentally friendly endeavours, and in turn, organisations who implement the Standard attract more ethical investors (Di Noia & Nicoletti, 2016; Hillary, 2004; Sorooshian *et al.*, 2018).

3.4.3 People Related Benefits

People related benefits typically come in the form of improved communication channels, the advancement of skills and knowledge, and improved staff morale (Fura, 2013). The Standard mandates employee engagement and works to open lines of communication between staff and management (Hillary, 2004). A study by Waxin *et al.* (2019) found that employee involvement and awareness was a critical factor in successfully implementing the Standard. This collaborative management approach, and improvement in communication help to develop employee commitment to environmental performance, and the morale in general (Johnson, 2018; Johnstone, 2020). Another benefit often realised from implementing the Standard is an increase in overall employee health and safety, these are often because of improved management controls and innovation (Alemagi *et al.*, 2006; Boiral & Sala, 1998).

The external benefits of the Standard are those improvements that are realised from dealings outside of the organisation. Hillary (2004) suggests grouping these benefits into three categories:

1. Commercial benefits,
2. Environmental benefits; and
3. Communication benefits.

3.4.4 Commercial Benefits

Commercially, the implementation of the Standard can assist an organisation to expand its customer base, access new markets, and improve customer satisfaction which often results in repeat business (Hillary, 2004; Qi *et al.*, 2011). The iterative improvement approach of the Standard encourages innovation and improved efficiencies (Darnall, 2003; Latridis & Kesidou, 2018) which can result in lower operating costs, more efficient materials usage, and decreased wastage, therefore, increasing profitability (Fura, 2013; Salim *et al.*, 2018; Valdez-Juárez *et al.*, 2019). Furthermore, compliance with the Standard signals to customers that an organisation is environmentally responsible as increasingly, customers prefer to do business with environmentally responsible businesses and prefer environmentally friendly products (Hillary, 2004; Miles & Russell, 1997; Sorooshian & Ting, 2018).

Additionally, the implementation, and often certification, of the Standard is becoming a requirement for trade within, and with the European Union (EU) and Asia, and increasingly governments are adding ISO 14001 compliance to their procurement policy requirements (Koegh, 2000; Massoud *et al.*, 2010; Qi *et al.*, 2011). From a South African context, this is important as materials, suppliers, and developers in the RE sector may be based in the EU and China. This reliance on trade with the EU and China could be seen as both a driver towards adopting the Standard and a benefit of implementing the Standard.

3.4.5 Environmental Benefits

The environmental benefits are, in many ways, the cornerstone of the Standard. The benefits of enhanced environmental performance under an EMS include improving regulatory compliance, increased efficiencies in energy and materials use, and reduced pollution (Potoski & Prakash, 2005a; Sorooshian & Ting, 2018; Testa *et al.*, 2014). The Standard directs organisations to conduct legal assessments, identify compliance obligations and ensure that these identified obligations are incorporated as performance indicators of which management is held accountable (Murmura *et al.*, 2018). The Standard requires regular internal management review to assess

environmental and regulatory compliance, and in doing so, results in improved performance (International Standards Organization, 2015).

3.4.6 Communication Benefits

The Standard has shown to improve communication with external stakeholders (Castka & Prajogo, 2013; Heras-Saizarbitoria & Boiral, 2013) and improve customer relationships (Balzarova & Castka, 2008; Singh *et al.*, 2015b). Furthermore, the Standard can improve relations with communities and interest groups, improve cooperation from government departments (Potoski & Prakash, 2005b), and generally improve the organisation's reputation (Hillary, 2004; Psomas Evangelos *et al.*, 2011; Tyira, 2012).

3.5 Barriers to the Implementation of ISO 14001

Barriers are the factors which, real or perceived, prevent an organisation from implementing the Standard. The most commonly cited barrier to implementation of the Standard is the cost associated with implementation and certification, both directly financial and administrative (Bravi *et al.*, 2020; Iraldo *et al.*, 2010; Murmura *et al.*, 2018; Raciu & Mortan, 2014; Zilahy, 2017), the lack of competent resources available in many organisations, and insufficient commitment from management to support the process (Bravi *et al.*, 2020; Zeng *et al.*, 2005). Organisations have expressed that the diversion of limited resources to the Standard detracted from more profitable initiatives and were perceived as an excessive expense (Boiral *et al.*, 2017). This cost barrier is particularly evident in developing countries where finances are limited, and skilled personnel are in short supply (Ikram *et al.*, 2019; Iraldo *et al.*, 2010; Massoud *et al.*, 2010), and in small and medium enterprises (Massoud *et al.*, 2010; Murmura *et al.*, 2018; Wong *et al.*, 2020). In a South African renewable energy context with low-profit margins, political and policy uncertainty and a volatile exchange rate, this is especially relevant (de Jongh *et al.*, 2014).

The cost barrier may be reflected by the market responses, such as falling share prices and lack of market confidence in the value of the Standard. Research into the financial benefit of the Standard found that there may be a negligible or even negative response by the market in both developed and developing countries (Riaz *et al.*, 2019). The reasons for this were identified as being that resources invested in implementing the Standard could be better utilised elsewhere in the organisation (Boiral, 2002; Riaz *et al.*, 2019), or that the implementation and certification come as a response to stakeholder pressure, rather than a pro-active investment. This response leads the market to believe that the Standard offers little value and is limited to an administrative exercise (Cañón-de-Francia & Garcés-Ayerbe, 2009). This perception is especially true when the

market perceives an organisation as having a low environmental impact, and therefore the investment into implementing the Standard is seen as wasteful or unnecessary expenditure (Bansal & Bogner, 2002).

3.6 Criticism of ISO 14001

While there are many benefits to the implementation of the Standard, there is also a great deal of criticism. Academic critics point out that the implementation of the Standard does not necessarily ensure improved environmental performance (Heras-Saizarbitoria *et al.*, 2020; Poksinska *et al.*, 2003). The Standard is a system framework, and rather than dictating outcomes, it focuses on the processes that organisations should follow to manage environmental impacts (Curkovic & Sroufe, 2011). This process-orientated approach allows variations in environmental goals and subsequent performance (Rondinelli & Vastag, 2000). Organisations decide on their specific targets and goals, and therefore firms of a similar size and operational sector could potentially have vastly different performance outcomes (Arimura *et al.*, 2015; Ferron *et al.*, 2012). Often the targets and objectives are based on the consensus within an organisation. The targets and objective may, therefore, be based on any number of factors over and above environmental performance improvement (Rondinelli & Vastag, 2000).

Academic researchers contend that the identification of environmental performance indicators is challenging and may not be comparable across organisations (Potoski & Prakash, 2005a; Rondinelli & Vastag, 2000). The most frequently used indicators are waste production and resource usage (Mungai *et al.*, 2020; Singh *et al.*, 2015a; Tan, 2005), but beyond those, there is a myriad of generalised performance indicators that are not comparable to other organisations and are often difficult to verify (Rondinelli & Vastag, 2000). A systematic review of ISO 14001 scholarly and practitioner literature found that while positive correlations between performance and the implementation of the standard were found, a near equivalent number of studies found little or no correlation (Boiral *et al.*, 2017).

Organisations may invest the bare minimum and only superficially adopt the Standard in an attempt to use the Standard as a symbol to gain legitimacy and signal their credibility to stakeholders (Boiral, 2002; Latridis & Kesidou, 2018; Rodríguez *et al.*, 2011; Turk, 2009). Superficial implementation is the adoption of the Standard for appearance, whereas substantial implementation embraces the Standard fully in all aspects of the organisation (Ferrón Vílchez, 2017; Lannelongue *et al.*, 2014). This superficial or symbolic implementation does not necessarily achieve environmental performance improvements (Castka & Prajogo, 2013; Heras-Saizarbitoria

et al., 2020; Johnstone & Hallberg, 2020; Truong *et al.*, 2020) and in some cases symbolic implementation or certification may have the sole aim of improving a company's image, contributing to the practice of "Greenwashing" (Di Noia & Nicoletti, 2016). Greenwashing is when organisations mislead consumers or stakeholders as to the environmental practices or the environmental benefits of a product or service (Delmas & Burbano, 2011). This is further complicated by the difficulty in differentiating between wholehearted implementation and symbolic adoption of the Standard from company to company (Boiral, 2002; Ferrón Vílchez, 2017; Truong *et al.*, 2020). Symbolic implementation typically occurs in countries or sectors with weak institutional or regulatory pressures (Latridis & Kesidou, 2018; Truong *et al.*, 2020).

Industry and practitioners have expressed an increasing lack of confidence in independent third-party audits. The reasons for this include the lack of rigour, focus, and confidence in the auditors (Aravind & Christmann, 2011; Christmann & Taylor, 2006; Heras-Saizarbitoria & Boiral, 2013). A similar situation has been experienced in the financial and accounting sector (Dimitriu, 2017; Potoski & Prakash, 2005a). This lack of confidence erodes the credibility of the Standard (Dogui *et al.*, 2014; Heras-Saizarbitoria & Boiral, 2013).

While the adoption of the Standard may provide assurance, industry representatives stated that it could also result in closer scrutiny (Jiang & Bansal, 2003). Organisations that are compliant or certified for implementing the Standard are expected to have complete administrative evidence of their management processes and environmental impacts and may be perceived as advertising their superior environmental performance. This perception could result in the organisations being a target for further investigation (Martín-de Castro *et al.*, 2017; Tyira, 2012).

3.7 Certification

An organisation may be ISO 14001 certified through a third-party audit. Certification demonstrates that all components of the Standard have been fully implemented (Di Noia & Nicoletti, 2016; Morrill & Berthelot, 2012). Certification provides credibility, legitimacy and external recognition (Cañón-de-Francia & Garcés-Ayerbe, 2009; Echchelh *et al.*, 2018); however, the process of certification comes at a financial cost (Reis *et al.*, 2018), often beyond the financial capability of smaller organisations (Murmura *et al.*, 2018). Jiang and Bansal (2003) found that where certification is not a regulatory or organisational requirement, the benefits of certification are inconclusive due to the cost-benefit trade-off. However, Morrill and Berthelot (2012) found that despite the costs, the ability for an organisation to communicate its environmental performance and the quality of their environmental system credibly are primary drivers for certification.

3.8 Chapter Summary

There are many well-researched drivers for the implementation of the Standard. Often implementation realises the anticipated benefits, including improved environmental performance, improved organisational efficiency, increased brand value and reputation, and improved knowledge, awareness, and commitment from employees (Boiral *et al.*, 2017; Turner & O'Neill, 2012; Waxin *et al.*, 2019). Section B and C of the interview guide explore the drivers and attempt to explore the benefits derived, whether measurable or not, of implementing the Standard, and of certification in terms of the Standard.

Conversely, the barriers to implementing the Standard are typically the high resource requirements, in terms of money, management time, and administration. The tight profit margins, and political and policy uncertainty place further pressure on these organisations. These factors informed the questions for Section D of the interview guide. The most significant criticisms of implementing the Standard are the incomparable performance standards from one organisation to the next, a lack of credibility in the Standard because of superficial implementation certification. Voluntary certification may also put the spotlight on the environmental impacts of an organisation that would otherwise have gone unnoticed. There are many variables, both internal and external, which may contribute to these adverse outcomes, and RE organisations in South Africa are exposed to a variety of these factors.

The literature review resulted in an initial set of themes used for analysing the data, as presented in Figure 3-1. The themes were developed by the researcher, taking into consideration recurrent subjects in the literature.

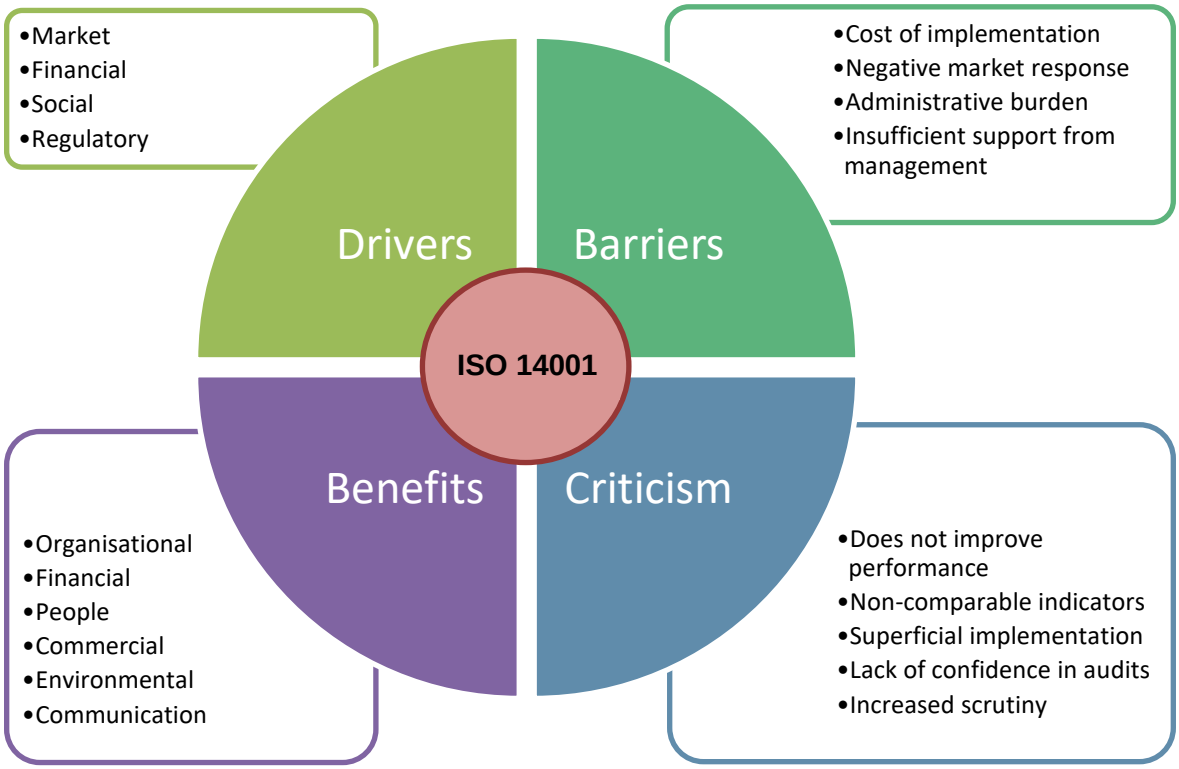

Figure 3-1: The initial set of themes used for analysing the data.

CHAPTER 4 RESULTS AND DISCUSSION

The research question of this study is: what are the practices and perceptions of ISO 14001 by independent renewable energy developer-operators in South Africa?

To fully answer the research question, the following sub-questions were posed:

1. Which independent renewable energy developer-operators in South Africa implement ISO 14001?
2. If the organisations do implement the Standard, then what are the drivers to implementation and what benefits, real or perceived, are derived?
3. If not, what barriers, real or perceived, deter the implementation of the Standard, and additionally what criticism do they have of the Standard?
4. And finally, regardless of their implementation of the standard or not, what are their perceptions and experiences of ISO 14001 certification?

4.1 Which independent renewable energy developer-operators in South Africa implement ISO 14001?

Section A of the interview guide sought to establish which independent renewable energy developer-operators implement the Standard, as well as to try to understand the profile of the organisations. The results of the section, as well as the designation of the interviewees are presented in Table 4-1 below.

Of the eight organisations that responded to the study, the data show that a slight majority of organisations implement the Standard, and four of the five organisations that do implement the Standard are also ISO 14001 certified. An investigation into the five organisations that did not respond to the study revealed that three of the five organisations do not implement the Standard, whilst the remaining two organisations do implement and are certified in the Standard.

The status of ISO 9001 implementation was investigated for the participating organisations because ISO 9001 is the most widely adopted ISO standard (Casadesus *et al.*, 2008; Jannah *et al.*, 2020). All participating organisations were found to be ISO 9001 certified. This is notable as ISO 9001 and the Standard are based on very similar management practices, structure and implementation methodology (Boiral, 2011; Mijatovic *et al.*, 2019).

Table 4-1: The profile of the participating organisations.

Company	International Head Office	Number of employees	Years' operating in SA	Operational Projects	Projects under development	Technology	Interviewee Designation
Implement ISO 14001							
A	N	38	8	1	2	Wind, Solar	Head of Environmental, Social & Governance
B	Y	65	10	3	4	Wind, Solar	Health, Safety, Environmental & Quality Manager
C	Y	150	6	7	5+	Wind, Solar	Head of Health, Safety, Environment & Quality
D	Y	148	9	6	Would not say	Solar	Environmental & Social Advisor
E	Y	58	8	2	Would not say	Wind, Solar	Quality, Safety, Environment & Social Manager
Do not Implement ISO 14001							
F	Y	50	9	4	4	Wind, Solar	Environmental, Social & Governance Director
G	N	20	9	7	28	Wind, Solar	Environmental Manager
H	N	18	8	2	Would not say	Wind	Head of Corporate Social Responsibility

Further exploration of the data collected in Section A showed that the organisations that implement the Standard are on average larger than those that do not implement the Standard, as measured by the number of employees in their South African offices. Figure 4-1 illustrates these results graphically. Organisations that implement the Standard have an average (arithmetic mean) of 92 employees. Two considerably larger companies unfortunately result in a large standard deviation of 47.5 which skews the results. In contrast, organisations that do not implement the Standard have an average of 29 employees, and a much smaller standard deviation of 14.6. However, while the standard deviation between the two groups is different, the difference in the co-efficient of variation between the two groups is very small. The co-efficient of variation for organisations that do implement the Standard was calculated to be 52%, while for those that do not implement the Standard was calculated to be 50%. This indicates that although the deviation from the mean was higher in the 'do implement' group, as a percentage, the variation from the mean between the two groups was similar (Fowler *et al.*, 2013:38-41). Although the size of the organisation and the implementation of the Standard correspond, it is inconclusive if the size is a causal factor to implementation.

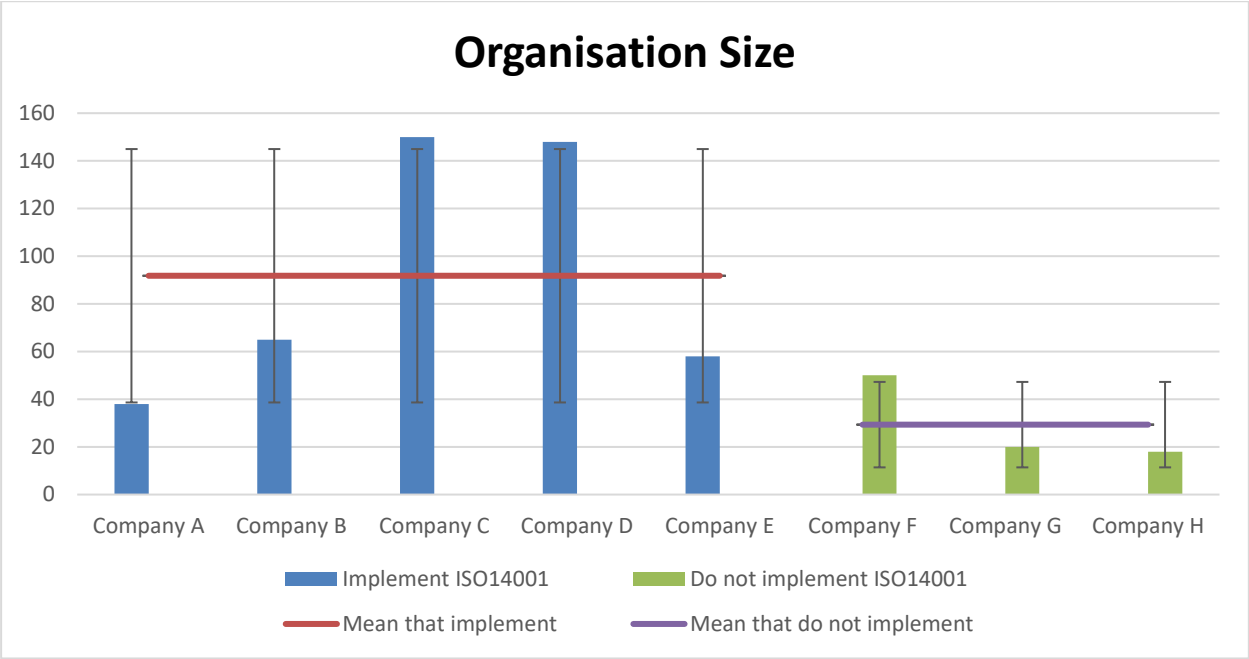

Figure 4-1: A comparison of the size of organisations (by employee numbers) that do and do not implement ISO 14001.

The link between size and implementation is not unexpected as researchers have found that tools such as ISO standards are often challenging for smaller organisations to adapt and operationalise (Barmasse, 2002; Hakim, 2003; Johnstone, 2020), and the implementation and certification of the Standard often has time and cost implications that are challenging to smaller organisations (Bravi *et al.*, 2020; Iraldo *et al.*, 2010; Murmura *et al.*, 2018)

The amount of time the organisations have been operating in South Africa varied between six and ten years. However, the largest organisation, both in terms of the number of employees (150 people) and operational projects (seven currently in operation), was the latest to enter South Africa in 2014. There does not appear to be a link between the amount of time an organisation has operated in South Africa and the implementation of the Standard.

Three of the organisations in the study had South African head offices, the remaining five had international head offices, all of which were in Europe. Of the organisations that implement the Standard, four out of five had international head offices, while only one of the three organisations that do not implement the standard was based internationally. This distribution is represented in Figure 4-2.

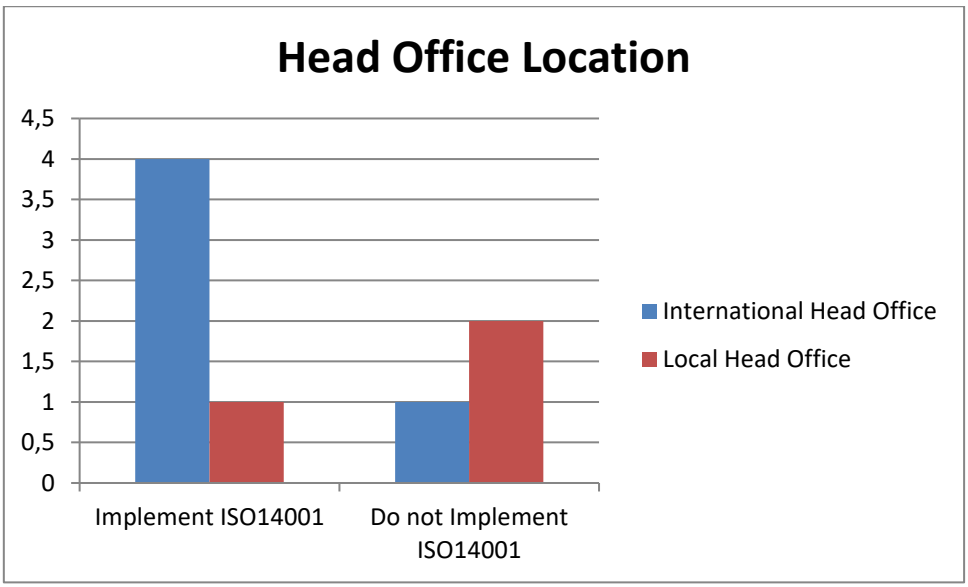

Figure 4-2: The comparison of the number of organisations with local and international head offices that do and do not implement the ISO 14001.

As with the relationship between size and implementation, the implementation of the Standard by organisations based in developed countries in Europe is not unexpected. These large well-established organisations have greater technical and financial capacity than smaller organisations in developing countries (Roht-Arriaza, 1996) such as South Africa. A further contributing factor is that developing countries played a comparatively small role in the development of the standard, and noted several procedural flaws in the drafting process (Mikulich, 2003). European organisations were early adopters of the Standard due to their international export focus, trade agreement restrictions (Bansal & Bogner, 2002) and compliance to the Standard continues to be a supplier and government business prerequisite (Massoud *et al.*, 2010).

4.2 What are the drivers to implementing the Standard and what benefits, real or perceived, are derived?

Section B and C of the interview guide were used to determine the drivers for implementing the Standard, as well as any benefits that were derived from the implementation. As explained in Chapter 3, drivers refer to the perceived or anticipated benefits that lead an organisation to implement the Standard. In contrast, benefits represent the positive results of having implemented the Standard. A summary of the responses received, and the frequency of the responses is presented in Table 4-2.

Table 4-2: A summary of the interviewee responses for drivers and benefits.

Theme	Mentioned Phrases	Frequency of Appearance
Drivers		
Corporate Requirement	*"Corporate policy", "Head office requirement", "Shareholder requirement*	7
Financial Drivers	*"Cost saving", "Reduced cost", "Bid requirement", "Commercial advantage*	5
Regulatory Compliance	*"Permit conditions", "Identify and close gaps", "Compliance to conditions"*	5
Social Drivers	*"Improved relations", "Improved reputation", "Better communication", "Provides confidence"*	4
Market Driver	*"Customer requirement", "Supplier requirement", "Competitive advantage"*	3
Benefits		
Environmental	*"Waste separation and disposal", "Care of the environment in the home", "Huge impact in terms of saving the environment"*	3
Regulatory compliance	*"Identify gaps", "Demonstrate compliance"*	2
Organisational Buy-in	*"Top management on board", "Employees actively participate"*	2
Operational Efficiency	*"Streamlined process", "Store and organise information"*	2
Risk Reduction	*"Guidance where regulation is lacking"*	1
Cost Reduction	*"Financial savings"*	1

4.2.1 Drivers for Implementing ISO 14001

The most frequently occurring theme for the driver of implementing the Standard was that it was a corporate requirement. All of the organisations that indicated that the implementation of the Standard was a company policy had international head offices primarily in Europe. The interviewees mentioned that representatives from the head office audit their compliance with the corporate procedures regularly. In this case, identifying the specific driver beyond 'a requirement from head office' is a complicated exercise and would involve research into the drivers of international parent organisations which is beyond the scope of this dissertation which is focused exclusively on South African organisations. When respondents were asked to speculate as to why implementation of the Standard was a head office requirement, the consensus was that it was as a result of regulatory and financial drivers. This is a logical explanation, as the majority of

respondent's head offices are based in Europe, which has stringent regulatory enforcement and well established financial incentives for implementing the Standard (Salim *et al.*, 2018). The initial theme of company policy as a driver was unexpected and was not apparent in the literature reviewed, however the contributing themes of regulatory and financial drivers aligned directly to the anticipated themes.

Financial drivers emerged again where interviewees explained that commercial policy and assurance were the drivers of implementation of the Standard. The Head of Health, Safety, Environment & Quality from Company C (the largest organisation, and last to enter the SA renewable energy market) stated: "*It is a [sic] corporate policy and in the renewable energy space has advantages for project bidding and contributes to our company contribution towards sustainability.*" Another interviewee, the Head of Environmental, Social & Governance from Company A, stated, "*Our lenders and shareholder want us to be compliant and certified with the ISO systems. We will require the same from our suppliers. I think it increases the reputation of the company in the eyes of the lender and gives them confidence that we're compliant. They're more open to talking about issues and engaging with us if they have that confidence in us. These commercial advantages were experienced through the lifecycle of the projects thus far, from bidding, securing funding, to the possible sale of the asset*." Company A does not have an international head office and is the smallest organisation in the study which implemented the Standard. The source of its funding is primarily from private equity firms, as against typical funding sources such as the IFC and World Bank (Kruger & Eberhard, 2018). It is noteworthy that the requirement for the Standard was that of locally managed private funders and not larger internationally-based organisations. An observation is that the largest and smallest organisations in the study both cited finance as an important driver for implementing the Standard.

The comment indicates that in this respondent's experience, financial and social drivers have resulted in improved stakeholder relations and commercial advantage over competitors. Similarly, the Health, Safety, Environmental and Quality Manager from Company B, which has been in the South African market for the longest of all of the participants, explained that "*In instances where projects are sold or other transactional events, then we can say that the way that we managed the project was in line with the principals of 14001 and provides confidence that the project was run in-line with global standard."*.

The first part of the respondent from Company A's answer, "…*Our lenders and shareholder want us to be compliant and certified with the ISO systems. We will require the same from our suppliers...*" highlights a customer/supplier relationship market driver, a theme which aligned

directly to the anticipated themes. This driver does not appear to be well documented in South Africa. However, research on suppliers in Asia and South-East Asia found that customer requirements are a significant driver towards implementation (Mikulich, 2003; Qi *et al.*, 2011; Sorooshian *et al.*, 2018; To & Margaret, 2014).

Notably, none of the interviewees mentioned the influence of ISO 9001 as a driver for or against implementing the Standard. This would seem contrary to research conducted by Mijatovic *et al.* (2019) that found a statistically significant relationship between the implementation of ISO 9001 and the Standard.

4.2.2 Benefits from Implementing ISO 14001

The benefits that were realised from implementing the Standard were varied, and no one common theme emerged. Risk reduction, regulatory compliance, organisational buy-in, and operational efficiencies were mentioned as benefits. The Environmental and Social Advisor from Company D, who works for an organisation that is expanding outside of South Africa said that "[the] *ISO 14001 standard requirement also provides guidance or standards on areas where local legislation is non-existent on specific subjects".* The interviewee from Company D went on to explain that their organisation is extremely risk-averse and that in the absence of explicit regulatory standards or standards which are deemed sub-par to those adopted by the organisation, the Standard, which is managed at a head office level, 'dictates' the requirements to be met which means the Standard is applied as a minimum. This experience represents both a driver, from head office, and a benefit, through improved governance and risk reduction. Company D was the second-largest organisations in the study, both in terms of the number of employees and the number of projects in operations. The organisation has operations in 14 countries, many of which are in developing and are, at times, politically unstable. The theme of organisation benefits aligned directly to the base themes, this benefit of the Standard as a 'crutch' for the often inadequate environmental legislation and the lack of capacity from authorities in developing countries was documented by Massoud *et al.* (2010).

The themes of organisational and compliance-related benefits were further highlighted by the interviewee from Company A, *who explained, "We are able [sic] demonstrate compliance and has [sic] assisted us to be very clear about information storage, and cataloguing information. We are able to systematically identify gaps. We're rigorous in our compliance, so any gaps stand out, and we're able to those gaps quickly."* A consideration is that Company A has only one project in operation but has two currently under construction (with more in the pipelines) and could therefore

be focused on compliance-related issues at the moment. The theme of organisational benefits was mentioned by Company D. The organisation has a diverse geographic footprint and has, according to the interviewee, found that the Standard had "*Streamlined and standardised environmental management processes".* In many ways, this comment captures the foundation of the Standard, that it is not a standard by which to measure anything, but a system for organisations to identify and manage their environmental performance criteria, and implement processes and procedures to improve performance across an organisation (Heras-Saizarbitoria *et al.*, 2011a; Poksinska *et al.*, 2003; Zilahy, 2017).

When asked if implementing the Standard has changed employee's perception of the environment, the interviewee from Company D replied: "*Yes, employees understand and participate actively on EMS processes*". Company A, who has only in the last two years started implementing the Standard, mentioned that "*…environmental matters were not really considered, and compliance issues pushed aside to be dealt with at a later stage. Now top management is on board and actively pushes for implementation*". This statement is aligned with findings from Rodríguez *et al.* (2011); Sorooshian and Yee (2019); Tung *et al.* (2014); Waxin *et al.* (2019); Zhu *et al.* (2008); and Zutshi and Sohal (2004), the researchers found that buy-in from senior management is a critical factor in the success of the implementation of the Standard.

Only one interviewee, the Quality, Safety, Environment and Social Manager from Company E highlighted cost reduction. Company E is a medium-sized company that is part of an extensive organisation based in Europe with operations in over 60 countries. The interviewee expressly referred to improved waste management which cut costs, and the environmental contribution that implementing the Standard has brought. They explained, "*We are a reputable, sustainable company and the environment is what we value a lot. It has resulted in waste separation making it easier to dispose of, as well as financial savings".* This was an anticipated theme and is well documented in the literature. The finding corresponds with research that the implementation of the Standard resulted in waste reduction and improved waste management in general (Curkovic & Sroufe, 2011; Djekic *et al.*, 2014; Martín-Peña *et al.*, 2014; Rondinelli & Vastag, 2000; Schylander & Martinuzzi, 2007). When asked why cost reduction was an uncommon driver in the sector, the interviewee opined that this might be due to the RE organisations having relatively low negative outputs such as waste, resource usage, spillages etc. compared to organisations in a sector such as manufacturing. The response links to two themes, the primary being that of financial benefits through cost reduction and linked to that the communication theme whereby the organisation is acutely aware of their reputation and the value that sustainability brings to their image.

When asked about their perception of the Standard in general, the same manager from Company E responded by saying *"I would encourage companies to become ISO certified and to teach their employees the importance of taking care of the environment, as this will filter to a person's home and in turn, a child will grow up with the care of the environment instilled in them*". This strong environmentally-centric view of the value of the Standard is encouraging, but when reflecting on the results, the theme of environmental benefits was among the benefits least experienced. This finding is somewhat alarming as one would expect an EMS to be environmentally beneficial. However, the finding does support international research by Ghisellini and Thurston (2005); Rondinelli and Vastag (2000) who found that environmental performance is not the primary driver of implementing the Standard. Similarly, local research by Matela (2006) found that among certified South African companies environmental performance related drivers came second to business-related drivers. This may be as a result of the lack of clear and comparable environmental performance indicators by which to measure the environmental improvements or benefits, which is a potential pitfall of the Standard (Boiral *et al.*, 2017; Potoski & Prakash, 2005a; Rondinelli & Vastag, 2000).

4.3 What barriers, real or perceived, deter the implementation of the Standard and what criticisms are there of the Standard?

Section D of the interview guide was used to gather information on the barriers to implementing the Standard, and criticisms of the Standard. Interviewees were asked to describe what prevents their organisation from adopting the Standard, and if they have had experience with implementing the Standard, what criticisms did they have for the Standard. A summary of the responses received, and the frequency of the responses is presented in Table 4-3.

Table 4-3: A summary of the interviewee responses for barriers and criticisms.

Theme	Mentioned Phrases	Frequency of Appearance
Barriers		
Lack of value	*"Doesn't add anything", "We don't see the value", "Doesn't assist",*	4
System duplication	*"Complied to IFC and EP", "Complied to lenders requirements", "Risk management is the same"*	5
Administrative costs	*"Would need a dedicated person", Admin heavy", Administration burden",*	3
Criticisms		
High Cost	*"Would need additional resource",*	1
Administrative burden	*"Administratively heavy"*	1
Lack of value	*Doesn't make a difference"*	1

4.3.1 Barriers to the Implementation of ISO 14001

The theme that emerged as the most frequently cited barrier for not implementing the Standard was the perceived lack of value, system duplication and the administrative costs. Renewable energy organisations as part of their lenders and investor requirements are required to comply with the IFC Performance Standards and Equator Principals (EP). The interviewees expressed opinions that the IFC and EP requirements met the needs of the organisation and its lenders, and that the implementation of the Standard would add no additional value, the Environmental, Social and Governance Director from Company F said "*We are an international organisation, with projects all over Africa. We have complied with IFC and EP standards and lender requirements instead of the international standards."* This is an interesting point of view as Company F's largest shareholder is based in Europe. However, their stance is contrary to all of the other internationally-based organisations in the study. This may be due to fact the Company F only operates in South Africa, where the Standard is purely voluntary. None the less, the response does highlight an interesting dichotomy in investor/head office expectations.

The interviewee from Company F went on to reiterate the administrative barrier by saying "*These days, most organisations just comply with* [*sic*] *the lenders' requirements and not the ISO requirements. The risk management part of ISO and the lenders' requirements are the same. ISO can be an administrative burden, and we'd like to avoid that".* Another interviewee, the Head of Corporate Social Responsibility from Company H, an organisation that has in the last six months

has been acquired by a South African investor, said that "*The previous shareholder did not see the need for a system. We would also need a dedicated person to administer the system, and we don't see enough value in the system to warrant that resource".* Company H was the smallest organisation in the study, and therefore it could reasonably be expected that they would be sensitive to the additional administration and cost that could result from implementing the Standard.

4.3.2 Criticism of ISO 14001

There were generally very few criticisms against the Standard. The organisations that implemented the Standard had positive experiences. However, the cost implications associated with the additional resources required to administer the Standard were cited; for example, the representative of Company C stated "*It* [the Standard] *is administratively heavy. All our plants have their own EMPr's,* [Environmental Management Programs] *we have to ensure we meet those conditions to be up to date with the requirements. ISO doesn't assist in this and doesn't make a difference in general."* Company C was the largest organisation in the study. While they may have more financial and human resource capacity than the other participants, the administrative burden of the Standard was still apparent to them. This would certainly seem to provide some justification for the administrative barrier mentioned by interviewees. This response represents the realisation of the cost and administrative barrier described above. The response also aligns with the base theme of the lack of performance improvement, but the cost criticism was a new, unexpected theme. It may be that due to Company C's perceived lack of value in the Standard, the cost of implementation is particularly noticeable. This perception was further highlighted by Company C's response to the value of certification, as discussed below.

4.4 The Perception and Value of Certification

The subject of ISO 14001 certification sparked many emotions in the interviewees, particularly around the costs vs value of certification. When asked about their opinion on the certification, an interview from Company C mentioned that "*To get ISO certified as a company, not just for 14001, is a huge cost. It's ridiculous for something that a business decides to follow. I think companies don't need to get certified, although the norm is to be certified to be a step ahead in a bid or to do business with certain companies".* This response represents the interviewee's perception of the value of certification, and while it may be true, there is a body of research to the contrary. A cost-benefit analysis of ISO 14001 certification in the South African manufacturing sector conducted by Johnstone (2020) found that the long-term financial benefits of certification justified the financial, administrative and human resource requirements to obtain certification. While there are many nuances from one sector to another, the research of Valdez-Juárez *et al.* (2019); and Wong

et al. (2020) showed that the Standard might have a positive influence on the profitability of small and medium enterprises.

A response from the interviewee from Company C identified the symbolic adoption of the system described by Ferrón Vílchez (2017); Johnstone and Hallberg (2020); and Latridis and Kesidou (2018), *"The companies that have the certification do not mean that they do as they are certified to do. Sometimes it's just a piece of paper, and the system is not a living system. It has become the norm that it is used to get business."* Aravind and Christmann (2011) describe this situation as the 'decoupling' of implementation from certification. Their research found that the environmental performance of organisations post-certification is entirely dependent on the quality of their implementation of the Standard. The researchers found that in some cases, non-certified organisations with high-quality implantation outperform certified organisations with lower-quality implementation. The comment also alludes to the research conducted by Christmann and Taylor (2006); and Heras-Saizarbitoria and Boiral (2013) that the increasing number of auditing and accounting scandals have eroded the credibility of management standard certifications.

4.5 Chapter Summary

This chapter presented the data obtained through interviews and attempted to address the research question by answering the research sub-questions. The interview responses were analysed using the methodology described and discussed in Chapter 2.

The data indicated which renewable energy developer-operators implemented the Standard and considered the characteristics of the developer-operators. Thereafter, the drivers and benefits of implementing the Standard in the applicable organisations was analysed. Lastly, the barriers to implementing the Standard was established, and for those organisations that have experience in the Standard, their criticism of the Standard was explored.

Chapter 5 provides the conclusions drawn from the research.

CHAPTER 5 CONCLUSION

5.1 Introduction

The objective of this study was to establish the practices and perceptions of the Standard by independent renewable energy developer-operators in South Africa. To fully answer the research question, several sub-questions were posed:

1. Which independent renewable energy developer-operators in South Africa implement ISO 14001?
2. If the organisations do implement the Standard, then what are the drivers to implementation and what benefits, real or perceived, are derived?
3. If not, what barriers, real or perceived, deter the implementation of the Standard, and additionally what criticism do they have of the Standard?
4. And finally, regardless of their implementation of the standard or not, what are their perceptions and experiences of ISO 14001 certification?

In examining which renewable energy developer-operators implement the Standard, the research showed that the majority of respondents do implement the Standard and are ISO 14001 certified. Using the number of employees as an indicator, it appears that the larger organisations tend towards implementing the standard. This supports literature on the difficulty faced by smaller organisations in adopting standards such as ISO 14001. The research further shows that the organisations with international head offices, in this case in Europe, are more likely to implement the Standard. This too supports literature on the tendency of developed countries to adopt voluntary self-regulation more readily such as the Standard, compared to developing countries like South Africa.

5.2 Drivers for Implementing ISO 14001

The predominant drivers for implementation were financial as a result of lender requirements for shareholder assurance. Notably, only one interviewee, from Company E cited cost savings as a financial driver. The interviewee opined that this could be due to the renewable energy sector producing lower levels of negative outputs as opposed to mining and manufacturing sectors, who typically experience cost savings from implementing the Standard. While this may not be true when considering the full renewable energy value chain, the scope of this study was limited to developer-operators. The influence and relationship of ISO 9001 as a driver for implementing the Standard was not mentioned by any interviewees.

5.3 Benefits of Implementing ISO 14001

The findings show that the RE organisations realise both internal and external benefits from the implementation of the Standard. Improved risk and compliance management, streamlined processes, and improved environmental awareness within the organisation were the most realised benefits by respondents. This finding very closely reflects the outcome of the literature review. It was, however, disappointing to find that environmental benefits were only achieved by one participating organisation.

5.4 Barriers and Criticisms of ISO 14001

The most frequently mentioned barrier was the perceived administrative and financial implications of implementing the Standard. This perception was realised and cited as criticism by one organisation. Further criticism was directed at the Standard in general, whereby respondents felt that the Standard was a duplication of existing requirements and offered no additional value to their organisations. The findings of both perceived barriers and experienced criticisms align strongly with the literature on the cost and administrative implications of the Standard, and the growing lack of confidence in the Standard.

5.5 The Value of Certification

Similarly, the perception and value of obtaining certification was generally negative, both as a result of the cost versus benefit of certification and the respondents' experience of symbolic certification and decoupled implementation, both findings are congruent with the literature and highlight a risk for the future value of ISO certification.

5.6 Results Summary

I conclude that although the majority of respondents implement and are certified in the Standard, their opinions and experiences are divided as to the benefits and value of the Standard, and the literature reflects this division.

The renewable energy sector in South Africa is set to grow rapidly over the next decade. Although renewable energy developments may be 'greener' than fossil fuel alternatives, there are areas for improvement both in terms of environmental performance and in optimising organisational processes. Lenders and stakeholder groups continue to demand more significant levels of assurance and transparency, and the implementation of the Standard could provide a framework for organisations to excel in these areas.

CHAPTER 6 RECOMMENDATIONS AND AREAS OF FUTURE RESEARCH

6.1 Recommendations to the Participating Organisations

Based on the recurrent comments on the administrative and cost barrier for the implementation of the standard, organisations should relook at the structure and reporting requirements of their management systems. The scope, complexity, and onerousness of their systems are to some extent, self-determined and there may be an opportunity to amend the system to ease the administrative and cost burden. In cases where the value of the Standard is in questions, for example, Company C, the organisation should take stock of the cost/benefit of the system, and if there is objectively no value then consider abandoning the system. Should they be obligated to continue implementing the Standard, then it is recommended that the organisation relook at the system scope and implementation, and where possible revise portions of the system so that they extract as much value from the system as possible.

6.2 Study Recommendations

Reflecting on the process and outcomes of the study, I recommend that a larger sample size be used for future research. Industry conferences and forums could be used to communicate the study and approach potential participants. The COVID-19 pandemic prevented such events during the period of this study. Another approach may be to expand the sample selection criteria to include sector participants such as suppliers, technology partners, and developers who do not directly operate the renewable energy plants post-construction. This would provide a broader overview of the renewable energy sector as a whole.

6.3 Future Research Opportunities

An area of future research, which could be valuable to pursue, would be to conduct studies into the implementation and value of ISO 14001 in other emerging renewable energy markets such as India, Brazil, Chile, and Kenya. This further research would provide some insight into the perceptions and implementation of ISO 14001 in a broader emerging market context.

A second opportunity for subsequent research could be the exploration of the effectiveness of the Standard in terms environmental performance. This could be conducted pre and post

implementation of the Standard by organisations, and between organisations that do and do not implement the Standard.

Finally, I postulate that an area which would glean beneficial results would be research into the overlap between lender requirements such as IFC guidelines and EP, and ISO 14001. This overlap was highlighted by several respondents and is worth further research and consideration. While this study focused on a specific section of the RE sector, lender requirements form part of many developments' requirements in the developing, to a lesser extent developed, economies. Therefore, such a study could have far-reaching relevance.

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APPENDIX A: PARTICIPANT INFORMATION SHEET

ISO 14001 EMS in the renewable energy sector: Practices and perceptions in South Africa

I would like to invite you to take part in a research study. Before you decide to take part, you need to understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information.

WHO I AM AND WHAT THIS STUDY IS ABOUT?

My name is Jonathan Szoke, and I am currently completing my Masters in Environmental Management at the North West University. As part of this program, I am researching the current state of ISO 14001 implementation, the benefits and factors driving implementation, and the factors preventing implementation in the renewable energy sector in South Africa.

WHAT WILL TAKING PART INVOLVE?

A telephonic, Skype, WhatsApp interview that will cover the following topics:

- Background information on your organisation

- The current state of ISO 14001 implementation within your organisation

- The drivers and advantages of implementing ISO 14001 that you have noted

- The barriers to implementing ISO 14001 your organisation may have experienced

Interviews, with your permission, will be recorded and transcribed at a later stage. A copy of the transcript will be sent to you for verification. The interview should not take longer than 45 minutes.

WHY HAVE YOU BEEN INVITED TO TAKE PART?

You have been selected as the person responsible for HSE within your organisation.

DO YOU HAVE TO TAKE PART?

Participation is completely voluntary, and you have the right to refuse participation, refuse any question and withdraw at any time without any consequence whatsoever.

WHAT ARE THE POSSIBLE RISKS AND BENEFITS OF TAKING PART?

There are no risks to taking part; the benefit to taking part would be that you would contribute to the body of research on the renewable energy sector and ISO 14001 in South

Africa.

WILL TAKING PART BE CONFIDENTIAL?

Should you choose, your information will remain completely confidential. All company names and company-specific information will be removed from the data. Non-anonymised data in the form of signed consent forms will be retained as part of the research process but will not be made publicly available under any circumstances.

HOW WILL INFORMATION YOU PROVIDE BE RECORDED, STORED AND PROTECTED?

Signed consent forms, original audio recordings and interview transcripts will be retained in a private Google Drive until after the degree has been conferred. A transcript of interviews in which all identifying information has been removed will be retained for a further two years after this. You are entitled to access the information you have provided at any time.

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?

The results of the study will be used for the completion of my Masters mini-dissertation.

WHO SHOULD YOU CONTACT FOR FURTHER INFORMATION?

For further information please contact the researcher:
Jonathan Szoke
Tel: 083 232 6356
Email: jonathanszoke@gmail

Alternatively, you may contact the research supervisor:
Professor Francois Retief
Research Unit for Environmental Science and Management
North West University (Potchefstroom campus)
SOUTH AFRICA
Tel: +27 18 299 1586
Email: Francois.Retief@nwu.ac.za

[THANK YOU]

APPENDIX B: CONSENT FORM

ISO 14001 EMS in the renewable energy sector: Practices and perceptions in South Africa

I confirm that I have been informed about the above study by Jonathan Szoke.

I have also received, read, and understood the study as explained in the participant information form.

I understand that my all personal details (identifying data) will be kept strictly confidential. I understand that I may, at any stage, withdraw consent and participation in the study.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

Participant Name: ..... Participant Signature: .....

Date: .....

Witness Name: ..... Witness Signature: .....

Date: .....

APPENDIX C: INTERVIEW GUIDE

Practices and perceptions of ISO 14001 by independent renewable energy developers and operators in South Africa

Name: Company Name:

A. Background

1) Where is your company head office located?
2) How many employees do you have?
3) How long has your organisation been involved in the South African RE sector?
4) How many RE developments are in operations, and/or in development?
5) How long have you been working with ISO 14001?
6) Do you have a formal environmental qualification?
7) Please describe any ISO 14001 specific training you have attended.

B. EMS implementation

8) Which, if any, EMS has your organisation established?
9) Did your organisation use a consultant to assist in the system development?
10) Who is responsible for the ISO 14001 implementation?
11) Has the above system been certified?
12) If yes, when by which body?
13) What was the driver for certification?

C. Drivers

14) What was the main driver for ISO 14001 implementation?
15) How would you rate the success of the system implementation?
16) If your answer was not positive, then what do you think led to this outcome?
17) If you answer was positive, then what do you think were the reasons for the success?

18) How has ISO 14001 impacted your organisation?

19) Do you believe that ISO 14001 has changed employee's attitude and /or perceptions to the environment?

D. Barriers

20) Could you describe the barriers you've encountered with ISO 14001 implementation?

21) What is your perception of ISO 14001 certification?

22) What do you think prevents your organisation from becoming certified? (if applicable)

E. Other

23) Do you have any other thoughts/inputs/comments on the subject?