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An assessment of the environmental sustainability guidelines and requirements set by international stock exchanges

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A Dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science.

Declaration

I declare that this Dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

_____ …… day of ……., 2017 in Johannesburg

Signed: Brandon Urdang

Dedication

This Masters Dissertation is dedicated to the future evolution and focus on sustainability in both the scientific and business worlds. It has been written in the hopes of encouraging sustainability by acknowledging the importance of the environmental dimension in the continuation of business. I believe that the cross-pollination of ideas is a critical step in enhancing sustainability within companies and industries. In a rapidly changing world of uncertainty it is more important now than ever for positive environmental change that will improve the resilience and certainty of our shared future.

Acknowledgements

I would like to express my sincere appreciation to my supervisor Dr. Ute Schwaibold of the School of Animal, Plants and Environmental Sciences (APES) at the University of the Witwatersrand. Her passion for sustainability, advice, discussions, education and challenging of ideas were both inspiring and invaluable.

I must express my profound gratitude to my mother, Adele Urdang, my girlfriend, Jenna Levin, my family and friends for providing me with continuous support and encouragement throughout the process of researching and writing this dissertation. This accomplishment would not have been possible without them. Thank you.

Finally, my appreciation to both the University of the Witwatersrand for providing me with funding for the first two years through the Postgraduate Merit Award and Liberty for funding my final year of this Master's degree; without their generous funding I would not have been able to complete this dissertation.

Abstract

Environmental reporting is largely voluntary for companies, unlike financial reporting which has well set standards for measurement, reporting, auditing and governing laws based on IFRS and GAAP. A driver such as a stock exchange is able to act as a "regulating body" that requires a minimum reporting standard for companies listed on the stock exchange. Stock exchanges have an ethical responsibility to encourage companies listed with them to be environmental stewards to provide investors with responsible investment opportunities. This study provides an understanding of the quality of environmental guidelines presented by international stock exchanges compared to key global environmental concerns. The aim of this dissertation was to assess and compare sustainability guidelines provided by selected stock exchanges, with specific focus on key global environmental concerns. The objectives were (1) to assess the existing environmental reporting requirements of 19 stock exchanges across all continents, (2) to determine how the JSE environmental reporting guidelines compared to those of other stock exchanges, (3) to compare 20 JSE listed companies' environmental reports based on the presence and quality of data, (4) to compare what companies reported to what the JSE required and (5) to identify possible differences in reporting between the impact levels and industries of companies. A Sustainability Balanced Scorecard (SBSC) was developed by identifying seven key global environmental concerns (resources; biodiversity; water; energy; emissions, pollution and waste; products and services; and supply chain management) that were common themes from the MEA (2005) and UNEP Ecosystem Management policy (2010). A five tier scoring system specific to assessing reporting guidelines and another five tier scoring system specific to assessing company environmental reports were used. Nineteen stock exchange guidelines were assessed to represent both developing and developed countries and all regions (Africa, America, Australasia and Europe). Overall, the stock exchange guidelines addressed the key global environmental concerns rather poorly. There were no differences in the quality of guidelines for stock exchanges that recommended guidelines in developing or developed countries. There were no differences found in the guidelines of stock exchanges operating in different regions. There were differences in the focus on key global environmental concerns by the guidelines.

The environmental information reported by twenty companies spanning three impact levels and seven industries was also assessed. The companies in the high and medium impact levels

reported similarly and better than the companies in the low impact levels. There were differences found in the way companies reported according to the different industries as well as differences in the way companies addressed the key global environmental concerns. Even though the JSE's developed guidelines did not account for resources and biodiversity, the Global Reporting Initiative (GRI) reporting guidelines that the JSE recommended to their listed companies covered these categories. Companies reported voluntarily on the categories because they may understand the importance of managing resources and biodiversity for the sustainability of their business.

Stock exchanges are faced with a variety of companies at different impact levels representing different industries, making it difficult to provide a minimum set of environmental reporting guidelines. Stock exchanges should require companies to report on all key global environmental concerns identified in this study, but should not dictate how the companies report on them. Global environmental reporting standards may be better suited with a global sustainability body like the Global Sustainability Standards Board (GSSB) that is able to provide global standards for all companies. Companies need to change the way that they do business, the benefits of reporting on environmental performance outweigh the risks of not reporting and managing these impacts. Sustainability reporting and best practise today may be the compliance of the future. Stakeholders are increasingly expecting companies to contribute more to environmental sustainability. Companies are essential in building a resilient planet that will be able to feed a growing population that will increase from seven to nine billion people by 2050.

Key words: Environmental Sustainability; Johannesburg Stock Exchange; Millennium Ecosystem Assessment; Sustainability Balanced Score Card Approach; United Nations Environment Programme Ecosystem Management Policy

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Chapter 1 : Introduction

Sustainability reporting

The uptake of corporate sustainability is a fairly recent concept that has been gaining increased momentum in the business world (Lubin and Esty 2010). Unlike financial reporting that is heavily regulated with well-established systems, policies, procedures and controls, sustainability reporting is largely an unregulated and voluntary practise that a company chooses to adopt (ISAE 3000 2005; UNEP *et al.* 2013; CERES 2014b). Unless a country has specific environmental legislation or there is an influential body, such as a stock exchange, that drives listed companies towards adopting sustainability practices (UNCTAD 2013; Schiehle and Wallin 2014). Sustainability reporting requirements for companies seem to be localised to country level, not providing an equal global "playing field" (a commerce concept about fairness: explains that all players, companies, abide by the same set of rules) for all companies in all countries (Morhardt *et al.* 2002; Kolk 2005; Pies *et al.* 2010; Berthelot *et al.* 2012; Schiehle and Wallin 2014; CERES 2014a).

Sustainability reporting allows companies to communicate their environmental, social and governance (ESG) performance, otherwise known as a company's 'triple context' or 'triple bottom line' (Elkington 1997; Fauzi *et al*. 2010; Roberge 2010; Tomorrow's Company 2012; GRI G4 2013a). The triple context model has since evolved into the International Integrated Reporting Council's (IIRC) six capitals model that further compartmentalises the triple context: natural capital encapsulates the environmental dimension, the social dimension is represented as intellectual capital, social and relationship capital and human capital, and the governance dimension combines financial capital and manufactured capital (IIRC 2013b; Cheng *et al.* 2014; Adams 2015). The six capitals represent value as defined by the capitals that can be created, destroyed or transferred among them (see IIRC 2013b; KPMG 2014).

Environmental sustainability

A specific focus area for this study was the environmental dimension of sustainability as all companies have an impact on the environment in one way or another. Natural capital is defined as the natural resources or environmental assets that are renewable or non-renewable resources that provide goods and services for the present and future of the company (de Groot et al. 2003; IIRC 2013c). Companies are a major contributor of environmental degradation, land transformation and climate change, either through direct or indirect means. Companies

are operating unsustainably in a system with limited natural resources (Maubane *et al.* 2014). The use of natural resources needs to be balanced with the regeneration capacity of the affected ecosystem. The importance of natural resources to local biodiversity needs to be considered to maintain ecosystem equilibrium. The environment provides ecosystem services to people and surrounding ecosystems, for example resource provision (food, building space) water purification and availability, and may act as a buffer to natural disasters (MEA 2005; Millar *et al.* 2007; Cutter *et al.* 2008; TEEB 2010). The importance of the environment in contributing to sustainability can therefore not be ignored. The combined effort of companies to reduce their environmental impact is an important strategic objective, not only to avoid reputational damage and save costs, but more importantly to avoid endangering society and remain in business. Companies will not be able to operate if a resource, such as freshwater, becomes unavailable. For example, the effects of El Niño (warm ocean water phase) during 2015-2016 in South Africa resulted in the worst drought experienced in 100 years, impacting food security resulting from a reduction in crop yields and availability of freshwater (Kruger 1999, OCHA 2016). It would be important to identify the key global environmental concerns that society is faced with and to understand if companies are addressing these concerns before they become a crises.

The Millennium Ecosystem Assessment (MEA) and the United Nations Environment Programme's (UNEP's) Ecosystem Management policy evaluated the changing environments of ecosystems and their related ecosystem services. There were several critical consequences to the environment that have been found to be exaggerated by business activities, such as climate change, extraction or overexploitation of resources and biodiversity loss. (Chapter 2, MEA 2005; UNEP 2010). These key global environmental concerns outlined by the MEA (2005) and UNEP's Ecosystem Management policy (2010) show similarity to the planetary boundaries framework, a 50+ year study that was first published in 2009. The planetary boundaries framework proposes boundaries for nine imperative processes affected by anthropogenic environmental impacts, and acknowledges that it is now widely accepted that Planet Earth has entered the "Anthropocene" geological age of uncertainty. The Anthropocene is defined by humans being the dominant species and significantly influencing environmental processes (Rockström *et al.* 2009; Steffen *et al.* 2011; Zalasiewicz *et al.* 2011; Smith and Zeder 2013).

Businesses are increasingly acknowledging the importance of the environment. Fortune 500 CEO's identified biodiversity loss and ecosystem collapse, natural catastrophes,

extreme weather events, failure of climate change mitigation and adaptation, and man-made environmental catastrophes as being major risks to the continuity of their businesses (WEF 2016). To ensure sustainable business, the emphasis needs to be placed on large (>250 employees or >R300 million revenue per annum) companies as they are more likely to implement sustainability strategies than medium (>50 but <250 employees or >R80 million but <R100 million revenue per annum) and small (<50 employees or <R80 million revenue per annum) sized companies (Roy *et al.* 2001; Papaspyropoulos *et al.* 2010; Cavell 2017). All companies need to be bound by rules and regulations to ensure that they operate in a sustainable manner. Since larger companies have increased stakeholder pressures and the resources and manpower to create the capacity to direct towards sustainability more emphasis should be placed on these companies. Small and medium sized companies often do not have the resources to direct towards sustainability initiatives as they struggle to secure their financial bottom line (Stanwick and Stanwick 1998; Skouloudis *et al.* 2010). Large companies, through supply chain management, are able to influence and assist their smaller suppliers in adopting sustainability initiatives (Haywood *et al.* 2010; GRI 2015).

Influence of stock exchanges

Stock exchanges are in an ideal position to influence reporting disclosures, sustainability practices and initiatives within companies. They are able to take on a regulatory role for the sustainability reporting requirements of companies to attempt to level the "playing field" in the space of sustainability (Tilman *et al.*2002; Kolk 2005; Dingwerth and Eichinger 2010; Hamann 2010;). At the very least, stock exchanges require their listed companies to provide financial reports and recently many stock exchanges have also started requesting companies to disclose certain sustainability and environmental information (Ebrahim 2013; SSE 2013a; SSE 2015c).

The Sustainability Stock Exchanges (SSE) Initiative was launched in 2009 and aims to encourage stock exchanges to facilitate sustainable investments. There are no formal criteria but stock exchanges need to sign a public commitment to demonstrate that they are willing to encourage sustainability among their listed companies (SSE 2013b). The SSE initiative is important for encouraging and monitoring sustainable development among stock exchanges in developing and developed markets. The SSE initiative has not yet defined a set of minimum requirements for environmental performance.

Stock exchanges in developed countries are more regulated than stock exchanges in developing countries (UNCTAD 2013). Stock exchanges may present differences in their

environmental reporting requirements due to specific market pressures (Gao *et al.* 2005). Stock exchanges in different regions of the world may be influenced by different governing bodies, such as the European Union, United States and Asian governing bodies. For example, the European Commission approved mandatory ESG reporting for large companies in 2013 (Deloitte 2014).

Stock exchanges in developing countries need to encourage foreign investment in their markets, often seen as higher risk environments than developed markets. This means that companies listed on these stock exchanges need to produce sustainability reports that take accountability for their environmental risks and opportunities (Aviva 2011; Ebrahim 2013). Stock exchanges in developing countries appear to have taken the lead over the stock exchanges in developed countries when it comes to the implementation of sustainability reporting guidelines (Ebrahim 2013). Different countries and regions operate differently according to their specific historical attributes (Gray *et al.* 1995; Kolk 1999; de Villiers and Barnard 2000; Niskanen and Nieminen 2001; O'Dwyer and Smurfit 2003; Gao *et al.* 2005; Kolk 2005; Lopez *et al.* 2007; Liu and Anbumozhi 2009).

South Africa has been playing a leading role in sustainable development as a developing country on the African continent (King 2009; Ebrahim 2013; JSE 2014). At the time of this research, reporting on sustainability issues was voluntary for companies, unless they were listed on the Johannesburg Stock Exchange (JSE). Companies were required to produce an integrated report as recommended by King III and report in accordance with the Global Reporting Initiative's reporting guidelines (King 2009; JSE 2014). The JSE was the first developing stock exchange to offer a Socially Responsible Investment (SRI) index launched in 2004 (JSE 2015b), thus showing South Africa's commitment to sustainable development.

Finally, companies may voluntarily commit to going beyond what is required of them to ensure best practise when reporting on their sustainability impacts. Some motivations for companies to voluntarily report include stakeholder demand, ethical considerations and reputation by demonstrating that the company is monitoring their sustainability risks and opportunities (Haywood *et al.* 2010; Schiehle and Wallin 2014). Companies take responsibility for their sustainability impacts when they report transparently, which may improve stakeholder perceptions about the company.

1.1. Significance of this research

Stock exchanges have societal ethical responsibility to control the flow of capital between investors and companies. They should enable the investor to make well-informed responsible investment decisions based on complete, balanced and comparable information about the company. This includes facilitating access to both sustainability and financial information in a manner that is easy to understand (Panwar and Blinch 2012; SSE 2013b). Therefore sustainability reporting and best practise today may be the compliance of the future. This research presented an opportunity to understand the current level of environmental guidance levied by international stock exchanges on their listed companies and the level of sustainability reporting performance of South African listed companies against key global environmental concerns as identified by the MEA and the UNEP Ecosystem Management policy (MEA 2005; UNEP 2010).

1.2. Scope of the research

The study focussed on international stock exchanges that are monitored and/ or partnered with the SSE initiative to encourage sustainability. The SSE initiative currently does not set minimum environmental requirements but requires stock exchanges to make a commitment to continually improve. These stock exchanges were focused on because it is believed that they are making a tangible effort to improve and control sustainability reporting for their listed companies. The influence of environmental guidelines on the reporting performance of companies was assessed. It was important to note whether the guidelines that stock exchanges recommend to companies are an acceptable operational standard for improving environmental reporting by addressing the correct key global environmental concerns. Reporting is only a method of communicating the state of sustainability within a company and thus cannot infer that the company actually practices what they disclose (Panwar and Blinch 2012; SSE 2013b). This study included JSE listed companies to assess how companies deal with the reporting regulations for their environmental impacts. The SRI index was launched by the JSE in 2004 and may be assumed that JSE listed companies are aware of these guidelines. This study was not limited to only JSE SRI constituents and thus the sample was drawn from the population of JSE listed companies to determine if the guidelines could be influencing companies' reporting.

1.3. Research aim, objectives and key questions

The aim of this dissertation was to assess and compare sustainability guidelines provided by selected stock exchanges, with specific focus on key global environmental concerns.

The objectives and key questions of the study were:

1. To assess the existing environmental reporting requirements of 19 stock exchanges across all continents.
    a. Is there a relationship between the economic status (developing or developed) of a country and the way in which stock exchanges focus on environmental reporting requirements?
    b. Are there similarities or differences among stock exchange reporting requirements in different regions?
2. To determine how the JSE environmental reporting guidelines compared to those of other stock exchanges.
    a. How do the environmental reporting requirements of the JSE in South Africa compare to other stock exchange guidelines in developed and other developing economies?
3. To compare 20 JSE listed companies' environmental reports based on the presence and quality of data.
    a. Are JSE companies reporting on key global environmental concerns?
4. To compare what companies reported to what the JSE required.
    a. Do companies report on the JSE developed guidelines *and* the GRI reporting guidelines that are recommended by the JSE?
5. To identify possible differences in reporting between the impact levels and industries of companies.
    a. Is there a relationship between reporting performance, impact levels and industries?

1.4. Layout of the Dissertation

Chapter one provides a brief introduction to the study and the significance of the research, scope of the research and identified the research aim, objectives and key questions.

Chapter two builds on the introduction in chapter one and provides a literature review to contextualise the study. Chapters three and four are the research chapters and are set out as full scientific papers with an abstract, an introduction that includes the chapter specific objectives, methods, results, discussion and conclusion specific to each research chapter. Chapter three focuses specifically on analysing 19 stock exchanges' environmental guidelines by assessing economies and regions. Chapter four presents an analysis of 20 JSE listed companies based on impact levels and industries, and discusses the companies' results in light of the stock exchange guidelines. Chapter five discusses the themes that emerged from the two research chapters and critically assesses what this means for the planet, future generations and business going forward. It concludes with the study limits, future direction of studies and overarching concluding remarks. Finally, there is a single reference list that accounts for all literature used in the dissertation, including the references to the stock exchange guidelines and company reports followed by the appendices for all chapters. The layout inherently allows for repetition among the chapters. This was intentional and allows each chapter to be read in isolation.

Chapter 2 : Background and literature review

The twenty-first century is filled with risks and opportunities for both companies and investors with an ever increasingly challenging global economy. Globalisation and free trade have led to increased economic and material growth, causing the degradation of natural ecosystems. This has allowed cities to support themselves with yields from ecosystems further afield (Kissinger and Rees 2009). The twenty-first century is a time where anthropogenic-induced climate change, resource scarcity, food security, population growth, energy demand, access to freshwater and environmental degradation pose major challenges to achieving global sustainability (Rockström *et al.* 2009; Steffen *et al.* 2011; Zalasiewicz *et al.* 2011; Ellsworth and Spalding 2013; Smith and Zeder 2013).

The degeneration of the environment is a major threat to the continuation of society. To stabilise the environmental abnormalities, adjustments need to take place in the way society operates (Rockström *et al.* 2009). Society is beginning to recognise the role that companies need to play in protecting our environment through maintaining biodiversity, conserving our freshwater resources, farming sustainably and reducing the rate of climate change. Thus the combined efforts of companies to reduce their environmental impacts are an important strategic objective to not only avoid reputational damage but more importantly to avoid endangering society. Yet change is difficult and thus accountability (taking responsibility and becoming liable) through transparency (disclosure of information into the public domain) is the key approach that companies adopt to demonstrate their responsibility towards improving environmental resilience (Kolk 2008; Hahn and Kuhnen 2013).

2.1. Sustainable development and corporate sustainability

Sustainability has many meanings that may vary depending on its use. The generally accepted definition for sustainable development is understood as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs", which comes from the Brundtland Commission in the 1987 report titled "Our common future" (WCED 1987, page 37). The Brundtland definition aimed broadly at country or global level applies to business by minimising environmental and social impact while balancing financial gain (Elkington 1997; Fauzi *et al.* 2010; Roberge 2010; Tomorrow's Company 2012; IIRC 2013a). The foundation of sustainability was built on the environmental dimension (biotic and abiotic ecosystems, Kolk 2004) and later expanded to

include society (communal system) and governance (ESG, flow of capital among stakeholders, GRI G4 2013a). This is known as the triple bottom line (financial focus) or the triple context which emphasises the environmental dimension (Figure 2.1).

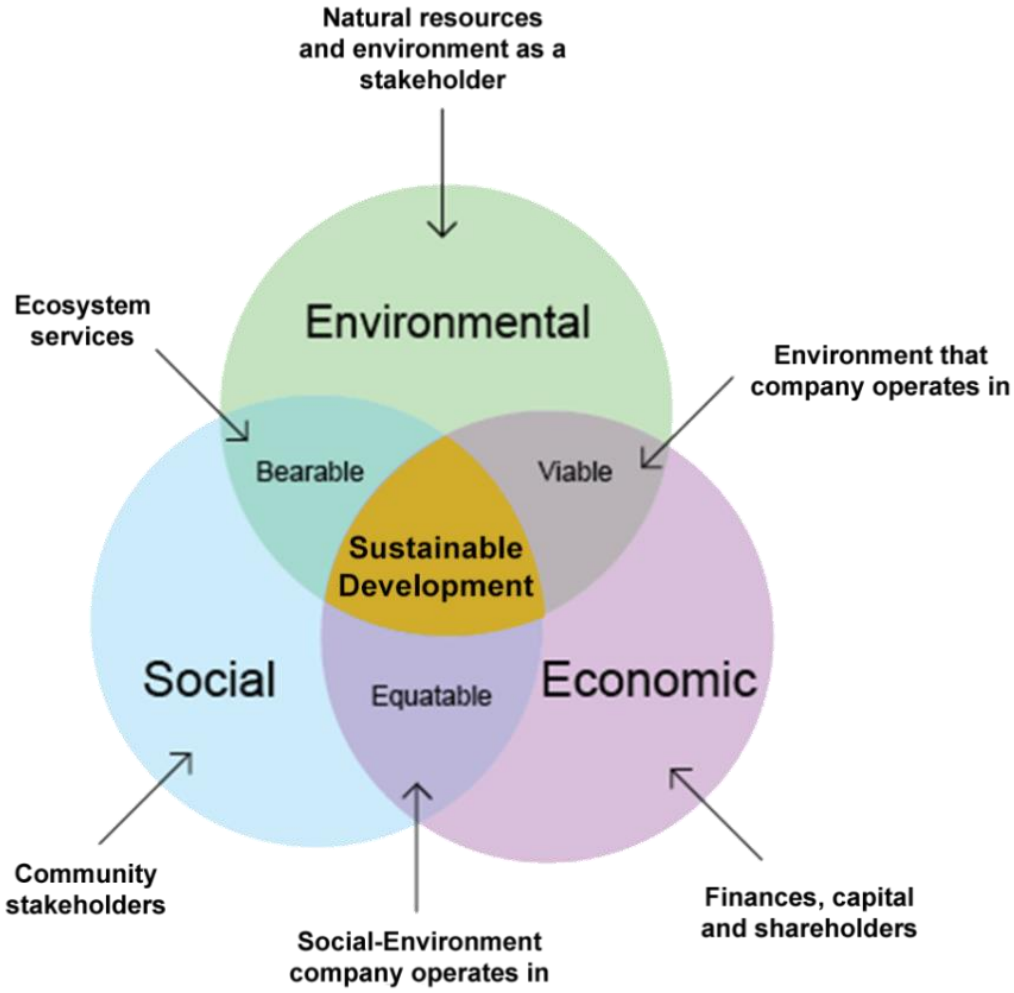


Figure 2.1. The accepted triple context model (adapted from Elkington 1997; Fauzi *et al.* 2010; Roberge 2010; Tomorrow's Company 2012).

The triple context model was first proposed by John Elkington in 1997, in his book "Cannibals with Forks: the triple bottom line of 21st century business" (Elkington 1997) and gained increased momentum in the sustainability community (Fauzi *et al.* 2010; Roberge 2010; Tomorrow's Company 2012). The model was designed to assist companies in coordinating the three dimensions of sustainability by breaking down the departmental silos within companies. For example, companies must understand how their increased economic growth and globalisation relate to an increased environmental and social impact. Therefore, to develop sustainably, the triple context needs to be functional in a company.

Since the inception of the triple context model, there has been an increase in voluntary guidelines referring to the three dimensions (see Kolk 2008; Hacking and Guthrie 2008; GRI G4 2013b; IIRC 2013b; Owen 2013; UNEP *et al.* 2013; Cheng *et al.* 2014; JSE 2014). During the 1990s, "Forum for the Future", a United Kingdom sustainable development charity, co-founded by Jonathan Porritt, refined the triple context dimensions into five capitals (Wood 2007; Visser 2009). A "capital" refers to any accumulation of value that a company can use in the production of products and services (IIRC, IIRC 2013b). The capitals can be understood as the elements of value that are necessary for sustainable development. They are a variation of the triple context dimensions and provide a more modern approach and business focus by using economic terms and are primarily focused for providers of financial capital (IIRC 2013a). The five capitals model evolved to include a sixth capital, namely "intellectual capital", to form the six capital model, and arose in the development of the IIRC Integrated Reporting (<IR>) Framework in 2013 (IIRC 2013a, Figure 2.2).

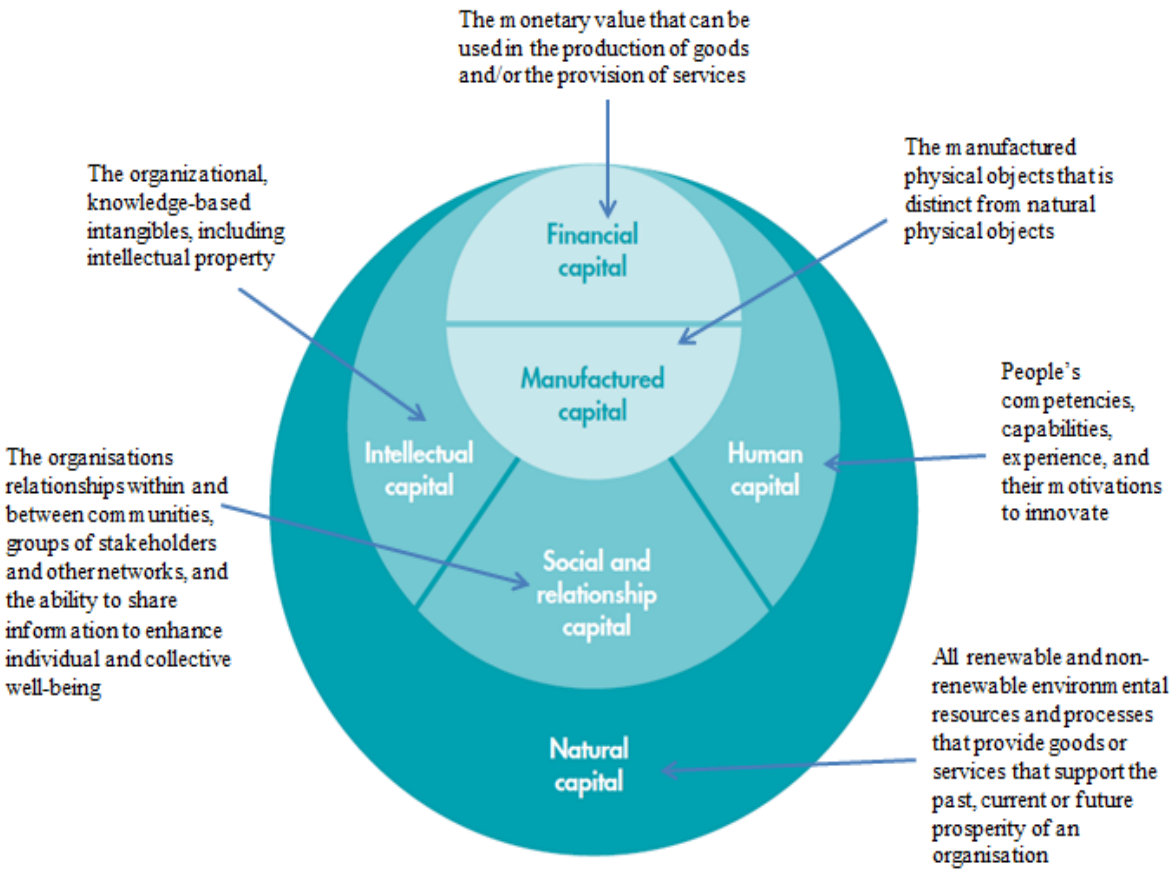


Figure 2.2. The six capital model representing sustainability (adapted from the IIRC 2013b, p. 3).

The six capitals are illustrated in the form of three rings, like the triple context model, but instead of overlapping each other, the rings are embedded in one another. At this stage, natural capital was already recognised as the basis for the other five capitals (Wood 2007; Visser 2009). The six capitals form the basis for the value creation of a company and are dependent on each other in one way or another. A company's business activities affect the six capitals by creating, destroying or transforming the value (IIRC 2013a). All companies rely on the six capitals; some companies may not rely on them in equal parts due to their business activities (IIRC 2013b). Yet it must be understood that every company relies strongly on natural capital, either directly (by using resources) or indirectly (by investing in other companies that directly use resources or through their supply chain). Resources such as water (for sanitation) are required for all companies to ensure the health and dignity of their employees.

The capitals are available to an organisation for the production of products or the provision of services (de Groot *et al.* 2003; IIRC 2013b). The six capitals are defined as (Figure 2.2, IIRC 2013b):

- Natural capital: renewable and non-renewable environmental resources, for instance air, water, land, forests, minerals and biodiversity;
- Intellectual capital: knowledge-based intangibles, including reputation, brand identity, patents, copyrights, software and other types of intellectual property;
- Social and relationship capital: relationships and networks within and between groups of stakeholders that allow for improvement and sharing of information;
- Human capital: skills and experience that drive innovation aligned to the strategy, ethical culture and governance frameworks;
- Financial capital: funds available to a company impacted by debt, equity and income;
- Manufactured capital: manufactured items, such as buildings, equipment and infrastructure.

This study focused on natural capital and environmental sustainability, defined as fulfilling the resource needs of current and future generations by conserving or improving natural resources, which in turn does not surpass the assimilative capacity of the ecosystem (Morelli 2011). The Organisation for Economic Co-operation and Development (OECD)

defines four criteria for environmental sustainability: (1) regeneration – renewable resources must be used in moderation to allow their long-term renewal; (2) substitutability – non-renewable resource use is limited and must be compensated by replacement with renewable resources; (3) assimilation – discharges of polluting substances into the environment must not surpass the ability of the environment to counteract the pollutants; and (4) irreversibility must be avoided (OECD 2001). These four criteria for environmental sustainability are important for the success of every company today.

Sustainable development has been motivated by severe anthropogenic environmental disasters and concerns around resource limitations, the depletion of the ozone layer, biodiversity loss and climate change among others, resulting in an uncertain future (Dobson *et al.* 1997; Drexhage and Murphy 2010; Haywood *et al.* 2010; Ellsworth and Spalding 2013). The realisation that society and business activities in particular were responsible for these severe environmental changes specifically influenced the environmental focus of sustainability (Millar *et al.* 2007; Cutter *et al.* 2008).

Public reporting historically focused on financial risks and neglected the sustainability risks, yet we have many examples of risky business involving environmental impacts (Roberts 1991; Kolk 2003). The Exxon Valdez oil spill, which occurred on 24 March 1989, released over 41 million litres of crude oil into Prince William Sound in Alaska, and the recent BP Deepwater Horizon, the largest marine oil spill in history, released over 757 million litres of oil into the Gulf of Mexico in 2010. These are only two examples that caused significant environmental damage and biodiversity loss, which still affect the areas impacted today. In both cases a cost-saving decision was made at the expense of the environment and in both cases the financial savings led to major environmental losses and significantly affected the society, impacting on the livelihoods of people living in the surrounding areas (Tagesson *et al.* 2009; Tunnell 2011; Holleman 2014).

Sustainable development is aimed at governments and other governing bodies, including companies. Governments need to provide the enabling environment in which requires business and society to address sustainability. Governments need to encourage companies to act in a sustainable manner when undertaking their activities, while not compromising the environment for future generations. Companies have begun to acknowledge their responsibility in protecting the environment that they operate in as well as

the impacts that the environment can have on their business if they were to neglect it (De Villiers 2003; CERES. 2014b).

2.2. Sustainability reporting

The sustainability reporting started developing in the 1990's when companies began publishing separate sustainability reports (Roberts 1991), which became increasingly popular in the 21st century (Kolk 2003). Economic motivations play a major role as businesses would not invest resources into this process without expecting some return (Schiehle and Wallin 2014). Indeed, companies need to ensure that their shareholders and other stakeholders are satisfied with their progress. If a company does not provide any sustainability information or neglects to include information, they risk being seen as irresponsible and not managing their sustainability risks and opportunities (Joshi and Gao 2009). On the other hand, a company disclosing sustainability information may be viewed in a positive light, thus improving their reputation and credibility (see Joshi and Gao 2009; Schiehle and Wallin 2014).

Companies choose to report in order to develop and maintain a positive public image, showing that their best practice improves their reputation (Kolk 2008; Hahn and Kuhnen 2013). This is important for retaining customers as well as attracting new customers and keeping their other stakeholders content. Reporting benefits a company by allowing it to assure their stakeholders that they will be operating profitably into the future, all while safeguarding the environment and protecting the communities' rights (Frost *et al.* 2005; Berthelot *et al.* 2012; Schiehle and Wallin 2014). Risk management, which is developed into sustainability reporting guidelines, allows companies to conceptualise possible setbacks along the way and thus plan for them in advance. Likewise, guidelines level the so-called "playing field" among companies by highlighting environmental sustainability concerns that companies do not have the expertise to identify themselves (Morhardt *et al.* 2002; Joshi and Gao 2009; Berthelot *et al.* 2012; CERES 2014a; Schiehle and Wallin 2014).

The transparent sustainability and financial performance of a company are essential information required by stakeholders. The evolution of corporate reporting has been discussed in many papers (for example, Hedberg and von Malmborg 2003; Kolk 2003; Perez and Sanchez 2009; UNEP *et al.* 2013; CERES 2014b). Large companies are more inclined to report on sustainability issues than smaller companies as they usually have more capacity and financial resources (Joshi and Gao 2009). Sustainability reporting is progressing with

companies disclosing more information that is relevant to their stakeholders and these reports are increasingly being used by stakeholders to make informed decisions about the company.

Companies may choose to report using either sustainability reports or a single integrated report. Sustainability reporting is generally separated into environmental, social and economic reports or sections. Sustainability reporting provides comprehensive disclosures but less connectivity. Integrated reporting requires companies to report using integrated thinking to assimilate their performance within the six capitals to demonstrate the connectivity (GRI G4 2013a; IIRC 2013a). Integrated reports need to include both quantitative and qualitative information on the six capitals in a balanced fashion (KPMG 2002) and can be used as a management tool for implementing the changes required for a sustainable global economy (UNEP *et al.* 2013; Maubane 2014). The Global Reporting Initiative (GRI) states that sustainability reports need to be inclusive and thus should address multiple stakeholders (GRI G4 2013b). The link between sustainability reporting and sustainability is still not yet clear and thus stakeholders should be cautious when assuming that a good report relates to good sustainability performance (Dingwerth and Eichinger 2010; GRI G4 2013a; UNEP *et al.* 2013). More metrics are required to understand if companies are contributing to sustainability in a positive manner.

2.3. Stock exchanges and their influence on company reporting

Stock exchanges principally function to control the flow of capital from investors to minimise and highlight the investors' risks and opportunities (Ebrahim 2013). Reporting financial and governance information is a requirement for listing on stock exchanges and is crucial for public companies. This usually does not include sustainability reporting as a requirement. There is an ongoing debate whether, why and how stock exchanges can or should regulate sustainability disclosures (C. le Roux, pers. comm[1].). Very few stock exchanges regulate sustainability disclosures extensively or with detailed indicators and it is mostly on a "comply or explain" basis with reference to initiatives such as the GRI guidelines and IIRC framework (Emerging Markets ESG 2012; C. le Roux, pers. comm.).

Since stock exchanges provide a platform for companies to sell their shares, they are able to influence companies by prescribing a minimum level of publicly available

[1] C. le Roux was Head of the Socially Responsible Investment (SRI) Index and is Head of Sustainability at the Johannesburg Stock Exchange (JSE, Emerging Markets ESG 2012).

information. Previously, these disclosures were centred on providing investors with key financial information to make informed investment decisions about the company. Companies are required to publish audited annual financial statements, which are based on a set of accounting standards, namely the International Financial Reporting Standards (IFRS) and United States Generally Accepted Accounting Principles (GAAP; Eccles and Saltzman 2011), which have become global standards for financial reporting. Financial reporting has well set standards for measurement, reporting, auditing and governing laws, which have not yet been developed as far for a company's sustainability reporting (Eccles and Saltzman 2011).

Stock exchanges can encourage high-quality sustainability reporting via their listing requirements and voluntary sustainability indices (UNCTAD 2013, C. Le Roux, pers. comm.). Stock exchanges have reiterated their responsibility to encourage enhanced sustainability among their listed companies (Panwar and Blinch 2012). A growing number of stock exchanges are re-evaluating their expectations of listed companies to fit in with global trends, such as introducing or developing initiatives to encourage sustainability reporting focused on the triple context (UNCTAD 2013). Many stock exchanges have added sustainability criteria to their listing requirements to comply with Agenda 21 (UNCED 1992). Stock exchanges are important catalysts for harmonising the depth, consistency and comparability of company disclosures globally on sustainability issues such as the impact on biodiversity and ecosystem resources (UNCTAD 2013; CERES 2014a).

Stock exchanges represent local efforts to provide companies with sustainability guidelines. The economic literature identifies stock exchanges as a "barometer" for the economic state of a country (Oskooe 2012). Stock exchanges have long had indices, such as the Top 100, Top 40, Mid Cap and Small Cap, to assist investors with well-informed investment decisions based on specific financial measurements. Unfortunately, these indices usually do not account for companies' sustainability performance but are solely based on financial reporting performance (Dahl 2012). Today, stock exchanges have, on their own or in collaboration with standard setters, introduced indices related to sustainability reporting performance to facilitate access to sustainability information for their investors (Lopez *et al.* 2007; JSE 2014; Schiehle and Wallin 2014), for example, the Dow Jones Sustainability Indices family (DJSI 2015) and the London Stock Exchanges' FTSE4Good UK index (FTSE4Good 2015). The only South African stock exchange, the Johannesburg Stock Exchange (JSE), offered the Socially Responsible Investment (SRI) Index, which consisted

of the top sustainability reporting companies listed with them (JSE 2014). The SRI Index has since been replaced by the FTSE/JSE Responsible Investment series from 1 January 2016; therefore the SRI Index still remains relevant to this 2014 study period (JSE 2015b).

Stock exchanges develop and recommend indicators that address important global and local sustainability concerns (Dahl 2012). Stock exchanges in developed countries are able to tightly regulate sustainability concerns because of a mature governance system (UNCTAD 2013). Stock exchanges in developing countries appear to implement sustainability reporting requirements better than developed countries' stock exchanges. Probably based on the impression that sustainability challenges are felt more directly in developing markets and investors require assurance that risks are managed well in these perceived higher risk economies (Ebrahim 2013).

The influence stock exchanges have on company performance and reporting as well as their commitment to responsible investment is growing. Investors have requested a global standard that stock exchanges adopt for their sustainability reporting requirements to not competitively disadvantage stock exchanges that have adopted sustainability practices (CERES 2014a). The Sustainable Stock Exchanges (SSE) initiative was formed to encourage this commitment among stock exchanges. It was launched in 2009 through collaboration among the United Nations Conference on Trade and Development (UNCTAD), the United Nations Global Compact (UNGC), the United Nations supported Principles for Responsible Investment (PRI) and the United Nations Environment Programme Finance Initiative (UNEP FI, Aviva 2011; SSE 2013b). In 2012 the SSE launched a new element, giving stock exchanges the opportunity to become SSE partner exchanges by making a public commitment to driving sustainability in their markets. The SSE initiative aims to encourage sustainable investment by creating a multi-stakeholder educational platform for stock exchanges, investors, regulators and companies to adopt best practices (SSE 2013b).

The SSE encourages stock exchanges to adopt sustainability practices and encourage long-term responsible investment. They do not require a minimum standard but they require that stock exchanges make a commitment to improve. The SSE monitors the world's largest stock exchanges according to market capitalisation, their partner stock exchanges (SSE 2015d), and conveniently organises the information for each stock exchange in their "Stock Exchange Factsheets" (SSE 2015d). The factsheets allow stock exchanges, investors and interested stakeholders to look up and compare information among the monitored stock

exchanges. The SSE is currently expanding their monitored and partner stock exchanges to make more information easily available and expand their database. Even though they collate the information, they often rely on the participation of the stock exchanges and do not verify the information or quality of the information (SSE 2013b; SSE 2015d).

2.4. Environmental reporting

Companies disclose information publicly by producing sustainability reports (Jose and Lee 2007; Tagesson *et al.* 2009). When assessing a company to understand their environmental performance, one may look at the information that the company has disclosed in the public domain (O'Dwyer and Smurfit 2003; Jose and Lee 2007; Tagesson *et al.* 2009; Maubane *et al.* 2014). In an effort to streamline and level the so-called "playing field" among companies in the sustainability reporting space, sustainability (including environmental) reporting guidelines have been developed and stock exchanges are recommending their listed companies to report on their sustainability performance. In fact, companies are faced with an ever increasing set of sustainability reporting guidelines and initiatives. For example, UNEP *et al.* (2013) identified more than 180 global reporting policies, guidelines and initiatives around the world.

Board members and top management generally have a very limited understanding of the environment and struggle to relate their business operations to environmental impacts (Mitchell and Hill 2009; Ramani 2015), many companies do recognise the benefits associated with adopting sustainability guidelines. Shareholders and stakeholders utilise sustainability reports to ensure that the company has their best interests at heart (CERES 2014a). Indeed reporting does go further; financing and loans require that companies report in order for the financing institution to determine if it is feasible to provide the company with funds (IFC 2012). Shareholders and financing institutions want to minimise their risks when investing and loaning money, whereas insurers want to minimise their pay-outs related to companies engaged with poor sustainable practices (Baumgartner and Ebner 2010; CERES 2014a; Maubane *et al.* 2014). This requires companies to act environmentally responsibly and to communicate their environmental performance transparently.

There are numerous efforts to promote sustainability and transparency by internationally recognised organisations or coalitions that have produced guidelines. Conventions, protocols and goals such as the United Nations Framework Convention on

Climate Change (UNFCCC 1992), the Kyoto Protocol (UNFCCC 1998), Agenda 21 (UNCED 1992), the United Nations Convention on Biological Diversity (CBD, Rio+20 2012), and the Millennium Development Goals (MDGs, MDG 2013), have been some of the driving forces behind today's environmental sustainability practices and reporting guidelines. Many sustainability reporting guidelines are freely available, easily accessible, and provide an easy to understand comprehensive set of globally accepted practices which make them useful tools when reporting on environmental sustainability (see UN 2007; Kolk 2008; UNEP *et al.* 2013). The most important sustainability guidelines for encouraging environmental sustainability and transparent reporting are: (1) GRI, (2) Carbon Disclosure Project (CDP), (3) United Nations Global Compact (UNGC), (4) United Nations Principles for Responsible Investment (UN PRI), (5) CDP Water Program, (6) Equator Principles and (7) International Integrated Reporting Council's integrated reporting framework (IIRC <IR> framework, see Appendix 1). Since, these initiatives are voluntary; stock exchanges may recommend companies listed on their stock exchange to adopt these initiatives. For example, a stock exchange may require that, when a bank finances a project for another company, that the loan should be based on the fulfilment of the UNGC, UN PRI and Equator Principles. Thus, it would be necessary for a financing institution, like a bank, to report on their compliance with these principles and standards to ensure that stakeholders are aware of their responsible investments.

Sustainability guidelines consist of sustainability indicators (Daub 2007; Ness *et al.* 2007; Singh *et al.* 2009; CERES 2014a) which identify, simplify, quantify, analyse and communicate complicated information (Ness *et al.* 2007; Singh *et al.* 2009; Dahl 2012; CERES 2014a). Sustainability indicators allow companies to set targets, measure their achievements and benchmark themselves against peers. Some examples of environmental indicators used for environmental reporting include resources used; energy consumption by type and greenhouse gas emissions (scope 1, 2 and 3), these are relatively easy and cheap to measure and report. Other indicators focusing on biodiversity are more difficult to measure and report on, for instance the number of endangered species in areas of high biodiversity value. These require long term studies and specialised skills to develop mitigation strategies that translate into expensive and time consuming studies (Bolund and Hunhammer 1999; Heal 2000; Morhardt *et al.* 2002 ; Kolk 2008; Papaspyropoulos *et al.* 2010; IFC 2012; CICES 2013; GRI G4 2013a; Costanza *et al.* 2014; JSE 2014).

The overarching goal for sustainability reporting is to communicate the company's sustainability performance and encourage companies to improve on their performance (Singh *et al.* 2009). Sustainability reporting in many cases is a voluntary and unregulated practise. Companies that wish to achieve best practice need to take voluntary pledges to ensure that environmental performance is maintained at a high standard (India 2011; UNEP *et al.* 2013). A stock exchange may act as a "regulator" requiring a minimum standard of environmental disclosure.

2.5. Key environmental concerns

The environment provides natural resources for 'basic human needs', i.e. food, water and shelter (MEA 2005; TEEB 2010). Ecosystem services are the benefits humans attain from ecosystems. TEEB (2010) describes how the loss of ecosystem services and pollution can be translated into billions of dollars' worth of financial losses each year. Ecosystem services are broadly classified into four categories:

1. Provisioning services: the resources acquired from the ecosystem, for example food, freshwater and other natural resources;
2. Regulating services: the benefits obtained from regulating ecosystem process, for example water purification, natural hazard regulation and climate regulation;
3. Cultural services: the social benefits that humans acquire from the ecosystem for example, spiritual value, aesthetic value and tourism;
4. Supporting services: the provision of habitat for species that provides for the basic needs of that species and allows for the maintenance of genetic diversity both among populations and within populations (MEA 2005; TEEB 2010; CICES 2013).

Moving beyond human basic needs, sustainable economic development, which contributes to the improvement of human lives, relies on companies utilising the planet's finite environmental resources responsibly. For example, high impact industries like mining and metals depend on water to supply their operations for daily activities, and the paper industry relies on forestry which also relies on water and good quality land. Medium impact companies like retailers require natural resources from the high impact industry, such as manufacturing of goods that use natural resources and have a large logistical footprint to deliver the products to their various stores, low impact companies like information technology companies use water, energy and generate waste. All companies inevitably rely

on environmental resources, at a bare minimum on water, land, clean air and resources such as coal required for the generation of electricity in coal-fired power stations, which is the case for South Africa and many other developing countries. Thus, companies place increasing pressure on ecosystem services, such as resources, biodiversity and buffer zones to natural hazards which makes it important to monitor and reduce their environmental impacts to achieve sustainability.

There are a number of studies that have related the value of ecosystem resources and biodiversity to social and economic success (see Pearce and Moran 1994; Bolund and Hunhammer 1999; Adams *et al.* 2004; Costanza *et al.* 2014). The bigger picture of the importance of ecosystem services assessments is that it allows decision-makers to determine progress towards specified sustainability goals with evidence of ecosystem service benefits in providing new business operating guidelines for improved sustainability (Ness *et al.* 2007). Ecosystem services and the building blocks like resources and biodiversity are often overlooked and stock exchanges may sometimes not require companies to report on these because they cannot impose the intense costs involved for companies to implement systems, policies, procedures and controls that are necessary to collect and report on resource and biodiversity information (ISAE 3000 2005; Lopez *et al.* 2007; IRAS 2015).

The Millennium Ecosystem Assessment (MEA) and the United Nations Environment Programme's (UNEP's) Ecosystem Management policy evaluated the changing environments of ecosystems and their related ecosystem services. Terrestrial, freshwater and marine ecosystems alongside a range of ecosystem services, for instance food and timber production, air quality regulation, nutrient cycling, recreation and aesthetic services were related to changes in human wellbeing. A key finding was that anthropogenic effects have transformed ecosystems more rapidly and extensively than in any other recordable time period. This has caused the irreversible loss in species diversity and a direct negative consequence on the associated ecosystem services, such as fisheries, freshwater, air and water purification, and the regulation of regional and local climatic conditions, natural hazards and alien species. The key global environmental concerns that may threaten human well-being and can be exaggerated by companies' business activities were climate change, the decline in trophic levels, ecosystem services, extraction or overexploitation of resources, genetic resources, habitat change or transformation, land use competition, natural hazard regulation and pollution (MEA 2005; UNEP 2010).

These key global environmental concerns outlined by the MEA (2005) and UNEP's Ecosystem Management policy (2010) show similarity to the planetary boundaries framework, a 50+ year study that was first published in 2009. The planetary boundaries framework proposes boundaries for nine imperative processes affected by anthropogenic environmental impacts, and acknowledges that it is now widely accepted that Planet Earth has entered the "Anthropocene" geological age of uncertainty. The Anthropocene is defined by humans being the dominant species and significantly influencing environmental processes (see Rockström *et al.* 2009; Steffen *et al.* 2011; Zalasiewicz *et al.* 2011; Smith and Zeder 2013). Planet Earth is moving towards a sixth mass extinction period, the first mass extinction caused by a single species, humans (Steffen *et al.* 2011; Ceballos *et al.* 2015). The prescribed boundaries use the relatively stable Holocene period as being the most desired state of ecosystem processes for modern human development and are known as the scientific "tipping point" where uncertainty and large-scale variations will impact the availability and quality of ecosystem services and increase risks to the global society and economy. The nine planetary boundaries study shows that four planetary processes are already in the risk zone, namely (1) land use change, (2) climate change, (3) loss of biosphere integrity and (4) changes to biogeochemical flows. Two processes require immediate action, namely (5) freshwater abstraction and (6) atmospheric aerosol loading; three processes are of concern but are currently below the prescribed limits, namely (7) release of novel entities, (8) ocean acidification and (9) loss of stratospheric ozone. Resilience of ecosystem processes relies on these nine planetary boundaries being stable and when one is not stable it destabilises, the ability of the others to maintain a stable state required for sustainable development (Rockström *et al.* 2009).

2.6. Contribution to existing knowledge

Sustainability in the 21st century is focused on action, transparency and accountability. Environment uncertainties are expressed most understandably as the unpredictable changes in ecosystem services due to anthropogenic impacts leading to an uncertain future. Companies contribute towards these environmental changes in their operations and should be managing their impacts on the environment. Stock exchanges have the ethical responsibility to society to encourage companies listed on their stock exchange to provide responsible investment opportunities that will be sustainable for investors. The key method used for communicating a company's environmental impact is by the company

publicly reporting on its environmental performance. Sustainability reporting demonstrates what companies are doing and allows them to benchmark themselves against their peers and track their performance overtime. Unfortunately, most environmental reporting guidelines today are voluntary and thus allow companies to choose what they report on. Stock exchanges are able to encourage companies to adopt specific environmental reporting standards.

Stock exchanges that encourage environmental reporting either recommend guidelines like the GRI reporting guidelines and/or develop their own set of environmental guidelines or recommend both to companies listed on their stock exchange. Many guidelines and indicators have been modelled to measure environmental reporting performance and it is important that these indicators actually measure and encourage companies to focus on the key global environmental concerns to achieve sustainability. This study used the MEA and the UNEP's Ecosystem Management policy to outline the key global environmental concerns (MEA 2005; UNEP 2010). To date, most sustainability research has been focused on sustainability as a whole rather than concentrating on the specific dimension of environmental sustainability (see, Morhardt *et al.* 2002; Labuschagne *et al.* 2005; Kolk 2008; UNEP *et al.* 2013; Maubane *et al.* 2014; IRAS 2015). Owing to the importance of the environment for the survival of companies, it is worthwhile to evaluate the quality of environmental reporting guidelines that stock exchanges expect their companies to follow when publicly reporting.

Chapter 3 : Environmental guidelines in stock exchange listing requirements – a comparative study between economies and regions

Abstract

Stock exchanges are in a good position to influence their listed companies' public disclosures through environmental reporting requirements. Subsequently, stock exchanges have started developing their own environmental reporting requirements and/or are recommending the use of existing guidelines to their listed companies to support responsible investing. The objectives of this chapter were (1) to assess the existing environmental reporting requirements of 19 stock exchanges across all continents, and (2) to determine how the JSE environmental reporting guidelines compared to those of other stock exchanges. Nineteen stock exchanges were selected from the pool of stock exchanges monitored by the Sustainable Stock Exchanges initiative. The stock exchange guidelines were scored using a sustainability balanced scorecard approach with 13 indicators based on key global environmental concerns and a five tier scoring system. The stock exchange guidelines were compared by economies and regions. Stock exchanges in developed countries performed slightly better than the stock exchanges in developing countries even though there were no significant differences for the stock exchanges that recommended guidelines. There were no significant differences among regions but the African stock exchanges lagged behind in their provision of guidelines compared to the other regions, yet South Africa performed best overall and in the region. There were significant differences in requirements for key global environmental concerns. The stock exchange guidelines performed well with reporting requirements for water, energy and emissions, pollution and waste but poorly on indicators related to resources, biodiversity, products and services and supply chain management. Overall, it is clear that stock exchanges need to work closely with environmental scientists to integrate the key global environmental concerns, like resources and biodiversity, into their reporting guidelines and/or recommend globally accepted guidelines like the GRI.

Key words: Environmental guidelines; Millennium Ecosystem Assessment; Stock Exchanges; Sustainability Reporting; UNEP Ecosystem Management policy

3.1. Introduction

The world is a constantly changing and adapting ecosystem. Since the beginning of time the human race has strived to forever improve the quality of human life. This led to the industrial era which changed the world to how we know it today. The implementations of new manufacturing processes as well as globalisation have led to an increase in the impact humans have had on the environment. With the never ending quest for companies to grow and expand, this has led to unsustainable exploitation of natural resources in many cases.

Nowadays there is a growing demand for increased information and transparency from companies by their stakeholders (Tagesson *et al.* 2009). Stakeholder awareness of the importance of the environment has increased over the years (UNEP *et al.* 2013). Stakeholders understand that the production of products and services (downstream environmental impacts) places pressure on the environment that those very same stakeholders and businesses require for their survival. The transformation of natural habitats by expanding companies places negative pressures on environmental resources such as biodiversity, water, food, habitat and natural buffers to environmental change. The Millennium Ecosystem Assessment (MEA) and the United Nations Environment Programme's (UNEP's) Ecosystem Management policy identified common environmental concerns that may threaten human well-being and that may be exaggerated by commercial activities. These include climate change, the decline in trophic levels and ecosystem services, extraction or overexploitation of resources, loss of genetic resources, habitat change or transformation, land use competition, natural hazard regulation and pollution (MEA 2005; UNEP 2010).

To ensure a sustainable world, the emphasis needs to be placed on large (>250 employees or >R300 million revenue per annum) companies who inherently have large environmental footprints and they are more likely to implement sustainability strategies than medium (>250 employees or >R300 million revenue per annum) and small (<50 employees or <R80 million revenue per annum) sized companies (Roy *et al.* 2001; Papaspyropoulos *et al.* 2010). All companies need to be bound by rules and regulations to ensure that they operate in a sustainable manner but larger companies have increased pressures. They have increased stakeholder pressures and the resources and manpower to create the capacity to direct towards sustainable practices, while small and medium sized companies often do not have the resources to direct towards sustainability initiatives as they struggle to secure their financial bottom line (Stanwick and Stanwick 1998; Papaspyropoulos *et al.* 2010; Skouloudis

et al. 2010). Large companies, through supply chain management, are able to influence and assist their smaller suppliers in adopting sustainable strategies (Haywood *et al.* 2010; GRI 2015).

A driver such as a stock exchange is in an ideal position to encourage sustainable practices for their listed companies by requiring them to communicate their progress through public disclosures. Ensuring that stakeholders base their business and investment decisions on sound information, while positively influencing companies to improve their processes and reduce their impact on the environment (SSE 2013b; UNCTAD 2013). Stock exchanges have started developing and imposing their own environmental reporting requirements on companies listed with them, as part of their undertaking towards catalysing and monitoring responsible investment. This includes developing models, metrics and tools for measuring and quantifying the level of unsustainable activities that companies engage in (Singh *et al.* 2009). Responsible investing is in the best interest of the stock exchange, the listed companies and the stakeholders. The stock exchanges are ethically responsible for providing investors with responsible investment opportunities, which improves the reputation of that stock exchange and attracts more investors. In turn companies need to earn investors' trust by demonstrating that they act responsibly and will safeguard their investors' money (Ebrahim 2013; CERES 2014a; UN PRI 2015).

Regulators, including the Department of Environmental affairs, play a minimal role in creating mandatory environmental reporting requirements. This leaves stock exchanges with the responsibility to implement these requirements (SSE 2013a; SSE 2015c). The feasibility of recommending that companies report on their environmental sustainability differs in developing and developed countries. Developed countries have often overused their natural resources and have to address their environmental sustainability challenges. Sustainability challenges (linked to environmental, social and governance (ESG)) are experienced more often in developing countries and investors require assurance over their investments. Stock exchanges in developing countries appear to have taken the lead over the developed stock exchanges when it comes to the implementation of sustainability reporting requirements (Ebrahim 2013).

In response to the increased demand for good environmental reporting, companies required some direction and thus guidelines were developed. These guidelines were developed by organisations that could only expect voluntary uptake, but this was a necessary

step towards further acceptance of, understanding of and improvement in sustainability reporting. The investment community soon favoured specific guidelines such as the Global Reporting Initiative (GRI), the most well-known and most applied set of sustainability guidelines to date (Morhardt *et al.* 2002; Kolk 2004; Brown *et al.* 2009; King 2009; SAICA 2011). Newer guidelines such as the International Integrated Reporting Council's (IIRC) integrated reporting (<IR>) framework and more specific guidelines such as those provided by the Carbon Disclosure Project (CDP) and CDP Water Programme have been recognised in the market, including in South Africa (CDP 2013; IIRC 2013a; CDP 2015b; IRAS 2015).

The economic status of countries (developing or developed countries) may influence the focus of stock exchanges on reporting requirements in that country. Different countries and regions operate differently according to their specific historical legacies, which may affect the way in which each region performs (Gray *et al.* 1995; Kolk 1999; de Villiers and Barnard 2000; Niskanen and Nieminen 2001; O'Dwyer and Smurfit 2003; Gao *et al.* 2005; Lopez *et al.* 2007; Liu and Anbumozhi 2009). Stock exchanges in different regions of the world may be influenced by different governing bodies, such as the European Union, United States and Asian governing bodies. For instance, the European Commission approved mandatory ESG reporting for large companies in 2013 (Deloitte 2014). These may play an important role in how stock exchanges deal with providing environmental guidance.

A special interest for this study was the performance of the Johannesburg Stock Exchange (JSE) in Johannesburg, South Africa. South Africa has a long history of racial discrimination and social inequalities which has led to the JSE customising the sustainability reporting requirements to local needs with a more intense focus on social rather than environmental issues (JSE 2014). The JSE is Africa's leading stock exchange and was the first developing stock exchange to offer a Socially Responsible Investment (SRI) Index from 2004 to 2015 (JSE 2015b). South Africa is in a unique situation as the country is also known for its diverse environment with nine biomes and high species diversity (Powrie 2000; Mucina and Rutherford 2006). This rich environmental system has become an ecotourism attraction and thus necessitates that guidelines be in place to preserve the natural ecosystems and their associated ecosystem services. South Africa's biodiversity thus contributes significantly to the country's gross domestic product (GDP) through ecotourism, and agriculture (DEA 2006). Ecosystem services have been shown to contribute greatly to the economy and the loss of these services can be translated into billions of dollars each year (Heal 2000; Farber *et al.* 2002; TEEB 2010)

When country legislation, including regulatory bodies, does not require disclosures to be made publicly available, stock exchanges may facilitate access to this information (Morales and van Tichelen 2010; UNCTAD 2013). Even though it is important to develop a global standard, it is equally important to adapt to the local requirements of each country and that is where stock exchange guidelines come into play (Ness *et al.* 2007). It is important to evaluate the guidelines that companies are expected to follow, in this instance the stock exchange environmental guidelines to assess the validity of the chosen reporting indicators. Stock exchanges need to select indicators that actually measure and encourage relevant environmental performance. Thus, a gap analysis using the Sustainability Balanced Scorecard (SBSC) approach can highlight where a stock exchange's environmental guidelines are doing well and where they are deficient in their guidance offered to their listed companies.

There is an enormous set of environmental reporting guidelines that stock exchanges can reference when developing their own set of environmental guidelines (see Chapter 2). It is important that stock exchange environmental guidelines actually address key global environmental concerns. Thus, the objectives of this chapter were (1) to assess the existing environmental reporting requirements of 19 stock exchanges across all continents, and (2) to determine how the JSE environmental reporting guidelines compared to those of other stock exchanges. I asked the following questions: (a) is there a relationship between the economic status (developing or developed) of a country and the way in which stock exchanges address environmental reporting requirements? (b) Are there similarities or differences among stock exchange reporting requirements in different regions? (c) How do the environmental reporting requirements of the JSE in South Africa compare to other stock exchange guidelines in developed and other developing economies?

3.2. Methodology

The scorecard approach is a useful method for evaluating both the quantitative and qualitative information presented in stock exchange environmental reporting requirements. A gap analysis using a scorecard approach allows researchers to compare the guidelines' indicators against a desired or potential indicator set. This method is limited by the indicators addressed in the scorecard and thus an appropriate scorecard based on reliable evidence should be used (Bieker 2003; Dias-Sardinha and Reijnders 2005). The SBSC is a specific scorecard that is used to run a gap analysis on sustainability information. The SBSC approach

has been used by accounting professionals to evaluate both the financial and sustainability information of a company (see Bieker 2003; Dias-Sardinha and Reijnders 2005; Gminder 2005; Hubbard 2009). The limitations of most assessment methods are that they evaluate what *is* presented instead of what *should be* presented (Morhardt *et al.* 2002). Therefore, the SBSC allows the assessment to be centred on the quality of the guidelines by evaluating what should be present and outlines what has and has not been presented by the guidelines and was thus the chosen method for this study.

The Sustainable Stock Exchanges (SSE) initiative was used to select a suitable sample (SSE 2015a). Nineteen stock exchanges were selected based on the availability of information, of which 17 were SSE partner stock exchanges and two were selected to represent all regions. The sample choice allowed for the classification of stock exchanges based on economy types and regions. Two economy types were identified, namely (1) stock exchanges in developing countries and (2) stock exchanges in developed countries. The regions were determined based on the continents included in the sample selection, resulting in the identification of four regions, namely Africa, America, Australasia, and Europe. If a country was found to form part of two regions (such as Turkey which falls into both Asia (financial) and Europe (governance)), it was classified into the region that it was governed by, which in this instance was Europe. Australasia was formed on the premise that Australia was the only stock exchange in its region (Australia) and required variance for statistics. Thus, combining it with Asia to form Australasia was the logical deduction given the proximity of the two regions. The sample included four African, eight American, three Australasian and four European stock exchanges, which can further be split into developing and developed markets, with 13 stock exchanges in developing countries and 6 stock exchanges in developed countries (Table 3.1).

Table 3.1. Nineteen stock exchanges selected for sampling (as at 20 July 2015).

Stock Exchange	Country	Region	SSE Partner Exchange	Economy type
Johannesburg Stock Exchange	South Africa	Africa	Yes	Developing
BM&FBOVESPA S.A.	Brazil	America	Yes	Developing
Bombay Stock Exchange	India	Australasia	Yes	Developing
Egyptian Exchange	Egypt	Africa	Yes	Developing
Namibian Stock Exchange	Namibia	Africa	No	Developing
Nigerian Stock Exchange	Nigeria	Africa	Yes	Developing
Stock Exchange of Thailand	Thailand	Australasia	Yes	Developing
Bolsa de Comercio de Santiago	Chile	America	Yes	Developing
Bolsa de Valores de Colombia	Colombia	America	Yes	Developing
Jamaica Stock Exchange	Jamaica	America	Yes	Developing
Bolsa Mexicana de Valores	Mexico	America	Yes	Developing
Bolsa de Valores de Lima	Peru	America	Yes	Developing
Borsa Istanbul	Turkey	Europe	Yes	Developing
NASDAQ	USA – NASDAQ	America	Yes	Developed
New York Stock Exchange	USA – New York	America	Yes	Developed
Australian Securities Exchange	Australia	Australasia	No	Developed
Deutsche Börse	Germany	Europe	Yes	Developed
London Stock Exchange	United Kingdom	Europe	Yes	Developed
Warsaw Stock Exchange	Poland	Europe	Yes	Developed

The SSE initiatives' factsheets (http://www.sseinitiative.org/data/fact-sheets/) provided links to each stock exchange's sustainability reporting information. These links as well as the stock exchanges' websites were used to locate any relevant sustainability

guidelines or recommendations for reporting. If the stock exchange recommended the use of GRI reporting and provided developed guidelines, then both guidelines were used to assess the stock exchange. If the stock exchange only recommended GRI reporting to their listed companies, then these indicators were evaluated to determine the reporting standard. The stock exchanges where information was absent were contacted by email to confirm whether they provided any environmental reporting requirements. Each stock exchange's external regulating body's website was visited to determine whether they provided any additional environmental reporting requirements.

Assessment criteria The SBSC approach was used to assess the accessible 2014 environmental reporting requirements which were recommended to listed companies. Seven key global environmental concerns were identified from the common themes that were being addressed by the MEA (2005) and the UNEP's Ecosystem Management policy (2010) and were translated into 13 indicators that cover seven key global environmental concerns (see list below) which the stock exchange guidelines could be assessed against (see Appendix 2 for detailed descriptions). Key global environmental concerns included:

1. **Resources** – Extraction or overexploitation of natural resources used to provide products and services (renewable and non-renewable).
2. **Biodiversity** – Land use competition and biodiversity value (including, genetic resources).
3. **Biodiversity** – Habitat change, impacts on biodiversity (including, protected species and decline in trophic levels).
4. **Biodiversity** – Ecosystem services protected and/or restored.
5. **Water** – Total water withdrawal by type (municipal, dam, borehole, etc.).
6. **Water** – Ecosystem services impacted by the company's effluent water.
7. **Energy** – Energy consumption by type.
8. **Energy** – Reduction of energy consumption.
9. **Emissions, pollution and waste** – Greenhouse gas (GHG) emissions – scopes 1, 2 and 3.
10. **Emissions, pollution and waste** – Nitrogen and phosphorus pollution (including NOx, SOx).
11. **Emissions, pollution and waste** – Waste by type and disposal method for both hazardous and non-hazardous waste streams.

12. **Products and services** (downstream environmental impacts) – Environmental mitigation of products and services (clean technologies, behavioural changes, etc.).
13. **Supply chain management** (upstream environmental impacts) – Environmental mitigation in the supply chain.

The SBSC was used with a high-level scoring system (Table 3.2) to maintain objectivity and consistency among all assessed stock exchange guidelines. The scoring system was adapted from the United Nations methodology for selecting indicators. The United Nations successfully reviewed sustainability indicators related to environmental and social sustainability with the scoring system (UN 2007). The assessments allowed for comparisons across the stock exchange guidelines in terms of economies and regions. This information was further used to determine the strength of South African (JSE) environmental reporting requirements compared to the rest of the sample.

Indicators were not weighted (see Morhardt *et al*. 2002; Singh *et al.* 2009), even though other studies weighted indicators based on their determined importance (see Kranjnc and Glavic 2005; Papaspyropoulos *et al*. 2010). Indicators were not weighted as only key indicators were assessed and related to the MEA and the UNEP's Ecosystem Management policy, thus identifying key environmental concerns. The highest score that a stock exchange could achieve per indicator was four, while the lowest score was zero; with 13 key indicators the overall score that could be achieved was 52 per stock exchange.

Table 3.2. Assessment scores for the SBSC (adapted from the United Nations methodology for selecting indicators, UN 2007). The scoring system is open ended allowing for different indicators to be assessed by the same requirements.

Score	Requirement	Description
0	No indicator present.	The topic has not been addressed by any indicators in the guidelines.
1	Indicator is relevant to encouraging sustainability.	The indicator is related to environmental sustainability and can relate to the required information.
2	Indicator is understandable, clear, unambiguous and conceptually sound.	The indicator provides the basic requires for the company to report the amount in units and provide an explanation for those figures i.e. both quantitative and qualitative information presented.
3	Indicator for the key global environmental concern can be applied internationally; it is open ended and adaptable to local requirements.	The indicator can be applied in any country because it is open ended allowing for flexibility but it can be adapted to specific local requirements.
4	Indicator encourages integration, for example links the environmental indicator with another environmental indicator or other pillars such as social or economic indicators. The indicator requires companies to disclose improvements or setbacks among years where appropriate.	The indicator is linked with other indicators. Linking the effects of one indicator to the health of other indicators. Thus, a form of triple context integration or risk management.

Data analysis

Statistical analysis was performed using Statistica Version 12 (StatSoft, Inc. 2014). A Kruskal-Wallis Anova using multiple comparisons of mean ranks for all groups was used to determine differences in the scores achieved by stock exchanges, economies and regions. The significance level for all statistical analyses was set at $p < 0.05$.

3.3. Results

The 19 sampled stock exchanges consisted of 32.73% of all SSE monitored stock exchanges at the time of sampling. It is important to acknowledge the small sample size when

taking the below results into consideration. Eight (42.11%) stock exchanges did not recommend the reporting of environmental information, namely Chile, Colombia, Jamaica, Mexico, Namibia, Nigeria, Peru and Poland. Six (31.58%) stock exchanges recommended that companies use the GRI when reporting, thus including environmental requirements, namely Australia, Brazil, Germany, Thailand, South Africa and USA – NASDAQ. Six (31.58%) stock exchanges developed their own environmental reporting requirements, namely Egypt, India, United Kingdom, South Africa, Turkey and USA – New York. South Africa was the only stock exchange that developed its own guidelines *and* recommended the use of GRI reporting. The stock exchanges that recommended the use of GRI guidelines achieved an average score of 2.46. Stock exchange reporting requirements were found to poorly address the key global environmental concerns identified in this study. In fact, the average scores were 1.17 for all stock exchanges, 2.01 for the stock exchanges that provided guidance (both developed *and* GRI reporting guidelines) and 1.46 for the stock exchanges that developed their own guidelines were below average environmental requirements for company reporting (2 – average, indicators cover main requirements).

The stock exchange performances were significantly different between the stock exchanges that provided guidance opposed to the stock exchanges that did not provide guidance, according to the Kruskal-Wallis test ($H_{(18, 247)} = 129.105$; $p<0.001$). When evaluating the stock exchanges that provided guidance, the performances were not significantly different from one another according to the Kruskal-Wallis. For the stock exchanges that recommended GRI *and* developed their own guidelines ($H_{(10, 143)} = 9.110$; $p>0.05$, Figure 3.1). The stock exchanges that developed their own guidelines ($H_{(10, 143)} = 1.687$; $p>0.05$). The mode score was four (indicator encourages integration) for South Africa and one (relevant indicator presented) for all other stock exchanges that recommended guidelines. The stock exchanges that recommended the use of GRI guidelines generally performed best overall, with a score of 2.46 and were not significantly different. Though, South Africa scored 2.54 for recommending environmental reporting guidelines. The South African environmental reporting requirements focused on all thirteen key global environmental concerns by developing guidelines *and* recommending the GRI reporting guidelines. The guidelines scored well for recommending reporting requirements for water, energy and emissions, pollution and waste. South Africa fell short in its developed guidelines (mean = 1.46), while India performed best (mean = 1.69) and Egypt poorest (mean = 1.08).

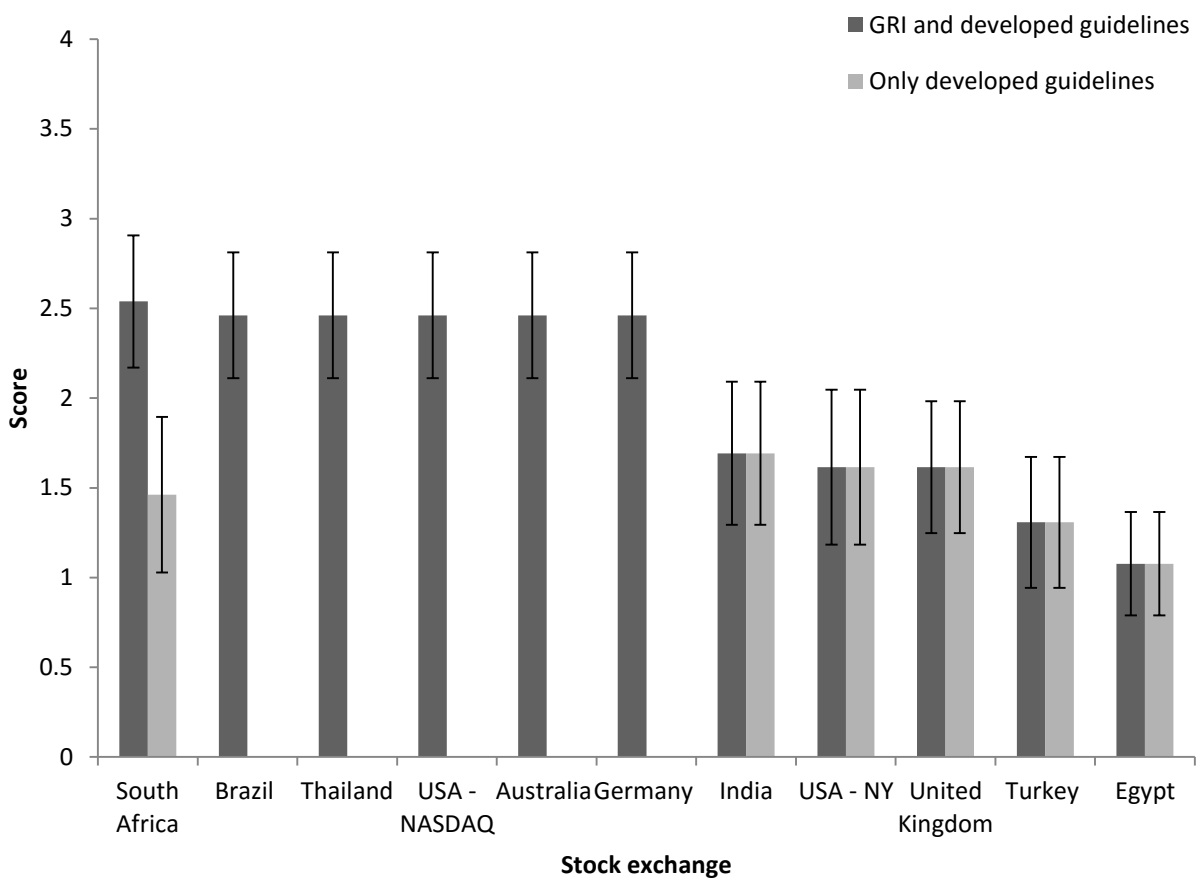


Figure 3.1. Stock exchange performances for recommending GRI and developed environmental guidelines, shown in descending order (stock exchanges without guidelines were excluded from the graph, mean ± SE).

The Kruskal-Wallis test revealed that the stock exchange guidelines in developing and developed countries performed significantly different ($H_{(1, 247)} = 12.486$; $p<0.01$, Figure 3.2). The stock exchanges that both recommended GRI *and* developed guidelines performed similarly ($H_{(1, 143)} = 0.053$; $p>0.05$). Figure 3.2 shows that stock exchange guidelines in developed countries (n=5, mean = 2.12) performed slightly better than stock exchange guidelines in developing countries (n=6, mean = 1.92).

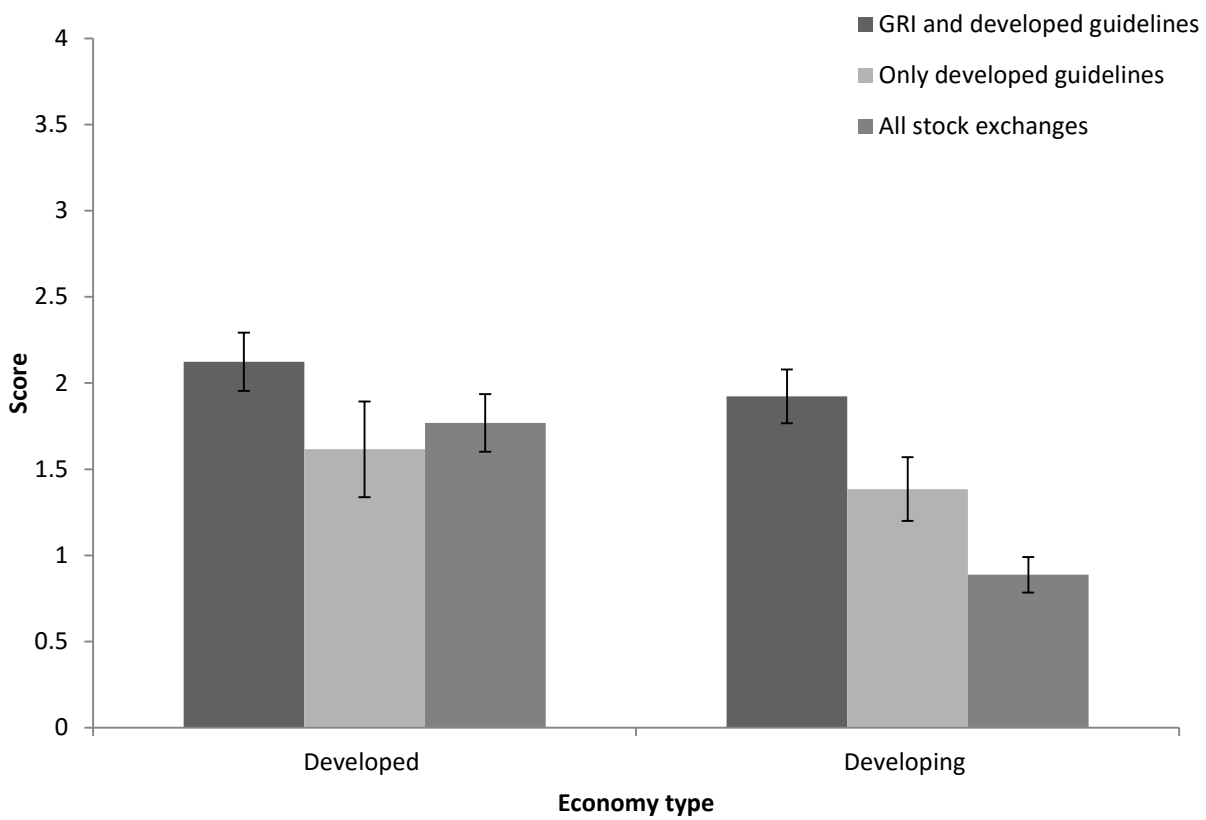


Figure 3.2. Performance of stock exchanges in developed and developing countries organised according to the type of guidelines recommended (mean ± SE).

According to the Kruskal-Wallis test, the different regions were found to report significantly differently for all of the stock exchanges ($H_{(3, 247)} = 27.621$; $p<0.001$, Figure 3.3). The stock exchange guidelines in Australasia performed better than the stock exchanges in America, Africa and Europe. Although, the stock exchanges that recommended GRI *and* developed guidelines ($H_{(3, 143)} = 1.294$; $p>0.05$) or only developed guidelines ($H_{(3, 78)} = 0.995$; $p>0.05$) performed similarly. The mode scores showed that guidelines for all stock exchanges and developed guidelines were zero; the mode was one for stock exchanges that both recommended GRI *and* developed their own guidelines. Interestingly, Australasia performed best overall but the other regions performed differently depending on the type of guidelines.

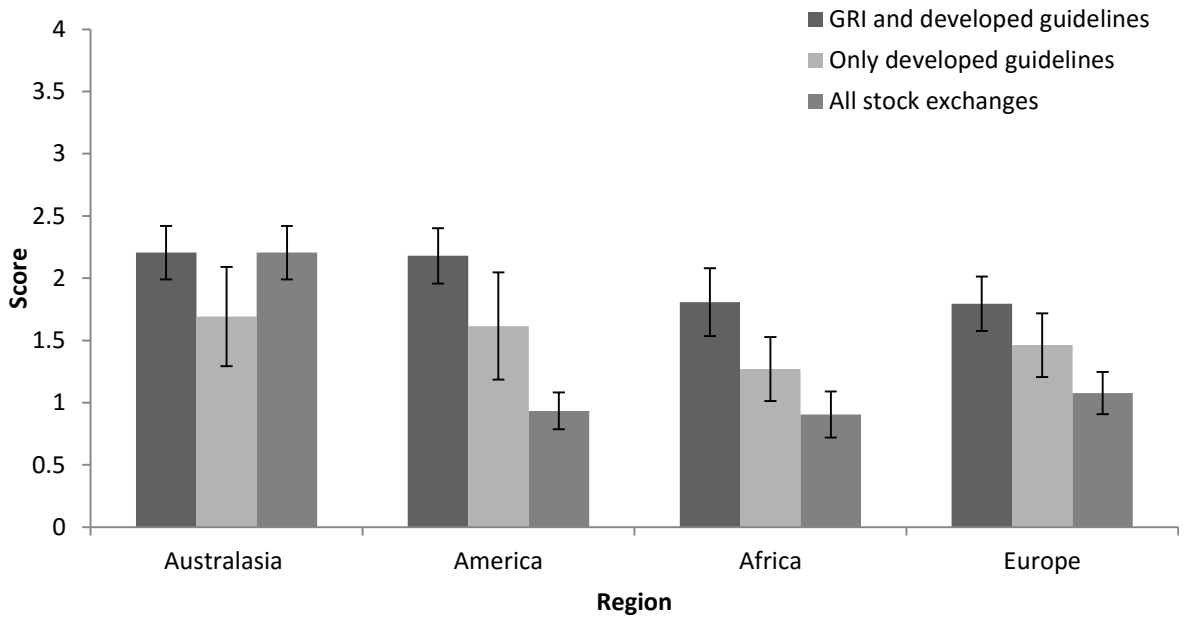


Figure 3.3. Performance of stock exchanges in different regions, shown in descending order (mean ± SE).

The Kruskal-Wallis test revealed that all stock exchange guidelines focused significant differently on key global environmental concerns ($H_{(6, 247)} = 32.913$, $p<0.001$, Figure 3.4), including both the GRI *and* developed ($H_{(6, 143)} = 64.623$, $p<0.001$, Figure 3.5) and developed guidelines ($H_{(6, 78)} = 39.757$, $p<0.001$, Figure 3.6). Stock exchanges generally reported better on water ($p<0.01$), Energy ($p<0.01$) and emissions, pollution and waste ($p<0.01$) than resources and biodiversity.

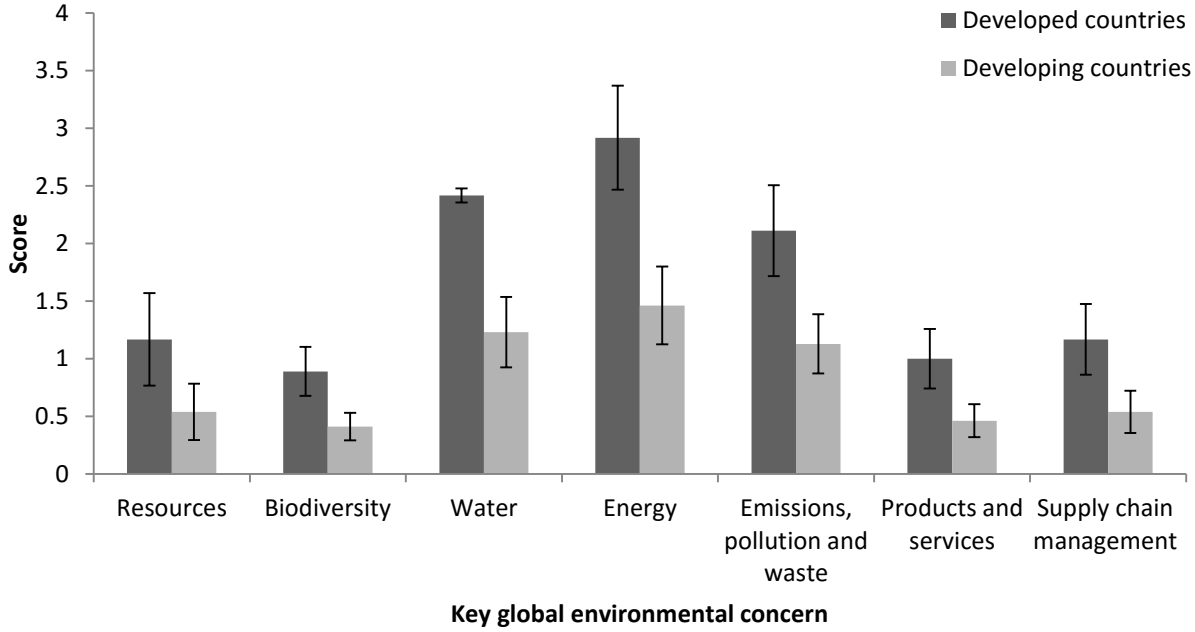


Figure 3.4. Focus on key global environmental concerns by all stock exchanges in developed and developing countries (mean ± SE).

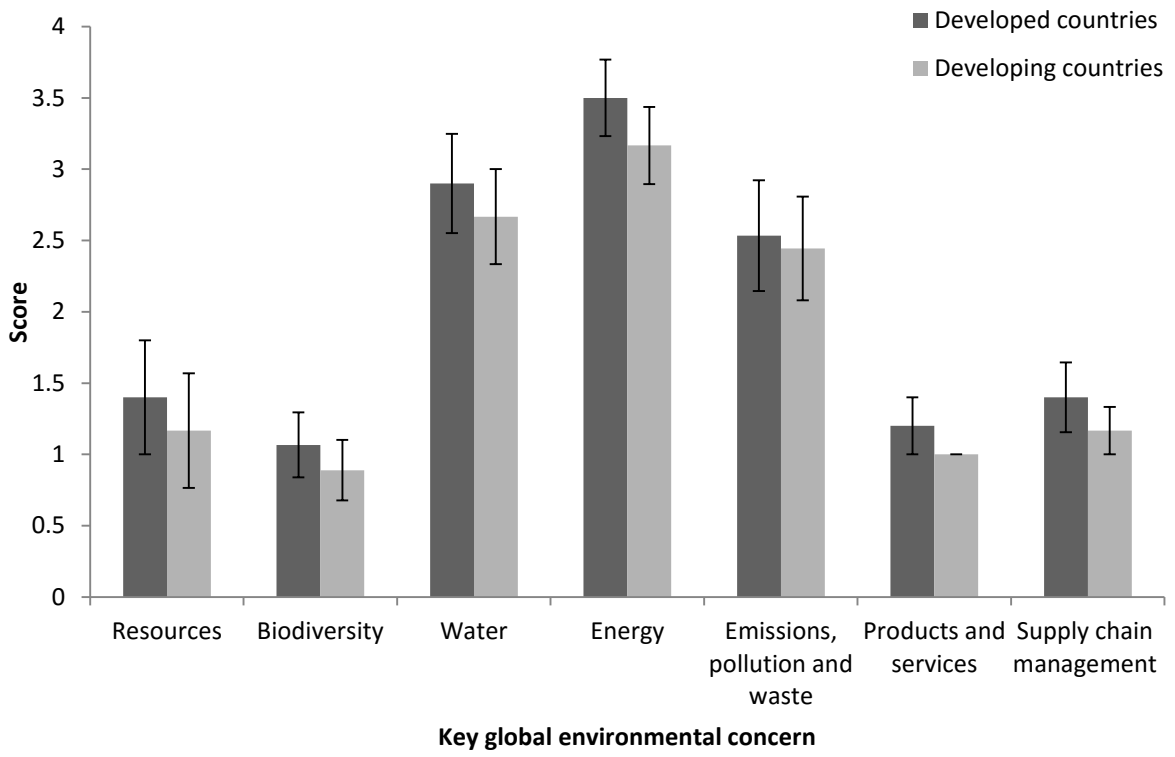


Figure 3.5. Focus on key global environmental concerns by stock exchange that recommended GRI *and* developed guidelines in developed and developing countries (mean ± SE).

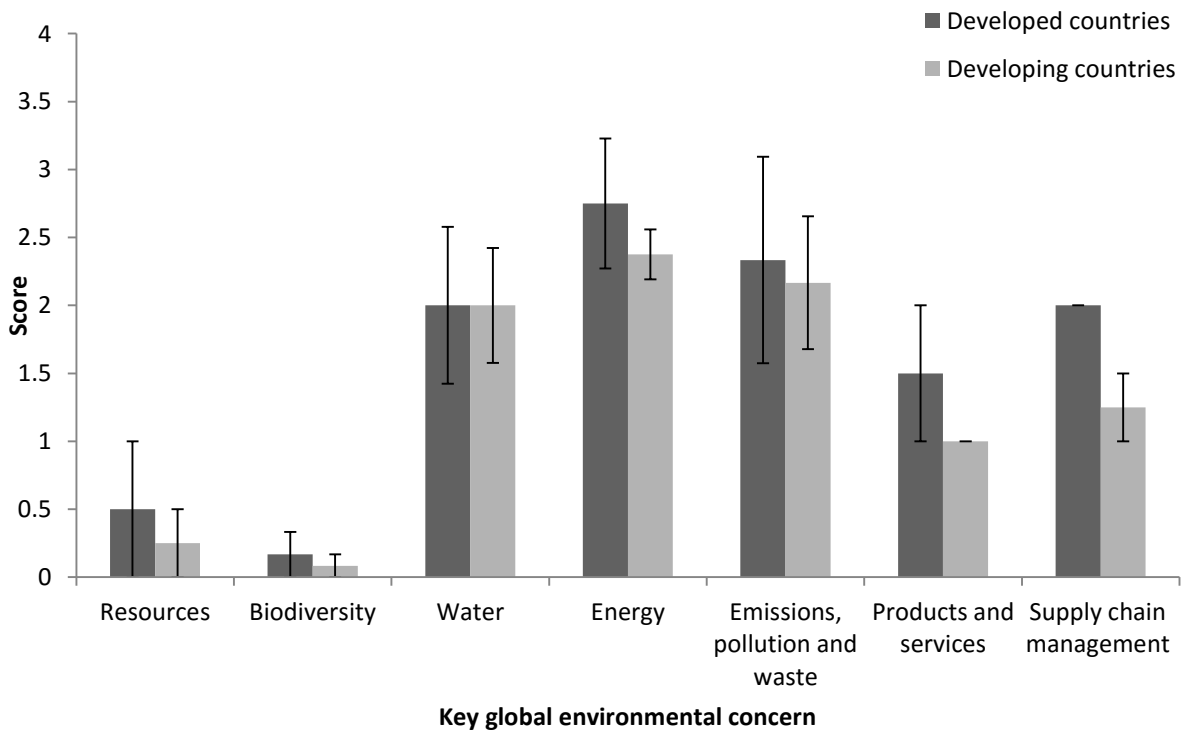


Figure 3.6. Focus on key global environmental concerns by stock exchange that recommended developed guidelines in developed and developing countries (mean ± SE).

Overall, South Africa's guidelines performed best globally and in Africa. This was because South Africa recommended the use of GRI reporting *and* developed guidelines that performed best on the specific indicator "Hazardous and non-hazardous waste". No stock exchanges in a single region implemented guidelines best for all of the key global environmental concerns. The average scores achieved by all stock exchanges for key global environmental concerns ranged from 2.91(energy) to 0.41 (biodiversity); for GRI *and* developed 3.32(energy) to 0.97 (biodiversity) and developed 2.50 (energy) to 0.11 (biodiversity). Generally, the data revealed that indicators relating to resources, biodiversity, products and services and supply chain management were poorly addressed by stock exchange guidelines compared to other indicators, namely water, energy, emissions, pollution and waste.

3.4. Discussion

This chapter aimed to determine whether stock exchanges recommended reporting requirements that covered the key global environmental concerns as identified by the MEA and the UNEP's Ecosystem Management policy. A SBSC with seven key global environmental concerns and a five tier scoring system was used to perform a gap analysis on the stock exchanges' environmental guidelines. The study assessed and compared economies and regions.

As the majority of stock exchanges are being monitored by the SSE initiative due to their large market capitalisation (SSE 2015d), it can be expected that these stock exchanges influence the industry as a whole. Therefore, they would recommend the most sophisticated environmental reporting requirements when compared to other stock exchanges not monitored by the SSE initiative. This study infers that the majority 61.11% of the assessed stock exchanges (32% of SSE monitored stock exchanged) provided some sort of environmental guidance. Aviva (2011) found that the majority of stock exchanges (57%, n=30) do not provide sustainability reporting guidance to their listed companies. It appears that more stock exchanges are beginning to recommend environmental guidelines to their listed companies, noting the small sample sizes. In fact, it is believed that companies that disclose sustainability information can be placed at a disadvantage because it often comes at a hefty price (Lopez *et al.* 2007), therefore deterring stock exchanges from placing additional pressure on their listed companies. Today, disclosing sustainability information may place

companies at an advantage because they are able to demonstrate that they are managing their sustainability impacts.

In general, stock exchanges were found to perform poorly in their coverage of the key global environmental concerns. The performance of stock exchanges may be related to the commitment level of the stock exchange towards the SSE initiative, noting that the SSE initiative does not provide a minimum environmental standard. Thus, being a SSE partner stock exchange, the social pressures, including investor and stakeholder interests around environmental sustainability may influence a stock exchange's uptake for recommending environmental guidelines (SSE 2013a). Companies already find it difficult to manage their environmental impacts because there is a general misunderstanding of the importance of the environment on business continuity (Morhardt *et al.* 2002 ; Kolk 2008; Papaspyropoulos *et al.* 2010; Dahl 2012; Costanza *et al.* 2014). Many stock exchanges still do not provide environmental guidelines to their listed companies because of this misunderstanding (Aviva 2011; SSE 2015d).

Developing countries have different challenges to developed countries they develop their own environmental guideline to align with the issues most relevant in their countries. The United Nations Department of Economic and Social Affairs (DESA 2013) believe that developed countries have overcome many of the challenges that developing countries are faced with today, providing the companies and stock exchanges in developed countries with the "freedom" to focus on environmental sustainability. Gao *et al.* (2005) suggest that developing countries do not prioritise environmental sustainability at the same high level as developed countries because of these challenges. In contrast to this study Ebrahim (2013) believes that stock exchanges in developing countries perform better than stock exchanges in developed countries because sustainability challenges are felt more directly and more often by companies that operate in developing countries. Thus, foreign investors want to be assured that the companies' that they invest in are managing their environmental risks and opportunities.

Developing countries may have a lower performance because they need to balance a variety of different issues. They are often faced with high levels of inequality, unemployment, water and food shortages, energy insecurity as well as low levels of trust in their governments (WEF 2016). These concerns are often linked to social inequalities that translate into economic value reductions, making it difficult to allocate resources to

environmental concerns. Adams *et al.* (2004) suggest that short term thinking leads people to believe that global collaboration to conserve biodiversity conflicts with efforts to reduce poverty. Since environmental concerns often translate into social inequalities or vice versa (see Pruss-Ustan and Corvalan 2007; Costanza *et al.* 2014; Franks *et al.* 2014). Guidelines should enforce socially relevant environmental stewardship. For example, poor management of ecosystem resources, such as the quality and availability of water for communities, may relate to an increase in diseases like cholera or dysentery (see Ashbolt 2004; Norman *et al.* 2007; Pruss-Ustan and Corvalan 2007; Khan *et al.* 2013; Costanza *et al.* 2014).

The results imply that stock exchange guidelines in Australasia perform best and better than stock exchange guidelines in America, Africa and Europe for all stock exchanges. This may be because all stock exchanges in Australasia sample recommended environmental reporting guidelines, which was not the case for the other regions. Environmental guidelines did not differ among regions where stock exchanges recommended GRI and developed guidelines or only developed guidelines. A European study suggested that sustainability reporting is less prescriptive in Europe than in America (Cormier and Magnan 2003). On the contrary, Jose and Lee (2007) found that voluntary environmental disclosures were more prominent in Europe than in America. Even though Africa lagged behind when recommending environmental reporting requirements, the data suggests that the region has started encouraging environmental sustainability and South Africa is leading in the region and globally. It is important to acknowledge that Africa is incorporating environmental concerns into business and progress to achieving sustainable development is a long term journey for countries.

Stock exchanges focused similarly on recommending the seven key global environmental concerns. It was expected that water, energy and emissions, pollution and waste would perform well (see Morhardt *et al.* 2002 ; Kolk 2008; Papaspyropoulos *et al.* 2010). This is because the information is easy to collect and benchmark. Resources and biodiversity were highlighted due to their poor performance as stock exchanges seemed to neglect these concerns in their developed guidelines and they were marginally included in the GRI reporting guidelines. Business practices have not yet identified the value of resources and biodiversity management (Pearce and Moran 1994; Adams *et al.* 2004), which I believe is still relevant today. Resources and biodiversity are the building blocks for today's society and can most understandably be translated into ecosystem resources as understood by the MEA and the UNEP's Ecosystem Management policy (MEA 2005; UNEP 2010).

Environmental guidelines do not focus on resources and biodiversity sufficiently which is a concern as it is this aspect of the global environmental concerns with is resulting in huge financial losses (TEEB 2010; Costanza et al. 2014).

A number of studies have related the value of resources and biodiversity to social and economic success (see Pearce and Moran 1994; Bolund and Hunhammer 1999; Adams *et al.* 2004; TEEB 2010; Costanza *et al.* 2014). Resource and biodiversity assessments allow decision-makers to determine progress towards environmental sustainability with evidence of biodiversity benefits being incorporated into new guidelines for improving sustainability (Ness *et al.* 2007). Biodiversity is often overlooked, more importantly, stock exchanges may be neglecting biodiversity because they cannot enforce the intense costs involved for companies to implement systems, policies, procedures and controls to collect and report on their biodiversity impacts when companies are already burdened with intense economic reporting (Lopez *et al.* 2007; IRAS 2015). The downstream environmental effects of products and services and upstream environmental effects of supply chain management were rarely considered by stock exchanges, even though these effects can cause the largest environmental impacts related to a company's activities, due to their compounding impacts (Wiedmann and Minx 2007).

The downstream effects of water discharge from companies were not accounted for in any of the stock exchanges' developed guidelines. Thus, if companies do not choose to go beyond what is required of them, then it could be assumed that the companies' discharge is compliant with water legislation in that country unless the discharged water is hazardous and a fine is levied on the company (Karpoff *et al.* 2005). Usually this would only occur if it is noticed by stakeholders, such as communities that suffer directly from the use of the polluted water (Veiga *et al.* 2001). Water risks are increasingly becoming more material to companies as the quality and availability of freshwater becomes compromised (Heal 2000; TEEB 2010; Ellsworth and Spalding 2013). Companies need to be mindful when discharging water into the surrounding environment as it can alter and diminish ecosystem services provided by that ecosystem to people and surrounding ecosystems (Gminder 2005; UNEP 2010; Costanza *et al.* 2014). The health of an ecosystem service such as water quality and availability impacts the ability of other ecosystem services to maintain their services.

The requirements recommended for companies to report on water, energy and emissions, pollution and waste was of a relatively high standard. The information required to

fulfil these indicator requirements is generally easily accessible for companies (Kolk 2008). All evaluated stock exchanges required companies to disclose their carbon emissions, as defined by the CDP. Thus, when looking at the CDP reporting of listed companies, the United Kingdom and Australian listed companies performed well when disclosing their scope emissions, which may relate to the guidelines recommended by the stock exchanges in those regions (CDP 2015a). The USA – New York, USA – NASDAQ and Indian companies were found to disclose limited climate change information (Topping and Sokell 2011). Climate denialism is a common mind-set in the United States and has been known to affect business leader's focus on environmental impacts, which may explain why USA fell short (Dunlap and McCright 2010). Still Topping and Sokell (2011) suggest that, when at least 50% of companies listed on the exchange disclose their scope carbon emissions, it influences other companies to start disclosing their emissions, due to market and peer pressures.

Generally, the stock exchange guidelines provided indicators that allowed for a wide scope to be defined (see Ness *et al.* 2007). South Africa was the only stock exchange that developed their own environmental guidelines *and* recommended the GRI reporting guidelines. Five other stock exchanges recommended only GRI guidelines (mainly operating in Australasia and American), which were broad enough to partially cover all key global environmental concerns. Even though the indicators partially covered the key global environmental concerns, the link was not always clear, resulting in poor performance. Environmental indicators are difficult for stock exchanges to choose as there are more indicators available than can be addressed at a given time (Dahl 2012; UNCTAD 2013). Stock exchanges need to balance the local environmental concerns of the countries in which they operate in with the key global environmental concerns as outlined by the MEA and the UNEP Ecosystem Management policy (see Rockström *et al.* 2009).

South Africa has a legacy of social injustices that the country needs to rectify. This forces the country and thus the JSE to focus on social concerns (Adams *et al.* 2004; JSE 2014), often at the cost of environmental concerns. South Africa performed best overall because it was the only stock exchange that both recommended GRI reporting *and* developed environmental reporting requirements. The JSE's developed guidelines neglected guidance for resources and biodiversity, which are more complex environmental concerns. This was similar to the poor performance of the other evaluated stock exchanges in the African region. Even though Africa as a whole performed poorest, South Africa performed best in the region and similar to stock exchanges operating in developed countries and stock exchanges that that

recommended the GRI reporting guidelines. South Africa recommended guidelines well for water, energy, emissions, pollution and waste. This may relate to South Africa's commitment to encouraging sustainability and trading with regions like Europe and America who both have strict requirements for their trading partners (JSE 2015b; EU 2016; USTR 2016).

Conclusion

The greatest impact that a stock exchange has is the ability to guide its listed companies and thus it has the responsibility to manage this (UNCTAD 2013). Most stock exchanges' environmental guidelines were based on a "comply or explain" approach. This may be related to the adolescent stage of sustainability in the business community (UNEP *et al.* 2013). It is important for stock exchanges to level the so-called "playing field" among companies reporting on their environmental impacts. Just like the IFRS and GAAP, it is necessary to create a similar environmental reporting standard that becomes an internationally accepted standard. The Global Sustainability Standards Board (GSSB) aims to address this issue by governing sustainability guidelines (GSSB 2015). Sustainability indices are important to monitor, benchmark, provide direction, encourage healthy competition and promote good reputable ethical behaviour among companies (UNEP *et al.* 2013). Stock exchanges that provide sustainability indices can be viewed as leaders in the industry as only 41.82% of stock exchanges provide sustainability related indices (SSE 2015d). When investors are interested in responsible investing, it encourages companies to be responsible for attracting those investors (Barnett and Salomon 2006; SSE 2015b; UN PRI 2015).

In order for stock exchanges to facilitate responsible investing they should focus more on the environmental impacts of companies that are listed with them. The triple context links need to be clear to avoid further anthropogenic environmental degradation. Despite both the GRI reporting guidelines and stock exchange developed guidelines addressing the key global environmental concerns, they did not properly focus on what was needed to fully guide companies to address these concerns raised by environmental scientists. This may result in companies focusing on less important environmental concerns, causing further degradation of the environment, impacting the health of society and the economy. Clearly, stock exchanges need to work closely with environmental scientists to better integrate environmental concerns like resources and biodiversity into their reporting guidelines to avoid allowing companies listed with them to greenwash and to facilitate actual responsible investment opportunities. Alternatively, stock exchanges should recommend globally accepted guidelines like the GRI,

which are arguably not perfect but still steer companies in the right direction to being more sustainable. It may be assumed that, with a lack of focus on the key global environmental concerns by stock exchange guidelines, companies will in turn neglect these concerns. It is necessary to understand if companies actually go beyond the GRI reporting guidelines and/or the developed stock exchange guidelines to address the key global environmental concerns that will have an impact on the continuity of their companies (see Chapter 4 for understanding this in a South Africa context, a developing country in Africa).

Chapter 4 : Environmental reporting in a developing country, South Africa, – a comparative study between impact levels and industries

Abstract

Financial reporting is based on well set accounting standards, which have not yet been achieved for sustainability reporting. Sustainability reporting allows companies to take responsibility for their environmental impacts. This is important in a developing country like South Africa that needs to demonstrate that it is able to strategically manage its environmental risks and opportunities to attract foreign and responsible investments. The objectives of this chapter were (1) to compare 20 JSE listed companies' environmental reports based on the presence and quality of data, (2) to compare what companies reported to what the JSE required and (3) to identify possible differences in reporting between the impact levels and industries of companies. Twenty companies selected from the JSE pool of listed companies were scored on their environmental reporting using a sustainability balanced scorecard approach with 13 key indicators and a five tier scoring system. The assessment of reporting performances were based on impact levels and industries. The majority of the assessed companies (90%) reported some form of environmental information but generally reported poorly on the key global environmental concerns, with high impact companies reporting best. Indicators related to water, energy, emissions, pollution and waste were reported on better than indicators related to resources, biodiversity, products and services and supply chain management. Even though companies were found to report poorly, the uptake of environmental reporting may have been high because it was a JSE listing requirement. Companies generally addressed key global environmental concerns that are relatively easy to obtain information for and neglected the more difficult key global environmental concerns. It was found that the level of disclosure was related to the performance of JSE guidelines. Companies were found to report on resources and biodiversity but at a low performance; these categories were neglected by the JSE's developed guidelines but were covered in the GRI reporting guidelines. Companies need to address the key global environmental concerns to ensure environmental resilience and sustainable continuation of their businesses.

Key words: Environmental reporting; Johannesburg Stock Exchange; Millennium Ecosystem Assessment; South Africa; UNEP Ecosystem Management policy

4.1. Introduction

Companies are required to publish audited annual financial statements, which are based on a set of accounting standards, namely the International Financial Reporting Standards (IFRS) and United States Generally Accepted Accounting Principles (GAAP, Eccles and Saltzman 2011). Financial reporting has well set standards for measurement, reporting, auditing and governing laws, which have as yet not been as well developed for the sustainability performance of a company (Eccles and Saltzman 2011; Christensen *et al.* 2015; Ernst & Young 2015). In comparison the Global Sustainability Standards Board (GSSB) plan to develop and approve global sustainability reporting standards (GSSB 2015).

Companies need to keep up with the current trends to gain momentum and maintain a competitive advantage over their peers. The sustainability information of a company defines the very risks and opportunities that the company is required to monitor to ensure its future success (Haywood *et al.* 2010; Ebrahim 2013; Schiehle and Wallin 2014). Financial reporting is no longer enough to fairly represent a company for the short, medium and long-term (IIRC 2013b). A company needs to report on sustainability, including environmental and financial impacts to allow stakeholders to make fair and responsible investment decisions based on balanced information representing the company's overall performance (Haywood *et al.* 2010; Ebrahim 2013; CERES 2014a; UN PRI 2015).

The concept of sustainability came about as a result of severe anthropogenic environmental disasters and concerns around resource limitations, the depletion of the ozone layer, biodiversity loss and climate change among others (Dobson *et al.* 1997; Drexhage and Murphy 2010; Ellsworth and Spalding 2013). The realisation that society and business activities were responsible for these severe environmental changes influenced the environmental focus of sustainability (Millar *et al.* 2007; Cutter *et al.* 2008). Public reporting historically focused on financial risks and neglected the sustainability risks, yet we have many examples of risky business involving environmental impacts (Roberts 1991; Kolk 2003). The Exxon Valdez oil spill in 1989 released over 41 million litres of crude oil into Prince William Sound in Alaska, and the recent BP Deepwater Horizon, the largest marine oil spill in history, released over 757 million litres of oil into the Gulf of Mexico in 2010. These two anthropogenic disasters were examples of cost-saving decisions that led to major environmental impacts and biodiversity loss, which still affect the areas impacted today (Tagesson *et al.* 2009; Tunnell 2011; Holleman 2014). It is no longer good enough for

companies to only address environmental crises once they have happened, companies need to manage and anticipate their impacts on the environment.

Environmental impacts can be significant and accordingly risky for investors. For example, since the 1970s many environmental disasters caused by companies have led to losses in their share price or even the company's closure (Anderson-Weir 2010; Flammer 2012; Wiggins and Yolen 2015). Sustainability reporting came about as a means of getting companies to take responsibility for their environmental impacts and in doing so protect stakeholders and investors from investing in risky business operations (Kolk 2008; Hahn and Kuhnen 2013 CERES. 2014b). Society has begun to understand that resources are finite and thereby they limit economic growth. This understanding that we need the environment to survive and grow but at the same time are limited by the environment in terms of our societal and economic growth has allowed sustainability to evolve (Elkington 1997; Kolk 2004; GRI G4 2013a; IIRC 2013a; Maubane *et al.* 2014).

The Millennium Ecosystem Assessment (MEA) and the United Nations Environment Programme's (UNEP's) Ecosystem Management policy identified common global environmental concerns that may threaten human well-being and may well be exaggerated by companies' business activities. The environmental issues identified were climate change, the decline in trophic levels and ecosystem services, extraction or overexploitation of resources, loss of genetic resources, habitat change or transformation, land use competition, natural hazard regulation and pollution (see Appendix 2, MEA 2005; UNEP 2010). These identified global environmental concerns were translated into seven key global environmental indicators in chapter three.

Companies have been reporting using the historic triple context approach or the more modern six capitals approach and other globally accepted guidelines and standards in an effort to integrate sustainability into their businesses, such as the International Organization for Standardization's (ISO) 14001 guidelines (ISO 14001 2015), Global Reporting Initiative (GRI, GRI G4 2013a), International Integrated Reporting Council's (IIRC) Integrated Reporting (<IR>) framework (IIRC 2013a), United Nations Global Compact (UNGC, UNGC 2015), Carbon Disclosure Project (CDP, CDP 2013) and CDP Water Program (CDP 2015b). Listed companies are required to follow the guidelines of the stock exchange that they are listed on. Companies may choose to report using a number of different layouts, such as annual financial statements, sustainability reports, environmental reports, socio-economic

reports, or the company may combine these separate reports into a single integrated report that demonstrates connectivity and integrated thinking (Morhardt *et al.* 2002; Labuschagne *et al.* 2005; Kolk 2008; UNEP *et al.* 2013; Maubane *et al.* 2014). Since 2010, the Johannesburg Stock Exchange (JSE) requires companies to report using integrated reporting, as recommended by King III (King 2009; JSE 2014).

With over 180 global sustainability reporting policies and initiatives (UNEP *et al.* 2013), companies need to navigate the vast range of guidelines available. As a result, companies are not restricted in the way that they report on their sustainability performance, even when listed companies need to meet the minimum requirements specified by the stock exchange that they are listed on. Since most stock exchange guidelines are in their infancy, they are usually instilled with a "comply or explain" approach (Lopez *et al.* 2007; UNEP *et al.* 2013), which means that companies can choose to comply or give reasons for not complying. Industry memberships have been shown to improve environmental disclosure (Cormier and Magnan 2003). A central point for improving sustainability performance is for companies to report transparently, which includes balanced reporting, i.e. reporting on both the positive and negative impacts of their business activities. To report accurate and meaningful data, companies need to have the right systems, policies, procedures and controls in place (ISAE 3000 2005; IRAS 2015).

South Africa has made considerable progress in the sustainability reporting field with the JSE playing a significant role in driving more sustainable business practices (Maubane *et al.* 2014; Shuro and Stainbank 2014; JSE 2015b). The JSE is the only South African stock exchange. The companies listed on the JSE must publish integrated reports in line with the IIRC <IR> framework, as recommended by the King III, the Code for Corporate Governance, and must make use of the GRI sustainability guidelines (King 2009; GRI G4 2013a; JSE 2014). There is specific environmental legislation that influences the environmental performance of companies in South Africa, like the National Environmental Management Act (NEMA) and several key acts associated with it (such as the Biodiversity Act, the Air Quality Act and the Waste Act) that aim to protect the environment and biodiversity (NEMA 1998; Mitchell and Hill 2009). The United Nations supported Principles for Responsible Investment (PRI, UN PRI 2015) and Code for Responsible Investing in South Africa (CRISA, CRISA 2011) encourage companies to adopt sustainability in their business strategies. These codes aim to assist investors and companies in making responsible investments and creating responsible investment opportunities for investors.

Until the end of 2015, the JSE Socially Responsible Investment (SRI) Index requirements incorporated the triple context for sustainability reporting. The SRI guidelines allowed for an annual assessment of a company's policies, management systems, performance and reporting on a "comply or explain" basis. Companies were assessed from the FTSE/JSE All Share Index population which includes all industries, and only publicly available information was considered (since 2004, JSE 2014). These JSE SRI guidelines were aimed at shaping the minimum level of sustainability reporting for companies listed on the JSE. The companies that addressed these environmental concerns, along with the social and economic concerns, were placed in the JSE SRI index and of those companies the best performers were selected annually (JSE 2013). The environmental indicators focussed on key concerns, such as climate change, energy, emissions, water pollution, water consumption, air pollution and waste. Climate change (since 2010) specifically focused on the company's efforts to reduce carbon emissions and thus their contribution to climate change and anticipated effects and risks of climate change on the company's future success. Lastly, a company had to demonstrate that it has an environmental policy or commitment statement in the public domain (JSE 2014).

The chapter focuses on how companies report on environmental concerns in relation to what the JSE expected. The objectives of this chapter were (1) to compare 20 JSE listed companies' environmental reports based on the presence and quality of data, (2) to compare what companies reported to what the JSE required and (3) to identify possible differences in reporting between the impact levels and industries of companies. I asked the following questions: (a) Are JSE companies reporting on key global environmental concerns? (b) Do companies report on the JSE developed guidelines *and* the GRI reporting guidelines that are recommended by the JSE? And (c) is there a relationship between reporting performance, impact levels and industries?

Current assessment approaches in the literature assess the report content, sometimes the report quality, but the actual sustainability performance has not yet been focused on (see Morhardt *et al.* 2002; Bieker 2003; Dias-Sardinha and Reijnders 2005; Gminder 2005; Hubbard 2009). Nevertheless, the research still proves to be valuable and shows that environmental reporting quality has been improving over time (Kolk 2004; Maubane *et al.* 2014). Content analysis is a widely used method for evaluating the sustainability information of a company, by looking for specific words, phrases or number of words dedicated to a sustainability section compared to the rest of the annual report (Kolk 2003; Perez and

Sanchez 2009; Beck *et al.* 2010; Maubane *et al.* 2014). Content analysis may be a biased approach because it does not actually look at the content but rather provides a very generic overview of the report. A previous study found no direct link between the length of disclosures and their quality (Brummer and Pavelin 2006). Thus, content analysis is limiting as it relies on the number of words, sentences, paragraphs and pages related to the topic concerned, rather than focusing on the quality of reported information.

To date, sustainability research has been focused on sustainability as a whole rather than concentrating on the specific dimension of environmental sustainability. Owing to the importance of the environment in the maintainable continuation of companies, it is valuable to assess the standard of JSE listed companies' environmental reporting in relation to key global environmental concerns, identified in the MEA (2005) and the UNEP's Ecosystem Management policy (2010). Thus, a gap analysis using the Sustainability Balanced Scorecard (SBSC) approach can highlight where the companies are reporting well and where they are lacking.

4.2. Methodology

The scorecard approach is a useful method for evaluating both the quantitative and qualitative information reported by a company. A gap analysis using a scorecard approach allows researchers to compare the company's actual reporting performance against a desired or potential performance. This method is limited by the indicators addressed in the scorecard and thus an appropriate scorecard based on reliable evidence should be used (see Bieker 2003; Dias-Sardinha and Reijnders 2005). The SBSC is a specific scorecard that is used to run a gap analysis on sustainability information. The SBSC approach provides a well-rounded idea of a company's sustainability performance by incorporating both quantitative and qualitative information provided by the company, and has been used by accounting professionals to evaluate the financial and sustainability information of a company (Bieker 2003; Dias-Sardinha and Reijnders 2005; Gminder 2005; Hubbard 2009). The limitations of most assessment methods are that they evaluate what *is* presented instead of what *should be* presented (Morhardt *et al.* 2002). Therefore, the SBSC allows the assessment to be centred on the quality of reported information by evaluating what should be reported and outlines what has and has not been reported by the companies and was thus the chosen method for this study.

The JSE All-Share index population of listed companies was used to select a random sample of 20 companies based on industry as at 28 February 2015 (JSE 2014). The companies were selected from the January to December 2014 financial year-ends (Table 4.1). The sample choice allowed for the classification of companies based on their environmental impact level and industry. The 2014 Background and Criteria set by the JSE SRI guidelines was used to classify companies according to their impact levels into high, medium and low impact companies (JSE 2014).

Table 4.1.The sample of JSE listed companies used to assess the level of environmental reporting compared to the key global environmental concerns.

Impact level	Industries	Companies
High impact	Metals and mining	Aquarius Platinum
		Assore
		DRD Gold
		Exxaro
		Jubilee Platinum
		Sentula
	Food and beverages	Illovo
		Tongaat Hulett
Medium impact	Banks	Barclays Africa
		Capitec
		Nedbank
		Standard Bank
	Retail	Truworths
		Woolworths
Low impact	IT	Datatec
		Mustek
	Telecoms	Blue Label Telecoms
		Telkom
	Media	Moneyweb
		Naspers

Assessment criteria

The SBSC approach was used to assess the 20 chosen companies' accessible environmental information for 2014 from their sustainability reports. In Chapter 3, the key global environmental concerns that were addressed in the MEA (2005) and the UNEP's Ecosystem Management policy (2010) were identified and translated into seven key global environmental concerns to assess the stock exchange guidelines. These same seven key global environmental concerns were used in this chapter to assess the environmental information reported by companies (see Appendix 2, MEA 2005; UNEP 2010).

The SBSC was used with a high-level scoring system (Table 4.2) modified from Deloitte and Touché (2006) to maintain consistency among all assessed stock exchange guidelines (see Bieker 2003; Dias-Sardinha and Reijnders 2005; Gminder 2005; Hubbard 2009). The Deloitte and Touché scoring system was successfully used to review company sustainability reports, including environment information (Deloitte and Touché 2006), and thus appeared appropriate to use for this study.

The scoring system did not weight indicators (see Morhardt *et al.* 2002; Singh *et al.* 2009), even though other studies weighted indicators based on their determined importance (see Kranjnc and Glavic 2005; Papaspyropoulos *et al.* 2010). Indicators were not weighted as only key indicators were assessed and related to the MEA and the UNEP Ecosystem Management policy, thus identifying the key global environmental concerns. The maximum score that a company could achieve per indicator was four, while the minimum score was zero and with 13 indicators the overall score that could be achieved was 52.

Table 4.2. Assessment scores for the SBSC (adapted from Deloitte and Touché 2006). The scoring system is open ended allowing for different indicators to be assessed by the same requirements.

Score	Requirement	Description
0	**Very insufficient/very little information.** No mention, no reasoning to why the indicator was not addressed.	No mention or barely mentioned the indicator. For example, no mention of the quantity of water used by the company.
1	**Qualitative information only or quantitative information only presented.** Some/little/partial mention or coverage but did not report as required by the indicator.	Indicator only mentioned in a table, not in text, and/or incorrect units of measurement. For example, the water consumption is reported for cost only and not in volume (m^3/year).
2	**Both qualitative and quantitative information presented.** Important concerns covered thus average reporting.	Reported as required by the indicator (minimum acceptable standard). For example, reported on the volume of water extracted per water source, monitoring both their water use and efficiency of water use.
3	**Shows at least three year trends in tables or figures or both.** Better than average reporting.	Trends of at least three years are shown, elaborated on how the indicator affected the company and statements on how the company will improve in this regard.
4	**Indicator integration –** Pace setting.	This indicator is linked with other indicators. Linking the effects of one indicator on the health of other indicators. For example, extracting x amount of water had y effect on wetlands downstream and z effect on biodiversity.

Data analysis

Statistical analysis was performed using Statistica Version 12 (StatSoft, Inc. 2014). A Kruskal-Wallis Anova using multiple comparisons of mean ranks for all groups was used to determine differences in the scores achieved by impact levels and industries. The significance level for all statistical analyses was set at $p<0.05$.

4.3. Results

The 20 sampled companies consisted of 5.56% of all listed JSE companies excluding the suspended companies at the time of sampling (JSE 2015a). It is important to acknowledge the small sample size when taking the below results into consideration. Ten percent of the sampled companies did not report publicly on their environmental impacts, thus scoring zero, while the other 90% reported some form of environmental information publicly, allowing for further analyses. All companies were found to report poorly on the requirements of the key global environmental concerns. In fact, the average score achieved for all companies was 0.89 below average reporting (1 – below average reporting; average reporting was defined as 2, indicators cover main requirements).

Generally, the Kruskal-Wallis test showed that companies disclosed environmental information differently ($H_{(19, 260)} = 79.338$, $p<0.001$, Figure 4.1). Companies achieved more scores of zero (no indicator presented) than scores of one (relevant information presented, $p<0.001$), two (average reporting, $p<0.001$) and three (trends presented, $p<0.001$), the mode was zero for reporting of environmental information. There were differences in the environmental reporting of company in the different impact levels, the low impact companies reported significantly less information than the high ($p<0.001$) and medium ($p<0.001$) impact companies. The high and medium impact companies were found to report similar on their environmental impacts ($p>0.05$), high impact companies reported slightly better than medium impact companies.

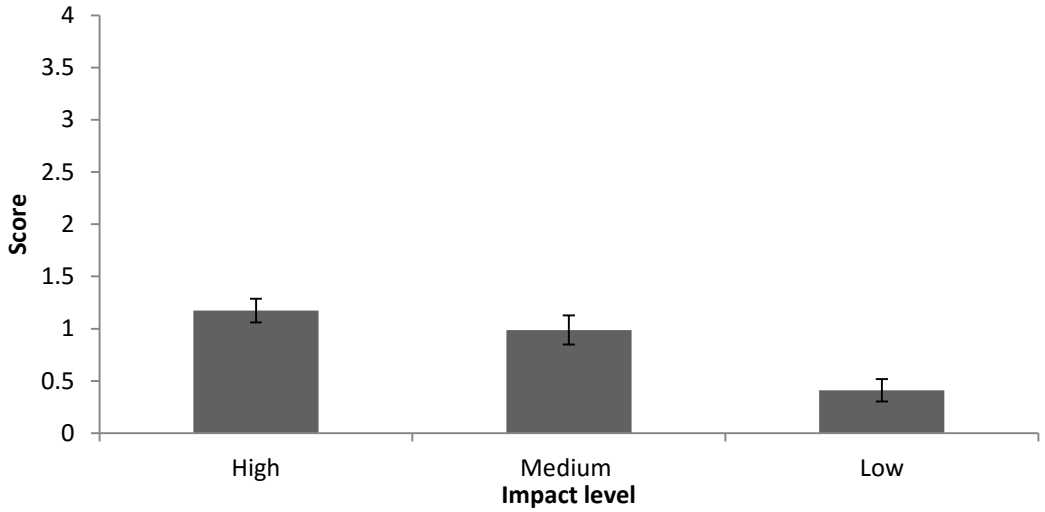


Figure 4.1. Environmental disclosure of companies in different impact levels, shown in descending order (mean ± SE).

There were significant differences in the performance of companies in different industries ($H_{(6,260)}$ = 32.292; p<0.001, Figure 4.2). Overall, the industries within the high and medium impact levels performed similarly (p>0.05) and better than the industries in the low impact level (p<0.001). Companies in the food and beverages industry reported significantly better on their environmental impacts than companies in the IT (p<0.01) and media (p<0.01) industries. Likewise, metals and mining companies reported significantly better on their environmental impacts than media companies (p<0.05).

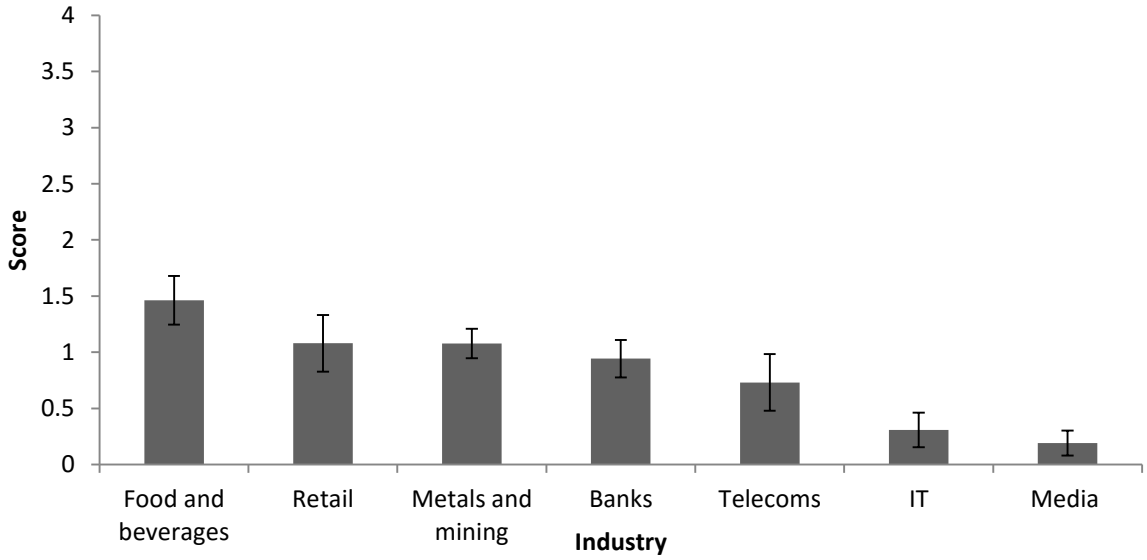


Figure 4.2. Environmental disclosure of companies in different industries, shown in descending order (mean ± SE).

The Kruskal-Wallis test identified significant differences in how companies reported on key global environmental concerns ($H_{(6, 260)}$ = 57.914; p<0.001, Figure 4.3). Companies reported on energy significantly better than on resources (p<0.05), biodiversity (p<0.001), products and services (p<0.001) and supply chain management (p<0.001). Reporting on water and emissions, pollution and waste was significantly better than on biodiversity (p<0.001), products and services (p<0.05) and supply chain management (p<0.05). Generally, there were more scores of zero (p<0.05) and one (p<0.05) than scores of two (p<0.01), the mode was zero for all key global environmental concerns except energy which had a mode score of three. Even though generally the high impact companies performed better than the medium impact companies, this was not the case for all key global environmental concerns. For example, medium impact companies outperformed the high impact companies when reporting on energy.

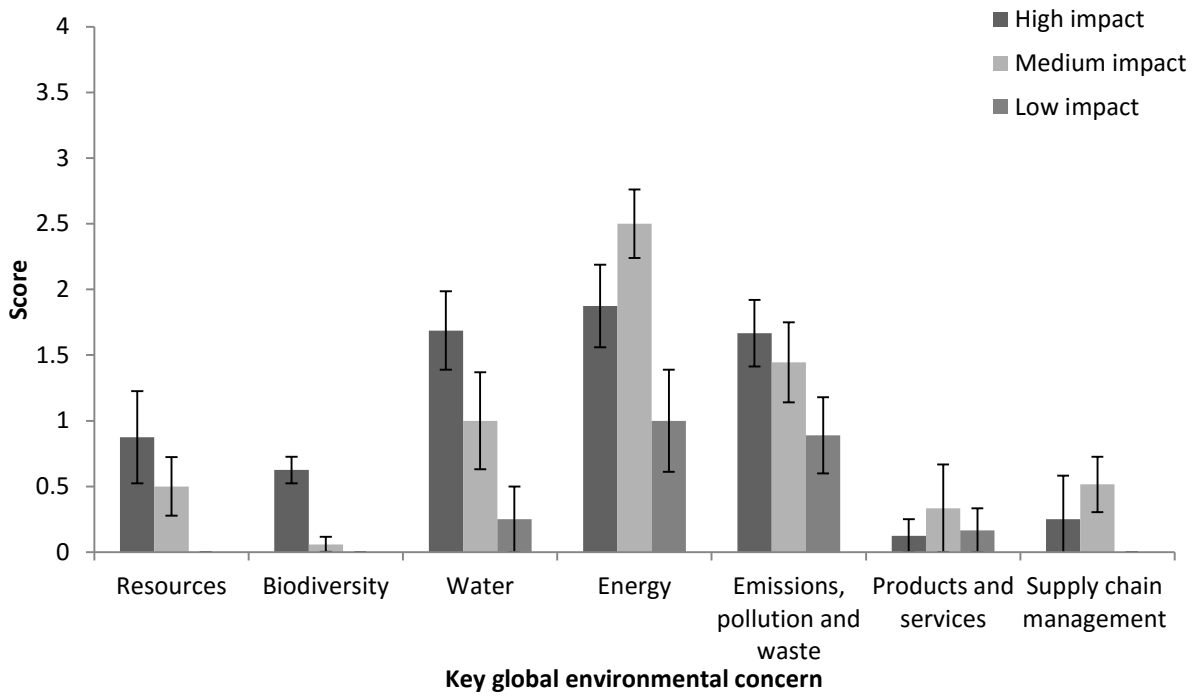


Figure 4.3. Reporting on key global environmental concerns organised in impact levels of the companies (mean ± SE).

South African companies were found to report similarly but with a lower performance on their environmental impacts compared to the requirements of stock exchange guidelines, including the performance of the JSE's environmental reporting guidelines. Specifically, water, energy, emissions pollution and waste were covered well in both the stock exchange reporting guidelines for companies and the information reported on by companies. In turn, products and services and supply chain management were covered poorly in both the stock exchange environmental reporting guidelines for companies and the environmental information reported on by companies. Interestingly, the JSE listed companies reported on resources and biodiversity even though the JSE developed guidelines did not provide guidance for resources and biodiversity but the GRI reporting guidelines did.

4.4. Discussion

The study aimed to assess if JSE listed companies reported on key global environmental concerns as identified by the MEA and the UNEP's Ecosystem Management policy. The seven key global environmental concerns determined in Chapter 3. The key global environmental concerns were compared to JSE requirements to see if they really are influencing company reporting. The same seven key global environmental concerns were used to assess the environmental reporting quality of JSE listed companies with a five tier scoring system specific to company reporting in this chapter. The study assessed and compared reporting performance between impact levels and industries.

Surprisingly, 10% of the selected companies did not publish any form of environmental information, even though the JSE requires their listed companies to disclose this information. The companies are able to explain why they believe that their environmental impact is immaterial, as a result of the "comply or explain" approach taken by the JSE. Companies did not report uniformly even though they are expected to use the same environmental reporting guidelines. This suggests that companies do not focus on the same environmental concerns because companies in different industries have different levels of impact on the environment. Thus, performance may depend on the company's level of impact, for instance a mining company will address biodiversity very differently to a bank, which is anticipated. Low impact industries have in the past been found to report poorly or not at all on their environmental impacts (Morhardt *et al.* 2002), this seems to still be relevant today. In contrast high impact industries usually report on their environmental impacts. This may be because of the increased stakeholder pressure on these companies. A similar study in Malaysia found that, even though listed companies are required to disclose environmental information, 28% (n=50) of listed companies did not disclose any environmental information (Sumiani *et al.* 2007). The academic literature lacks information on environmental reporting, as suggested by Shuro and Stainbank (2014), who explained that studies on sustainability are limited, incomplete and not recent. One must note that studies in developing countries and South Africa in particular are very limited and outdated.

It is important for companies to understand the link among the environmental, social and economic value drivers (Elkington 1997; IIRC 2013b). The company may choose to go beyond what is required of them by the stock exchange that they are listed on to implement best practise and gain an economic advantage related to managing their environmental and

social risks and opportunities. Reporting on environmental performance provides companies with a competitive edge that leads to enhanced reputation among their stakeholders, including customers, regulators and employees. A study found that 27% of Global 200 companies justified environmental disclosures as being a competitive advantage (Jose and Lee 2007). Generally, companies struggled to integrate their environmental impacts into the social and economic value drivers of the business. This may be a result of the lack of integrated thinking on a daily basis across the business, which may align to the general theory that company departments operate in silos and just collate the information before reporting on it (Kurland *et al.* 2010; Roberge 2010; UNEP *et al.* 2013). Struwig and Janse van Rensburg (2016) suggest that South African companies do not use integrated indicators but rather focus on the historic triple context concept.

The very few companies that scored relatively well on an indicator went beyond just presenting information to comply with that indicator. They used baselines, targets, presented at least three year trends for comparison of the data and demonstrated the link to social or economic business drivers. A study based on the sustainability performance of companies listed on the Dow Jones Sustainability Index from 1998 to 2004 found that companies that adopt sustainability practices created long-term reputational value by integrating models. For example, brand reputation, customer loyalty, corporate ethics and talent retention (Lopez *et al.* 2007). The consistency and comparability was important for the key global environmental concerns and would be important for companies to benchmark themselves against their peers to make sure that they are staying ahead of the game or at least on track (Krajnc and Glavic 2005; UNEP *et al.* 2013; IRAS 2015).

Companies that performed poorly on the key global environmental concerns did not present the data with context, either quantitatively or qualitatively. There were no baselines, targets or trends identified, or the companies simply did not report on the information and did not relate their environmental impacts to their business risks. The results suggest that companies need to improve their environmental reporting to effectively manage their environmental impact and associated risks. This supports the results of previous studies (Morhardt *et al.* 2002; Sumiani *et al.* 2007; Skouloudis *et al.* 2010). In fact, Struwig and Janse van Rensburg (2016) recommended that South African companies must move from adopting low-level compliance and conformance indicators to using more complex integrated sustainability indicators.

Even though South African companies performed poorly, they are known to provide more detail than some companies in other countries (Kolk 2004). An older study of companies in Malaysia and Greece found that environmental concerns were reported with a low level of uptake and disclosure (Sumiani *et al.* 2007; Papaspyropoulos *et al.* 2010). The disclosed environmental information was general or only qualitative, providing no actual evidence (Sumiani *et al.* 2007). A study that looked at JSE Socially Responsible Investment (SRI) index constituent mining and manufacturing companies over a five year period noted that the level of environmental reporting was improving (Shuro and Stainbank 2014). A company's ability to operate and generate profits depends on environmental concerns being integrated into the business (Matthews 2011). Stakeholders should be aware that reports may display very general environmental information that may attract eco-conscious investors but may appear as "greenwashing" to investment professionals (Morales and van Tichelen 2010). Meanwhile, it should be noted that companies may greenwash unintentionally because of a poor understanding and a lack of implementation of environmental sustainability into their business practices (Baumgartner and Ebner 2010).

As noted in Chapter 3, the JSE environmental reporting guidelines focused on the seven key global environmental concerns, which included all 13 indicators. The key global environmental concerns related to resources and biodiversity were not required in the JSE's developed guidelines but the companies did address resources and biodiversity, possibly as a result of the JSE recommending GRI reporting guidelines that covered these categories. Alternatively, the JSE listed companies may have reported on these categories simply by acknowledging the importance of resources and biodiversity in the continuation of their business (Costanza *et al.* 2014). Despite the JSE having provided environmental guidelines, the indicators did not link well with the MEA (2005) and the UNEP Ecosystem Management policy (2010) key themes and thus companies in turn performed poorly against the key global environmental concerns.

South African citizens and stakeholders are mindful of environmental concerns and their effects on human health, such as the relationship between atmospheric pollution and the increase in respiratory illness or the link between poor water quality and availability and the increase in cholera and dysentery (see Adams *et al.* 2004; Ashbolt 2004; Norman *et al.* 2007; Pruss-Ustan and Corvalan 2007; Khan *et al.* 2013; Costanza *et al.* 2014). This creates a sense of social awareness and thus pressure placed on companies to safe-guard everyone's shared ecosystem services (Ioannou and Serafeim 2011; IRAS 2015). Companies may be utilising

environmental reporting as a proxy for enhancing their reputation among stakeholders (Cormier and Magnan 2003). It is important for the JSE and South African companies to address the local environmental concerns in addition to the key global environmental concerns. Struwig and Janse van Rensburg (2016) believe that companies use local environmental concerns to a lesser extent than key global environmental concerns.

Specific South African environmental concerns were identified by the Department of Environmental Affairs in the State of the Environmental Report (DEA 2012). These environmental concerns address the critical environmental issues in South Africa that directly affect the quality of human lives and the availability and quality of ecosystem services. The top 10 concerns (in alphabetical order) that the DEA dealt with were (1) air quality and atmospheric pollution, (2) biodiversity, (3) climate change, (4) ecosystem vulnerability on surrounding communities, (5) governance around environmental developments, (6) inland freshwater, (7) land ecosystems and transformation, (8) marine ecosystems and transformation, (9) ozone depleting substances, and (10) pollution and waste streams (DEA 2013). These local South African environmental concerns align to and are similar to the key global environmental concerns as identified by the MEA and the UNEP's Ecosystem Management policy. Thus, even though both the local and global environmental concerns align, the majority of stock exchanges have not aligned to these critical concerns.

In support of this study, Brummer and Pavelin (2006) found that company reporting performance was related to the companies' environmental impact level, with the high impact level reporting best followed by the medium and low impact levels. This study found differences in reporting quality within the same impact level, for example the high impact level showed that the food and beverages industry outperformed the metals and mining industry. The metals and mining industry (high impact) in South Africa was affected by the longest South African wage strike (industrial action) as noted in the company's public disclosures during 2014 (Hamann 2010; Singh 2014), thus it may be hypothesised that these companies were negatively affected by the ability to report environmental information because they were redirecting resources towards alleviating the industrial action and thus prioritising social reporting. There are differences within the same impact levels; one study found that metals and mining companies disclosed more environmental information than manufacturing companies, both in the high impact level (Shuro and Stainbank 2014). Unexpectedly, the medium impact retail industry outperformed the metals and mining industry.

All companies rely on the environment in one form or another. High impact companies will inevitably have a high impact on the environment, but how they manage and mitigate their impacts is important. Low impact companies may be quick to rule out their impact on the environment as a concern to the continuation of their business as they struggle to link their business operations to the environment. Thus, it is important for companies to monitor their environmental impacts to actually identify and quantify their impacts. For example the low impact industries may rely directly on water, energy and emissions, pollution and waste more than resources and biodiversity, while the high impact level companies place a larger reliance on resources and biodiversity than the medium and low impact levels (see Niskanen and Nieminen 2001; Morhardt *et al.* 2002; Adams 2004; Gao *et al.* 2005; Shuro and Stainbank 2014). The metals and mining industry depends on the environment for the extraction of non-renewable resources like precious metals and coal. The food and beverages industry relies on the environment for high quality renewable resources like water, fertile land and a supporting climate. The medium impact levels rely on the environment but often have the ability to influence high impact industries environmental impact. The banking industry may depend on how high impact companies utilise resources and biodiversity to manage their risks. For example, when providing loans to a metals and mining company, a bank must ensure that it will receive its loaned money back, which relies on the metals and mining company operating responsibly and managing its environmental impact. The retail industry relies on environmental resources obtained from higher impact industries, as well as having a large logistical footprint related to procuring stock (Adams 2004). The low impact industries, namely telecoms, IT and media rely on the environment for resources from the high impact industries but more so on energy, water and emissions, pollution and waste. Stock exchanges need to adapt their environmental guidelines to both address the key global environmental concerns and the specific industries' environmental impacts, making it difficult to require a minimum level of disclosure by all of their listed companies.

Adams *et al.* (2004) suggest that short term thinking leads people to believe that worldwide efforts to uphold biodiversity conflict with efforts to reduce poverty. When a company focuses on easy-to-report environmental concerns, they face the risk of neglecting important environmental concerns that may affect their business' ability to continue into the future. For example, when a mining and metals company neglect to focus on mitigating impacts to the surrounding biodiversity, they may run the risk of having to rehabilitate the

land at much higher costs after they have damaged it (Limpitlaw *et al.* 2005). Thus, to facilitate responsible investing and reduce the investor's risk related to environmental mishaps, stock exchanges must enforce their listed companies to report on their key environmental impacts in line with key global environmental concerns.

Key global environmental concerns that were relatively easy to understand and where information is generally readily available were reported on well, such as water, energy, emissions, pollution and waste. Energy is an important local issue in South Africa with the only local power producer, Eskom, not being able to effectively provide power to the country and its businesses (Eskom 2015), thus encouraging businesses to monitor their energy requirements as well as seek renewable energy alternatives and energy efficient technologies that help reduce their consumption of electricity and allow them to operate during load shedding, as understood from many of the assessed reports. This shows that companies are being influenced by more than just the minimum set of reporting requirements that stock exchanges provide to their listed companies. Accordingly the CDP acknowledges that South African, United Kingdom, German and Australian listed companies perform well when disclosing their carbon emissions, which may relate to the high level of energy and emission reporting requirements in these countries (CDP 2015a), as well as pressures like the Kyoto Protocol and COP 20 during 2014 (UNFCCC 1998; UNFCCC 2014). A Greek study found that water, energy and waste were the main disclosures by companies but less than 10% of listed companies actually disclosed this information (Papaspyropoulos *et al.* 2010). In contrast, USA – New York, USA – NASDAQ and Indian companies were found to disclose limited energy and emissions information (Topping and Sokell 2011). A common trend was that companies reported well on their water discharge in volume but did not report the quality of the water and thus did not fulfil the requirements of the indicator. Water usage is less of an issue in ecology than the quality of the discharged water (Lee *et al.* 2009).

A United Kingdom study found that voluntary environmental disclosures were more common in larger, less indebted, publicly listed companies (Brummer and Pavelin 2006). A South African study by Struwig and Janse van Rensburg (2016) suggested that companies with international status show a stronger tendency to use international standards, While, voluntary disclosures may reduce the risks and associated costs that may arise from misinformed investors (Brummer and Pavelin 2006).

There are still deterrents to why companies may choose to not disclose environmental information i.e. to "explain" instead of "comply" with the guidelines (see Lopez *et al.* 2007;

Kolk 2005; Kolk 2008; Papaspyropoulos *et al.* 2010; IFC 2012; CICES 2013). The high costs associated with measuring, collating, verifying and publishing environmental information, may disadvantage companies in the short term compared to companies that do not disclose environmental information (Brummer and Pavelin 2006; Lopez *et al.* 2007). As environmental reporting is not yet standardised, companies are left to decide on their approaches and the guidelines that they adopt (Shuro and Stainbank 2014), making the minimum environmental guidelines provided by stock exchanges important for listed companies. The international standardisation not only by stock exchanges but by a central governing body of sustainability guidelines will be welcomed by stakeholders, stock exchanges and the companies themselves to level the so called "playing field". It can reasonably be assumed that companies that adopt voluntary sustainability practices today will benefit when legislation is put in place. The GSSB may be the future overarching body for sustainability standards like the IFRS and GAAP are for financial reporting (Eccles and Saltzman 2011; GSSB 2015).

Developing economies, Africa and South Africa, offer exciting opportunities for foreign investors. Companies that are able to demonstrate clear management of their environmental risks and opportunities should be a prime interest for responsible investors. Boards should be including environmental performance for the company's short, medium and long-term sustainability (Ramani 2015). Sustainability is a long-term journey and environmental sustainability is still a relatively new concept for most companies. Sustainability requires that progress and setbacks are monitored and measured to track the company's progress (Singh *et al.* 2009). Companies today are reporting with different levels of performance attributed to the stage of maturity of sustainability within the companies themselves.

The environmental guidelines recommended by stock exchanges (see Chapter 3) were not truly reflected in the companies' reporting. In some cases the companies went beyond what was recommended by stock exchanges and reported on additional information, for example for resources and biodiversity, while in other cases the companies were unable to properly address what was needed to fulfil the indicator requirements, thus, showing that science and business do not always align and that environmental sustainability is not yet mainstream business practice in most companies. Largely, companies did not fully address the key global environmental concerns, which may result in further degradation of the environment in the long term. If companies want to be a going concern into the future they

need to change the way that they do business today. Companies need to understand that they operate in an increasingly volatile world and that how they operate affects both them and their stakeholders, the environment is a shared finite resource. Companies need to address the key global environmental concerns to ensure environmental resilience and continuation of their businesses.

Chapter 5 : Discussion

Sustainability thinking came about as a result of severe anthropogenic environmental disasters and concerns around resource limitations, the depletion of the ozone layer, biodiversity loss as a result of habitat transformation and climate change among others (Dobson *et al.* 1997; Rockström *et al.* 2009; Drexhage and Murphy 2010; Ellsworth and Spalding 2013). Understanding that society and business activities were responsible for these severe environmental alterations influenced the environmental focus of sustainability (Millar *et al.* 2007; Cutter *et al.* 2008). Historically, public reporting focused on financial risks at the cost of avoiding focus on environmental risks. Yet we have examples like the Exxon Valdez oil spill and BP Deepwater Horizon that outline the consequences of not focusing on environmental management (see chapter 4). An example that outline the advantages of environmental management, British Petroleum simply identified and fixed leaks allowing them to reduce their carbon emissions by 10% which translated into a $650 million dollar saving over three years (Carey 2004).

The world contains finite resources, and humans are using these resources unsustainably while at the same time experiencing exponential population growth rates (Cilliers et al. 2014). The transformation of natural habitats by expanding companies places negative pressures on environmental resources, biodiversity, water, food, habitat and natural buffers to environmental change (Millar et al. 2007; Cutter et al. 2008). Stakeholder awareness around the importance of the environment has increased over the years (UNEP et al. 2013). Nowadays, there is a growing demand for increased information and transparency from companies by their stakeholders (Tagesson et al. 2009, see Chapter 2). Stock exchanges have identified this increased need for transparency and have started developing and imposing their own environmental reporting requirements on companies listed with them, as part of their undertaking towards catalysing and monitoring responsible investment. With over 180 global sustainability reporting policies and initiatives (UNEP et al. 2013), it is important to understand if stock exchanges have identified the correct environmental requirements that encourage companies to focus on the key global environmental concerns as identified by the MEA (2005) and the UNEP Ecosystem Management policy (2010). The aim of this study was to assess and compare sustainability guidelines provided by selected stock exchanges, with specific focus on environmental sustainability.

5.1. The influence of stock exchanges

Stock exchange environmental reporting requirements were assessed to see whether they address key global environmental concerns. The stock exchanges that focused on sustainability reporting were found to either develop their own set of environmental reporting guidelines and/or recommend the use of the GRI reporting guidelines. Generally, the stock exchanges provided environmental guidelines that addressed the key global environmental concerns. Resources and biodiversity were not addressed by the majority of stock exchanges' developed reporting guidelines; even though they are important components of environmental value that companies rely on either directly or indirectly. Key global environmental concerns related to water, energy and emissions, pollution and waste were recommended with a relatively high performance, which may largely be driven by the CDP (CDP 2013). There were no differences in the focus of guidelines among stock exchanges in developing and developed countries that provided guidance to their listed companies; stock exchanges in developed countries performed slightly better than stock exchanges in developing countries.

Countries are faced with environmental and social concerns that need to be balanced with financial gains (Ebrahim 2013). South Africa is characterised by a complicated social history and a diverse natural environment, which needs to be balanced with economic returns for sustainable development. Haywood *et al.* (2010) explain that the Millennium Development Goals are echoed in South Africa's challenges as a developing country. Nevertheless, companies performed poorly and differently but there was a high uptake for reporting on their environmental impacts, which is not surprising as the JSE requires companies to report on their environmental impacts. The high and medium impact companies were found to report similarly and better than the low impact companies. This may have been related to the chosen industries, for example banks are classified into the medium impact level but have the ability to influence companies that they provide loans to and thus looked into encouraging environmental sustainability. In accordance with this study, it has been found that industries with a higher environmental impact report with a higher performance on their environmental sustainability (Niskanen and Nieminen 2001; Gao *et al.* 2005). This is not surprising as companies with higher environmental impacts receive increased stakeholder pressure.

Stock exchanges in Australasia performed better than stock exchanges in America, Africa and Europe (see Chapter 3). Aviva (2011) noted that South Africa's, Singapore's and

Malaysia's stock exchanges were making progress in the sustainability field but the companies listed on their markets were still performing poorly with regards to environmental reporting. The JSE in South Africa performed relatively well compared to the other stock exchanges and performed best out of the African stock exchanges. Different stock exchanges required different environmental information from their listed companies, which shows that there is no global standard for environmental reporting across all stock exchanges. To understand if companies were actually using these environmental reporting requirements recommended by stock exchanges. South Africa was used as a proxy for determining how well the JSE listed companies address the key global environmental concerns (see Chapter 4). Generally, the JSE listed companies sampled in Chapter 4 and that reported on their environmental impacts demonstrated that they were addressing the key global environmental concerns. Companies reported on resources and biodiversity with a low performance (scores of 0 and 1). These categories were neglected by the Stock Exchanges developed guidelines but they were recommended by the GRI reporting guidelines.

Stock exchanges and companies neglected environmental impacts downstream in products and services and upstream in supply chain management. They addressed water, energy and emissions, pollution and waste relatively well across all impact levels and most sectors, aligning to the requirements in the JSE developed guidelines. Reporting on energy may be related to the energy crises in South Africa and the drive for emissions disclosure by the CDP (CDP 2013; Eskom 2015, see chapter 4). This may be forcing companies to look for alternative means and cut down on their electricity usage. This may be seen as being environmentally friendly and moving towards sustainable energy but this was catalysed by the unreliable electricity supply by Eskom and the unpredictable increase in electricity tariffs, which may be the business case for why companies choose to adopt sustainability initiatives in the first place (Eskom 2015).

5.2. Environmental relevance in business

The MEA (2005) and the UNEP's Ecosystem Management policy (2010) identified common global environmental concerns that may threaten human well-being and may be exaggerated by companies' business activities. A key finding was that anthropogenic effects have transformed ecosystems more rapidly and extensively than in any other recordable time period. This has caused the irreversible loss in species diversity and a direct negative consequence on the associated ecosystem services, such as fisheries, freshwater, air and water

purification, and the regulation of regional and local climatic conditions, natural hazard regulation and alien species invasion. These key global environmental concerns are important for companies to focus on and thus equally important for stock exchanges to recommend ways of addressing these in their guidelines to level the so-called "playing field" among companies.

The OECD (2001) identified four criteria that are critical for environmental sustainability and may affect the continuity of businesses, thus should be required by stock exchange environmental guidelines. When utilising renewable resources, like freshwater and fisheries, companies must not exceed the regenerative ability of that ecosystem to continue providing those resources. Companies must *substitute* non-renewable resources with renewable resources, for instance a coal-fired power station should be substituted with renewable solar plants and wind farms. The ecosystem must be able to *assimilate* the company's activities, for example the quality of discharged water by a company must be safe for use by the ecosystem including plants, animals and humans. Lastly, the company must not damage the ecosystem beyond *irreversibility*, for example a mining site should be able to be rehabilitated to provide for its former ecosystem services (OECD 2001).

Companies that are able to demonstrate clear management of their environmental risks and opportunities should be a prime target for responsible investors. Investors should be reviewing the environmental sustainability of companies when making a fair representation of the company's short, medium and long-term sustainability position to safe-guard their investments (Haywood *et al.* 2010; IIRC 2013a). It is important for companies operating in these volatile environments to show that they are in fact managing their environmental impacts to reduce the associated risks for foreign investors (CDP 2013). Fewer than 40% of Global 200 companies considered environmental planning as a top priority for their businesses' success (Jose and Lee 2007). Despite that, the World Economic Forum's Global Risk Report showed that Fortune 500 CEO's identified, biodiversity loss and ecosystem collapse, natural catastrophes, extreme weather events, failure of climate change mitigation and adaptation, and man-made environmental catastrophes as being major risks to the continuity of their businesses (WEF 2016). A long-term vision is important in creating short, medium and long-term value (IIRC 2013a). The companies operating and listing in developing countries seek foreign investment to gain a competitive advantage in their local markets and to increase their contribution towards the gross domestic product that funds development. Thus, these companies need to prove that they are responsible and able to

manage their material sustainability concerns, as well as identify and act on their risks and opportunities (CDP 2013).

The Sustainability Stock Exchanges (SSE) initiative has identified this and has called on stock exchanges to encourage sustainable development within their markets (SSE 2013b; SSE 2014). A driver such as a stock exchange is in an ideal position to encourage sustainable practices for their listed companies. Listed companies must be required to communicate their progress through public disclosures (Panwar and Blinch 2012). To ensure that stakeholders base their investment decisions on relevant information that reduces the company's impact on the environment (UNCTAD 2013). This research implies that environmental guidelines are not adequate for companies' sustainability, for responsible investors nor for environmental stewardship and by default society and business continuity.

The Equator Principles (EP 2011), United Nations Global Compact (UNGC, UNGC 2015) and the United Nations supported Principles for Responsible Investment (PRI, UN PRI 2015) provide principles for financing institutions to make responsible investment decisions and assist investors in choosing responsible investment opportunities. Financing institutions and banks in particular are able to influence other companies' environmental management through these initiatives because those companies rely on funding for the continuation of their business (EP 2011; UNGC 2015; UN PRI 2015). Stock exchanges are not the only enablers that are able to voluntarily influence the environmental performance of companies.

5.3. The role of stock exchanges in sustainability

It is important that stock exchanges encourage their listed companies to address the key global environmental concerns but stock exchanges are faced with a variety of challenges. They aim to level the so-called "playing field" among their listed companies for investors to make comparative well informed decisions. This prescribed guidance proves to be challenging when coordinating the diversity of companies with different impact levels and industries listed on the stock exchange, therefore finding a mutual set of guidelines for all listed companies proves to be difficult (CERES 2014a). Currently, guidelines allow companies to comply or explain why they were not complying, which is flawed by nature, allowing companies to choose what they report on. This often translates into companies

focusing on the relatively easy indicators and neglecting the more difficult ones (Lopez *et al.* 2007; JSE 2014). It is important to make guidelines feasible for companies but all the reporting and measuring has little value if the companies are not focussing on the right key global environmental concerns. Thus, stock exchanges need to encourage companies to monitor and measure their progress and setbacks (Singh *et al.* 2009; Ness *et al.* 2007).

For responsible investments, stock exchanges should encourage companies to be environmental stewards to avoid environmental risks and uncertainty. For example the Exxon Valdez oil spill and BP Deepwater Horizon were anthropogenic disasters that affected and continue to affect the ecosystem services and thus communities and businesses themselves (Tagesson *et al.* 2009; Tunnell 2011; Holleman 2014). The uncontrolled release of carbon emissions results in an ever changing and unpredictable climate, which negatively affects the functioning of ecosystems (Heal 2000; Farber *et al.* 2002; MEA 2005; Haywood *et al.* 2010; CDP 2013). The planetary boundaries framework identified limits based on the stable Holocene period for nine important environmental processes, of which four are already approaching the point of uncertainty (Rockström *et al.* 2009). Thus, countries like South Africa that do not experience as many natural disasters as other regions like America, for example tornados, tidal waves and volcanic eruptions, might be complacent when identifying the risks related to environmental disasters or changes to a company's ability to operate into the future. With increasing uncertainty and climate change countries like South Africa are experiencing extreme and unusual weather events. South Africa has had several tornadoes on the East Rand, extreme rainfall events with hail and extreme droughts throughout the country (eNCA 2016). During 2015 and 2016 South Africa experienced an unexpected extreme drought related to the El Niño effect. The drought was said to be the worst in over 100 years causing impacts on the ability of the country to provide freshwater and food to its citizens and businesses as well as impacting the economy and more specifically the poor (Kruger 1999; OCHA 2016).

Extreme natural disasters increase the likelihood of environmental refugees, which impact companies' ability to operate sustainably into the future (Reuveny 2007; Hartmann 2010). For instance, Syria experienced one of the worst droughts in history from 2007 to 2010, affecting both companies' ability to operate as well as forcing rural communities to relocate into cities as environmental refugees, which resulted in social instability and the Syrian civil war (Reuveny 2007; Hartmann 2010; Beck 2014; Kelley *et al.* 2015). The loss of ecosystem services has been known to translate into billions of dollars' worth of financial

loss each year (TEEB 2010). The actual losses experienced are not only financial, they relate to compounding environmental and social costs, we therefore need to understand the true "cost" of losing these ecosystem services. Unfortunately, only when a crises occurs do companies start addressing environmental concerns, even though it makes business sense to address key global environmental concerns way before they become a disaster. If stock exchanges or other regulating bodies do not enforce a minimum standard of environmental reporting, we could risk a future of uncertainty and environmental damage that becomes irreversible (Rockström *et al.* 2009, UNEP *et al.* 2013).

Environmental impacts are a global concern and perhaps stock exchanges are not in the best position to influence companies' environmental reporting. Companies are listed on stock exchange with very diverse industries and impact levels, making it difficult for a stock exchange to effectively address environmental challenges on their own. Alternatively, stock exchanges could play a more "flexible" role, where they require companies to report on how they affect and are being affected by the key global environmental concerns identified in this study. This leaves the onus on the company to identify and mitigate key global environmental impacts. Clearly a global reporting standard is required alongside the environmental requirements encouraged by stock exchanges. A global reporting standard would be important for encouraging all companies to take accountability for their environmental impacts and not just listed companies. The GSSB aims to set and approve global sustainability standards and the 'GRI Standards' have already been approved by the board. Sustainability reporting needs to be more regulated, moving away from being voluntary reporting to being globally legislated like the IFRS and GAAP accounting standards are for financial reporting (Eccles and Saltzman 2011; GSSB 2015). Once sustainability reporting becomes legislated, an increase in performance can be expected, which would result in an improved resilient planet. Stock exchanges are already recommending the use of GRI reporting guidelines either in combination with their own developed guidelines or on their own.

5.4. Study limits, future studies and conclusion

A few study limits should be acknowledged, (1) the academic literature has not gained momentum but there were a number of non-academic studies that provided valuable information, (2) the research considered only publicly available information for the reporting

guidelines and disclosures made by companies and did not verify the information, which means that if a company had a good report writer they could perform well, while on the contrary if a company actually performs well in relation to their environmental impacts but does not report on it, they may be understood as a poor environmental player, (3) the study only focused on the environmental dimension and thus could not infer performance around the other important dimensions of sustainability, (4) the subjectivity of the researcher may have contributed to the outcome but it was minimised by the rigorous SBSC used and researcher's experience in the disciplines of environmental sciences and corporate sustainability, and (5) the small sample sizes should be noted and the results should be considered in light of this.

Future research should look into (1) corporate environmental education as it is an important catalyst for improving sustainability practices, the level of environmental education provided by stock exchanges to educate their listed companies, shareholders and the public should be assessed, (2) the effects of societal issues in the country, such as conflict and industrial action or the level of the country's financial debt to the quality of environmental reporting guidelines imposed on listed companies and the companies reporting performance compared to preceding years, (3) integration of key global environmental concerns through trans-disciplinary approaches, where researchers that specialise in different disciplines work together to assess the state of sustainability according to the six capitals and pave the way forward for sustainability guidelines, company reporting and stakeholder relevance, finally (4) research to incorporate standalone academic sustainability courses and degrees should be used to formalise the route to develop sustainability professionals, just like accountants have formalised their accounting courses.

In conclusion, the future holds massive challenges for companies and society, such as feeding and sustaining over 9 billion people by 2050 with the same finite resources that planet Earth has today to feed 7 billion people (Leach *et al.* 2012). There is a great need to stimulate innovative change (for example, rewards for switching to renewables opposed to using non-renewables) to adapt to global changes and build planet resilience, this will require mass collaboration among stock exchanges, standard setters, governments and companies. It is clear that the way business operates today necessitates change to improve the resilience of the planet and protect the environment from further degradation for future generations. Real progress towards environmental sustainability requires that progress and setbacks are monitored and measured (Singh *et al.* 2009). All companies need to include environmental

risk management in their business strategies. Currently, business responds to crises rather than pre-empting what will become a crisis in the future, but with crisis there is opportunity for environmental uptake in businesses. For example, when it was understood that the ozone layer was being reduced by chlorofluorocarbons (CFC's) emissions, the Montreal Protocol came into effect from 1989 to phase out the use of CFC's, which has since proven successful moving the planet back into the so-called "safe operating space" for resilience (UNEP 1987, Rockström *et al.* 2009).

Planet Earth is a resilient and forgiving ecosystem but change needs to happen before it is too late. The future of sustainability reporting should expect more companies reporting according to more rigorous environmental guidelines and legislation with a trend towards a common set of global sustainability standards. Sustainability reporting and best practise today may be the compliance of the future. The standardisation of reports across companies including within sectors is important as companies are known to report with varying performances attributed to their level of corporate environmental maturity (Jose and Lee 2007). Lastly, stakeholders expect companies to contribute significantly towards sustainability, including environmental sustainability.

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Appendix

Appendix 1. Important frameworks and guidelines that have had international influence on public environmental reporting.

Name	Abbreviation	Founded in	Founded by	Focus/ Objective
Global Reporting Initiative	GRI	1997	Coalition for Environmentally Responsible Economies (CERES) and the Tell us Institute	Corporate sustainability reporting aimed at sustainable development (GRI G4 2013a).
Carbon Disclosure Project	CDP	2000	Paul Dickinson	To improve the management of environmental risk related to carbon emissions (CDP 2013).
United Nations Global Compact	UNGC	2000	United Nations	A policy initiative that allows companies to support their 10 universal principles, of which three are environmental (UNGC 2015).
United Nations Principles for Responsible Investment	UN PRI	2006	United Nations Secretary General Kofi Annan and 20 institutional investors	To understand the environmental, social and governance factors of investment decisions based on six principles,

				of which two are environmental (UN PRI 2016)
CDP Water Program	CDP Water Program	2008	CDP	To improve water management and awareness (CDP 2015b).
Equator principles	Equator Principles	2010	Formed by an association of member Equator Principles Financial Institutions	A project finance initiative that guides companies in making investment decisions based on 10 principles, of which three are environmental (EP 2011).
International Integrated Reporting Council's Integrated Reporting Framework	IIRC Framework	2010	Formed by a broad coalition	To create a globally accepted integrated reporting framework for value creation overtime (IIRC 2013a).

Appendix 2. Seven key global environmental concerns (consisting of 13 indicators) identified by the Millennium Ecosystem Assessment and the United Nations Environment Programmes Ecosystem Management policy (MEA 2005; UNEP 2010). When using this table for assessment one may need to infer the link between the indicator and/or guideline because sustainability has many different meanings. It is important that the information is able to relate to the indicator with justification.

Key global environmental concerns	**Indicator and description**	**Score (0-4)**
Resources	**Extraction or overexploitation of natural resources used to provide products and services (renewable and non-renewable)** Biotic (living e.g. plants and animals) and Abiotic (non-living e.g. soil and atmosphere).	
Biodiversity	**Land use competition and biodiversity value (including, genetic resources)** The provisioning of land for different uses, usually resulting in a homogenous species in the case of agriculture rather than allowing for species diversity. This causes the ecosystem to rely on additional inputs rather than being self-sustaining, for example animal products, crops, mining, forestry, urban areas and transport.	

	Habitat change - impacts on biodiversity (including, protected species and decline in trophic levels) Alteration of habitat due to anthropogenic causes at rates that are too fast to allow for species adaptation or speciation to occur, for example through acidification, eutrophication, soil erosion, habitat fragmentation and invasive species. **A food chain represents a community of different species that live by consuming one another in a specific order defined by their trophic level. Marine environments may support more trophic levels than terrestrial environments. A trophic level of a species is its position in the food chain:** • **Level 1 – primary producers;** • **Level 2 – herbivores;** • **Level 3 – predators/carnivores;** • **Level 4 and 5 – top carnivores.**	

	Ecosystem services protected and/or restored
	
	There are four recognised ecosystem services:
	
	1. Provisioning services
	  • Food from crops, livestock and fisheries
	2. Regulating services
	  • Climate regulation
	  • Natural buffers to natural disasters e.g. flooding
	3. Cultural services
	  • Recreation and ecotourism
	4. Supporting services
	  • Primary production, soil formation and photosynthesis	

Water	**Total water withdrawal by type (municipal, dam, borehole, etc.)** The withdrawal of water may impact the ecosystems ability to	

	provide water to its community of species and rural communities.	
	Ecosystem services impacted by the company's effluent water The quality and destination of effluent water may alter the species composition, health of the ecosystem and health of rural communities. For example, acid mine drainage, oil spills and contaminated water from other sources.	
Energy	**Energy consumption by type** Energy consumption from non-renewable resources (e.g. coal) may impact the power stations surrounding communities and diesel generators may impact the employees on the company's premises and surrounding communities.	
	Reduction of energy consumption Since the burning of fossil fuels contributes to global warming it is imperative to reduce reliance on these fuels. The use of renewable energy (wind, solar, hydro) is favoured and should be increased along with energy efficient technology.	
Emissions, pollution and waste	**Greenhouse gas (GHG) emissions – scopes 1, 2 and 3** Regional climate change could occur as a result of the change in vegetation. Vegetation acts as a carbon sink to buffer climate change and controls water, through transpiration from plants into the atmosphere.	
	Nitrogen and phosphorus pollution (including NOx, SOx) Change in the nitrogen cycle balance due to adding nitrogen (e.g. farming) resulting in increasing the nitrogen in the soil, water and atmosphere, changes the composition of the ecosystem and	

	may make it toxic for biotic organisms e.g. eutrophication.	
	Waste by type and disposal method for both hazardous and non-hazardous waste streams Organic waste can be filtered and decomposed naturally but other waste like plastics, metals, glass and hazardous waste need to be disposed of responsibly to not contaminate the ecosystem.	
Products and services (downstream environmental impacts)	**Environmental mitigation of products and services (clean technologies, behavioural changes, etc.)** The life cycle of products and services has an environmental impact and thus companies should seek to understand this impact and reduce it.	
Supply chain management (upstream environmental impacts)	**Environmental mitigation in the supply chain** The environmental impacts in a company's supply chain needs to be understood in order for the company to introduce mitigation strategies. Suppliers may impact the environment by their operations, which in turn compound on the reporting companies environmental impacts.	
	Total score (13 indicators X 4 possible points)	**x / 52**