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Natural Capital and Externality Accounting Within Large South African Organisations

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Abstract

In a world with finite natural resources, the prevalence of economic models which exclude environmental impacts signals a non-sustainable business context. A paradigm shift is required to ensure that sustainable economic growth is achieved without further environmental degradation. The research investigated the organisations' thinking surrounding aspects of natural capital, which include their interpretation, reporting and the range of valuation methods being utilised. In addition perspectives on deemed barriers and enablers to achieve natural capital accounting in South Africa have been explored with the intent to reduce potential market failures or opportunity costs incurred by society.

Through semi-structured interviews with 15 experts, nine Johannesburg Stock Exchange (JSE) listed organisations across four industries, namely mining, banking, food retail and brewing, the study qualitatively explored the level of sophistication of natural capital accounting in South Africa and presents an enablement model for natural capital accounting.

The results indicate that the influence of conventional economic paradigms, coupled with lack of knowledge flows and institutional voids has marginalised natural capital, creating an unquantified social cost. While institutional voids exist, there remains an opportunity for business and stakeholders to align and manage natural capital more pragmatically and create truly sustainable businesses.

Keywords:

Natural capital accounting, Externalities, Sustainability, South Africa.

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Chapter 1: Introduction

1.1. Purpose

The rise in consumption and economic activity coupled with the dominant economic logic is causing environmental degradation. As a result sustainable bottom lines are an augmented reality. Business is responding through the triple bottom-line which includes Corporate Social Responsibility (CSR), Corporate Sustainability (CS) and Shared Value (SV). The performance of pursuits is time-stamped through frameworks such as the Global Reporting Initiative (GRI) or integrated reports. However, CSR/CS/CSV is failing to address market failures borne from environmental externalities not having been internalised. Economic growth remains incompatible with environmental sustainability. This research looks at how organisations in South Africa are addressing this shortcoming.

The purpose of this study is to enter the research narrative surrounding the impact of organisations' activities on the environment and gain insight into how a variety of organisations in South Africa are measuring their impact on natural capital. Secondly the study considers the barriers dominating natural capital and externality accounting in the South African context. The analysis of potential enablers against a range of constraining factors presents an enablement model to advance natural capital accounting and finally providing a schematic for a shift toward sustainable bottom lines compatible with the environments capacity. To date studies have not analysed the state of natural capital accounting in South Africa. This study leverages a qualitative approach with experts across four industries to determine the natural capital valuation technique being applied and factors enabling or prohibiting the accounting of natural capital.

The research objective is to determine:

1. How do South African organisations understand, measure and report on natural capital?
2. What are the barriers and enablers to achieve full cost accounting for natural capital?

1.2.Definitions

In order to reduce ambiguity and provide context into the aspects under study, key definitions have been outlined below.

1.2.1. Natural capital

Natural capital is the environmental stock or Earth's resources providing goods, flows and ecological services required to support life (Adams *et al.,* 2013). In the context of the organisation, it is defined as all renewable and non-renewable environmental capital that is essential to current and future value creation (Corder, 2015).

These include air, water, land, minerals, forests, biodiversity and eco-system health (the International Integrated Reporting Council, 2013).

Natural capital is one of the six commonly recognised capitals, which include financial, manufactured, social and relationship, human, and intellectual capital (NCC, 2015).

1.2.2. Full cost accounting for natural capital

Full cost accounting is a set of valuation techniques utilised to measure and account for the depletion of natural capital (Rout, 2010). The methods account for the direct and indirect environmental costs and externalities linked to an organisation's activities (Jasinski, Meredith, & Kirwan, 2015).

1.2.3. Externalities

Externalities are defined as a cost incurred by parties not involved in the product process (Baye & Prince, 2013). In most cases, negative externalities are unaccounted costs incurred by society, and examples of these costs on society include pollution stemming from an organisation's operations or consumption of natural resources, which reduce the sustainability of ecosystems (Baye & Prince, 2013).

1.3. Academic contribution

The continued increase in volume of consumption, when underpinned by inefficient modes of production, has resulted in the accelerated decline of crucial natural resources (van Zyl, 2013). To date, an increasing number of research papers has focused on the economic case for Corporate Social Responsibility (CSR) and the assessment of non-financial information disclosed within the integrated reports of both South African and global organisations. Existing research and the organisations' response to sustainability issues have been centred around the business case's cognitive frame (Figge, 2014). This can prove problematic for natural capital and organisations with dependencies on primary resources, since economic capital is prioritised over investment in human, social and natural capital (Isada & Isada, 2014).

Although more simplistic approaches to sustainability such as shared value (Porter & Kramer, 2011) have evolved, and impacted the narrative surrounding the organisations' role in society and the environment. In order for organisations to transcend their focus toward natural, social and relational capital and derive intellectual and economic capital as a result, organisations need to move beyond CSR to an integrated value creation approach (Visser & Kymal, 2015). In South Africa, until now, research has not assessed the natural capital valuation techniques across a broad range of organisations.

In cases where full cost accounting is neglected, the result is market failure and society unknowingly accepting an opportunity cost (Ring, Hansjurgens, Elmqvist, Wittmer, & Sukhdev, 2010). Although mechanisms such as integrated reporting call for the internalisation of externalities with the aim of creating a socially acceptable efficient market (Baye & Prince, 2013), the question remains as to how many organisations in South Africa are accounting for their externalities. This fundamental research gap supports the need for this study.

A major motivation for this study is to help advance the thinking and alignment between the environment, business ethics and economics by understanding the organisations' methods, techniques and consciousness surrounding natural capital and externality valuation and reporting.

1.4. Business contribution

Organisations directly create value for society, while generating goods and services required by the market they serve (KPMG, 2014). As a result, organisations contribute taxes and create jobs, which has a positive economic contribution to society (KPMG, 2014). However, when an organisation's activities draw on the natural resources, this can negatively affect people and the environment (KPMG, 2014). In most cases, this negative impact is not accounted for in the cost of goods or operating activities of the business. In cases where the organisation's consumption of natural capital is close to the environment's natural capital capacity, it is unlikely that for such organisation, sustainability can be achieved. As recent headlines indicate, South Africa faces existing electricity supply constraints and future water shortages. It is not clear how organisations have considered the cost and their impact on these constrained resources.

Informal institutions, which consist of culture, traditions, norms and attitude, also play a role in sustainability development; thus, any concept of sustainable development depends on economic and non-economic attitudes (Raja, 2014). This research is motivated by the assumption that the Earth is not inherited from our ancestors, but rather borrowed from our children; and thus, ethically, organisations should account for each activity. The net effect should be a business society, which best endeavours to remediate for the damages caused or account for externalities, which cannot be remediated (Bottero, Ferretti, & Mondini, 2013).

Natural, physical and human capital regarded as the "wealth of the nations" (Raja, 2014), and are considered to have a significant impact on the steady-state growth of small open economies (Guilló & Perez-Sebastian, 2015), such as South Africa (WEF, 2013). In the context of classical economics, economic growth can be constrained when key production factors, which cannot be substituted, are in short supply (Blignaut, Aronson, & de Wit, 2014). Natural capital is thus the aorta to the heart of sustainability. The combinations of these arguments create a resonating message; without natural capital, we do not have an environment for business.

The International Integrated Reporting Framework requires organisations to disclose and quantify the impact their activities have on the six capital factors, namely economic, human, social, manufactured, natural and intellectual capital in the short-, medium- and long term (International Integrated Reporting Council, 2013).

Furthermore, it is envisaged that the information enclosed in these integrated reports will influence the investment decisions of stakeholders, including key decisionmakers within capital markets (Soyka, 2013).

Therefore, in this context, for businesses to remain competitive going concerns, management systems must be configured to reflect the realities of economic, social, and environmental conditions (Visser & Kymal, 2015). This includes not only acknowledging, but quantifying in monetary terms, the impact of the respective organisations' actions on society (Avila *et al.,* 2013).

Organisations with a mature, proactive and conscious stance regarding their environment of business, will be able to identify circular economy opportunities or embed efficiencies, which reduce externalities not priced into products and services. The Ellen MacArthur Foundation, and McKinsey & Company (2014), forecast that circular economy-related activities have the potential to generate over 100 000 jobs and one trillion United States (US) dollars in revenue by 2025. Thus, although mega-forces, such as growth in consumption by developing economies and depletion of finite natural resources have a negative impact on businesses with a dependency on natural resources, there remains value creation potential in these new semi-explored markets (Ellen MacArthur Foundation, McKinsey & Company, 2014).

The study will assist businesses to gain material insights into the broad range of valuation techniques being utilised by organisations across different industries. The discussion surrounding enablers and barriers to achieving full cost accounting will assist to reduce ambiguity, especially for those South African organisations with a high level of consciousness, wanting to migrate to a circular virtuous business model.

1.5.Outline of the document

The document is structured as follows. Chapter 2 discusses some of the central ideas and understandings related to new economics and the various valuation techniques employed to account for natural capital in sustainable development, including their limitations. This narrative is followed by an overview of literature pertaining to sustainability reporting, both globally and within the South African context.

Chapter 3 outlines the fundamental research questions developed on the back of the enclosed literature. Chapter 4 articulates the research methodology and data gathering process, which was undertaken to gain insight into natural capital and externality accounting. The results gathered through a series of semi-structured interviews is outlined in Chapter 5 and is followed by a detailed discussion in chapter 6 which provides meaningful insights and answers to the research objectives. Chapter 7 concludes the study and provides proposals for future research.

Chapter 2: Literature Review

2.1 The need for new economics

In the context of simple supply and demand theory, when the demands on ecosystems exceed the capacity to regenerate, the cost of those ecosystem services can increase exponentially, resulting in price increases on all products with linkages (Kula & Evans, 2011). Thopil and Pouris (2010) referred to externalities as an unaccounted positive or negative the effect on a third party not privy to the decisions from which the effect resulted.

Applying an Egalitarian lens, sustainability entails conserving natural capital for future generations (Raja, 2014). This additional dimension results in the optimal economic growth model not being constrained to the transformation of natural capital into man-made capital (Kula & Evans, 2011). Organisations are presented with the complex task of being competitive and realising products to achieve this goal, while in parallel developing human and natural resources required for future sustainability (Pavláková Dočekalová, Kocmanová, & Koleňák, 2015).

A major gap within the current economic paradigm, which seeks to account for corporate behaviour, is linked to costs of goods and services not reflecting social and environmental externalities (Gray, 2010). Ring, Hansjurgens, Elmqvist, Wittmer, & Sukhdev (2010) contextualised the root cause as being linked to the existing “dominant economic model”. This model does not prioritise better consumption, but rather private wealth creation above natural capital conservation (Ring *et al.,* 2010)

According to (Rout, 2010), at a macro level, the national accounting systems leveraged by the nations’ leaders making strategic economic decisions, lack consideration for the degradation of natural capital. Although the national accounts contribute to assessing the gross domestic product (GDP), which provides an indication of the economic progress and output of a nation (Miles, Scott, & Breedon, 2012), this accounting framework predominately ignores non-marketed goods and services such as nature (Rout, 2010) and as such, they remain unaccounted. In support, Rammelt and Boes (2013) acknowledged that the national accounting systems lack consideration for changes in natural capital inflows and outflows.

The accounting gap reduces the quality of information, leading to potentially inefficient decisionmaking and presents high opportunity cost to the environment, since decisions do not include a critical lens, which evaluates the trade-off between economic growth and environmental considerations or the discounting of economic impact by the annuity cost such economic growth activities endow on the natural environment (Rout, 2010). Considering this method, the Exxon Valdez Oil spill counterintuitively had a positive impact on the Gross National Product (GNP) of Alaska, since the cost of remediating ecosystem services were considered as a positive gain to the economy due to the economic inflow, resulting in the externality not being accurately internalised (Rout, 2010).

This potential shortfall has created a burning platform, which has directly given rise to green accounting or environmental accounting, which in essence is an attempt at measuring sustainable development and accounts for the depletion of natural capital, (Rout, 2010).

> "Green accounting is one of the methods, which accounts for environmental resources and services, and changes therein, and measures their effects on national accounts to reveal true maximum income, which a nation can consume, while maintaining a sustainable development and growth without jeopardising the interests of the present and future generations as well as our neighbours" (Rout, 2010).

The value derived from environmental services can be compared and quantified by considering the associated costs of substitutes. This fungibility approach considers forests functioning as a flood control and provide absorptive capacity to enable carbon emission diffusion, while waste disposal services can be quantified when benchmarked against infrastructure investments made to offer the same or similar prevention and remediation services (Rout, 2010).

The acknowledgement of the gap in the current accounting paradigm, coupled with the intent of nations, institutions, society and organisations to promote sustainable development has influenced the recognition of natural resources and the environment to effectively be treated as capital assets as they provide services to the economy and so named natural capitals (Rout, 2010).

As a response, the United Nations Natural Capital Declaration has included a requirement for financial institutions and investors to integrate natural capital into their accounting, economic practices and reporting frameworks (UNEPFI, 2013). The crux of the declaration is to understand the impact and dependency of natural capital, increasing reporting related to natural capital and furthermore embed natural capital considerations into financial products and services, thus reconfiguring the investment decisionmaking model for providers of capital (UNEPFI, 2013).

The implication is a supply side push, whereby an organisation's disclosures are reviewed by providers of economic capital and their corporate valuations consider economic commentary on the relevant capitals (UNEPFI, 2013). Thus, organisations need to clearly articulate their ability to derive value from natural capital without generating externalities, while meeting the demand of their respective markets (Adams *et al.*, 2013).

Since the organisations' concept of value creation is guided by the cognitive frame of the leader, this is a fundamental shift, in cases where the concept of value is confined to financial performance; whereas in other cases, organisations persevere to create value for a broad range of stakeholders within their operating environment (Figge, 2014).

2.2 The impact of cognitive frames on sustainability orientation

Figge (2014) proposes that managers have two frames of reference, which influence their decisionmaking; the proposed frames are the business case frame and a paradoxical frame. The business case frame is oriented around economic metrics and managers perceive a rather narrow portion of the information on sustainability issues, with major focus on financial capital (Figge, 2014).

In contrast, managers with a paradoxical cognitive frame consider a broader suite of indicators per capital. However, due to the breadth of focus, the detail pertaining to each capital presents a resource challenge (Figge, 2014).

The cognitive frames proposition advances the opportunity threat dichotomy further by including layers linked to different perceptions of value for individual organisations. If investment in human, social and natural capital is deemed beyond an organisation's cognitive frame and potentially requires a sacrifice in short-term economic value, what motivates an organisation to report and promote environmental and socially responsible behaviour? Porter and Kramer (2011) claimed that corporate social responsibility (CSR) is not a cost, constraint or charity, but rather an untapped source of opportunity to innovate and derive competitive advantage (Crane, Palazzo, Spence, & Matten, 2014).

Furthermore, Porter and Kramer (2011), although having been criticised for being unoriginal (Crane *et al.,* 2014), described the use of natural capital as an important consideration within an organisation's procurement strategy. Mature awareness toward natural capital and advances in technology are driving innovation in areas such as utilisation of water and raw materials, which includes expanding recycling and reuse toward circular business models (Porter & Kramer, 2011). These opportunities apply to all capitals. Improved resource utilisation enabled through innovative and efficient technology will deliver benefits to all areas of the value chain, ensuring that for example, landfills fill more slowly (Isada & Isada, 2014).

The cognitive orientation can result in corporate decisionmakers progressing choices that meet short-term financial capital requirement; however, these decisions may have detrimental impacts for the long term (Hahn, Pinkse, Preuss, & Figge, 2014). As a resolution, Hahn *et al.* (2014) proposed a human resource strategy, which embeds the long-term orientation as core responsibility within the organisation. This partially links to the governance component of integrated reporting (International Integrated Reporting Council, 2013). However, the implementation of this approach is cemented by performance recognition or compensation mechanisms.

This solution − although plausible − may face scrutiny from shareholders, if financial value is constrained or the respective activity set does not yield tangible results when prioritised over conventional tangible performance indicators such as those listed on conventional financial statements. This tension is linked to sustainable initiatives requiring a longer benefit realisation time than the typical investment horizons (Hahn *et al.*, 2014).

Slawinski and Bansal (2012) evaluated how the organisation's time perspective influences its response to climate change. They proposed that organisations should quantify the relative capital component to create focus and prioritisation. For example, organisations can deal with climate change elements of natural capital by translating them into financial metrics, such as the relative cost of carbon.

In conjunction, the authors suggested that organisations should focus on specific technologies that could be realised quickly. Although this approach enables faster responses to climate change and creates appeal by reducing the issue to an internal cost-avoidance metric, it narrows the range of potential solutions (Slawinski & Bansal, 2012). The short-term orientation somewhat reduces the need for organisations to only explore long-term solutions and enhances the consideration of externalities (Hahn *et al.,* 2014).

In line with existing research, the managerial responses to sustainability issues have been centred around an opportunity cost and benefit dichotomy dominated by the firm's economic objectives (Figge, 2014). This can prove problematic for natural capital and organisations and economies dependant on primary resources, given that developing countries, which once supplied raw materials to developed countries, are now turning into huge consumers (Isada & Isada, 2014). Since resources are finite, there is a risk for organisations that have a dependency on virgin resources and do not create sustainable processes (Vermeulen, 2015).

2.3 Leveraging full cost accounting for decisionmaking

In order for financial institutions, as the providers of economic capital to benefit and recognise the value of natural capital, accounting approaches should include relevant criteria, which includes the introduction of alternative discount rates as part of the evaluation process (van den Belt & Blake, 2015).

Kula and Evans (2011) found that a dual discounting methodology, which leverages separate discount rates for economic and environmental impacts, can support the United Nations' intent to imbed accounting for natural capital into financial products. The approach provides decisionmakers with information, which has a dual sustainability focus on economic value and the resulting environmental impacts (Kula & Evans, 2011). This is achieved by leveraging separate discounting rates for economic

and natural capital value and costs. The result is a distinction whereby projects may have similar economic net present values, but different environmental impact values, ultimately providing assurance that preference is given to environmentally-friendly projects (Kula & Evans, 2011).

The approach is anything but simple and Blignaut, Aronson, and de Groot (2014) argued that discount rates, which influence these estimates, should account for the time period and include macro factors such as the country context, including the distribution of income. Although discount rates seems plausible, finding the appropriate discount rates for projects that deliver irreversible changes will present a major conundrum (Ring *et al.*, 2010).

In parallel, Thopil and Pouris (2010) proposed the utilisation of the damage cost method, which determines the costs and benefits of the externalities by evaluating the damage caused to both material and non-material assets such as the impacts of uncontrolled emissions delivered from a power plant on the depletion of coal, the environment and society.

The ecosystem services valuation (ESV) model, which quantifies the benefit of natural capital, and secondly the quantity of natural capital utilised to assist in evaluating projects by introducing the dimension of the impact on quantity of natural capital (Liu, Costanza, Farber, & Troy, 2010). The complexity linked to the above approaches is embedded in the fact that no formal economic market for natural goods and services actually exists (Liu *et al.,* 2010). This market failure (Baye & Prince, 2013) results in valuation techniques becoming resource intensive since the quantification of natural capital in terms of goods and services benefit delivered to society can prove complex (Liu *et al.*, 2010).

2.4 Full cost accounting methods

The full cost accounting framework in the context of natural capital accounting shifts the accounting paradigm to measure the direct and indirect environmental costs linked to an organisation's activities (Jasinski *et al.*, 2015). Although full cost accounting attempts to quantify negative externalities, the costs remain borne by society. If the market is truly efficient, the market prices for products and services should reflect the total cost of environmental externalities (Jasinski *et al.*, 2015).

Epstein *et al.'s* (2011) findings supported this argument and estimated that the damages linked to energy production from coal when accounted for, would more than double the price of electricity in the United States. The net effect would be a realignment of the social posture toward consumption and investments in efficient power generation and electricity conservation. However, this cost, which remains unaccounted for, contributes to the sum total of the intergenerational debt, which is the opportunity cost one transfers onto future generation (Bottero *et al.,* 2013).

In a business environment, where economic profit does not account for externalities in the organisations' operating costs, can the economic results be deemed sustainable? Jasinski *et al.* (2015) conducted a study of full cost accounting techniques utilised by organisations between the periods 1992 and 2014. The framework utilised included the following evaluation dimensions:

- Cost focus: Did the organisation's accounting process consider natural capital impacts both internal to the organisation and those external, such as society and the environment?
- System boundaries: Two boundary dimensions were considered. Wide boundaries referred to whether the organisation considers impacts across the entire value chain, including suppliers. In contrast, narrow boundaries referred to factors deemed internal to the organisation and within their sphere of control.
- Sustainability dimensions: This component relates to the number of capitals, which were considered in the sustainability consideration.

The framework outlined that the organisations were predominately internally focused and the dominant full cost accounting techniques included assessing the damage cost, cost avoidance, cost restoration and cost maintenance valuation (Jasinski *et al.*, 2015).

Although, alternative techniques exist, such as contingent valuation, where stakeholders that include society are engaged to determine the compensation, they will accept that these approaches are open to ambiguity and un-informed bias as stakeholders have intent to receive the maximum compensation, while organisation aim to minimise cost (Liu *et al.,* 2010).

The internally focused orientation of organisations presents a limitation. Gao and Bansal (2013) found that simultaneous integration is required and realises creative solutions, which provide competitive advantage in harmony with the planet and society. For example, a traditional procurement approach forces organisations to maximise their bargaining power over suppliers and drive down prices (Adams *et al.,* 2013).

When purchases are from small businesses and these entities are marginalised due to the organisations' buying power, this can result in degradation in the quality of the supplier's operations (Adams *et al.,* 2013). Through the increase in access to inputs, such as provision of financing or technology-sharing organisations, can improve supplier quality and productivity, resulting in stronger suppliers with less environmental impact (Isada & Isada, 2014).

Visser and Kymal (2015) progressed the existing literature and argued that value creation can only be realised through an integrative response across the business. This integration approach touches on corporate governance, strategy, offer development, offer delivery, and supply and customer chain management (Visser & Kymal, 2015). The integrated value creation process enables organisations to identify external and internal issues critical to future success. The advanced approach advocates that if organisations are able to understand their environment of business and potential risks associated with capital depletion, the organisation is able to respond effectively (Visser & Kymal, 2015).

The integrated value creation process is an enabler for the generation of innovative solutions contributing to intellectual capital and financial capital, while investing in activities, which have positive implications for social, relational and natural capital (Visser & Kymal, 2015). Isada and Isada (2014) supported that innovation and technology are key enablers for solutions and echo Robert Solow's belief in the significance of technological progress as a factor of economic growth and that the crisis of a global environment can be overcome by innovation.

Although Jasinski *et al.* (2015) identified ten widely used full cost accounting methods, the sustainability assessment model (SAM) and the forum for the futures (FFF) sustainability accounting methodologies were the dominant valuations models used across the studies.

- The sustainability assessment model (SAM): This approach aims to determine the environmental impacts of a project and uses 22 performance indicators to evaluate the economic, resource, environmental and social impacts of a project.
- Forum for the future's (FFF) sustainability accounting: This method uses restoration cost as the valuation method in conjunction with avoidance cost. The result is an evolution of the traditional accounting method to recognise sustainability liabilities on the balance sheet (Jasinski *et al.*, 2015).

Although various methods exist, as an adjunct, in order to close the gap, which considers natural capital as intangible without a market or prices, the economics of ecosystem and biodiversity (TEEB) have standardised true cost accounting and introduced tools and policies (Jones-Walters & Mulder, 2009). The TEEB focus is to account for market failures and the estimation externalities in a socially acceptable way by considering value placed on natural capital by affluent and less affluent social groups, since direct dependencies may differ (Ring *et al.*, 2010).

The economics of the ecosystem and biodiversity valuation method considers a wide organisation boundary and furthermore considers an inclusive approach similar to contingent valuation to adequately account for the opportunity cost linked to existing stakeholders and future generations (Reyers *et al.,* 2010).

2.5 Moving toward true economic value add

Numerous large organisation presently utilise the economic value add equation (EVA) to measure an organisation’s financial surplus after discounting operating profit by the total cost of capital (Ward & Price, 2006). If organisations deliver negative EVA, which translate into equity destruction, the organisations’ ability to attract investment decreases or investment is gained at a higher cost of capital (Ward & Price, 2006). However, the yardstick equation, in most cases, is claimed not to consider the impact of the organisations’ activities on natural capital, thus Dr Robert Repetto and Trucost adapted the measure by further subtracting environmental impacts, resulting in a new

economic measure termed true value added (TRUEVA) (Thomas, Repetto, & Dias, 2007).

TRUEVA recognises that an organisation while synthesising useful products for which customers have a willingness to pay, may also output damaging waste and emissions, which victims would pay to avoid. Thus TRUEVA estimates the industry's real economic contribution on an organisation-by-organisation basis, "This by implication suggests that there is a large degree of unaccounted for risk among companies in the industry" (Thomas *et al.*, 2007). The application of this measure, when employed to the EVA of power generation, organisations demonstrated in most cases that organisations delivered economic deficits instead of surpluses, which may challenge fund managers to re-consider investment decisions and industry players to rehash their environmental strategy (Thomas *et al.*, 2007).

TABLE 1 Comparison of economic value add to tru economic value add (Thomas *et al*., 2007)

Company name	NOPAT 2004 ($millions)	EVA 2004 ($millions)	TRUEVA2004 ($millions)	ROC 2004 (%)	TRU ROC 2004 (%)
Ameren Corp	790.415	97.185	–1,458.370	5.496	–5.320
American Electric Power	1,429.582	134.994	–4,853.359	4.958	–12.343
Allegheny Energy Inc	341.716	–13.456	–1,525.960	4.137	–14.175
Cinergy Corp	568.262	11.156	–1,987.005	4.825	–12.140
Centerpoint Energy Inc	617.131	–159.328	–1,162.770	3.386	–2.119
Dpl Inc	218.166	53.555	–429.240	6.256	–7.588
Duquesne Light Holdings	106.029	9.424	9.424	5.235	5.235
Dte Energy Co	652.383	–90.258	–1,139.762	3.953	–2.406
Consolidated Edison Inc	763.240	–42.136	–101.309	4.539	4.187
Edison International	1,511.968	403.366	–882.726	5.919	0.884
Entergy Corp	1,093.428	114.785	–634.187	5.307	1.672
Exelon Corp	2,285.552	542.397	224.534	6.162	5.305
Firstenergy Corp	1,620.799	309.470	–882.234	5.513	1.459
Fpl Group Inc	991.320	–15.767	–1,140.436	4.636	–0.624
Great Plains Energy Inc	217.207	95.052	–394.450	8.624	–10.811
Hawaiian Electric Inds	240.720	28.594	–119.725	5.084	1.951
Idacorp Inc	57.129	–42.048	–182.196	2.667	–3.876
Alliant Energy Corp	323.209	18.815	–449.540	4.831	–2.170
Nstar	336.382	60.106	58.717	5.564	5.541
Northeast Utilities	267.471	–125.714	–306.197	2.952	0.960
Pg&E Corp	1,501.360	507.895	497.362	6.725	6.678
Progress Energy Inc	953.079	–34.062	–1,567.562	4.451	–2.711
Pnm Resources Inc	103.676	–62.713	–226.831	2.810	–1.638
Pinnacle West Capital	348.573	–56.742	–368.069	3.956	0.423
Pepco Holdings Inc	537.856	92.083	–206.956	5.345	2.373
Ppl Corp	893.759	247.623	–660.077	6.391	–0.100
Reliant Energy Inc	125.587	–419.521	–1,316.605	1.000	–6.142
Southern Co	1,779.665	410.977	–3,353.323	6.319	–7.047
Sierra Pacific Resources	250.582	5.849	–143.835	4.362	1.756
Teco Energy Inc	210.150	–140.033	–466.863	2.653	–1.473
Unisource Energy Corp	157.418	59.932	–204.959	6.927	–4.730
Westar Energy Inc	203.152	48.226	–641.954	5.809	–13.926
Xcel Energy Inc	680.189	–135.492	–2,231.211	3.711	–7.723

To advance the narrative and enable organisations to improve their transparency and quantify their impact on the environment, Trucost has established sophisticated representative data warehouse holding estimated costs for externalities, enabling organisations to monetise their impact and internalise their damage by multiplying the physical quantity consumed by an estimated economic natural capital price (Thomas *et al.*, 2007).

2.6 The Carbon disclosure project

The Carbon Disclosure Project (CDP) is an example of internationalisation mechanism driven by regulation. The non-governmental and non-profit organisation has provided a quantum to determine and report on greenhouse gas (GHG) emissions and the impact on their climate change strategies (Luo, Tang, & Lan, 2013). The CDP considers emission as direct or indirect (Matisoff, Noonan, & O'Brien, 2013).
The structure has given rise to three levels of emission, defined as Scope 1, Scope 2 and Scope 3 emissions. Scope 1 emissions refer to GHG emissions emitted by organisations directly through operational activities, while Scope 2 emissions refer to indirect emissions, such as those borne through electricity consumption (Lotz & Brent, 2015). Scope 3 refers to indirect emission not under the control of the reporting entity (Lotz & Brent, 2015).

The introduction of a regulatory framework to govern carbon emissions has provided both economic incentives and consequences for organisations. Although voluntary, the CDP has promoted the Scope 2 and Scope 3 emissions disclosures, while in parallel, this mechanism enables the internalisation of the emission, which usually has been unaccounted (Luo *et al.,* 2013), through the establishment of a carbon accounting methodology (Matisoff *et al.*, 2013). The voluntary nature of the programme has also been criticised for not being uniform and thus one that prevents comparability across organisations and industries (Matisoff *et al.*, 2013).

A dominant example of CDP implementation is the European Union Emission Trading Scheme (EU ETS), accounting for 79% of carbon trading (CQ Researcher, 2010). Although criticised for providing only limited emissions data and volatility of emission cap (Aldy & Stavins, 2012), the programme's usefulness is derived from organisations being motivated to adopt cleaner technology, resulting in some instances in a carbon credit surplus with the option to trade (CQ Researcher, 2010). Yuan, Tuladhar,

Bernstein, & Lane(2011) supported the utilisation of a taxation mechanism as a cost-effective tool to lower carbon emissions and energy consumption. Direct carbon taxation is considered a plausible substitute for carbon cap and trading frameworks. However, in both cases the design flaw inherent in the schemes means that organisations in concentrated markets or monopoly markets can opt to do nothing and accept this new cost, creating an economic draw-down on society with emission cost ultimately passed onto the consumer, in addition to unaccounted externalities (CQ Researcher, 2010).

Aldy and Stavins (2012) promulgated that in order for climate change programmes to become effective, they must impact the way the organisations perform activities. This can be achieved by mandating organisations to select only technologies that are renewable and enabling this shift through the provision of subsidies at the individual and organisation's level (Aldy & Stavins, 2012).

2.7 The limitations of green accounting and environmental accounting

Although green accounting can enable sustainable decisionmaking and propel nations to achieve an environmentally adjusted net domestic product (EDP), the adoption of this practice is largely dependent on the availability of data to adequately price an ecosystems service; it is resource intensive and requires the development of huge data with potentially different quality indicators for a forest (Rout, 2010). While the incorporation of green indicators provide insight and demonstrate that a nation's wealth and performance is lower than indicated by its GDP, the output provides little indication of activities, which can be undertaken to remediate as they are retrospective; thus, if translated to the microcosm as taxation, cannonballing organisations' bottom lines, the result could be industry shrinkage, retrenchment or a decrease in economic activity (Rout, 2010).

Stilwell (2015) observed that the dominant monetary valuation logic associated with existing economic theory impedes the internalisation of non-monetised goods such as natural capital. Stillwell (2015) further elaborated that a key misconception with current econometric methodologies is that "money is fungible with natural capital". Although an equation could be realised, the lack of information exists to truly valuate natural capital, resulting in the incorrect relationship between the organisations' average cost of natural

capital and their willingness to utilise natural capital, creating a weak form of sustainable development (Stilwell, 2015).

2.8 Sustainability reporting

A sustainability-oriented organisation takes into consideration the economic, social and environmental elements of the business model (Perrini & Tencati, 2006). In this context, the financial and competitive success, society and the use of natural capital are interconnected (Perrini & Tencati, 2006). These organisations require appropriate management systems to assess the effectiveness of their response to stakeholder concerns and furthermore, a mechanism to disclose and demonstrate the results achieved (Perrini & Tencati, 2006). Although integrated reporting claims to deliver this system, the short-term orientation of an organisation focuses the organisation toward prioritising financial objectives, resulting in a lower orientation for environmental protection (Hahn *et al.,* 2014).

The International Integrated Reporting Council (IIRC) intends to correct some significant market failures such as externalities. The objective is to provide a yardstick for investors to assess the sustainability of organisations, thus enabling them to invest their funds into value creating organisations (Soyka, 2013). Furthermore, the IIRC elevates the definition of value to include human, social and natural capital (International Integrated Reporting Council, 2013). When this extended definition is coupled with the time-focus requirement, with the short-term economic goals centred on shareholder ambitions, which lead to externalities, are somewhat neutralised (Soyka, 2013).

The IIRC framework created a burning platform for organisations to shift their focus to a shared value approach by including capitals not directly under the organisations' control (International Integrated Reporting Council, 2013). Although loosely enforced, the framework embeds this thinking by advocating stewardship and the ethical responsibility of the organisation. The compliance with this framework could prove costly and may require change in the organisations' cognitive frame.

Kolk (2010) identified some of the key reasons behind organisation reporting and choosing not to report on natural capital impacts. In summary, the key contributors for reporting are centred on reputational benefits, which present organisations with the

ability to market their environment contribution both within the organisation raising staff morals and externally to raise consumer awareness. In addition, organisations believe that by assessing their impact, the result is an identification of cost savings, constraints and efficiencies within their operations (Kolk, 2010).

Amongst the reasons for organisations not reporting on environmental impacts is negative reputational risk, whereby organisations feel that reporting may confirm the presence of negative externalities (Kolk, 2010). In addition, organisations' perception toward reporting of environmental impacts is that of cost-intensive activity, in lieu of the process requiring the gathering of information across a number of functions (Kolk, 2010).

Furthermore, Matisoff *et al.* (2013) suggested that one of the contributing factors to the decrease in transparency amongst organisations in the United States (US) is linked to the fact that CDP is a voluntary and not mandatory framework. Although this can be viewed as a contributor, Lee, Park, and Klassen (2015) observed that voluntary carbon emission disclosures are perceived negatively by capital market investors due to having negatively impacted market returns.
Milne and Gray (2013) argued that the Global Reporting Initiative (GRI) is an insufficient framework for sustaining of natural capital as some industries may prove unsustainable regardless of the process efficiencies as a result of the operations cannibalising natural capital. Although the GRI standard does not enhance accountability, the resulting disclosures − while perceived as broad − are more likely to be comparable output (Michelon, Pilonato, & Ricceri, 2015).

The natural capital protocol has responded with a mission to create a framework, which enables the reporting and capturing of credible, consistent and reliable information for managers to create actionable outcomes and quantitatively realise the impact of their operations on natural capital and vice versa (NCC, 2015). The process also seeks to identify opportunities to deliver efficiencies, identify potential for positive externalities, and understand the implication of current and future legislation, which − when coupled − reduces social costs and has positive implications for the organisations' bottom line and future sustainability (NCC, 2015).

2.9 Sustainability reporting in South Africa

Gray (2010) identified that the activities, which organisations are reporting as sustainable, have minimal relevance to sustainability. In the South African context, van Zyl (2013) found that the organisations' understanding of the content required by integrated reports remains low. Furthermore, the request is that future research should focus on developing guidelines related to natural capital materiality (van Zyl, 2013).

The request is linked to the criticism that South African organisations do not understand the importance of environmental impacts, resulting in natural capital impacts not being actively incorporated into organisations' business strategies (van Zyl, 2013). This is supported by the finding that disclosures encapsulated in non-financial reports pertaining to environmental sustainability or natural capital, remain minimal and continue to decline, while no disclosures are increasing (van Zyl, 2013).

However, the International Integrated Reporting Council (2013) published a contrasting view, stating that South African organisations understand the benefits of integrated reporting and are willing to share their value creation stories in respect of the capital.

Maubane, Prinsloo, and Van Rooyen (2014) indicated that mining organisations have a strong focus on environmental and societal aspects of reporting, while governance reporting remains low, while South African organisations in the banking and retail sectors in general have a low environmental and societal focus.

In South Africa, although carbon disclosures remain voluntary, 83% of the Top 100 organisations listed on the Johannesburg Securities Exchange disclose their emissions, resulting in South Africa being ranked second globally and furthermore ahead of the Global Top 500 organisations (CDP, 2013). The construct of disclosures identifies that while the majority of organisations report Scope 1 and Scope 2 emissions, Scope 3 disclosures have declined (CDP, 2013). A leading contributor is the accounting process. Matisoff *et al.* (2013) highlighted that although Scope 2 and 3 emissions are potentially higher than the organisations' Scope 1 emissions, the accounting process and standard remain highly variable.

Another contributing factor, discounting the value of the carbon disclosure, is due to organisations not being graded on the quality of the information disclosed, but rather having provided a response (Matisoff *et al.*, 2013).

While the King III code recommends that organisations use the Global Reporting Initiative (GRI) (Gray, 2010), to date, within the South African context, the organisational responses have been criticised for being a tick-box checklist, dismissing the effort to deliver sustainability (van Zyl, 2013).

The debates surrounding the relationship between corporate social responsibility (CSR) and corporate financial performances (CFP) are not new in South Africa. In 2015, Chetty, Naidoo, and Seetharam (2015) compared the performance of organisations listed on the Johannesburg Securities Exchange's (JSE) Social Responsibility Index (SRI) to peers not listed in the index. Similar to global organisations, South African organisations are grappling with how to define the capital metrics for their own requirements (Adams *et al*., 2013).

When organisations are presented with a proliferation of standards, a sensible response can prove difficult to be achieved (Visser & Kymal, 2015). When organisations are faced with a context filled with ambiguity, the decision of which capital to prioritise is based on the cognitive frame of the managers (Figge, 2014). Furthermore, managers simultaneously need to address multiple factors, but conflicting economic, environmental and social aspects at economic and social levels, which operate in different time frames and have different logical drivers (Figge, 2014).

2.10 Barriers and Enablers to change in management accounting practices

Angonese and Lavarda (2014) identified dominant themes, which influence changes in management accounting practices and can counteract the inertia for change or implementation of an integrated management accounting system. These include the notion that where lack of knowledge exists, barriers to implementing or developing a costing system automatically realise themselves. In addition, the emergence of increased workload and lack of resources present an opposition to the change process (Angonese & Lavarda, 2014). When these constraints to change are coupled with the lack of acceptance among leaders within the organisation, new accounting paradigms

can prove difficult to implement, since these resistance factors reside in the dominant logic of the organisations and human actors (Angonese & Lavarda, 2014).

Luo, Tang, and Lan (2013) described that these internal restrictions originate from culture, management philosophy, organisational structure and existing expertise. In these cases, the absence of compulsory legal requirements results in the disclosures decision being centred around the business case (Luo *et al.*, 2013).

However, where the organisations' boards actively focus their efforts to serve as points of light and endorse the change, the probability of successfully implementing a change in accounting systems is increased (Angonese & Lavarda, 2014).

In support of this view, Wagner (2015) identified that the demands of stakeholders internal to the organisation are a key influencer to driving the integration of environmental considerations within the organisation, while the impact of regulatory stakeholders defined as policies and penalties, may have little effect. In addition, the demands of public stakeholders, although weak, are a contributing factor to the environmental considerations of organisations (Wagner, 2015).

In South Africa, the Nedbank Group Limited is the first financial services organisation to achieve carbon neutrality. The organisation's Chief Executive Officer, Mike Brown, is a sterling example of a leader driving sustainability. The organisation believes that carbon reduction is but one of many components within an organisation; thus, Nedbank is focused on creating positive impacts through products and services and working with a broad range of partners to create a sustainable impact (Lotz & Brent, 2015). He stated that, "Often, the carbon management journey begins with just a few staff members being tasked with an overwhelming duty of plotting the course for the rest of the organisation" (Lotz & Brent, 2015).

Schandl *et al.'s* (2015) predictive model presents economic policy as a useful enabler. The introduction of policy, which attributes costs to carbon emission, can be leveraged to achieve the required standard of living, human wellbeing and a sustainable environment (Schandl *et al.,* 2015). Furthermore, the probable outcome of an increased carbon cost, realised through policy, would not translate into a GDP decline, but rather create momentum for a shift, whereby organisations are incentivised to invest in renewable energy and more efficient technologies (Schandl *et al.,* 2015).

The resulting capital investment has positive implications for the GDP equation since the capital inflow can be adequate enough to offset negative losses resulting from the constraint on carbon emissions (Schandl *et al.*, 2015).

At an organisational level, Stillwell (2015) aligned with Schandl *et al.*'s (2015) position that a shift can have positive implications toward sustainable development. If organisations and participants in the market have an understanding and scientific indication as to the value of natural capital and furthermore, they are able to internalise the unintended costs and benefits or externalities, the organisations' average cost of natural capital will increase, resulting in the decrease in natural capital consumption (Stilwell, 2015).

Although this can be perceived as a constraining factor for organisations in the short-run, since the internalisation of costs associated with externalities are perceived to increase price and reduce consumption of said goods, depressing profits and potentially growth in the economy (Thomas *et al.*, 2007). The internalisation produces the positive externality of social welfare, which is also generated as organisations scale their natural capital impacts to a socially acceptable level (Thomas *et al.,* 2007).

In order to maximise economic value add, organisations need to decrease operating costs or reduce the cost of capital (Ward & Price, 2006), thus the positive spill-over associated with the introduction of accounting for externalities is the development of innovative substitutes within organisations, resulting in more efficient use of capital (Stilwell, 2015).

In instances where organisations are unable to adapt or leapfrog efficiencies, the prices of products will increase and applying a Porterian lens, and economic theory results in an increased need for new entrants, which can provide compelling substitutes (Thomas *et al.*, 2007). The business acceptance of "clean-tech" can be increasingly improved if "dirty-tech" was to internalise environmental impacts (Thomas *et al.,* 2007).

Luo, Lan, and Tang (2012) observed that within the Top 500 global organisations, social, economic and legal aspects are key influencers in organisations increasing their focus on carbon disclosure, while providers of capital have been less influential.

The economic pressure created as a result of carbon cost discounting organisations' operating profit, has incentivised organisations to optimise their business processes and realise efficient business practices (Luo *et al.*, 2012), while in parallel greater levels of reporting enable organisations to advocate their efforts to stakeholders *(*Luo *et al*., 2012).

Luo *et al*. (2013) proposed that institutional factors, such as legal and regulatory systems, can motivate organisations to invest in carbon-efficient products and renewable energy, while financial incentives can encourage carbon reduction and reporting disclosures.

2.11 Conclusion to literature review

The existing knowledge base provides insight into the evolution of natural capital accounting frameworks utilised internationally. The existing research also provides context on the underlying negative implications on sustainable economic development and market efficiency which can arise from the lack of externality accounting. However, the literature to date has not explored the organisations natural capital focus, natural capital understanding and furthermore the natural capital measurement techniques being utilised within the South African context.

In addition the existing environmental reporting disclosures of South African organisations continue to be critiqued based on the review of published information, while literature has not explored expert perceptions of existing frameworks and reporting methods being utilised within South African organisations.

Although potential barriers have been identified within developed economies, developing markets which are increasingly engaged in the green versus growth debate are yet to be considered. Furthermore, South African specific issues have not been explored. Ultimately, there lacks a blue print which provides insight into potential contributing factors which could advance natural capital accounting in South Africa.

Chapter 3: Research Questions

In order to account for natural capital and internalise externalities, organisations need to have a clear understanding of the premise and the capital aspects being solved for and measured. Since a large number of standards and methods exist, the research project also seeks to understand and gain insights into the full cost accounting valuation techniques that organisations use to account for natural capital value creation or destruction in relation to their activities, and in addition, how they report on natural capital as these disclosures influence investor decisions. Furthermore, the research will identify if in fact valuation techniques are being employed. While these techniques are not without limitations and may not be utilised due to the dominant logic of the organisations, the research will seek as another key contribution, to determine what industry experts deem as the barriers and enablers to move toward a sustainable natural capital accounting orientation. The key research questions are articulated below.

- **Research Question 1:** How do South African organisations understand and measure natural capital?
- **Research Question 2**: How do South African organisations report on natural capital?
- **Research Question 3**: What are the barriers and enablers to achieve full cost accounting for natural capital in South Africa?

Chapter 4: Research Methodology

4.1 Research design

Saunders and Lewis (2012) described three potential research designs. These different approaches are namely the descriptive, explanatory and exploratory design approaches.

While descriptive studies have been used to create links through the use of quantitative data and explanatory studies focus on causal relationships between a dependant and independent variables, exploratory research provides a suitable approach for qualitative research and is best positioned to provide insights and new information on a topic in cases where there is uncertainty (Saunders & Lewis, 2012).

4.1.1. Exploratory research study

In order to achieve the research objective, which sought to gain a deeper understanding of how South African organisations measure and report on natural capital and externalities, including potential barriers and enablers, the exploratory approach was selected to facilitate the delivery of this aim.

In addition to the definition of this approach, the reasoning below provided further support for the utilised research method:

- Context is important and thus, the context, within which the organisations operate, is important and can only be achieved through exploratory research.
- Descriptive designs prevent the collection of open-ended answers and detail underpinning their choices due to the quantitative nature (Saunders & Lewis, 2012).
- Qualitative methods and exploratory studies have always aided the researcher to understand the experiences and attitudes of subjects, including their perception of issues. This is achieved through open-ended questions. McCusker & Gunaydin (2014) referred to this approach as the “what”, “how” or “why” as opposed to the “how many” or “how much”.

4.2 Population

The chosen population for the semi-structured interviews were individuals with expertise in the sustainability industry, environmental reporting and environmental management. In order to ensure adequate insights into the topics under exploration, the population included sustainability managers, heads of the sustainability and experts from accounting and audit organisations located within South Africa, with experience in environmental reporting. Since in most cases, individuals at accounting and audit organisation have been exposed to a broad range of organisations in South Africa due to the nature of their corporate responsibilities, this provides an adequate premise for inclusion and also ensures provision of a broad perspective.

4.2.1. Additional considerations related to the target population

The Johannesburg Stock Exchange's (JSE) Social Responsibility Index (SRI) has classified organisations as high impact, medium impact or low impact, based on the impact of their business activities on the environment. The index was established in 2004 with the overarching philosophy of triple bottom-line (people, profit and planet) achievements and good corporate governance (JSE Limited, 2014).

According to the JSE, only two thirds of all companies achieved the environmental requirements of the SRI Index (JSE, 2014). Furthermore, in terms of environmental reporting, medium impact companies report better than high impact organisations, while high impact organisations continue to grapple with coverage of key environmental issues (JSE, 2014).

Due to the relevance of these organisations and the JSE SRI as a proxy for sustainable organisations, the sample is inclusive of experts with experience at South African organisations listed on the 2014 SRI index. This list was selected since the JSE has undertaken to review the SRI from 2015 onwards and disclosures for 2015 have not been made available to the public.

Table 2 which follows summarises the organisations according to environmental impacts rating as specified by the 2014 JSE SRI Index.

TABLE 2 - Environmental impact rating by sector (JSE LIMITED, 2014)

High impact industries	Medium impact industries	Low impact industries
• Air Transport and Airports • Building Materials • Chemical and Pharmaceuticals • Construction • Fast Food Chains • Food Beverage And Tobacco • Forestry and Paper • Major Systems Engineering • Mining and Metals • Oil and Gas • Pest Control • Power Generation • Road Distribution and Shipping • Supermarkets • Vehicle Manufacture • Waste • Water	• Banks • DIY and Building Supplies • Electronic and Electrical Equipment • Energy and Fuel Distribution • Engineering and Machinery • Hotels Catering and Facilities Management • Ports • Printing and Newspaper Publishing • Property Development • Public Transport • Vehicle Hire	• Consumer Finance • Information Technology • Leisure • Media • Property Investors • Research and Development • Support Services • Telecoms • Wholesale Distribution

In parallel, the Global Reporting Initiative's (GRI) fundamental belief that many sectors face unique sustainability issues and as such should include these in their integrated reports, has led to the creation of GRI sector supplements (Global Reporting Initiative, 2013). These sector supplements cater for unique needs of industries such as mining (Global Reporting Initiative, 2013).

According to the GRI (2013), the three key reasons underpinning the decision to implement sector specific guidance are as follows:

- The need for sector-specific content in reporting;
- The potential to improve the sustainability performance of organisations in a sector;
- The potential for increasing the number and quality of reports in a sector.

As such, the mining industry has potentially complex relationships with the environment, due to their highly extractive nature, thus requiring a careful assessment of the potential for direct environmental impact (Global Reporting Initiative, 2013). According to the GRI guidelines (2013), organisations within these sectors are required to articulate and report on their impact on the environment, including their habitat protection and restoration efforts.

Since mining organisations are listed as high impact on the JSE SRI and have sector-specific supplements per the GRI, the sample included sustainability managers with experience in the mining sector. However, the sample was not exclusive to sustainability managers who have experience in mining organisations. It also included two organisations from the food retail industry, two organisations from the banking industry and one organisation from the brewing industry, with four mining organisations being included.

4.3 Unit of analysis

The unit of analysis pertaining to this study comprises individuals with sustainability expertise and experience related to South African organisations listed on the JSE.

4.4 Sampling method and technique

The non-probability sampling technique, which includes purposive sampling, was utilised (Saunders & Lewis, 2012). The sampled group of experts that were engaged through semi-structured interviews was homogenous; however, the sample for non-integrated reports was deemed heterogeneous since organisations from a broad range of industries were reviewed. These industries included mining, financial services, beverage and food retail.

The in-depth data gathering process, which is the nature of the qualitative process, requires a smaller sample size. Whilst the interview quantum was governed by the academic boundaries stipulated by Guest, Bunce, and Johnson (2006), who advocated that saturation is achieved on average once 12 interviews are conducted, the primary data was collected through interviews with 15 respondents congruent to Saunders and Lewis (2012). One interview was excluded from the final sample.

In order to establish relationships with industry experts, the LinkedIn social media tool was utilised as the primary mechanism to create the initial connection. Individuals were identified based on their job role or function outlined on LinkedIn. Although the interview consent forms included a summary of the research being undertaken, the selection process was further governed and validated by way of interview questions. The questions requested that the participants outline their role within their organisations and furthermore, articulate their experience in this field.

These questions were followed by a request for the participant to outline if natural capital was a concept they were familiar with and understood, while requesting them to provide their own definition, which was compared to the definition outlined by International Integrated Reporting Council. This process was utilised to ensure their experience and ensure relevance.

In addition, post interviews were conducted, in which respondents provided access to their peers. The snowball sampling technique was thus also leveraged and further contributed to the homogenous nature of the sample (Saunders & Lewis, 2012).

4.5 Measurement instrument

Semi-structured interviews were conducted at the managers' offices and in some instances, telephonic interviews were utilised to gather primary data.

4.6 Data gathering process

The process was aligned to Saunders and Lewis (2012), who proposed the use of semi-structured interviews to be utilised, where questions are complex, where there is relative uncertainty regarding responses and the researcher may need to probe deeper to ensure adequate information is provided for key questions.

Due to the exploratory nature of this study, the majority of the interviews were conducted face to face at the organisations' offices and in some cases telephonically. The interviews were conducted with seven sustainability managers and five heads of sustainability, employed by JSE-listed organisations and three experts, two which were senior individuals involved in environmental reporting, employed by audit and accounting firms operating in South Africa.

The face-to-face nature assisted the researcher to minimise non-response and question bias, while telephonic interviews assisted discussions with experts located in other regions in South Africa. In addition, a pilot discussion interview was conducted with the research supervisor to ensure that the interviews flowed correctly, thus ensuring that the research objectives are met, and construct validity is achieved (Saunders & Lewis, 2012).

Two of the interviewees requested the interview questions in advance; however, they were not able to peruse them prior to the interview. The data was collected using a combination of text (handwritten notes) and non-text (voice recorder). As part of the process, the interviewees were presented with the option to state, which aspects are on record, and those that are not on record will be omitted from the transcripts. No statements were retracted.

The research included the semi-structured interviews and the review of integrated reports specific to organisations relative to respondents for the 2015 financial year, with introduction of reports for the 2016 financial year, where information for 2015 was not available. The data-gathering process and underpinning data collection tools and techniques have been summarised within the table below.

TABLE 3- Research phases and sampling information

Research Phase	Phase objective	Data collection method	Sampling technique	Sample size
Phase one	Face-to-face interviews with sustainability managers, heads of sustainability and sustainability experts in South Africa	Semi-structured interviews	Purposive, non-probability sampling techniques, which also included the snowball sampling technique	**15**
Phase two	High level analysis and review of data disclosed on natural capital from the integrated reports of organisations in the sample.	Retrieval of sustainability reports and integrated reports from the company's website	Purposive	**7**

4.7 Summary of respondents

Table 4 provides a summative description of the individuals who participated in the interviewing process. The table encapsulates their role, sector and interview duration and word count of the initial transcription. The majority of interviews were conducted with experts who had sustainability management and reporting experience and were employed by organisations (labelled as sustainability managers or head of sustainability). Three interviews were conducted with experts/consultants to organisations of which two where employed by audit firms.

These respondents were attributed the title “sustainability experts” for the purpose of the study. The sample of respondents outlined below is thus in line with the population outlined in section 4.2 from both an industry and expertise perspective.

TABLE 4- Respondent interviews summarised by role

Interview number /Respondent Number	Role in the organisation	Industry	Length (minutes)	Initial word count	Final word count
1	Head of Sustainability	Mining	57.29	8744	8558
2	Sustainability Manager	Mining			
3	Sustainability Manager	Mining	31.25	4775	4656
4	Sustainability Manager	Food Retail	21.53	2851	2797
5	Head of Sustainability	Breweries	50.23	6952	6947
6	Sustainability Expert	Mining	43.1	6773	6652
7	Sustainability Expert	Audit	30.47	4232	4067
8	Sustainability Manager	Mining	40.25	5222	4998
9	Head of Sustainability	Banking	36.34	5374	5343
10	Sustainability Manager	Mining	49.16	6460	6444
11	Sustainability Manager	Mining	37.22	3810	3769
12	Head of Sustainability	Food Retail	19.16	2713	2679
13	Sustainability Manager	Banking	44.18	7132	7119
14	Head of Sustainability	Mining	31.54	4476	4481
15	Sustainability Expert	Audit	56.59	8640	8643
		Total	548	78154	77153
		Average	39.2	5582	5511

The cumulative interviewing time translated into 548 minutes (over 9.1 hours) of audio recordings and when transcribed, equalled 77 153 words. On average, each interview lasted 39 minutes and transcriptions amounted to 5 389 words per transcript. The longest interview was approximately 57 minutes in length.

While only 15 interviews were utilised, the original interview 14, which was conducted with a Sustainability Manager within the mining sector, was removed from the sample since partially through the actual interview, the respondent realised that the questions were outside the scope of activities and focus. The respondent then kindly directed the researcher to the new respondent 14, who was the Head of Sustainability. He welcomed the interview and advised that the internalisation of externalities is a project on his roadmap

4.8 Data analysis approach

In order to analyse the data, a computer-aided qualitative data analysis software was utilised (Saunders & Lewis, 2012). In particular, the ATLAS.ti tool was used. The ultimate purpose was to assign data enclosed in documents to each code (Saunders & Lewis, 2012). The benefit of this process is that all documented information will be reviewed multiple times and result in the identification of key themes, potential similarities and differences.

Since thematic analysis is deemed suitable for questions, which relate to individuals' experiences and exploratory research (University of Auckland, n.d), the researcher undertook thematic analysis due to the flexibility of the approach. In addition, due the exploratory nature of the research, an inductive approach to transcript coding was undertaken. Since the researcher is new to the field of study, the inductive nature enabled the emergence of ideas, while it maintained an unbiased receptive nature through the process (Hsieh & Shannon, 2005).

4.9 Interview transcription and verification

The services of a third-party transcriber were utilised and the researcher reviewed each transcription, while listening to the voice recordings. Inaudible areas have been described as such in the documents. The first and second interviews were conducted, with two managers concurrently, which meant that the two managers were present and they answered the interview questions after each other. The researcher initially had the intention to reformat the first two interviews into two separate transcripts.

However, a review of the documentation showed that each respondent's input was complementary to the discussion and thus the transcripts were left combined. Given their different experiences and the fact that the head of the unit was new to the organisation, they were able to provide different input and value. This was then considered as two separate interviews for the purposes of the study.

In order to ensure consistency, all font sizes and headings enclosed within the transcripts were reformatted. This included line spacing and marking the interviewer's speech in bold and for the interviewer and normal for the respondent. This took approximately one hour to two hours per transcript.

4.10 Transcription coding and analysis using ATLAS.ti

4.10.1. Transcription preparation

In order to synthesise the information gathered through the interviewing process, the ATLAS.ti qualitative data analysis software was utilised. Each interview was transcribed by a third-party, and in-order to ensure consistency, each interview was reviewed by the researcher.

Since the transcriber returned the transcripts in .rtf format, all transcripts were compatible with ATLAS.ti. The transcriber made use of the title "respondent" and "interviewer" to distinguish the different roles and actors in the interviewing process.

The documents were also renamed per the following naming convention to aid ease of coding and identification, "Respondent", "Initials", "Role" "Sector", "Interview number". In this convention, "Role" referred to the interviewer's role as outlined in section 4.7. Where the text applied to the interviewer in the document, the respective text was changed to bold font and a hard return was included to separate the text, where not already included. The research also removed common parts of speech, such as, "You Know", "umm", "I mean", "and okay" or "Okay", where these words were used by the interviewee or respondent to start a sentence.

In the initial interviews, where adjustments to the microphone were made by the researcher and the respondent was advised as such, these aspects were omitted. In addition, repeated words such as “okay” when used by the respondent as a pause break, were also removed. In the initial interview, in cases where the respondents made use of the word “gona” and “Yeah”, this word was changed to “going to”. The font was also adjusted to Arial 11, with 1.5 line spacing. In addition, grammar and spelling corrections were made to the respondent’s quotes inserted into Chapter 5.

Since the research method included snowballing as a part of the technique to gain access industry experts, where the transcript captured details pertaining to this component, this information was removed from the transcript.

4.10.2. Transcription coding process

The transcripts were inputted into the ATLAS.ti data analysis tool, and based on the themes derived from the theory, the researcher assigned codes to statements made by each respondent. One transcript was reviewed at a time and codes assigned inductively for each research question. As the review continued, common words were identified in many of the transcripts and codes assigned to describe the statements provided by respondents. The first cycle of coding revealed 166 codes, of which some codes had zero quotation linked to them. The codes with no linkages were removed, resulting in approximately 162 codes.

Since the researcher was not completely acclimatised with the ATLAS.ti tool, Microsoft Excel (Excel) was utilised in conjunction. As part of the process to derive insight fundamental to each research question, the researcher first reviewed the codes per question. Use the ATLAS.ti code manager, a code search was conducted and the researcher then reviewed each quotation linked to a specific code per respondent. This process enabled the identification and consolidation of codes, where redundancy may have existed. For instance, the code “no full cost accounting” was merged into the code “no natural capital accounting”.

A similar approach was utilised for the codes “board support”, “CEO support” and “leadership support”, which were merged into “leadership support”, using the ATLAS.ti merge function in code manager.

Once the researcher was comfortable with the codes per question, the individual codes were then exported into Excel for each research question and sub question. As a next step, the codes were linked to each respondent, using an “X” to create a linkage. The “countA” function in Excel was then utilised to count the occurrences per code and resultant weighting. In conjunction with this step, the researcher maintained a visual and written journal of codes and categories and emergent themes. This enabled the evolution of thinking, identification of congruencies, linkages and reflective critique throughout the process. An example of the Excel method described above is contained in Appendix 4.

This process reduced the number of codes to approximately 143 codes. The final coding scheme is outlined in Appendix 3.

4.11 Ethical considerations

Consideration relating to the protection of participants’ interests was given. All interviews were conducted in English and all interviewed respondents were English speaking.

In order to ensure authenticity of the process, consent forms were issued to each participant and these were signed. These forms were signed prior to the commencement of the interview and were shared prior to commencement of the interview to allow participants time to consider their participation. This also created an enabling environment in cases, where the interviews were conducted telephonically. In one case, the respondent re-signed the form and dated it post the date of the interview.

As part of the validation, signed consent documentation has been scanned and is contained as part of the evidentiary documentation. The sample consent form is enclosed in Appendix 6. The interview did not request any information relating to the age, race or gender of the respondents as this was not a contributor following the review of the supporting literature. It was agreed that respondents’ names are to be kept confidential; thus, as part of the study, reference to participants or information quoted is referenced by way of the individual’s initials only.

4.12 Data validity

In order to ensure validity of results and that the research results are in fact plausible, (Saunders & Lewis, 2012), the researcher undertook a method, where results outlined in the chapter were created through grounded data. In doing so, the researcher analysed the information gathered from varying perspectives such as industry, respondent and experience. In addition, where a perspective was found to a single view, but deemed important, the research sought to triangulate this perspective with open-source information such as expert quotes and industry reports. The process followed by the researcher to derive the results is also outlined within each research question with quotes to support the findings. This supports the need for description of the process undertaking (Creswell, 2007).

4.13 Researcher bias

The exploratory and qualitative nature of the research approach leads to an interpretivism philosophy being innate in the research method. This is guided by the fact that the approach did not follow a positivism philosophy, since the research by construct, did not seek to and did not consider the influence independent variables on one or many dependant variables within a particular context (Saunders & Lewis, 2012). In contrast, the research sought to understand the different full-cost accounting techniques utilised by various organisations (if any), in their role as social actors within the South African context (Saunders & Lewis, 2012).

However, the primary disadvantages linked to interpretivism are related to the subjective nature of the approach and the inclusion of the researcher's bias; thus, the primary data generated in interpretivism studies cannot be generalised since data can be impacted to an extent by personal intrinsic values (Davies, 2007).

In consideration of the above mentioned arguments regarding interpretivism, although the risk existed since the researcher is cognitively framed toward the belief that natural capital should be accounted for, the potential risk was mitigated to an extent by applying a theoretical lens and only evaluating the facts received through the data gathering process.

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4.14 Research limitations

The following research limitations have been identified:

- The use of non-probability sampling may exclude organisations, thus resulting in the research not being representative. However, exploratory research, which is qualitative, by definition is not representative and needs to be followed up by deeper quantitative investigation (Saunders & Lewis, 2012).
- Although the JSE SRI data ranks organisations according to impact, this may be subjective as it is based on disclosed information.
- Sustainability management and reporting professionals or experts disclosed limited information pertaining to efficiency programmes and benefits since organisations may derive competitive advantage from these activities.
- Some respondent's careers have built their career capital within one organisation; thus, their ability to provide a broad perspective may be limited. In addition, this may result in saturation being reached earlier.
- The interpretivism approach − although probably low − may be a contributing factor, which discounts the researcher's ability to hold a neutral stance on the topic as they have a cognitive frame guided by a belief and value system (Davies, 2007).
- Implicit biases may exist in both the minds of the researcher and respondents.
- The availability of resources and time limited the face-to-face interviews with respondents located in Cape Town and London.
- The limited availability of organisation specific GRI reports reduced the level of comparison across organisations

Chapter 5: Research Findings

5.1 Introduction

The interviews conducted as part of this research project provided valuable insight into the natural capital accounting techniques, maturity, barriers and enablers within South African organisations.

This chapter is structured as follows. The results presented are based on the data gathering method and coding process outlined in Chapter 4. The chapter initially presents contextual information relating to the respondents and a summary of respondents' experiences. The key themes, which have been developed and coded inductively are then discussed with an incorporated approach and encapsulated within the research question presented in Chapter 3, following a detailed literature review. Finally, the process is validated through a demonstration of grounded data and triangulation.

5.2 Summary of Interviews Conducted

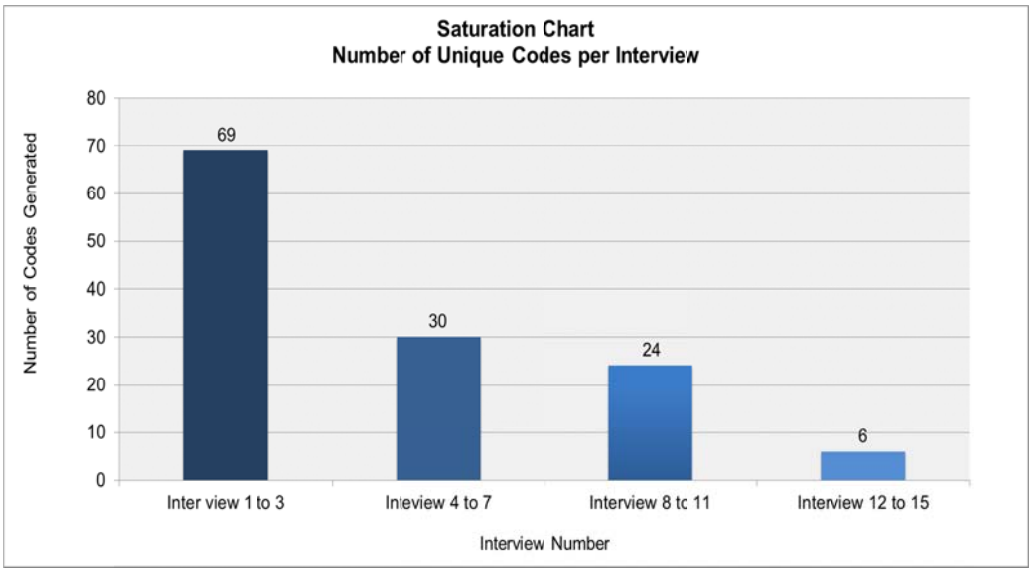
5.2.1. Data saturation

The researcher intended to conduct a minimum of 12 interviews (Guest *et al.,* 2006) and a maximum of 15 interviews (Saunders & Lewis, 2012) up to the point, where data saturation was realised. A total of 15 sustainability industry experts were interviewed as part of the process. This is defined as sustainability management and reporting professionals with experience in sustainability management, natural capital and sustainability reporting within organisations listed on the Johannesburg Stock Exchange (JSE) as defined in section 4.2. The sample included experienced individuals involved in integrated reporting, environmental reporting or those with expertise in this field of study, such as employees of accounting and audit firms located within South Africa. This is in line with the definition of the population articulated by the researcher in section 4.2.

Through the evaluation of codes identified during the initial coding process, the researcher observed diminishing returns in terms of new codes developed.

Data saturation became evident as the researcher approached the 12th interview as illustrated in figure 1 below.

FIGURE 1 - Illustration of saturation



While inherently, the researcher during the process began to observe saturation, the researcher continued as interview 12 to 15 included heads of sustainability from the food retail and mining sector, a sustainability manager from the banking sector and a sustainability expert from the auditing fraternity.

5.2.2. Interview contextual information

The respondents were not known to the researcher prior to the commencement of the interviewing process and the LinkedIn social media tool was leveraged as a primary mechanism to identity respondents. In order to establish contact with a respondent from the brewing industry, the researcher contacted multiple global offices. Due to this discovery process, the interviews were conducted over a period of nine weeks with use of a discussion guide developed in advance and reviewed by the research supervisor.

As a precursor to the start of the interviewing process, the researcher introduced a few pre-questions to validate the experience of respondents and their knowledge base in relation to the research topic. This review enabled the researcher to gain comfort through the interviewing process. The interviews were conducted as follows: three interviews were conducted telephonically; one was conducted in person at the

organisation's informal meeting area; while the remainder were conducted in person in a private meeting room at the organisations' offices. All interviews were recorded, using a digital voice recorder, and following the interview, were downloaded and backed up to a cloud storage facility.

Although no prior relationship existed, the passion shared by the respondents relating to the subject matter contributed to respondents being forthcoming with their perspectives and information pertaining to their role and experience. As part of interview nine, the respondent spent approximately an hour with the researcher sharing his background and experience and getting to know the researcher on an interpersonal level. Once the interview was completed, the researcher was given a guided tour of the corporate office and insight into the organisational culture and the importance of sustainability for their business. The respondent also requested that the researcher share the first draft of the research, once completed.

In the interest of knowledge sharing, respondent six shared a research paper, which had already been referenced by the researcher as part of the literature review. Respondent three was reviewing the Trucost framework moments before the interview, as part of her personal interest and intention to increase her career capital on the topic.

As mentioned above and in section 4, all respondents were asked whether they have an understanding of natural capital and all respondents answered yes to this question. In addition, respondents were asked to provide a definition of natural capital. All respondents provided a definition, except for the first two respondents, as they moved straight into the maturity of natural capital accounting in South Africa.

5.3 Summary of respondent experience

Since a semi-structured interviewing process, exploratory in nature, was followed with the use of an interviewing guide outlined in Appendix 5, not all respondents were asked the exact same questions. However, there was an attempt to capture some contextual information across the respondents to become included as part of the analysis.

There is evidence to support that the group interviewed have vast experience within their field and that the majority of respondents also have a broad range of experiences. In some cases, this experience spans multiple industries, geographies and institutions.

Of the total sample, 10 respondents, which equates to 66%, have experience across multiple organisations. In instances, where experience was linked to only one organisation, their time within the role signals that their level of experience and understanding of the area under study is mature and provides in-depth insight into the topic under study. In addition, respondents 5 and 13 also have experience working with institutional bodies with a focus on sustainability in in South Africa.

Five of the respondents, namely respondents 5, 7, 12, 14 & 15 hold senior leadership positions within their organisations. Due to the nature of his role, respondent 15 has experience across multiple Stock Exchange-listed organisations both locally in South Africa and globally. One can infer that these individuals have adequate influence on the natural capital narrative within their organisations and are the source of direction for their organisations related to natural capital and sustainability reporting.

5.4 Research Question 1

5.4.1. How do organisations understand and measure natural capital?

In order to facilitate a focused and constructive conversation, this research question was divided into two components during the interviewing process. The first aspect focused on how organisations in South Africa understand natural capital and the scope of their focus. The second component endeavoured to gain insight into the various valuation techniques being utilised by organisations in South Africa to account for externalities.

The literature pertaining to research question 1 sought to determine the organisational boundary or scope of measurement and value chain focus. The literature relating to the how organisations measure natural capital focused the questions on valuation techniques, internalisation of externalities and consideration of societal value.

The coding process revealed insights into how the respondents described natural capital and further, based on their experience and processes within the organisation, on the scope of their focus when it comes to natural capital. The researcher searched for descriptions of accounting methods being utilised by the organisations, how they internalised externalities and furthermore, whether − and to want extent − organisations

considered the value place by social groups on natural capital when quantifying externalities.

Where codes and themes were perceived of significant value in the mind of the researcher, these were written with the word in bold, followed by an asterisk at the end as a mechanism to outline the difference.

Where a majority perspective was identified, the research grouped this as a strong form; if an insight was considered only by a minority of respondents, the insight was considered a weak form.

5.4.2. How do organisations understand natural capital?

5.4.2.1.Key results: Understanding

Each respondent had a clear understanding of natural capital and natural capital accounting conceptually; however, the review of the transcripts indicates that majority of respondents felt that the understanding of natural capital amongst organisations in South Africa was limited. The quotes below provide evidence to support this finding. In addition table 5 below provide a summary of respondent perspectives

> *"It's been out there for a while, but I don't think it's really taken hold in the businesses."(Head of Sustainability, mining).*

> *"I don't think they're acquainted, understanding of the value of natural capital, I don't think it's a term that's used very broadly and certainly not in business do I think it's understood or appreciated." (Head of Sustainability, breweries).*

TABLE 5 – Respondents' response on understanding of natural capital accounting

Respondents' insights	Total number of respondents
Limited understanding across SA	8
Fragmented understanding across SA	4
Understanding in SA is good	3
Understanding in SA is growing	1

The review of respondent frequency outlined in table 5 illustrates that the majority of respondents believe that there is a limited understanding of natural capital accounting across South Africa. However, an additional perspective shared indicates that there is some fragmented knowledge. Respondents 7 and 8, who both have experience across a broad range of organisations, provide evidence that the understanding is growing:

> *"I think yes, most companies that I deal with and people I talk to would have a very similar understanding." (Sustainability Expert, audit).*

> *"I think yes, most companies that I deal with and people I talk to would have a very similar understanding." (Sustainability Manager, mining).*

Respondent 15, who is a sustainability expert within audit, provided a detailed overview of the understanding across two separate sectors, which were included in the study, namely, mining and financial services:

> "*So, I mean it's much more tangible for someone in the mining sector to understand something like natural capital and more difficult as you get into say financial services, which are a bit more distant from the natural capital because their usage would be less direct. I do see that the financial services sector is getting a better grasp of understanding of their indirect contribution to the use of natural capital through the financing that they're providing to their clients, so what would have started as being closer to project finance, let's say equator principle for related work, you can see that getting extended into understanding their clients a little bit better from an environmental and social perspective before they would make a corporate loan." (Sustainability Expert, audit).*

Since there is an indication that there are different perspectives based on organisational experience and the sector, the responses were summarised by sector and experience of respondents to ensure dependability.

The review of results based on organisational experience indicates that among individuals with experience in one organisation, there is a view that understanding is limited, while half of the majority individuals who have experience within multiple organisation (5 out of 10), the understanding is limited or fragmented.

The review of results by sector indicates that amongst all sectors except the experts, respondents indicate that knowledge of natural capital accounting is limited or fragmented.

The factors outlined above were elevated as contributors to the knowledge barriers and a resulting family created. Due to the majority respondents sharing this view, these aspect were considered as being strong form contributors. In parallel the finding that understanding is good and understanding is growing in SA are considered weak contributors to the knowledge enabler family. The key extraction from this analysis is that the level of understanding and sophistication amongst organisations is deemed to be in the embryonic stage and is less mature than that among our international counterparts.

5.4.2.2. Key results: Scope of management

The intent was to understand the extent to which organisations manage their environmental impacts. The review of the responses grouped by respondents' feedback outline in table 6 indicate that the scope under management is primarily linked to aspects within their locus of control and there is limited measurement across the product value chain.

TABLE 6 - Summary of scope of management

Respondents Insights	Total number of respondents
Value chain focus	5
Limited value chain focus	6
Direct impact only	4
Total	15

Since impacts can be considered more direct in industries such as mining, breweries and food retail, and in indirect contrast within industries such as banking, an argument may exist in that the banking sector is but a provider of capital, initiative was taken to apply an industry lens to the data. Thus, responses were summarised by industry in table 7 to understand if the focus on direct impact and limited value chain impacts hold true across a broad range of industries.

TABLE 7 - Summary of scope of management by industry

Respondents' insights	Mining	Banking	Food retail	Experts	Breweries
Value chain focus	2	1	1		1
Limited value chain focus	4			2	
Direct impact only	1	1	1	1	

The results enclosed in table 7 indicate that the majority of mining organisations have a limited value chain focus and this is also the perspective of experts.

The conversation with respondent 11 from the mining sector revealed that they have a limited value chain focus:

> "*On the carbon side,… we would be considering our customers, probably accounting for the suppliers as well and so that is quite clearly defined. On the air quality side of it, probably there's not… well maybe we wouldn't really be at this stage so much or we don't have a clear link to that, to our products*."

Respondents 1, 2, 6 and 11 mentioned that they rely on the procurement process to manage supplier behaviour. Respondent 2 also mentioned that while Scope 3 carbon emissions is a focal points, natural capital aspects such as water are limited to direct impact. In contrast, respondent 8 indicated that his organisation considers impacts across the value chain.

> *"We look at it across the entire value chain, yes. We need to understand it as an input, where it comes from, as an input and then where it's going" (Sustainability Manager, mining).*

In the food retail industry, one company has gone to the extent of taking accountability for activities across the value chain*:*

> *"It's not by any means a sort of perfect model but we have to take accountability for what happens across our value chain both in terms of direct suppliers now increasingly also putting commodity risk issues and their impact on both environmental and social labour issues in the supply chain." (Head of Sustainability, food retail).*

In the banking industry, respondent 9 indicated that his company has a very advanced focus:

"Needs to be the value chain because a lot of the bank's influence is where the money goes to, what does the money do, so the bank doesn't manufacture stuff. So, part of the value chain is okay if you lend money to a mining organisation, what happens to that money and especially with really big deals that trigger the Equator principles for example, you need to make sure that you understand the natural capital much wider than a narrow definition; so per unit in the bank you've got a specialist narrow focus, but if you put all the narrow views together it's supposed to cover the whole value chain."(Sustainability Manager, banking).

In summary, while a few organisations have advanced their orientation to consider the entire value chain, the majority of organisations are grappling with management impacts across the value chain. Respondents 7 and 15 , who are both sustainability experts holding senior level positions within audit firms and reporting organisation provided insights into the barriers facing organisations in respect of achieving success across the value chain. Their thoughts on potential barriers towards achieving a value chain focus are summarised in table 8 below.

TABLE 8 - Potential barriers to achieving value chain focus

Respondents insights	Total number of respondents
Lack of value chain Information	2
Lack of value chain influence	2
Quality of value chain information	1
Data availability	8

The data above supports the emergent family of value chain barriers. However, lack of value chain information, quality of data and influence also contribute to the emergent family of valuation chain barriers and fundamentally are barriers to achieving full cost accounting for natural capital in South Africa. While only a few respondents raised this as an issue, the theme is dominant amongst the sustainability experts. In addition, a common issue identified by respondents is the availability of data to account for natural capital. This aspect when coupled with the codes above, create a dominant theme for value chain barriers.

5.4.3. How do organisation measure natural capital

5.4.3.1. Key results: Measures

All respondents were familiar with the concept of externalities. The respondents were asked to provide insight into the full cost techniques they have experience with or that are known to them. A total of 11 frameworks were identified and summarised in table 9 with the highest frequency count being four linked to a project discounting method which reduces the economic value of projects based on their impact on Social and Natural Capital. The codes outlined in the table below link to the emergent family of knowledge barriers.

TABLE 9 - Summary of valuation frameworks identified by respondents

Respondents' Insights	Total number of respondents
Audit a: social return on investment (SROI)	1
Sustainability valuation method*	3
Project discounting	4
Natural capital protocol	1
TRUE cost	3
SAM*	1
Audit b: Total impact measurement and management*	1
Biodiversity assessment	1
Internal carbon pricing	1
Material flow accounting*	1
Equator principle*	3

One mining house utilises their own internal framework developed by respondent 4. The framework, named the Sustainability Valuation Method, is utilised to evaluate projects taking into account for economic, social and natural capital impacts, to the extent that a new project will not be considered if they create economic value, but have significant environment impact. Respondents 9, 13 and 15 who have experience within the banking industry were familiar with the Equator Principle, which looks at the indirect impacts the banks' lending activities have based on an assessment of the recipients' business practices.

> "*Triggers additional criteria that one should look at, including how natural capital is being used or sustainability matters are being addressed (Sustainability Manager, banking).*

Two audit firms acknowledged their own proprietary frameworks which are the Social Return on Investment (SROI) framework and Total Impact Measurement and Management, respectively. While the latter was only recently published, the SROI is being used across the continent and great value is being derived in particular by a company in Kenya.

Another interesting insight, which lends itself to the idea that products in the market are potentially not priced correctly due to the lack of full cost accounting techniques, was gained from respondent 8 during her tenure within the construction industry:

> "*We look at the price, this was at one of our steel tubes manufacturing factory. So we said let's follow one rim of tube through our production. So we started with when we get it and how much does it cost, how much did it cost them to produce that particular rim of steel. Then we looked at the cost of transporting it to our site, what happens when it gets there, the storage, the lighting, it costed every little thing as far as this one particular rim was concerned. Then the cutting of that rim and the shaping of that rim into a tube product, the waste that was generated, the labour that was used, all the input materials like the oil, the welding, we costed each and every aspect in producing one single tube from that one rim and the results were astonishing because in there, people now begin to understand. We, as practitioners, say that waste is tripled, it triples the cost of the input."*

Respondent 8 further elaborated that:

> *"Producing the waste from when you get to your products and making sure that you dispose of it safely, it costs you three times more than it costs you to buy that raw material."* (Sustainability Manager, mining).

Another emergent theme centred on the current utilisation of natural capital accounting. While there is an indication of limited knowledge amongst respondents, a key theme, which emerged is that limited full cost accounting or natural capital accounting is being conducted by organisations. The main aspects quantified are waste, water, carbon, with some respondents from a mining companies creating in internal carbon price.

TABLE 10 - Internalisation of natural capital impacts

Respondents' insights	Total number of respondents
No natural capital accounting	12
Limited internalisation	13
Contingent liabilities	4
Rehabilitation costs	4
Externality not costed into products	8

The researcher also inferred from the review of responses that within the mining sector, while natural capital accounting is not being conducted − this sector leverages rehabilitation costs and the use of contingent liabilities to internalise externalities. The idea is to return the land as close as possible to its original state. This triangulates back to the limited internalisation and further raises the eyebrow around the theme of product and services not being priced correctly.

Respondent 12 provided an insight into the South African context as a whole, which provides supporting evidence for the limited internalisation:

> *"Probably not all that well to be honest, in terms of the formal way of looking at it, I think there's quite a bit about some of the input, natural resource inputs that are measured. Well, whether it's about water, energy or some of the biodiversity aspects, but yes, I don't think we're quite at the same level as a couple of international organisations. If you look at somebody like … with their natural capital accounting and sort of environmental profit and loss statement, there's quite of bit of work still to be done in the local context and I think it's quite important if you look at the sort of biodiversity value that South Africa holds as a country as well."*

In addition, while most organisations consider social groups and non-profit organisations as key stakeholders and have a qualitative understanding of their perceived value of natural capital and furthermore the impact of their operations of social stakeholders through stakeholder engagement, no quantitative exercises are conducted. However, respondent 15 using the audit firm's SROI framework, has effectively interviewed more than 3 000 stakeholders to determine the value, which a MPESA transaction has delivered to the individuals in Kenya. This approach, while resource intensive, expands the organisational boundary, their ability to identify positive externalities and leapfrogs their approach to stakeholder engagement.

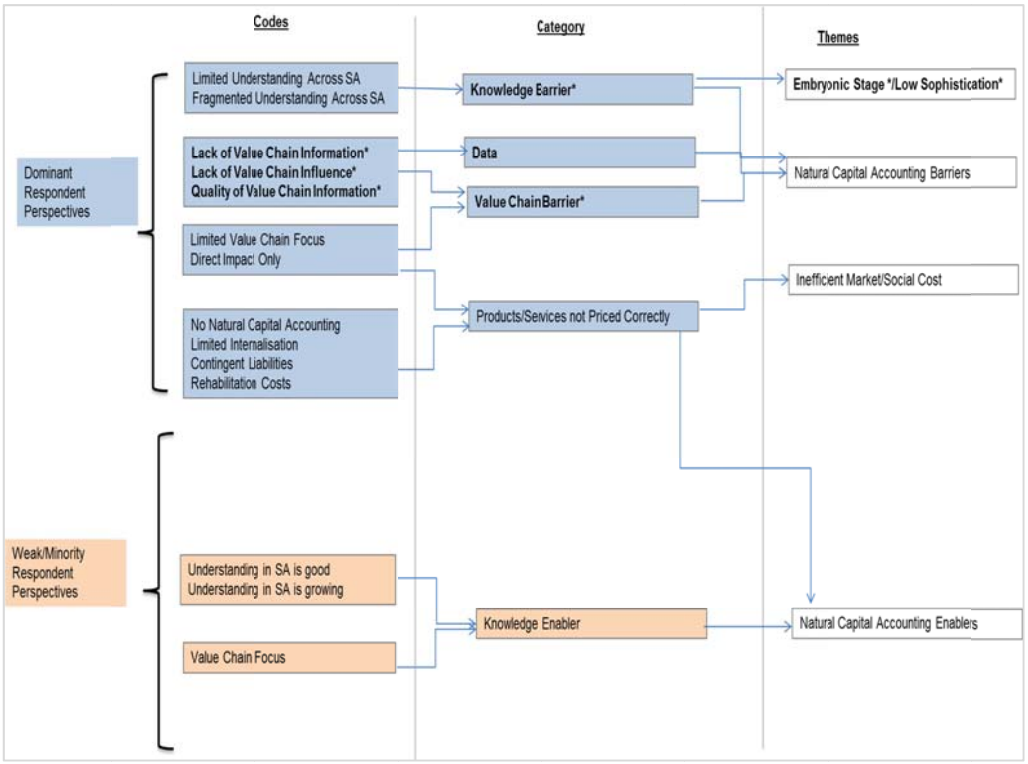
5.4.4. Conclusion: Research question 1

The analysis of the codes summarised by respondents and by industry has given rise to three major families or categories of codes. These are namely knowledge barriers, data and value chain barriers.

The existence of limited internalisation and the non-internalisation of externalities due to no natural capital accounting, when coupled with the limited value chain focus, contribute to products and services not potentially being priced correctly. This aspect is of a strong form or dominant logic.

The linkages between codes and categories are illustrated within the diagram below. The arrows indicate linkages across themes. The dominant logic identifies that natural capital accounting is potentially in its embryonic stage, underpinned by the limited knowledge and understanding in the South African context. In addition, there are numerous barriers obstructing the implementation of natural capital accounting.

FIGURE 2 - Summary of categories and themes from research question 1



The level of natural capital sophistication is low within in South Africa. Since significant barriers exist with regard to the availability of information, its influence is constraining

the organisations. When this aspect is coupled with the availability of knowledge within organisations, there are significant barriers to conduct a complete value chain analysis and natural capital accounting. While natural capital knowledge exists, the limited internalisation of environmental impacts across all industries is creating a burning platform surrounding the true cost of product and services in the market, resulting in a potentially inefficient market..

5.5 Research Question 2

5.5.1. How do organisations report on natural capital?

To ascertain results, respondents were requested to provide insight into how their organisations determine what aspects to report on and their resulting perception of current reporting frameworks. In conjunction, and to provide validity, the researcher reviewed a combination of the integrated reports, annual reports and GRI reports for each organisation. Some limitations included the fact that the 2015 GRI reports for a brewery could not be located online; however, this was overcome through the utilisation of the 2016 reports. Although one of the major banks publishes an Annual Integrated Report, the organisation has not published a GRI report. There was a similar finding for a major food retailer; thus the indicators could not be retrieved. In terms of the organisation's reporting, according to the Head of Sustainability at the food retailer:

> ”W*e do account for carbon, even though… and I think that's probably as far as it goes at this stage.”*

The reports for a total of nine organisations were reviewed, while GRI reports for only seven organisation were reviewed.

The breakdown of the nine organisation are as follows:

- Three organisations were from the mining sector;
- Two from the food retail industry;
- Two from the banking industry; and
- One from the brewing industry.
- These organisations were, Anglo American, Goldfields, Sibanye Gold Pick and Pay Group, Woolworths Holding, Standard Bank Group limited, Nedbank Group limited and SAB Miller.

All organisations were listed on the Johannesburg Securities Exchange at the time of the study. Since the information contained in the organisational reports were extremely rich, the researcher applied a specific lens pertaining to the research question.

The researcher sought to understand the environmental impacts, which were disclosed and the natural capital aspects, which were accounted for, if any. A high level summary of the environmental aspects reported per organisation and the respective environmental GRI indicators are outlined in Appendix 2. This data is complemented with information gathered during the interviewing process. The findings are organised according to the key families identified.

5.5.1.1. Key results: Reporting – materiality analysis

Due the large amount of available information organisations require a mechanism to focus their reporting efforts. A theme, which arose during the discussion from the majority of respondents, is that a materiality analysis is conducted within the organisation to determine aspects that pose a major risk to the organisations' operations.

A mining house defines materiality, within their Sustainability Report, as:

> "*A matter is material if, in the view of the Board, senior management and key stakeholder groups, it is of such importance that it could in the short, medium or long term, have a significant influence on, or is of material interest to, our stakeholders, substantively influences the company's ability to meet its strategic objectives." (mining house, 2015)*

This approach is not limited to a specific sector and one can conclude, that this approach is a generally accepted practice across the organisations and industries. However, the actual aspect reported on differs across sectors according to respondent 7:

> *"They will look at … obviously there're different processes, what's material, what're the big issues, what's the big number. Often, they're guided by global reporting guidelines on the type of things that could be reported, but it's very much an analysis of well,… this is the type of business I am and this is what's*

big in my life, … water use and carbon is a big thing for the mining sector; for the banking sector direct carbon use and water is quite a small issue. Someone else will have … that creates a lot of … chemical processes will have a lot of hazardous waste, so it's all about the industry and analysis over … these are my different environmental touch points, but what are the biggest stuff that actually have a big impact (Sustainability Expert, audit).

While not every respondent elaborated on the aspects they reported on, the review of the published reports indicate that all organisations report on water usage, waste and carbon emission, although voluntarily. This information is summarised in Appendix 2.

5.5.1.2. Key results: GRI and natural capital reporting

An interesting finding established in relation to the perception of the GRI, is that some respondents consider the process a tick box exercise. Although the exact words were only stated by five respondents, two of whom were sustainability experts with the remainder coming from the mining industry and banking, other respondents indicated that the GRI is a compliance activity regarded as onerous. The codes below summarise the various respondent perspectives, which were identified.

TABLE 11 - Summary of respondent perspective on GRI

Respondents' insights	Total number of respondents
GRI indicators assist management	3
GRI lack performance improvement	6
GRI lack sector comparability	2
GRI tick box	5
GRI not a tick box*	2
GRI is compliance	3
GRI is onerous *	4
Mature organisation moving away*	2
Moving toward IIRC	3
Internal reporting KPI's *	4
Only GRI core aspects	3

A contributing factor to this "tick box orientation" could be related to the maturity of organisations. Although this aspect is of a weak form − was highlighted by respondent 15, based on his observation across his client base. The indication is that mature organisations are moving away from the GRI, with mature organisations defined as

those where there is significant board involvement in the process. The resulting perspective is outlined below as evidence:

> *"The ones that are mature are the ones where it's gone into the board and the board has been involved in the process; so that would probably be something that I would use to define the levels of maturity. So I think they have reported for a number of years, the board has been involved in that reporting and the board has been involved in determining the materiality" (Sustainability Expert, audit).*

In pursuit of confirmation of this insight, the commentary provided by the Heads of Sustainability at two mining companies were reviewed, since according to table 11, both organisations have defined internal key performance indicators The review indicates that both organisations had been through an extensive process with their respective boards to define additional indicators deemed material to their business as complementary to the GRI. While the statements below provide evidence, triangulation of the information through the review of the organisations' reports captured in Appendix 2 indicate that the one mining house continues to report extensively on the GRI, while the other one is focusing on core reporting. This could be related to compliance further supporting the GRI as a "tick box" exercise. The summary of the quotation utilised to triangulate the validity have been outlined below:

> "*Most mature clients are moving away from the GRI, I think it's been a really good framework for a lot of my clients to have got started, but more of them are finding that it's perhaps less relevant as they've got mature, it's forcing them to do stuff, which is perhaps not as meaningful and so certainly in South Africa, we're seeing more clients using the integrated reporting framework as a basis and they would apply GRI to help them, but they are no longer hell-bent on being the various levels of GRI, whether it was A, B or C, I don't think I have any clients that are trying or want to be comprehensive now in terms of the GRI, all of them will be core and most of them are just happy to apply the principles and use it to inform their reporting, though I think they are leaning on the integrated reporting framework more" (Sustainability Expert, audit).*

Within another mining house:

> "*I took the GRI G3 a couple of years ago and I used that as an input to see what we could measure in natural capital because the indicators are all there, so all*

the EN indicators were a good guidance to me for what we had to measure; so I drafted a whole bunch of indicators in the natural capital area and I started reporting it to the board on a quarterly basis in 2012 and they were mainly fed off the GRI as a start and then we had a few that we customised and we added what was particularly important to us" (Head of Sustainability, mining).

In the case of another mining house:

"We do have additional KPIs or measurements that are relevant to that specific material issue or any other issue that we believe is important, it will be included in the reporting (Sustainability Manager, mining).

"The GRI is core, but certainly for our strategy and things we want to accomplish, there's another set and for other stakeholders' industry, there's another set, so it's certainly not GRI only reporting, there're other commitments that we've made and other commitments to industry as well as to stakeholders and shareholders that we need to deliver on and those make up, what was the number? "1 800 measurements" (Head of Sustainability, mining).

Additional evidence was gained from the published Anglo American Annual Report. The organisation indicates that a sustainability committee, which reports directly into the board, has been established. This can be interpreted as the organisation having large board commitment, support and the organisation have a sustainability orientation (Anglo American, 2015).

A further factor for consideration and contributing to the contentious perspective of the GRI amongst respondents is related to the GRI having a lack performance improvement. This view is supported by respondents 5 and 7

"I need to really understand the detail; those types of comparisons are useless. So we find that many of those aggregated frameworks become a beauty contest, where everybody competes to have the best questionnaire rather than spending their time improving their performance" (Head of Sustainability, breweries).

"It's very different at the moment, but again, in that way GRI stuff and internal development are still very much only reporting … performance data, not looking

at the outcome or the impact, saying what water did they use, how much waste do they create, how much carbon did they put into the air, etc., it's still historical performance data, it's not impact" (Sustainability Expert, audit).

This could be a contributing factor for the migration of organisations toward the incorporation of their own measures to enable more measurable and focused outcomes.

An observation and common theme amongst organisations, which created integrated reports, is that these reports did not provide adequate information relating to natural capital issues, thus the supplementary report was reviewed. This could be linked to the fact that:

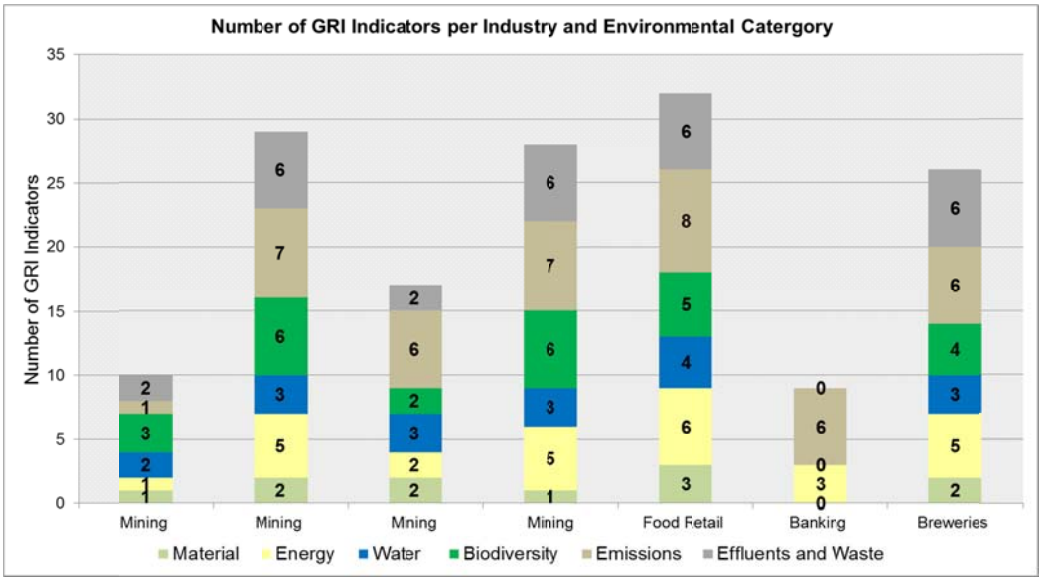
"IIRC tends to favour the people who provide funding to your company as your main audience, but we go a bit broader than that" (Head of Sustainability, mining).

5.5.1.3. Conclusion: Research question 2

The results indicate that organisations incorporate reporting on carbon emission, water usage and waste. Although organisations incorporate GRI aspects into their disclosures, the process is considered mere compliance and there is a movement toward the creation of internal indicators to proactively measure performance aspects relevant the organisation's strategy and what is deemed material. This orientation realises itself when organisations' boards become involved in the process. This can also be perceived as the organisations' sustainability orientation accelerating faster than the progression of the GRI.

While the actual framework is static and lacks performance improvement, the extent of GRI usage remains extensive within the mining sector, the food retail sector and brewing sector, and when coupled with internal metrics, could be contributing to an onerous fatigued reporting process. Figure 3 outlines the GRI reporting patterns per industry.

FIGURE 3- Summary of number of GRI reporting patterns



5.6 Research Question 3

5.6.1. What are the barriers and enablers to achieve full cost accounting for natural capital in South Africa?

As part of the interviewing process, respondents were asked to specify − based on their experience − what are the deemed barriers and enablers to natural capital accounting. In parallel, the researcher inductively retrieved barriers and enablers mentioned during the interviewing process. The key results identified through the coding process are outlined in the sections that follow with underpinning data in support.

5.6.1.1.Key findings: The organisation

One of the aspects, which emerged through the interviewing process, was that there existed a sustainability orientation and leadership support at a senior level within most organisations. The codes' leadership support and sustainability orientation occurred 14 times and 24 times, respectively across the transcripts. This could be argued as a discernible attribute as de facto all organisations are participants in the JSE Social Responsibility Index.

While evidence in support of board inclusiveness and inclination was provided within research question 2 for two mining houses, the transcripts indicate within other organisations (mining, banks and food retail), there is a clear support from the organisations' leadership teams.

> *"From a company perspective, it's a very strong part of culture as an organisation as well as our brand externally, so making sure that we really are leading in terms of the work that we're doing and understanding our impact as well is really important, so that's a big driver.", (Head of Sustainability, food retail).*

While this orientation can be considered a substantial enabler, the respondents also outline that counter forces exist in relation to internal alignment and conflicting priorities in an environment, where there is a perception of economic uncertainty and political instability. These forces and limitations caused by a lack of resource availability added to the constraints.

An observation from respondent 3 was that:

> *"Leadership always does the trick, when anyone's CEO says go and find about XY and Z, 10 people jump up and go and do it" (Sustainability Manager, mining).*

While the leadership support is crucial to advance the organisation's focus toward accounting for natural capital, there remains a void in relation to internal stakeholder alignment.

> *"He gets it, but even if he gets it, but you don't have the support of the operations, then you will hit a stone wall" (Sustainability Manager, mining).*

These barriers to internal alignment include the alignment of practices within the organisations such engineering, sustainability management and accounting. Respondent 13, who is a Sustainability Manager at a major bank, provided a banking sector-specific example to support respondent 8:

> *"It always comes down to how does it impact ROE, so it's trying to get people to think outside of the ROE box essentially. So it's really trying to find a*

language we can speak together between financially-based people" (Sustainability Manager, bank).

The tables below summarise the organisational barriers by responses and industry.

TABLE 12 - Summary of organisational barriers

Respondents' insights	Total number of respondents
Internal stakeholder alignment	6
Conflicting priorities	7
Lack of resources	4

While conflicting priorities lean toward a strong form, further analysis indicates that this issue is of a larger concern amongst respondents from the banking, food retail and brewing industry. Internal stakeholder alignment is a key barrier amongst experts and sustainability managers, while lack of resources is a dominant category amongst the business unit heads.

According to respondent 1, who heads up sustainability at a mining company, these said 'Chinese walls' can be ascended by creating the competencies with the organisation and furthermore packaging natural capital accounting into the language of business.

"*I think part of it is building the capability and understanding and getting the value proposition out there, getting an understanding of that value proposition and does it make sense, it's all about business too and is there a business case around it?" (Head of Sustainability, mining).*

According to respondent 12, Head of Sustainability at a food retail organisation, there may be a business model shift incorporated into this discussion, where organisations are able to quantify significant benefits from going green:

"Efficiency and cost savings are a big enabler and a big driver of momentum" (Head of Sustainability, food retail).

Internally one of the major banking groups is reviewing the mechanism to influence the prioritisation of environment and social aspect in the same manner that economic

capital is prioritised; the intention is to imbed these metrics into the individuals' balanced score cards:

5.6.1.2.Key findings: Frameworks

While internal considerations potentially can be managed through the introduction of performance management systems and stakeholder alignment driven through senior leadership, in order to account for natural capital, consideration needs to be given to the accounting framework. Natural accounting remains notional with organisations raising concerns surrounding the quantification of natural capital. Since no formal markets exist for natural capital, this is the perspective shared by respondent 6, a sustainability expert:

> "*There isn't a defined market for natural capital; there isn't an establishment of value that is consistent across all companies" (Sustainability Expert, mining).*

This is one of the contributors to the orientation of the majority of respondents toward natural capital as being difficult to quantify. In parallel, the lack of a consistent method and availability of systems also contribute as barriers. The table below summarises the respondent's perspectives on frameworks.

TABLE 13 - Summary of framework barriers and enablers

Respondents' insights	Total number of respondents
Barriers	
Difficult to quantify	8
Lack of consistent Methods	12
Systems to capture data	5
Enablers	
Standardised accounting method	14
Intermediary	8

A probable contributor to these factors being raised as barriers could be related to respondents only listing a limited number of valuation tools as part of research question 1. While this is plausible, these barriers were also identified by respondents 7 and 15,

both directors at audit firms, and by respondent 8, who had previous exposure to the material cost accounting method, explained under research question 1:

> "*The systems to collect the data and report on it in organisations …because you can have a good part, but if you don't have the systems and you don't have the right people doing the analysis end-figures, yes it will be difficult for it to apply" (Sustainability Expert, mining).*

Respondent 9 provided an additional perspective to support the conclusion outlined in the table above, stating an important critique of the existing economic paradigm:

> *"We are struggling with that conversion table, "How do you put a value on a rock and then all of a sudden … we don't know how to do it, yet we put a value on a diamond" (Sustainability Manager, banking).*

In light of the above, while knowledge and understanding remain barriers, unless a pricing mechanism, which is acceptable across a multitude of industries, is introduced, a barrier will exist. This barrier may dominantly negate any internal business alignment. Thus, a key enabler amongst respondents, which had a frequency of 33 occurrences across 14 respondents, is the introduction of a standardised accounting method. The framework should follow the iterative evolutionary process of IFRS.

The interpretation of the respondents' concerns and requirements gives rise to key constructs, which this system should consider. A key characteristic of the systems' architectural design is the management of natural capital information; thus, this would resolve constraints and ambiguity-related quality and value chain information.

Furthermore, the systems should resolve for uncertainties surrounding price, education and comparability. Due to the resource constraints acknowledged by respondents, the ideal implementation model will require the implementation of a structure managed by an intermediary. A third-party managed model, coded as intermediary alignment, was mentioned nine times and linked to eight respondents.

While the prevailing business model was not unpacked, an intuitive assumption was that this can reside in the realm of management consulting or an innovative alternative would be a shared value business model. However, given the long-term orientation, which could be associated with said activities, the intermediary should be one, which

has a strong balance-sheet and cash-flow position. While the concept seems plausible for adoption to take place, it will require bold organisations to take bold steps and be willing to disclose the 'heap under the carpet', disguised as a rehabilitation project.

5.6.1.3. Key findings: Institutional factors

Although, when summarised, institutional factors indicate a weak perspective for both barriers and enablers, the majority of respondents indicated that regulation and a push from the investor fraternity could serve as a potential enabler. This enabler was identified by 40% of respondents (6 out of 15 respondents), coupled with a tax incentive, and could be considered as propellers to elevate the business case conversation within organisations. These findings are summarised in table below.

TABLE 14 - Summary of institutional factors

Respondents' insights	Total number of respondents
Barriers	
Regulation	3
Economic uncertainty	2
Political instability	1
Investor requirement	1
Enablers	
Regulation	6
Tax Incentive	3
Investor requirement	6

In addition, respondent 9 raised the point that surrounding regulation was a weak enabler. A further insight, which was only raised by respondent 9 , could be a blind spot among the majority of organisations and lead to a mega trend, creating greater burning platform than that of regulation. Respondent 9 proposed that society at large will move toward a pro-sustainable development philosophy. He envisioned that future generations will naturally migrate away from organisations that are not environmentally-conscious and would not invest in such companies.

The extent of this migration will result in future generations not seeking employment, product or services from these organisation, resulting in a reduced market for services from non-environmentally-conscious organisations. Should this force gather adequate momentum, it has the potential to disrupt organisations.

"Regulation, especially the law, the law always specifies the lowest common denominator. It does not let you do more than the absolute minimum, so the law and regulatory compliance only sets the lowest possible standards. we cannot wait for regulatory developments, generation Y society moves much quicker than any regulatory system you can develop, so regulation sets the bottom tier and say that's it, below this you are unlawful and we will fine you or send you to prison, but it's not an industry leader, it's not an industry pointer" (Sustainability Manager, banking).

"The Y's are just,… look, either you tell me what your impact is or I move my money. It's as simple as that. So, I don't think business needs to move, I think society forces us to move" (Sustainability Manager, banking).

While these stated enabling factors may be considered an island, in the interest of confirmability of this proposal, when considered with the perspective presented by an audit firm that society has the ability to influence business (KPMG, 2014) and the view that, "As our technologies make hyper-connectivity the norm, we all have the potential to be citizen activists "(Visser, 2016), which was demonstrated in the 2015 *#fees-must-fall* social activism in South Africa, this ideation is plausible.

Another code, which emerged as an enabler, was the support of investor requirements. This perspective was shared by experts, sustainability managers and sustainability heads, signalling that the investor community is slowly increasing their consciousness toward environmental activities.

An additional factor raised by respondents 14 and 15, raised concerns around the political climate and economic uncertainty facing South Africa. These factors influence the prioritisation within organisations. Their view is that if these macro aspects are not resolved, organisation will remain short-term focused on survival. As a result, the long-term investment required to migrate toward more sustainable technologies becomes secondary to the organisation, especially return of capital has a shorter-term orientation.

5.6.1.4. Conclusion: Research question 3

There are numerous barriers to achieve natural capital and externality accounting within South African organisation. These barriers are linked to the intangible nature of natural capital, organisational aspects such internal alignment, lack of resources and prioritisation and institutional factors such as regulation and investor requirements. The key categories, which emerged, are that there is a need for frameworks and institutional enablers, while within the organisations, internal alignment and lack of resources coupled with conflicting priorities create barriers.

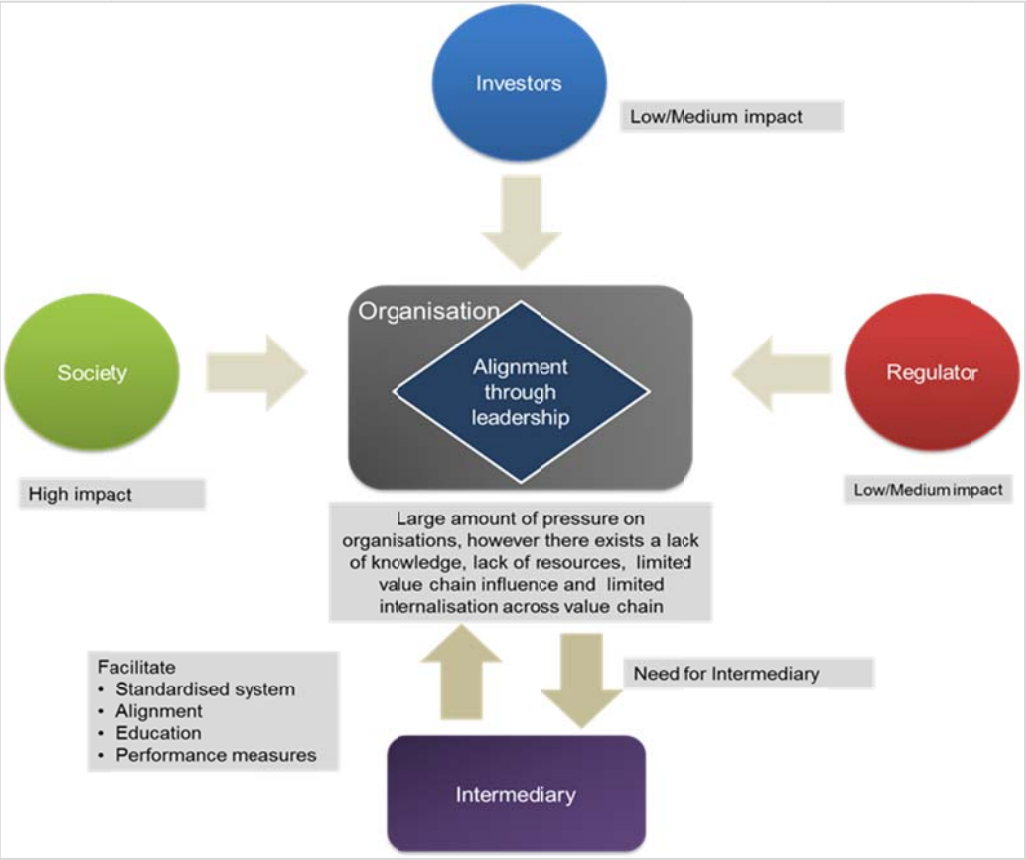
While there exist conflicting priorities within the organisations, leadership support can assist to drive alignment within the organisations. In order to progress to an environment that accounts for externalities, organisations require a concise, consistent and comparable framework, which provides organisations with an algorithm to account for natural capital, which is considered intangible. Due to the lack of resources and the limited knowledge base (if any), the results indicate that a constructive approach would be for organisations to seek the guidance of a third party intermediary to manage the substructure and enable the incorporation of natural capital accounting in their business processes.

In parallel, regulation can provide the push required to move organisations toward the implementation of natural capital. Although weak, this force will create a response where the organisational response is stretching only to adhering to minimum standards.

A positive outcome and movement may arise, should investors increase their requirements of organisations with regard to environment impacts. The ultimate shift could be a ‘South Paw’ impact driven by society who today bares the unaccounted-for costs not internalised into goods and services. The shift could be influential regardless of the prevalence of economic headwinds.

The conceptual model outlined in the diagram below has been developed on the premise of information provided into evidence from the interpretation of the qualitative results. The model that will be discussed in Chapter 6 provides an enablement model and encapsulates the key factors, which will enable the migration toward an operating environment, where externalities are internalised and natural capital accounting is implemented.

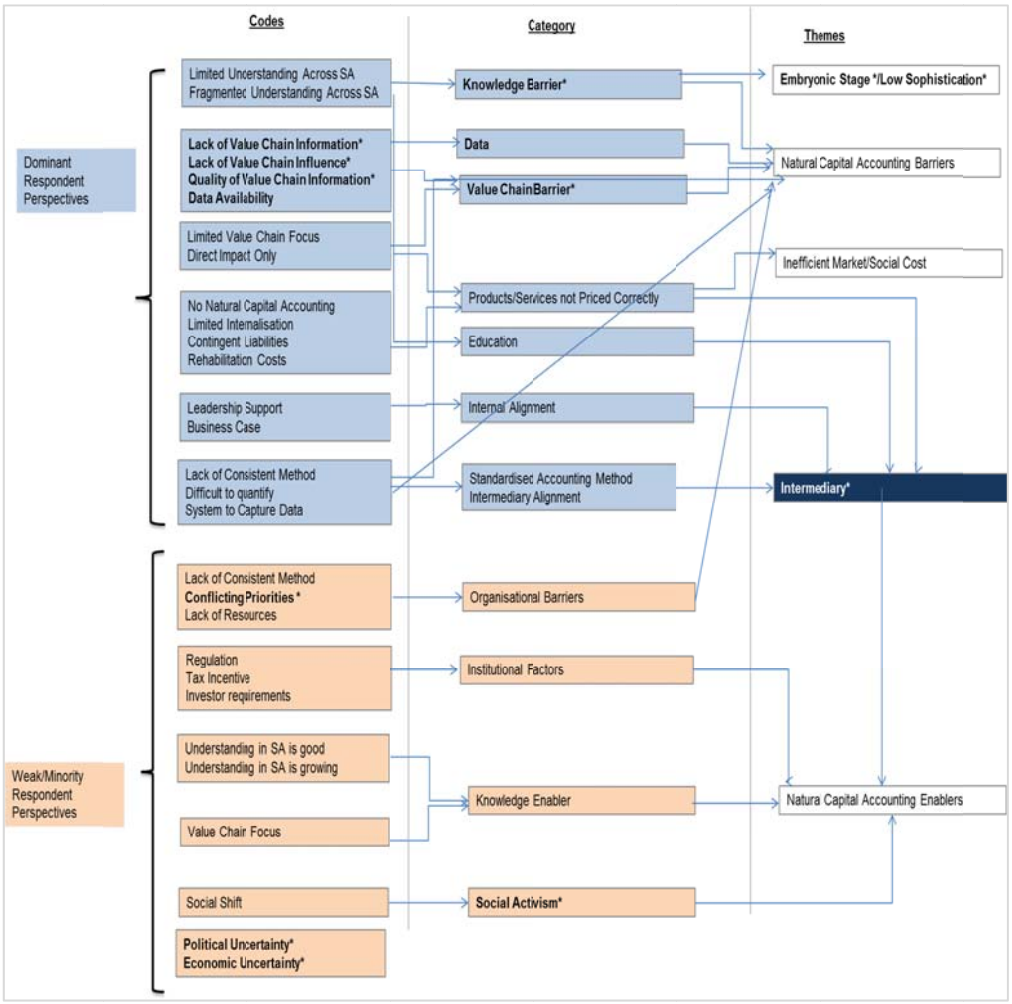
FIGURE 4 - Conceptual model for enabling natural capital accounting in South Africa (authors own)



5.7 Summary of thematic analysis

The illustration below summaries the linkages between key codes, categories and themes outlined during the review of information gathered through the interviewing process.

FIGURE 5 - Summary of thematic analysis



Chapter 6: Discussion of Findings

6.1 Introduction

This chapter considers the qualitative results outlined in Chapter 5, which were generated following 15 semi-structured interviews against the literature base presented in Chapter 2. The intricate process will apply a critical lens to the results. This process will seek to acknowledge contrasting results and alignment to the existing thought leaders. The relevance of the conceptual model will also be considered. The overall intent of this research, which is of exploratory nature, is to provide insight into how organisations in South Africa understand, measure and report on natural capital, while − in parallel − seeking to understand what individuals in the field of sustainability deem to be the barriers and enablers to natural capital accounting.

The results indicate that while natural capital and externalities are understood at a conceptual level, the actual accounting for externalities is not being undertaken, with only limited internalisation. This lack of internalisation results in goods and services not being priced correctly due to a lack of information available to the market. The level of sophistication amongst organisations is at an embryonic stage.

In addition, reporting frameworks are considered largely a compliance tool and superseded with the introduction of internal metrics. Beyond the limited understanding of natural capital accounting, the barriers include factors internal to the organisations, such as lack of resources, stakeholder alignment and conflicting priorities. Natural capital and the resulting externalities are believed to be difficult to quantify due to the lack of consistent methods and systems. At an institutional level, the lack of regulation and macro factors such the political and economic climate contribute to barriers.

The key enablers include the stewardship of leadership for internal alignment, and the introduction of an acceptable standardised accounting framework. However, due to organisational constraints, this requires a third-party intermediary to facilitate and manage the process. The introduction of regulation, tax incentives and the investor requirements could motivate organisations to internalise externalities, while the key contributor could be a societal requirement stemming from the unwillingness to accept the social cost.

6.2 Comparison of results with literature

6.2.1. Research question 1

6.2.1.1. Knowledge barrier

A dominant theme that emerged in Chapter 5 is that knowledge barriers exist in South Africa. This theme is underpinned by the finding that there is a limited understanding of natural capital accounting in South Africa and this limited understanding is a contributing force, restricting the advancement toward a system, which internalises externalities, while organisations outside of South Africa, for example Puma or Safaricom, are conducting environmental accounting. This finding is supported by Angonese and Lavarda (2014), who proposed that one of the dominant factors counteracting and influencing changes in management accounting practices is a lack of knowledge.

6.2.1.2. Scope of management

Jasinski *et al.* (2015) identified that organisations have narrow system boundaries, which implies that their natural capital focus is limited to the consideration of impacts deemed internal and those direct to the organisation rather than those across the entire value chain.

A similar finding was identified in the results outlined in section 5.4.2.2. There is an indication that organisations are struggling to understand impacts across the entire value chain and as a result, continue to focus on impacts within their locus of control and have rather limited value chain focus.

The results further indicate that several challenges are constraining the organisations' ability to measure impact across the value chain; these include the lack of information, the lack of influence, and the poor quality of data. Liu *et al.* (2010) in support, acknowledged that there is significant complexity linked to the fact that no formal economic market for natural goods and services actually exists, while influence is a new factor that emerged and remained a risk, especially within organisations (Vermeulen, 2015).

Potentially, procurement and relationship building can be leverage to reduce impact. Porter and Kramer (2011) described natural capital as an important consideration within the organisations' procurement strategies and through information sharing, organisations can improve supplier quality, resulting in stronger suppliers with less environmental impact (Isada & Isada, 2014).

While in section 5.4.2.2, respondents associated with a major mining house promulgated their reliance on procurement to influence and include accountability amongst suppliers; in contrast, organisations such as a major food retailer undertook accountability across their value chain; this could be inferred as differing cognitive frames of the organisations.

While there is a consensus from the majority of the respondents that there exists a sustainability orientation, the internalisation of externalities remains weak or non-existent. Figge (2014) provided an explanation for this potential gulf, identifying that the business case frame has a narrow focus toward sustainability issues, while the paradoxical or sustainability cognitive frames consider broader factors and the data gathering is onerous and resource intensive.

6.2.1.3. Measuring natural capital

The review of the results in section 5.4.3.1, in comparison to the various existing valuation techniques articulated in the in the literature review, indicate that while there is a relative awareness of sustainability management and environmental rehabilitation efforts by organisations, there is an overarching lack of sophistication when it comes to natural capital accounting methods. This is attributed to the finding that there is a limited internationalisation to lack of natural capital accounting. The extent of internalisations is limited to the quantification of carbon and water, while within the mining industry, most organisations cater for rehabilitation cost or contingent liabilities. In comparison to the existing literature, the dominant conventional accounting techniques include assessing the rehabilitation damage cost and cost restoration (Jasinski *et al.*, 2015).

An obvious similarity was identified between the dual discounting methodology proposed by Kula and Evans (2011) and the sustainability valuation assessment by a major mining house. While this approach provides decisionmakers with information and

considers externalities from the organisation's perspective, the approaches within this methodology are deemed complex by Blignaut, Aronson, and de Groot (2014) as well as by Ring *et al.*(2010). The complexity of the method is innate in the discounting approach, while discount rates seem plausible, finding the appropriate discount rates for projects that deliver irreversible changes will present a major conundrum *(*Ring *et al.,* 2010) and may not be uniform across the industry. While the value can be debated, the process is directionally sound according to van den Belt and Blake (2015), who believed that discounting projects according to environmental impacts provides investors with a mechanism to recognise the value of natural capital.

The consequence of the limited internalisation, coupled with the lack of impact assessment across the value chain and the demonstration by way of commentary provided surrounding the example of the material flow accounting process, indicates a basis for goods that potentially are not priced correctly. This identified inefficiency is supported by the literature, which indicates that if the market is truly efficient, the market prices for products and services should reflect the total cost of social and environmental externalities (Jasinski *et al.*, 2015).

The TRUEVA method, which was not identified as methodology utilised by respondents, recognises that there is unaccounted-for risk among organisations (Thomas *et al.*, 2007), thus risk exists. The findings by Epstein *et al.* (2011) support that should cost be internalised, the price of products and service will spiral upwards; however, until such time, this market failure contributes to the sum total of the intergenerational debt (Bottero *et al.*, 2013).

While the resulting knowledge base remains low, methods such as the economics of ecosystem and biodiversity (TEEB) account for market failures and the estimation externalities, which includes understanding the value that social groups place on ecosystems and services (Ring *et al.,* 2010).

6.3 Comparison of results with literature

6.3.1. Research question 2

6.3.1.1. The Global Reporting Initiative (GRI)

There is a cross-industry perspective, which emerged from the results, providing support for the notion that the GRI is considered a “tick box” exercise and compliance activity rather than value adding.

The results provide acceptable support for the researcher to enter the current narrative in alignment with Milne and Gray (2013), as well as van Zyl (2013). The “tick box” finding provides factual support for van Zyl’s (2013) critique of reporting in South Africa being a tick-box checklist, not delivering improvements toward sustainability (van Zyl, 2013). In addition, the argument positioned by Milne and Gray (2013), which suggests that the Global Reporting Initiative (GRI) is an insufficient framework is supported. In parallel, the arguments for lack of value-add pronounced by prior research are supported by the result of this study, which indicates that a lack performance improvement is derived by management.

Although raised by a minority of respondents, there is evidence that opposes the posture toward GRI providing a comparable output, which was the position of Michelon, Pilonato, and Ricceri (2015). Instead, the framework is considered to have a lack of comparability by some, with mature organisations migrating away. The evidence indicates that the organisations’ maturity is an underpinning factor contributing to this perspective on the reporting framework.

The organisations’ evolution, supported by the board, is resulting in the definition and inclusion of additional indicators deemed material to their business being used complementary to the GRI. This finding is interesting since organisations are taking this approach even though the Global Reporting Initiative’s (GRI), in acknowledgement of the unique sustainability issues per sector, has created GRI sector supplements, (Global Reporting Initiative, 2013).

The introduction of additional relative metrics provides a contrasting view to van Zyl's (2013) argument that South African organisations are not actively incorporating environmental impacts into their organisations' business strategies, while the results from research question 1 indicate a lack of internalisation, align. Although not tested, this combination could indicate a potential disconnect exists between reporting and actual accounting.

Soyka (2013) viewed integrated reporting as a tool influencing the investment decisions of stakeholders. While organisations seem to be moving toward an integrated reporting framework, integrated reports are already in use, but they lack detailed information pertaining to natural capital issues.

Finally, the review of the quantity of GRI aspects complement the findings by Maubane *et al.* (2014) that mining organisations have a large environment reporting focus, while overall, retailers have a lower environmental focus. The results indicate that a major food retailer may be deemed an outlier due to the organisation's accountability across the value chain and their focus on environmental reporting, which also provides further support for the organisations having a sustainability orientation.

6.4 Comparison of results with literature

6.4.1. Research question 3

6.4.1.1. The organisation

The findings discussed with regard to research question 1 indicated that the organisations' attempt to increase the scope of natural capital management across the value chain is constrained by the inability to influence the value chain, the lack of available data and the lack of quality information. In parallel, the results gathered relative to barriers indicate that organisations are faced with conflicting priorities. There is a lack of resources and a lack internal alignment. The resources barrier was identified as a contributing factor to resistance to implementation of management accounting systems by Angonese and Lavarda (2014).

The researchers also identified the lack of acceptance among organisations' leaders as a barrier (Angonese & Lavarda, 2014). However, where there is acceptance and leadership support, this factor is a key influencer to driving the integration of environmental considerations within the organisation (Wagner, 2015).

This perspective also aligned with the results in section 5.6,1.1 that indicated that the majority of organisations have board support and a sustainability orientation, thus if institutional and methodological barriers are overcome, the organisations' leaders can enable alignment. The results indicate the utilisation of a balanced scorecard as an HR approach to influence the sustainability focus within the organisation. While this aspect was of a weak form because the proposal was only utilised by one organisation, the finding was supported by Hahn *et al.* (2014), who indicated that this approach can enable sustainability as core focus within organisations.

The results supported by literature confirm the acceptability of the organisational component of the conceptual model outlined in section 5.6.1.4. This component is illustrated below.

FIGURE 6 - Organisational component of conceptual model

6.4.1.2. Frameworks

The findings indicate that key barriers to accounting for externalities and natural capital circulate around the perceived intangible nature of the environment, thus being difficult to quantify and lacking a consistent quantification method. Furthermore, the systems to capture the data remain a barrier. These aspects have also been highlighted by Stilwell (2015), who indicated that dominant monetary valuation logic impedes the internalisation of natural capital, with lack of information inhibiting the actualisation of a monetary relationship.
In addition to these aspects, it was acknowledged that there is a lack of systems to capture data related to natural capital. Stilwell (2015) indicated that if the market has an understanding and scientific indication as to the value of natural capital, organisations have the ability to internalise such externalities.

While these barriers serve as external constraints for organisations and have the potential to nullify leadership efforts to rally the organisation internally toward sustainability focus, enablers to overcome these hurdles do exist.

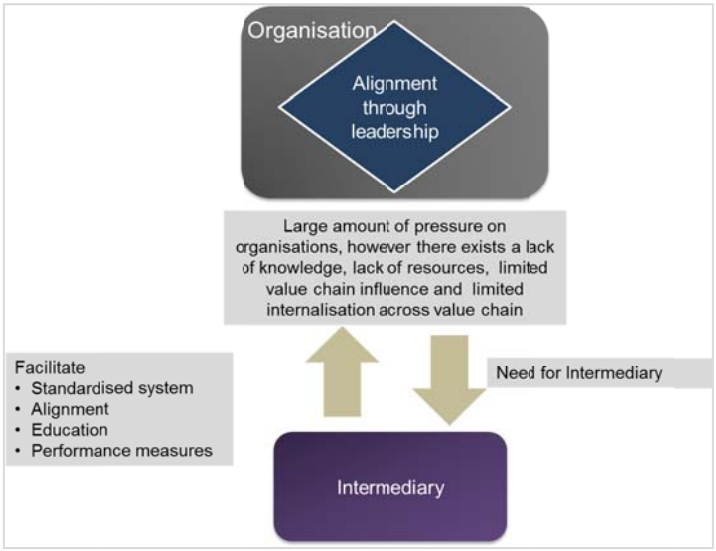
The iterative evolution of conventional accounting architectures to the current international financial reporting standard (IFRS) provides organisations with a practical model to internalise conventional economic aspects within their respective businesses through educated practitioners; thus, the introduction of acceptable standardised accounting models that are managed and evolved under the stewardship of a third-party, given the organisations' resource constraints and lack of knowledge, is a required outcome.

This finding identifies a burning platform within organisations and accounting practices. The literature identifies that in other markets, the economics of ecosystem and biodiversity (TEEB), which a non-governmental organisation has standardised, true cost accounting introduced tools and policies (Jones-Walters & Mulder, 2009).

In addition, the natural capital protocol is focused on creating a framework that enables the reporting and capturing of credible, consistent and reliable information (NCC, 2015). The literature provides support for the identified barriers, and enablers are currently being implemented through intermediaries to address these voids.

Furthermore, the literature provides support for the intermediary requirement in the South African market as outlined in the conceptual model presented in Chapter 5. This component is illustrated in figure 7 below. .

FIGURE 7- The need for an intermediary



In the South African context, the intermediary would support the advancement of the academic and business knowledge surrounding natural capital accounting and close the identified void.

6.4.1.3. Institutional factors

The environment in which South African businesses operate is of great importance since regulation, or institutional requirements or lack thereof influence the rule of the game. Institutional consideration, although identified as weak contributors to barriers and enablers, indicate that regulation, economic uncertainty, political instability and investor requirements are existing barriers, while regulation, tax incentives and investor requirements are prevalent enablers.

Although regulation can contribute to the momentum required to enable the business case for internalisation of externalities, it may attract limited conformance. Schandl *et al.* (2015) provided evidence from the literature and identified economic policy as a useful enabler, while Wagner's (2015) findings indicated regulatory considerations are weak contributors, but do influence environmental considerations within organisations.

Luo *et al.* (2013) increased the frequency of support for regulation and signalled that legal frameworks prove as motivators for organisations to focus on products and processes, which are renewal and have less environmental impact, while in parallel, greater levels of reporting enable organisations to advocate their efforts to stakeholder (Luo, Lan, & Tang, 2012).

Although the results indicate that the investor orientation and requirements are an enabler, social, economic and legal aspects are key influencers, while investors have less influence (Luo *et al.*, 2012)

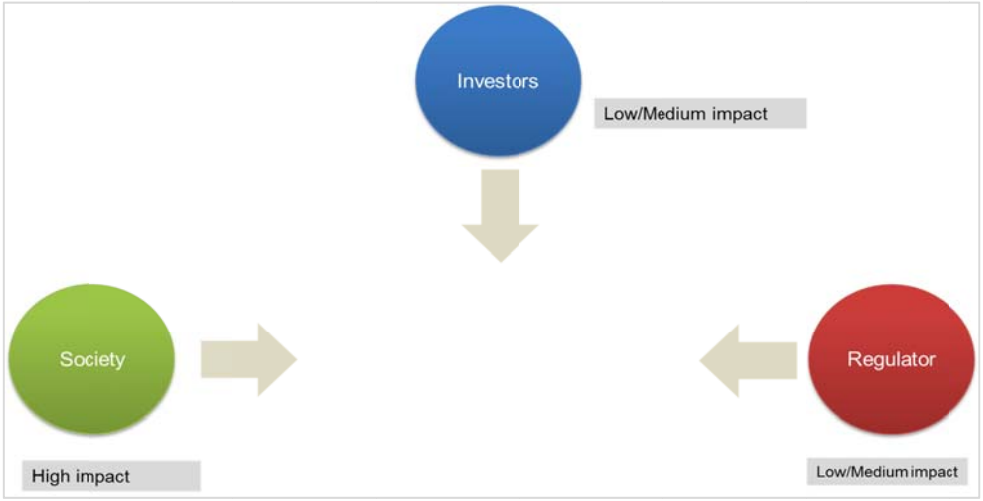
6.4.1.4. Social activism

The ultimate enabler and one that cannot be ignored nor passed over, the pricing chain will be borne from the societal demands for organisations to become accountable for the impact their operating activities have on the environment, resulting in reduced market demand for products or services that are not environmentally conscious.

Should this force gain momentum, it has the potential to disrupt organisations. In cases, where natural capital accounting is neglected, the market failure is unknowingly accepted by society (Ring *et. al.,* 2010). However, a lack of knowledge does have an expiry date and once the disruption has created adequate momentum, it has the potential to create major impact. The findings by Epstein *et al.* (2011) support this argument and estimate that the internalisation will result in true costing and result in social consumption being focused on efficient products. However, should it remain unaccounted for, the future generations will bear this undemocratic burden (Bottero *et al.,* 2013).

The results, supported by literature, provide acceptable grounds for regulatory, social and investor forces being enablers to advance natural capital and externality accounting in South Africa. These forces, which have varying degrees of impact, have the potential to influence the organisational focus and create the case for realignment and prioritisation of natural capital. The combination of institutional forces are summarised in figure 8 which follows.

FIGURE 8- Institutional forces



6.5 Conclusion

The comparison of results outlined in Chapter 5 against the existing literature base indicates that there is evidence for the acceptability of the outlined conceptual model to enable natural capital and externality accounting in South Africa. This validation also raises the issue that an institutional void exists, while the potential inefficient markets − stemming from the lack of internalisation for product and services − is creating unquantified social cost.

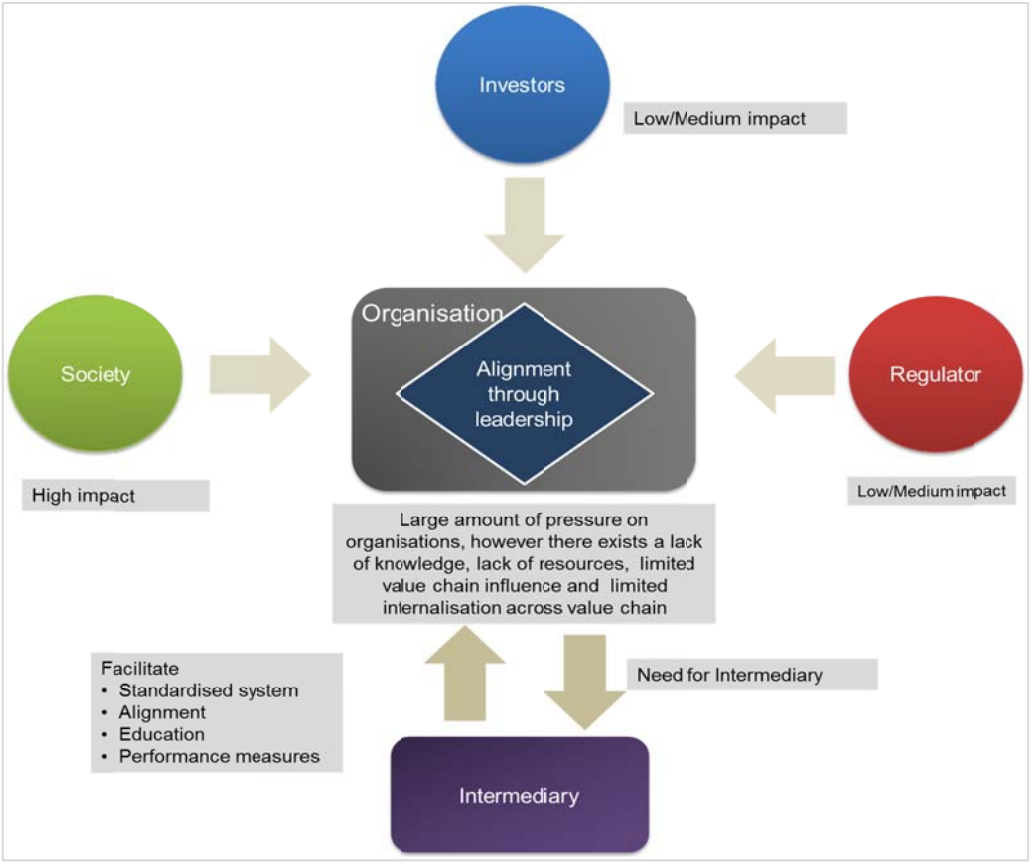
The evaluation indicates that the objectives of research question 1 has been met. While the understanding and measurement is embryonic, the inherent movement of organisations toward sustainability provides a promise of future accountability.

The findings in research question 2 provide resolve for existing proposals around the Global Reporting Initiative held by researchers. The objectives were deemed partially met due to the unavailability of published information limiting the comparison between organisations in similar industries.

In terms of research question 3, the objective was exceeded, leading to the development of a conceptual model (figure 9) outlining enablers for natural capital accounting, which was furthermore validated by literature. The findings surrounding the intermediary provide resolve for the existing institutional void in South Africa.

The resulting forces − while strengthening the organisational focus − also enable the migration toward a green circular economy thinking, which has the ability to deliver positive externalities.

FIGURE 9 - Conceptual model for enablement of natural capital accounting



Chapter 7: Conclusion and Recommendations

7.1 Principle findings

The main objective of the study was to explore the understanding and level of sophistication of the natural capital measurement method, while understanding the potential barriers and enablers to accounting for natural capital and externalities.

The four key findings were:

- Natural capital accounting remains conceptual and has been superseded by conflicting priorities, the lack of internal alignment and limited knowledge on the subject within organisations and the market. The insufficiency of reporting frameworks contributes to the organisations' ability to correctly measure and manage environmental aspects in an impactful way. The combination lends itself to inefficient pricing of goods and services.

- While numerous barriers exist within organisations there remains an institutional void in South Africa. While leadership can assist with organisational factors, their efforts may be prejudiced and seen as inefficient, if the institutional void is not dealt with. The prevalence of these voids is impeding the advancement of internalisation practices and natural capital accounting. There is a need for clear regulation with incentives and above all, the positioning of an intermediary that can align with stakeholders and support organisations through the change process.

- The resulting resolutions that can be delivered through the intermediary include a standardised and acceptable accounting framework to enable access to quality information for internalisation. The lack of resource presents an employment opportunity and the development of knowledge workers to support a sustainable South Africa, thus the intermediary has a functional role to play within the economic environment, creating positive societal spill-overs.

- Although investors and regulations will have an impact, the ultimate shift will be delivered by the evolution of the societal consciousness on this topic and thus organisations that act first may have the opportunity to derive significant

competitive advantage in the long run; however, until such time, the inefficient market and social cost remain.

7.2 Implications for management

It is important for organisations not only to begin preparing for different futures, but also taking an active role in defining a future that creates a zero-sum game for negative externalities and one that creates truly shared value through positive externalities. Directionally as the first step, organisations should begin to adjust their focus and consideration toward the internalisation of externalities related to natural capital. Although natural capital accounting is deemed to be at an embryonic stage in South African organisations, should organisations seek to attract international investors, these requirements will filter through into their businesses or in the case of acquisition and mergers, it will have the potential to discount the innate organisational value.

The upskilling of resources is a key requirement and organisations should begin to develop competencies relating to natural capital accounting within their organisations. The quantification using a mature method can enable organisations to develop contingencies and processes, which reduce the impact on the environment. The giant leap will be realised through the introduction of circular economy initiatives and could enable the organisations to improve their bottom-line through significant efficiencies and decouple from environmental volatility.

The narrative needs to move beyond shared value toward the integrated value creation (Visser & Kymal, 2015). Where organisations have high dependency on water resources as a primary input with no or limited substitutes, the organisation could seek to move into developing more efficient salinisation technologies or alternatively work with local bodies, advancing to prioritise best utilisation of available water, while ensuring the sustainability of the community. The benefits of correctly pricing water, biodiversity and ecosystem services through natural capital computational methods will weed out inefficient, extractive business models that create large unaccounted-for costs on current society and future generations.

The orientation of the social posture toward ensuring the sustainability of the environment will challenge organisations to change their business models. Where an organisation’s brand is deemed to act in a manner that is contradictory to the belief

systems of future generations, this business model will be disrupted by social activism. The recent #fees-must-fall narrative in South Africa has demonstrated the power of social activism, fuelled by the additive of electronic word-of-mouth.

The business sector is not alone, intermediaries can assist to close the exiting void, enabling organisations to mitigate against the potentially rising headwinds and create businesses that consumers deem positive and investors deem sustainable.

7.3 Limitations of the research

The time allocated to conduct the research, access to subject matter experts and resource availability are limiting factors to the study undertaken. When coupled with the maturity of natural capital accounting, it limited the extent of the narrative surrounding how organisations measure natural capital. Another factor, together with the time constraint, given the extent of the scale of information contained in each organisation's sustainability report or integrated report, there was a limitation on the information the researcher was able to extract and include into the narrative for research question 2.

A total of three of the respondents were employed for a short period within their respective current organisation, thus their understanding of the organisation's practices is limited to their scope of work and time orientation within the organisation. The individuals may or may not have an in-depth perspective on all aspects of culture. In contrast, two respondents spent in excess of 10 years within their organisation, which in turn restricts their understanding of other organisations in South Africa.

Due to the extent of information gathered as part of the interviewing process, which amounted to circa 180 to 200 pages, the researcher may have neglected to include certain narratives from the respondents. While this was mitigated to an extent by the multiple-coding review and processing approach, this limitation still exists.

Due to the qualitative research design and the fact that only 15 interviews were conducted, the research may not be representative of all listed organisations in South Africa.

7.4 Suggestions for future research

The four main recommendations for future research are:

- Decisions can be improved by exploring avenues, which assign monetary values to environmental resources and services that remain undervalued or unvalued in the existing accounting and economic paradigm. In this process, we must take into account the limited or non-existing knowledge of the working of ecosystems and the value of said natural resources in a particular market.Thus, future research should seek to create a relational link between ecosystem services and the value these services offer to business and society in pursuit of creating and defining a comparable and acceptable natural capital accounting framework, which organisations can implement into their operational and strategic decisionmaking.

- In parallel, to advance the narrative, research should consider the implications of applying TRUEVA to the reported financials of listed organisations to determine whether these organisations are truly valued correctly and furthermore sustainable. The externality, which could arise from this research, such as the implication of pension fund investments and the South African economy, should be considered and approached with care. Ultimately this will challenge fund managers to re-consider investment decisions and industry players to rehash their environmental strategy (Thomas *et al.,* 2007).

- There is also a need for future research to seek to quantify and understand the impact of externality reporting disclosures by South African organisations and the link between investor and stakeholder perceptions, understanding how the share price of organisations is impacted. Should the carbon tax legislation be implemented in South Africa, post implementation, the study will provide rich information into how the South African capital market views these disclosures and non-disclosures as opposed to international markets. Lee, Park, and Klassen (2015) observed that voluntary carbon emission disclosures are perceived negatively by capital market investors due to having negatively impacted market returns.

- Finally, the enablement model outlined in Chapter 6 should be tested quantitatively to identify potential blue ocean solutions, which organisations can employ to maintain economic capital while internalising externalities.

7.5 Conclusion

The main objectives of this study have been exceeded. The study has revealed that the natural capital accounting knowledge base in South Africa remains low and requires attention. While several factors posing as barriers have been identified across various sectors, there is an opportunity to enable a shift toward internalisation of externalities. The enablement model presented is a pioneering step and provides an indication of the requirements to advance the natural capital accounting narrative within South Arica.

The findings, underpinned by a rigorous and well-structured qualitative process, during which 15 interviews were conducted across four different industries, align to literature, while presenting unique learning for South Africa. These unique factors include the need for management systems to reflect the realities of natural capital instead of operating within an unquantified constraint. The shared value approaches will remain notional marketing messages without this true reflection. The lack of resource needs to be addressed with resourcefulness, and organisations need to move to a virtuous circular model before the finite environment of business is exhausted.

The process of quantifying the value of natural capital and the enhancement of sustainable decisionmaking will require a collaborative effort. The increase in the quality of information and knowledge flows can be realised through the convergence of environmental economics, mathematics and information technology. To achieve the transition toward natural capital accounting, the existing institutional voids and market inefficiencies can only be overcome through the introduction of an intermediary to support the inclusion of the new economic paradigm as organisations remain constrained and lack sophistication. In parallel, social, regulatory and investor requirements will prove to be vital enablers to progress the macro posture toward adopting full cost accounting for natural capital.

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Appendix 1: Consistency matrix

TABLE 15 - Consistency matrix

Research question	Literature review	Data collection tool	Analysis
Research question 1 : How do South African organisations understand and measure natural capital?	Angonese & Lavarda, (2014) (Blignaut, Aronson, & de Groot, 2014) (Epstein *et al.*, 2011) (Gao & Bansal, 2013) (Isada & Isada, 2014) (Jasinski *et al.,* 2015) (Jones-Walters & Mulder, 2009) (Liu *et al.,* 2010) (Miles *et al.,* 2012) (Porter & Kramer, 2011) (Reyers *et al.,* 2010) (Thomas *et al.*, 2007) (van den Belt & Blake, 2015)	Open-ended questions in semi-structured Interviews to gather qualitative information.	Content analysis using coding to identify patterns, similarities and differences.
Research question 2: How do South African organisations report on natural capital?	(Adams *et al.*, 2013) (Aldy & Stavins, 2012) (Gray, 2010) (Lee *et al.,* 2015) (Lotz & Brent,2013) (Matisoff *et al.,* 2013) (Milne & Gray, 2013) (Schandl *et al.,* 2015) (Soyka, 2013) (Wagner, 2015) (van Zyl, 2013)	Review of integrated reports followed by open-ended questions in semi-structured interviews to gather qualitative information.	Content analysis using coding to identify patterns, similarities and differences
Research question 3 : What are the barriers and enablers to achieve full cost accounting for natural capital in South Africa?	(Figge, 2014) (Hahn *et al.*, 2014) (Kolk, 2010) (Luo *et al.,* 2012) (Luo *et al.*, 2013)	Open-ended questions in semi-structured interviews to gather qualitative information.	Content analysis using coding to identify patterns, similarities and differences

	(Ring *et al.*, 2010) (Rout, 2010) (Slawinski & Bansal, 2012) (Stilwell, 2015) (Visser & Kymal, 2015) (Yuan *et al.,* 2011)		

Appendix 2: Summary of reporting by organisation.

TABLE 16 - High level overview of organisational reporting

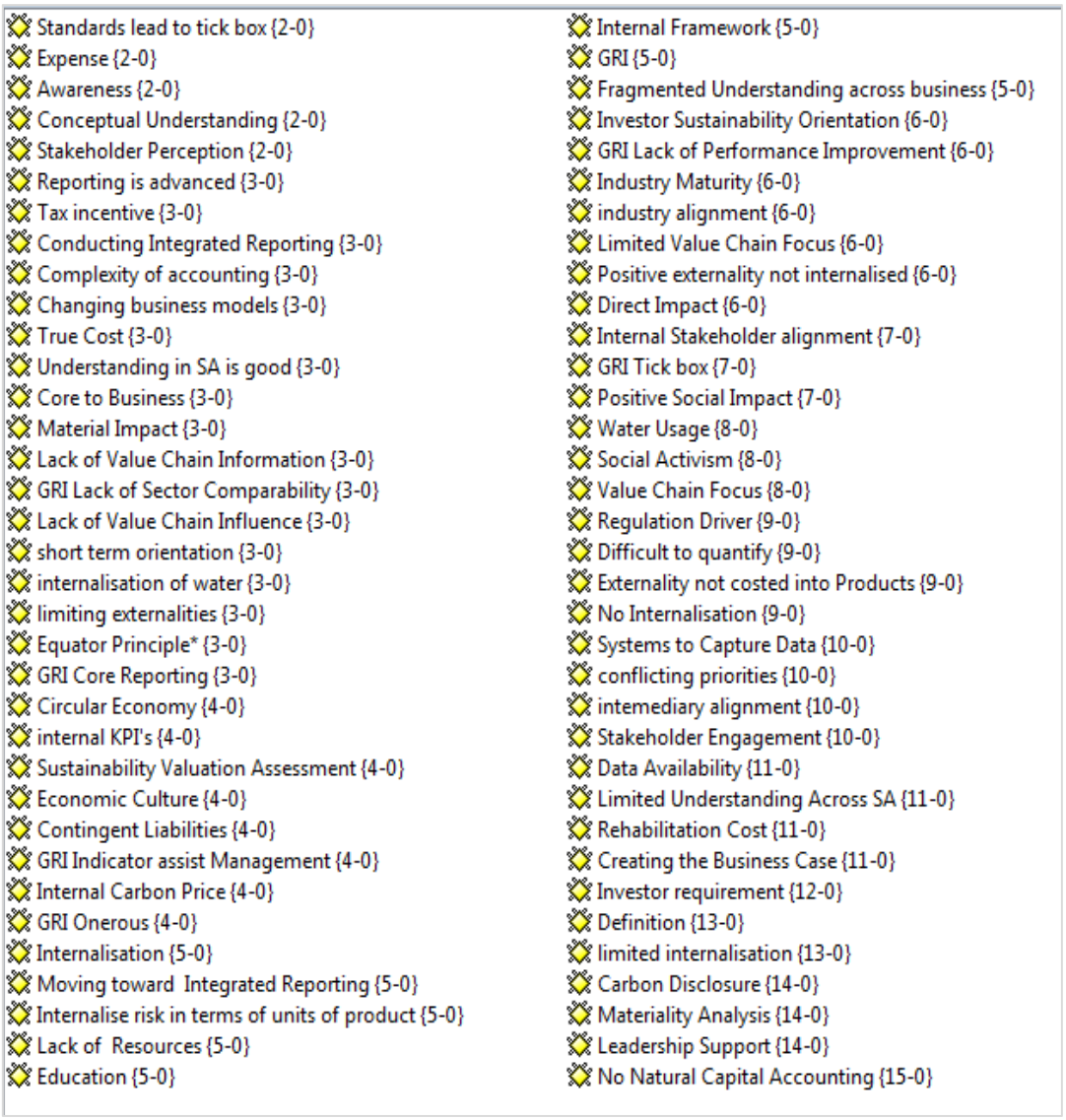
		Summary	Summary	Summary	Summary		Summary	Summary	Summary	Summary	Summary
Organisation Name		**Anglo American**	**Gold Fields**	**Sibanye Gold**	**Exxaro**		**Pick and Pay**	**Woolworths**	**Nedbank**	**Standard Bank**	**SAB Miller**
Sector		**Mining**	**Mining**	**Mining**	**Mining**		**Food Retail**	**Food Retail**	**Banking**	**Banking**	**Breweries**
Natrual Capital Aspects											
Carbon Emissions											
Scope 1		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes
Scope 2		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes
Scope 3		No	Yes	Yes	Yes		Yes	Yes	Yes		Yes
Water usage		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes
Waste		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes

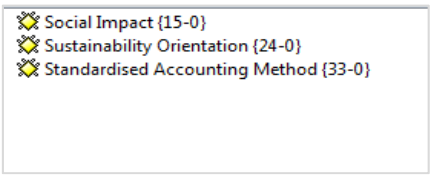
TABLE 17 - Summary of gri indicators reported by organisation

	Summary	Summary	Summary	Summary	Summary	Summary		Summary	Summary	Summary
Organisation Name	**Anglo American**	**Gold Fields**	**Sibanye Gold**	**Exxaro**	**Pick and Pay**	**Woolworths**		**Nedbank**	**Standard Bank**	**SAB Miller**
Sector	**Mining**	**Mining**	**Mining**	**Mining**	**Food Retail**	**Food Retail**		**Banking**	**Banking**	**Breweries**
Type of Report Reviewed										
Integrated Reporting (IR)		Yes	Yes	Yes	No	Yes		Yes	Yes	
Annual Report	Yes									Yes
Sustainability Reporting	Yes				Yes					
Supplement to IR				Yes						
GRI Publication			Yes	Yes	Yes	Yes		Yes		Yes
GRI Aspects										
Material										
	G4 EN1	G4 EN1	G4 EN1	not reported	unable to locate	G4 EN1	Partial			G4 EN1
		G4 EN2	G4 EN2			G4 EN2	Partial			G4 EN2
						G4 DMA				
Energy										
	G4 EN3	G4 EN3		G4 EN3		G4 EN3		G4 EN3		G4 EN3
		G4 EN4		G4 EN4		G4 EN4		G4 EN4		G4 EN4
		G4 EN5	G4 EN5	G4 EN5		G4 EN5		G4 EN5		G4 EN5
		G4 EN6	G4 EN6	G4 EN6		G4 EN6				G4 EN6
		G4 EN7		G4 EN7		G4 EN7				G4 EN7
						G4 DMA				
Water										
	G4 EN8	G4 EN8	G4 EN8	G4 EN8		G4 EN8				G4 EN8
		G4 EN9	G4 EN9	G4 EN9		G4 EN9				G4 EN9
	G4 EN10	G4 EN10	G4 EN10	G4 EN10		G4 EN10				G4 EN10
						G4 DMA				
Biodiversity										
	G4 EN11	G4 EN11		G4 EN11		G4 EN11				G4 EN11
		G4 EN12		G4 EN12		G4 EN12				G4 EN12
		G4 EN13		G4 EN13		G4 EN13				G4 EN13
		G4 EN14		G4 EN14		G4 EN14				G4 EN14
	G4 MM1	G4 MM1	G4 MM1	G4 MM1						
	G4 MM2	G4 MM2	G4 MM2	G4 MM2						
						G4 DMA				
Emissions										
	G4 EN15	G4 EN15	G4 EN15	G4 EN15		G4 EN15		G4 EN15		G4 EN15
		G4 EN16	G4 EN16	G4 EN16		G4 EN16		G4 EN16		G4 EN16
		G4 EN17	G4 EN17	G4 EN17		G4 EN17		G4 EN17		G4 EN17
		G4 EN18	G4 EN18	G4 EN18		G4 EN18		G4 EN18		G4 EN19
		G4 EN19	G4 EN19	G4 EN19		G4 EN19		G4 EN19		G4 EN20
		G4 EN20		G4 EN20		G4 EN20	Partial	G4 EN20		G4 EN21
		G4 EN21	G4 EN21	G4 EN21		G4 EN21	Partial			
						G4 DMA				
Effluents and Waste										
		G4 EN22	G4 EN22	G4 EN22		G4 EN22				G4 EN22
		G4 EN23		G4 EN23		G4 EN23				G4 EN23
	G4 EN24	G4 EN24		G4 EN24		G4 EN24				
		G4 EN25		G4 EN25		G4 EN25				
		G4 EN26		G4 EN26		G4 EN26				G4 EN26
										G4 EN 29
	G4 MM3	G4 MM3	G4 MM3	G4 MM3						G4 EN 30
						G4 DMA				G4 EN 31

Appendix 3: Final coding scheme

FIGURE 10 - Final coding scheme





Appendix 4: Sample of management of data

How do organisations understand natural capital?

Respondent	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
Limited understanding across SA	X	X		X	X				X			X	X	X		8
Fragmented understanding across SA			X						X		X				X	4
Understanding in SA is good						X	X	X								3
Understanding in SA is growing	X															1

Respondents' insights	Total number of respondents
Limited understanding across SA	8
Fragmented understanding across SA	4
Understanding is SA is good	3
Understanding is SA is growing	1

Appendix 5: Interview guide

Name and Surname:

Please tell me about your role.

Please tell me about your experience:

Question 1: **Is natural capital a concept you are familiar with?**

Background to guide interview flow if required:

Natural capital is defined as the environmental stock or Earth's resources providing goods, flows and ecological services required to support life (Adams *et al.,* 2013). In the context of the organisation, it is defined as all renewable and non-renewable environmental capital that is essential to current and future value creation (Corder, 2015). According to the International Integrated Reporting Council (2013), these include air, water, land, minerals, forests, biodiversity and eco-system health (International Integrated Reporting Council, 2013).

Question 2: **In your experience, how do organisations in South Africa, including your organisation, understand natural capital?**

Potential Probing Questions:

a) ***Probe:*** What is the scope of your management of natural capital?
b) ***Probe:*** Do you only consider natural capital aspects within your value chain or also within the operations of suppliers? Why?

Question 3: How do organisations in South Africa and your organisation measure natural capital?

Background to guide interview flow if required:

The full cost accounting framework seeks to measure the direct and indirect environmental costs linked to an organisation's activities currently borne by society (Jasinski *et al.,* 2015).

Externalities refer to unaccounted positive or negative impacts created by organisations, which impact third parties such as society not privy to the decisions from which the effect resulted (Thopil & Pouris, 2010).

Potential Probing Questions:

a) ***Probe:*** Are you familiar with the concept of externalities?
b) ***Probe:*** In your experience, what valuation techniques does your organisation and do other organisations use to measure the impact of business operations on natural capital?
c) ***Probe:*** To what extent do organisations use or assign financial value and metrics to natural capital or environmental impact?
d) ***Probe:*** What methods do organisations use to account for externalities – considered as contingent liabilities, expenses or other methods?
e) **Probe**: Why do you think organisations have chosen to approach it in this way?
f) **Probe:** Does this approach work and has it brought value to the organisation?
g) ***Probe:*** Do organisations consider the value placed by social groups on natural capital?

Question 4: How do organisations report on natural capital? And how does your organisation report on natural capital?

Potential Probing Questions:

a) ***Probe:*** How does your organisation decide what aspects of natural or environmental capital to report on?
b) ***Probe:*** What GRI and IIRC aspects does your organisation or do other organisations consider relevant and why?
c) ***Probe:*** Who is your target audience for the integrated reports and natural capital reporting?

Question 5: What do you deem as potential barriers to achieve full cost accounting for natural capital?

Question 6: What do you deem as potential enablers to achieve full cost accounting for natural capital?

Appendix 6: Interview consent form

Dear Sir/Madam,

My name is Avir Bhaidas and I am a student at the Gordon Institute of Business Science. As part of my MBA degree, I must conduct a research project to be submitted in November 2016. The Research topic is natural capital and externality accounting within large South African organisations.

The research will focus on South African organisations listed on the Johannesburg Securities Exchanges and will study how organisations measure, account and report on natural capital.

The interview is expected to last about an hour, and will help me to gain insight into the various valuation techniques being utilised by South African organisations and potential barriers and enablers to achieve full cost accounting in respect of natural capital and externalities. The interview will be recorded using an audio recorder and complemented with the scribing of text notes.

Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential. The contents of the interview may be made publicly available, in the form of an MBA thesis, without your name or any other personal details except for organisation and industry being referred to. If you have any concerns, please contact me or my supervisor. Our details are provided below.

Researcher: Avir Bhaidas
Telephone: 083 783 4063
Email: avir.bhaidas@gmail.com

Research Supervisor: Wayne Visser
Email: wayne@kaleidoscopefutures.com

Name of Participant: _____ Designation: _____

Signature of participant: _____Date: _____

Signature of researcher: _____Date: _____

Appendix 7 Ethical clearance

Dear Mr Avir Bhaidas

Protocol Number: **Temp2016-01188**

Title: **Natural capital and externality accounting within large South African organisations**

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

Adele Bekker