Developing a water disclosure index for the food, beverage and tobacco industry: An integrative perspective

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ABSTRACT

This study was performed on water disclosures in the food, beverage and tobacco industry – against a backdrop of a growing population and increased water scarcity. The intensity of water use in agriculture, and the fact that water is used throughout the food production chain, brought about the interconnection between water, energy and food – recognised as the water, energy and food (WEF) nexus.

Moreover, stakeholders are demanding to be better informed about the economic, social and environmental impacts of business, and have become increasingly aware of water as a scarce resource. In this sense, sustainability reporting has become an important mode of discourse to firms to report on the triple bottom line (TBL). However, moving away from individual, stand-alone reports, brought about the combination of financial and non-financial information into one report – known as an integrated report. Water was identified as part of natural capital, and an organisation should provide insight through integrated reporting (IR), about how these resources are used and affected.

This study took on an integrative perspective to determine whether the concept of integrated thinking and IR were associated with improved water disclosures in the food, beverage and tobacco industry. Additionally, non-probability, purposive sampling was utilised to select firms from the Johannesburg Securities Exchange (JSE) in South Africa, the ASX in Australia, and global companies listed on the Dow Jones Global Sustainability Index (DJGSI) in the food, beverage and tobacco industry – in order to compare the water disclosure practices of the three groups. South Africa and Australia are water scarce countries, and a global perspective was added by including firms listed on the DJGSI.

A mixed methods research strategy was utilised, as qualitative and quantitative data was collected simultaneously from the integrated, sustainability or environmental reports. In this sense, the research strategy was acknowledged as concurrent and integrative, with a dominant quantitative character. Manual content analysis was implemented as the research design, and qualitative observations from the analyses informed the abductive reasoning research approach. From the literature review, a water disclosure index was developed in three phases – and was utilised as the measuring instrument. A three-point assessment scale, with a quality description for each element in the water disclosure index, was developed in order to improve the accuracy towards coding every item. Each element in the water disclosure index was deliberated at a colloquium of experienced persons, followed by pilot coding, and a subsequent discussion of the results – before further analyses commenced.

Various hypotheses (H_{main}, H_1 to H_6) were formulated from the literature review to evaluate whether IR and integrated thinking, had any value in terms of water reporting. After the water disclosure index was developed, the hypothesis of each construct was further refined. T-tests, Spearman's correlation, and multiple linear regression were implemented as data analyses techniques to test the various hypotheses. Control variables, firm size, assurance, conciseness, and countries were included in the regression analyses, to control for interventions. In order to compare the firms listed on the three indices with each other, analysis of variance (ANOVA) was implemented – and when significant differences were identified – Tukey's test was utilised to indicate significant differences. The quantitative results were accompanied by fundamental qualitative observations from the reports throughout the presentation of the findings – which inferred the conclusions, recommendations and contributions of the study.

Improved water-related disclosure was evident from the findings, with the IR group outperforming the non-IR firms in terms of overall performance measured against the entire water disclosure index. Firm size had a unique relationship within the regression model towards total water disclosure, which implied that larger companies produced improved water reporting practices. Significant differences were apparent between the water disclosures among the three groups, which announces the difficulty to compare among countries or firms. The interrelated nature and connection of water reporting practices between the constructs in the water disclosure index were evident, especially when firms were able to disclose on water strategies and future-orientated water information.

Companies operating in the food, beverage and tobacco industry should recognise water as a material aspect as an inception process to water disclosures, and an integrated approach or the implementation of IR – should be purposefully considered. Firms should realise their impact on one another and should drive sustainable water disclosures in their entire supply chain.

Subsequent to the empirical analyses, an improved water disclosure index was developed. This water disclosure index should be implemented by firms operating in the food, beverage and tobacco industry, in order to combine the most essential water-related aspects into a holistic and comparable report, which would provide stakeholders with forward-looking and strategic water information. Moreover, the study contributed by confirming that an integrative disclosure approach is fundamental to effective water disclosures in the food, beverage and tobacco industry – and an integrative disclosure theory is proposed.

Key words: Water; integrated reporting; water disclosure; food, beverage and tobacco industry; sustainability; integrated thinking.

OPSOMMING

Hierdie studie ondersoek die openbaarmaking met betrekking tot water in die voedsel-, drank- en tabakindustrie teen die agtergrond van ʼn groeiende bevolking en toenemende waterskaarste. Die intensiteit van watergebruik in landbou en die feit dat water regdeur die voedselproduksieketting gebruik word, beteken dat daar ʼn verbintenis is tussen water, energie en voedsel, genoem die WEV nexus.

Belanghebbers wil beter ingelig wees rakende die ekonomiese-, sosiale- en omgewingsimpak van besigheid en hulle word meer bewus van water as ʼn skaars hulpbron. Volhoubaarheidsverslaggewing het daarom ʼn belangrike diskoers geword waarbinne firmas moet rapporteer oor hulle trippel slotreël (TSR). ʼn Verskuiwing weg van alleenstaande inligting het gelei tot die samevoeging van finansiële en nie-finansiële inligting in een verslag, bekend as ʼn geïntegreerde verslag. Water word geïdentifiseer as deel van natuurlike kapitaal, en ʼn organisasie moet toon hoe hierdie hulpbronne aangewend en geaffekteer word tydens geïntegreerde verslaggewing.

Hierdie studie het ten doel om vanuit ʼn geïntegreerde perspektief te bepaal of die konsep van geïntegreerde denke en geïntegreerde verslaggewing geassosieer kan word met verbeterde waterbekendmaking in die voedsel-, drank- en tabakindustrie. Nie-waarskynlike, doelgerigte steekproefneming is gebruik om firmas wat gelys is op die Johannesburgse Effektebeurs in Suid-Afrika, die ASX in Australië, en internasionale maatskappye gelys op die Dow Jones Global Sustainability Index (DJGSI) binne die voedsel, drank en tabakindustrie uit te soek om hulle waterbekendmakingspraktyke te vergelyk. Suid-Afrika en Australië is waterskaars lande, en ʼn globale perspektief is bygevoeg om firmas wat op die DJGSE gelys is in te sluit.

ʼn Gemengde-metode navorsingstrategie is gebruik, aangesien kwalitatiewe en kwantitatiewe data gelyktydig versamel is uit geïntegreerde, volhoubaarheid- en omgewingsverslae. Die navorsingstrategie was dus gelyklopend en geïntegreer, met ʼn dominante kwantitatiewe aard. Inhoudsanalise is per hand uitgevoer aangesien die navorsingsontwerp en kwalitatiewe observasies uit die analises ingelig is deur die induktiewe navorsingsbenadering. ʼn Waterbekendmakingsindeks in drie fases is uit die literatuuroorsig ontwikkel en dit is as meetinstrument gebruik. ʼn Drie-punt assesseringskaal met ʼn kwaliteitsbeskrywing vir elke element in die meetinstrument in die indeks is ontwikkel om die akkuraatheid van kodering van elke item te verbeter. Elke element is oorweeg by ʼn colloquium van ervare persone, gevolg deur ʼn loodskodering en ʼn bespreking van die resultate voor verdere analise.

Verskeie hipoteses (H_{main}, H_1 tot H_6) is uit die literatuuroorsig geformuleer om te evalueer of geïntegreerde verslagdoening en geïntegreerde denke enige waarde het vir water verslagdoening. Na die waterbekendmakingsindeks ontwikkel is, is die hipoteses vir elke konstruk verder verfyn. T-toetse, Spearman se korrelasie, en veelvuldige liniêre regressie is gebruik as data-analisetegnieke om die verskillende hipoteses te toets. Toetsveranderlikes, firmagrootte, versekering, bondigheid en lande is ingesluit in die regressie-analise om te kontroleer vir intervensies. 'n Analise van variasie (ANOVA) is gebruik om die firmas op die drie indekse te vergelyk. Waar betekenisvolle verskille sigbaar was, is Turkey se toets gebruik om dit aan te dui. Die kwantitatiewe resultate het gepaard gegaan met fundamentele kwalitatiewe observasies uit die verslae regdeur die aanbieding van die bevindinge. Die gevolgtrekkings, aanbevelings en bydraes van die studie is daaruit afgelei.

Die resultate dui op verbeterde waterverwante bekendmaking. Firmas met geïntegreerde verslaggewing presteer beter as die met nie-geïntegreerde verslaggewing met betrekking tot oorhoofse prestasie gemeet aan die volle waterbekendmakingsindeks. Firmagrootte het 'n unieke verhouding met totale waterbekendmaking in die regressiemodel, wat impliseer dat groter maatskappye beter praktyke het. Daar is beduidende verskille tussen die drie groepe, wat toon hoe moeilik dit is om die lande of firmas te vergelyk. Die interverwante aard van die waterrapporteringspraktyke en konstrukte in die waterbekendmakingsindeks was duidelik, veral in gevalle waar firmas waterstrategieë en toekomsgerigte waterinligting kon aandui.

Maatskappye binne die voedsel-, drank- en tabakindustrie moet water as 'n wesenlike aspek raaksien en begin met 'n proses van waterbekendmaking binne die geïntegreerde benadering of die implementering van geïntegreerde verslaggewing. Firmas moet besef watter effek hulle op mekaar het en moet volhoubare waterbekendmaking deel maak van hulle hele ketting.

'n Waterbekendmakingsindeks is ontwikkel onderhewig aan die empiriese analise. Firmas binne die voedsel-, drank- en tabakindustrie behoort die indeks te implementeer om sodoende die belangrikste waterverwante aspekte by die verslag te betrek op 'n holistiese wyse. Dit sal belanghebbers voorsien van vooruitkykende en strategiese waterinligting. Die studie dra verder by deur aan te toon dat 'n geïntegreerde bekendmakingsbenadering belangrik is vir die voedsel-, drank- en tabakindustrie en bied so 'n geïntegreerde bekendmakingsteorie.

Sleutelwoorde: Water; geïntegreerde verslaggewing; water bekendmaking; voedsel, drank en tabakindustrie; volhoubaarheid; geïntegreerde denke.

ABBREVIATIONS

ACCA	Association of Chartered Certified Accountants
ANOVA	Analysis of variance
ASX	Australian Securities Exchange
CIMA	Chartered Institute of Management Accountants
CDP	Carbon Disclosure Project
CDSB	Climate Disclosure Standards Board
DJGSI	Dow Jones Global Sustainability Index
DWS	Department of Water and Sanitation South Africa
CSR	Corporate Social Responsibility
EMS	Environmental Management System
ESG	Environmental, Social and Governance
EU	European Union
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GICS	Global Industry Classification Standard
GL	Gigalitres
GRI	Global Reporting Initiative
GSSB	Global Sustainability Standards Board
HLPW	High Level Panel on Water
IIRC	International Integrated Reporting Council
IIRF	International Integrated Reporting Framework
IISD	International Institute for Sustainable Development
IR	Integrated Reporting
IRCSA	Integrated Reporting Committee of South Africa
ISO	International Organisation for Standardisation

JSE	Johannesburg Securities Exchange
KPI	Key Performance Indicator
ML	Mega litres
MCA	Minerals Council of Australia
NBIM	Norges Bank Investment Management
NGO	Non-Government Organisation
OECD	Organisation for Economic Co-operation and Development
PCA	Principal Component Analysis
SASB	Sustainability Accounting Standards Board
SPSS	Statistical Package for the Social Sciences
SS	Sum of Squares
TBL	Triple Bottom Line
UK	United Kingdom
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
USA	United States of America
VIF	Variance Inflation Factor
WAF	Water Accounting Framework
WASB	Water Accounting Standards Board
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development
WEF	Water, Energy and Food
WRI	World Resource Institute
WWAP	World Water Assessment Programme

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CHAPTER 1

INTRODUCTION AND SCOPE

1.1 INTRODUCTION

In a world with a rapidly growing population and a climate change induced increase in rainfall variability, water scarcity makes sustainable water resources management practices a pressing issue (Daniel & Sojamo, 2012:636). After Australia, Africa is the second-most arid continent, and water scarcity has become a critical issue as populations grow and climate change continues to affect rainfall patterns (Besada & Werner, 2014:129). As industrialisation and urbanisation increases in South Africa, water consumption has grown to a point where demand exceeds supply. As such, South Africa is classified as one of Africa's water-stressed countries (Tewari, 2009:693). Similar to South Africa, Australia is particularly vulnerable to water scarcity. Although Australia is the driest inhabited continent in the world, it has the highest water usage per capita (Godfrey, 2010:2).

With water becoming a global concern, individuals, countries and small and large companies have become aware of the importance of this scarce resource. Industries such as food and beverages, power generation, mining, high technology and pulp and paper depend heavily on water and are therefore directly exposed to water scarcity (McKinsey & Company, 2009:4). These industries interact with water in many different ways that can negatively affect the environment and in turn communities (Kemp *et al.*, 2010:1553).

Stakeholders are demanding to be better informed about the social and environmental impacts of business, and deteriorating environmental conditions have heightened the expectations of stakeholders around corporate social responsibility (CSR) practices (Boiral, 2013:1036; Dong *et al.*, 2014:59). Companies are accountable to both its internal and external stakeholders, therefore it is important that companies provide evidence of their social and environmental responsibility through sustainability accounting and reporting (Lodhia & Hess, 2014:44).

1.1.1 Sustainability reporting

Sustainability reporting or triple bottom line (TBL) reporting refers to a tripartite reporting framework that highlights the economic, environmental and social performance of a company. Sustainability reporting has become an important mode of communication for companies to report about their economic, environmental and social performance which could improve the company's value creation process (Choudhuri & Chakraborty, 2009:48). Since the turn of the century there has been a drive to move away from stand-alone financial and sustainability reports towards a more integrated approach. The concept of value creation remains one of the three fundamental concepts underpinning IR, and can be defined as: ‘Creating value through an organisation’s business model, which takes inputs from the capitals and transforms them through business activities and interactions to produce outputs, that over the short, medium and long term, create or destroy value for the organisation, its stakeholders, society and the environment’ (IIRC, 2013c:1).

1.1.2 Integrated reporting (IR)

The relevance and reliability of annual financial reports as a basis for making decisions about a company, has been questioned by stakeholders. The first attempt in South Africa to enforce IR across all listed companies was introduced in 2010 by the Johannesburg Securities Exchange (JSE). The listing requirements of the JSE compel compliance via the King III Report and therefore companies are recommended to produce an integrated report (IRCSA, 2011:7).

In essence, an integrated report is a compilation of the conventional financial statements and the so-called sustainability report, with the aim of providing the stakeholders of the company with a complete overview of the company’s historical operations and future prospects. It also integrates and links information about strategy, risks and opportunities and relates these to the social, environmental, economic and financial issues (IIRC, 2011:2). One of the elements central to IR is the “Organisational overview, business model and external environment” which is seen as the process by which an organisation seeks to create and sustain value in the short, medium and long term. IR aims to provide insight about the resources used and affected by an organisation and these are referred to as “capitals” in the IR Framework. The International Integrated Reporting Council (IIRC) identifies six capitals which are in essence the financial and non-financial resources, and they are classified as: financial, manufactured, intellectual, human, social and natural capital. A company must explain how it interacts with the external environment and various capitals (IIRC, 2013b:4).

1.1.3 Natural capital

One of the six capitals mentioned above refers to the natural capital resource and is important within the context of this study. Natural capital are renewable and non-renewable environmental resources that support the past, present and future prosperity of an organisation. Natural capital includes air, water, land, minerals and forests as well as information regarding biodiversity and ecosystem health (IIRC, 2013b:12). The startling erosion of natural capital is gathering pace and will become the defining challenge facing every business in the 21st century. Natural capital is the foundation that supports human society, all economic activities and every business (CIMA, 2013:1). The world is rapidly changing due to globalisation, population growth and increased consumption, and the availability of scarce resources, such as water, are significantly negatively affected. With water at the core of sustainable development underpinning poverty reduction, economic growth and environmental sustainability, it can arguably be the most important natural capital resource (WWAP, 2015:2). Water is a prerequisite for food and energy production and forms the basis of a resilient economy, and water-scarce countries such as South Africa is testing the limits of its resource constraints (Von Bormann & Gulati, 2014:4). In this context the disclosure and reporting on natural capital, especially water, is important.

1.1.4 The value of reporting and disclosure of water

The importance of access to information has become increasingly recognised and the access to water information may indeed constitute a human right (Hazelton, 2013:278). The value of reported information depends on whether the information adheres to certain quality characteristics. The Chartered Institute of Management Accountants (CIMA) (2003:6-8) characterises quality information as being relevant, integrated, in perspective, timely, reliable and comparable. Apart from the latter characteristics, the information disclosed should also be measurable through the use of key performance indicators (KPIs) or quantifiable data (ACCA, 2013:3). This can assist companies to manage, compare and communicate the disclosed information. If the disclosed information adheres to the abovementioned characteristics, it could serve as a platform for good decision making.

Reporting on water information could be provided through various initiatives aiming to improve sustainability reporting, such as the Global Reporting Initiative (GRI), King IV, The Carbon Disclosure Project, The Climate Disclosure Standards Board (CDSB), The Water Footprint Network and The Association of Chartered Certified Accountants (ACCA).

In the context of disclosing water information, the Carbon Disclosure Project (CDP) Water Disclosure Program guided companies to disclose water information that raise awareness and understanding of the business risks and opportunities around water. They also urge companies to accelerate the development of standard measures and performance benchmarks (CDP, 2015:5). Now in its eleventh year, the CDP’s water program approached 1 252 of the largest global companies to provide data about their efforts to manage and govern freshwater resources (CDP, 2016:2; CDP, 2017d:6). The number of investors requesting corporate water data through the CDP has quadrupled in just three years. Per contra the number of Global 500 companies taking action and disclosing water information has not met this rate (CDP, 2013:2).

The increasing emphasis on how to measure, manage and report water information is driven by the lack of uniformed standards and guidelines on reporting practices, which led to the investigation of this problem. Additionally, a review of previous research conducted on the topic has to be performed.

1.2 PREVIOUS RESEARCH CONDUCTED

In order to formulate the different needs and shortcomings in the previous research conducted below, such as the need for CSR reporting, a more integrated approach, information about risks, future-orientated information as well as more industry and country specific information, sub-headings were used to arrange the information.

1.2.1 CSR reporting

The increasing debate over the lack of completeness and credibility of CSR information and its potential benefits to investors and financial stakeholders, motivated Michelon *et al.* (2015:60) to offer new insights concerning the quality of CSR disclosures. Relying on legitimacy theory, Michelon *et al.* (2015:60) explored whether the presence of a stand-alone report, the use of the GRI framework and the assurance of CSR information are associated with disclosure quality under a substantive or symbolic approach. The research provides evidence that stand-alone reports provide more information, however this information is diluted within other irrelevant pieces of information camouflaging important items of disclosure. On a different note, companies adopting the GRI guidelines are providing more complete information and appear not to be simply ticking boxes, however they are rather approaching CSR reporting in a substantive way (Michelon *et al.*, 2015:73, 74). Although CSR reporting has evolved from information on corporate environmental and social policies to be included in annual reports to stand-alone combined reports that include social, environmental and economic information, there are still some questions about the usefulness and accountability of these reports (Cho *et al.*, 2015:19).

1.2.2 The need for an integrated approach

A study performed by Frías-Aceituno *et al.* (2013:45), advocate a more pluralist approach which takes stakeholders, sustainability, business ethics and transparency into account. The study also indicated that although important initiatives have been taken, only a few of the 750 international companies studied for the years 2008 to 2010, have moved towards IR (Frías-Aceituno *et al.*, 2013:52). Perego *et al.* (2016:58) presented qualitative findings from interviews with three experts and field entrepreneurs of IR. The interviewees agreed that current IR initiatives have developed in isolation, consequently any form of comparison between disclosed information on sustainability practices remain extremely difficult (Perego *et al.*, 2016:59). All three experts identified the pressing need to scale-up diffusion of IR thinking and practice, revealing that the diffusion of IR practices requires greater engagement with investors and academics (Perego *et al.*, 2016:60).

The IIRC (2013b:16-23) states that some guiding principles should be part of the content of integrated reports namely materiality, a focus on risk, risk management, strategy, and the need for future-orientated information. These guiding principles of IR forms part of previous research conducted and are organised in the paragraphs below.

1.2.2.1 Materiality

In practice, the materiality of sustainability-related information is notoriously difficult to establish. Placing a financial value on materiality for financial risks is a complex process but establishing materiality and materiality thresholds for traditional non-financial risks which are hard to quantify, is far more challenging, if possible at all (ACCA, 2012:8). Materiality for sustainability reporting is not limited to those sustainability topics that have a significant financial impact on the organisation, however determining materiality for a sustainability report also includes considering economic, environmental and social impacts that cross a threshold in affecting the ability to meet the needs of the present without compromising the needs of future operations (GRI, 2013:17). In the light of these arguments, it is important to consider whether water is a materiality aspect for a specific company under investigation.

1.2.2.2 Water risks

In 2015, the World Economic Forum categorised water crises as the number one global risk in terms of impact (World Economic Forum, 2015:9). The CDP global water report of 2015 indicated that almost two thirds (65%) of the 405 responding companies reported that they are facing substantive water risks (CDP, 2015:10). Another point of criticism according to the Water Footprint Network is that current reporting does not provide enough information for stakeholders to assess the various risks related to water scarcity and quality (Water Footprint Network, 2015:18). This concern is consistent with findings by the Ceres investor coalition, the financial services firm UBS, and financial data provider Bloomberg, that issued a report that found that many of the 100 publicly traded companies do not include data on water risks, and none of them provided data on water usage or risk for their supply chains (Wilburn & Wilburn, 2013:64). Botha and Middelberg (2016:16) emphasised that more detail could be provided on how companies are addressing the water risks they face, especially within the context of the materiality aspect.

Money (2014:45) analysed the CSR and annual reports of 58 global companies in the consumer staples sector. Of the companies disclosing quantitative data on water use, water efficiency (units of water used per unit of output) was the only metric used by the majority of companies, however it became evident from the longitudinal data that companies do not apply this benchmark consistently or comparably (Money, 2014:54). Money (2014:55) concluded that approaches to corporate water risk disclosure are fundamentally unsatisfactory when applied to understand the scale of the challenges faced. Within this context it is imperative to realise that all the mainstream decision makers should be aware of the importance and associated risks of water and the disclosure thereof.

1.2.2.3 Future-orientated information

Fonseca *et al.* (2012:74) stated that the GRI predominately adopts a retrospective reporting approach, and that there is a need for future-orientated information. The need for future-orientated information is part of the philosophy of the latest King IV code of conduct, which mentions that there should be a paradigm shift from short-term capital markets to long-term sustainable capital markets (Deloitte, 2016:5; IoDSA, 2016a:60). This approach is echoed by explaining the underlying objectives of IR principles, such as the definitions of the various capitals and material issues. The focus on material issues requires the company to evaluate its ability to create value in the long term (Mio *et al.*, 2016:207). Mio *et al.* (2016:207) added that the incorporation of IR principles may therefore lead to more usage of non-financial measures of performance, because of the focus on the long term and capitals. Stacchezzini *et al.* (2016:105) analysed 54 companies' integrated reports and used the evidence in a multivariate statistical analysis to test the relation between disclosures and specific corporate characteristics. The authors state that IR should encourage the disclosure of leading indicators (which are usually non-financial), and found limited disclosure of quantitative and forward-looking indicators (Stacchezzini *et al.*, 2016:107).

Kamala *et al.* (2016:583) investigated the environmental information needs of South African users of environmental reports by distributing questionnaires to ethical investment funds, environmental Non-Government Organisations (NGOs) and accounting researchers. The study revealed that users need balanced environmental information that identifies and describes key, relevant issues that is both specific and accurate. In addition it was found that users need future-orientated information that identifies and addresses key stakeholders' concerns which demonstrates the integration of environmental issues into core business processes (Kamala *et al.*, 2016:589). In light of these arguments this study investigates the need for forward-looking information.

1.2.3 Studies performed in specific countries

A study conducted by Remali *et al.* (2016:68), analysed 10 of the largest Malaysian public listed companies by market capitalisation, which has a high water risk profile. The paper utilised the

GRI and CDP as a basis of analysis, identifying themes which was scored using a scale of 0 to 4. It was evident from the findings that the water-related disclosure level among the companies was fairly low, with four companies disclosing no information (Remali *et al.*, 2016:71). The study was based on the legitimacy theory and the authors emphasise the need for improvement, if companies want to legitimise their position in society.

Drawing on a stakeholder theory, Burritt *et al.* (2016:68) identified six independent drivers for corporate water-related disclosure. It was observed through the analysis of 100 integrated and sustainability reports of Japanese companies, that large, water-sensitive companies with dispersed ownership have the highest levels of water-related disclosure (Burritt *et al.*, 2016:71).

1.2.4 Studies performed in specific industries

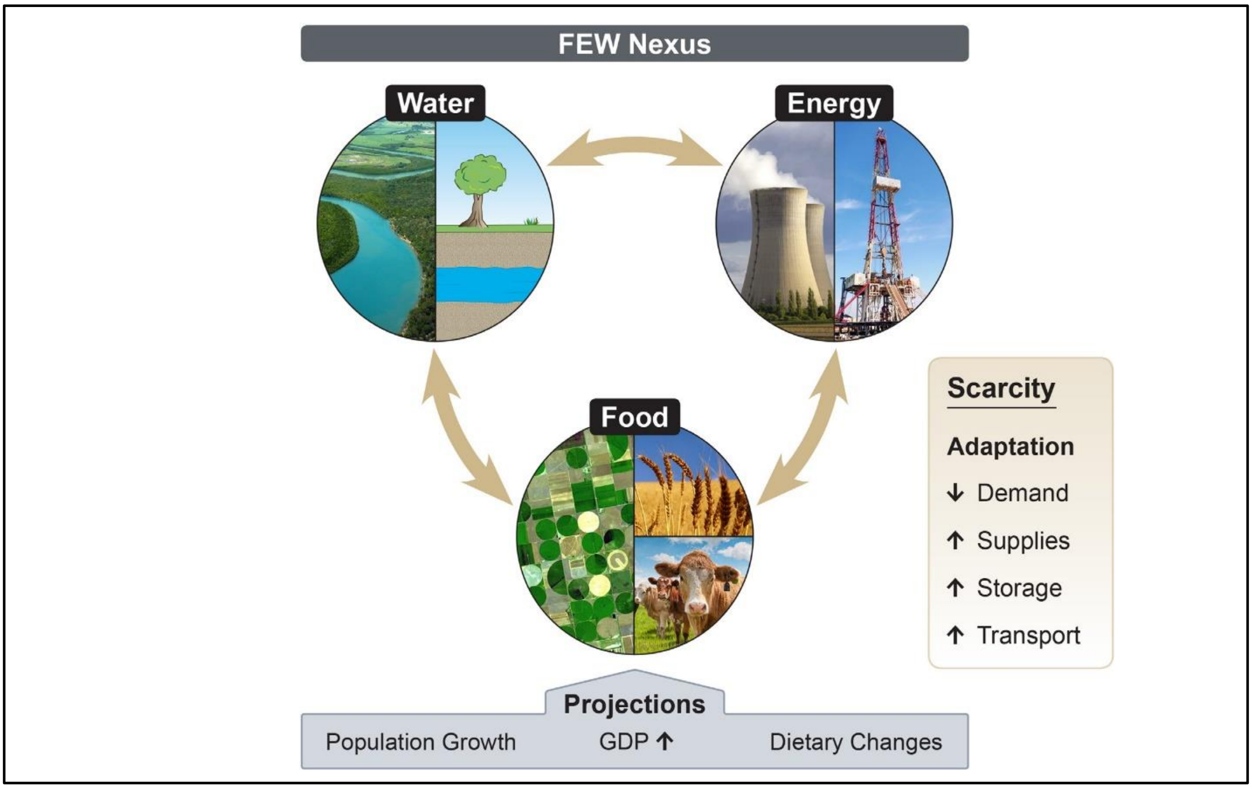
Jones *et al.* (2015b:118) conducted an exploratory study selecting the world's top 10 food and drinks companies as ranked for social responsibility by Oxfam. The findings revealed considerable variations in the information provided by the food and beverage companies on their approach to water stewardship. Jones *et al.* (2015b:122) argued that the lack of common and agreed frameworks and standards, not only make it difficult to establish meaningful comparisons between companies, but also to assess the contribution they are making towards water stewardship at regional, national and international levels.

Studies performed in the mining industry revealed similar results (Fonseca *et al.*, 2012; Leong *et al.*, 2014). According to Fonseca *et al.* (2012:70), only a few scholars have scratched below the surface of criticism in order to consider how to improve the effectiveness of the GRI framework. In spite of several attempts to improve water reporting, there are still arguments that the GRI adopts a predominately retrospective and non-geographical approach (Fonseca *et al.*, 2012:74). By providing consistent information across all sites, Leong *et al.* (2014:98) argued that companies can show that they are not manipulating their reports by cherry-picking the best stories and results across their operations.

Green *et al.* (2017:319) stated that governments worldwide are concerned about delivering and access to sufficient food, energy and water resources to ensure human wellbeing. They argued that it is not only the concern of governments, but that the private sector also has a critical role to play (Green *et al.*, 2017:320; Guerry *et al.*, 2015:7352). According to the United Nations (UN) (2017:1), the current world population of 7.6 billion is expected to reach 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in the year 2100. This enforces a serious challenge in the provision and distribution of sufficient food, water and energy resources to meet the demands of the growing population.

Although there were numerous contributions to meet the Millennium Development Goals of the United Nations to increase the access to water, energy and food (WEF) resources, 821 million people experience food insecurity, 844 million still lack access to safe drinking water and 1 billion do not have access to electricity (FAO *et al.*, 2018:2; United Nations, 2018:18). Figure 1-1 indicates the interconnections between the components of water, energy and food, together with adaption strategies for scarcity.

Figure 1-1: The WEF nexus



Source: Adopted from Scanlon *et al.* (2017:3551).

A report released by PwC (2015:1) projects the world economy to grow at an average of just over 3% per annum in the period 2014 to 2050, doubling in size by 2037 and nearly tripling by 2050. The increase in global population, the increase in per capita gross domestic product (GDP) by 1-5% in different countries, and increased protein consumption promotes pressures on available WEF resources (FAO, 2017:84; PwC, 2015). Food production is extremely water intensive, with irrigation accounting for 70% of global freshwater withdrawal and 90% of freshwater consumption (Siebert *et al.*, 2010:1863). Conversely, 25 to 30% of food produced globally is estimated to be lost at postharvest or processing stages, or wasted at retail and consumer stages, representing substantial losses in the embodied water and energy (FAO, 2011:5; Kummu *et al.*, 2012:484).

The WEF nexus has been debated since the 2011 Bonn Nexus Conference, and Endo *et al.* (2017:21) argue that clarifications of the interrelationships are limited as the complex link between the three essential resources are often ignored and investigated separately. Endo *et al.* (2017:29) recognised a need for integrated indices and models and stressed that current mono-disciplinary research results need to be integrated in order to understand the complexities of water-energy-food systems.

Taking cognisance of the importance of water within the context of the WEF nexus, this study aimed to address two elements in the WEF nexus (water and food), through the selection of the food, beverage and tobacco industry – which is discussed later in this chapter.

1.3 PROBLEM STATEMENT

Policy makers, academics, governments and researchers increasingly refer to the interconnection between water, energy and food as the 'nexus' (Green *et al.*, 2017:320; Leck *et al.*, 2015:445). At the core of the nexus debate are natural resource scarcities and the recognition that water, energy and food are interlinked with insightful consequences for human wellbeing, poverty and inequality (Halbe *et al.*, 2015:879; Leck *et al.*, 2015:446). Inequalities such as nutrition, health sanitation and security are at the heart of the nexus and companies play a vital role in ensuring that supply chains are dynamic and able to provide food, energy and water (Whiteman *et al.*, 2013:317).

Water has become one of the dominant environmental issues around the world, resulting in a focus on corporate water disclosures driven by increasing importance of sustainable water use (Hazelton, 2013:270). According to Chalmers *et al.* (2012b:1003), the importance of high-quality water-related information to support decision making is of critical importance when addressing water management. The world is seeking solutions to water-related issues, increasing the recognition of the potential of water accounting to contribute to the solution by providing relevant water information (Chalmers *et al.*, 2012a:282).

The GRI, which consists of lists of metrics related to sustainability, is arguably currently the most widely reported initiative utilised by companies (Fonseca *et al.*, 2012:78-81; GRI, 2013:54-61). However, previous research conducted on the improved GRI G4 guidelines where companies have to specify the standards and methods they apply in their reporting, indicate that researchers are still questioning the usefulness of water data that is aggregated from many sites (Danoucaras *et al.*, 2014:728). Another study performed by Fonseca *et al.* (2012:70) contested the effectiveness of the GRI framework by arguing that GRI-based reports could mislead decision makers because unsustainable practices, particular at site level, is not reported on. Semmens *et al.* (2013:247) stated that more standardised water reporting guidelines would allow companies to conduct meaningful comparisons of internal activities to benchmark against competitors' operations.

Australia is the nation leading the world in developing general purpose water accounting (Hu *et al.*, 2013). Chalmers *et al.* (2012a:277) identified various other water accounting systems for measuring and reporting on water that are in different stages of development. This raises the possibility that the various water accounting systems could become internationally inconsistent and incomparable if not regulated by international water accounting standards (Chalmers *et al.*, 2012a:282).

South Africa and Australia are perceived as water scarce countries, and firms listed on the food, beverage and tobacco industry in these countries were included in the analyses in this study. However – considering that water is a global concern – the listing requirements of the Dow Jones Global Sustainability Index (DJGSI) provided a global perspective and comparison towards best practices in the food, beverage and tobacco industry.

Reflecting on the importance of the water, energy and food nexus, the call for more research has been resonated by Cai *et al.* (2018:259) that address water researchers specifically, to come together and share a working context that is broader than before, to solve this integrated problem. The objective of this study partly adheres to this call as it attempts to address two of the issues, namely water and food. A study conducted by Weitz *et al.* (2017:171) explored the integration of the WEF nexus, and identified three gaps in the literature related to environmental governance:

- the conditions for cross-sector coordination and collaboration;
- the dynamics beyond cross-sector interactions; and
- political and cognitive factors need to be identified as elements of change.

Referring back to previous research conducted, it was evident that the following shortcomings were identified: (a) the need for consistency and comparability between countries and industries, (b) a more integrated approach, (c) a focus on materiality, (d) water risks, and (e) future-orientated information. Taking cognisance of the scenario regarding the importance of the natural capital water and the arguments regarding shortcomings in current practices, there is a need to evaluate companies' reporting and disclosure of water information. The following research questions have been raised:

(1) What are the current reporting and disclosure practices on water in South African-, Australian- and globally selected companies in the food, beverage and tobacco industry?

(2) To what extent is it possible to make meaningful comparisons about water reported data between South African-, Australian- and globally selected companies?

(3) Are the reporting principles and methodologies currently utilised standardised per country? If not, what are the current problems and how could it be improved?

(4) What are the reporting principles and methodologies currently utilised in the food, beverage and tobacco industry?

In addition to the research questions, and based on the literature review and previous research, the following hypotheses can be formulated to be tested in the study. The relevance of each is made clear in Chapter 2.

$H_{main:}$ There is a significant association between IR and total water-related disclosure.

H_1: There is a significant association between IR and water-related disclosure in terms of materiality.

H_2: There is a significant association between IR and water-related disclosure on governance.

H_3: There is a significant association between IR and water-related disclosure on targets and measures.

H_4: There is a significant association between IR and water-related disclosure on risks.

H_5: There is a significant association between IR and water-related disclosure on future-orientated information.

H_6: There is a significant association between IR and water-related disclosure on supply chain information.

Cai *et al.* (2018:269) state that the WEF nexus paradigm has a clear opportunity of integration over the interrelating areas of food, energy and water sectors, which may allow interdisciplinary research to progress. In order to close the knowledge gap, these research questions and hypotheses stated above need to be answered and tested which led to the following research objectives.

1.4 OBJECTIVES

The following section provides an overview of the main- and secondary objectives of this study. It is worthy to note that this study had two main objectives, with the secondary objectives divided into literature- and empirical objectives.

1.4.1 Main objectives

The main objectives of this study were two-fold, as stated below:

(1) To develop a water disclosure index in order to evaluate whether the concept of IR and an integrative approach is associated with improved water disclosure in the food, beverage and tobacco industry.

(2) To utilise the developed water disclosure index for the food, beverage and tobacco industry, to compare the water reporting practices of firms in South Africa, Australia and globally – in order to develop an improved water disclosure index.

1.4.2 Secondary objectives

In order to reach the main objectives, the following secondary literature objectives were formulated:

- To conceptualise from literature the practice of sustainability- and IR, including the need for reporting on water.
- To conceptualise from literature the current reporting and disclosure practices on water, with a focus on IR, materiality, governance, targets and measures, risk assessment, future-orientated information and supply chain information.
- To conceptualise from literature the current reporting and disclosure practices on water in South Africa, Australia and globally.
- To conceptualise from literature the current reporting and disclosure practices on water in the food, beverage and tobacco industry.
- To identify the research philosophy, -approach, -strategy, -design, sample and data analyses techniques utilised in the study.

After completing the abovementioned literature objectives, the following secondary empirical objectives were formulated:

- Develop a water disclosure index based on the literature review which will be utilised as the measuring instrument.
- Identify the current shortcomings and best practices associated with the reporting and disclosure of water, utilising the measuring instrument.

- Identify and compare the water reporting practices of the selected companies in South Africa, Australia and globally.
- Evaluate and compare the utilisation of IR on materiality, governance, targets and measures, risk assessment, future-orientated- and supply chain information in terms of water disclosure.
- Prepare an improved water disclosure index that could be utilised as a benchmark in the food, beverage and tobacco industry.

In order to achieve the abovementioned objectives, the researcher had to understand and state the approach towards the paradigmatic assumptions or research philosophy, theories and contextual framework and selected research design.

1.5 RESEARCH PHILOSOPHY

Research philosophies are systems of interrelated ontological, epistemological and methodological assumptions that act as perspectives that provide a rationale for the research and commit the researcher to particular methods of data collection, observation and interpretation (Durrheim, 2006:40). According to De Vos and Strydom (2011:41), it is important that all scientific research is conducted within a specific paradigm, or way of viewing one's research material. Creswell (2013:6) identifies four basic paradigms, philosophical assumptions or worldviews that refer to a basic set of beliefs that guide the actions of the researcher.

The four worldviews or philosophical assumption that Creswell (2013:6) refers to are post positivism, constructivism, transformative and pragmatism. The post positivists' assumptions represented the traditional way of research, and these assumptions are applicable for quantitative and qualitative research. The knowledge gathered through the viewpoint of the post positivist is based on careful observation and measurement of the objective under study – and was followed in this research.

There are three research strategies, namely qualitative, quantitative, and mixed methods. Qualitative research is a strategy for exploring and understanding the meaning of individuals or groups ascribed to a social or human problem. It normally refers to an inductive style, a focus on individual meaning and the importance of rendering the complexity of the situation (Creswell, 2013:4). Quantitative research on the other hand, is a strategy for testing objective theories by examining the relationships between variables. These variables can be measured, typically on instruments, so that numbered data can be analysed by using statistical procedures (Creswell, 2013:5). This study followed a mixed methods research strategy, with a dominant quantitative character.

Bryman (2006:16) refers to 'the paradigm wars' as the debate regarding qualitative and quantitative research at the epistemological stage. In this sense qualitative and quantitative research strategies are incommensurable according to their paradigm and worldview, and reflect epistemological- and ontological philosophical assumptions (Bahari, 2010:19).

1.5.1 Ontological assumptions

Ontology is defined as the study of 'being' (Crotty, 2003:10). Ontological assumptions are those that respond to the question 'what is there that can be known?' or 'what is the nature of reality?' (Denzin & Lincoln, 1998:201). It was acknowledged that this study comprises of a mixed methods strategy, with a dominant quantitative character. The researcher recognises that the performance of firms with regard to their water disclosures, are external to the researcher, which can be objectively measured.

1.5.2 Epistemological assumptions

Epistemology is 'the theory of knowledge' and a way of understanding and explaining how we know what we know (Crotty, 2003:3). Epistemology isolates and orders the systems of knowledge so that it is possible to have knowledge of other aspects of the world. It formulates your ability to understand the forms of knowledge that are possible, and the conditions in which knowledge may be achieved (Gaffikin, 2014:3). Epistemological assumptions were applied in this study to assist in the manner to acquire knowledge, in order to evaluate the water disclosure practices of firms listed on the food, beverage and tobacco industry. The different assumptions and research strategies are compiled in Table 1-1.

Table 1-1: Fundamental differences between qualitative and quantitative research strategies

Assumptions	Qualitative	Quantitative
Principle orientation to the role of theory in relation to research	Inductive; generation of theory	Deductive; testing of theory
Epistemological assumptions	Interpretivism	Positivism
Ontological assumptions	Subjectivism or constructivism	Objectivism

Source: Adapted from Bryman (2012:37).

Table 1-1 signifies that this study follows an epistemological philosophy with mainly, a quantitative approach paradigm of postpositivism. Moreover, Table 1-1 presents inductive- and deductive orientations to the role of theories in relation to research. However, the researcher applied abductive reasoning in this study, as content analysis is utilised as the research design. Content analysis was unique in its empirical approach in this study, as abductive inferences are made from qualitative observations in the reports of the various firms (Krippendorff, 2013:41). Within the context of the research philosophy, the underlying theories and contextual framework are discussed.

1.5.3 Theories and contextual framework

The legitimacy-, institutional-, resource dependence-, and stakeholder theories are most often used as important frameworks for social and environmental accounting research (Bhattacharyya, 2014:27). They are generally alike because they share a similar ontological view and are considered to be system-orientated theories (Chen & Roberts, 2010:652; Gray *et al.*, 1995:50). The assumption of a system-orientated theory, is that any organisation is influenced by the society in which it operates, and the organisation on the other side, influences the society (Chen & Roberts, 2010:652).

On the one side, some organisations engage in CSR and disclose information based on external pressures they consider to be acceptable, because they operate within boundaries and rules according to the expectations of their stakeholders. In this context the disclosure of information appears to be an instrument to legitimise the organisation (Branco & Rodrigues, 2008:687). Reporting information becomes a way for companies to legitimise their actions, and this leads to an apparent link between accounting research and the legitimacy theory (Tilling & Tilt, 2010:62). The company should therefore operate within the boundaries and rules imposed by society to be legitimate. According to Remali *et al.* (2016:67), it is evident that there is an interdependency that exists between human beings, the ecosystem and a company's reliance on water to operate, and that this refers to a social contract between a company and the larger society.

On the other side, corporate, social and environmental disclosure is expected to be an effective management strategy for developing and maintaining stakeholder relationships. According to Lu and Abeysekera (2014:428), the stakeholder theory attempts to explain how a firm identifies powerful stakeholder groups that may affect, or be affected, by the firm's social and environmental disclosure practices, and how the firm responds to their expectations. Some companies believe that being seen as socially responsible will result in a competitive advantage, and that good relationships with their stakeholders could lead to increased financial results (Bhattacharyya, 2014:27).

Taking cognisance of the above, it seems that both the legitimacy- and stakeholder theory are applicable for this study. Both theories were identified and recognised as complementary rather than alternatives in performing the study.

1.6 RESEARCH DESIGN

Both a literature review and an empirical analysis was conducted.

1.6.1 Literature review

In the literature review the latest relevant journal articles, internet articles, dissertations, government publications, textbooks and discussion papers were utilised in order to gain a thorough understanding of the literature and theoretical background.

1.6.2 Empirical research

The research design implemented in this study was content analysis. This method was selected, because it is widely used in accounting research to reveal useful insights into accounting practices (Steenkamp & Northcott, 2007:12). As described by Beattie *et al*. (2004:214), content analysis involves classifying text units into themes or constructs. The researcher had to decide whether manual- or computerised content analysis would be implemented. After deliberating both methods, it was decided that manual content analysis would be implemented, as in-depth reading was required to reveal best practices from the qualitative information in the reports.

1.6.3 Measuring instrument

A water disclosure index was developed in three phases from the literature review (Appendix A to C). The developed water disclosure index was utilised to measure the water reporting practices of the selected firms during the empirical study. Several themes or constructs were identified in the water disclosure index. Within each construct, elements were identified that underlies/describes or provides additional information towards that specific construct.

A study performed by ACCA (2013:3) found that reporting on natural capital can be split into two main categories: (a) narrative reporting on strategy and management, and (b) performance reporting. On the one hand, *narrative reporting* provides stakeholders with a qualitative understanding of a company's relationship with natural capital and the processes used to manage the various risks and opportunities associated with such company activities. On the other hand, *performance reporting* provides stakeholders with quantitative information, in the form of key performance indicators, which can be used to track performance over time (ACCA, 2013:4). Based on this differentiation, both narrative and quantifiable information was included in the water disclosure index.

1.6.4 Population and sample

The target population identified for the study included all the companies listed on the food, beverage and tobacco industry in South Africa on the JSE Ltd., companies listed on the Australian Securities Exchange (ASX), and the DJGSI.

The study purposefully selected companies in the food, beverage and tobacco industry, not only for their dependence on water, but also for their connection with the WEF nexus. South Africa and Australia were selected as these are water scarce countries, and the inclusion of firms listed on the DJGSI, added a global perspective to this study. The aim of the DGJSI is to provide investors with objective benchmarks for managing their sustainability investment portfolios (DJSI, 2019:1). Firms listed on the DJGSI could be regarded as companies implementing 'best sustainability practices' due to the strict listing requirements.

The target was to select the top 20 companies on each index on the basis of market capitalisation – which would result in a total of 60 companies analysed (3 x 20). However, the population consisted of 57 firms, 18, 26 and 13 from South Africa, Australia and global, respectively. The sample outcome was 16 companies from the JSE in South Africa, 20 companies on the ASX in Australia, and 13 global firms under the DJGSI – a sample of 49 firms. In this sense, the sample almost fully represented the population of firms listed on the three indices in the food, beverage and tobacco industry. Purposefully selecting the food, beverage and tobacco industry, restricted the sample size, as each index did not contain 20 firms. The companies' latest annual- or integrated reports were analysed utilising the water disclosure index. Information that does not form part of the annual report, such as sustainability- or environmental reports, were also analysed.

1.6.5 Data collection

By definition, content analysis is a mixed research method that contains both quantitative and qualitative techniques. In some instances qualitative data is employed and subsequently transformed to quantitative data (Kondracki *et al.*, 2002:224). It is also essential when discussing the research method, to make a clear distinction between the data collection method and the method used to analyse the data. Data collection and data analysis are two separate phases in the research process (Franzosi, 2008:32). The collection of the data in this study contained both narrative (qualitative) and performance-based (quantitative) information.

The most recent integrated- and sustainability reports of the target sample were downloaded from the respective company websites. The selected information was analysed utilising the water disclosure index to evaluate the reporting and disclosure of each company. For each element, a score of 0 (no disclosure) or a score of 1 (some disclosure) and 2 (comprehensive disclosure) was awarded. These scores have been aggregated to form an overall disclosure score. As mentioned by Marston and Shrives (1991:195), and cited by Beattie *et al*. (2004:210), the index score can give a measure of the extent of disclosure but not necessarily the quality of the disclosure, but that it is still a valuable research tool. They also added that disclosure index studies are often used to analyse inter-company, inter-industry/sector or inter-country differences which was the aim of this thesis.

1.6.6 Analysis of data

Various statistical techniques were applied to analyse the data and test the hypotheses in a quantitative format. The descriptive statistics presented frequencies, standard deviations and mean values. All the constructs and elements within the water disclosure index were utilised in order to conduct a principal component analysis (PCA), factor loadings and reliability checks.

Means analysis was implemented by utilising t-tests and analysis of variance (ANOVA). The t-tests compared the water disclosure practices of firms publishing integrated reports, opposed to those not practicing IR. Through ANOVAs, the water disclosure practices of companies listed on the JSE in South Africa, the ASX in Australia, and DJGSI were compared. When significant differences were identified between the groups, Tukey tests were performed to reveal these disparities.

With the intention to test for relationships between variables, this study utilised correlation- and regression analysis. Spearman’s correlation was employed to measure the strength and direction among variables. Multiple linear regression was implemented to test the hypotheses. Meaningful qualitative disclosures analysed from the reports were presented alongside the quantitative data – which revealed best practices observed.

1.7 PROPOSED CONTRIBUTIONS OF THE STUDY

The proposed contribution of this study was divided into theoretical and practical contributions.

1.7.1 Theoretical contributions

This study adopted an integrative perspective, and compared the water reporting practices of firms practicing IR, opposed to companies not adopting IR. To the best knowledge of the researcher, this study was the first to evaluate whether IR and integrated thinking is related to improved water disclosure practices in the food, beverage and tobacco industry. Moreover, this study could extend on the existing knowledge on IR on water disclosures in the food, beverage and tobacco industry. In this sense, the results could reveal whether an integrated approach and integrated thinking is associated with improved water disclosures in the food, beverage and tobacco industry. This could add to theoretical foundation of the legitimacy- and stakeholder theories, and the integrative approach could reveal an integrated theory.

Two elements were addressed within the WEF nexus – water and food – and considering the importance of water within the food, beverage and tobacco industry, this study could contribute valuable insights towards the WEF nexus literature.

This study compared the water disclosure practices of firms listed on the food, beverage and tobacco industry, South Africa, Australia, and global companies listed on the DJGSI. By including firms listed on the DJGSI – which is perceived to implement best practices with regard to sustainability reporting – enabled the study to take on a global perspective in order to compare the three indices.

1.7.2 Practical contributions

The water disclosure index was developed in three stages (Appendix A to C) from the literature review. The process was initiated using the document attached as Appendix A, which includes all the relevant information from the literature review to form the constructs. Within Appendix B, information was reallocated to relevant constructs with reasons contained in the remarks column. Appendix C formed and refined each element together with the coding instructions applicable to every element.

The developed water disclosure index (Appendix C) was then applied to analyse the current water disclosure practices of the firms listed on the three indices in the food, beverage and tobacco industry. Best practices were identified through qualitative observations in the empirical analyses of the firms listed in food, beverage and tobacco industry, which was utilised to develop an improved disclosure index (Appendix E). The new water disclosure index considered the integrated nature of water reporting in the food, beverage and tobacco industry.

Consequently, the new water disclosure index could be applied by firms operating in the food, beverage and tobacco industry, which could contribute to the skills needed to disclose integrative and comparable water-related information. The different constructs in the water disclosure index could contribute to future reporting frameworks, and practitioners, policymakers, academics or standard setting bodies could utilise the index as a benchmark to test, refine or adjust the index.

1.8 CHAPTER OUTLINE

Figure 1-2 presents an overview and description of the chapters in this study.

Figure 1-2: Overview and description of chapters

OVERVIEW OF THE STUDY	DESCRIPTION
CHAPTER 1 Introduction and scope	• Introduced the research topic. • Previous literature and theoretical background provided to construct the research problem.
CHAPTER 2 Sustainability and integrated reporting: the need for reporting on water	• This chapter is aligned with H_1 to H_6 that were tested in Chapter 5 in order to test whether IR is associated with improved water disclosure.
CHAPTER 3 Water disclosure in different countries, and in the food, beverage and tobacco industry	• This chapter is aligned with the research questions evaluated in Chapter 6 in order to compare the water reporting practices among the three indices.
CHAPTER 4 Research methodology	• After developing the water disclosure index, H_1 to H_6 were further refined and tested in Chapter 5.
CHAPTER 5 Comparing the water disclosures of firms implementing IR, to the non-IR group	• Tested the hypotheses to evaluate whether IR is associated with improved water disclosures. • Utilised t-tests, Spearman's correlation & multiple linear regression.
CHAPTER 6 Comparison between countries	• Compared the indices to answer the research questions. • Used ANOVA to determine significant differences; Tukey to indicate these differences.
CHAPTER 7 Conclusions and recommendations	• Important to note that meaningful, qualitative observations – or best practices observed – informed the abductive reasoning and inferences made in this chapter.

Source: Researcher's own compilation.

The chapter outline and intention of each chapter for this study is also presented in the discussion below.

- **Chapter 1: Introduction and scope**

  The first chapter introduced the research topic and provided an overview of the study. Previous literature and the theoretical background were provided in order to construct the research problem. The chapter presented research questions and proposed the hypotheses. The research objectives were set to address the research problem and test the proposed hypotheses. The research methodology, contribution, and chapter outline concluded the chapter.

- **Chapter 2: Sustainability and IR: the need for reporting on water**

  In this chapter the background and theoretical framework of sustainability reporting and IR was presented. This was followed by the development and importance of environmental reporting which led to the discussion of reporting on natural capital. The chapter moved its focus towards reporting on water, which revealed several constructs that would form part of the development of the water disclosure index. H_1 to H_6 were formulated from this chapter.

- **Chapter 3: Water disclosure in different countries, and in the food, beverage and tobacco industry**

  This chapter initiated with the characteristics of quality water reporting. This was followed by exploring statistics, laws and regulations and previous research on water reporting in South Africa, Australia and globally. The focus moved to water disclosure in the food, beverage and tobacco industry.

- **Chapter 4: Research methodology**

  This chapter presented the research methodology followed to address the set research objectives.

- **Chapter 5: Results: comparing the water disclosures of firms implementing IR, to the non-IR group**

  In this chapter, the disclosure practices of firms utilising IR was compared to those who have not implemented IR in order to evaluate whether IR is associated with improved water disclosures. The formulated hypotheses from Chapters 2 and 4 were tested in this chapter utilising t-tests, Spearman’s correlation coefficient, and multiple regression analysis.

- **Chapter 6: Results: comparison between countries**

  This chapter compared the water disclosure practices of the firms listed on the three indices, through ANOVAs, and Tukey tests. Firms listed on the JSE in South Africa, the ASX in Australia, and global companies listed on the DJGSI was compared with one another.

- **Chapter 7: Conclusions and recommendations**

  The summary and conclusions of the study were presented, together with contributions, limitations and suggestions for future research.

The following chapter embarks on the literature review, initiated through background and theoretical framework discussions on sustainability and IR.

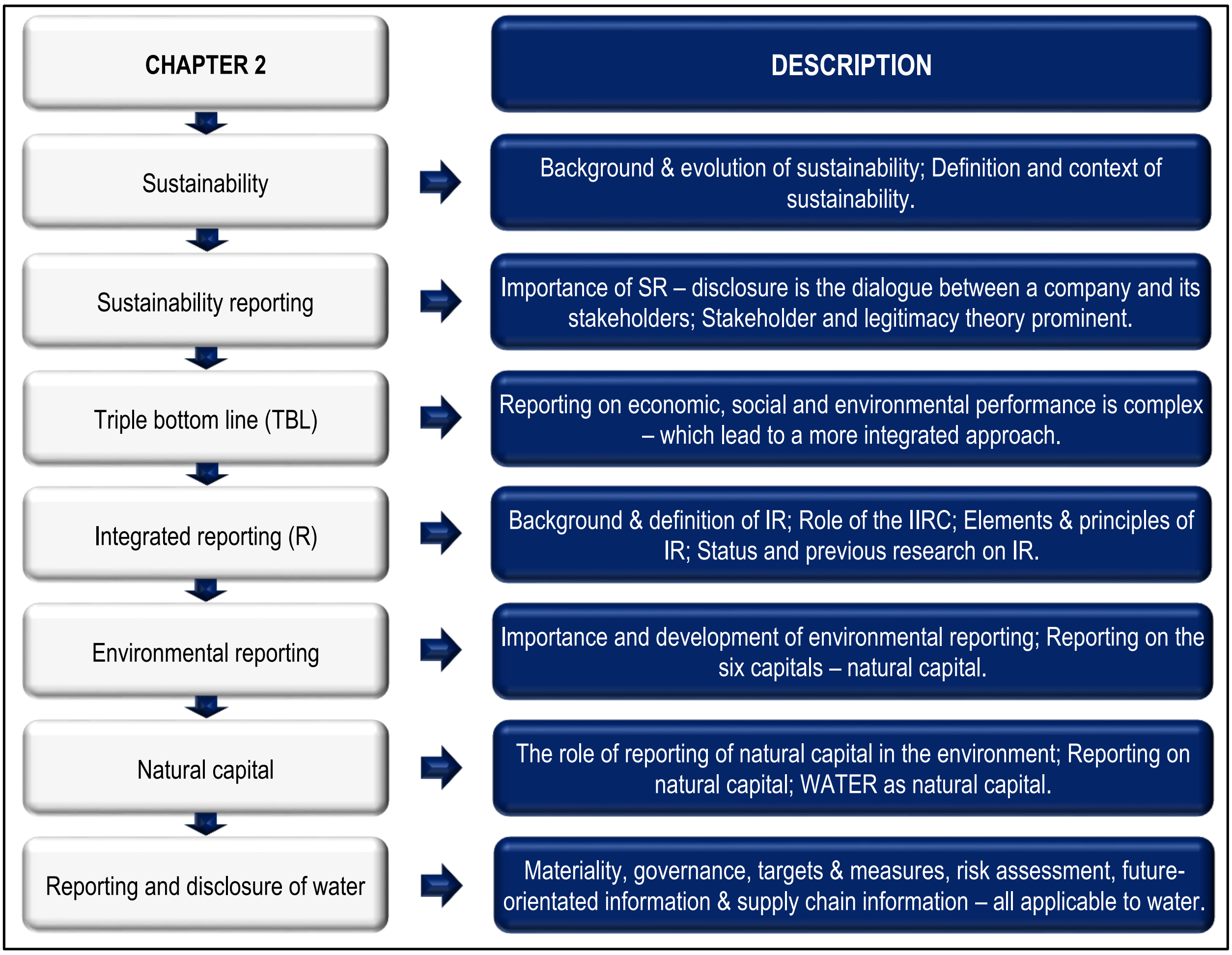
CHAPTER 2

SUSTAINABILITY AND IR: THE NEED FOR REPORTING ON WATER

2.1 INTRODUCTION

The intent of this chapter is to address the first two secondary objectives as set in Chapter 1 (refer to section 1.4.2). The first secondary objective aims to conceptualise from literature the practice of sustainability and IR and the need for reporting on water. The second secondary objective is to conceptualise from literature the current reporting practices on water, with a focus on IR, materiality, governance, targets and measures, water risks, future-orientated and supply chain information. The chapter introduces the broader concept towards sustainability and sustainability reporting, followed by a discussion of integrated and environmental reporting. After the concept of natural capital has been introduced, the chapter concludes with important aspects and the need for reporting on water. Figure 2-1 provides an outline of the chapter.

Figure 2-1: Outline and flow of Chapter 2



Source: Researcher's own compilation.

2.2 BACKGROUND AND EVOLUTION OF SUSTAINABILITY

The evolution of sustainability has been described as a series of three waves, the first occurred in the 1960s and 1970s with the birth of the Green Movement and the rise of NGOs. This developed an understanding that environmental impacts and natural resource demands have to be limited (Bharma & Lofthouse, 2016:1; Elkington, 2004:7). The second wave occurred in the 1980s, initiated by a range of economic crises and environmental catastrophes. Issues such as ozone depletion and rainforest destruction stimulated a new movement of green consumerism (Elkington, 2006:524). Protests against the World Trade Organisation, the World Economic Forum, and other institutions at the beginning of the new millennium brought about the start of the third wave. The 2002 UN World Summit on Sustainable Development brought the issue of governance for sustainable development firmly onto the global agenda. The third wave brought about campaigns on issues such as water scarcity and exploitation and recognised that profound changes in the governance of corporations are required (Bharma & Lofthouse, 2016:2; Elkington, 2004:9).

According to the International Institute for Sustainable Development (IISD) (IISD, 2012:1), Rachel Carson first published the concept of sustainability in 1962 with the publication of the book “Silent Spring”. Carson’s research is considered a turning point in the understanding of the interconnections between the environment, economy and social wellbeing (ADB, 2012:1). Many milestones have marked the journey towards sustainable development since Carson’s publication in 1962, and some key events are captured in Table 2-1.

Table 2-1: Key events towards sustainable development

Year	Event
1970	The First Earth Day is held as a national teach-in on the environment.
1971	The Founex Report calls for the integration of environment- and development strategies.
1975	The Worldwatch Institute is established to raise public awareness of global environmental threats.
1977	The Greenbelt Movements starts in Kenya, using community tree planting to prevent desertification.
1978	The Organisation for Economic Co-operation and Development (OECD) re-launches research on environmental and economic linkages. The work builds the foundation for the 1987 report, “Our Common Future” by the World Commission on Environment and Development (WCED).
1982	The UN World Charter for Nature calls for an understanding of our dependence on natural resources and the need to control their exploitation.
1987	The WCED publishes “Our Common Future,” also known as the Brundtland Report and popularises the term sustainable development, weaving together social, economic, cultural and environmental issues and global solutions.

Table 2-1: Key events towards sustainable development (continues)

Year	Event
1990	The IISD is established and begins publishing the "Earth Negotiations Bulletin" to record negotiations on environment and development.
1994	The Global Environment Facility gives more decision-making power to developing countries for work on biodiversity, climate change, water, land degradation and pollutants.
1996	ISO 14001 is formally adopted as voluntary international standard for corporate environmental management.
1999	Launch of the DJGSI, tracking leading corporate sustainability practices worldwide and providing guidance to investors seeking for profitable companies following sustainable development principles.
2000	The second World Water Forum recognises water security as a critical concern for the 21st century.
2002	The GRI releases guidelines on how organisations should report on economic, environmental and social dimensions of their business activities.
2005	The Kyoto Protocol enters into force, legally binding developed country parties to goals for greenhouse gas emission reductions.
2008	Green economy ideas enter the mainstream as a low-carbon economy and green growth become new objectives for the future economy.
2012	The third Earth Summit reconvenes in an effort to secure measures for clean energy and more sustainable and fair use of resources.
2014	The World Bank Group's Water Global Practice generates more firepower for transformational solutions to help countries grow sustainably.

Source: Adapted from ADB (2012), IISD (2012), and IISD (2016).

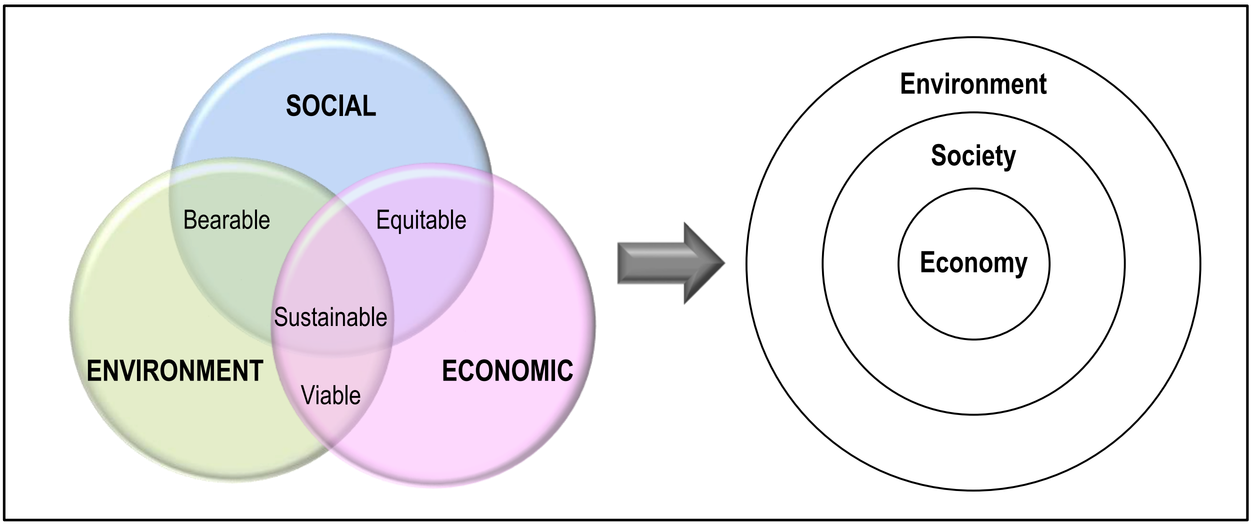
It is evident from Table 2-1 that businesses, governments, social reformers and environmental activists have embraced the fact that sustainable behaviour is crucial for future development. The key events from 1970 to 2014 were captured in Table 2-1. The trends and practices after 2014 are addressed in more detail as part of the literature study below.

2.3 DEFINITION AND CONTEXT OF SUSTAINABILITY

There have been many definitions of sustainability or sustainable development (Juwana *et al.*, 2012:358), but one that remains relevant is from the Brundtland report "Our Common Future", published by the WCED (1987:37). They state that: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It contains within it two key concepts, namely (a) the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and (b) the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs (WCED, 1987:37). South Africa adopted the National Framework for Sustainable Development in 2008, and defined sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision making to ensure that development serves present and future generations (DEA, 2012:22).

In a longitudinal analysis, Barkemeyer *et al.* (2009:73) applied data mining in analysing the media coverage of sustainability related concepts between 1990 and 2008. A significant increase was identified in the level of coverage, with the term “sustainability” surpassing “sustainable development” as the more widespread term used globally (Barkemeyer *et al.*, 2009:77). Barkemeyer *et al*. (2014:17) also analysed six globally important business guidance documents on sustainable development to explore whether, and to what extent, the initial emphases taken by Brundtland have been maintained – or not. Their findings suggest that the sustainability discourse indicates a predominant focus on the environment with little attention to social issues, and that the involvement of the private sector is critical in building awareness of environmental issues (Barkemeyer *et al.*, 2014:29). Giddings *et al.* (2002:189) stated that sustainable development is divided into the economy, environment and society, and that these three sectors are often presented as three equal interconnected rings, approaching issues of sustainable development in a compartmentalised manner. Giddings *et al.* (2002:189) suggest that the sectors are rather nested within each other as shown in Figure 2-2, where the economy is dependent on society, while both the economy and society is dependent on the environment.

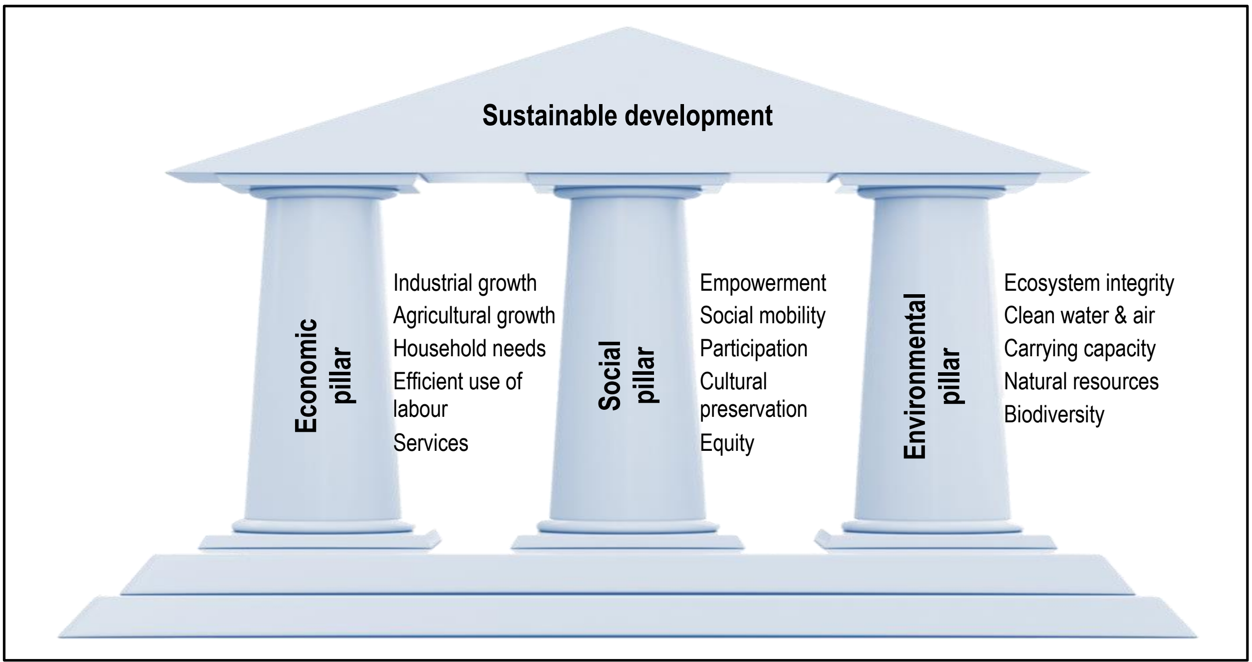
Figure 2-2: Models of sustainability



Source: Adapted from DEA (2012:19) and Giddings *et al.* (2002:192).

According to the World Bank (2016), meeting the needs of the future depends on how well the interconnecting relationships between economic, social and environmental objectives or pillars are managed when making decisions. Figure 2-3 presents the World Bank’s view of these three pillars, and how the interrelationships affect each other.

Figure 2-3: The pillars of sustainable development



Source: Adapted from OECD (2016:8).

Since sustainable development and environmental sustainability are such wide-ranging concepts, there are many different systems for reporting on sustainability. The term "social and environmental reporting" is used less frequently, with organisations more often adopting the term "sustainability reporting". There is however no consensus on what sustainability reporting means, nor a common shared framework (Adams & Larrinaga-González, 2007:350; DEA, 2012:23; Farneti & Guthrie, 2009:89). The term sustainability accounting refers to the process of collecting, analysing and communicating sustainability information (Burritt & Schaltegger, 2010:832). A company should adhere to its social responsibility and communicate sustainable information to its stakeholders through sustainability reports.

2.4 SUSTAINABILTY REPORTING

Sustainability reporting has become an increasingly needed and common practice by companies to meet the expectations of various stakeholders. A broad array of stakeholders are continually demanding companies to provide transparent disclosure on multiple dimensions of the triple bottom line (Hahn & Kühnen, 2013:5; Maubane *et al.*, 2014:153). In order to fulfil these expectations and to respond to the pressures and criticisms of stakeholders, companies have to communicate their business activities and the impact thereof on the environment and society (Akhter & Dey, 2017:62; Boiral, 2013:1036).

Sustainability reporting has become an important mode of communication for companies to report about their economic, environmental and social performance that could improve the company's value creation process. Sustainability reporting has shown to create new opportunities for companies to advance their image, to create value within a company and to strengthen the credibility of a company (D'Andrea, 2017:10). As stated in the legitimacy and stakeholder theories, disclosure is part of the dialogue between a company and its stakeholders, allowing the company to manage its reputational risks (Michelon, 2011:80). Herremans *et al.* (2015:418) argue that companies create different relationships with their stakeholders and that stakeholders utilise disclosure to evaluate the probability of continuing the relationship. Dong *et al.* (2014:59) state that social and environmental issues have become increasingly important to a wider range of stakeholders, demanding reliable and accurate information on CSR reporting. According to Lozano (2015:41), the most important external drivers towards corporate sustainability are reputation, customer demands and legislation. Husted and De Sousa-Filho (2017:93) stated that environmental, social and governance (ESG) disclosure has a long history within the CSR literature. ESG performance refers to the actual outcomes and impacts of CSR initiatives focussing on the environment, social and governance aspects. CSR actions of companies have been under analysis, as more companies realise that their environmental efforts, ethical labour practices and corporate governance are not meeting the expectations of their stakeholders (Tamimi & Sebastianelli, 2017:1660). A study by Eccles *et al*. (2011:113) revealed that there is a significant increase in Bloomberg's ESG disclosure scores, as many investors use them as proxies in assessing the quality of management.

It is evident that the demands from stakeholders for quality information have increased and in the same instance there is a notable variation in their demands. In order to meet the range of demands, the literature depends on various theories to support the disclosure actions of companies. Theories such as the institutional theory, legitimacy theory, resource dependence theory, agency theory and stakeholder theory have revealed themselves to support the viewpoint about sustainability reporting (Chan *et al.*, 2014:61; Hahn & Kühnen, 2013:14; Herremans *et al.*, 2015:418; Lokuwaduge & Heenetigala, 2017:440; Michelon *et al.*, 2015:60; Tamimi & Sebastianelli, 2017:1662).

The institutional theory advocates that a variety of external pressures (whether from government, customers or communities) activate companies to respond and disclose required information (Amran & Haniffa, 2011:143). The legitimacy theory emphasises the social contract between a business and society leading companies to disclose socially responsible information to display their communal accountable image. This is often the case to alleviate societal pressures and to legitimise their operations (Branco & Rodrigues, 2006:237). Complementing the legitimacy theory, the stakeholder theory considers interactions and pressures by specific parties and enables the company to manage the complex relationship between the company and all its stakeholders (Ruf *et al.*, 2001:144; Snider *et al.*, 2003:176). It is evident that the theories share some related themes such as the interlinked relationship a company has with its stakeholders. As cited by Tamimi and Sebastianelli (2017:1662), Deegan and Blomquist (2006:351) note that the theories addressed above may essentially be seen as broadly similar, because all focus on the internal or external pressures on a company to communicate social responsible disclosures to all stakeholders. This confirms the statement by Gray *et al.* (1995:52) to view all these theories as complementary rather than to recognise them as competing with each other. It appears that the legitimacy and stakeholder theory could form part of the theoretical foundation of this study.

Although sustainability reporting is rapidly becoming more prevalent and although it may hold substantial benefits to reporting companies, it is not without limitations. There is, however, an increasing debate over the lack of completeness and credibility of CSR information and its potential benefits to investors and financial stakeholders (Michelon *et al.*, 2015:60). Some shortcomings arising from the literature pertaining to sustainability reporting are listed below:

- Considerable diversity in the types of formats increased over the years, and verification also carries considerable costs (Kolk, 2010:373).
- Sustainability reporting guidelines tend to create compartmentalisation, not considering economic and environmental interlinkages (Lozano & Huisingh, 2011:101).
- Stand-alone reports provide more information, however some information is irrelevant, camouflaging other important items of disclosure (Michelon *et al.*, 2015:73).
- The requirement to disclose environmental information within annual reports, has not kept pace with legislative reform (Deegan & Rankin, 1996:50).

Keeping these limitations in mind, the idea of managing, measuring and reporting on the three elements of an organisation's social, environmental and economic impacts gained prominence, known as the TBL (Dumay *et al.*, 2016:166).

2.5 TRIPLE BOTTOM LINE (TBL)

Elkington proposed the TBL approach in 1997 as a tool towards sustainable development, providing a new language to express the sustainability concept (Adams *et al.*, 2004:18). The TBL concept also presented as the "three pillars" approach, emphasises the concept of capital. According to Elkington (1997), the concept of economic capital will need to absorb much wider concepts, such as natural capital and social capital (Elkington, 2004:10). Savitz and Weber (2007:22) gave credit to the TBL approach by stating that a sustainable company should be one that creates profits for its shareholders while protecting the environment and improving the lives of those with whom it interacts. As sustainability reporting or TBL reporting refers to a tripartite reporting framework that addresses the economic, environmental and social performance of a company, it becomes challenging to report on every aspect.

During the past two decades, there has been a tendency among companies to separate social and environmental disclosures into distinct stand-alone reports. This resulted in a wide range of issues to disclose in order to meet the expectations of various stakeholders, with the reports becoming long and more complex (De Villiers *et al.*, 2014:1045). Bernardi and Stark (2018:16) mentioned that the stand-alone report which attempts to provide non-financial information related to environmental and societal activities, lacks integration and tends to put the information into compartments. This was corroborated by Lozano and Huisingh (2011:101), who mentioned the shortcomings pertaining to sustainability reporting. This compartmentalisation resulted in stakeholders experiencing problems to link and connect information effectively in order to evaluate the company's business performance, strategy and value creation. Pavlopoulus *et al.* (2017:23) share this view that separate reports to explain a company's strategy, value creation and accounting information, confuse investors. The abovementioned criticism is recognised as the trigger towards adopting an integrated approach (Bernardi & Stark, 2018:17).

Because of this complexity, initiatives were launched to combine the social and environmental reports into a single report and follow a more integrated approach (Du Toit *et al.*, 2017:655). Steering away from individual reports has created the trend for combining financial as well as non-financial information in one report, referred to as an integrated report (Anderson & Varney, 2015:60). The rationale behind IR was to enable stakeholders to view and assess the organisation's capability to create and sustain values over the short, medium, and long term, without depleting the resources of the business (Bouten & Hoozée, 2015:375; Hughen *et al.*, 2014:61).

Considerations linked to social and environmental reporting have driven the early development of IR policies and practices (De Villiers *et al.*, 2014:1044). Frameworks such as TBL reporting was recognised as one of the solutions to the shortcomings of financial reporting, and as a result, IR has been promoted as a solution to the deficiencies of traditional financial reporting. The next section discusses the integrated approach towards reporting.

2.6 INTEGRATED REPORTING

As pointed out in the preceding paragraphs and expressed by King IV, the resources or capitals used by organisations constantly interconnect and interrelate with each other (IoDSA, 2016b:5). The following paragraphs elaborate on IR, its status, definitions, principles as well as previous research conducted on IR.

2.6.1 Background of IR and the IIRC

South African business organisations were increasingly called to account for their non-financial performance and for-profit motive during the 1990 to 1994 negotiations following *apartheid*. This setting, under conditions of social and economic inequalities, provided the backdrop for the King reports on corporate governance issued by the Institute of Directors in South Africa (De Villiers & Van Staden, 2006:769). The starting point of IR began in 1994 with the release of King I. The King I report is named after Professor Mervyn King, responsible for South Africa's first King Code of Corporate Governance Principles, putting an emphasis on stakeholder inclusiveness (Gleeson-White, 2014:151). The King II report was published in 2002 which introduced the concept of integrated sustainability reports. The content of King II was based on the TBL and included some guidelines of the GRI (Gleeson-White, 2014:157). King III was introduced in 2009 and its focus was on a holistic and integrated representation of a company's performance in terms of finances and sustainability (IoDSA, 2009:108).

In August 2010, The Prince's Accounting for Sustainability Project (A4S) and the GRI announced the formation of the IIRC (Eccles & Serafeim, 2011:71). The IIRC aims to forge a global consensus on the direction in which reporting needs to evolve where integrated thinking is embedded within mainstream business practices facilitated by IR (IIRC, 2011:1; IIRC, 2013b:2). Gray (2010:50) mentioned that sustainability reports are often criticised for non-integration into day-to-day management activities, and therefore not advancing sustainability. As stakeholders have questioned the relevance and reliability of annual financial reports as a basis for making decisions about a company, there was a move towards a more integrated approach (IRCSA, 2011:1).

The first endeavour in South Africa to implement IR across all listed companies was introduced by the JSE in 2010. These stipulations require listed companies to issue an integrated report for financial years starting on or after 1 March 2010, or to explain why they are not complying. However, the literature reveals some misunderstandings about the listing requirements of the JSE with regard to IR. The JSE issued a guidance letter dealing with IR on 27 June 2013, which stated that the production of an IR is not a mandatory principle as long as South African companies produce reports that comply with the substance of King III or King IV, corporate guidelines or with the requirements of the JSE (Dumay *et al.*, 2017:464). IR emphasises the incorporation of CSR and sustainability reporting into annual reports, to serve as an indication of what businesses have done and planning to do in order to contribute to society.

The Integrated Reporting Committee of South Africa (IRCSA) started to work on a framework for an integrated report. This resulted into the development of an International Framework on IR, called the International Integrated Reporting Framework (IIRF), released by the IIRC in 2013. The aim of the IIRC was to improve the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital (IIRC, 2013b:2). The latest King IV report was published in 2016 which put an emphasis on IR and integrated thinking (IoDSA, 2016a:11). King IV is different from previous King reports as it advocates an outcome-based approach with clear differentiation between principles and practices. In order to reinforce the qualitative application of its principles and practices, King IV proposes an "apply *and* explain" approach in contrast with King III where an "apply *or* explain" approach was followed (IoDSA, 2016b:30). The IIRF is an integral part of the new King IV, although preparing reports based on the IIRF is not a requirement. According to Dumay *et al.* (2017:464), the outcome-based approach of King IV determine that companies in South Africa could prepare an IR in any format as long as they adhere to all the governance principles of King IV on an "apply and explain" basis.

King IV emphasises the concept of good corporate governance based on ethical and effective leadership by the governing body of the organisation. The underpinning philosophies of King IV, to ensure sustainable development, are based on integrated thinking, corporate citizenship, stakeholder inclusivity and to recognise the organisation as an integral part of society (IoDSA, 2016b:23). As King IV promoted integrated thinking, the move from silo reporting towards IR was inevitable.

2.6.2 Definition and elements of IR

In essence, an integrated report is a compilation of the conventional financial statements and the so-called sustainability report, with the aim of providing the stakeholders of the company with a complete overview of the company's historical operations and future prospects. It also integrates and links information about strategy, risks and opportunities and relates these to the social, environmental, economic and financial issues of a company (IIRC, 2011:2). IR is also defined as:

> *"Creating value through an organisation's business model, which takes inputs from the capitals and transforms them through business activities and interactions to produce outputs that over the short, medium and long term, create or destroy value for the organisation, its stakeholders, society and the environment"* (IIRC, 2013c:1).

The concept of value creation remains one of the three fundamental concepts underpinning IR (IIRC, 2013c:9). One of the elements central to IR is the "organisational overview, business model and external environment" which is seen as the process by which an organisation seeks to create and sustain value in the short, medium and long term. As mentioned before, IR aims to provide insight about the resources used and affected by an organisation and are referred to as "capitals" in the IR framework. A company must explain how it interacts with the external environment and various capitals (IIRC, 2013b:4). The IIRC identifies six capitals that are in essence the financial and non-financial resources: (a) financial, (b) manufactured, (c) intellectual, (d) human, (e) social, and (f) natural capital. Natural capital is important within the context of this study and is discussed later in this chapter. Some important principles of IR are discussed next.

2.6.3 Important principles of IR

As previously stated, the primary aim of IR is to improve the quality of information that is presented to the suppliers of financial capital in order to be more efficient and productive in the way capital is allocated (IIRC, 2013b:4). In order to deliver quality information, the IIRC proposed a set of principles to guide and improve IR practices (IIRC, 2013b:5):

- **Strategic approach and future orientation:** An integrated report should provide insight into the organisation's strategy and how it relates to the organisation's ability to create value over the short, medium and long term. An analysis of risks and opportunities must be carried out.
- **Connectivity of the information:** An integrated report should be interrelated and present connectivity between the different capitals.
- **Relationship with stakeholders:** Providing insight into the nature and quality of key stakeholder relationships and how, and to what extent, it meets their needs.
- **Materiality:** An integrated report should disclose information that substantially affect the value creation process (the concept of materiality) of the company.
- **Conciseness:** The integrated report should find a balance between the other principles and the amount of information provided.
- **Reliability and integrity:** The report should include all material aspects, both positive and negative in a balanced manner.
- **Consistency and comparability:** An integrated report should be consistent over time, enabling comparison with external organisations.

Ruiz-Lozano and Tirado-Valencia (2016:256) analysed 21 companies in the industrial sector on how effectively they respond towards the principles in the IR framework as detailed above. The results revealed that all of the principles scored below 80% with an average disclosure of 65%. The highest level of attention was in terms of the strategic approach (79.5%), followed by connectivity of the information (77%), materiality (70.6%), consistency and comparability (68.3%), and commitment to stakeholders (63.7%). The main findings reveal that, although the level of consideration to the principles is not very high, the results are still offered in an integrated manner. The results also reveal high narrative content, not answering to the principle of conciseness, and although the reports analysed are from the same sector, the comparability of the KPIs used, are not homogeneous (Ruiz-Lozano & Tirado-Valencia, 2016:258).

2.6.4 Status of IR

In the light of criticism to financial reporting not satisfying the needs of all stakeholders seeking social and environmental information, companies encounter more pressure to act in sustainable ways and to be more transparent about their sustainability practices (Bernardi & Stark, 2018:16; Lozano & Huisingh, 2011:100). The question arises: "Does IR favour the integrative management of sustainability by conveying unbiased disclosures related to the sustainability of a company?" Stacchezzini *et al*. (2016:103) aimed to answer this question by analysing 54 integrated reports, investigating how the adopters of IR are able to incorporate their sustainability actions into their disclosures. The results indicate that the firms analysed do not actually integrate sustainable management accounting with sustainability reporting, resulting in disclosures appearing inadequate towards managing sustainability. It also reveals that IR, at the stage of investigation, has not overcome the limitations of other sustainability reporting initiatives, and that quantitative and forward-looking information is still inadequate (Stacchezzini *et al.*, 2016:109). In this light, Flower (2015a:5) criticises IR on the extent to which it addresses sustainability and anticipates that IR will have little effect on corporate practices. However, Adams (2015:25) states that sustainability is not the main purpose of IR, and that many businesses are adopting IR. Adams (2015:27) expands that internationally, regulation is increasingly requiring the disclosure of strategy, risks and business model information in annual reports.

South Africa is considered a pioneering country when it comes to IR and the formalisation thereof, due to King III. PwC surveyed the top 40 JSE-listed companies in terms of the quality of their reports and found that the extent of reporting on governance showed improvement since the inception of IR. The companies reviewed also communicate effectively on their business models, strategy and resource allocation (PwC, 2014:8).

A case study performed on four high-impact companies from different sectors in South Africa, investigated the long-term effect of IR on the quality of information (Du Toit *et al.*, 2017:654). An interpretive case study approach, informed by thematic content analysis, was implemented to establish whether the extent of social, environmental and ethical reporting changed during the 2012 to 2014 selected years of the integrated reports. This study used the same methodology and list of items as Solomon and Maroun's study in investigating years from 2009 to 2011 (Solomon & Maroun, 2012:10). Solomon and Maroun's (2012:34) study indicated increased disclosure, with social, environmental and ethical issues appearing in a greater number of sections in the 2011 integrated reports. However the most recent study indicate a reduction in the amount of reporting during the three year period. Du Toit *et al.* (2017:668) argued that it could be a positive signal indicating that companies are reducing needless information and making efforts to integrate sections. The researcher agrees with the statement of Du Toit *et al.* (2017:668), as the conciseness of information connects with the materiality concept which involves the disclosure of significant matters.

Higgins *et al.* (2014:1090) undertook semi-structured interviews with 23 managers, providing insight into the institutionalisation of IR by early adopting Australian firms. Early adopters of IR are viewed as organisational role models crucial to the institutionalisation of IR. The findings revealed that the discursive and material strategies narrated by the managers continue to focalise strategic motivations as the rationale for undertaking IR (Higgins *et al.*, 2014:1112). The statement above is supported considering that strategic content could provide stakeholders with a more forward-looking vision of the company's intentions.

2.6.5 Previous research on IR

A study performed by Frías-Aceituno *et al.* (2013:45), advocate a more pluralist approach which takes stakeholders, sustainability, business ethics and transparency into account. The study also indicated that, although important initiatives have been taken, only a few of the 750 international companies studied for the years 2008 to 2010, have moved towards IR (Frías-Aceituno *et al.*, 2013:52). Perego *et al*. (2016:58) presented qualitative findings from interviews with three experts and field entrepreneurs of IR. The interviewees agreed that current IR initiatives have developed in isolation, consequently any form of comparison between disclosed information on sustainability practices remains extremely difficult (Perego *et al.*, 2016:59). All three experts identified the pressing need to scale-up dispersion of IR thinking and practice, revealing that the diffusion of IR practices requires greater engagement with investors and academics (Perego *et al.*, 2016:60). This view connects with Eccles and Saltzman (2011:59), stating that IR benefits improved internal resource allocation and greater stakeholder engagement. However, the integration of information is still lacking in the sense that financial and non-financial information regarding the tangible and intangible capitals are not integrated (Eccles & Saltzman, 2011:61).

Research performed by Dumay *et al*. (2016:168), utilised the Structured Literature Review methodology to review both peer-reviewed conference papers and academic articles on IR. The most prominent publications on IR were scrutinised revealing the following results formulated below (Dumay *et al.*, 2016:179):

- Predominantly public listed companies use IR. The potential to broaden this behaviour to private companies and non-profit organisations was identified.
- The study found that the European Union (EU) was the most active publishers with 27 articles on the topic, followed by Australasia with 15 articles. It was expected that South Africa should take the lead, as at that stage it was the only country where IR was widely adopted.
- At the stage of the investigation, there was little research found on the assurance of information in IR.

Based on the results, the following shortcomings were identified and related recommendations were made (Dumay *et al*., 2016:179):

- IR is still very diverse and lacks comparability.
- There is still no consensus whether the IR guidelines should be prescriptive or normative.
- Given the differences in organisational types and activities, fluidity and flexibility should be built into the guidelines and standards of IR. This refers to the fact that industry-based or site-level-based metrics should be considered.

In this light, Eccles and Saltzman (2011:60) also recognised challenges such as the lack of a framework or standards for non-financial information and questions around the reliability of the information in the report, but stated that these challenges must soon be overcome. An important conclusion of Dumay *et al.* (2016:179) directly influencing this study is that researchers should convince others about the usefulness of non-financial measures based on the capitals and to demonstrate a meaningful interplay between quantitative measures of performance and qualitative performance indicators. More shortcomings, conclusions and recommendations emerging from previous studies about IR are listed below:

- Fragmentation in regulatory standards and across institutional settings makes it difficult to make comparisons across companies (Frías-Aceituno *et al.*, 2013:52).

- The fact that after more than two decades of research in corporate sustainability, there are still no convergence of definitions and measurements of complex processes of sustainable-related practices (Montiel & Delgado-Ceballos, 2014:113; Perego *et al.*, 2016:61).
- The mainstream providers of financial capital lack an understanding of IR and there are information gaps between information disclosed by companies and the needs of investors (Stubbs & Higgins, 2014:1081).
- There is a need for a broader set of skills for the assurance of IR information, because of the broad range of resources and relationships that should be assured (Simnett & Huggins, 2015:51).
- The tension between conciseness and completeness of the information disclosed could generate useful insights for both standard setters and companies who embark on the IR movement (Perego *et al.*, 2016:62). The conciseness of reporting links with the materiality concept in an attempt to disclose the most significant information – which is addressed in more detail later in this study.

To summarise, it is recognised that IR is still evolving, and that time is needed for companies to get acquainted with this form of reporting. Although IR has progressed and is in the process of being recognised, there are still some limitations. As the focus of IR is on the three pillars of reporting on economic, social and environmental information, the attention of this study moves to the pillar that deals specifically with the reporting of environmental information.

2.7 ENVIRONMENTAL REPORTING

The Millennial Generation (1981 to 1996) – as the most numerous age cohort setting the global agenda – have indicated their concern about the global environmental crunch much more than the global financial crises (IoDSA, 2016b:3). The shift from short-term to long-term financial performance and the need to create value, underlines the need for sustainable development that includes taking care of the environment. The importance of environmental reporting and how it operates within the context of the TBL, are discussed next.

2.7.1 Introduction and background

The environment includes all living and non-living objects, and humanity utilises environmental resources including air, land and water to meet their basic survival requirements (Camp & Heath-Camp, 2016). Many companies have been criticised for contributing to environmental problems such as climate change, depletion of natural resources and lagging their responsibility (Braam *et* *al.*, 2016:724). Environmental degradation is initiated by several anthropogenic factors to meet human needs. The deterioration of the environment through the depletion of resources such as air, water, soil, the destruction of ecosystems and the extinction of wildlife are familiar features of environmental degradation. It can be defined as any change or disturbance to the environment perceived to be undesirable (Gwangndi *et al.*, 2016:487). The conservation and protection of the environment is vital for the survival and wellbeing of humankind. Natural resources such as land, air and water should be used wisely and sustainably to ensure a healthy environment for present and future generations (Ekins, 2002:72).

There has been a significant increase in the number of regional and global environmental challenges in the 21st century (Simsekli, 2015:222). Table 2-2 provides a summary of the most significant (although not all) environmental challenges that the world will face during the 21st century, and the associated impacts on the environment (Flower, 2015b:248).

Table 2-2: Most significant environmental challenges for the 21st century

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

Source: Adapted from Flower (2015b:249-252).

Attributable to the challenges indicated in Table 2-2, the topic of environmental sustainability has attracted considerable attention during the last decade (Paillé & Raineri, 2015:2404). All the global environmental challenges need to be addressed with urgency, and therefore the importance of environmental awareness cannot be underestimated (Simsekli, 2015:223). Environmental awareness alludes to understanding the fragility of our natural environment and the importance of protecting it (Du *et al.*, 2018:19). In order to stimulate this awareness, a company needs to manage its resources and report on its impact on the environment.

2.7.2 The importance and development of environmental reporting

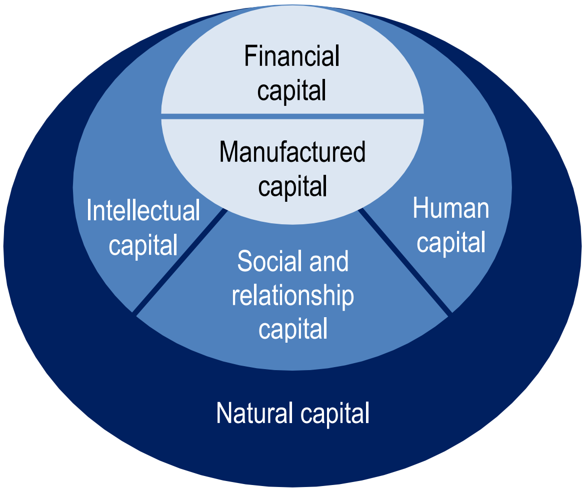
Environmental reporting is the disclosure of information relating to environmental impacts, activities, policies and performance of an organisation in annual reports or by some other medium: stand-alone corporate environmental reports, environmental policy statements, or web publications – utilised by multiple stakeholders. There are a large number of factors driving a company to report on environmental issues such as international standards, mandatory national requirements, a competitive advantage, investment opportunities or stakeholder pressures (Pahuja, 2007:23). Accounting for environmental issues and environmental information is important in advancing sustainable development and holds the key to successful accountability interrelationships between an organisation and its stakeholders (Schaltegger & Burritt, 2017:26).

Deegan (2017:70) reflected on the past 25 years of social and environmental accounting research, and noted that environmental reporting was not common in the early 1990s. However, a spike in the number of social and environmental accounting publications between 2009 and 2014, is reflective of increased scholarly efforts to address social and environmental accounting issues. Drawing on the stakeholder theory, Gallego-Alvarez *et al.* (2017:811) analysed 3 931 companies focussing only on the GRI G3 core indicators. The results indicated that companies follow two environmental reporting approaches, which depend on specific stakeholders and institutional requirements. Companies operating in codified law countries (more civil law dependant) mostly focussed on water and emissions, while those operating in common law countries emphasised materials and energy issues (Gallego-Alvarez *et al.*, 2017:809). With the current corporate environment and access to information, a company's success depends on their reputation and trust by its consumers, as consumers are identifying greener companies and their products (Gallego-Alvarez *et al.*, 2017:809; Goyal & Agrawal, 2017:355).

Companies realise that their environmental efforts, ethical behaviour and corporate governance becomes increasingly important to various stakeholders, therefore affecting business success (Tamimi & Sebastianelli, 2017:1660). In response to these pressures, companies disclose environmental information in order to increase transparency and ensure legitimacy (Delgado-Márquez *et al.*, 2017:115). Transparency, as part of environmental reporting, requires companies to have a commitment to collect and to disclose detailed information on governance, social and environmental aspects. Two key theoretical frameworks that unveil themselves when disclosing on the environment is the stakeholder and legitimacy theories. Environmental reporting is also closely linked to the concept of natural capital as referred to in IR.

As mentioned previously in this chapter, natural capital – as part of the six capitals of the IR framework – is important within the context of this study. Natural capital underpins all other forms of capital including financial capital, resembling how the society and economy is dependent on the environment (CIMA, 2013:1). Figure 2-4 displays this connectivity between the capitals, indicating how companies are dependent on the six capitals.

Figure 2-4: The six capitals prototype framework



Source: Adopted from IIRC (2013a:3).

Reporting on the capitals as illustrated in Figure 2-4 are embedded in the Content Elements of the IR framework as follows (IIRC, 2013a:5):

- Consideration of the availability, quality and affordability of the capitals is included within the content element "organisational overview and operating context".
- The organisation's culture and ethical values are reflected in its practice and effects on the capitals.
- The links between the organisation's strategy and its use of and effects on financial and other capitals, are used to arrive at performance based compensation, and are included in the content element "governance".
- Opportunities and risks relating to the continued availability and quality of relevant capitals are included in the content element "opportunities and risks".
- The organisation's strategy and resource allocation plans affect key capitals and risk management arrangements related to them are included in the content element "strategy and resource allocation".
- A description of relevant capitals is inherent in the description required by the content element "business model".

- Demonstrating the connectivity of financial performance with performance and outcomes regarding the other capitals is included in the content element “performance and outcomes”.

- The implications for future performance and outcomes of the availability, quality and affordability of capitals the organisation uses, and why they are important to the organisation’s ability to create value over time, are included in the content element “future outlook”.

Recognising the importance of the six capitals and their relationship to the elements in the IR reporting framework, natural capital is discussed in more detail.

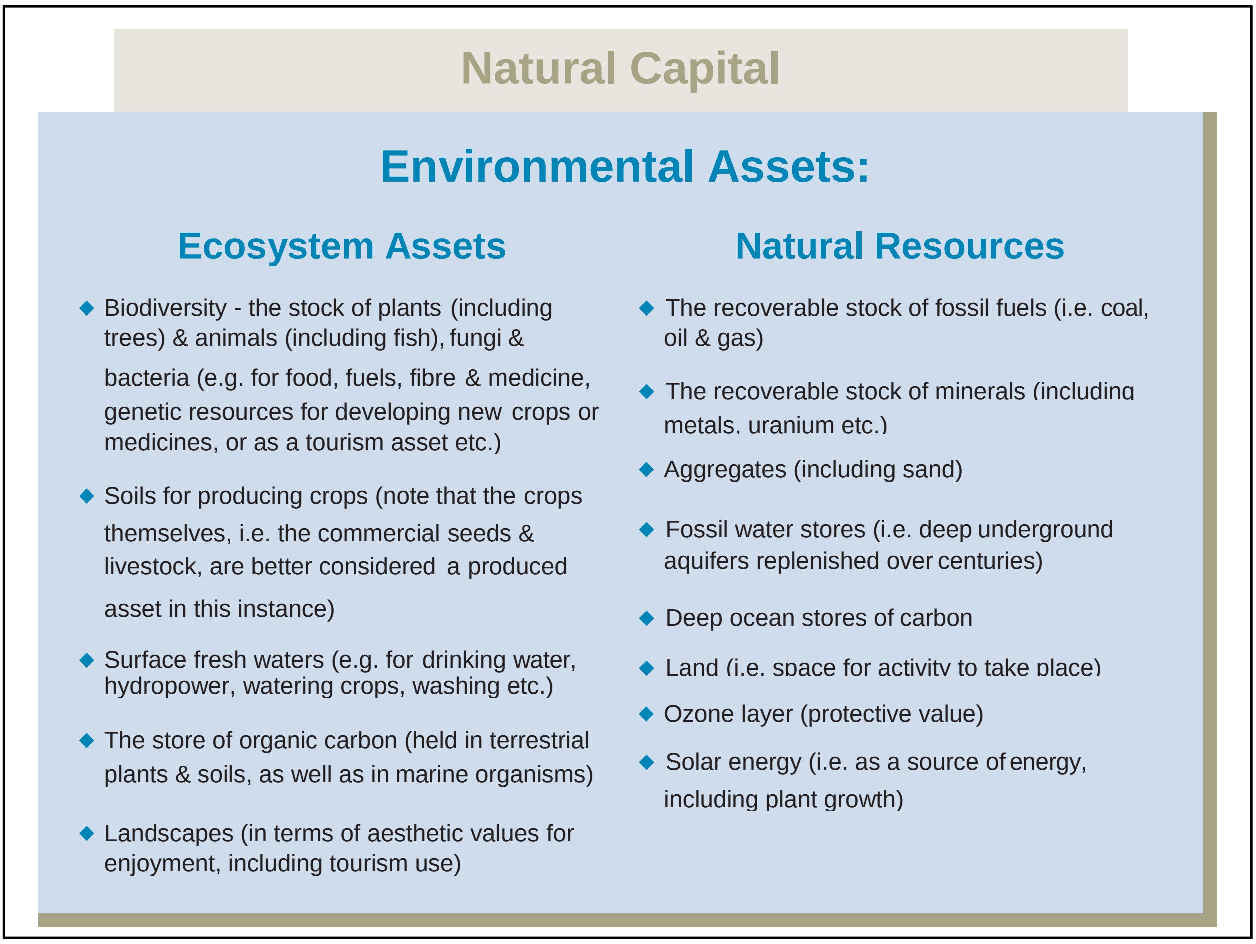
2.8 NATURAL CAPITAL

The concept of natural capital is more relevant than ever as we find ourselves in the midst of the fourth industrial revolution, devising a means to achieve sustainable development goals (UNEP, 2017). All businesses are either directly or indirectly dependant on natural capital (ACCA, 2014:3). The following paragraphs provide more information on natural capital, with the aim to illustrate how natural capital – as part of the six capitals – could be reported on.

2.8.1 Introduction and background

According to Recuero Virto *et al.* (2018:244), there is no single agreed-upon definition of natural capital. The Climate Disclosure Standards Board adopted the IIRC’s definition of natural capital as: “All renewable and non-renewable environmental resources and processes that provide goods or services that support the past, current or future prosperity of an organisation. It includes air, water, land, minerals and forests, biodiversity and ecosystem health” (CDSB, 2015:8). The United Nations Environment Programme (UNEP) emphasises specific components of natural capital by stating that: “Natural capital includes land, minerals and fossil fuels, solar energy, water, living organisms, and the services provided by the interactions of all these elements in ecological systems” (UNEP, 2014:7). The System of Environmental Economic Accounting framework, refers to natural capital as all types of environmental assets, the naturally occurring living and non-living components of the Earth, constituting the biophysical environment (European Commission *et al.*, 2013). UNEP (2014:8) recognises no difference between their definition and SEEA’s definition of environmental assets confirming that natural capital is made up of ecosystem assets and natural resources as illustrated in Figure 2-5.

Figure 2-5: Natural capital: examples of ecosystem assets and natural resources



Source: Adopted from UNEP (2014:8).

2.8.2 The role of natural capital in the environment

Natural capital should be part of a company's policy and decision making. Governments around the world are exploring how to measure their success (value creation) based on incorporating natural capital in- and outputs. Institutions such as the World Bank, OECD and the UN took a leading role to incorporate and highlight the importance of natural capital (UNEP, 2014:6). As an example, the Natural Capital Declaration was launched by the UNEP Finance Initiative, which led to financial institutions becoming signatories in working out how natural capital accounting might be carried out (UNEP, 2014:10).

Natural capital should be part of a broader decision-making context, and in that regard, it could affect large-scale transformations in policies, practices and investments. These considerations are not only relevant to natural resource and conservation decisions, but also for health, agriculture, energy, water security, infrastructure, urban development, finance and areas that extend beyond classic conversation (Goldstein *et al.*, 2012:7565). According to Sukhdev (2012), most business and economic practices still ignore natural capital. The reason cited is that natural capital is perceived to be in isolation from the other forms of capital and the mainstream of economic and social activity. The focus of accounting and reporting on natural capital has gained significant interest and some developments have been observed to incorporate natural capital in companies' reports. Advances in national-level natural capital accounting may increase the robustness of performance indicators on the issue. The World Bank led a project, called Wealth Accounting and Valuation of Ecosystem Services, which intended to support countries rich in natural capital to balance trade-offs among industry, communities and biodiversity, and ecosystem services (ACCA *et al.*, 2013b:33). The following shortcomings were identified (ACCA *et al.*, 2013b):

- The detail of reporting on natural capital vary even between sectors.
- Natural capital risk tends to be reported only by companies required by law to do so.
- A lack of agreed metrics and reporting guidance combined with a perceived immateriality hampers more comprehensive reporting; this represents a failure to meet the needs of stakeholders.

2.8.3 Reporting on natural capital

The long-term viability of business and society depends on maintaining natural capital, however, freshwater, forests, and biodiversity are being consumed at an alarming rate (CIMA, 2014:4; Maxwell, 2017:5). Growing business demand for natural capital and failing supply due to environmental degradation, are contributing to natural resource constraints such as water scarcity (Trucost, 2013:7). The Natural Capital Impact Group (2017:2), recognised the obstacle of providing for as many as nine billion people by 2050 with limited resources of land, water and natural resources. The growing awareness of the link between the earth's natural systems and corporate value, urge companies to evaluate their impacts and dependencies on natural capital and to disclose these to their stakeholders (Trucost, 2013:20). ACCA *et al.* (2013b:7) point out that stakeholders' attention on biodiversity and ecosystem services issues grows, as these issues begin to feature in management disclosure and analysis, the qualitative part of the annual report and accounts, or within separate sustainability reports. ACCA *et al.* (2013b:7) also state that there are instances where an item or issue might be measurable in financial terms and therefore included in the quantitative elements of the accounts.

According to ACCA (2013:3), reporting on natural capital can be split into two main categories: (a) narrative reporting on strategy and management, and (b) performance reporting. *Narrative reporting* provides stakeholders with a qualitative understanding of the organisation's relationship with natural capital and the processes used to manage the several risks and opportunities connected with the organisation's activities. *Performance reporting*, on the other hand, uses KPIs to track performance over time to provide stakeholders with quantitative information (ACCA, 2013:7). ACCA (2013:3) recognises the challenge to report on natural capital performance based on KPIs, arguing that indicators generally reflect organisation-wide performance, while corporate impacts and dependencies on natural capital are often site-specific in nature. Figure 2-6 indicates in which line natural capital could be included in an organisation's statement of financial position.

Figure 2-6: The effect of natural capital in the statement of financial position

How would goodwill be affected by the manner in which a company addresses natural capital? Could better management increase a company's goodwill or could poor management lead to goodwill impairment?

Would new market mechanisms, such as biodiversity markets, create credits that would qualify as intangible assets?

Could trends in natural capital reduce the value in use or recoverable value of PPE, resulting in the need for impairment?

How would tighter rules on rehabilitating industrial sites affect restoration provision? Would tighter environmental regulation lead to the increasing of environmental provisions?

	2012 (£'m)	2011 (£'m)
Goodwill	20	25
Intangible assets	40	43
Property, plant and equipment	730	800
Non-current assets	**790**	**868**
Inventories	12	15
Trade and other receivables	35	45
Cash and cash equivalents	4	5
Current assets	**51**	**65**
Total assets	**841**	**933**
Borrowings	-80	-100
Trade and other payables	-23	-26
Current liabilities	**-103**	**-126**
Borrowings	-150	-170
Provisions	-350	-340
Non-current liabilities	**-500**	**-510**
Total liabilities	**-603**	**-636**
Net assets	**238**	**297**
Share capital	14	14
Share premium	139	139
Reserves	35	85
Retained earnings	50	59
Total equity	**238**	**297**

Source: Adopted from ACCA *et al.* (2013b:38).

The Natural Capital Coalition, a multi-stakeholder initiative and global collaboration between research, science, academia, business, accountancy, reporting, standard setting, finance and other organisations and initiatives developed the Natural Capital Protocol (CIMA, 2013:11; Natural Capital Coalition, 2016). While there are national level natural capital accounting initiatives such as the UN System of Environmental Economic Accounting implemented by governments, the Natural Capital Protocol is focussed at a business decision-making level that can be implemented across boundaries (Natural Capital Coalition, 2015:11). The Protocol provides guidance on qualitative, quantitative and monetary valuation and allows a business to adapt and integrate existing business processes to inform decision making (Natural Capital Coalition, 2016:3). The Protocol consists of four stages namely: Why, What, How and What next, and is further broken down into nine steps containing specific questions to be answered when carrying out a natural capital assessment (Natural Capital Coalition, 2015:8). Table 2-3 is an indication of what the Protocol does, and does not intend to, accomplish.

Table 2-3: The Natural Capital Protocol's intentions

The Protocol intends to…	The Protocol does not intend to…
Build on existing tools, methods and techniques to identify, measure and value natural capital.	Seek to create new tools and methods.
Focus on improving internal management decision making.	Provide a framework for external financial reporting, although decisions can be reported.
Provide a standardised process that is flexible in the choice of measurement and valuation approaches.	Explicitly promote specific tools, methodologies or approaches.
Provide a process to internally standardise the approach you adopt.	Produce results that are comparable within or between different businesses or applications.

Source: Adapted from Natural Capital Coalition (2015:8).

Natural capital is needed to sustain growth, to support human wellbeing and could be regarded as a critical asset for developing and developed countries. To value the environment and incorporating natural capital into a company's accounts, can support better decisions. To account for natural capital could be the "elephant in the boardroom", because by 2030 the world will need natural capital equivalent to two planets to sustain ourselves (CIMA, 2013:5).

Natural capital can be seen as fundamental in supporting all other forms of capital. For example, the benefits of fresh water (natural capital) are often only realised by applying other forms of capital like a water pump (manufactured capital), which is purchased using money (financial capital), and owned and operated by social and human capital (Natural Capital Coalition, 2016:3).

The interconnection and interconnectedness between the six capitals as part of IR have been mentioned previously, but it is also important to understand the impacts and dependencies which are experienced within this relationship. According to the Natural Capital Coalition (2016:2), every business impacts and depends on natural capital and these impacts or dependencies could be positive or negative. A negative impact such as pollution or poor water quality could result in companies experiencing higher risks, whereas an improvement in water quality could provide more opportunities (Natural Capital Coalition, 2015:5). With any impact or dependency on natural capital, costs and benefits are created that needs to be measured and communicated. These costs and benefits have an impact on business and society, illustrating the interconnection between the capitals (Natural Capital Coalition, 2016:80).

2.8.4 Water as natural capital

Green *et al.* (2017:320) support the serious challenge of providing sufficient food, water and energy to supply the increasing size of the global population. Fundamental to this point is the need to understand and account for the manner in which food, energy, water and the environment interact and the implications of these interactions on human wellbeing. Often policy and research communities refer to this interconnected milieu as the 'nexus' (Vira, 2015:766). Governments, as well as the private sector, have a serious role to play in formulating and implementing policies to manage the distressing impacts of the nexus crises (Guerry *et al.*, 2015:7352). As water is part of natural capital, its impact and dependency needs to be measured and communicated to business and society. The Nature Conservancy and Dow Chemical Company (2017:15) recognised that communities and businesses are faced with increasing risk of water shortages and water price increases. Water is an irreplaceable resource, vital to human life and becoming one of the scarcest and most sought after resources worldwide (Askham & Van der Poll, 2017:1).

2.9 REPORTING AND DISCLOSURE OF WATER

The CDP Water Disclosure Program directs companies to disclose water information that raise awareness and understanding of the business risks and opportunities around water. They also urge companies to accelerate the development of standard measures and performance benchmarks (CDP, 2015).

2.9.1 Introduction

According to Hazelton (2013:293), the access to water information has gradually been accepted as important and access to water information may indeed constitute a human right. Water disclosure is a critical component of a company's water management efforts and can be applied in a number of ways, for example:

- it can act as the foundation of a stand-alone report on the company's water management activities;
- serve as a component of broader sustainability reports;
- inform company financial filings;
- augment information on company websites; and
- be a starting point for dialogue with company shareholders (CDP, 2012:9).

The maturity and sophistication of water disclosures are directly linked to the maturity and comprehensiveness of a company's water management practice. Thus, companies cannot report data they do not measure, or management response strategies they are not pursuing. As previously stated, companies should be aware of reporting irrelevant information, and focus on significant matters – which led to the materiality concept.

2.9.2 Materiality

Materiality could be recognised as a multifaceted concept that is in an evolutionary phase. Key stakeholders such as investors review corporate performance on the basis of measures of financial materiality. The original goal of accounting was to provide a true and fair view of a company's performance and in this context materiality indicates the point after which the financial information becomes relevant to the needs of the users thereof. ACCA *et al.* (2013a:5) define material issues as those items that could impact the users of financial accounts.

Materiality is an important indicator in the traditional corporate financial context, but appears to be more critical in non-financial reporting (Lai *et al.*, 2017:533). Materiality should be recognised as a guiding principle in financial and non-financial information, and currently we are in a transitional phase where sustainability reporting is shifting from a voluntary regulation system to a more concrete or rigorous one (Ortar, 2018:20). This requires recognising what is material to investors from the company's perspective and what is significant to society (Reverte, 2015:286).

The GRI (2013:3) states that organisations should report on those topics that are material to the business and their key stakeholders, which could lead to more relevant and credible reports. In essence, companies need to report on material issues that are critical to achieve their goals and objectives. Materiality could be recognised as the strainer to determine whether information is considered important and useful to stakeholders. This connects with the stakeholder theory as the company would prefer to disclose only important information that could have an impact on their stakeholders (Ngu & Amran, 2018a:4).

The IIRF, proposed by the IIRC, that focusses on the six capitals and promotes the sustainability and value creation concepts, define materiality as an item that can substantively affect the organisation's ability to create value over the short, medium or long term (International Federation of Accountants & International Integrated Reporting Council, 2015:5). In the context of IR, the challenges as indicated by Lai *et al.* (2017), was to align a company's materiality process with regulatory frameworks to offer a concise explanation of a company's business model. It was also difficult to provide a balanced view of the issues that appear to be material to both the company and its external stakeholders.

In formulating their definition of materiality, the Sustainability Accounting Standards Board (SASB) has been influenced by the United States federal securities laws, as well as by regulations of the Securities and Exchange Commission (Wu *et al.*, 2018:3). The SASB is a US based non-profit organisation, and the counterpart of the Financial Accounting Standards Board, who is responsible to develop and circulate sustainability accounting standards – with a focus on US public companies (Goelzer & Hackett, 2014). The SASB defines materiality as follows:

> *“Information is material if there is a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the ‘total mix’ of information made available”* (SASB, 2017:5).

In practice the materiality of sustainability-related information is extremely difficult to establish and effective and consistent reporting on materiality is lacking. Due to this problem, in order to improve the completeness, consistency and uniformity of sustainability reports, Wu *et al.* (2018:11) completed a study to review the definition and identification of materiality to propose screening methods for materiality assessments. The results indicated that the GRI’s Sustainability Disclosure Database is recommended for practitioners due to its balanced disclosure on management, economic, environmental and social sustainability themes.

The GRI 101 document with the title ‘foundation’, is the starting point for using the set of GRI Standards as set out according to the Global Sustainability Standards Board (GSSB) (GRI, 2016a:4). The GRI states that materiality is the principle that determines which topics are expected to reflect significant impacts on the organisation’s TBL. Impacts that are considered important enough to require active management or engagement by the organisation are considered significant (GRI, 2016a:12). The GRI (2016a:18) expands by asserting that material topics are those that an organisation has prioritised for inclusion in the report, and that this prioritisation process is carried out by using the stakeholder inclusiveness and materiality principles. Ngu and Amran (2018b:3) state that high-level discussions between the board of directors and stakeholders in relation to materiality, are crucial steps for prioritising issues that are material. The materiality principle identifies material topics based on the following two dimensions (GRI, 2016b:6):

- the significance of the company’s economic, environmental, and social *impacts*; and
- their substantive influence on the assessments and decisions of *stakeholders*.

The GRI standards are divided into four series, as illustrated in Table 2-4.

Table 2-4: GRI standards

Series	Description
Universal series (100 series)	
GRI 101	Foundation; GRI 101 sets out the Reporting Principle for defining report content and quality.
GRI 102	General Disclosures; they are used to report contextual information about a company and its sustainability practices.
GRI 103	Management Approach; is used to report information about how a company manages a material topic. Applying GRI 103 allows the company to provide a narrative explanation of why the topic is material, where the impacts occur, and how the company manages the impacts.
Topic-specific standards	
200 series	Economic topics
300 series	Environmental topics (Water is part of the 300 series and is named GRI 303: Water and Effluents)
400 series	Social topics

Source: Adapted from GRI (2016a:4).

Indicated in the GRI 103, management approach document, a company should provide (a) a narrative explanation of why a topic is material, (b) indicate where the impacts might occur, and (c) how the company is managing it (GRI, 2016b:6). It is challenging to establish materiality and materiality thresholds for traditional non-financial risks which are difficult to quantify and consequently it is a complex process to put a financial value on materiality for financial risks (ACCA *et al.*, 2013b:35).

The GRI (2016a:14) states that an organisation is expected to aim for consistency in its reports over time within the confines of the materiality principle, which would also facilitate comparability. The organisation is expected to include total numbers, as well as ratios to enable analytical comparisons. In the context of these arguments, it is imperative to consider whether water is a material aspect for the specific company under investigation. This discussion about materiality highlights H_1 (refer to section 1.3): "*There is a significant association between IR and water-related disclosure in terms of materiality.*"

Ngu and Amran (2018a:10) found that, from a stakeholder theory perspective, to report on materiality provides greater transparency and also attains greater accountability for the stakeholders. In the same study from a resource-based theory perspective, they concluded that the board of directors are key decision makers in a company and that the board could influence the methods in which a company provides non-financial information to its stakeholders. With this in mind it is important to consider governance issues as part of the reporting process.

2.10 GOVERNANCE

As mentioned by Abeysekera (2013:232), IR brings governance, financial capital, intellectual capital, social capital and environmental capital into a common platform. The concept of governance is discussed next. This section is divided into a general introduction towards governance and then governance aspects that deals specifically with water.

2.10.1 Introduction

The board of directors is responsible for establishing appropriate mechanisms to monitor and control activities of a company and also to be accountable and transparent through the disclosure of information (Dias *et al.*, 2017:4). This also applies to the disclosure of environmental information and the company being governed according to good corporate environmental principles – which include governance principles applicable to water disclosures.

CSR governance (which includes water) can be defined as the control mechanisms that companies accept to integrate their social and environmental concerns into their business operations, as well as core strategies to interact with their stakeholders (Wang & Sarkis, 2017:1608). Windolph *et al.* (2014:274) mentioned the legitimacy theory stipulates that CSR governance could be argued as the company's intention to pursue its moral legitimacy. Wang and Sarkis (2017:1608) added that companies may engage in two types of CSR strategies to build legitimacy, namely (a) taking serious action and being committed to environmentally and socially responsible behaviour, and (b) engaging in symbolic CSR governance to improve corporate image known as 'greenwashing'. The results of the study indicated that companies will benefit from implementing CSR governance only if they can 'walk the talk' ultimately achieving superior CSR outcomes (Wang & Sarkis, 2017:1615).

2.10.2 Water governance

The UN World Water Assessment Program's (WWAP) World Water Development Reports, which are published annually, identify governance as part of the 'global water crises' – as a continuing theme (WWAP, 2016:57). The failure of water systems is also often considered a governance issue (Guppy & Anderson, 2017:6). The World Economic Forum mentioned that water governance is necessary to accommodate the growing population, to assist economic development and to adapt to climate change (World Economic Forum, 2016:7). Water governance is the overarching framework where objectives are set, strategies are formulated and the outcomes are controlled, while water resource management is more focussed on the operational activities of monitoring and regulating water resources and their use (Woodhouse & Muller, 2017:226).

The next section focusses on water governance as described by several role players in water reporting, such as King III, King IV, GRI and CDP. Water governance is normally reported and disclosed in the narrative parts of the annual or integrated reports. The water resource management section, which focuses more on the operating activities, is addressed in the section on ‘measuring and reporting’.

In King III the underlying theme was the board’s responsibility for business sustainability. The sustainability principles are now well embedded in King IV, with a new focus on ethical leadership and good governance (Deloitte, 2016:5). Robust governance and management systems are required to manage water, consequently water governance in the boardroom is essential. Companies that have board-level oversight of water issues are reaping the rewards, which include market differentiation, shareholder confidence and business resilience (CDP, 2017d:13). Corporate water stewardship is an approach that allows companies to identify and manage water-related risks and impacts they face in their direct operations and value chain, seizing water-related opportunities (CDP, 2017a:6).

The GRI 103 (refer to Table 2-4), which deals with governance and management approach issues, requires the following for each material topic (GRI, 2016b:8):

- An explanation of how the company manages the topic.
- A statement of the purpose of the management approach.
- A description of the following, if the management approach includes that component: policies, commitments, goals and targets, responsibilities, resources, grievance mechanisms and specific actions such as processes, projects, programs and initiatives.

The GRI 303 (refer to Table 2-4) document which deals with water and effluents, states that companies have to address governance issues in the management approach section, the GRI 103. This section provides a narrative explanation of how a company manages a material topic, the associated impacts, and stakeholders’ reasonable expectations and interests (GRI, 2018a:5). The GRI 303-1 ‘interactions with water as a shared resource’, stipulates that organisations should report the following information, if the topic is regarded as material (GRI, 2018a:6):

- A description of how the organisation interacts with water, including how and where water is *withdrawn*, *consumed* and *discharged*, and the water-related impacts caused or directly linked to the organisation’s activities, products or services by a business relationship.

- A description of its approach for identifying water-related *impacts*, including the scope of assessments, their timeframe and tools or methodologies used.

- A description of how water-related impacts are addressed, including how the organisation works with *stakeholders* on *stewarding water* as a shared resource, and how it engages with suppliers or customers with significant impacts.

- An explanation of the process for setting any water-related goals and targets that are part of its management approach, and how they relate to public policy and the local context of each area with *water stress*.

The GRI recommends that the reporting organisation should provide an overview of water uses across the value chain, and list specific catchments where the significant water-related impacts are caused (GRI, 2018a:6).

The document expands to disclosure part 303-2 dealing with the 'management of water discharge-related impacts'. The organisation should provide a description of any minimum standards set for the quality of effluent discharge, and how these minimum standards were determined, including (GRI, 2018a:8):

- how it determined standards for facilities operating in locations with no local discharge requirements;

- any internally developed water quality standards or guidelines;

- any sector-specific standards considered; and

- whether the profile of the receiving water body was considered.

The new GRI 303 water standard is one of the first GRI standards to be updated. This was done through a robust, multi-stakeholder approach. The GSSB, the GRI's independent standard-setting body, appointed a project working group to review GRI 303: Water. The changes aim to improve the quality and usefulness of the organisation's water impacts, in order to improve comparability and ultimately transparency in water reporting (GRI, 2017:2). The above discussion aims to assist in testing H_2 (refer to section 1.3): "*There is a significant association between IR and water-related disclosure on governance.*" When mentioning terms such as usefulness and comparability, it also implies that the information should be measurable to improve its quality.

2.11 MEASURING AND REPORTING

The continued availability of sufficient water resources is unclear, and as corporate value chains expand globally, water scarcity is creating new business challenges (Mueller *et al.*, 2015:31). To address the water issue, the phrase ‘what gets measured, gets managed’, could be applied. This section deals with the quantitative part of water disclosure as corroborated by ACCA and the GRI, where they distinguish between narrative reporting and KPIs (ACCA, 2013:3; GRI, 2018a:6).

2.11.1 Introduction

Poor resource management of scarce water resources contribute to the water-related challenges faced by companies (Mueller *et al.*, 2015:30). To identify and to quantify water impacts are crucial for companies, in order to make effective management decisions. Mueller *et al.* (2015:33) stated that several water assessment tools have been developed to assist companies to understand the complex nature of water challenges. However, despite these efforts, significant gaps in datasets and inconsistencies in measurement and reporting of geographical water shortfalls are still prominent. They emphasise the need for more complete datasets, containing the following information (Mueller *et al.*, 2015:42):

- Amount of water withdrawal and discharge.
- Amount of freshwater availability and depletion.
- Water quality to be monitored.
- Reuse and recycling information on water.

This argument is corroborated by the CDP’s global water report of 2017, where they indicate that companies have to measure and monitor water withdrawals, discharges, quality, consumption and the provision of Water, Sanitation and Hygiene services across their operations (CDP, 2017d:13).

Water management has been a core focus area for Norges Bank Investment Management (NBIM), who has supported the CDP water program since 2009 to reach a greater number of companies (CDP, 2017d:5). The NBIM is committed to joint efforts with the CDP to promote transparent water measurements and reporting, as well as sustainable water management by companies (NBIM, 2015:5). The NBIM reports that sector-level and geographic level disclosures expectations are directed at companies with operations in sectors with high water dependency and in regions exposed to water scarcity. To understand the operational business resilience of companies to local water challenges and the relevance of risk mitigation strategies, sector-level and geographic information could add value (NBIM, 2015:2).

Mueller *et al.* (2015:33) discuss four available water assessment tools in their study, namely the Global Water Tool, India Water Tool, Water Risk Filter and Aqueduct, in order to highlight elements in these tools that are most critical to water-related decisions. The findings underline that the functionality of these tools could be extended by incorporating facility location, water use data and industry-specific information as part of the tool inputs (Mueller *et al.*, 2015:42). A sub-division of measuring and reporting is to set definite targets and goals.

2.11.2 Targets and measures

Companies have to set targets to reduce impacts on water availability and quality. Once these targets are set, companies should have to commit to these targets as they are fundamental to determine the status of water resources.

Only 418 (56%) of the total companies investigated in the latest CDP global water report have set targets and goals. However the majority remain short-term goals and do not adequately account for sustainable thresholds of the basin upon which the company relies (CDP, 2017d:13). Unlike for carbon emissions, no collective accepted standard exists for the setting of meaningful and measurable targets for water. Significant targets are therefore those that are closely linked to the context within which a company's direct operations and supply chains are located (CDP, 2017a:10). This statement is significant within the context of this study where supply chain information is important to the food and beverage industry.

The GRI 303 (refer to Table 2-4) document which deals with "water and effluents", explains that there is a strong relationship between water withdrawal, water consumption and the discharge of water (GRI, 2018a:4). Because of this strong relationship, companies are expected to report on all three topic-specific disclosures. As water-related impacts are often localised, the company is encouraged to support any quantitative aggregate-level information with narrative descriptions of any contextual factors that were considered when compiling the information (GRI, 2018a:4). To adhere to this need, a more comprehensive overview of the company's water use should be available. This standard includes disclosures on the management approach and topic-specific disclosures. The requirements in terms of the management approach has already been discussed in the previous section. The following part discusses the topic-specific disclosures, namely disclosure GRI 303-3 water withdrawal, disclosure GRI 303-4 water discharge, and disclosure GRI 303-5 water consumption.

In terms of disclosure GRI 303-3, water withdrawal, the reporting organisation should report the following information (GRI, 2018a:9):

(a) Total water withdrawal from all areas in megalitres (ML), and a breakdown of this total by the following sources, if applicable:

  (i) surface water;

  (ii) groundwater;

  (iii) seawater;

  (iv) produced water; and

  (v) third-party water.

(b) Total water withdrawal from all areas with water stress in ML, and a breakdown of this total by the following sources, if applicable:

  (i) surface water;

  (ii) groundwater;

  (iii) seawater;

  (iv) produced water;

  (v) third-party water, and a breakdown of this total by the withdrawal sources (listed in (i) to (iv) above).

(c) A breakdown of total water withdrawal from each of the sources listed in disclosures GRI 303-3 (a) and GRI 303-3 (b) in ML by the following categories:

  (i) freshwater (≤1 000 mg/L Total Dissolved Solids); and

  (ii) other water (>1 000 mg/L Total Dissolved Solids).

(d) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies and assumptions used.

Disclosure GRI 303-4 deals with water discharge, and the reporting company should report the following information (GRI, 2018a:14):

(a) Total water discharge to all areas in ML, and a breakdown of this total by the following types of destination, if applicable:

   (i) surface water;

   (ii) groundwater;

   (iii) seawater; and

   (iv) third-party water, and the volume of this total sent for use to other firms, if applicable.

(b) A breakdown of total water discharge to all areas in ML by the following categories:

   (i) freshwater (≤1 000 mg/L Total Dissolved Solids); and

   (ii) other water (>1 000 mg/L Total Dissolved Solids).

(c) Total water discharge to all areas with water stress in ML, and a breakdown of this total by the following categories:

   (i) freshwater (≤1 000 mg/L Total Dissolved Solids); and

   (ii) other water (>1 000 mg/L Total Dissolved Solids).

(d) Priority substances of concern for which discharges are treated, including:

   (i) how priority substances were defined, and any international standard, authoritative list, or criteria used; and

   (ii) the approach for setting discharge limits for priority substance.

(e) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies and assumptions used.

Disclosure GRI 303-5 which deals with water consumption, states that the reporting organisation should report the following information (GRI, 2018a:15):

(a) Total water consumption from all areas in ML.

(b) Total water consumption from all areas with water stress in ML.

(c) Change in water storage in ML, if water storage has been identified as having a significant water-related impact.

(d) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies and assumptions used, including whether the information is calculated, estimated, modelled or sourced from direct measurements, and the approach taken for this, such as the use of any sector-specific factors.

The set targets should be scientifically informed by sustainable thresholds and the social context of a given catchment and should be aligned with other targets. Referring to these targets, the company should be able to account for the local context where the water is withdrawn and discharged. The targets should be aligned with public sector efforts, such as the targets of the UN Sustainable Development Goal number 6 on water, or with other targets set by national and local government institutions, trade associations and action groups (GRI, 2018a:7).

The discussions with regard to water-related disclosure aims to contribute in testing H_3 (refer to section 1.3): "*There is a significant association between IR and water-related disclosure on targets and measures.*"

2.12 RISK ASSESSMENT

In 2015, the World Economic Forum categorised water crises as the number one global risk in terms of impact. Since 2015, water crises has remained as one of the top five risks in terms of impact from the years 2016 to 2018 (World Economic Forum, 2015:14; World Economic Forum, 2018:1). Mentioning water as one of the top global risks, the study address water-related risks in the following paragraphs.

2.12.1 Introduction

The CDP global water report of 2015 indicated that almost two thirds (65%) of the 405 responding companies reported that they are facing substantive water risks (CDP, 2015:36). The latest CDP global water report of 2017 points out that an increasing number of companies are taking cognisance of the importance of water, prompted by the numerous risks they face (CDP, 2017d:8).

In the report CDP of 2017, 3 770 water risks were reported from an increased sample of 742 of the world's largest publicly listed companies. This includes risks that threaten their licence to operate, the security of their supply chains and therefore their ability to grow. The report revealed increased water scarcity as the top risk driver resulting in possible higher operating costs (CDP, 2017d:9). Failing to increase water security will likely create systematic risks to the global ecosystem that underpins human prosperity and quality of life.

2.12.2 Previous studies on water risks

The Water Footprint Network criticises that current reporting does not provide enough information for stakeholders to assess the various risks related to water scarcity and quality (Water Footprint Network, 2015:18). Findings by the Ceres investor coalition, the financial services firm UBS, and financial data provider Bloomberg, resonated this statement in a report which indicates that many of the 100 publicly traded companies do not include data on water risks, data on water usage, or risks for their supply chains (Wilburn & Wilburn, 2013:64). The latest CDP European water report (2017a:10) indicates that 36% of the respondents report exposure to water risks in both their direct operations and supply chains and only 46% undertake a comprehensive company-wide risk assessment that covers their direct operations and supply chain.

Money (2014:45) analysed the CSR- and annual reports for the previous six years of 58 global companies in the consumer staples sector, in order to consider corporate water risk from the perspective of company disclosure. From the longitudinal data it was evident that companies do not apply any benchmarks consistently or comparably. Companies that disclose quantitative data on water use – water efficiency (units of water used per unit of output) – was the only metric applied by the majority of companies (Money, 2014:54). Money (2014:55) concluded that approaches to corporate water risk disclosure are fundamentally unsatisfactory, bearing in mind the scale of the challenges faced. Within this context it is imperative to realise that all the mainstream decision makers should be aware of the importance and associated risks of water and the disclosure thereof.

2.12.3 The content of information on water risks

Followed by the discussions on water risks, the subsequent section addresses the items that should be included as part of water risk disclosures. There is a need for investors to recognise the engagement of management with issues that present material risks and opportunities (CDP, 2017a:10). Investors recognise that water security poses risks to their investments and, conversely, that proactive water stewardship reduces these risks (CDP, 2017a:22). The following summary obtained from the CDP guidance document for completing the water questionnaire, provides insight on the risk disclosures of a company (CDP, 2017c:49):

- The company should indicate whether it undertakes water-related risk assessments and what procedures they use with regard to assess water risks.

- The organisation should state how frequently they undertake water risk assessments, at what geographical scale and how far into the future they consider risks for each assessment.
- The organisation should indicate if they have evaluated how water risks could affect the success of their organisation's growth strategy.
- The company should indicate which methods they used to assess water risks.
- The organisation should indicate which contextual issues and stakeholders are factored into their water risk assessments.

The CDP identifies several mapping tools that organisations can use to characterise water risk, such as the World Resource Institute (WRI) aqueduct water risk atlas that provides up-to-date information on global water risks (CDP, 2017c:56). This tool provides companies with information on current conditions, future water stress and future water supply. Risks such as (a) physical risk quality and quantity, (b) regulatory and reputational risk, (c) drought severity, and (d) access to water in terms of a scale of low to extremely high risks, are provided (WRI, 2013; WRI, 2015:14).

The literature indicates that all forms of water risks stem from physical risk related to either stress in water resources or failure of supply systems (WWF, 2012:21). This connects with the argument that water risks in the supply chain of a company could not be ignored when reporting on risk assessments. The World Business Council for Sustainable Development (WBCSD) states that the range of risks associated with poor water management practices include financial, operational, product, reputational and regulatory risks (WBCSD, 2012:4).

Mueller *et al.* (2015:31) emphasise that a more holistic approach to risk assessment should include a broadened perspective about the ability of nearby communities to access water, the adequacy of local water management practices and water allocation practices by sector. Many indices evaluate water or environmental sustainability, but do not specifically address water-related risks or forecast future impacts (Mueller *et al.*, 2015:33). The need to focus on risk for water-intensive sectors is highlighted by Ernst & Young (2012:1), which also mentioned that agriculture, forestry and food and beverage companies are most at risk. The researcher agrees with the statements above by accentuating the importance of water risk assessments and the reporting thereof – especially when considering the supply chain of the food, beverage and tobacco industry.

This discussion about water risks highlights H_4 (refer to section 1.3): "*There is a significant association between IR and water-related disclosure on risks.*" Closely linked to risk and the assessment of risk, is information that offers a future-orientated perspective.

2.13 FUTURE-ORIENTATED INFORMATION

Some critics of the GRI stated that it adopts a predominately retrospective approach and that more future-orientated information is needed (Fonseca *et al.*, 2012:74). The need for forward-looking information correspond with the philosophy of the newly released King IV code of conduct, which appeals for a paradigm shift from short-term capital markets to long-term sustainable capital markets (Deloitte, 2016:5; IoDSA, 2016a:60). King IV states in principle 5 that:

> *"the governing body should ensure that reports issued by an organisation enable stakeholders to make informed assessments of the organisation's performance, and its short, medium and long-term prospects"* (IoDSA, 2016b:48).

This approach is resonated by the underlying principles of IR reporting, such as the descriptions of the capitals and material issues, and the concept of value creation (Fonseca *et al.*, 2012:74).

The company's ability to create value in the long term relies strongly on its focus on the material issues and in its ability to incorporate the IR principles (Mio *et al.*, 2016:207). The incorporation of IR principles may increase the usage of non-financial measures of performance, since the emphasis move to long term information and capitals (Mio *et al.*, 2016:207). As companies rely on adequate water to support their operations over the short and long term, water accounting information needs to be updated regularly. As mentioned by Signori and Bodino (2013:126), a company-wide strategy for water management is the best way to address long-term business-related water risks and information. This view is shared by Ernst & Young (2012:18), which stated that long-term water management should be a strategic concern.

Stacchezzini *et al.* (2016:105) analysed 54 companies' integrated reports and used the evidence in a multivariate statistical analysis to test the relation between disclosures and specific corporate characteristics. The authors state that, although IR encourage the disclosure of leading indicators (which are usually non-financial), they found limited disclosure of quantitative and forward-looking indicators (Stacchezzini *et al.*, 2016:107).

An investigation into the need for environmental information of South African users of environmental reports was performed by Kamala *et al.* (2016:583). Questionnaires were distributed to ethical investment funds, environmental NGOs and accounting researchers. The findings indicated that users need balanced environmental information that is both specific and accurate. Users need future-orientated information that recognises and reports key stakeholders' concerns, displaying the integration of environmental issues into core business processes (Kamala *et al.*, 2016:589). The previous discussions about future-orientated water information is to assist with information to test H_5 (refer to section 1.3): "*There is a significant association* *between IR and water-related disclosure on future-orientated information*." As mentioned previously, companies cannot only disclose company specific water information, but should also address disclosure through its supply chain.

2.14 SUPPLY CHAIN ENGAGEMENT

Supply chain management is defined as:

> *"the management of a network of relationships within a firm and between independent organisations and business units that facilitate the forward and reverse flow of materials, services, finances and information from the original producer to the final customer with the benefits of adding value, maximising profitability through efficiencies and achieving customer satisfaction"* (Stock & Boyer, 2009:691).

With this definition in mind, it is evident that all the activities in the whole supply chain have an impact on the environment and therefore on water as a scarce resource. Companies are accountable not only for their operations and processes, but also for their suppliers, thus extending environmental management activities outside the company's boarders (Krause *et al.*, 2009:21). But on the contrary, Bateman *et al.* (2017:119) state most companies only report on their own operations, and not for the entire supply chain. Critics of standard reporting suggest that assessments performed at company level misses far too much and do not account for the supply chain at all (Bateman *et al.*, 2017:120). They recommend that this oversight can be eliminated through full product transparency, which is often understood as the future of reporting. By using this method, a company could report impacts at every phase of the supply chain (Bateman *et al.*, 2017).

Companies should engage with their suppliers to also report and manage water, trying to incentivise them to behave in a sustainable manner. Only 297 (41%) of the companies investigated in the CDP global report engaged with their suppliers (CDP, 2017d:13). The CDP's European water report also recognised that collaboration with suppliers, regulators, local communities and other water users in the river basin, is fundamental to effective water stewardship and that transparency is key for companies seeking to understand water risks related to their supply chain (CDP, 2017a:16).

The requirement to report on how the organisation addresses impacts in the supply chain related to products and services, has been merged in the GRI 103 (refer to Table 2-4) document which deals with management approach disclosures to encourage IR on impacts across the entire value chain (GRI, 2018b:2). With regard to topic-specific disclosures, the GRI recommends that companies should report on the total water withdrawal by suppliers causing significant water-related impacts in water-stressed areas under disclosure GRI 303-1 water withdrawal (GRI, 2018b:3). Companies should also disclose supplier information with regard to water discharges and water withdrawal as illustrated in Table 2-5.

Table 2-5: Presenting supply chain information

Disclosure item	Description	Metric
Water withdrawal	Total water withdrawal by suppliers causing significant water-related impacts in areas with water stress.	Volume in ML
Water discharge	Percentage of suppliers causing significant water-related impacts from discharge that have set minimum standards for the quality of their water discharge.	%
Water consumption	Total water consumption by suppliers causing significant water-related impacts in areas with water stress.	Volume in ML

Source: Adapted from GRI (2018b:23).

It is clear that the major trend is to move from company-wide reporting to supply chain-wide reporting. Upstream and downstream impacts should form part of the reporting practices. A company should report its overall approach for managing impacts, both in its own operations and elsewhere in the value chain. If the company has identified water-related impacts in the supply chain and refer to its products and services as material, it is required to report additional information about these impacts. The GRI 103: management approach documents, addressed some aspects with regard to supply chain engagement – which was discussed under governance (refer to section 2.10.2). Furthermore, as a supplement to the GRI 103: management approach, the following examples are provided as guidance to report on engagement with suppliers (GRI, 2018b:9):

- The organisation can describe the number of suppliers it engages with.
- How it engages with suppliers in order to help them improve their water management practices.
- The organisation's future plans and goals for working with suppliers on reducing water-related impacts.

The conversation around the importance of considering and reporting about the supply chain intends to assist in testing H_6: "*There is a significant association between IR and water-related disclosure on supply chain information.*"

2.15 SUMMARY

The chapter commenced with the broader concept of the background and evolution of sustainability reporting. The definition and context of sustainability reporting was discussed next where the importance of reporting on the TBL came to light. A more detailed discussion around sustainability reporting, taking more recent literature into consideration, exposed the theoretical foundations. The legitimacy and stakeholder theory report that disclosure by companies is important in meeting the expectations of stakeholders. It was evident that the demands from stakeholders for quality information has increased, and it seems that the legitimacy and stakeholder theories are most prominent to this study.

Sustainability reporting revealed the importance of reporting on social, environmental and economic information, which led to the discussion around the TBL. Steering away from stand-alone reports on social, environmental or economic information, the concept of IR was uncovered. The background of IR, definition and elements, important principles and previous research around IR was discussed. The importance of reporting on material items, governance issues, targets and measures, risks, future-orientated information and the supply chain was recognised. As the focus of IR is on the three pillars, the study moved to reporting the pillar that deals specifically with the reporting of environmental information. An introduction and the importance of reporting on the environment was discussed which revealed natural capital that is also part of the six capitals mentioned in IR. An introduction and background, the role, and reporting on natural capital was discussed. Water as part of natural capital, and the essence of this study initiated the discussions to follow.

The importance of water cannot be overlooked, which led to conversations around the reporting and disclosure of water. It was found that reporting on water information could be split into qualitative and quantitative information. Materiality, governance, targets and goals, risks, future-orientated information and supply chain engagement about water was conversed. Recognising water as a material concept to report on, connected with the stakeholder theory, as a company should disclose important information that could have an impact on their stakeholders. It was mentioned that water governance is necessary to accommodate the growing population, and that a company's board of directors should manage various aspects pertaining to water.

The discussion around measuring and reporting on water information indicated various targets and goals a company should consider when reporting on water. Reporting on water risks could not be unnoticed, and investors recognise water security poses risks that need to be managed. The need to report on future-orientated water information correspond with the philosophy of King IV, which is also resounded in the underlying principles of IR. It was stated that long-term water management should be a strategic concern. The significance of reporting on supply chain information revealed that companies should engage with their suppliers to also report and manage water, trying to incentivise them to behave in a sustainable manner.

The following chapter focuses on water reporting within different industries, with specific focus on the food, beverage and tobacco industry. Different reporting rules and regulations between South Africa, Australia and global companies are also addressed.

CHAPTER 3

WATER DISCLOSURE IN DIFFERENT COUNTRIES AND IN THE FOOD, BEVERAGE AND TOBACCO INDUSTRY

3.1 INTRODUCTION

The aim of this chapter is to address the third and fourth secondary objectives set in Chapter 1 (refer to section 1.4.2). The third secondary objective aims to conceptualise from literature the current reporting and disclosure practices on water in South Africa, Australia and the rest of the world. The fourth secondary objective intends to conceptualise from literature the current reporting and disclosure practices on water in the food, beverage and tobacco industry. Essentially, this chapter aims to address water reporting and disclosure in different countries with specific focus on the food, beverage and tobacco industry. After an overview of the characteristics of quality disclosure, the chapter continues by observing the different rules and guidelines that influence reporting, as countries are regulated differently.

South Africa and Australia were the chosen countries to be observed. The selected companies in South Africa are listed on the JSE, and the Australian companies are listed on the ASX. Australia, which is perceived as a first world country, was selected because it is very similar to South Africa, with scarce water resources. A global perspective is added by including companies listed on the DJGSI. This selection aims to enable the researcher to compare the water reporting practices globally with those of the selected countries.

The food, beverage and tobacco industry group which is heavily dependent on water, was purposefully selected. The food, beverage and tobacco industry group was selected not only for its dependence on water, but also for its contribution towards the WEF nexus as described in the previous chapter. On each of the indices, the top 20 largest companies – by market capitalisation – in the food, beverage and tobacco industry, were selected. Based on the concerns and the need for water disclosure, in context of the stakeholder theory, the users of information have a prerogative on quality information. The next section pays attention to the characteristics of quality information.

3.2 THE CHARACTERISTICS OF QUALITY WATER REPORTING

The annual, sustainable or integrated reports are utilised to communicate and inform various stakeholders of the company on the financial, environmental and social information. The reported information is even more valuable if it adheres to certain quality characteristics. The most recent

GRI standards identify accuracy, balance, clarity, comparability, reliability and timeliness as the reporting principles for defining report quality (GRI, 2016a:7). The GRI states that their new standards are designed to enhance the comparability and quality of environmental impacts, thereby enabling greater transparency and accountability of organisations (GRI, 2016a:3). It is worthy to recognise that the reporting principles of the GRI for defining report quality, has not changed from the G3 to the G4 and most recent GRI standards. The CDP global water report recognised measurement, transparency and accountability of information as essential tools to enable and assess the progress made towards a water-secure world (CDP, 2017d:12). Krivačić (2017:3) avers that the growth trend in sustainability reporting is unquestionable and stakeholders are increasingly concerned with the quality of reported information and the models of its measurement.

Boiral *et al.* (2017) analysed 138 sustainability reports from the mining sector and 163 from the energy sector between the years 2006 and 2013, with the objective to analyse the opinions of assurance providers regarding the quality, limitations and recommendations to improve GRI-based sustainability reports. The findings revealed that a reassuring approach is adopted by assurance providers by emphasising the absence of problems, rather than the quality or reliability of reports. The findings indicate that assurance providers express scepticism indirectly, by highlighting possible avenues for improvement rather than stressing limitations or issues of non-compliance (Boiral *et al.*, 2017). Table 3-1 reveals the results with regard to assessing the quality of information for their study.

Table 3-1: Assessment of the quality of information

GRI G3 principles on the quality of information	Sector		Total (%) (n = 301)
	Mining (%) (n = 138)	Energy (%) (n = 163)	
Accuracy	60	45	52
Reliability	37	49	44
Balance	24	24	24
Comparability	13	12	13
Clarity	12	9	10
Timeliness	3	7	5

Source: Adopted from Boiral *et al.* (2017).

The study indicates that the GRI principles are not systematically verified by assurance providers, and that certain GRI principles such as clarity of information and timeliness of reports are almost never reviewed or mentioned (Boiral *et al.*, 2017). Michelon *et al.* (2015:75) concur by suggesting that the assurance of CSR reports is used as a symbolic practice, with no relationship between assurance and the dimensions of disclosure quality.

A study by Diouf and Boiral (2017:652) uncovered similar results after conducting 33 semi-structured interviews with consultants, fund managers and analysts in Canada about their perceptions of the quality of sustainability reports around the principles proposed by the GRI. It was found that 70% of respondents thought that the GRI indicators are both too general and vague to compare over time or between companies (Diouf & Boiral, 2017:653). In some countries reporting is voluntary and in others there are governmental policies that force companies to report on specific environmental practices or impacts. Taking into consideration the growth of public concern over water consumption and water quality, companies are potentially exposed to penalties and reputational damage (Remali *et al.*, 2016:65). After analysing 10 Malaysian companies, Remali *et al.* (2016:71) found that water-related disclosure is still fairly low in terms of quality. Michelon *et al.* (2015:73) combined the content of information disclosed, the type of information and the managerial orientation as different dimensions to measure the quality of CSR disclosure. It was found that companies adopting the GRI guidelines are providing more complete information in line with the reporting quality principles than companies producing stand-alone reports (Michelon *et al.*, 2015:74).

Krivačić (2017:4) mentioned that the quality of decisions made by users of sustainable reports depends on the quality of the provided information. Hąbek and Wolniak (2016:405) assessed the quality of 507 CSR reports in six European countries based on the relevance and credibility of information, where 11 criteria of relevance and six criteria of credibility were identified. Nearly half of the reports were prepared in accordance with the GRI guidelines, and the quality level of the reports was generally low, indicating room for improvement. Of the 507 reports, 304 were mandatory and 203 voluntary, with the findings indicating that reports developed on a mandatory basis achieving higher levels of quality (Hąbek & Wolniak, 2016:416).

The studies mentioned above highlight a lack of completeness and credibility in CSR reports. A means to overcome these shortcomings are to establish targets and measures to improve measurability and comparability of the information to assist stakeholders to compare and evaluate the disclosed information. Another manner to improve the quality of information is to provide more rules and guidelines to be adhered to. If the disclosed information adheres to quality characteristics, it could serve as a platform to improve decision making. In the next section different rules, frameworks and guidelines that companies utilise to report, are discussed.

3.3 DIFFERENT RULES AND GUIDELINES THAT HAVE AN IMPACT ON NON-FINANCIAL DISCLOSURES

Frameworks and standards to report on non-financial disclosures, such as integrated or sustainability reports, are not as developed as those for financial reporting (Du Toit *et al.*, 2017:658). Despite this, the demand from stakeholders for this type of information has increased over the years (Eccles & Saltzman, 2011:58; García-Sánchez & Martínez-Ferrero, 2018:16).

ESG disclosures are a subset of non-financial reporting and do not follow a standardised format as found in financial reporting. Empirical research documents indicate that ESG disclosure differs across companies and countries as it is published on the discretion of management (Ioannou & Serafeim, 2012:835). Country-specific factors such as political, labour laws and cultural systems also have an influence on companies' ESG disclosure practices (Baldini *et al.*, 2018:93).

Amel-Zadeh and Serafeim (2018:92) agree with the statement of Du Toit *et al.* (2017:658), and mentioned that an important obstruction to employ ESG (non-financial) disclosures are the lack of reporting standards which results in the lack of comparability and reliability. They mentioned that the information should be provided in a format that is relevant to assist investments and evaluate investment performance. The following paragraphs provide an introduction and a discussion around the rules, regulations and guidelines applied in different countries.

3.3.1 Introduction

Various frameworks have been designed to support and provide guidance for this gap (lack of guidelines) and to enhance the quality of reporting, as the variability of reports made it difficult to compare information from different companies (Mintz, 2011:28). There are various frameworks in different countries that could be utilised to support the disclosure of social and environmental information, although none are mandatory. Pandit and Rubenfield (2016:53) explained that one must examine a company's sustainability disclosures in order to gather governance policies and practices adopted to avoid possibilities of fraudulent acts and consequent damage to their reputation. In the sections that follow is a discussion of the most common reporting initiatives, such as the CDP, Greenhouse Gas Protocol, GRI, and the ISO 26000 standards.

- The CDP evaluates a company's reports based on the quality and completeness of disclosures made in the report (Siew, 2015:183). They also attempt to put measurements and targets in place and to manage future risks. The influence from the CDP has led to a global movement of companies to measure and disclose their greenhouse gas emissions, climate change risk and water strategies (KPMG *et al.*, 2016:26).

- The GHG Protocol is the most widely-used international accounting tool for governments and companies to recognise, quantify, and manage their greenhouse gas emissions. In 2016, 92% of Fortune 500 companies responding to the CDP used the GHG Protocol as the platform for GHG reporting (Greenhouse Gas Protocol, 2016:3).
- The GRI's main objective is to generate a global sustainability reporting framework that could be applied to all companies worldwide (Godha & Jain, 2015:65). The GRI can be viewed as the most extensive standard for sustainability reporting to communicate between organisations and their stakeholders (Junior *et al.*, 2014:8). The GRI guidelines are appropriate for all types of companies, across various sectors, independent of size or nature and can be applied at different application levels (Tschopp & Huefner, 2015:566).
- ISO 26000 is an additional standard providing voluntary guidelines with regard to social responsibility. The content of the ISO 26000 guidelines is similar to the aspects included in the GRI reporting guidelines.

3.3.2 Reporting requirements in different countries

Although many companies choose to report voluntarily, they also experience pressure from external stakeholders to disclose information. There are governmental policies that force companies to report on specific environmental practices. Regulations can vary across cities, states and countries, and this variability holds multinational companies to adhere to various regulatory mandates. Krivačić (2017:3) mention that in most countries, sustainability reporting is still voluntary and that most companies decide independently on when, how and to what context they prefer to report. According to Krivačić (2017:3), future pressures from different stakeholders will affect the content of sustainability reports, as was the case with financial reporting. Previous research on sustainability reporting policies and practices utilised worldwide was completed by a group of partners that includes KPMG, the GRI, the UNEP and the Centre of Corporate Governance in Africa. The research revealed the following mandatory and voluntary guidelines per country (KPMG *et al.*, 2013; KPMG *et al.*, 2016):

- **Germany**

  Almost all of the listed companies in Germany is required to publish a group management report, which includes non-financial information. Germany is well-known for their CSR efforts, but has not ordered CSR reporting as mandatory. The country presented the German Sustainability Code as a voluntary guideline, inspiring companies to report sustainability on 20 indicators, which is in line with the GRI, the UN Global Compact guidelines, the OECD guidelines for multinational companies as well as the ISO 26000 guidelines.

- **France**

  In 2007, *Grenelle for environment* set goals for sustainable development and led to the adoption of the Grenelle Act, which makes it mandatory for all listed companies with activities in France to prepare CSR reports. The information required should reflect from the following main international guidelines accepted in France: ISO 26000, Global Compact principles, the Guiding Principles on Human Rights and business, OECD guidelines for multinational enterprises and the GRI.

- **United Kingdom (UK)**

  Companies listed on the London Stock Exchange are required to report on GHG emissions and other mandatory reports include the Quoted Companies GHG Reporting, British Companies Act, UK Corporate Governance Code, The Climate Change Act of 2008 and the Carbon Reduction Commitment. According to Li *et al.* (2018:63), the UK is one of the leading countries in terms of promoting ESG disclosures as it forms part of a firm's Business Review, as laid out in the UK Companies Act of 2006.

- **United States of America (USA)**

  Sustainability reporting is not required in the USA, but many companies issue a separate annual sustainability report which is in most cases guided by the GRI guidelines (Tamimi & Sebastianelli, 2017:1662). Another framework often used in the USA, is the SASB, utilised by public listed companies to disclose non-financial sustainability issues related to risk management and value creation (Schooley & English, 2015:24). Other mandatory requirements include the Dodd-Frank Act, Presidential Executive Order 13514, Sarbanes-Oxley Act (SOX), Clean Air Act, Clean Water Act, Toxic Release Inventory, California Transparency in Supply Chains Act, and the US Environmental Protection Agency Proposed Mandatory Greenhouse Gas Reporting Rule.

- **Sweden**

  CSR reporting is mandatory for state-owned companies in Sweden and the GRI guidelines are recommended. Mandatory standards in Sweden include the Annual Accounts Act, Guidelines for External Reporting by state-owned Companies, and Sustainability Goals for State-Owned Companies.

Taking cognisance of the various CSR frameworks and guidelines highlighting corporate practices, it could be worthy to note if these practices have increased or not. Therefore, reporting rates are discussed next.

3.3.3 Reporting rates

KMPG's survey of corporate responsibility reporting assessed reporting among the 100 largest companies in 41 countries, resulting in 4 100 companies in total. Results indicated high reporting rates on environmental disclosures in the developed world, with 86% in the United States and 91% in the UK (KPMG, 2013:26). The reporting rate in Australia increased significantly from 57% in 2011 to 82% in 2013, due to a number of companies reporting for the first time (KPMG, 2013:22). The report also indicated positive growth rates in developing countries, for example reporting in China increased from 59% in 2011 to 75% in 2013. South Africa, a developing country recorded one of the highest reporting rates of 98% in 2013.

In 2017, the sample increased to 49 countries resulting in 4 900 companies analysed (KPMG, 2017:4). South Africa remained one of the top countries with regard to corporate responsibility reporting with a rate of 92% in 2017, while Australia recorded a rate of 77%. Of the 4 900 companies analysed in 2017, 8% are in the food, beverage and tobacco sector. When comparing the 2013 and 2017 reports in the food, beverage and tobacco sector, corporate responsibility reporting remained consistent with reporting rates of 72% in 2013 and 73% in 2017 (KPMG, 2013:27; KPMG, 2017:20).

Many of these increases in reporting rates could be connected to the stakeholder theory, indicating that companies are sensing the pressure to partake and disclose on their CSR.

All the frameworks, standards and guidelines as discussed in the previous paragraphs refer to more general frameworks that are applicable to the broad spectrum of CSR reporting. The next section dealing with water-related reporting, refers back to information already addressed in more detail in Chapter 2.

3.3.4 Water reporting requirements and guidelines

When focussing on water-related disclosures, the spectrum of reporting frameworks and guidelines becomes more limited. Initiatives which focus more on water disclosures are the GRI, CDP, Climate Disclosure Standards Board, and the Water Footprint Network. These frameworks and guidelines have already been addressed in Chapter 2.

Despite all the efforts, these frameworks do not provide reliable information that are comparable between companies in the same or different sectors (Lokuwaduge & Heenetigala, 2017:439). They mentioned that the disclosed information is not reliable, differs in terms of content, boundary, style and complexity therefore making it difficult for stakeholders to understand which companies are better or worse.

In the context of disclosing water information, the CDP water program guides companies to disclose water information that raise awareness and understanding of business risks and opportunities around water. They also urge companies to fast-track the development of standard measures and performance benchmarks (CDP, 2015:18). The 2016 CDP water program approached 1 252 of the world's largest companies for data regarding their efforts to manage and govern freshwater resources, of which 607 responded (CDP, 2016:6). In the 2017 report, 742 companies responded, indicating an increased number of companies recognising the need to disclose on water-related information. Similar to the growth in reporting rates illustrated in section 3.3.3, the increase in the number of companies reporting on water-related information could indicate the influence of the stakeholder theory.

Before this section on water-related disclosures within the context of frameworks and guidelines is completed, it is necessary to touch on the concept of integration and IR. Dumay *et al.* (2016:179) note that the attempt to globalise IR and to provide an alleged IR guideline is still in question and in an experimental phase. Taking into consideration the differences in organisational types and activities, the variances between countries and sectors, Dumay *et al.* (2016:179) express that industry-based guidelines that are contextually specific are the way to proceed. Notwithstanding the efforts to standardise and to align reporting, it is evident that there is room for improvement. The need to measure, manage and report on water information has increased, and driven by the lack of uniform standards and guidelines led to the investigation of this problem. The next section focusses on water reporting in South Africa, Australia and attempt to provide a global perspective on water reporting.

3.4 WATER REPORTING IN SOUTH AFRICA

This section on water reporting in South Africa addresses a few introductory comments, followed by statistics on water and conclude by addressing the rules and regulations on water reporting in South Africa.

3.4.1 Introduction

After Australia, Africa is the second-most arid continent, and water scarcity has become a critical issue as populations grow and climate change continues to affect rainfall patterns (Besada & Werner, 2014:129). South Africa, and specifically the western parts of the country, has experienced the worst drought in decades resulting from a sustained below average monthly rainfall since 2015 (CDP, 2017b:2; Masante *et al.*, 2018:4). Conway *et al.* (2015:841) noted that the majority of climate models are projecting annual rainfall for southern Africa to decrease by 20% by 2080, resulting in reduced water availability and crop yields. The fact that 93% of South

African companies reported water as a direct risk to their operations in 2017 (CDP, 2017b:4), resonates water as one of the top global risks in terms of impact (World Economic Forum, 2016:11).

3.4.2 Statistics on water in South Africa

Every year, South Africa uses approximately 15 billion m^3 of water and national demand is expected to increase to 17.7 billion m^3 by 2030 due to population growth and industrial development (GreenCape, 2017:10; WWF, 2016:13). This implies that South Africa could be facing a water deficit of 17% per year by 2030, depending on which new supply systems are developed (CDP, 2017b:3; Department of Water and Sanitation, 2018a:6; WWF, 2016:13).

A report compiled by Donnenfeld *et al.* (2018) and published by the Institute for Security Studies revealed the following:

- The 403mm rainfall South Africa received in 2015 was the lowest annual total recorded since 1904.
- More than 60% of South Africa's rivers are currently overexploited.
- About 40% of the country's wastewater is untreated.
- Nearly 36% of municipal water put into the distribution system is non-revenue water. This refers to physical losses because of poor maintenance or commercial losses caused by meter manipulation and other forms of water theft. According to the Department of Water and Sanitation (2018a:1), municipalities are losing about 1 660 million m^3 per annum through non-revenue water amounting to R9.9 billion each year.

Donnenfeld *et al.* (2018:18) stressed that South Africa cannot afford to delay the implementation of more aggressive water policies, and recommended that implementing water conservation, demand reduction measures and increasing the amount of wastewater treatment, could restore balance to the water sector.

South Africa's water is drawn from a variety of sources. According to figures from the Department of Water and Sanitation South Africa (DWS), published in its National Integrated plan, 71% of water is drawn from surface water, 19% from groundwater and 10% from reusing return flows (Department of Water and Sanitation, 2018b:37).

3.4.3 Laws and regulations in South Africa

In order to manage the water resources, various stakeholders along the value chain have to contribute. The DWS articulates and implements policies to regulate the water sector and provides strategies for sector support. This is accomplished by operating across the value chain as a national government. However, the DWS does not execute all functions. In line with the National Water Act (Act 36 of 1998), some functions are delegated to appropriate sector institutions such as the Catchment Management Agency. Water services authorities (WSAs) are typically municipal departments, and of the 278 municipalities in South Africa, 152 are designated WSAs. Some local municipalities contractually delegate water boards as WSAs, or in some areas such as the Eastern Cape, the district municipalities are WSAs.

Access to water in society is determined by the following legal rights and strategies (GreenCape, 2017:25):

- International law affirms that water and sanitation are human rights according to a resolution adopted by the United Nations Human Rights Council in 2010.
- The Constitution of South Africa protects the basic right to adequate and safe water.
- The National Water Act of 1996 is the primary legislation that regulates and protect water resources.
- The Water Services Act of 1997 focuses on the right to basic supply of water and sanitation services, and water services institutions that take reasonable measures to realise these rights.

A substantial amount of South Africa's important economic activities occur in areas where water availability is limited and the quality of water is a concern (WWF, 2013:23). Poor municipal management and weakening infrastructure increases the risk of untrustworthy water supply and inadequate quality.

3.4.4 Previous research on water reporting in South Africa

Donnenfeld *et al.* (2018:1) mentioned that South Africa is overexploiting its renewable water resources, and with the country's water infrastructure in despair, continuous forecasts of more withdrawal than supply is posing a bleak picture. All over the world society demands collective responsibility to ensure economic development (Ackers & Eccles, 2015:515), and this is also the case for the management of water.

Conway *et al.* (2015:842) suggest that climate change, economic development and urbanisation will strengthen the interdependencies within the WEF nexus. The wide ranging effects of climate change on the water resources availability and demand of Southern Africa was highlighted in the conclusions of Kusangaya *et al.* (2014:51), with the researchers making a persuasive case for the need to strengthen water resource management.

A study on the perception of employees to test sustainable water management in the coal and iron mining sector in South Africa, reveals that the development and implementation of corporate water strategies or plans, need critical interventions (Liphadzi & Vermaak, 2017:608). The perception of employees are that the use of green infrastructure to decrease the impact on water resources, reduction of wastewater discharges and communication of water issues are aspects that were marginally applied by mining companies (Liphadzi & Vermaak, 2017:617). A high number of respondents (42%) had no opinion about water disclosure and reporting practices of their companies giving the impression that information seems to be withheld or not communicated effectively within the organisation (Liphadzi & Vermaak, 2017:616).

Several studies dealing with the technical side of water management and conservation in South Africa were found, but limited literature dealing with water disclosure. One of the more technical studies performed in South Africa was how to assess the water footprint of citrus production (Munro *et al.*, 2016:668). The results indicated that stakeholders and governments could use water footprint assessments to determine the status of river basins to evaluate future water usage and impacts of increasing agricultural practices (Munro *et al.*, 2016:668). These findings associate with another study (Northey *et al.*, 2016:1111) stating that water footprint assessments in the mining sector could aid as a benchmarking tool for water performance and improve the quality of cross-sectoral assessments of water use. Similarly, Haggard *et al.* (2015:286) mentioned that mining companies can become aware of the amount of water they use by calculating the water footprint of their operations. An important conclusion by Northey *et al.* (2016:1112) was that usefulness and relevance of water-related data disclosures that are presented by corporate sustainability reports, should be improved.

Closely related to this thesis, Sánchez-Hernández *et al.* (2017:837) addressed water reporting in the agri-food sector in South Africa through thematic content analysis on 22 companies. Findings suggest that companies were committed to create value for all their stakeholders by conducting sustainable business through ethical dealings and protecting the environment. All the companies incorporated water management within different levels and with variant degrees of importance for its business strategy (Sánchez-Hernández *et al.*, 2017:845). Correspondingly, the 37 companies analysed by Botha and Middelberg (2016:1), illustrated commitment towards water stewardship by reporting on water-related aspects. With the exception of the industrial sector, most companies were serious and transparent towards reporting on water governance issues.

The inclusion of water issues as part of the company's business model were evident in the study of 22 agri-food companies in South Africa by Sánchez-Hernández *et al.* (2017:845), and such inclusion could be considered as one of the best practices in the field. This finding relates to IR and the integrative approach as mentioned by Hoque (2017:246) where it was concluded that IR supports the improvement of the business model and strategy formulation of a company, because of its process of integrated thinking and decision-making support. Taking cognisance of the statements above, this study investigated whether IR is associated with improved water disclosure. The essential messages forthcoming from the study of Sánchez-Hernández *et al.* (2017) are the following:

- CSR reporting rates are relatively high in South Africa, although there is no specific mandate to report on water management.
- The integration of water issues has been exposed in the sustainability reports analysed.
- In terms of the quality of disclosure, the results indicate that companies include useful information about water management in their reports, but that compliance as opposed to ethical behaviour, was the motivation.
- Following previously observed trends (Braam *et al.*, 2016:726; Hahn & Lülfs, 2013:401), it was concluded that companies mostly communicate positive issues, and avoid the disclosure of negative actions that could damage their corporate reputation.

3.5 WATER REPORTING IN AUSTRALIA

Water reporting in Australia is addressed in the next sections by providing an introduction, discussing some statistics followed by rules and regulations that guide reporting in Australia. To conclude, the section provides previous studies related to water reporting in Australia.

3.5.1 Introduction

Similar to South Africa, Australia is particularly vulnerable to water scarcity, and although it is the driest inhabited continent, Australia has the highest water usage per capita in the world (Future Directions International, 2014:1; Godfrey, 2010). The Bureau of Meteorology is responsible for producing regular reports on water resources, availability and use in Australia to inform decision making by water managers and policy makers (Bureau of Meteorology, 2018:7). The Bureau of

Meteorology (2018:50) recognises that there has been a declining trend in per capita residential water use in major urban areas, due to water-restrictions and changes in user behaviour as a result of increased awareness about water scarcity.

3.5.2 Statistics on water in Australia

The Australian Bureau of Statistics (2017) compiles The Water Account of Australia, which presents the physical and monetary supply of water in the Australian economy. The information is prepared in accordance with the SEEA relating to water consumption by industries and households in Australia. During the 2015 to 2016 period, total consumptive water use was 16 132 gigalitres (GL), of which the agriculture, forestry and fishing industry consumed the most, with 9 604 GL (60%). Total water used for industrial purposes were estimated at 1 526 GL (9%), where the mining industry contributed 661 GL (4%) to this total (Australian Bureau of Statistics, 2017; Bureau of Meteorology, 2018:52). It is worthy to note that during 2015 and 2016, the gross value of Australian agriculture production was more than $56 billion, of which more than $15 billion of this was spent on irrigation of produce (Department of Agriculture and Water Resources, 2018:1).

3.5.3 Laws and regulations in Australia

Internationally, Australia has taken leadership in implementing water-related sustainable development goals through the UN High Level Panel on Water (HLPW). Australia is also leading work through the International Organisation for Standardisation (ISO) to develop an ISO international standard for water efficiency (Department of Agriculture and Water Resources, 2018:2). Considering the contributions above, Australia is acknowledged as a country leading the world in water accounting through the establishment of the Water Accounting Standards Board (WASB), an independent advisory board of the Bureau of Meteorology (WASB, 2012:1). The WASB define water accounting as:

> *"a systematic process of identifying, recognising, quantifying, reporting and assuring information about water, the rights or other claims to that water, and the obligations against that water"* (WASB, 2014:8).

Through the Water Act 2007 and reforms, such as the National Water Initiative, the Australian government offers national leadership to support the agricultural sector with the management of water resources. Other frameworks and rules utilised in Australia articulated to water disclosures are the GRI, the ASX Corporate Governance Council Principles and Australia's Water Accounting Standards. Principle 7 of the ASX Corporate Governance Council Principles and Recommendations relates to recognising and managing risk, where recommendation 7.4 (ASX Corporate Governance Council, 2014:30) states that "*a listed entity should disclose whether it* *has any material exposure to economic, environmental and social sustainability risks, and if it does, how it manages or intends to manage those risks*". This correlates with the materiality principle of IR (refer to section 2.6.3), stipulating that if information is important, it should be disclosed. However, the Principles and Recommendations referred to above are not mandatory, and do not seek to prescribe the corporate governance principles that a listed ASX firm must adopt (ASX Corporate Governance Council, 2014:3).

The only legal requirement for sustainability disclosure in Australia is contained within the Corporations Act of 2001. Section 299(1) (f) of the Act requires the disclosure of details of a company's performance in relation to any significant Commonwealth, State or Territory environmental regulation to which the company's operations are subject. An additional requirement is contained in section 1013D (1), which mandates that issuers of investment products are to include in a Product Disclosure Statement 'the extent to which labour standards or environmental, social or ethical considerations are taken into account in the selection, retention or realisation of the investment'. The provision applies specifically to investment products and is not a general requirement for non-financial information (Herbohn *et al.*, 2014:425).

3.5.4 Previous research on water reporting in Australia

Lokuwaduge and Heenetigala (2017:445) analysed 30 Australian companies in the metal and mining sector and found that 13 companies used a separate sustainability report, 12 produced integrated reports, while 5 had neither. The extent of ESG reporting is highly influenced by the regulatory or compliance requirements, which provides evidence of the influence of the legitimacy theory. The research indicates that Australian mining companies choose to report ESG information in a manner that reduces the regulatory risk and safeguards their legitimacy. The study confirms the perception that reporting practices in Australia is consistent with the legitimacy and stakeholder theory and supports the concept of overlapping between the two theories.

Analysing 339 mining companies, Herbohn *et al.* (2014:456) found that sustainability disclosure is significantly positively associated with a firm's sustainability performance. However, on average, the sampled firms do not undertake a high level of sustainability disclosure, with an average score of under one out of five – where one is low and five is high (Herbohn *et al.*, 2014:455). Important conclusions reached are countless opportunities for more empirical research on the integration of sustainability into the strategic planning processes of a company and also the need for a framework with uniform standards and indicators, not only for the mining industry, but for all sectors (Herbohn *et al.*, 2014:456; Lokuwaduge & Heenetigala, 2017:448). These conclusions relate to the outcomes of IR and the integrative approach utilised to improve the strategy formulation of a company.

A study conducted by CPA Australia (2015:10) in the food, beverage and tobacco industry scrutinised voluntary disclosures provided by nine organisations on three different dates. The rationale for the selection of different dates (March 2009, May 2013 and September 2014) is to consider how reporting practices might change as social pressures to be more water efficient eased, because of subsiding drought conditions in 2009 and 2010 (CPA Australia, 2015:11). It was observed that since 2009, the quality and quantity of water reporting became gradually more sensitive and responsive to the needs of the community. As found in previous studies (Leong *et al.*, 2014; Michelon *et al.*, 2015:60), it appeared that management chose not to disclose related available data which might reflect negatively on the organisation (CPA Australia, 2015:8). Against a backdrop of increased GRI focussed reporting and organisations that are known to collect total water consumed, the findings revealed declining water-specific disclosures as drought conditions eased (CPA Australia, 2015:8).

Various theories support the existence and application of the WASB and water accounting in Australia, such as the public interest theory, the stakeholder theory and the legitimacy theory. The public interest theory avers that the WASB is put into place to benefit society as a whole, while the stakeholder theory explains how sustainability reporting adheres to the expectations of stakeholder groups that could influence corporate strategies (Hu *et al.*, 2013:428). The legitimacy theory affirms that companies are operating within the restrictions and procedures of their respective societies. This interconnection between the theories once again emphasises the integrative approach as water is a precious resource to society and companies, especially in a water restricted country.

3.6 WATER REPORTING GLOBALLY

This part on global water reporting introduce water scarcity as a global concern. This is followed by global statistics and previous studies in other parts of the world that were not addressed in the discussions above relating to water reporting in South Africa and Australia. This section conclude by emphasising the integrative approach.

3.6.1 Introduction

The United Nations Sustainable Development Goal number 6 aims to *ensure the availability and sustainable management of water and sanitation for all,* but with estimated projections of a 40% shortfall in water availability by 2030, serious actions are needed to reach this goal and to address the problem (HLPW, 2018:7). Consequently the UN and the World Bank have convened a HLPW to tackle one of the world’s most pressing challenges – an approaching global water crises (HLPW, 2018:5). An outcome from this panel was a document called: *“Making every drop count,* *an agenda for water action"* published in March 2018. The HLPW also launched its Water Action Plan, which is a comprehensive plan accentuating that effective actions by all stakeholders are required to understand and address the quality, quantity, distribution and risks associated with water (HLPW, 2018:13).

3.6.2 Statistics on water globally

Estimates indicate that the world's population is increasing with roughly 83 million people annually and that the upward trend in population size is expected to continue, even with declining fertility levels in virtually all regions of the world (UN, 2017:12). The United Nations Department of Economic and Social Affairs (UNDESA) reports that more than half of this growth is expected to occur in Africa (+1.3 billion), with Asia (+0.75 billion) expected to be the second largest contributor. The world's population prospects are essential to guide policies aimed at achieving the Sustainable Development Goals (SDGs). Statistics indicate that China (with 1.4 billion inhabitants) and India (with 1.3 billion inhabitants) remain the most populous countries, comprising a combined 37% of the global population (UN, 2017:1). The total citizens in Nigeria, presently the 7th biggest in the world is anticipated to exceed that of the USA, becoming the 3rd largest population before 2050 (UN, 2017:5).

The increasing populations' influence on water availability cannot be ignored. This statement is reiterated by the WWAP (2017a:2), emphasising that global water demand is predicted to increase significantly over the coming decades. In addition to the agricultural sector, which is responsible for 70% of water abstractions worldwide, large increases are foreseen for industry and energy production, with changing consumption patterns towards water-intensive foods such as red meat worsening the situation (Guppy & Anderson, 2017:3; WWAP, 2017b:12). At present, an estimated 3.6 billion people (nearly half the global population) live in areas that are potentially water scarce at least one month per year, and this can increase to between 4.8 to 5.7 billion in 2050 (WWAP, 2018:3).

From 2017 to 2050, it is projected that half of the world's population growth will be concentrated in just nine countries, namely India, Nigeria, Democratic Republic of the Congo, Pakistan, Ethiopia, United Republic of Tanzania, USA, Uganda and Indonesia. It is clear that many of these countries are in Africa and it is expected that the populations of 26 African countries will expand to at least double their current size in the same period (UN, 2017:13). Companies operating in continents like Europe, with a well-developed infrastructure and abundant rainfall, water security may appear to be of less concern. However in the winter of 2015/2016, the UK experienced the worst flooding since 1947, severely affecting water quality (CDP, 2017a:6). The deterioration in water quality is a global concern, which is expected to intensify over the next decades causing serious threats to human health, the environment and also for sustainable development (WWAP, 2018:3). Of all the industrial and municipal wastewater released to the environment, 80% is untreated, also contributing to the deteriorating of overall water quality (WWAP, 2017b:2).

Against this backdrop of the growing population, the growth in global GDP and declining water quality, food must be provided. The increase in the abovementioned figures stimulates global demand for agricultural and energy production, both of which are water intensive. The expected growth rate of global consumption for all agricultural products from 2005/2007 until 2050 is 1.1% annually, resulting in a required global production increase of 60% by 2050 (Alexandratos & Bruinsma, 2012:7). Burek *et al.* (2016:41) projected increases in water requirements for global crop irrigation by 2050 to be between 23 and 42% above the 2010 level. Solutions to these challenges have to emanate from all stakeholders, including water and energy providers to ensure food security. Previous research on water reporting globally is discussed next.

3.6.3 Previous research on water reporting globally

As an emerging economy, China is considered to be a late starter in terms of CSR reporting. There is a broad variation of guidelines and reference criteria for CSR disclosure by Chinese companies and the most often adopted are the GRI, Shanghai Stock Exchange Guidelines and the Chinese Academy of Social Sciences guidelines (Lu *et al.*, 2017:1801). Analysing 42 publicly listed forestry companies, Lu *et al.* (2017:1809) revealed significant gaps in the provision of environmental information, with some enterprises not disclosing any data at all.

Germany, for example, faces prosecution in the European Court of Justice over failure to address nitrates pollution from agriculture. European companies are also confronted with serious water risks in their supply chains. The European Water Stewardship initiative was established to provide a practical tool with its standards and certification scheme to evaluate the performance of water users. Despite the increased pressures to disclose water data, 58% of European companies approached by the CDP, failed to disclose critical water-related data (CDP, 2017a:6, 8).

Zhou *et al.* (2018:1313) examined 334 listed Chinese companies in high water risk industries between 2010 and 2015. Based on the legitimacy theory, the study examines the moderating effect of organisational legitimacy in terms of the impact of water disclosure on corporate risk-taking. The results reveal water disclosure is negatively correlated with corporate risk-taking, possibly because investors remain unconcerned as water disclosure is not mandatory and relatively new (Zhou *et al.*, 2018:1321). Concluding remarks urge high water risk enterprises to identify water risks, strengthen water management and strive to improve communication with stakeholders in order to enhance corporate risk-taking (Zhou *et al.*, 2018:1323).

Cantele *et al.* (2018:440) conducted an empirical analyses on 22 water utility companies in Italy by selecting 39 qualitative and quantitative indicators from the GRI and SASB. Cantele *et al.* (2018:443) found low level disclosures with limited use of indicators, representing a tendency to use reports as communication tools for descriptive purposes. The researchers stressed that an international industry specific standard for water utilities could increase disclosure levels and reporting quality (Cantele *et al.*, 2018:443).

Previously referred to in this thesis, the study by Remali *et al.* (2016:71) on ten Malaysian companies, revealed low water-related disclosure levels. Another study by Remali *et al.* (2017:6) proposed a matrix to map companies in Malaysia on the extent of their corporate disclosure of water policies, initiatives and performance (low, medium or high) based on the intensity of their industry (low, medium or high). Only one company fell under the low-risk category, while more than 50% was classified under the high-risk category due to low corporate water disclosure. Remali *et al.* (2017:8) concluded that the lack of disclosure could become the basis for authoritative bodies to revisit the need for mandatory disclosure in order to accomplish improved accountability, consistency and comparability.

Burritt *et al*. (2016:68) identified six independent drivers for corporate water-related disclosure by analysing the integrated and sustainability reports of 100 Japanese companies. It was detected that large, water-sensitive companies with dispersed ownership, have the highest levels of water-related disclosure, proactively responding to stakeholder concerns (Burritt *et al.*, 2016:71). It was stated that greater scrutiny is experienced by larger firms due to external stakeholder expectations, leading management to disclose more comprehensive information about water. Burritt *et al.* (2016:73) concluded that water resources management by companies is not only an environmental – but also a social concern – to stakeholders, and expects increased attention granted to water-related accountability and disclosure.

3.6.4 The integrative approach

During an event "Strengthening integrated responses to water and energy as a strategy for climate change action," co-organised by ITAIPU BINACIONAL and UNDESA (2018:1) on 26 September 2018, it was evident that a global approach towards water sustainability is crucial. Juwang Zhu, Director of UNDESA Division for SDGs stated that: "Water is the thread that links all of our lives." This statement was supported by the Under-Secretary-General Liu Zhenmin who asserted: "If we can strengthen the water-energy nexus, we will be better placed to achieve all of the SDGs" (UNDESA, 2018).

The role of water and energy in agriculture and maintaining a sustainable food supply was highlighted by several speakers on the two panel discussions, including Cristina Gallach, High Commissioner for the 2030 Agenda for Spain. She cited Spain's involvement in intergovernmental water groups for Latin America and the Mediterranean regions as an important way to discuss the interlinkages between water, energy and climate change and share best practices to "minimise our consumption of energy and move to new systems to create more efficient food delivery processes" (UNDESA, 2018).

An integrated approach to water and energy is also helping small farmers, according to Arianna Giuliodori, Secretary General of the World Farmers' Organisation. She pointed to the example of mango farmers in Zambia who are able to grow, dry, store and export their product internationally thanks to thoughtful investment in solar energy to supply water to their farms (ITAIPU BINACIONAL & UNDESA, 2018:2; UNDESA, 2018). The World Bank (2018:5) called for a paradigm shift from traditional urban water practices to an integrated water management mind-set that can help water scarce utilities secure reliable and sustainable water supplies.

The abovementioned events and comments emphasise that interdisciplinary research is essential for effective management of WEF systems. While the various science disciplines have long histories of working autonomously in mechanisms of the WEF nexus, future research should integrate physical, agri-ecological, and social sciences with economics (Scanlon *et al.*, 2017:3554). Taking into consideration that large-scale agricultural and energy industries are controlling WEF systems in many regions, Scanlon *et al.* (2017:3554) concluded that collaboration between academia and industry is essential to effect change.

It is evident that, due to different regulations, laws, frameworks and guidelines in various countries, water reporting varies substantially. Some countries have mandatory reporting requirements while in others environmental reporting is voluntary. In the next section the reporting on water in different industries is addressed.

3.7 WATER REPORTING IN INDUSTRIES

Numerous industries, such as food and beverages, power generation, mining, high technology, pulp and paper depend heavily on water and are directly exposed to water scarcity (McKinsey & Company, 2009:3). Many industries interrelate with water in many different ways that can negatively disturb the environment and, in turn, communities. This section provides an introduction, followed by previous research on water-intensive industries.

3.7.1 Introduction

NBIM states that reporting on water issues should become more performance-relevant and that sector-specific questionnaires should be developed, bringing forth a deeper understanding of the operational challenges and risks facing companies (CDP, 2017d:5). This signifies and correlates with previous studies (Dumay *et al.*, 2016:179; Fonseca *et al.*, 2013:187; Mueller *et al.*, 2015:42) that water disclosure should ultimately be industry-driven.

The Global Industry Classification Standard (GICS) is a standardised classification system for equities developed mutually by Morgan Stanley Capital International and Standard & Poor's Dow Jones Indices (GICS, 2018b:3). The main objective of the GICS is to classify shares of all market participants – by a standardised industry definition – into sectors (GICS, 2018a:1). The GICS classifies companies into 11 sectors, namely Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecommunication Services and Utilities. The food, beverage and tobacco industry is identified as one of the industry groups in the Consumer Staples sector (GICS, 2018a:2). The GICS is utilised to determine the industries in the following discussions. The next section discusses some industries that have a high impact on water resources.

3.7.2 Chemicals and pharmaceuticals

Chemical companies are classified under the Materials sector and pharmaceuticals fall under Health Care as per the GICS, and are discussed together (GICS, 2018a:3). Although limited research on water reporting with regard to the chemical or pharmaceutical industry were found, it was clear that the industries could have negative impacts on water resources. The earth's capacity to adapt to chemical pollution has been proposed as part of one of the nine planetary boundaries, in relation to which anthropogenic (human) impacts needs to be reduced (Steffen *et al.*, 2015:736).

Threats to clean water have resulted in a number of global regulations aiming to reduce the production and use of the most hazardous chemicals. Notwithstanding significant successes, toxic pollution still poses a substantial risk to almost half of the water bodies monitored in Europe (Malaj *et al.*, 2014:9549). According to Loos *et al.* (2009:561), there are more than 100 000 chemicals registered in the EU, where 30 000 to 70 000 are used daily. A large portion of those can be expected to find their way into the environment and water systems together with substantial numbers of environmental transformation products and manufactured by-products occurring in complex chemical mixtures.

The results of the CDP global water report 2013 show that the Health Care sector's strategic response to water-related risks has increased as a result of increased exposure. The sector responded positively on policy, strategy or plans as well as board-level oversight (highest of all sectors) and concrete targets and goals (CDP, 2013:32). Despite the increasing public and regulatory scrutiny over the pharmaceutical sector on the environment, only 9% of the respondents report to have paid penalties for significant breaches on regulations (CDP, 2013:33).

3.7.3 Forestry and paper

Forestry and paper companies are classified as part of the Materials sector according to the GICS (GICS, 2018a:3). Water availability is important in this sector and, changes in water availability, directly affect agriculture in terms of growing seasons, pests and crop productivity (CDP, 2014:40). Water management is particularly important in the irrigated agriculture and forestry sectors of South Africa, to which approximately two thirds of the surface water resources have been allocated (CSIR, 2018).

Plantation forestry in South Africa is critical for timber and fibre production, income generation and job provision, but it comes with a cost to the environment – notably on water resources. Different techniques such as in-field vegetation water use monitoring, application of water use impact indices, water use efficiency tools and crop and tree water use modelling are essential to manage water use (CSIR, 2018).

The Rainforest Alliance Certification that identifies whether farming practices obey to sound social and environmental principles are often found in the forestry and paper industry (Bateman *et al.*, 2017:135). The "Rainforest Alliance Certified Seal" indicates whether products are made from ingredients sourced from farms that apply the standards of the Sustainable Agriculture Network. These rules include practices to protect the local environment, workers, water and the communities from which materials are brought (Rainforest Alliance, 2017:51).

The Chinese Forestry Industry Association and the Chinese National Forest Products Industry Association released *The Compilation guidelines for CSR reporting* to regulate and guide CSR activities of forestry enterprises (Lu *et al.*, 2017:1802). Despite these guidelines, Chinese companies in the forest industry lag behind their counterparts in developed economies, with room for improvement in terms of CSR disclosure (Lu *et al.*, 2017:1808).

According to Man *et al.* (2018:1377), previous investigations of water consumption in the papermaking industry have focussed on key processes, ignoring the impacts of intermediate and interrelated processes in paper production, therefore underestimating sustainability impacts. Man *et al.* (2018:1387) advocated for optimised production processes with the aim to reduce direct water consumption by improving the efficiency of water use and recycling.

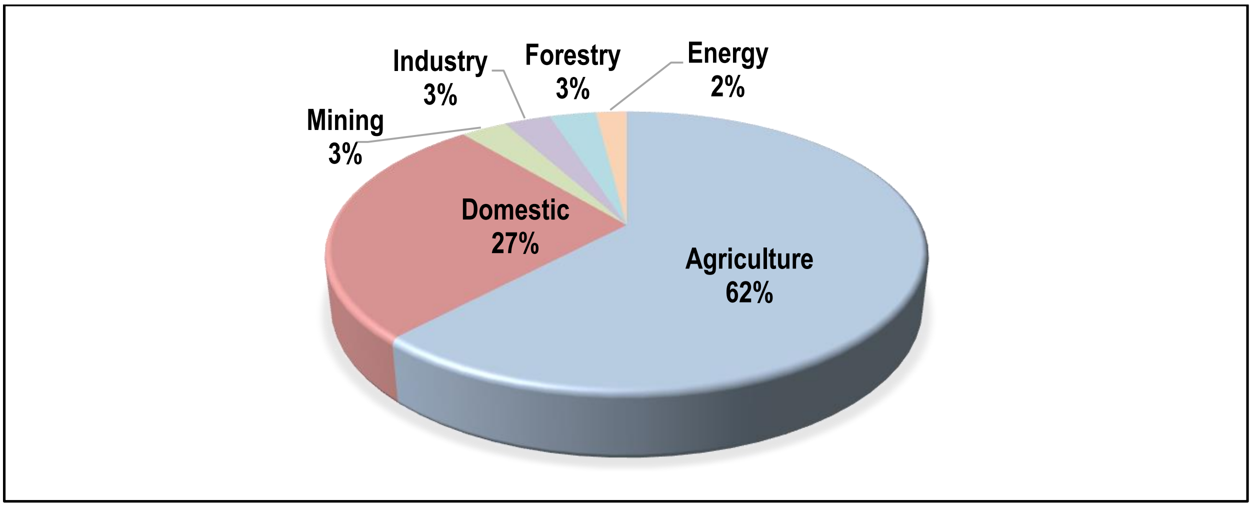
3.7.4 Mining and metals

Mining and metal companies are classified as part of the Materials sector (GICS, 2018a:3). The materials sector has one of the highest response rates on water as well as the highest proportions of respondents reporting water as a substantive business risk (CDP, 2013:38). In the 2016 CDP Water Report, 92% of companies integrated water into their business strategies (highest of any sector), and 77% of companies have board-level oversight of a water policy or strategy (CDP, 2016:46).

The mining industry still plays a significant role in South Africa, constituting 6.8% of the economy and contributing R312 billion to GDP (Chamber of Mines, 2018:8).

When compared to other industries, the mining industry does not consume as much water, illustrated in Figure 3-1.

Figure 3-1: South Africa's water use per economic sector



Source: Adapted from Department of Water and Sanitation (2015:8).

Australia's water consumption in 2015/16 revealed similar results per industry, with agricultural usage at 58.48% and mining 4.1% (APPEA, 2018:19). Although the mining industry does not consume huge amounts of water, there are many potential problems associated with the mining and metals industry, such as acid mine drainage, pollution of groundwater due to seepage of tailings, and mine water discharges into surface water (Danoucaras *et al.*, 2014:727). These problems increase as the mining industry contest for water with other industries and local communities.

Instead of a list of metrics, as in the GRI, the Water Accounting Framework (WAF) provides a method to ensure that internal flows are accounted for and flows to and from the environment are balanced against the change in water store volumes (Danoucaras *et al.*, 2014:728). The Minerals Council of Australia (MCA) member companies produce more that 85% of Australia's annual minerals (MCA, 2017:6). The MCA in connection with the Centre for Water in the Minerals Industry developed the WAF. The WAF supports the minerals industry by generating a reconciled water account and also supply some consistency in definitions used. The result is that most mining and mineral companies in Australia endorsed the WAF's Input-Output model. Testing the WAF's model shows that the framework is flexible which means that any site regardless of its location or commodity can report to it. The advantages of the Input-Output Statement is that it provides a clear picture since all losses such as seepage, evaporation, task loss and entrained water in final products are considered (Danoucaras *et al.*, 2014:734).

Not overlooking the importance of other industries with regard to water, this study addressed the food, beverage and tobacco industry, which is more water intensive, as evident in Figure 3-1 above.

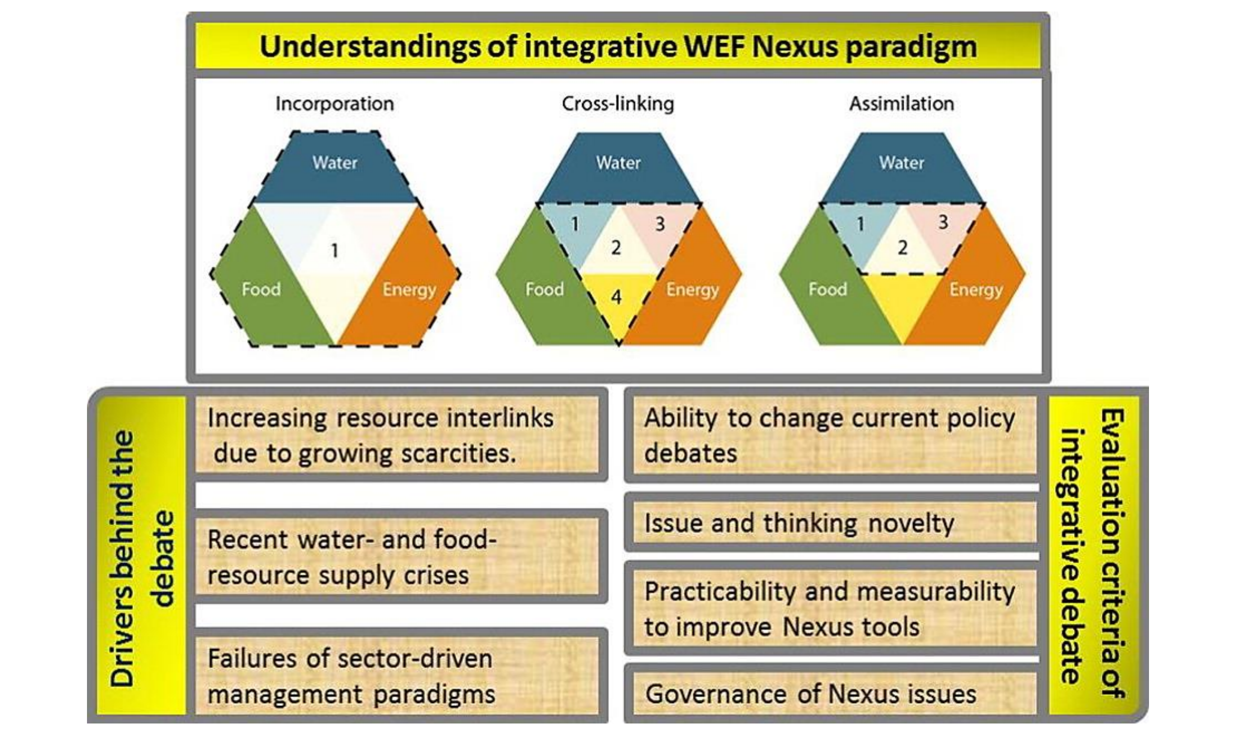
3.8 THE FOOD, BEVERAGE AND TOBACCO INDUSTRY

Water is a major element within the food, beverage and tobacco industry and although there are variations in the way it is used across this industry, it is often the main ingredient for many products (Jones *et al.*, 2015b:117).

3.8.1 Introduction

Endo *et al.* (2017:22) investigated previous research on the WEF nexus and found that only six out 37 identified projects investigated the water-food nexus (refer to section 1.2.4). This supports the importance and relevance of this current study, as it focusses on water reporting in the food, beverage and tobacco industry. After an overview on studies performed of more than 300 nexus-specific publications since 2009, Al-Saidi and Elagib (2017:1132) found that there is no consistent view on the meaning of integration within the nexus concept. They concluded that using an integrated perspective on the management of the three resources – water, energy and food – is still a new approach. Figure 3-2 was developed where incorporation, cross-linking and assimilation was used to illustrate the latest integrated paradigm in environmental sciences (Al-Saidi & Elagib, 2017:1135).

Figure 3-2: Understanding the integrative WEF nexus paradigm



Source: Adopted from Al-Saidi and Elagib (2017:1131).

In the next section the two elements that are part of the nexus, namely water as a scarce resource and the demand for more food, in the context of the food, beverage and tobacco industry are addressed. As mentioned by Jones *et al.* (2015b:117), increased water scarcity poses risks to business in physical, reputational and financial terms. Jones *et al.* (2015b:124) expanded that water risks are bound up with a company's reputation, and that reputational risks receive little attention within corporate sustainability reports. The corporate sector, and especially agribusiness, is one of the largest users of freshwater with rising demands for businesses to be responsible, transparent and accountable for their water management and use. Investors, rating agencies, suppliers, customers, trade organisations, employees, local communities, regulators, governments and non-government organisations, all have an interest in water-related disclosures and call for improved reporting practices on water (Burritt *et al.*, 2016:66). The studies, alluded to above, reveal the interest of various parties with regard to water-related disclosure, exposing the stakeholder theory.

Meneses *et al.* (2017:72) recognise that climate change, population growth and economic development play a vital role in the increasing demand for water, which is also driven by growing domestic demand and dietary shifts into higher animal protein consumption. Kleinman *et al.* (2017:342) note that climate change has an impact on the hydrological cycle, causing shifting rainfall and weather patterns, affecting crop yields through severe droughts or heavy rainfall. With this in mind, a growing population calls for increased crop production and processing crops into processed foods, of which both are heavy consumers of water (Kleinman *et al.*, 2017:342). The challenge of feeding a growing population is intensified, as water is used throughout the food production chain at different stages, including irrigation, processing, cooling, heating and cleaning (Meneses *et al.*, 2017:73).

3.8.2 Industry classification and reporting in the food, beverage and tobacco industry

The food, beverage and tobacco industry forms part of the Consumer Staples sector, and has six sub-industries, namely brewers, distillers and vintners, soft drinks, agricultural products, packaged foods and meats and tobacco, as displayed in Table 3-2 (GICS, 2018a:2).

Table 3-2: The food, beverage and tobacco industry

	Industry	Sub-industry	Description
Food, beverage and tobacco industry group	Beverages	Brewers	Producers of beer and malt liquors, including breweries not classified in the restaurants sub-industry.
		Distillers and vintners	Distillers, vintners and producers of alcoholic beverages not classified in the brewers sub-industry.
		Soft drinks	Producers of non-alcoholic beverages including mineral waters. Excludes producers of milk classified in the packaged foods sub-industry.
	Food products	Agricultural products	Producers of agricultural products. Includes crop growers, owners of plantations and companies that produce and process foods but do not package and market them. Excludes companies classified in the forest products sub-industry and those that package and market the food products classified in the packaged foods and meats sub-industry.
		Packaged foods and meats	Producers of packaged foods including dairy products, fruit juices, meats, poultry, fish and pet foods.
	Tobacco	Tobacco	Manufacturers of cigarettes and other tobacco products.

Source: Adapted from GICS (2018b:28).

As indicated in Table 3-2, the type of companies that are selected as part of the empirical study, almost covers the entire supply chain. Water is a central environmental issue, specifically in the food, beverage and tobacco industry, either as part of the input to a product, as a by-product or a component in the manufacturing process (Pederson *et al.*, 2017:1049). Irrigation could be recognised as the most water demanding operation in the food supply chain, and Meneses *et al.* (2017:73) suggest that water need to be reused and conditioned to incorporate better water management and sustainability in food processing operations. Alkaya and Demirer (2015:179) found evidence that water recycling and reuse can be successfully implemented in the beverage industry as a sustainable water management approach. In order to determine areas where water-saving potential is present, water use evaluation or benchmarking was carried out, saving 55% of total water consumption of a selected company in Turkey (Alkaya & Demirer, 2015:178).

An exploratory study performed by Jones *et al.* (2015b:118) selected the world's top 10 food and drinks companies, as ranked for social responsibility by Oxfam. Substantial variations were revealed in their disclosures on their approach to water stewardship. Jones *et al*. (2015a:274; 2015b:122) reasoned that the lack of common and agreed frameworks and standards, make it difficult to establish significant comparisons between companies, and also to evaluate the contribution companies are making towards water stewardship at regional, national and international levels.

Weber and Hogberg-Saunders (2018:973) analysed the connection between water risk indicators and general CSR ratings of 61 companies in the food and beverage industry, developing water indicators from an ecosystem view to evaluate whether firms address water risks from a sustainability or business case perspective. Weber and Hogberg-Saunders (2018:974) argued that firms mainly follow a strategic CSR approach to address water risks and opportunities that are material for their businesses to achieve a competitive advantage. Some descriptive results under the Water Value category revealed that 33.2% of the firms recognised freshwater as a major input and 29.5% identified water risk factors that present a threat to their financial performance. Under the Water Inventory category, 31.6% monitored changes in their local water supply quality over time and 28.7% identify their water sources (Weber & Hogberg-Saunders, 2018:969). The Water Accounting category revealed 45.5% of companies established efficiency targets and goals for water use, while 25.8% assessed their impact of water use on local communities (Weber & Hogberg-Saunders, 2018:970).

Referring back to the study of Sánchez-Hernández *et al.* (2017), addressed under previous research on water reporting in South Africa (see section 3.4.4), it relates to South Africa and the food, beverage and tobacco industry. Relying mostly on the legitimacy theory, the most important findings revealed that companies demonstrated integration of water issues in their reports, include useful information about water management, but that compliance is their motivation rather than ethical spirit (Sánchez-Hernández *et al.*, 2017:836).

Egan (2015:73) explored how five food and beverage organisations in Australia were able to develop some focus on water management at a time of severe drought by conducting 29 interviews with a range of staff. Change in two organisations was driven by a concern at board level about community criticisms and a sense of scrutiny from regulators and that the ongoing, open water dialogues evident in these two cases, provide evidence of progress (Egan, 2015:87).

Using formal concept analysis, Kleinman *et al.* (2017:345) seek to pinpoint similarities and differences in water disclosure between seven firms in the food and beverage industry in the USA. Moreover, the researchers link seven firms' water disclosures to the characteristics of the GRI and the CEO Water Mandate to provide stakeholders with a management tool to compare firms within the industry. Results revealed that if firms report water discharge, they also report water withdrawal, water consumption and water recycled under the GRI G3 characteristics (Kleinman *et al.*, 2017:347). All seven companies indicate their efforts on water quality and goal setting under the CEO Water Mandate, while partnership, leadership and employee involvement requires higher priority (Kleinman *et al.*, 2017:352). In essence, the research provides a visual tool of the different dimensions of water disclosure utilised by companies using the GRI and CEO Water Mandate to compare firms within the industry.

A study executed by Kang *et al.* (2017:5) analysed the present state and future trend of water and food security in China. Although total food production increased, there is no significant food surplus, and the food import dependency ratio more than doubled during the 2005 to 2014 period (Kang *et al.*, 2017:7). As irrigated crops yield 2.5 times the production output compared to rain-fed land, the amount of water used by irrigation could not be ignored. Worsening this matter is that China's irrigation water delivery efficiency ratio (the volume of irrigation water available from an irrigation reservoir to the volume of water delivered to the reservoir) is only 52% when compared to 70 to 80% in developed countries (Kang *et al.*, 2017:6). The authors call for an integrative approach to improve water use efficiency at multiple scales, as well as how to develop policies and management plans to improve water productivity (Kang *et al.*, 2017:15).

As the focus of this study is on the food, beverage and tobacco industry, which is a crucial part of the agri-food supply chain, the latter is addressed in the next section.

3.8.3 Supply chain in the food, beverage and tobacco sector

As a result of increased populations, growing concern from consumers and pressure to produce food, the focus on sustainability is rapidly increasing for companies along the agri-food supply chain (BASF, 2014:3; Rankin *et al.*, 2011:2).

Environmental concerns have become so prominent that environmental aspects are integrated within supply chain management, evolving into a separate growing field of green supply chain management (Sarkis, 2012:202). Food retailers have to provide environmental-friendly products to their consumers, but should also demonstrate responsible environmental practices in the supply chain. By managing their activities they can ensure that environmental targets and policies are integrated upstream (suppliers) and downstream to the consumer (Petljak *et al.*, 2018:3).

In total, 66 agribusinesses were included in a study by Topp-Becker and Ellis (2017:22) on the role of sustainability reporting in the agri-food supply chain. Results revealed that on average, companies only scored 20.1% for environmental reporting, and it appears that companies along the agri-food supply chain has not fully embraced sustainability and environmental reporting (Topp-Becker & Ellis, 2017:26). Taking into consideration that enough food needs to be produced for the growing population and that consumers are concerned about agricultural sustainability, Topp-Becker and Ellis (2017:27) urge companies to consider the potential benefits of sustainability reporting.

Referring back to the study of Weber and Hogberg-Saunders (2018:970), results in terms of the supply chain categories revealed that 42.1% of firms identified water risks as key factors in their agricultural inputs, 36.2% apply strategies to measure supply chain risks and 17.1% incorporate water policies in their procurement codes.

Taking cognisance of the supply chain in the food, beverage and tobacco industry and WEF nexus, the concept of integration emerges as a prominent issue. As this study deals with water reporting and disclosure in the food, beverage and tobacco industry, evaluating the reporting practices out of an IR perspective, the integration concept as discussed as part of IR becomes more significant. The abovementioned aspects were identified as those that need more attention and should be addressed in the empirical study.

3.9 SUMMARY

The aim of this chapter was to focus on water reporting within different industries, with specific emphasis on the food, beverage and tobacco industry, addressing diverse reporting rules and regulations between South Africa, Australia and global companies.

Based on the concerns and the need for water disclosure, in context of the stakeholder theory revealed in the previous chapter, the users of information have a prerogative on quality information. Consequently, this chapter commenced with the characteristics of quality reporting. Studies investigated mentioned a lack of completeness and credibility in CSR reports, with various authors calling for targets and measures to improve the measurability and comparability of information. Another means to improve the quality of information is to provide more rules and guidelines which was discussed next.

As various frameworks were designed to support and provide guidance for this gap – lack of guidelines – and to enhance the quality of reporting, the variability of reports made it difficult to compare information from different companies. It was also evident that frameworks and standards for non-financial reporting do not follow a standardised format and are not as developed as those for financial reporting. Reporting requirements in countries, other than South Africa and Australia, were investigated to provide a global picture. It was mentioned that in most countries sustainability reporting is still voluntary and that most companies decide independently on when, how and to what context they prefer to report. It was apparent that the GRI guidelines can be viewed as the most extensive standard utilised and recommended by various countries. It was worthy to note that increases in environmental reporting rates were discovered, which could be connected to the stakeholder theory, indicating that companies are sensing pressures from stakeholders to disclose on their CSR.

Moving towards water reporting requirements and guidelines, it was noted that the range of frameworks and guidelines became more limited, of which many had already been addressed in Chapter 2. Variances between countries and sectors asked for industry-based guidelines that are contextually specific. The discussion progressed to focus on water reporting in South Africa, Australia and attempted to provide a global perspective.

Decreasing projected annual rainfall, the lowest annual recorded rainfall in 2015, and 60% of overexploited rivers are some of the distressing statistics in South Africa. Consequently, it is not surprising that 93% of South African companies reported water as a direct risk to their operations in 2017. Poor municipal management and weakening infrastructure increases the risk of unreliable water supply and inadequate quality. The inclusion of water issues as part of a company's business model were identified, which relates to IR and the integrative approach to improve business model and strategy formulation of a company, because of its process of integrated thinking and decision-making support.

Water-related issues in Australia was discussed next, and similar to South Africa, the country is exposed to water scarcity. Australia can be considered as a country leading the world in water accounting implemented at government level. Various studies revealed weak disclosure scores with regard to sustainability reporting. Opportunities for more empirical research on the integration of sustainability into the strategic planning processes of a company, and the need for a framework with uniform standards and indicators were important conclusions discovered. The interconnection between various theories adopted also emphasised the integrative approach as water is a precious resource to society and companies, especially in a water restricted country.

Global statistics such as an estimated shortfall of 40% in water availability by 2030 and an increasing population calls for serious actions to tackle one of the world's most pressing challenges – an approaching global water crisis. Previous research on water reporting globally revealed low level disclosures, with authors calling for increased attention granted to water-related disclosure.

Not disregarding the importance of other industries that was discussed in this chapter, the conversation moved towards the food, beverage and tobacco industry, which is more water intensive. Within the concept of the WEF nexus, the relevance of this study as it focusses on water reporting performed in the food, beverage and tobacco industry, was highlighted. The challenge of feeding a growing population is intensified as water is used at different stages throughout the food production chain. It was stated that the food, beverage and tobacco industry forms part of the Consumer Staples sector, with six sub-industries. Previous research on water reporting in the industry revealed substantial variations in disclosures and companies' approach to water stewardship, with authors calling for an integrative approach to improve water use efficiency at multiple scales. The chapter concluded by recognising the importance of water in the supply chain and WEF nexus, exposing the concept of integration as discussed as part of IR.

The following chapter discusses the research methodology utilised in order to achieve several secondary objectives set in Chapter 1.

CHAPTER 4

RESEARCH METHODOLOGY

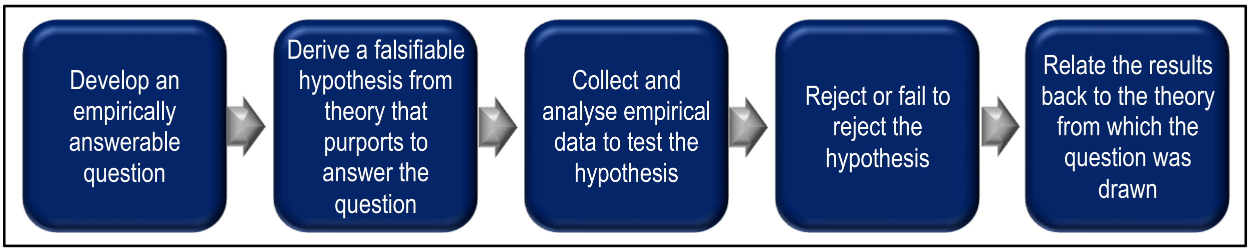
4.1 INTRODUCTION

Research methodology is a systematic way to solve a problem, and a science of studying how research is to be carried out (Rajasekar *et al.*, 2006:5). The intent of this chapter is to gain insight into the research methodology utilised in order to address the research problem and to achieve the secondary objectives in the empirical study (refer to section 1.4.2). To do research is a way to achieve new knowledge by using various research methods and methodologies. Scientific and academic research are the core drivers of every science to achieve a deep comprehension and knowledge sustainability (Lopes, 2015:11). In the context of discovering and contributing to the pool of new knowledge, the objective of this chapter is to comprehend what research is all about in order to provide an understanding of the underlying philosophies and theories that support the research process. In this chapter, the research process and design methods are discussed. The approach towards paradigmatic assumptions, theories and contextual framework are addressed, followed by the research design and data collection methods. Subsequently, the measuring instrument, research sample and analysis of the data are conversed. More specifically, the water disclosure index (measuring instrument) is developed in this chapter. The chapter concludes with methodological rigour, ethics and the researcher's reflection.

4.2 THE RESEARCH PROCESS

McCusker and Gunaydin (2015:541) describe research as a systematic and rigorous process of enquiry, with the aim to describe phenomena in order to develop and test explanatory concepts and theories. Rajasekar *et al.* (2006:2) state that research has to be an active, diligent and systematic process of inquiry in order to discover, interpret or revise facts, events, behaviours and theories. It is evident that research follows a systematic process to obtain new insight into a specific phenomenon for the purpose of formulating answers and solutions about previously identified research questions (Kumar, 2008:6). Fouché and Delport (2011:63) agree with Babbie and Mouton (2001:72) that all empirical research includes and conforms with what they call the "ProDEC" framework: (a) a research **PRO**blem , (b) research **D**esign, (c) empirical **E**vidence, and (d) **C**onclusions. Figure 4-1 provides an illustration of the scientific research process as mentioned by Lynch (2013:5).

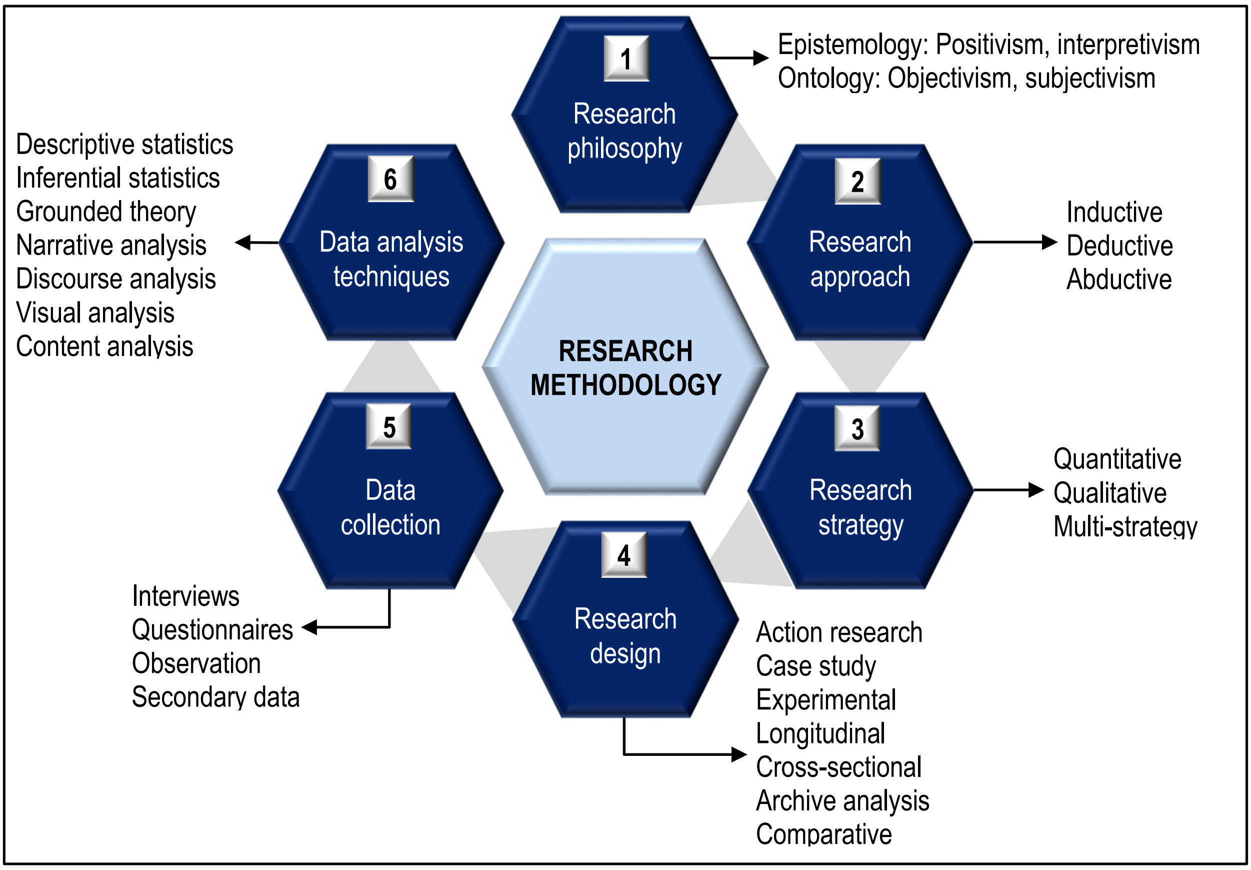
Figure 4-1: The scientific research process



Source: Adopted from Lynch (2013:5).

Consequently, research follows systematic procedures by applying research methods to investigate the formulated research questions, with the purpose of adding value to the existing pool of knowledge. Mouton (2001:56) states that the research methodology focuses on the research process – and the kind of tools and procedures to be used. Wilson (2014:7) views research methodology as the approach and strategy used to conduct research. In order to understand the key concepts of research, and how they fit into the research methodology, this study applied Wilson's (2014:7) *'honeycomb of research methodology'* – as illustrated in Figure 4-2.

Figure 4-2: The honeycomb of research methodology



Source: Adopted from Wilson (2014:7).

4.3 RESEARCH PHILOSOPHY

It is important to understand the underlying philosophical assumptions that direct the research process. In order to establish appropriate research methods for the development of knowledge in a given study, all research is grounded on some underlying philosophical assumptions (Antwi & Hamza, 2015:217). Antwi and Hamza (2015:218) elaborate that the selection of research methodology depends on the research philosophies or paradigms – that guides the research process.

4.3.1 Introduction

A paradigm consists of the following components: (a) ontology, (b) epistemology, (c) methodology, and (d) methods (Scotland, 2012:9). In essence, paradigms are systems of interrelated ontological, epistemological and methodological assumptions that act as perspectives to provide a rationale for the research and to commit the researcher to particular methods of data collection, observation and interpretation (Durrheim, 2006:40). All scientific research should be conducted within a specific paradigm, or way of viewing one's research material (De Vos & Strydom, 2011:41).

Scientific and academic research is normally structured around two different dimensions: (a) the ontological dimension, which is associated with the objectivity or subjectively level, and (b) the epistemological dimension, which describes the ways to acquire knowledge (Lopes, 2015:14).

4.3.2 The ontological dimension

The ontological dimension is more related to the human beliefs about the natural and social world (Lopes, 2015:15). Ontology is defined as the study of 'existence' and 'being' (Crotty, 2003:10; Ryan *et al.*, 2002:13). Ontological assumptions or dimensions are those that respond to the question 'what is there that can be known?' or 'what is the nature of reality?' (Denzin & Lincoln, 1998:201). O'Gorman and MacIntosh (2015:56) state that ontological assumptions can be divided into objective and subjective configurations. An objective ontology assumes that reality exists independently of our comprehension of it, whereas a subjective ontology postulates that our perceptions are what shape reality (O'Gorman & MacIntosh, 2015:57). According to Jackson (2016:35), the existence of a concept such as sustainable development, can generate critical conversations among scholars based on reality between people, communities and it is measurement (quantitative and [or] qualitative parameters). In an ontological dimension towards accounting research, knowledge can be created at different levels, for example: (a) at an individual level, (b) at an organisational level, or (c) within organisations in order to link theoretical and applied knowledge in a process of value creation (Lopes, 2015:13).

In this study, the researcher views the investigation of water disclosures and performance of firms in the food, beverage and tobacco industry, as external to the researcher, which can be objectively measured utilising scientific enquiry.

4.3.3 The epistemological dimension

King and Horrocks (2010:8) provide a concise definition of epistemology as the philosophical theory of knowledge. Crotty (2003:3) states that epistemology is 'the theory of knowledge' and 'a way of understanding and explaining how we know what we know'. Bryman and Bell (2015:12) argue that an epistemological issue concerns the question of what is (or should be) regarded as acceptable knowledge in a discipline. In essence, epistemology orders and formulates your ability to understand the forms of knowledge that are possible, and the conditions in which it may be achieved (Gaffikin, 2014:3). King and Horrocks (2010:10) state that epistemological questions around what represents knowledge within a particular ontological view, expose the connectedness of research. Several authors share this view by arguing that ontological and epistemological issues (a) tend to emerge together, (b) cannot be viewed in isolation, and (c) cannot be mutually exclusive (Crotty, 1998:10; Jackson, 2016:36; King & Horrocks, 2010:10). According to Jackson (2016:35), the concept of sustainable development from an epistemological dimension, is strongly rooted in scientific methods of investigation.

Epistemology can be deconstructed into a 'positivist' as opposed to an 'interpretivist' epistemological position. An objective ontology is typically associated with a positivist epistemological approach, while subjectivity inclines to be driven by an interpretivist epistemology (O'Gorman & MacIntosh, 2015:59). Many authors also refer to different philosophies or approaches as epistemologies or paradigms (Creswell, 2010:55; Mertens, 2010:470). Although reference is only made to positivist and interpretivist epistemologies or philosophical approaches above, others are applied in social science research – which are discussed subsequently, before it is applied to this study.

4.3.4 Different philosophical approaches

Halcomb and Hickman (2015:42) describe the philosophical approaches as the lens through which the researcher sees the world. Creswell (2013:6) identifies four basic paradigms, philosophical assumptions or worldviews that shapes the basic set of beliefs that direct the actions of the researcher. Creswell (2013:6) refers to these approaches as different worldviews and recognise them as a general philosophical orientation about the world and the nature of research the researcher brings to a study. Accordingly, he classifies them into postpositivism, constructivism, transformative and pragmatism.

Referring to Sekaran and Bougie (2016:28), the most important perspectives for contemporary research in business is (a) positivism, (b) constructionism, (c) critical realism, and (d) pragmatism. It is clear that different authors use different terms to describe these research approaches, but the essential aspect is that the researcher should adopt the worldview that underpins the study in the most applicable manner.

(a) Positivism

The positivist approach (also called the scientific method) is recognised by the replicability of the research, the reliability of observations, and the generalisation of findings (Scotland, 2012:10; Sekaran & Bougie, 2016:28). Undertaking deductive reasoning, theories and cause and effect relations are tested by means of objective measures (Sekaran & Bougie, 2016:28).

(b) Postpositivism

Postpositivism relies on multiple methods as a way of capturing as much of reality as possible, with emphasis placed on the discovery and verification of theories (De Vos et al., 2011:7). Normally the knowledge gathered through the viewpoint of the postpositivist is based on careful observation and measurement of the objective under study. Postpositivists believe there are laws or theories that govern the world, and these need to be tested or verified and refined so that we can understand the world (Creswell, 2014:7).

Nieuwenhuis (2016:60) state that postpositivist thinkers focus on establishing and searching for evidence that is valid and reliable in terms of the existence of phenomena, instead of generalisation. Nieuwenhuis (2016:60) proceeds that this is in contrast with the positivist approach of making claims about the absolute truth through the establishments of generalisation and laws.

(c) Interpretivism or constructivism

Interpretivism is also referred to as constructivism, because it emphasises the ability of the individual to construct meaning (Nieuwenhuis, 2016:60). Constructivism, to the furthest extent, rely on the participants' views of the situation being studied (Creswell, 2014:8). Participants become active and involved in all phases of the research process, and it is believed that the outcome of the project is enhanced with more accurate results (De Vos *et al.*, 2011:9). The creation of knowledge is often based on the observations and interpretations of social practices and its qualitative nature is more centred towards the ontological dimension (Ryan *et al.*, 2002:18). Senik (2009) agreed that the ontological dimension has a social subjectivity and declared disagreement between positivist approaches.

(d) Critical realism

Critical realism is an approach which places its genesis on the assumption that an objective truth exists but cannot be reliably measured, and that reality can be understood best by investigating multiple viewpoints (Creswell & Plano Clark, 2011:44). Modell (2015:1143) reports that critical realists take exception to stronger correspondence theories of truth and that empirically observable phenomena are underpinned by deeper mechanisms, never within full grasp of human beings as perceiving subjects. Critical realists are thus critical of their ability to understand the world with certainty, believing that the goal of research is to progress towards this objective, even though it could not be reached (Sekaran & Bougie, 2016:29). This approach is often visible in the behavioural sciences where the researcher finds it difficult to observe subjective items, for example values, emotions and satisfaction.

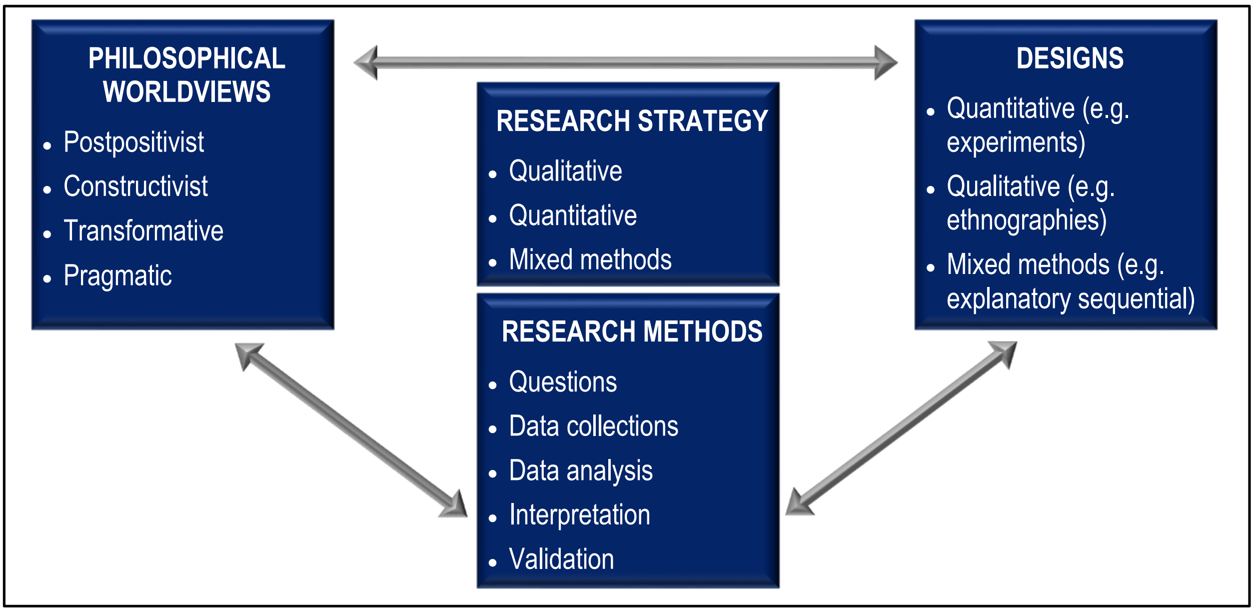
(e) Pragmatism

Creswell (2014:10) argues that as a worldview, pragmatism arises out of action, situations, and consequences – rather than antecedent conditions (as in postpositivism). Pragmatism appears as a pluralist but practical perspective, aligning research methodologies as a mix of (a) research objectives, (b) observable phenomena, and (c) research questions (Lopes, 2015:15).

Creswell and Plano Clark (2011:42) mention that pragmatism perceives the research problem as the most important aspect, and also value subjective and objective information to support answers. Pragmatism concentrates on practical, applied research where different viewpoints on research and the subject under study are helpful in solving a business-related problem (Sekaran & Bougie, 2016:29). Sekaran and Bougie (2016:29) conclude that, for a pragmatist, the value of research lies in its practical relevance, with the purpose of theory to inform practice.

The broad research approach involves the intersection of philosophy, research designs, and specific research methods. Creswell (2014:6) explains the interaction between these components in Figure 4-3.

Figure 4-3: A framework for research – the interconnection of worldviews, design, and research methods



Source: Adopted from Creswell (2014:5).

This research was categorised as postpositivist and used a literature review to gather knowledge about the sustainability and IR domain. More specifically, the focus of water disclosures was carefully observed and measured in the empirical analyses. The theories applicable to this study were verified and tested by evaluating whether IR is associated with improved water disclosures in the food, beverage and tobacco industry, and could be refined. At this stage, it would be relevant to distinguish between deductive, inductive and abductive research approaches.

4.4 RESEARCH APPROACH

A distinguishing feature of scientific research is that it requires theoretical content (theory) – which brings forth the differentiation between deductive, inductive and abductive approaches/reasoning (Wilson, 2014:12-13). Deductive-, inductive-, and abductive reasoning are deliberated before it is applied to this study.

4.4.1 Deductive reasoning

Deductive reasoning moves from 'theory to data' or from 'the abstract and general' to 'the specific and more concrete' – following a top-down approach (Joubert, 2017:8). Delport and De Vos (2011:48) stated that quantitative researchers use a deductive form of reasoning, beginning with hypothesis or abstract generalisations, and moving towards proving these. Sekaran and Bougie (2016:23) refers to the hypothetic-deductive method as a systematic approach for generating knowledge in order to solve managerial problems. One of the central principles is that the hypothesis must also be *falsifiable* – the possibility of future research to disprove the hypothesis (Popper, 2002:55; Sekaran & Bougie, 2016:24). Smith (2017:23) argues that the deductive approach offers greater possibilities for the implementation of scientific methods, since it potentially provides more reliable measurement and control. Figure 4-4 provides an example of a basic deductive research design.

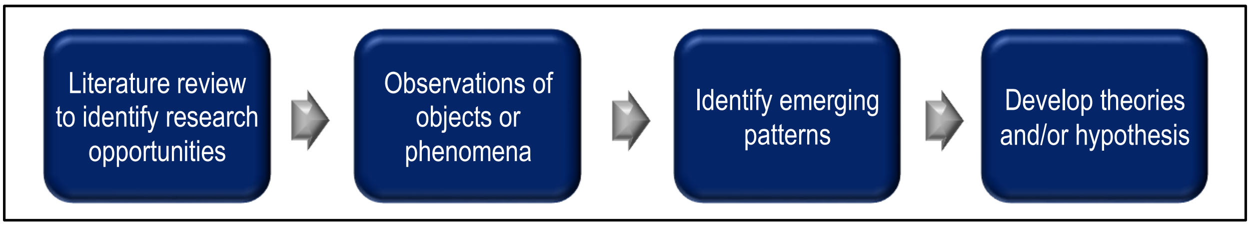
Figure 4-4: Basic deductive research design

Source: Adopted from Joubert (2017:9).

4.4.2 Inductive reasoning

Inductive reasoning moves from 'the concrete and specific' to 'the abstract and general' – and is often used where theoretical foundations in the field of study are not strongly established (Joubert, 2017:10). According to Delport and De Vos (2011:49), induction is a creative reasoning mode, adding to scientific knowledge with tentative or possible conclusions. Graneheim *et al.* (2017:30) note that the challenge in conducting inductive analysis is to avoid surface descriptions and general summaries. Joubert (2017:10) states that inductive research mostly applies flexible research designs, and is strongly associated with the process of theory building as illustrated in Figure 4-5.

Figure 4-5: Basic inductive research design



Source: Adopted from Joubert (2017:10).

Both inductive and deductive processes are used in fundamental and applied research, with many researchers arguing that theory generation (induction) and theory testing (deduction) are essential parts of the research process (Sekaran & Bougie, 2016:26). Predominantly, deductive processes are used in causal and quantitative studies, whereas inductive processes are regularly used in exploratory and qualitative research (Sekaran & Bougie, 2016:26).

4.4.3 Abductive reasoning

Locke *et al.* (2008:908) state that abduction, along with induction and deduction, is one form of reasoning comprising the living process of inquiry. According to Walton (2014:4), abduction is often associated with the kind of reasoning used in the construction of hypothesis at the discovery stage of scientific evidence. Abduction is to recognise and create contexts of meaning, where the interpretation of underlying patterns is a fundamental idea (Eriksson & Lindström, 1997:197). A principal use of abduction involves drawing theoretical conclusions from empirical data (Mantere & Ketokivi, 2013:82).

For the reason that abductive reasoning is central to the research design of this study, it is discussed in more detail later in this chapter (refer to section 4.7.4). Within the context of research philosophies and approaches – and taking note of the importance of theoretical content in scientific research – the underlying theories and contextual frameworks are conversed.

4.5 THEORIES AND CONTEXTUAL FRAMEWORK

Ryan *et al.* (2002:7) stated that: “Research is a process of intellectual discovery, which has the potential to transform our knowledge and understanding of the world around us”. Therefore, in the world of business and accounting, research is understood as the methodical pathway to achieve a solution or a reasonable understanding for a business-related problem. Taking the above into consideration, Smith (2017:9) states that there must be some theoretical justification for the question being addressed and the research approach adopted.

4.5.1 Introduction

Welman *et al.* (2005:20) argue that concepts are the building blocks and most critical element in any theory, and serve the following purposes: (a) the foundation of communication, (b) introducing a way of looking at the empirical world, (c) a means of classification and generalisation, and (d) the components of theories, explanations and predictions. According to Lynch (2013:10), a theory offers a framework for understanding how things in the world operate and enables prediction in the form of hypothesis.

Developments in accounting research have increased in the last decades (Lopes, 2015:15; Unegbu, 2014:6). Increasing complexity of organisations and developments in the business environment, requires additional insights towards value creation – especially from academia (Lopes, 2015:15). Traditionally, accounting is divided into two complementary fields, namely (a) financial accounting with an external focus, and (b) management accounting, with a more internal focal point (Cloete & Marimuthu, 2018:10). In terms of research, financial accounting tends to move towards a more positivist approach, while management accounting has followed an interpretive or even a critical approach. Research in both financial and management accounting have to explore social practices in its related scientific fields based on the applications of conceptual theories and frameworks in practice (Lopes, 2015:9, 18).

Briefly directing attention to studies previously addressed, the next two paragraphs intend to support and provide a backdrop for the forthcoming discussion on different theories.

Husted and De Sousa-Filho (2018) report that ESG disclosure has a long history within the CSR literature. Tamimi and Sebastianelli (2017:1660) state that CSR actions of companies have been under greater scrutiny, as more companies realise that their environmental efforts, ethical labour practices and corporate governance are not meeting the expectations of their stakeholders – affecting business success. Eccles *et al.* (2011:113) mentioned that growing market interest in CSR and ESG disclosure, reflects investor concerns – with many using them as proxies for assessing management quality.

The concept of accountability provides the constituent for sustainability accounting and reporting (Gray *et al.*, 2014:266), the context within which this study operates. Ultimately, an organisation is accountable to both its internal and external stakeholders – and sustainability accounting and reporting allows an organisation to provide evidence of its accountability (Lodhia & Hess, 2014:44). Equally, various theories have been postulated to explain and motivate sustainability accounting and reporting practices.

4.5.2 Different theories

The legitimacy theory, institutional theory, resource dependence theory and stakeholder theory, provide important theoretical frameworks for social and environmental accounting research (Bhattacharyya, 2014:27; Chen & Roberts, 2010:651). They are commonly similar because they share a related ontological view and are considered to be system-orientated theories (Chen & Roberts, 2010:652; Gray *et al.*, 1995:50). The assumption of a system-orientated theory, is that any organisation is influenced by the society in which it operates, and the organisation on the other side, influences the society (Chen & Roberts, 2010:652).

Social and environmental reporting are influenced by the socio-political and economic environment in which companies operate (Bhattacharyya, 2014:27). The theoretical framework that companies therefore adopted are influenced by those environments. The adopted frameworks in this context could then be either from a resource-based perspective or from an institutional perspective. According to Bhattacharyya (2014:27), the institutional perspective of the legitimacy theory is one of the dominant theories in social disclosure research.

In 1996, Hackston and Milne (1996:78) cited that there is still no universally accepted theoretical framework for corporate social accounting. Chan *et al.* (2014:61) however noted the legitimacy and stakeholder theory as the most widely used theories used in examining CSR disclosures. In the next sections, different theories – that form the theoretical basis of this study – are discussed.

4.5.2.1 Legitimacy theory

Some organisations engage in CSR and disclose information based on external pressures they consider to be acceptable, because they operate within boundaries and rules according to the expectations of their stakeholders. In this context, the disclosure of information appears to be an instrument to legitimise the organisation (Branco & Rodrigues, 2008:687). According to the legitimacy theory, organisations need to legitimise their existence to society in order to survive. Sustainability accounting and reporting is utilised by companies as a vehicle to legitimise its actions (Deegan *et al.*, 2002:319). The company should therefore operate within the boundaries and rules imposed by society to be legitimate.

The legitimacy theory highlights that a company should consider the rights of the public at large and not only the rights and needs of its investors (Lokuwaduge & Heenetigala, 2017:440). According to Deegan (2014:252), the legitimacy theory does not provide prescription about what management should do, but rather seeks to explain or predict particular managerial activities. To disclose company operations and how the company is managing its resources is projected to have a positive impact on stakeholders' views to legitimise the actions of a company. The legitimacy theory could be reflected in South Africa, where companies should produce reports that comply with the substance of King III or King IV, corporate guidelines or with the requirements of the JSE.

According to Remali *et al.* (2016:67), it is evident that there is an interdependency that exits between human beings, the ecosystem and a company's reliance on water to operate, which refers to a social contract between a company and the larger society. In this sense water disclosure is needed to legitimise the company's contract with society, and the legitimacy theory is therefore applicable to this study.

4.5.2.2 Stakeholder theory

Deegan (2014:252) argues that the both the legitimacy and stakeholder theory conceptualise the organisation as part of a broader social system wherein the organisation affects and is affected by other groups within society. While the legitimacy theory discusses the expectations of society in general, the stakeholder theory refers to different stakeholder groups, each viewing how an organisation should conduct its operations (Deegan, 2014:252).

CSR reporting by companies is not only a responsibility towards its shareholders, but to a broader audience that includes all role players. The stakeholder theory focuses on the importance of managing the complex and conflicting relationship companies have with various stakeholders, such as: employees, customers, public interest groups, creditors, environment, board of directors, competitors and governmental bodies (Tamimi & Sebastianelli, 2017:1663). Internal, as well as external stakeholders need information in order to make some decisions related to a company. The stakeholder theory emphasises the fact that each stakeholder has different needs and expectations that could also be in conflict with each other (Chen & Roberts, 2010:653).

The stakeholder theory attempts to explain how a company identifies powerful stakeholder groups that may affect, or be affected, by the firm's social and environmental disclosure practices – and how the company responds to their expectations (Lu & Abeysekera, 2014:428). Some companies believe that being seen as socially responsible will result in a competitive advantage for the company (Bhattacharyya, 2014:27). Li *et al.* (2018:62) provide an example that for instance investors, consumers and employees (stakeholders), will reward good management through investment, consumption and higher productivity.

Sustainability decision making is closely linked with the needs of stakeholders and therefore, social and environmental reporting is clearly connected with the stakeholder theory. This implies that corporate social and environmental disclosure is expected to be an effective management strategy tool for a company to develop and maintain stakeholder relationships.

When placing the objectives (refer to section 1.4.1 and 1.4.2) of the study into perspective, it is clear that water and water reporting affects a variety of stakeholders and that companies have the responsibility to disclose the information that concerns the stakeholders. In this context, this study is guided by the stakeholder theory.

4.5.2.3 Institutional theory

The institutional theory strongly emphasises that organisations can incorporate institutionalised norms and rules to gain stability and enhance survival prospects (Chen & Roberts, 2010:6563). This theory proposes that organisations favour structures and management procedures previously adopted or accepted by similar organisations (Velte & Stawinoga, 2017:293). The institutional theory advocates that a variety of external pressures (whether from government, customers or communities) activate companies to respond and disclose required information (Tamimi & Sebastianelli, 2017:1662). According to Chen and Roberts (2010:661), institutional theorists believe that conformity to long-established institutional norms is the path towards institutional legitimacy.

Velte and Stawinoga (2017:293) state that organisations operating in the same field compete on issues such as their social standing and public perception of their environmental practices. According to Velte and Stawinoga (2017:293), institutional practices such as voluntary IR are linked to a society's values, norms and boundaries. Hence, IR may connect an organisation to the society in which it operates, enhancing its continued legitimisation (Velte & Stawinoga, 2017:293).

4.5.2.4 Resource-based theory

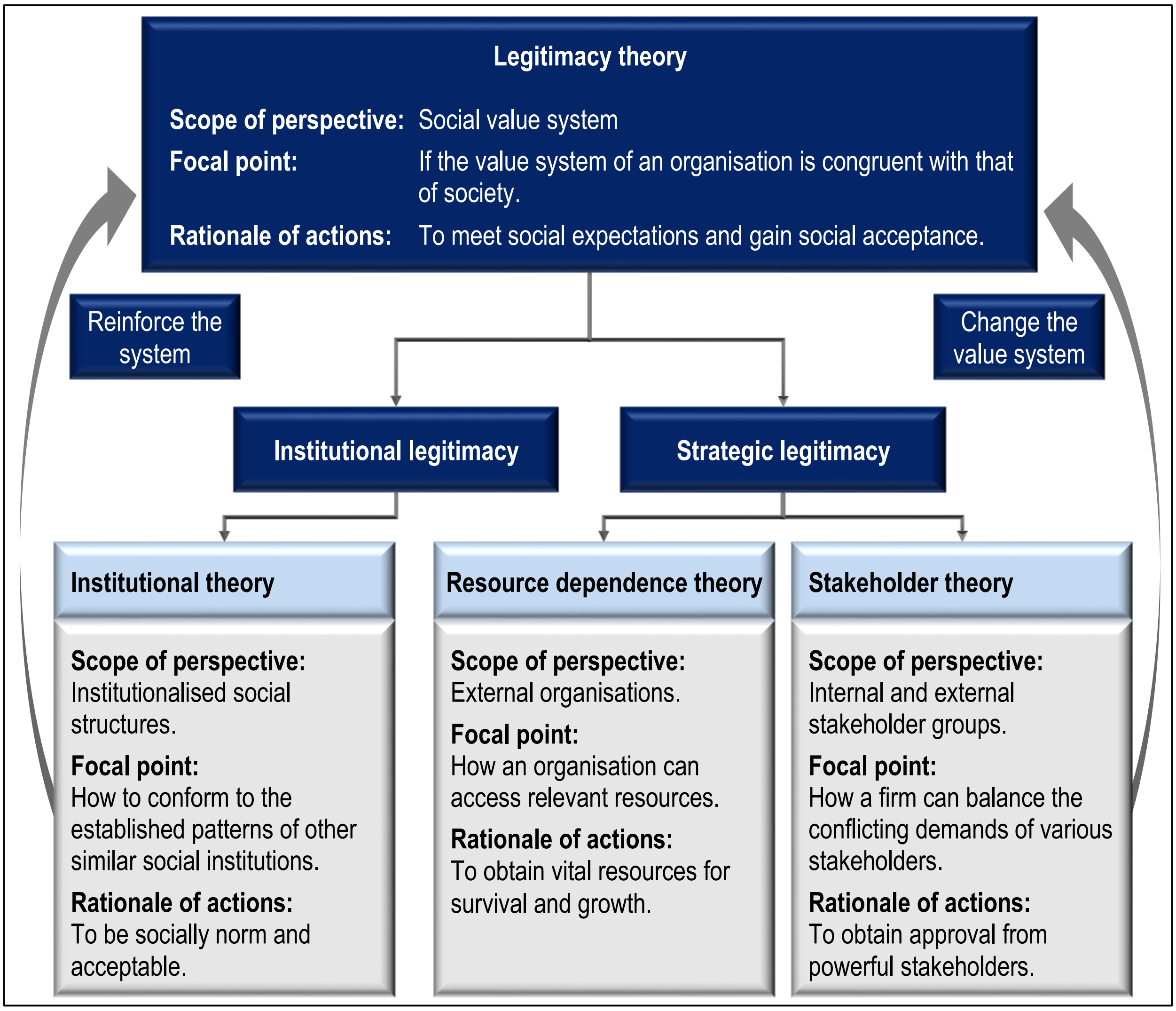
Instead of concerning itself with social expectation, the resource dependence theory attempts to explain the effect of environmental constraint on organisations (Chen & Roberts, 2010:653). The resource-based theory can be documented on how a company engage and interact with other entities for various resources in the supply chain (Schnittfeld & Busch, 2016:338). Companies operate in society, and their operations have an effect on these resources. An example used could be to perceive the board of directors as a resource that has to manage a firm's external environmental dependencies (Shaukat *et al.*, 2015:571).

Resource dependence theorists state that organisations must participate in exchanges and transactions with other entities for various resources (Chen & Roberts, 2010:653). Velte and Stawinoga (2017:294) noticed similarities between the resource dependency theory and IR in the form of (a) the presence of multiple capitals affecting the entity's activities and growth, and (b) demonstrating the possibilities of ensuring the continuous supply of relevant resources in order to achieve long-term value creation.

4.5.2.5 Summary on theories

When analysing all the relevant theories it is evident that they share some related themes. One common theme is the interlinked relationship which a company has with its stakeholders. Deegan and Blomquist (2006:350) note an overlapping in the legitimacy and stakeholder theory, both providing consistent, but slightly different insights to their study. This confirms the statement by Gray *et al.* (1995:52) to view these theories as complementary rather than to recognise them as competing with each other. This opinion is shared by Chen and Roberts (2010:653) as illustrated in Figure 4-6.

Figure 4-6: The relationship among theories



Source: Adapted from Chen and Roberts (2010:653).

The stakeholder theory could be recognised as prominent in terms of disclosure on water in the food, beverage and tobacco industry, supported by the legitimacy theory. Taking cognisance of the complex situation (conflicting interest) and the variety of stakeholders involved in the disclosure of water, the consumption of water resources and the need for water in the food, beverage and tobacco industry, water affects various stakeholders and the organisation itself. The management and use of water, the disclosure of water-related information, and the rules and regulations that an organisation must comply with, are closely linked to the needs of stakeholders. For example, a company polluting a river for financial benefit, while the community utilise the river for drinking water, poses a conflict of interest. Moreover, the use of water to irrigate the crops, which could be used by the community for household purposes, signifies the same conflict. In this sense the company should not only be efficacious to their shareholders, but also to other stakeholders who have an interest in the social and environmental performance of the company.

To conclude, it seems that both the legitimacy and the stakeholder theory, as discussed, is applicable to this study. The study is therefore supported by both theories as they are complementary rather than alternatives in the execution of the study.

At this stage it could even be valuable to introduce a new theory – the integrative disclosure theory – based on the interrelated and interlinked relationship between water, food and the need for sustainable disclosure of information. It is possible that this newly suggested theory could also be supported by the introduction of IR, which aims to create value for all stakeholders over the long term. This is elaborated on during the course of this study, subsequent to the findings. After the theoretical approach of the study has been confirmed the next step is to provide more clarity on the research strategy.

4.6 RESEARCH STRATEGY

After considering the research approach and theoretical context (added by the author) of the study, the honeycomb of research methodology (refer to Figure 4-2) addresses the research strategy (Wilson, 2014:7). There are three research strategies, namely (a) qualitative, (b) quantitative, and (c) mixed methods (Fouché & Delport, 2011:63; Wilson, 2014:7). Qualitative research is a strategy for exploring and understanding the meaning of individuals or groups ascribed to a social or human problem. It normally refers to an inductive style, a focus on individual meaning and the importance of rendering the complexity of the situation (Creswell, 2013:4). Qualitative data are descriptive and represented in words rather than in numbers and could be beneficial as they provide more detailed information about an experience or aspects of behaviour. Quantitative research is a strategy for testing objective theories by examining the relationships between variables. These variables can be measured, typically on instruments, so that numbered data can be analysed by using statistical procedures (Creswell, 2013:5). Quantitative data is numerical and represents how much there is of a specific phenomenon.

4.6.1 Background and contextualisation of research strategies

Different paradigms or worldviews act as a contextual background to guide the researcher through its research process. Bryman (2006:16) refers to 'the paradigm wars' as the debate regarding qualitative and quantitative research at the epistemological stage. In this sense qualitative and quantitative research strategies are incommensurable according to their paradigm and worldview and reflect epistemological and ontological assumptions (Bahari, 2010:19). The different assumptions and research strategies are compiled in the Table 4-1.

Table 4-1: Fundamental differences between qualitative and quantitative research strategies

Assumptions	Qualitative	Quantitative
Principle orientation to the role of theory in relation to research	Inductive; generation of theory	Deductive; testing of theory
Epistemological assumptions	Interpretivist	Positivism
Ontological assumptions	Subjectivism or constructivism	Objectivism

Source: Adapted from Bryman (2012:37).

Non-experimental designs such as surveys provide a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It includes cross-sectional and longitudinal studies using questionnaires or structured interviews as methods to collect data. In terms of qualitative designs, narrative research, phenomenology, grounded theory, ethnographies and case studies can be acknowledged (Creswell, 2014:13, 14).

4.6.2 Introduction and background on mixed methods

Both quantitative and qualitative research methods have weaknesses. Triangulating data sources, namely to seek for convergence across quantitative and qualitative methods was invented in 1959 by Campbell and Fiske (1959:85), which has led to the development of the mixed strategy (Creswell, 2014:14; Ivankova *et al.*, 2016:314). Triangulation requires that research is addressed from multiple perspectives, such as (Sekaran & Bougie, 2016:106):

- Method triangulation: using multiple methods of data collection and analysis.
- Data triangulation: collecting data from several sources and/or at different periods.
- Researcher triangulation: multiple researchers collect and/or analyse data.
- Theory triangulation: multiple theories and/or perspectives are used to interpret and explain the data.

In an article entitled: "The movement of mixed methods research and the role of educators" by Creswell and Garrett (2008:322), they argue that by combining quantitative and qualitative research, the attributes of both strategies could lead to a better understanding of the research problems. Mixed methods is described as the 'third movement' in the evolution of research methodology – and seen as the main strategy most educators will adopt (Creswell & Garrett, 2008:322; Teddlie & Tashakkori, 2003:5).

Halcomb and Hickman (2015:4) mention the following eight items that should be considered when planning a mixed methods strategy: (a) examine the rationale for using the mixed method, (b) explore the philosophical approach, (c) understand the different mixed method designs, (d) assess the required skills, (e) review project management considerations, (f) plan and justify the integration of the qualitative and quantitative aspects, (g) ensure that rigour is demonstrated, and (h) disseminate mixed methods research proudly.

The integrative quality of mixed methods could occur in many or all stages of the research process (Yin, 2006:41). The attractiveness of this strategy is that it allows for (a) a combination of inductive and deductive thinking, (b) more than one research method to address the research problem, and (c) solving the problem using different types of data (Sekaran & Bougie, 2016:106). Creswell and Plano Clark (2011:26) highlight that no single paradigm applies to all designs and that multiple worldviews can be combined when designing the mixed methods of study.

The philosophical underpinnings of mixed methods is widely discussed, and questions whether one philosophy or worldview could be compatible with another epistemological assumption, are raised (Grafton *et al.*, 2011:9). This argument is premised on the fact that a qualitative research methodology is more inductive, while the more logic, deductive way reinforces the quantitative methodology (Creswell & Garrett, 2008:325; Grafton *et al.*, 2011). The two dominant views about mixing methodologies are the incompatibility thesis and the pragmatists view. The pragmatists recognise that the mixing of methodologies is a sensible thing and that mixed research should focus on the entire research process, with an emphasis on integration (Grafton *et al.*, 2011).

4.6.3 Mixed methods

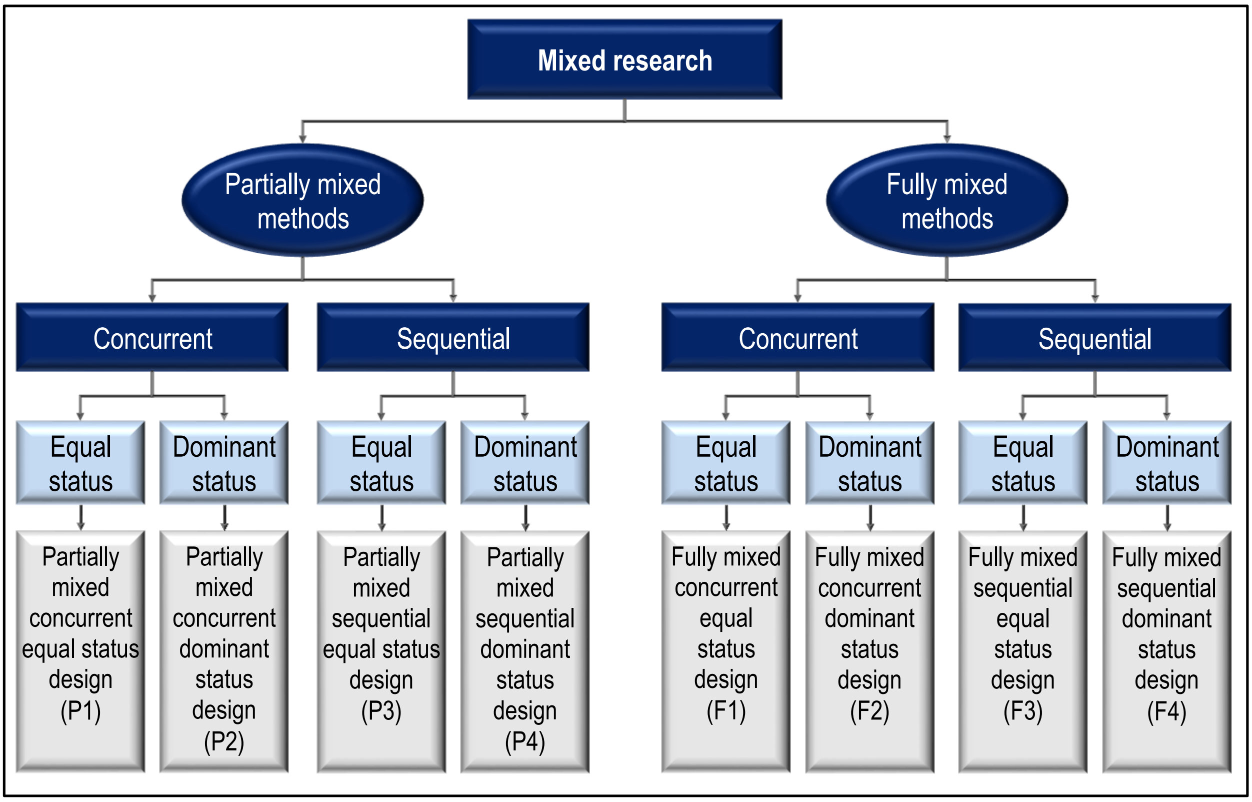
Plano Clark *et al.* (2015:299) define mixed methods research as “research that involves collecting, analysing, and integrating quantitative data and qualitative data within a single study or multiple phases of a program of research”. In essence, mixed methods research comprises collecting, analysing, and interpreting quantitative and qualitative data in a single study (Leech & Onwuegbuzie, 2007:267). Accordingly, mixed method research falls into a continuum from not mixed (monomethod designs) to fully mixed methods, with partially mixed designs lodged somewhere between (Johnson & Onwuegbuzie, 2004:20).

Leech and Onwuegbuzie (2007:268) conceptualised that mixed method designs can be represented as a function of the following three dimensions: (a) level of mixing (partially mixed versus fully mixed), (b) time orientation (concurrent versus sequential), and (c) emphasis of approaches (equal status versus dominant status).

In the first place, level of mixing refers to whether the research is partially or fully mixed. With partially mixed methods, the quantitative and qualitative phases are not mixed within or across stages and conducted concurrently or sequentially before being mixed at the data interpretation stage (Leech & Onwuegbuzie, 2007:267). In the second place, time orientation refers to whether the quantitative and qualitative phases of the research study occur at approximately the same point in time (concurrent) or whether these two stages follow one after the other (sequential) (Ivankova *et al.*, 2016:323). In the last place, the emphasis of approach refer to whether both qualitative and quantitative phases of the study have almost equal emphasis with respect to addressing the research question(s), or whether one component has a significantly higher priority than the other (Nel & Jordaan, 2016:386).

Leech and Onwuegbuzie (2007:268) believe that most mixed research studies use designs that can be classified as falling into one of the following designs as illustrated in Figure 4-7.

Figure 4-7: Typology of mixed methods



Source: Adapted from Leech and Onwuegbuzie (2007:269).

Creswell (2014:15-16) classified the different mixed methods, as: convergent parallel, explanatory sequential, exploratory sequential and transformative, and embedded or multiphase approaches. Table 4-2 provides a summary that explains the different mixed method designs according to Creswell's interpretation.

Table 4-2: Mixed methods designs

Research design	Process	Purpose	Level of interaction	Priority
Convergent parallel (concurrent)	Qualitative & quantitative	Obtain different but complementary data to answer a research question	Independent data collection and analysis	Equal
Explanatory sequential	Quantitative → qualitative	Qualitative data are collected to explain the quantitative findings	Quantitative data frames with qualitative data collection	Quantitative dominant
Exploratory sequential & transformative	Qualitative → quantitative	Quantitative data builds on qualitative findings to provide generalisability	Qualitative data frames; quantitative data collection	Qualitative dominant
Embedded, nested or multiphase	Qualitative (quantitative) or quantitative (qualitative)	Obtain different data to answer a complementary research question	Embedded dataset provides answers to a complementary research question	Qualitative or quantitative dominant

Source: Adapted from Halcomb and Hickman (2015:43).

This study falls into the embedded or nested mixed method. The embedded mixed method design is selected as the researcher converges or merges quantitative and qualitative data from the annual, sustainability or integrated reports in order to address the research problems.

Although the mixing of the data is important, more detail on how and when to do it has not received a lot of attention in the literature (Zhang & Creswell, 2013). Zhang and Creswell (2013) identified three separate processes for mixing within the mixed method strategy: (a) integration, (b) connection, or (c) embedding. Table 4-3 provides a definition of each process.

Table 4-3: Models of mixing

Models of mixing	Definitions
Integration	Qualitative and quantitative data are collected concurrently and analysed separately. Integration occurs during the interpretation phase.
Connection	One strategy is built upon the findings of the other strategy.
Embedding	The analysis of one type of data is embedded within the other. Commonly this involves a small qualitative component nested within a quantitative study.

Source: Adapted from Zhang and Creswell (2013).

Qualitative and quantitative data was collected simultaneously or concurrently, at the same point of time. The data collected from the integrated, sustainability or environmental reports is in a quantitative as well as in a qualitative format. The quantitative data is collected utilising the water disclosure index developed from the literature. Additional data with regard to disclosure and measuring of water not on the disclosure index, is collected in the form of qualitative information.

The quantitative data selected by utilising the disclosure index, is expected to be significantly more dominant than the qualitative data. As this study follows a mixed methods strategy, it was argued as concurrent and integrative, with a dominant quantitative character.

After the discussion about the research strategy and different methods, the next step is to determine the research design utilised in the study.

4.7 RESEARCH DESIGN

The research design provides the guidelines, recipe or blueprint that has to be followed when planning the research project. The research design provides the guiding principles to select which data collection method is the most appropriate to meet the researcher's objectives and therefore it is important that the researcher clearly understands the objectives of the research (Delport & Roestenburg, 2011:171). After a clear understanding of the objectives, the choice regarding the research method, the data collection methods and analyses of data could be identified.

4.7.1 Introduction

Accounting researchers have utilised content analysis as the dominant research method for a number of years (Beck *et al.*, 2010:207; Parker, 2005:854). Content analysis has become a popular way of collecting verbal, printed and web pages information to reveal useful insights into accounting practices (Steenkamp & Northcott, 2007:12). It is therefore identified as the most appropriate method to collect data on the disclosure and reporting on water.

4.7.2 Definition of content analysis

Krippendorff (2004:18) describes content analysis as: "A research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use". It is a technique utilised to collect data, codify qualitative and quantitative information into predefined categories for the purpose to derive patterns integral to the presentation and reporting information (Guthrie *et al.*, 2004:287). Beattie *et al.* (2004:214) stated that content analysis involves classifying text units into categories or themes. In essence, content analysis is a method of codifying the text of writing into various groups or categories based on selected criteria (Guthrie *et al.*, 2004:287).

It is clear that an essential element of content analysis is how to select the content units, categories or themes. Basically, content analysis could be described as a statistical exercise that involves the categorising of information by applying codes or themes, and then count the number of times it occurs.

4.7.3 Quantitative content analysis versus qualitative content analysis

Content analysis has moved from only a 'counting exercise' to a more interpretive approach within the qualitative paradigm (Egberg Thyme *et al.*, 2013:102). Accordingly, content analysis is a process for systematically analysing messages in any type of communication. It has been described as a technique which lies in the crossroads of quantitative and qualitative methods that allows a quantitative analysis of seemingly qualitative data (Kondracki *et al.*, 2002:224). The statement above brings into question whether content analysis as a research method is classified as quantitative or qualitative research. In order to answer this question, it is essential to make a clear distinction between the data collection method and the method used to analyse the data. Data collection and data analysis are two separate phases in the research process (Franzosi, 2008:27).

In most qualitative studies, there is not a sharp distinction between data collection and analysis, with the two processes occurring simultaneously (Franzosi, 2008:28). On the contrary, quantitative content analysis demonstrates a clear separation between the time when the data is collected (coded) and afterwards – when the data is analysed (Franzosi, 2008:28).

In this study, the data collection and analysis processes are separated, thus a quantitative content analysis method is followed. The collection of the data in this study contains both (a) performance-based (quantitative), and (b) narrative (qualitative) information. After the coding process the analysis of the data was performed. By applying various statistical techniques, the data were analysed quantitatively. Additional information (qualitative/narrative) gathered from the reports added value to the quantitative data.

4.7.4 Different approaches to content analysis

When referring to the methodological approaches, inductive, deductive or abductive approaches should be considered when using content analysis (Krippendorff, 2013:42). The inductive approach is characterised by searching for patterns, and is also called the data-driven or text-driven approach (Schreier, 2012:25). In quantitative research, categories or themes utilised for data collection are derived from theory or prior research – also called a concept-driven or deductive strategy (Schreier, 2012:85). According to Graneheim *et al.* (2017:31), an abductive approach can be employed for a more complete understanding and implies a movement back and forth between inductive and deductive approaches.

Steenkamp and Northcott (2007:13) argue that inferences must be made about the meaning of text in order to answer research questions. Content analysis is unique to other forms of empirical research, because the application of inferences intend to draw what "may be hidden in the human process of coding" – consisting of inductive, deductive and abductive inferences (Krippendorff, 2013:41). With this in mind, Krippendorff (2013:42) advocates that abductive inferences are central to content analysis. Dumay and Cai (2015:121) analysed 110 articles, and tied into issues relating to content analysis as a research methodology for investigating intellectual capital disclosure. Dumay and Cai (2015:144) found that most studies lack an explicit research question and hypothesis suited to abductive inferences, with none of the articles alluding to the development of abductive inferences.

It is also important to consider whether the information collected by applying content analysis adheres to certain quality requirements. Simply counting words or sentences, and assuming that the quantity of disclosure reflects quality, is not always the correct assumption (Beck *et al.*, 2010:208). Within this context, two distinct approaches to content analysis have been identified: (a) "form orientated" (objective), and (b) "meaning orientated" (subjective) analysis (Smith & Taffler, 2000:627). Form orientated analysis involves the routine counting of words, concepts and themes, while meaning orientated approach focuses on the underlying themes in the texts under investigation (Smith & Taffler, 2000:627).

Beck *et al.* (2010:218) argue that the 'form orientated' approach is limited by its inability to capture meaning. This explains the value of interpreting the meaning of texts through quantifying and analysing the presence of, and relationships between words and concepts, and then making contextualised inferences about the messages within the text (Steenkamp & Northcott, 2007:13).

This study utilised both the form orientated (counting words or concepts) and meaning orientated approach in order to enhance the quality of the analysis. The next step in the content analysis process was to decide on the measuring instrument utilised to collect the data in this study.

4.8 DATA COLLECTION

It is important that the researcher puts a lot of thought into identifying the appropriate data collection method that suits the data to be collected and analysed. In this study, the integrated and sustainability reports of the selected companies were the objects under investigation. As these documents are all published, printed or electronically available, the ideal method to collect the data was identified as content analysis.

A disclosure index or measuring instrument is also termed as a data collection tool and described as a tool comprised of a tabular checklist which could be utilised to collect data as evident in the study of Gitahi *et al.* (2018:338). In the process of developing a measuring instrument, several constructs/themes with its underlying content items/elements were identified.

4.8.1 Developing the measuring instrument

Based on the literature study performed in Chapters 2 and 3, a water disclosure index (checklist) was developed to assist the process of measuring water-related disclosure of the selected companies. The water disclosure index was developed based on the following: (a) IR principles and content elements, (b) GRI 303: water and effluents, (c) GRI G3 and G4 guidelines, (d) CDP water disclosure framework, (e) GRI sector guidance for food and beverage processing, and (f) grounded literature from Chapters 2 and 3. The disclosure index is refined by adding elements to describe themes/constructs identified in the literature review.

As mentioned in Chapter 2, IR is a fundamental change in the way companies report to their stakeholders. The aim of IR is to support integrated thinking and decision making. In order to test the hypotheses formulated in Chapter 2, it could add value to highlight the guiding principles of IR and embed it into the context of water reporting. In Table 4-4, the guiding principles of IR, together with its explanation in a water reporting context is provided.

Table 4-4: Guiding principles of IR within a water reporting context

Guiding principles of IR	Explanation within water reporting context
Strategic focus and future orientation	The IR should provide information about the water strategy of the company, which has an impact on future operations and water risks.
Connectivity of information	Indicate an overview of the combination, relation and dependencies between water issues that affect a company's ability to create value.
Stakeholder relationships	Insight into the nature and quality of the company's relationships with its key stakeholders that have an effect on water.
Materiality	Disclose information about water issues that affect a company's ability to create value over the short, medium and long-term.
Conciseness	Sufficient context to understand the company's water strategy, water governance and prospects without being burdened by less relevant information.
Reliability and completeness	Including all material water-related matters, both positive and negative, in a balanced way without material error.
Consistency and comparability	Ensuring consistency over time and enabling comparisons with other companies with regard to water disclosure.

Source: Adapted from IIRC (2013b:5).

The content elements of IR as suggested by the IIRC (2013b:5) were also reviewed and put in context with water reporting in Table 4-5.

Table 4-5: Content elements of IR within a water reporting context

Content element	Explanation of content element within water context
Organisational overview and external environment	Indicate the effect of water on the circumstances under which the company operate.
Governance	The company's governance structure on water should support its ability to create value in the short, medium and long term.
Business model	Provide the company's business model and how it influences water and the water nexus.
Risks and opportunities	Identify the risks and opportunities in terms of water which could affect the company's ability to create value over the short, medium and long term. Determine the strategy and resource allocation in terms of water risks.
Performance	Indicate whether the company achieved its strategic objectives in terms of water for the period.
Outlook	Indicate challenges and uncertainties the company could encounter in pursuing its water strategy, with potential implications for its business model and future performance.

Source: Adapted from IIRC (2013b:5).

With the concept of integration in mind (Table 4-4 and 4-5), the next step was to incorporate the GRI guidelines into the process of developing the water disclosure index. This is consistent with the study of Weber and Hogberg-Saunders (2018:967) who utilised the GRI as a basis to develop the water risk benchmarking framework applied in their study. Weber and Hogberg-Saunders (2018:967) stated that the GRI is one of the key sustainability reporting standards – also decreasing subjectivity.

While adding the previous GRI guidelines, the latest GRI 103 and GRI 303, the CDP, the GRI sector guidance for food and beverage processing, and grounded literature on water reporting identified in Chapters 2 and 3 are included and presented in Appendix A. The information referred to above, was combined in the process of developing the water disclosure index.

Referring to the process performed (refer to Appendix A), the following six constructs/themes were identified: (a) governance and management approach, (b) supply chain management, (c) targets and measures, (d) site information, (e) risk assessments, and (f) future-orientated information. In order to refine the water disclosure index, the next step was to describe each construct/theme by adding/moving items and provide additional information towards that specific theme (Appendix B). In the process of developing the water disclosure index, decisions with regard to coding the instrument were considered.

4.8.2 The coding process

Codes represent the meaning in data by assigning a measurement symbol to different categories of responses – this could be numbers, letters or words (Babin & Zikmund, 2016:393). Kondracki *et al.* (2002:224) agree that raw data in the form of textual material, visual images or illustrations need to be coded – an essential process in content analysis. In qualitative research, the codes are normally words or phrases that represent themes. According to Bengtsson (2016:12), codes can be generated inductively or deductively depending on the design. Bengtsson (2016:12) elaborates that the researcher has to create a coding list before starting the analysis if the study follows a deductive approach. Hooks and Van Staden (2011:201) state that an essential element of research design in content analysis is the selection of content units.

A *word* is the smallest unit that could be counted, and results in a frequency distribution of specified words (Deegan & Rankin, 1996:56). For example, how many times a publication mentions the word 'water'. Another method of coding is to identify a *theme* that refers to a string of words that are connected – signifying a specific *theme.* Hooks and Van Staden (2011:201) refer to sentence counts as a preferred method, as individual words lack meaning without the context of a sentence. In this study, a *theme* could describe the governance or management aspects of water in the company. It is advisable to predict the place or places to search for these themes because it could be in more than one place in the publication.

Utilising a disclosure index with the selection of *items* based on other indices in the literature or benchmarks (such as the GRI), are considered to be a practical and valuable research tool (Hooks & Van Staden, 2011:202; Schneider & Samkin, 2008:466). A disclosure index can be applied using a binary coding system, providing an aggregated measure of the quantity, and not the quality of disclosure (Beattie, 2014:114). A binary coding system is similar to nominal scaling, recording the presence or absence of a characteristic, consisting out of only one variable, the same as answering a closed-ended question. This enables cross-sectional analysis of the frequency of disclosed items between the various reports (Guthrie & Abeysekera, 2006:118). Beattie *et al.* (2004) confirmed that these studies are often used to analyse inter-company, inter-industry/sector or inter-country differences, which is part of the aim of this thesis.

More complex analysis involves not only assessing the quantity of themes, but also the quality of disclosure (Guthrie *et al.*, 2004:289; Van Staden & Hooks, 2007:201). Thus, a disclosure index can be constructed to include an assessment scale (ordinal scale) to distinguish between poor and excellent disclosure of items (Hooks & Van Staden, 2011:202).

Lee (2017:210) investigated the relationship between the quantity and quality of environmental disclosure among 55 Australian mining and metal companies listed on the ASX. In order to address the issue of quality, Lee (2017:216) adapted a ordinal scale from the study of Van Staden and Hooks (2007:202) to measure corporate environmental reporting quality. The findings revealed a significant, positive correlation between quantity (number of words) and the quality of environmental disclosure (Lee, 2017:218). Table 4-6 provides an example of a five-point scale to measure reporting quality.

Table 4-6: Quality scale for measuring

Scale	Description
0	Not disclosed, no discussion of the item.
1	Minimum coverage, little detail-general terms. Anecdotal or briefly mentioned.
2	Descriptive: the impact of the company or its policies was clearly evident.
3	Clearly defined in monetary terms and/or physical quantities. Clearly defined measurement methodology.
4	Truly extraordinary. Positive and negative disclosures included. Benchmarking against best practices.

Source: Adapted from Lee (2017:216) and Van Staden and Hooks (2007:202).

The considerations as described above were taken into account through the development stages of the water disclosure index. With regard to this study, a three-point assessment scale (ordinal scale) with scores ranging from 0 (minimum) to 2 (maximum) was applied in order to measure the quality of water disclosure. A quality description for each element in the water disclosure index was developed to improve the accuracy towards coding every item (refer to Appendix C). After considering the importance of coding, Appendix C provides the water disclosure index developed from Appendix A and B – which was utilised to analyse the various reports.

4.8.3 Methodological options for content analysis

In order to describe the methodological options when performing content analysis, Kondracki *et al.* (2002:225) identify two main axes of differentiation. The first axis describes the *intent* or purpose of analysis and type of outcome that is desired, while the second axis, *technology*, differentiates between the physical methods of analysis – from manual reading to fully computerised coding (Kondracki *et al.*, 2002:225). On the *intent* axis, it must be decided whether inductive or a deductive approach should be followed – discussed earlier in this chapter (refer to section 4.7.4).

When referring to the second axis (*technology)*, a number of factors could possibly influence the decision whether to perform manual or computerised content analysis, such as (Kondracki *et al.*, 2002:226):

- the amount of material to be analysed;
- the number of researchers involved;
- the level of experience of the researchers with related methodologies; and
- the financial implications.

The computer-aided- and manual methods are described in section 4.8.4 to confirm the most appropriate method.

4.8.4 Computer-based and manual content analysis

Computer-based content analysis was one of the most promising developments in the 1960s (Franzosi, 2008:30). 'General Inquirer', a software program developed by Philip Stone, performed content analysis automatically and objectively. As with any other content analysis application, the program starts with a coding scheme (Franzosi, 2008:31). Although the computer is doing the coding, the program should be supplied with an extensive dictionary of possible words, concepts or expressions, clearly assigned to each coding category. The 'General Inquirer' was a pioneering approach to computer-assisted programs for content analysis, with many new programs based on this software (Franzosi, 2008:31).

ATLAS.ti is a powerful workbench considered, capable of analysing of large bodies of textual, graphical, audio and video data analysis (Friese, 2013:9). The integrated and sustainability reports are the Primary Documents that could be downloaded into ATLAS.ti. The integrated and sustainability reports contain the data to be analysed, which would form part of the Hermeneutic Unit (HU) of ATLAS.ti. Primary Document Families are created in ATLAS.ti by grouping families per country in order to make meaningful comparisons.

Whether information is entered manually or tagging textual expressions before files are read into the software, computer-aided content analyses are still time-consuming (Franzosi, 2008:35). Ironically, content analysis software has allowed researchers to create more complex coding schemes, which also requires greater coding time. Researchers have attempted to automate the coding process, which could eliminate a human coder, however the coding process still requires human interventions (Franzosi, 2008:35).

Grimmer and Stewart (2013:295) reveal that there is no substitute for careful thought and close reading, which is lost when utilising automated methods. Moreover, automated methods require extensive and problem-solving validation (Grimmer & Stewart, 2013). In this sense, Neuendorf (2017:39) agrees with Kondracki *et al.* (2002:226), that the lack of direct human contact and the influence of computerised technology in computer-aided text analyses, could leave questions around the validity of the automatically applied measures.

After considering both the computer-aided and manual methods, this study implemented the manual method for the following reasons:

- In addition to publishing an integrated- or sustainability report, some companies provided extensive information through interactive web pages, which could be difficult to enter into a computer-aided program.

- Qualitative information was gathered from the reports with the intention to emphasise best practices, which required careful thought and in-depth-reading.

In order to revise, for content analysis to be effective, the following technical requirements should be met: (a) the categories of classification must be clearly and operationally defined, called the units of analysis, (b) the capturing of data should be systematic, referring to the fact that an item either belongs or does not belong to a particular category, and (c) content analysis should demonstrate some characteristics for validity and reliability (Guthrie & Abeysekera, 2006:120).

After the measuring instrument was developed, and decisions about the coding and manual content analysis have been made, the elements under each construct within the water disclosure index (Appendix C) was refined into hypotheses to be tested.

4.8.5 Hypotheses refinement from constructs

The following refined hypotheses under each construct, for the following elements were formulated from Appendix C – and tested within the quantitative analysis.

H_1: There is a significant association between IR and water-related disclosure in terms of materiality.

$H_{1\ (M1)}$: There is a significant association between IR and the disclosure of water as a material aspect.

$H_{1\ (M2)}$: There is a significant association between IR and the disclosure of the process of identifying water as a material aspect.

H_2: There is a significant association between IR and water-related disclosure on governance.

$H_{2\,(G1)}$: There is a significant association between IR and the disclosure of environmental management systems (EMS) and strategy for water.

$H_{2\,(G2)}$: There is a significant association between IR and the disclosure of the context in which a firm operates in terms of water.

$H_{2\,(G3)}$: There is a significant association between IR and the disclosure of water-related aspects as part of a firm's business model.

$H_{2\,(G4)}$: There is a significant association between IR and the disclosure of board oversight water governance.

$H_{2\,(G5)}$: There is a significant association between IR and the disclosure of water-related policies, commitments and programmes.

H_3: There is a significant association between IR and water-related disclosure on targets and measures.

$H_{3\,(TM1)}$: There is a significant association between IR and the disclosure of total water withdrawal by source.

$H_{3\,(TM2)}$: There is a significant association between IR and the disclosure of total water discharge.

$H_{3\,(TM3)}$: There is a significant association between IR and the disclosure of water quality.

$H_{3\,(TM4)}$: There is a significant association between IR and the disclosure of total water consumption.

$H_{3\,(TM5)}$: There is a significant association between IR and the disclosure of total water recycled and reused.

H_4: There is a significant association between IR and water-related disclosure on risks.

$H_{4\,(RA1)}$: There is a significant association between IR and the disclosure of physical water risks.

$H_{4\,(RA2)}$: There is a significant association between IR and the disclosure of regulatory water risks.

$H_{4\ (RA3)}$: There is a significant association between IR and the disclosure of reputational water risks.

$H_{4\ (RA4)}$: There is a significant association between IR and the disclosure of procedures and methods used for water risk assessments.

$H_{4\ (RA5)}$: There is a significant association between IR and the disclosure of stakeholders identified and considered in water risk assessments.

H_5: There is a significant association between IR and water-related disclosure on future-orientated information.

$H_{5\ (FO1)}$: There is a significant association between IR and the disclosure of quantified future-orientated information on water issues.

$H_{5\ (FO2)}$: There is a significant association between IR and the disclosure of a long-term water strategy.

$H_{5\ (FO3)}$: There is a significant association between IR and the disclosure of water information that could affect value creation over the short, medium and long term.

$H_{5\ (FO4)}$: There is a significant association between IR and the disclosure of water risk assessments that could affect future success and growth strategy.

H_6: There is a significant association between IR and water-related disclosure on supply chain information.

$H_{6\ (SC1)}$: There is a significant association between IR and the disclosure of suppliers causing significant water-related impacts.

$H_{6\ (SC2)}$: There is a significant association between IR and the disclosure of a policy and strategy to manage water-related aspects in the supply chain.

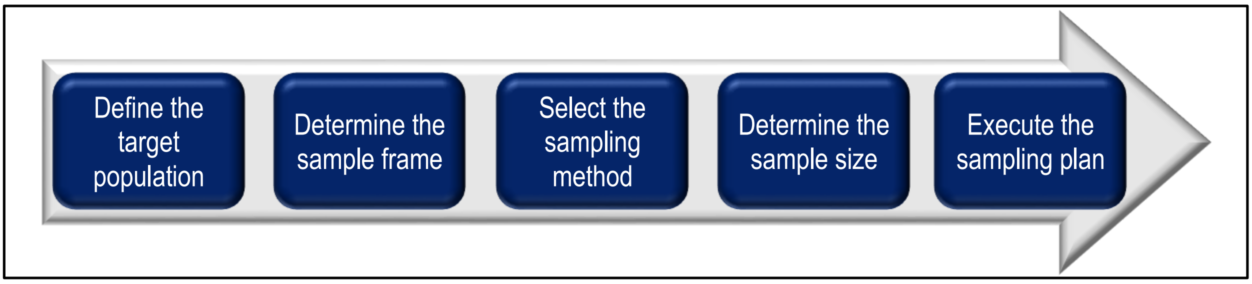
$H_{6\ (SC3)}$: There is a significant association between IR and the disclosure of water risk factors in the supply chain.

$H_{6\ (SC4)}$: There is a significant association between IR and the disclosure of upstream and downstream role players in the supply chain.

4.9 RESEARCH SAMPLE

Malhotra (2010:372) highlights that the target populations refers to the objects that possess the information sought after by the researcher. The information from a portion of a larger group or population should be obtained, known as sampling, in order to make estimates from a sample of a larger population (Silver *et al.*, 2013:152). Sampling is an important part of the research process (Strydom, 2011b:222), and Figure 4-8 portrays the steps adapted from Sekaran and Bougie (2016:240) and Hair *et al.* (2016:173) to determine the sample in this study.

Figure 4-8: Steps to select the sample as applied in this study



Source: Adapted from Hair *et al.* (2016:173) and Sekaran and Bougie (2016).

4.9.1 Define the target population

A population comprises of any well-defined set of elements or characteristics (Adams *et al.*, 2014:82). The target population consists of four parts, and should be defined in terms of elements, sampling units, extent and time (Malhotra, 2010:372; Silver *et al.*, 2013:154). Sekaran and Bougie (2016:240) concur and suggest that the target population should be defined in terms of elements, geographical boundaries, and time. Elements refer to the objects from which the information is desired, while sampling units are the elements or objects available for selection during the sampling process (Hair *et al.*, 2016:173; Malhotra, 2010:372). Extent refers to the geographical boundaries, and time refers to when the sampling plan is executed in order to collect the data (Malhotra, 2010:372). Table 4-7 provides a summary of the target population for this study.

Table 4-7: Summary of the target population

Dimension	Description
Elements	All companies listed on the food, beverage and tobacco industry under three indices, namely: the JSE (South Africa), the ASX (Australia), and the DJGSI.
Sampling unit	The food, beverage and tobacco industry group under the Consumer Staples Sector – as classified by the GICS (GICS, 2018b:28).
Extent	South African, Australian, and global perspective.
Time	November 2018 – February 2019.

Source: Researcher's own compilation.

4.9.2 Determine the sample frame

Sekaran and Bougie (2016:240) describe the sampling frame as a physical representation of all the elements in the population from which the sample is drawn. Hair *et al.* (2016:175) state that a sampling frame is a comprehensive list of all the elements in the population targeted by the research. Malhotra (2010:373) identifies an association directory listing firms in an industry as an example of a sampling frame. Consequently, it can be described that the sampling frame for this study is all the companies listed under the food, beverage and tobacco industry in the JSE, ASX and DJGSI. In this sense, the sample frame for this study was 57 companies, which materialised from 18, 26 and 13 firms listed on the JSE, ASX and DJGSI, respectively.

4.9.3 Select the sampling method

All sampling designs or methods can be categorised into probability or non-probability samples (Burns & Bush, 2014:214). Probability sampling is based on randomisation, where each element in the population has a known, non-zero chance of being included in the sample (Maree & Pietersen, 2016:192; Strydom, 2011b:228). Non-probability sampling relies on the judgement of the researcher to decide what element to include in the sample, which may yield good estimates of the population characteristics (Brown *et al.*, 2014:305; Malhotra, 2010:376).

Smith (2017:74) finds that although probability sampling may be desirable, a random sample of companies may not present any representatives of a particular industry. For this reason, Spurgin and Wildemuth (2017:310) argue that a representative sample should be obtained when utilising content analysis. Consequently, a non-probability sampling design is followed in this study. Non-probability sampling designs fit into the broad categories of convenience sampling and purposive sampling, which are discussed subsequently (Sekaran & Bougie, 2016:247):

- **Convenience sampling**

  As the name implies, this sampling method attempts to obtain a sample from people or units that are conveniently available (Babin & Zikmund, 2016). Convenience samples are most often used in exploratory research in order to obtain information in a quick and cost-effective manner (Hair *et al.*, 2016:183; Sekaran & Bougie, 2016:247).

- **Purposive sampling**

  Purposive or judgement sampling involves the selection of population elements for a specific purpose – on the judgement of the researcher (Hair *et al.*, 2016:184). A purposive sample adheres to certain criteria or characteristics best suited to provide required information to address the objectives (Babin & Zikmund, 2016:349; Van Zyl & Pellissier, 2017b:136).

Considering the discussions above, this study follows a purposive sampling method. As the emphasis of this study is on water disclosure, the food, beverage and tobacco industry group, which is heavily dependent on water, was identified – and purposefully selected as the industry under investigation. The food, beverage and tobacco industry group was selected not only for its dependence on water, but also for its contribution towards the nexus as described in Chapter 2 and 3. Two countries were selected identified, namely South Africa and Australia. South Africa was selected as the country is perceived to be leader in IR, and also a water scarce country. Australia, which is a first world country, was selected because of its similarity to South Africa, with scarce water resources. The DJGSI was selected to provide an international perspective of best practices to this investigation. The GICS system was utilised to identify the listed companies in the food, beverage and tobacco industry. The GICS was established to account for a need to provide a complete and consistent set of global sector and industry definitions. The GICS has become the standard widely recognised by market participants worldwide, developed by Standard & Poor's Financial Services LLC, and Morgan Stanley Capital International (GICS, 2018b:3). Table 3-1 was used to identify the companies as part of the food, beverage and tobacco industry.

4.9.4 Determine the sample size

The number of elements to be included in a study refers to the sample size (Malhotra, 2010:374). The target population was refined to all the companies listed in the food, beverage and tobacco industry on the JSE, ASX and DJGSI. The study intended to select the 20 largest companies per market capitalisation in the food, beverage and tobacco industry on each of the indices. In South Africa, only 18 companies were listed in the food, beverage and tobacco industry group – therefore no need to classify them per market capitalisation. On the ASX index in Australia, 26 companies were detected under the food, beverage and tobacco industry – resulting in the selection of the 20 largest companies per market capitalisation. Thirteen companies on the DJGSI adhere to the listing requirements of the index and formed part of this study. Table 4-8 presents the sample companies, and consequently, the sample size.

Table 4-8: Sample companies

South African companies (JSE)	Australian companies (ASX)	DJGSI	Country
Ah-Vest Ltd	Australian Agricultural Company Ltd.	Ajinomoto Co. Inc.	Japan
Anheuser-Busch InBev SA	Bega Cheese Ltd.	British American Tobacco plc.	UK
Rhodes Food Group Holdings Ltd.	Dongfang Modern Agriculture Holding Group Ltd.	Coca-Cola European Partners plc.	UK
AVI Ltd	Bubs Australia Ltd.	Coca-Cola HBC AG	Switzerland

Table 4-8: Sample companies (continues)

South African companies (JSE)	Australian companies (ASX)	DJGSI	Country
British American Tobacco plc.	Capilano Honey Ltd.	Danone S. A.	France
Clover Industries Ltd.	Clean Seas Seafood Ltd.	Diageo plc.	UK
Crookes Brothers Ltd.	Costa Group Holdings Ltd.	General Mills Inc.	USA
Distell Group Holdings Ltd.	New Zealand King Salmon Ltd.	Grupo Nutresa S.A.	Colombia
Libstar Holdings Ltd.	Elders Ltd.	Hershey Co.	USA
Oceana Group Ltd.	Fonterra Ltd.	Kellogg Co.	USA
Pioneer Foods Group Ltd.	Freedom Foods Group Ltd.	Mondelez International	USA
Premier Fishing Brands Ltd.	Huon Aquaculture Group Ltd.	Nestlé S.A.	Switzerland
Quantum Foods Holdings Ltd.	Inghams Group Ltd.	Thai Beverage plc.	Thailand
Astral Foods Ltd.	Bellamy's Australia Ltd.		
RCL Foods Ltd.	Select Harvests Ltd.		
Sea Harvest Group Ltd.	Tassal Group Ltd.		
Tiger Brands Ltd.	The A2 Milk Company Ltd.		
Tongaat Hulett Ltd.	Wattle Health Australia Ltd.		
	Wellard Ltd.		
	Farm Pride Foods Ltd.		
Total: 18	**20**	**13**	**51**

Source: Researcher's own compilation.

Although the target sample was to select the top 20 companies per market capitalisation on each of the indices, the sample size outcome was 49 active participants (firms). The reasons for this deviation were as follows:

- Libstar Holding Ltd only recently (9 May 2018) listed on the JSE in South Africa, and has not yet published an annual- or sustainability report.
- British American Tobacco was listed on the DJGSI as well as on the JSE, but was reckoned under the DJGSI in order to compare to global best practices.

This culminated into 16 companies on the JSE in South Africa, 20 companies on the ASX in Australia, and 13 global firms under the DJGSI – a sample of 49 firms.

4.9.5 Execute the sampling plan

After the target population has been identified, the sampling frame has been chosen, the sampling method selected, and the sample size determined – the researcher can implement the sampling plan (Hair *et al.*, 2016:189). Table 4-9 provides a summary of the sampling plan for this study.

Table 4-9: Sample plan for this study

Description	Empirical application
Target population	All companies listed on the food, beverage and tobacco industry under the three indices, namely: The JSE (South Africa), the ASX (Australia), and the DJGSI.
Sampling method	Non-probability, purposive sampling
Sample size	49 companies

Source: Researcher's own compilation.

After developing the measuring instrument and identifying the target sample, the data analysis techniques should be considered.

4.10 DATA ANALYSIS TECHNIQUES

According to Burns and Bush (2014:289), data analysis is the process of describing a dataset by calculating a number of statistics that characterise various aspects of the dataset. After the data has been collected utilising the disclosure index, various statistical procedures could be performed. The following statistical techniques were employed when analysing the data: (a) descriptive statistics, (b) means analysis, and (c) relationship analysis. All statistical tests and analysis were performed utilising the Statistical Package for the Social Sciences (SPSS), version 25. In this section, the descriptive statistics and data utilised are discussed, followed by an explanation of the extraction methods namely, principal component regression analysis and the index average method. The statistical techniques utilised for the means- and relationship analysis and the decision rules for the p-value significance level conclude this section. The p-value, as an inferential statistical tool to generalise from the sample to the population, is reported for completeness and guidance to the hypotheses tests – since the 49 firms almost fully represented the population (Wegner, 2007:9).

4.10.1 Descriptive statistics

Descriptive statistics refer to a number of statistical methods utilised to describe, organise and give meaning to a set of data (Pietersen & Maree, 2016c:204). The descriptive results are used to indicate the frequencies of disclosure as per the different themes identified in the disclosure index, namely (a) governance and management approach **(G)**, (b) water-related impacts in its supply chain **(SC)**, (c) targets and goals **(TG)**, (d) site information **(SI)**, (e) risk assessment **(RA)**, and (f) future-orientated information **(FO)**. Included in the analysis of the six themes are mean values and standard deviation. These methods correspond with the study of Weber and Hogberg-Saunders (2018:969) which analysed water management and corporate performance in the same industry as this study.

Selected quantitative data from this study – applicable to each section – are presented together with the discussion. Table 4-10 presents descriptive data from this sample.

Table 4-10: Descriptive data

Construct: Sub-theme or element		N	Min	Max	Mean	SD	Mean %
Materiality	M1: Identify water as material aspect.	49	0	2	1.00	44.49	50.00
	M2: Describe the process and identify stakeholders.	49	0	2	0.86	44.49	42.86
Governance and management approach	G1: EMS in place and developed water strategy.	49	0	2	1.18	42.91	59.18
	G2: Understands the context in which it operates.	49	0	2	1.33	35.92	66.33
	G3: Includes water-related aspects in business model.	49	0	2	0.69	39.80	34.69
	G4: Indicates board-level oversight for water.	49	0	2	0.82	40.41	40.82
	G5: The company has water-related policies etc.	49	0	2	1.20	39.50	60.21
Supply chain information	SC1: Identify suppliers causing water-related impacts.	49	0	2	0.55	28.98	27.55
	SC2: Policy to manage water-related aspects in SC.	49	0	2	0.82	39.10	40.82
	SC3: Identifies water risk factors in SC.	49	0	2	0.98	41.44	48.98
	SC4: Understands role players in SC (WEF nexus).	49	0	2	0.88	37.68	43.88
Targets and measures	TM1: Total water withdrawal per source.	49	0	2	0.88	41.62	43.88
	TM2: Total water discharged.	49	0	2	0.65	42.76	32.65
	TM3: Disclosure on water quality.	49	0	2	0.86	40.82	42.86
	TM4: Total water consumption.	49	0	2	0.80	44.46	39.80
	TM5: Volume of water recycled and reused.	49	0	2	0.65	43.96	32.65
Site information	SI1: Water-related information for each facility.	49	0	2	0.35	26.12	17.35
	SI2: Water risk assessments at geographical scale.	49	0	2	0.51	34.04	25.51

Table 4-10: Descriptive data (continues)

Construct: Sub-theme or element		N	Min	Max	Mean	SD	Mean %
Risk assessment	RA1: Disclosure of physical water risk.	49	0	2	1.39	36.54	69.39
	RA2: Disclosure of regulatory water risk.	49	0	2	1.06	37.37	53.06
	RA3: Disclosure of reputational water risk.	49	0	2	0.71	38.19	35.71
	RA4: Procedures & methods of water risk assessment.	49	0	2	0.96	39.47	47.96
	RA5: Stakeholders identified in water risk assessment.	49	0	2	0.88	40.35	43.88
Future-orientated information	FO1: Reports on future-orientated water information.	49	0	2	1.16	38.66	58.16
	FO2: Identified a long-term water strategy.	49	0	2	0.67	37.34	33.67
	FO3: Information on which could affect value creation.	49	0	2	0.49	30.83	24.49
	FO4: How water risk assessment affect future growth.	49	0	2	0.53	36.94	26.53

Source: Researcher's own compilation.

Table 4-10 reveals the constructs and elements analysed within the water disclosure index. Furthermore, the number of companies analysed, the minimum- (0) and maximum (2) score is illustrated. The assessment scale (ordinal scale) enabled the index to provide the quality of disclosure. It is worthy to note that a quality assessment scale applicable to each element in the water disclosure index was developed in order to enhance the accuracy towards coding every item (Appendix C). The mean, and standard deviation, and mean percentage is also provided. The mean percentage was utilised throughout the study, taking into account that it is a more descriptive display of the quality of disclosure.

4.10.2 Methods to compile weight of components

In developing the index, the question arises what weight should be attached to each construct, and elements within such a construct. Therefore, a principal component regression analysis can be calculated or as alternative (index average) all 27 elements can contribute an equal weight. The following section explains the two possible methods.

4.10.2.1 Defining principal component regression analysis and index average method

Principal component regression analysis is a variation of factor analysis that attempts to identify principal component(s) that best explains the constructs – which include the elements. Principal component regression analysis, analyses a data table represented by several dependent variables that are generally inter-correlated (Abdi & Williams, 2010:433). The objective of principal component regression analysis is to calculate the principal regression score in order to extract important information from the data table to express as a new set of variables known as principal components.

An alternative to the principal component regression analysis method is to calculate the mean of all 27 elements included in the seven constructs, i.e. each element contributes an equal weight. Refer to Table 4-10 to view all the elements included in each construct. The following sections (4.10.2.2 to 4.10.2.5) are related to the principal component regression analysis.

4.10.2.2 Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity

The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis and indicates the proportion of variance in variables that might be caused by underlying factors (Williams *et al.*, 2010:5). Bartlett's test of sphericity tests the hypothesis that your correlation matrix is an identity matrix, which would indicate if variables are unrelated and therefore unsuitable for structure detection. Bartlett's test should be significant with a p-value of less than 0.05. Table 4-11 displays these values.

Table 4-11: KMO and Bartlett's test of sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.806
Bartlett's Test of Sphericity	Approx. Chi-Square	1173.415
	df	351
	Sig.	0.000

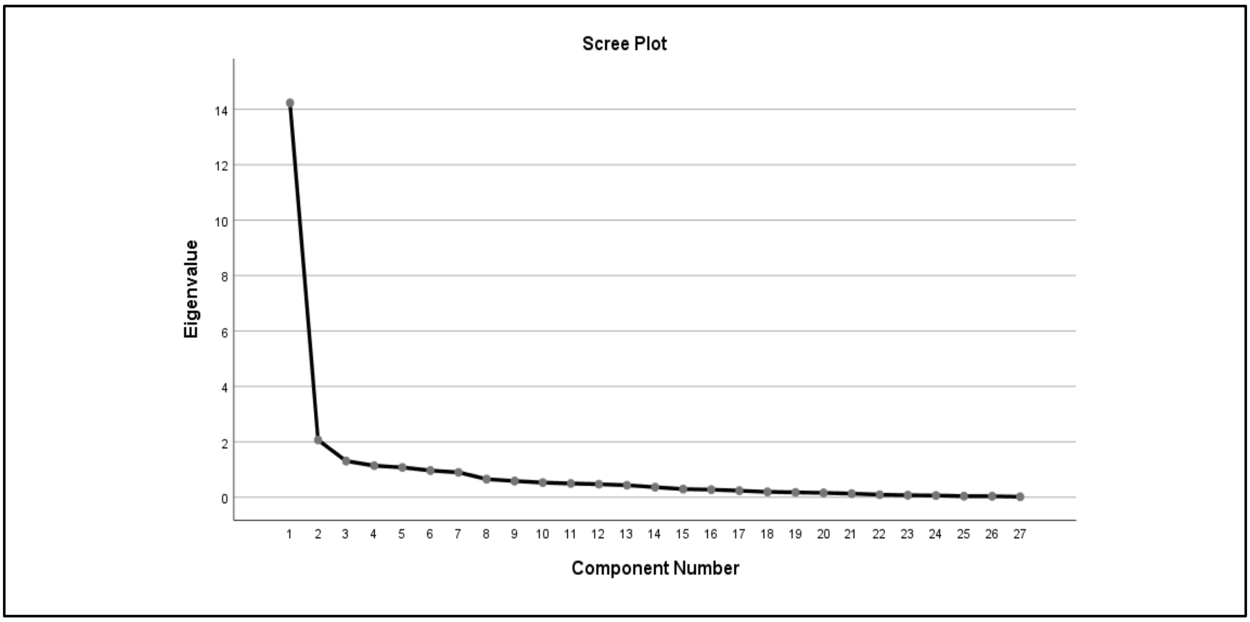
Source: Researcher's own compilation.

It is evident from Table 4-11 that the KMO measure of sampling adequacy provided a value of 0.806, which is close to one and an indication that factor analysis could be performed. Bartlett's test of sphericity provided a value of 0.000 (less than 0.05).

4.10.2.3 Variance explained

A scree plot could be used to indicate the number of factors, and Pietersen and Maree (2016b:243) state that the line (plot of the eigenvalues) normally forms a clear bend (elbow). The number of eigenvalues to the left of the turning point indicates the number of factors. The scree plot indicates that only one factor is sufficient and that is explains 52.72% of the total variance as illustrated in Figure 4-9.

Figure 4-9: Scree plot (variance explained)



Source: Researcher's own compilation.

4.10.2.4 Factor loadings and reliability

The factor loadings ranged between 0.513 and 0.846, an indication that all items load sufficiently (> 0.5) onto one factor – implying that the index can be constructed. Table 4-12 exhibits a rank order loading of all 27 elements within the water disclosure index utilised in the empirical analysis (Appendix C) and indicates the importance of each element.

Table 4-12: Rank order of factor loadings

Rank order	Sub-theme or element	Factor loading
1	G5: The company has water-related policies etc.	0.846
2	G1: EMS in place and developed water strategy.	0.841
3	RA5: Stakeholders identified in water risk assessment.	0.834
4	RA4: Procedures & methods of water risk assessment.	0.822
5	FO1: Reports on future-orientated water information.	0.820
6	FO2: Identified a long-term water strategy.	0.812
7	TM1: Total water withdrawal per source.	0.787
8	G4: Indicates board-level oversight for water.	0.759
9	M1: Identify water as material aspect.	0.759
10	SC2: Policy to manage water-related aspects in SC.	0.756
11	SC3: Identifies water risk factors in SC.	0.754
12	G2: Understands the context in which it operates	0.750
13	RA1: Disclosure of physical water risk.	0.745

Table 4-12: Rank order of factor loadings (continues)

Rank order	Sub-theme or element	Factor loading
14	SC4: Understands role players in SC (WEF nexus).	0.743
15	RA3: Disclosure of reputational water risk.	0.731
16	TM2: Total water discharged.	0.716
17	G3: Includes water-related aspects in business model.	0.712
18	FO3: Information on which could affect value creation.	0.696
19	M2: Describe the process and identify stakeholders.	0.694
20	FO4: How water risk assessment affect future growth.	0.693
21	TM3: Disclosure on water quality.	0.676
22	SI2: Water risk assessments at geographical scale.	0.663
23	RA2: Disclosure of regulatory water risk.	0.612
24	SC1: Identify suppliers causing water-related impacts.	0.611
25	SI1: Water-related information for each facility.	0.572
26	TM4: Total water consumption.	0.544
27	TM5: Volume of water recycled and reused.	0.513

Source: Researcher's own compilation.

In order to measure the internal consistency of a test or scale, Cronbach's alpha coefficient, which is expressed as a number between 0 and 1, could be utilised (Tavakol & Dennick, 2011:53). It is recommended that values of the Cronbach's alpha coefficient should be above 0.7 to be acceptable (DeVellis, 2012:112). The Cronbach's alpha value for the entire water disclosure index consisting of all 27 elements was 0.964, which indicates very good internal consistency reliability. The Cronbach's alpha values for each construct in the water disclosure index are provided in the reliability discussion (refer to section 4.11.2).

4.10.2.5 Selection between principal component regression score or index average

The correlation between the principal regression score and the alternative method of including the mean score of all 27 elements in the index (refer to Table 5-4) was rho = 0.998 which indicates that either of the two could be used. Considering that the index (mean of 27 elements) can be viewed as a percentage, the index average was utilised in this study.

4.10.3 Means analysis

The analysis of means compares a collection of means, rates or proportions to identify whether any are significantly different (Nelson *et al.*, 2005:1). This study utilised the t-test and ANOVA, which are discussed next.

4.10.3.1 T-test

The t-test is employed when two independent groups are compared based on their mean score on a quantitative variable (Pietersen & Maree, 2016a:255). More specifically, an independent-samples t-test (Pallant, 2016:244) was applied in this study to compare the disclosure practices between companies who prepared integrated reports (IR group), opposed to organisations not publishing an integrated report (non-IR group). The mean differences between the two groups are compared for each construct and element in the water disclosure index.

A p-value of less than 1%, 5% and 10% was applied to indicate statistically significant differences between the mean values of the dependent variable for the IR and non-IR group. Cohen's d effect size statistic was utilised in this study to provide an indication of the magnitude of the difference between the IR and non-IR groups. The criteria for interpreting Cohen's d effect sizes are (a) 0.2 = small effect, (b) 0.5 = medium effect, and (c) 0.8 = large effect (Cohen, 1988:40).

4.10.3.2 ANOVA

The technique used to compare the mean scores and analyse the variances between more than two groups is known as ANOVA (Pallant, 2016:255). The one-way ANOVA was applied in this research in order to test the differences between the means of three groups that comprise a single independent variable (Tokunaga, 2016:429). The water disclosure practices of the three groups, i.e. companies listed on the JSE in South Africa, the ASX in Australia, and DJGSI are compared with each other. The companies listed on the DJGSI are considered to execute best practice with regard to sustainability reporting and were selected to serve as a benchmark to compare with South African and Australian firms.

Rather than calculating a t-statistic (t-test), an F-ratio is calculated which represents the variance between the groups divided by the variance within the groups (Pallant, 2016:255; Wegner, 2007:387). A significant F test indicated by a p-value lower than 1%, 5% and 10% represents significant differences among groups, however additional tests known as post-hoc comparisons are performed to identify where these differences occur (Pallant, 2016:211). Tukey's Honest Significant Difference test (HSD), one of the most commonly used tests, was utilised in this study to indicate significant differences among the groups.

4.10.4 Relationship analysis

The nature of relationships between variables relates to the manner in which changes in scores of one variable correspond to changes in the scores of another variable (Tokunaga, 2016:574). In this study, correlation and regression analysis were utilised, and are discussed next.

4.10.4.1 Correlation analysis

Correlation analysis measures the strength and direction of the identified association between variables (Pallant, 2016:133; Wegner, 2007:407). Spearman Rank Order Correlation (rho) was employed as it is designed for the use of ordinal level or ranked data (Pallant, 2016:132; Pietersen & Maree, 2016a:267). The possible values of Spearman's correlation range from -1 to 1 indicating the positive or negative direction of the relationship (Tokunaga, 2016:613). A positive relationship indicates that the variables are very similar to one another, whereas a negative correlation between the two variables implies dissimilarity (Tokunaga, 2016:613). The strength of the correlation should also be considered, where 0 indicates no relationship, and one implies a perfect positive correlation (Pallant, 2016:137). The following guidelines as provided by Cohen (1988:80) were implemented to determine the strength of the relationship:

- small $r = 0.10$ to 0.29;
- medium $r = 0.30$ to 0.49; and
- large $r = 0.50$ to 1.0.

4.10.4.2 Regression analysis

Malhotra (2010:568) states that regression analysis is a powerful and flexible procedure for analysing associative relationships between a metric dependent variable and one or more independent variables. Regression analysis could also be applied to test a theory – where prior knowledge exists of the phenomenon – and a specific set of variables are hypothesised to predict the outcome variable (Van Zyl & Pellissier, 2017a:174).

A variety of regression techniques exists, including simple linear regression, multiple linear regression, ordinal regression and nonlinear regression (Van Zyl & Pellissier, 2017a:174). Simple regression is used when there is only one dependent and one independent variable (Pietersen & Maree, 2016a:269). Multiple regression contains a single dependent variable and two or more independent variables (Malhotra, 2010:577). Pietersen and Maree (2016a:272) state that multiple regression is utilised in situations where more than one independent variable is used to predict a single dependent variable.

In order to test the hypotheses developed in Chapter 2, multiple ordinary least squares (OLS) regression was used in this study, as the residuals were normally distributed. This method was utilised by Burritt *et al.* (2016:70) in order to test six potential drivers of water-related disclosures from the developed hypothesis. Michelon *et al.* (2015) also applied multiple OLS regression when analysing CSR disclosure quality. The hypotheses developed in Chapter 2 are provided below:

H_{main}: There is a significant association between IR and total water-related disclosure.

H_1: There is a significant association between IR and water-related disclosure in terms of materiality.

H_2: There is a significant association between IR and water-related disclosure on governance.

H_3: There is a significant association between IR and water-related disclosure on targets and measures.

H_4: There is a significant association between IR and water-related disclosure on risks.

H_5: There is a significant association between IR and water-related disclosure on future-orientated information.

H_6: There is a significant association between IR and water-related disclosure on supply chain information.

In each case where the hypothesis is tested, the dependent and independent variables should be identified. According to Pietersen and Maree (2016a:272), the dependent variable is usually denoted by Y and the independent variables by X_1, X_2, and so forth. When referring to the hypothesis above, the water-related disclosure index score is the dependent variable and denoted as Y.

To test the main hypothesis, the total water disclosure index score is applied, and to test H_1 to H_6, the water disclosure score for the specific construct is utilised. The independent variable is the IR status (IR or non-IR) of the firms. In order to control for interventions, the following independent variables were also included: (a) firm size (total assets), (b) assurance, (c) conciseness (number of pages), and (d) country (South Africa, Australia and Global). The motivation for including the abovementioned control variables are expanded on later in this section.

Studenmund (2015:74) states that some concepts might seem difficult to include in the regression equation since they are inherently qualitative in nature and cannot be quantified. Such concepts can be quantified by using dummy (or binary) variables which takes on the values of one or zero (Gujarati & Proter, 2010:179; Studenmund, 2015:74). In this study, the values of 0 was applied to South African companies, 1 to Australian companies, and 2 to Global companies listed on the DJGSI – which implies that the dummy variable “country” has three categories. Gujarati and

Proter (2010:182) mention that the intercept value represents the mean value of the category that is assigned with the value 0, or South Africa, as in this study.

After performing multiple regression the statistical test's significance level or *p*-value becomes a key indicator of whether or not a hypothesis can be supported (Babin & Zikmund, 2016:403; Pietersen & Maree, 2016a:272). Low *p*-values indicate little likelihood that the statistical expectation is true (Babin & Zikmund, 2016:404). When sample sizes are small, it might turn out that the *p*-value does not indicate a practical significance – which could be overcome by calculating an effect size. An effect size is a standardised, scale free measure which determines the magnitude of the difference or correlation – which is not affected by the size of the sample (Pietersen & Maree, 2016d:234). When multiple regression is used, the effect sizes (f^2) for possible interpretation of the data is provided in Table 4-13.

Table 4-13: Guidelines for interpreting effect sizes

Effect size (f^2)	Effect	Values of R^2	Conclusions on R^2
Smaller than 0.15	Small	Smaller than 0.13	Non-significant
0.15 – 0.35	Medium	0.13 – 0.25	Significant
Larger than 0.35	Large	Larger than 0.25	Practically important

Source: Adopted from Ellis and Steyn (2003:53).

The motive for selecting the control variables mentioned in the discussions above unveiled themselves during the literature review in Chapters 2 and 3, and are briefly discussed next.

4.10.4.3 Control variable – firm size (total assets)

Previous empirical studies have repeatedly found company size to be significantly positively associated with CSR disclosure (Bhattacharyya, 2014:39; Hackston & Milne, 1996:92; Michelon *et al.*, 2015:69; Zhou *et al.*, 2018:1319; Zorio *et al.*, 2013:489). More specifically, Burritt *et al.* (2016:70) found organisational size to be a significant predictor of water-related disclosure. Brammer and Pavelin (2004:91) suggest that large and highly visible firms face greater external pressures, therefore pursuing voluntary disclosures to manage their relationships with stakeholders. In this sense, both legitimacy and stakeholder theories contain arguments for a size-disclosure relationship.

Market capitalisation is often used as a measure to determine firm size, however the logarithm (in order to correct for non-normality) of total assets was utilised in this study – as the firms operate in different markets. The total asset value of all the firms were converted from the respected currency to Rand values on the 4th of March 2019, and the logarithm of the total assets in Rand was utilised as the control variable for firm size.

4.10.4.4 Control variable – assurance

External assurance is one of the methods used to overcome the question of the credibility- and quality of information in sustainability reports (Hąbek & Wolniak, 2016:415; Junior *et al.*, 2014:1). Moreover, Braam *et al.* (2016:726) argue that the process of external assurance may induce firms to produce and disclose more reliable and accurate environmental information. Boiral *et al.* (2017) found that assurance providers express scepticism indirectly, by highlighting possible avenues for improvement rather than stressing limitations or issues of non-compliance. Michelon *et al.* (2015:75) found that the assurance of CSR reports is used as a symbolic practice, with no relationship between assurance and the dimensions of disclosure quality. More specifically, Simnett and Huggins (2015:51) stated that there is a need for a broader set of skills for the assurance of IR information, because of the broad range of resources and relationships that should be assured. In this study, the distinction was made between internal and external assurance as a control variable in order to establish whether there is a relationship between assurance (internal or external) and water disclosure. The reporting firm had to disclose in their reports that external assurance transpired through auditors such as KPMG or PwC.

4.10.4.5 Control variable – conciseness

Michelon *et al.* (2015:73) provide evidence that stand-alone reports provide more information, but that this information is diluted within other irrelevant pieces of information camouflaging important items of disclosure. The conciseness of reporting links with the materiality concept in an attempt to disclose important matters that could affect a firm's value creation process or topics which are expected to reflect significant impacts on the organisation's TBL. Perego *et al.* (2016:62) stated that an analysis between the tension of conciseness and completeness of the information disclosed could generate useful insights for both standard setters and companies who embark on the IR movement.

In essence, conciseness refers to the ability of a firm to express material concepts clearly and in as few words as possible, which could result in more concise reports. In this study, the number of pages was used as a measure of conciseness, and divided into four categories, namely 0 to 70 pages (0), 71 to 140 pages (1), 141 to 210 pages (2), and more than 210 pages in order to establish whether there is a relationship between conciseness (report size) and water disclosure. It is worthy to note that it was difficult to implement, as some firms disclose an annual- and sustainability report, where other companies display information on interactive web-based documents. Where more than one report was provided, the pages was added together.

4.10.4.6 Control variable – countries

This study analyses the water disclosures of companies listed on the JSE in South Africa, the ASX in Australia, and global companies listed on the DJGSI. As a consequence of different listing requirements, regulatory bodies and a variety of frameworks and rules applied – the distinction is made between the different indices in order to establish whether there is a relationship between a specific country and water disclosure.

4.10.5 Decision rule for the statistical significance test

In order to determine association, the following techniques were utilised: analysis of means which included t-tests and ANOVA; and analysis of relationships, which comprised of Spearman's correlation coefficient and multiple regression analysis. To determine statistical significance, the decision rule and terminology explained by Wegner (2007:267) was utilised as follows:

- 1% – Overwhelming evidence of statistical significance.
- 5% – Strong evidence of statistical significance.
- 5% to 10% – Weak evidence of statistical significance.

A p-value of less than 1% and 5% was utilised in this study to support statistically significant evidence of association.

4.10.6 Synopsis and application of data analysis techniques

This summary intends to provide the rationale of the different data analysis techniques, and where it was implemented in this study. One of the intentions of this study was to compare the water reporting practices of companies that have prepared integrated reports, as opposed to firms who have not compiled integrated reports – analysed against the water disclosure index. This concerns the aspect of the integrated perspective of this study, as the researcher would like to evaluate whether the concept of IR and integrated thinking has any value in terms of reporting on water-related information. As a result, the different hypotheses were developed in Chapter 2 – and after developing the water disclosure index – the hypotheses were further refined in Chapter 4 (refer to section 4.8.5).

Three data analysis techniques were implemented to test the different hypotheses (Chapter 5), as explained below:

- The t-test was implemented to test the main hypothesis (H_{main}), each construct (H_{1-6}), and every element ($H_{1\ (M1-2)}$, $H_{2\ (G1-5)}$, $H_{3\ (TM1-5)}$, $H_{4\ (RA1-5)}$, $H_{5\ (FO1-4)}$, and $H_{6\ (SC1-4)}$) – in order to test the mean difference of the water disclosure index score between the IR- and non-IR group.

- Spearman's correlation coefficient was implemented to test the relationship between the water disclosure index (H_{main}), including each construct (H_1 to H_6) and the IR status (i.e. IR- and non-IR group).

- Multiple linear regression was implemented as the second relationship test between the dependent variable, water disclosure index (H_{main}, and H_1 to H_6), and IR status as independent variable – as well as other independent variables that acted as control variables.

Another intention of this study was to compare the water disclosure practices of three different groups (Chapter 6), namely firms listed on (a) the JSE in South Africa, (b) the ASX in Australia, and (c) global companies listed on the DJGSI.

The data analysis technique utilised to compare the food, beverage and tobacco firms listed on the three indices with each other, was ANOVA. If significant differences among groups were identified, post-hoc comparisons were performed to identify where these differences occur (Pallant, 2016:211). Tukey's Honestly Significant Different test (HSD), was utilised to indicate significant differences among the groups.

4.11 METHODOLOGICAL RIGOUR

As a mixed method was used in this study, the approach with regard to the trustworthiness of the information could be a little bit different than with a quantitative study. Long and Johnson (2000:30) argue that all research must be open to criticism and evaluation. Quantitative research refers to the terms validity, reliability and generalisation (Long & Johnson, 2000:30), where qualitative research denotes the concepts of credibility, dependability, transferability and confirmability (Guba & Lincoln, 1989:242).

Credibility – similar to internal validity in quantitative research – refers to the process of establishing how the data and analysis procedures are carried out in order to ensure that no relevant data has been omitted (Bengtsson, 2016:13; Thomas & Magilvy, 2011:152). Credibility could be improved by receiving agreement from co-researchers, colleagues, experts or participants (Graneheim & Lundman, 2004:110). Thomas and Magilvy (2011:152) argue that credibility is achieved by checking for the representativeness of the data as a whole.

Dependability – related to reliability in quantitative research – occurs when another researcher can follow the decision trail used by the researcher (Thomas & Magilvy, 2011:153). Dependability alludes to stability, which purports the extent to which data could change over time, and the possible changes that the researcher could have made during the period of analysis (Bengtsson, 2016:13). Bengtsson (2016:13) expands that it is vital to keep track of coding decisions and that the researcher should use memos to track changes.

Transferability – equal to external validity in quantitative research – refers to the degree to which the results of a study could be applicable to other settings, groups or study objects (Bengtsson, 2016:13; Thomas & Magilvy, 2011:153). A sample is said to be representative of a population, in essence, the ability to generalise the results of a study to the population (Krippendorff, 2004:112). Finfgeld-Connett (2010:250) notes that although large samples are frequently associated with increased generalisability, it does not necessarily ensure transferability to diverse contexts.

Taking cognisance of the above, and on the account that this study follows a mixed method approach, with a dominant quantitative character, the concepts of validity and reliability are discussed next.

4.11.1 Validity

To obtain valid and reliable data the researcher should make sure that the measurement procedures and instruments have acceptable levels of reliability and validity (Delport & Roestenburg, 2011:172). Validity determines if the research is measuring what it is supposed to measure (Van Zyl & Pellissier, 2017b:150). Golafshani (2003:598) states that a quantitative researcher needs to construct a measuring instrument according to predetermined procedures – but the question is if the measuring instrument measures what it is supposed to measure.

Smith (2017:135) identifies three validity concerns: (a) construct-, (b) internal-, and (c) external validity, while Pietersen and Maree (2016b:240) differentiate between face validity, content validity, construct validity and criterion validity. Face validity refers to the extent that the measuring instrument looks or seems to be valid, while content validity alludes to the degree to which the instrument covers the complete content of a particular construct (Pietersen & Maree, 2016b:240). Babin and Zikmund (2016:282) combine face- and content validity and state that it refers to the extent to which individual measures' content match the intended concept's definition. A researcher could assess content validity by enquiring experts about the content area in order to confirm if all possible dimensions are covered (Van Zyl & Pellissier, 2017b:150). Neuendorf

(2017:125) argues that face validity checks can be very informative, and that the researcher should to take a step back, in order to examine the measures freshly, and as objectively as possible.

Construct validity not only involves the validation of the instrument itself – but also the underlying theory (Delport & Roestenburg, 2011:175). Thus, construct validity requires a sound theory of the nature of the construct being measured to indicate the relationship with other constructs which can be predicted and interpreted within that construct (Delport & Roestenburg, 2011:174; Malhotra, 2010:321). Methods utilised to compare the extent to which variables correlates within a construct, or not, is (a) convergent validity (correlates), and (b) discriminant validity (does not correlate) (Bryman & Bell, 2015:39; Malhotra, 2010). Factor analysis can be utilised when there is some uncertainty towards the exact nature of the dimensions being measured or when the researcher wants to confirm whether the theoretical dimensions are measured (Delport & Roestenburg, 2011:175; Pietersen & Maree, 2016b:241).

Criterion validity involves multiple measurement by comparing scores on an instrument with external criterion known to measure the construct (Delport & Roestenburg, 2011:174). A high or low correlation between the instrument and the criterion indicate the degree of validity (Pietersen & Maree, 2016b:241).

Onwuegbuzie and Johnson (2006:48) mention when mixed method research is performed, the term validity could be replaced with legitimacy. Neuendorf (2017:122) states that validity within content analysis refers to the extent to which a measuring procedure represents the intended concept. According to Kondracki *et al.* (2002:226), a study utilising content analysis should adhere to the following criteria in order to be valid: (a) that the population of text to be studied should be adequately defined, and (b) the sampling strategy must be systematic and explicitly described. Kondracki *et al.* (2002:226) expand that construct validity is significant to content analysis, and that researchers must ensure that variables address research questions. Construct validity could also be illustrated in content analysis by evaluating whether categories or constructs truly test the proposed hypothesis (Hamad *et al.*, 2016:12). Hamad *et al.* (2016:12) continued by affirming that the categories should be maintained to ensure validity and proper statistical inferences – specifically in quantitative dominant studies.

In a quantitative dominant study – as performed in this research – sampling validity concerns the degree to which a population is accurately represented in the sample (Krippendorff, 2004:321). Polit and Beck (2010:1454) argue that quantitative researchers would do better at achieving representative samples if a more purposive approach is followed. In this study, purposive sampling is used, and the sampling criteria are provided (refer to section 4.9.3) and applied to ensure an unbiased and representative sample to enhance the validity of the study.

4.11.2 Reliability

The concept of reliability refers to the fact that the same results would be achieved at different times with different respondents, utilising the identical measuring instrument in the same population (Pietersen & Maree, 2016b:238). In essence, reliability refers to the extent to which a measuring instrument produces consistent results when multiple measurements are made (Malhotra, 2010:318). Babin and Zikmund (2016:280) state that reliability is an indicator of a measure's internal consistency.

Internal consistency is used to assess whether several items in a scale are all measuring the same underlying construct (Malhotra, 2010:319; Van Zyl & Pellissier, 2017a:165). The Cronbach's alpha is calculated to measure internal consistency, with values ranging from of 0 – 1 (Bryman & Bell, 2015:38). A recommended value of 0.7 and above usually implies an acceptable level of internal consistency (Babin & Zikmund, 2016:281). It should be noted that the Cronbach's alpha tends to increase with a rise in the number of scale items – therefore dependent on the number of items in a scale (Malhotra, 2010:319; Van Zyl & Pellissier, 2017a:165).

Kondracki *et al.* (2002:226) identify two types of reliability to maintain in content analysis, namely (a) inter-coder reliability, and (b) intra-coder reliability. Intra-coder reliability – also referred to as stability – is when the same coder recodes the data after a period of time, producing the same results or decisions. In a study with multiple coders, inter-coder reliability (reproducibility), must be calculated to ensure that constructs are sufficiently defined to avoid systematic differences (Kondracki *et al.*, 2002:226). Krippendorff (2004:215) adds accuracy, and states that is the degree to which a process conforms to its specifications and yields what it is designed to yield.

Table 4-14 provides an indication of the types of reliability according to Krippendorff (2004:214).

Table 4-14: Types of reliability

Reliability	Designs	Causes of disagreements	Strength
Stability	Test-retest	Intra-observer inconsistencies	Weakest
Reproducibility	Test-test	Intra-observer inconsistencies and inter-observer disagreements	Medium
Accuracy	Test-standard	Intra-observer inconsistencies, inter-observer disagreements and deviations from a standard	Strongest

Source: Adopted from Krippendorff (2004:215).

Taking cognisance of the discussion above, inter-coder reliability could be tested before conducting the analysis, which often requires pilot coding (trial coding) or presenting constructs several times before the actual coding (Hamad *et al.*, 2016:12). Kondracki *et al.* (2002:226) state that reliability checks are sometimes performed retrospectively – but should preferably form part of pilot testing.

According to Guthrie *et al.* (2004:289), the following methods could increase the reliability in recording and analysing data in content analysis: (a) including disclosure categories from well-grounded and relevant literature, (b) developing a reliable coding instrument with well specified decision categories, and (c) training the coders with an indication that coding decisions made on a pilot sample have reached an acceptable level. Pilot coding involves coding a small portion of the total sample that could enable researchers to determine whether constructs are clearly defined, that the coding instructions are adequate, and that coders are familiar with the data.

In this study, pilot coding was performed by providing an experienced colloquium (working in the same research field) with the disclosure index and its descriptions to code 10% of the sampled companies. Before the pilot coding was performed, the researcher and experienced colloquia addressed and discussed each element within the water disclosure index. The researcher coded the same companies, and the results was compared in order to evaluate the reproducibility of the disclosure index. Minor differences between the comparisons were identified and discussed in order to agree on further coding of each element within the water disclosure index. The pilot coding process evaluated the validity of the research instrument in order to ensure the reliability of the coder. The researcher proceeded to analyse each firm utilising the water disclosure index.

The Cronbach's alpha values for each construct within the water disclosure index are presented in Table 4-15.

Table 4-15: Cronbach's alpha values for each element

Construct	Cronbach's alpha
Materiality (M)	0.930
Governance and management approach (G)	0.909
Supply chain information (SC)	0.817
Targets and measures (TM)	0.875
Site information (SI)	0.754
RA	0.866
Future-orientated information (FO)	0.846

Source: Researcher's own compilation.

The Cronbach's alpha values in Table 4-15 suggests very good internal consistency reliability. This denotes that the elements within each construct are relevant in order to test the developed hypotheses of the selected constructs utilising the t-test, Spearman's correlation coefficient and multiple regression (refer to sections 4.10.3 and 4.10.4). The research ethics issues are discussed next.

4.12 RESEARCH ETHICS

Strydom (2011a:114) defines ethics as: "A set of moral principles which is suggested by an individual or group, is subsequently widely accepted, and which offers rules and behaviour expectations about the most correct conduct towards experimental subjects and respondents, employers, sponsors, other researchers, assistants and students". Strydom (2011a:115) proceeds that ethical principles are something that need to be internalised in the personality of the researcher to such an extent that ethical behaviour becomes a part of the researcher's lifestyle.

Hair *et al.* (2016:61) agree that the researcher has an ethical obligation to have a thorough working knowledge of the analytical and statistical tools necessary to conduct the research and that the responsibility lies on the researcher to interpret the results honestly and truthfully. According to Hartell and Bosman (2016:41), researchers have an ethical obligation towards the participants (human and non-human) and the subject discipline – to conduct accurate and honest work in the research report.

With regard to this study, the following ethical considerations were applied:

- Ethical clearance was obtained from the North-West University's ethics in commerce research committee, with ethics number: NWU-00419-17-A4 assigned to this study.
- As the participants in this study are companies of which the integrated-, annual-, environmental- or sustainability reports are publicly available, no consent letters were necessary.
- The researcher attempted to be responsible, honest and consistent in the process of coding, analysing and interpreting the various reports.

The researcher has the duty to be transparent about the methods of reasoning used during the research process, and as research ethics includes a component of reflection, reflectivity is discussed next (Mortari, 2015:2).

4.13 RESEARCHER REFLECTIVITY

Methodological rigour was discussed (refer to section 4.11) followed by deliberating on validity and reliability. Although this study comprises of a dominant quantitative character, it also contains a qualitative element – more connected with reflection (Mortari, 2015:1).

To be a competent researcher – and not merely a technician – requires a researcher to reflect on the research (Mortari, 2015:1; Palaganas *et al.*, 2017:426). Reflection on one's research is a mental (cognitive) experience in order to engage into a thoughtful analysis of the research process (Mortari, 2015:1; Palaganas *et al.*, 2017:426). The researcher and the research process do not exist independently, and could be recognised as a dialogue with challenging perspectives and assumptions to enrich the process and outcomes (Palaganas *et al.*, 2017:427).

Dowling (2006:7) mentions that reflectivity is both a concept and a process. As a concept, it refers to the level of consciousness (self-awareness) which entails being actively involved in the research process (Lambert *et al.*, 2010:325). Palaganas *et al.* (2017:427) mention that reflectivity as a process, is introspection on the role of subjectivity. This view is shared by Attia and Edge (2017:33) which mention that reflectivity is an ongoing process mutually shaping the research and the researcher.

Attia and Edge (2017:33) argue that the researcher should 'step back' in order to theorise what is taking place, but also 'step up' to be an active part of the research process. Berger (2015:220) describes reflectivity as turning the lens onto oneself, taking into consideration the background of the researcher, and the effect it might have on the research process. This should be performed to ensure the outcomes are independent of the researcher – and therefore objective (Berger, 2015:220).

Within the context of the postmodern paradigm – to reflect on one's empirical experience – is an essential part to validate the research (Mortari, 2015:2). Furthermore, reflectivity is considered to be an important factor to improve the ethical stance and credibility of the research project (Valentine, 2007:159).

Reflectivity is critical during all phases of the research process, including (a) the formulation of research questions, (b) the data collection process, (c) the analysing of the data, and (d) also while writing the conclusions (Bradbury-Jones, 2007:292; Guillemin & Gillam, 2004:275). Valentine (2007:174) agrees that being consciously involved during the research process enables the researcher to engage intensely with the data – resulting in a more comprehensive and in-depth analysis.

Taking cognisance of the importance of reflectivity, the researcher is convinced that reflection in this study is crucial. In content analysis, various actions are performed from the worldview of the researcher, for example when the water disclosure index, with different themes were developed. Furthermore, during the coding process, the researcher constantly depended on his own perceptions or paradigms.

Evaluating own actions, the researcher is altered by an article published by Dumay and Cai (2015:121), where the authors critically evaluate the use of content analysis as a research methodology to investigate the disclosure of intellectual capital. As content analysis is utilised in this study to investigate water-related disclosure, the findings of Dumay and Cai (2015:143-146) could not be ignored – but employed to reflect.

Dumay and Cai (2015:121) analysed 110 articles which utilised content analysis as methodology and provide insight into methodological issues and problems encountered by accounting and management researchers. The authors underpin this analysis by referring to Krippendorff's content analysis framework, which comprises of six conceptual components (Krippendorff, 2013:35-45). In Table 4-16, the researcher adopts the framework of Krippendorff (2013:35-45) as the basis, combined with the research of Dumay and Cai (2015:121-146) – in order to reflect on the research process of this study.

Table 4-16: Reflection on Krippendorff's content analysis framework

No.	Conceptual component	Researcher's reflection
1.	A body of text, the data that a content analyst has available to begin an analytical effort.	The researcher performed a literature review in Chapters 2 and 3 in order to understand the underlying theories, concepts and previous research with regard to water disclosure (Dumay & Cai, 2015:124).
2.	A research question that the analyst seeks to answer by examining the body of text.	After completion of the literature review, the researcher was able to raise research questions, and afterwards, to formulate the hypothesis (Dumay & Cai, 2015:133).
3.	A context of the analyst's choice within which to make sense of the body of text.	The researcher investigated several theories and decided that they are intertwined – which lead to the integrative approach of this research. Various other frameworks and disclosure indices were investigated to establish the water disclosure index utilised in this study (Dumay & Cai, 2015:137-138).
4.	An analytical construct that operationalises what the analyst knows about the context.	The literature study performed in Chapters 2 and 3 enlightened the formation of the different constructs with its associated themes as units of analysis. The themes are evaluated not only by counting, but also measuring the quality of disclosure (Dumay & Cai, 2015:139).

Table 4-16: Reflection on Krippendorff's content analysis framework (continues)

Nr.	Conceptual component	Researcher's reflection
5.	Inferences that are intended to answer the research question, which constitute the basic accomplishment of content analysis.	In order to apply an abductive approach, the researcher will not only rely on the data analysed from the disclosure index, but intends to enhance the analysis by adding additional qualitative information (Dumay & Cai, 2015:141).
6.	Validating evidence, which is the ultimate justification of the content analysis.	In order to validate the study, the researcher will (a) use well-grounded theory to develop the disclosure index, (b) develop a reliable coding instrument, and (c) perform a pilot study to test the coding process (Dumay & Cai, 2015:142).

Source: Adapted from Dumay and Cai (2015:121-146) and Krippendorff (2013:35-45).

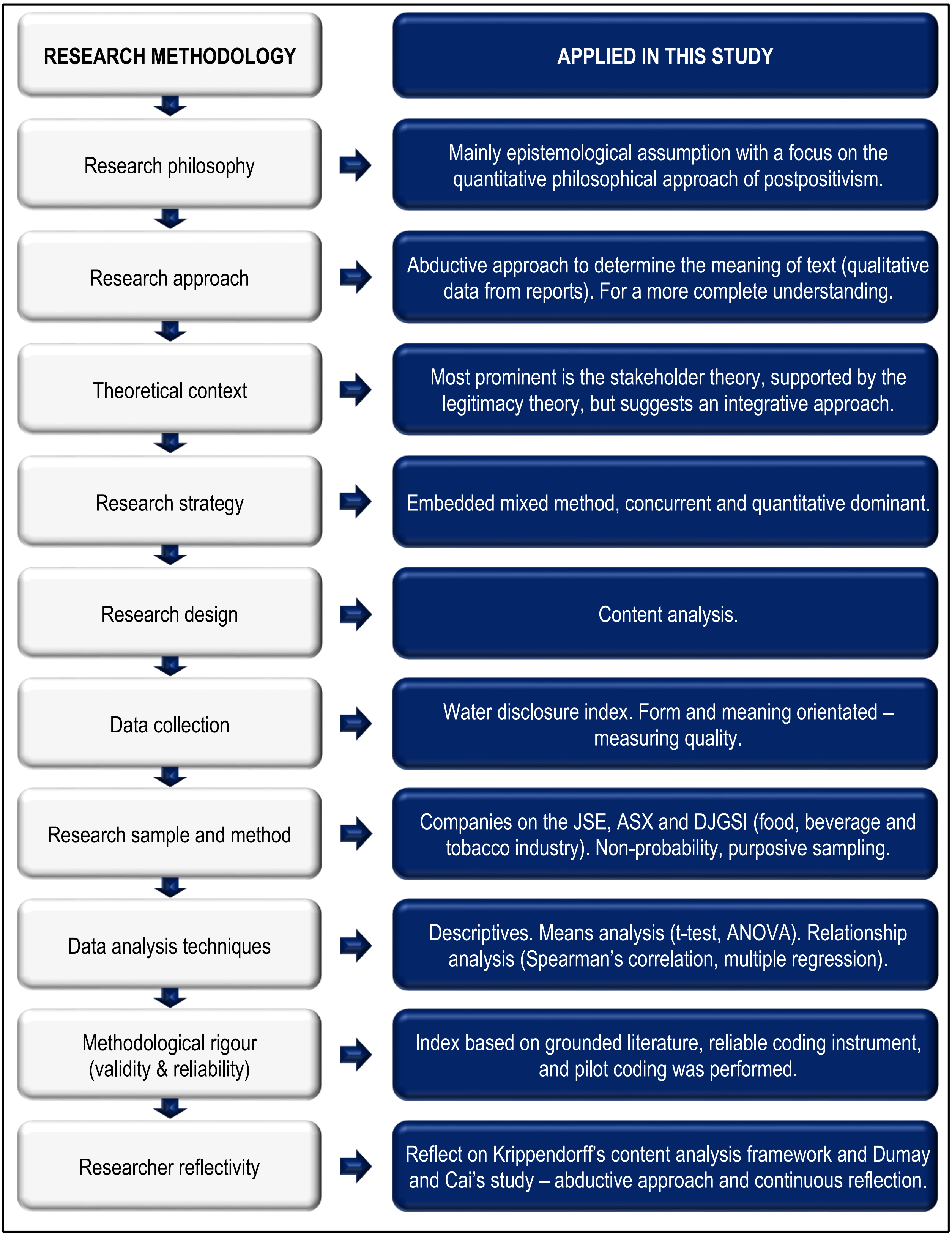
The researcher recognises that to reflect and to be actively involved is a continuous process and applied this while performing the empirical part of the study.

4.14 SUMMARY

The aim of this chapter was to gain insight into the research methodology utilised in order to address the research problem and achieve the secondary objectives set for the empirical study. Figure 4-10 provides a summary of the research methodology applied to this study.

Chapters 5 and 6 to follow present the findings of the empirical study. More specifically, Chapter 5 compares the companies utilising IR, against the companies who published separate sustainability or environmental reports – in order to test the different hypothesis.

Figure 4-10: Research methodology applied to this study



Source: Researcher's own compilation.

CHAPTER 5

RESULTS: COMPARING THE WATER DISCLOSURES OF FIRMS IMPLENETING IR, TO THE NON-IR GROUP

5.1 INTRODUCTION

In the discussions of Chapters 2 and 3, the notion of how companies communicate relevant non-financial information to a variety of stakeholders was addressed. The lack of completeness and standardisation when reporting on sustainability items were emphasised. It was evident that reporting on sustainable issues (such as water) need to be incorporated into the reporting actions of a company by following a more pluralist approach – taking stakeholders, sustainability, business ethics and transparency into account (Frías-Aceituno *et al.*, 2013:48). With the forming of the IIRC, the concept of an integrated approach, with an emphasis on integrated thinking progressed in the discussion of Chapter 2. The principles that could direct the integrative approach and guide the process of IR are as follows (IIRC, 2011:12):

- strategic focus;
- connectivity of information;
- future orientation;
- responsiveness and stakeholder inclusiveness; and
- conciseness, reliability and materiality.

According to Sierra-García *et al.* (2015:287), integrated reports could be the most effective way to communicate the company's overall performance to stakeholders and inform them about sustainable strategies. The goal of the IIRC is for companies to provide – in a multi-dimensional manner – information to their stakeholders which includes financial-, social-, environmental-, governance-, and risk and opportunity information (IIRC, 2011:15).

Fundamental to the integrative approach is to disclose a holistic, balanced picture of a company, integrating various functions, operational sections and strategic direction in a concise way to their stakeholders. The principles of IR need to be visible in the strategic approach, corporate governance, business model, core values and future information related to the company. To combine all these aspects into a holistic and concise report is a skill that needs to be rehearsed by the practitioners who embraced the concept of an integrative approach.

The literature addressed the WEF nexus, which complements the perspective of interrelated relationships and the integration of information. As a prominent role player in the food, beverage and tobacco industry, Coca Cola European Partners plc (2013:1) mentioned the following:

> *"We are increasingly addressing water stewardship in the context of the "water-energy-food nexus" – the inextricable connections among resources that demand a 360-degree perspective and an integrated approach. Through our work with the World Resource Institute's Aqueduct project, the 2030 Water Resource Group, and other efforts, we support initiatives that take a balanced approach and build synergies as they seek to equally ensure water, energy and food security for everyone".*

Another global company listed on the DJGSI demonstrates their understanding of the nexus as follows:

> *"Growing water scarcity is a global risk, for our business and the communities around the world where we source ingredients and make our foods. The 2030 Water Resources Group estimates that 25 percent of total water demand in 2030 will not be met, which will have significant impacts on food security, human health and business continuity. We respect the human right to water as defined by the United Nations Committee on Economic, Social and Cultural Rights and General Assembly, and are working to reduce our worldwide use"* (Kellogg's, 2018:36).

Taking cognisance of these citations, with the integrated approach in mind, as well as the prominence of the WEF nexus, this chapter aims to test the different hypotheses developed in Chapters 1, 2 and 4. This is conducted to determine whether the concept of IR and integrated thinking has any value in terms of reporting on water-related information. The empirical investigation consists of analysing the water disclosure of 49 companies in the food, beverage and tobacco industry. These analyses include the testing of the main hypotheses (Chapter 1), the hypotheses for each construct (Chapter 2), and the refinement of the hypotheses per construct (Chapter 4).

From the sampled companies, 18 (36.7%) produced integrated reports based on the principles of the IIRC, while 31 companies (63.3%) did not prepare integrated reports – as illustrated in Table 5-1. Unless indicated differently, all tables in this chapter are the researcher's own compilation.

Table 5-1: IR or not IR

Description		Frequency	Valid %	Cumulative %
Valid	0 (IR)	18	36.7	36.7
	1 (non IR)	31	63.3	100.0
	Total	49	100.0	

5.2 COMPARING THE OVERALL PERFORMANCE OF THE IR AND NON-IR GROUP

The objective of this chapter is to compare the water reporting practices of companies that have prepared integrated reports, as opposed to those who have not compiled integrated reports. Initially, this chapter provides an overall analysis of the entire water disclosure index with the IR and non-IR groups, where after each construct is analysed. The analysis includes qualitative and quantitative results. The quantitative analysis tests associations, analysis of means (t-test) and relationship analysis (Spearman's correlation coefficient and regression analysis). The various data analysis techniques were applied to supplement each other for the reason that they measure different aspects of association. When presenting the overall (quantitative) results (section 5.2) a more complete explanation is narrated. This would provide a basis for the reader to interpret the remainder of the constructs – which focus mostly on testing the different hypothesis.

The broad question that needs to be answered concerns the aspect of the integrated perspective. The researcher would like to evaluate if the concept of IR and integrated thinking has any value in terms of reporting on water-related information.

The intent of the overall analysis is to test H_{main} stipulating that: "*There is a significant association between IR and total water-related disclosure*." Table 5-2 presents an analysis of the means, which compares the overall mean score results achieved for the water disclosure index with the companies who prepared integrated reports – or not.

Table 5-2: Overall index: t-test – mean difference between IR/not IR groups

Description	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes
Index_100	0	18	55.35	21.62309	0.007***	0.72
	1	31	34.77	28.75129		

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Table 5-2 illustrates that companies implementing IR recorded a mean of 55.35% in terms of reporting on all items in the water disclosure index, while those who did not apply IR achieved a mean of 34.77%. This explains that companies utilising IR performed better in communicating water-related information towards their stakeholders. Since this is the analysis of a population, the p-value is indicated for completeness and serves as a guide to support or reject the hypothesis. Consequently, Table 5-2 reveals that the IR group outperformed the non-IR group by almost 20.58 percentage points. Effectively, the p-value which is less than 1%, implies that there is overwhelming evidence to support H_{main}. Moreover, the effect size which indicates the magnitude of the difference, could be interpreted as a medium effect – since the effect size of 0.72 is substantially higher than 0.5 (refer to section 4.10.3.1).

Before each construct and its association with IR are discussed, the summary of each construct and its analysis of means is portrayed in Table 5-3.

Table 5-3: Each construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size
Materiality (M)	0	18	70.83	41.34681	0.003***	0.93
	1	31	32.26	37.74561		
Governance (G)	0	18	71.67	28.95229	0.001***	0.96
	1	31	40.97	31.97445		
Supply chain (SC)	0	18	47.92	24.34812	0.146	0.38
	1	31	35.89	32.07120		
Targets and measures (TM)	0	18	45.56	34.33781	0.275	0.32
	1	31	34.19	35.00230		
Site-specific information (SI)	0	18	23.61	24.95912	0.660	0.12
	1	31	20.16	28.44538		
Risk assessment (RA)	0	18	63.33	23.76354	0.012**	0.65
	1	31	42.26	32.42527		
Future-orientated information (FO)	0	18	52.78	27.30397	0.002***	0.99
	1	31	25.81	26.79698		

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Table 5-3 presents the analysis between means for every construct and could be interpreted in the same manner as Table 5-2. Examining the mean values of the different constructs, it is evident that the companies practicing IR outperform the organisations from the non-IR group. The most significant differences between companies utilising IR and not, is found under the materiality-, governance-, risk assessments and future-orientated information constructs. With regard to materiality, companies implementing IR report an average of 70.83% while the non-IR group report 32.26% – a difference of 38.57%. In connection with governance, the IR group of companies disclosed 71.67%, whereas the non-IR organisations recorded 40.97%. Referring to the risk assessment construct, a difference of 21.07% originated between the IR and non-IR group. Referring to the future-orientated construct, a difference of 26.97% between companies employing IR or not, was confirmed – with companies implementing IR outperforming the non-IR group. Taking into consideration that materiality, governance, risk assessment and future-orientated information is central to IR (statistically significant), higher disclosure values among companies publishing integrated reports is evident.

The findings in Table 5-3 were introduced to illustrate differences between the IR and non-IR group among constructs (addressed in more detail in sections 5.3.1 to 5.3.6). Table 5-4 presents the results of Spearman's correlation coefficient, which was implemented to test the relationship between the water disclosure index (H_{main}), and the IR status (i.e. IR and non-IR group).

Table 5-4: Spearman's correlation coefficients

Spearman's rho		PC regression analysis	Index average (27 elements)	IR (0) / Not IR (1)	Concise-ness (pages)	Assurance	Size (total assets)
PC regression analysis	Correlation Coefficient	1.000	0.998***	-0.380***	0.685***	-0.008	0.651***
	Sig. (2-tailed)		0.000	0.007	0.000	0.955	0.000
	N	49	49	49	49	49	49
Index average (27 elements)	Correlation Coefficient	0.998***	1.000	-0.368***	0.697***	-0.017	0.664***
	Sig. (2-tailed)	0.000		0.009	0.000	0.910	0.000
	N	49	49	49	49	49	49
IR (0) / Not IR (1)	**Correlation Coefficient**	**-0.380****	**-0.368*****	**1.000**	**-0.243***	**0.173**	**0.111**
	Sig. (2-tailed)	**0.007**	**0.009**		**0.092**	**0.235**	**0.449**
	N	**49**	**49**	**49**	**49**	**49**	**49**
Conciseness (pages)	Correlation Coefficient	0.685***	0.697***	-0.243*	1.000	0.185	0.700***
	Sig. (2-tailed)	0.000	0.000	0.092		0.203	0.000
	N	49	49	49	49	49	49
Assurance	Correlation Coefficient	-0.008	-0.017	0.173	0.185	1.000	0.008
	Sig. (2-tailed)	0.955	0.910	0.235	0.203		0.955
	N	49	49	49	49	49	49
Size (total assets)	Correlation Coefficient	0.651***	0.664***	0.111	0.700***	0.008	1.000
	Sig. (2-tailed)	0.000	0.000	0.449	0.000	0.955	
	N	49	49	49	49	49	49

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

The correlation between the principal regression factor score and the average of all items in the index average was rho = 0.998 which indicated that either of the two could be used. Considering that the index based on the average on the 27 elements can be viewed as a percentage, it was utilised through the study. When principal component regression analysis is used as the index, the rho = -0.380 (p-value 0.007), which is close to the rho = -0.368 (p-value 0.009) when the average of all elements is used as the water disclosure index. Note that the negative rho values result from the fact that IR companies were coded as (0) and non-IR as (1). This implies that the disclosure index increases when the independent variable decreases from 1 to 0. In essence, if a firm implements IR, the index score is likely to increase. Note that a p-value of less than 1% indicates there is a statistical significance change in the index score (y) when there is a change in the IR status (x), which implies that H_{main} is supported.

The regression analyses in Table 5-5 is an extension of Spearman's correlation, which takes the control variables in the relationship test into account.

Table 5-5: Comparing the entire water disclosure index with other variables

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. error	Beta (β)			Tolerance	VIF
(Constant)	-123.811	43.119		-2.871	0.006		
IR (0) / Not IR (1)	-10.092	9.566	-0.176	-1.055	0.297	0.265	3.773
Conciseness (pages)	5.789	4.069	0.185	1.423	0.162	0.437	2.290
Size (total assets)	17.207	4.730	0.614	3.638	0.001***	0.258	3.874
Country_Global	-15.541	10.979	-0.248	-1.415	0.164	0.240	4.168
Country_Austr	-18.803	10.508	-0.334	-1.789	0.081*	0.211	4.731

[a.] Dependent Variable: Index_100
($R = 0.827$; $R^2 = 0.684$; Adjusted $R^2 = 0.647$; $F = 18.604$); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

The first symbol in the unstandardised coefficients column in Table 5-5 represents the unstandardised beta (B). The unstandardised beta (B) indicates the slope of the line between the predictor variable and the dependent variable. This implies that for every one-unit increase IR or non-IR, in the independent variable (index) increases with 10.092 units. The following symbol within the unstandardised coefficients column is the standard error for the unstandardised beta (B). This value is similar to the standard deviation for a mean, the larger the number, the more spread out the points are from the regression line.

The following column contains the standardised beta (β), which is similar to a correlation coefficient. The standardised beta (β) has a range between 0 to 1 or 0 to -1, depending on the direction of the relationship. The closer the value is to one or -1, the stronger the relationship. This enables the researcher to compare the independent variables in order to establish the strongest relationship. It is evident from Table 5-5 that the size of the companies had the strongest relationship. In the subsequent column, the t-test statistic (t) is calculated by dividing the unstandardised beta (B) with the standard error, which is utilised to calculate the p-value (Sig).

The next column contains the probability level (p-value) or sig. The p-value depicts whether the independent variable significantly predicts the dependent variable. In order to test for multicollinearity, two factors, namely tolerance and the Variance Inflation Factor (VIF) could be utilised. A small tolerance value indicates that the variable under consideration is almost a perfect linear combination of the independent variables already in the equation – and should not be added to the regression equation. All variables involved in a linear relationship have a small tolerance. It is suggested that a tolerance value less than 0.1 should be investigated further.

Evaluating the VIF in Table 5-5, a value smaller than ten implies that multicollinearity is not a problem. If the VIF is near or above 5, a possible solution could be to remove highly correlated predictors from the model. Table 5-5 represents that none of the variables have a tolerance lower than 0.1 as well as a VIF near 10 – alluding that multicollinearity is not a problem.

The only p-value that has a significant positive association with the total water disclosure index is the size of the companies, with a p-value of 0.001. The size of the company was determined according to the total assets, indicating that an organisation with more total assets are associated with improved reporting on all water-related aspects in the disclosure index. H_{main} is not supported in the regression analyses, since $p = 0.297$ (thus $p > 0.05$).

5.3 RESULTS OF EACH CONSTRUCT

The subsequent paragraphs address the results of the different constructs in order to test each of the hypotheses. Although seven constructs were identified in the disclosure index, only six were recognised in Chapter 2. The hypothesis for each construct listed below (H_1 to H_6) was refined (refer to section 4.8.5) and tested.

H_1: There is a significant association between IR and water-related disclosure in terms of materiality.

H_2: There is a significant association between IR and water-related disclosure on governance.

H_3: There is a significant association between IR and water-related disclosure on targets and measures.

H_4: There is a significant association between IR and water-related disclosure on risks.

H_5: There is a significant association between IR and water-related disclosure on future-orientated information.

H_6: There is a significant association between IR and water-related disclosure on supply chain information.

With the presentation of the results on each construct, two tables containing quantitative information was discussed. The first table contains statistical information on each item in the construct in relation with adopting IR or not, whereas the following table provides the entire construct within the regression model. The quantitative information is accompanied by qualitative information from the reports of the companies – revealing meaningful disclosures observed. The first construct, materiality, which contains two elements, is discussed next.

5.3.1 IR and materiality

Materiality could be recognised as a guiding principle in financial and non-financial information, which requires the company to recognise what is material to investors and significant to society (Ortar, 2018:20; Reverte, 2015:286). The materiality construct contained two elements (M1 and M2), where M1 measured whether the company identified water as a material aspect, and further provided a description or understanding of the significant impacts identified. Within the second element (M2), the company should describe the process of recognising water as a material aspect, as well as identify the stakeholders affected. Materiality connects with the stakeholder theory – as Ngu and Amran (2018a:10) stated – that to report on materiality provides greater transparency and also attains greater accountability for the stakeholders.

Oceana Group (2018a:1) provides an example of a company implementing the materiality concept as follows:

> *"This report focuses on those matters that we see as being most material to our capacity to create value, and to delivering on our core purpose, as assessed in discussion with representatives of Oceana's executive team and subsequently signed off by the board. Our approach to managing these material matters is reflected in our strategic objectives. These objectives have been identified based on an assessment of how we create value, the impact of the external operating context*

on value creation, the material interests of our stakeholders, and the principal risks facing the group."

The Ajinomoto Group (2018:9), a company listed on the DJGSI, developed a materiality matrix where water was identified considering the importance of water as a material aspect towards society and the company's business activities. They explain their materiality matrix by stating that:

"While carefully assessing the macro environment, the Ajinomoto Group has engaged in dialogue with external experts to identify several materiality items. In 2017, these items were updated to reflect the United Nations' SDGs and incorporated into the FY17-19 (medium-term management plan) MTP with consideration paid to the level of importance to society and the Group's business in non-financial areas."

Premier Fishing and Brands Limited (2018:36) presented an example of the process of identifying water as a material issue in the following manner:

"We have identified material matters through a formal process involving the CEO, CFO and EXCO members. The Board of directors through the audit and risk committee endorsed the material matters. The process takes into account the issues raised, their relevance, our strategy, our stakeholders and our governance structure."

The company further elaborated by identifying stakeholders affected by their material matters:

"Material interests, expectations and concerns of our stakeholder groups most likely to influence the Group's ability to create sustained stakeholder value, form the primary basis for the determination of our material matters. Stakeholders identified with regard to material matters include shareholders, suppliers and service providers, customers, employees and trade unions, government and regulatory authorities, local communities and other small quota holders".

Table 5-6(a) displays the t-test between the IR and non-IR groups for the materiality construct.

Table 5-6(a): Materiality construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Materiality (M)	0	18	70.83	41.34681	0.003***	0.93	Supported
	1	31	32.26	37.74561			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is evident from Table 5-6(a) that an overall p-value of 0.003, and effect size of 0.93 was recorded. In this regard, H_1, specifying that: "*There is a significant association between IR and water-related disclosure in terms of materiality*." – is supported. The association is measured between the difference of the IR and non-IR group mean scores, which indicates that the IR group outperformed the non-IR group in terms of materiality disclosure. This signifies a statistically significant difference between the IR and non-IR groups of companies with regard to the materiality construct. Table 5-6(b) displays the quantitative information on each element in the materiality construct.

Table 5-6(b): Materiality elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
M1: Identify water as material aspect and impacts associated	0	18	72.22	0.856	0.008***	0.82	Supported
	1	31	37.01	0.815			
M2: Describe the process and identify stakeholders	0	18	69.44	0.850	0.002***	0.99	Supported
	1	31	27.42	0.768			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Table 5-6(b) indicates that companies adopting IR scored an average of 72.22% disclosure in terms of identifying water as a material aspect and providing a description of the impacts associated, as opposed to a recorded percentage of 37.01 by organisations not implementing IR. Sea Harvest (2017:9) represents their understanding of water-related impacts by stating that: *"The Western Cape is currently experiencing a severe drought and every attempt should be made to conserve water, as a valuable resource."* Companies practicing IR outperformed the non-IR group in the second item with an average mean percentage of 69.44% when describing the process of recognising water as a material matter and identifying stakeholders affected.

The effect sizes for $H_{1\,(M1)}$ and $H_{1\,(M2)}$ are larger than 0.8, indicating that IR has a large effect on reporting on materiality and that it is statistically significant. The p-values smaller than 0.05 for both elements under the materiality construct is an indication of a significant association between IR and water-related disclosure in terms of materiality. This implies that $H_{1\,(M1\text{-}2)}$ is supported with a statistically significant mean difference between the groups – where the IR group outperformed the non-IR group.

Spearman's correlation coefficient – the first relationship analysis between the materiality construct and IR status revealed rho = -0.429, which is statistically significant at a 1% level (Appendix D). Table 5-6(c) includes the materiality construct in the regression model.

Table 5-6(c): Materiality construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta (β)			Tolerance	VIF
(Constant)	-59.738	78.799		-0.758	0.453		
IR (0) / Not IR (1)	**-39.154**	**17.350**	**-0.444**	**-2.257**	**0.029****	**0.318**	**3.141**
Conciseness (pages)	13.154	8.737	0.273	1.506	0.139	0.374	2.673
Size (total assets)	13.464	8.389	0.313	1.605	0.116	0.324	3.084
Country Australia	9.228	17.354	0.107	0.532	0.598	0.306	3.267
Assurance	-35.289	14.826	-0.290	-2.380	0.022**	0.827	1.209

[a.] Dependent Variable: M_100

(R = 0.686; R^2 = 0.471; Adjusted R^2 = 0.410; F = 7.666); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

H_1 is supported. **Sig $p < 0.05$ implies unique relationship

The IR status recorded a p-value of 0.029 within the regression model, which is statistically significant below the 5% level. This signifies that H_1 is supported and that the IR status has a unique statistically significant relationship with the materiality construct. Note that the negative beta and t-value are the result that IR companies was coded as (0) and non-IR as (1). This implies that the materiality construct increases when the independent variable (IR status) decrease from 1 to 0. Assurance was also statistically significant, which implies that a change from internal (0) to external (1) assurance leads to a decrease in the materially construct. Note that assurance was included as a control variable in above regression analyses, and not in the subsequent regression models. Assurance was only included when it highly correlates to the dependent variable.

5.3.2 IR and the governance and management approach

Robust governance and management systems are required to manage water, consequently water governance in the boardroom is essential. The CDP (2017d:13) mentioned that companies with board-level oversight of water issues are reaping the rewards, which include market differentiation, shareholder confidence and business resilience. In connection with the legitimacy theory, Quantum Foods (2018:63) provided an example how the firm's governance structures help achieve the outcome of legitimacy by mentioning that: *"The board ensures legitimacy and accountability by approving the materiality of matters that are reported on by management".* This signifies the integrated nature of reporting on sustainability matters by identifying and disclosing material items, and then moving towards the governance structures, which are reported on.

Five elements featured in the governance construct (G1 – G5), where G1 identified whether the company has an environmental management system (EMS) and developed their own water strategy. Concerning the second element (G2), the reporting organisation should indicate that it understands the context within it operates in terms of water stress, flooding, water quality and regulatory uncertainty. The company should include water-related aspects as part of their business model (G3) and disclose that water governance is embedded in their organisational structure at board-level (G4). Within the fifth element (G5), the company should disclose detail information about their water policies, commitments, resources, projects, programmes and initiatives.

Ingham's (2018:19), an ASX listed company operating in the poultry industry in Australia and New Zealand, indicates how the organisation's EMSs are incorporated into their water strategy as follows:

> *"The Group takes its environmental obligations seriously and has had an environmental policy in place for more than 30 years. The policy provides the framework for a comprehensive management strategy that is integrated with overall business strategy and ensures individual sites are managed in a consistent way to a high standard. In the past decade, sustainability has become a focus for the organisation and is a key business objective, helping identify business improvements and further efficiencies. Ingham's is now recognised as a leader in sustainability and aims to lead the world in the continued adoption of advanced water treatment to reduce water use."*

The company continues to explain that the policy contains a commitment to protect the environment, including water, energy and material conservation (Ingham's, 2018:19).

The following disclosure by Tongaat Hulett (2018:61) presents an example of a company understanding the context within which it operates:

> *"As an agriculture and agri-processing business, water is a vital part of Tongaat Hulett's daily operations. Climate change, with its consequent impacts on water availability and water quality, continues to impact on several regions in which Tongaat Hulett and its suppliers operate. Water pollution has the potential to increase operational costs and compromise the quality of products. It is therefore in Tongaat Hulett's interest to ensure sustainable management of shared water resources in the regions where it operates and procures."*

The company expands on its awareness of the environment within the context of water and illustrate initiatives towards water-related programs:

> *"Tongaat Hulett recognises the need to adapt to the physical impacts of climate change, which may affect operations, particularly through the availability of water and the occurrence of extreme weather events. The company continues to engage with experts on several innovative initiatives, including programmes to improve irrigation efficiency and more drought-resistant crop varieties"* (Tongaat Hulett, 2018:59).

Another example of a company realising the impact of water in their environment was Tiger Brands (2018:35) which brought about the following commitments and plans:

> *"The drought in the Western Cape, which has had a significant impact on the quality and availability of key raw materials such as wheat and fruit. Our facilities coordinated in mitigating the water shortage, working closely with authorities on water allocation, permits for boreholes and ensuring that communities around our facilities were not affected by our water use. Similarly, we worked with industries around us to optimise water efficiency, learning from each other. All the facilities had plans in place for day zero (the forecast day when the Western Cape would have run out of water) to ensure minimal disruption of production."*

General Mills (2018:23) a company listed on the DJGSI acknowledges their responsibility towards their stakeholders within their water policy as follows:

> *"The General Mills Water Policy provides a framework for engaging with stakeholders and health of watersheds that are critical to our business. Improving watershed health requires extensive collaboration to protect the water quality and supply that benefit our growers, communities and the environment."*

Furthermore, General Mills (2018:6) illustrates board-level oversight through their leadership team accountable for the company's global responsibility programs and performance – naming the members of the team. The company states that:

> *"The team meets regularly and receives input from internal and external experts. The Board of Directors' Public Responsibility Committee provides oversight and receives regular updates from the operating teams"* (General Mills, 2018:6).

Similarly, the social and ethics committee of Quantum Foods (2018:74) monitors the sustainable development and non-financial performance of the group, specifically relating to the management and monitoring of the company's environmental impact – of which water is part of. In addition, Quantum Foods (2018:74) disclosed their progress and action taken by stating that:

> *"The committee monitored water, energy and waste disposal management and a report containing usage details is reviewed biannually. The short-term aim is to reduce wastage of these elements across the Group's operations by monitoring performance year on year."*

Including water-related aspects as part of a company's business model was reported by RCL Foods (2018:6) as follows:

> *"Guided by Our Sustainable Business Drive, we strive to apply alternative business models in our consumption of natural resources in order to achieve energy-sufficient, water-smart and waste-free operations."*

As a result – driven by their new business model – RCL Foods (2018:13) reduced municipal water usage by 596 million litres. Table 5-7(a) provides the t-test for the entire governance disclosure construct between the IR and non-IR groups.

Table 5-7(a): Governance construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Governance (G)	0	18	71.67	28.95229	0.001***	0.96	Supported
	1	31	40.97	31.97445			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

With reference to Table 5-7(a), the overall p-value for the governance construct is 0.001 with a recorded effect size of 0.96 – an indication of a large effect. In this regard, H_2 stipulating that: "*There is a significant association between IR and water-related disclosure on governance.*" – is supported. In essence, there is a statistically significant difference between the IR and non-IR groups with regard to the governance disclosure construct. The association is measured between the difference of the groups' means which signifies that the IR group outperforms the non-IR group in terms of governance disclosure. Table 5-7(b) provides the results of the t-test for each element within the governance construct.

Table 5-7(b): Governance elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
G1: EMS in place and developed water strategy	0	18	72.22	0.784	0.097*	0.47	Rejected
	1	31	51.61	0.875			
G2: Understands the context in which it operates	0	18	86.11	0.461	0.001***	0.84	Supported
	1	31	54.84	0.746			
G3: Includes water-related aspects in business model	0	18	61.11	0.808	0.001***	1.03	Supported
	1	31	19.35	0.615			
G4: Indicates board-level oversight for water governance	0	18	61.11	0.808	0.009***	0.79	Supported
	1	31	29.03	0.720			
G5: The company has water-related policies, targets etc.	0	18	77.78	0.616	0.010**	0.68	Supported
	1	31	50.00	0.816			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is evident from Table 5-7(b) that the companies performing IR recorded higher mean percentages in each element (G1 – G5) within the governance construct. The most comprehensive difference [41.76% (61.11% - 19.35%)] between companies performing IR or not, could be pointed out in element G3, which measured whether companies include water-related aspects as part of their business model. Acknowledging that a description of relevant capitals is inherent in the explanation required by the content element ‘business model’ in the IR framework IIRC (2013a:5), a company recognising water – which is part of natural capital – as an material aspect, could explain the higher disclosure percentage by companies implementing IR.

Sánchez-Hernández *et al.* (2017:845) considered the inclusion of water issues as part of a company’s business model as one of the best practices in the field of sustainability disclosure. This relates to IR and the integrative approach as mentioned by Hoque (2017:246), where it was concluded that IR supports the improvement of the business model and strategy formulation of a company, because of its process of integrated thinking and decision-making support. Grupo Nutresa (2017:182), a company listed on the DJGSI, disclosed that:

> *“As medium-term and long-term plans, the Organisation works on the water-related risk evaluation, on the measurement of the water footprint and on the disclosure of good practices and policies to the stakeholders from its sourcing chain.”*

This statement could reflect that IR supports the improvement of the business model and strategy formulation of a company.

The highest disclosure element was G2, where companies practicing IR scored an average of 86.11% when illustrating an understanding of the context in which it operates – as opposed to 54.84% recorded by the non-IR group. A significant difference of 32.08% (61.11% - 29.03%) was recorded between the IR and non-IR group of companies within the element reporting on board-level oversight for water governance (G4), where the IR companies scored 61.11% in contrary to an average of 29.03% by the non-IR group.

To summarise Table 5-7(b), $H_{2\ (G2\text{-}5)}$ is supported, implying that there is a statistically significant mean difference between the groups where the IR group outperformed the non-IR group. $H_{2\ (G1)}$ was rejected, with no statistically significant difference between the groups' means.

The first of two relationship analyses were conducted. Spearman's correlation coefficient between the governance construct and IR status is rho = 0.456, which is statistically significant at a 1% level (Appendix D). From this analysis, H_2 is supported. Table 5-7(c) presents the second relationship analysis.

Table 5-7(c): Governance construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta (β)			Tolerance	VIF
(Constant)	-176.312	58.974		-2.990	0.005		
IR (0) / Not IR (1)	**-23.913**	**13.084**	**-0.342**	**-1.828**	**0.075***	**0.265**	**3.773**
Conciseness (pages)	-0.055	5.566	-0.001	-0.010	0.992	0.437	2.290
Size (total assets)	25.381	6.470	0.744	3.923	0.000***	0.258	3.874
Country Australia	-19.872	14.372	-0.290	-1.383	0.174	0.211	4.731
Country Global	-26.100	15.016	-0.342	-1.738	0.089*	0.240	4.168

[a.] Dependent Variable: G_100

($R = 0.775$; $R^2 = 0.601$; Adjusted $R^2 = 0.554$; $F = 12.941$); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

H_2 is rejected. *Sig $p < 0.1$ implies weak relationship

The correlation analysis (refer to Appendix D) included assurance as an independent variable, however it did not correlate with governance, and was not included in the regression model. Performing IR or not-IR recorded a p-value of 0.075 in the regression model. Since the p-value lies between 5% and 10%, there is a weak unique contribution of IR status to the governance construct. However, the relationship is not statistically significant on a 5% level to support H_2.

Moreover, it was found that firm size had a unique statistically significant contribution related to governance.

5.3.3 IR and targets and measures

Quantified water information is crucial to enable companies to make effective management decisions (Mueller *et al.*, 2015:30). Diageo (2018:8), a company listed on the DJGSI disclosed the following as a reason for why they measure:

> *"Water is the main ingredient in all of our brands. To sustain production growth, address climate change risk and respond to the growing global demand for water while scarcity increases, we aim to improve efficiency, minimising our water use particularly in water-stressed areas."*

Combi (2018:20), the chairman of Pioneer Foods listed on the JSE in South Africa, stated that the company made *measurable* progress in reducing their environmental impacts, with noteworthy and continued progress on reducing water usage.

Five elements were analysed within the targets and measures construct (TM1 – TM5), where TM1 measured whether companies disclose total water withdrawal per source – and more specifically – quantified each source. The second element (TM2) required companies to report on their water discharge to all areas, and TM3 provides detail with regard to water quality disclosure. Within the fourth item, companies should disclose total water consumption (TM4) (total water withdrawn – total water discharged) and report on water recycled and reused under in the fifth element (TM5).

Distell, a JSE-listed company in the alcoholic beverages industry in South Africa, disclosed the following:

> *"Our resource efficiency targets for 2020 (relate to the usage of water, electricity and fossil fuel-based energy in our production processes) will enable us to actively drive annual improvements in performance to ensure we reach our long-term goals. We achieved our 2018 target and even exceeded our 2020 target to reduce water usage by 15% by increasing water recycling at our Adam Tas and Green Park sites and installing a closed loop cooling system at our Wellington distillery"* (Distell, 2018a:30).

The abovementioned example of setting targets for water usage connects with future-orientated information which is addressed later in this chapter. Nestlé, the world's largest food and beverages company stated that they implemented 578 water-saving projects in their factories with expected savings of 5.4 million m^3 of water a year, through operational efficiency and technology for reusing water (Nestlé, 2017b:80). The ability of Nestlé to quantify water information illustrates their commitment towards water governance.

Table 5-8(a): Targets and measures construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Targets and measures (TM)	0	18	45.5556	34.33781	0.275	0.32	Rejected
	1	31	34.1935	35.00230			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is evident from Table 5-8(a) that the overall p-value of 0.275 for the targets and measures construct is not statistically significant. This conveys that H_3, which states: "*There is a significant association between IR and water-related disclosure on targets and measures*." – is rejected. Table 5-8(b) provides the quantified information of the t-test for each element within the targets and measures construct.

Table 5-8(b): Targets and measures elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
TM1: Total water withdrawal per source	0	18	55.56	0.758	0.125	0.43	Rejected
	1	31	37.10	0.855			
TM2: Total water discharged	0	18	41.67	0.857	0.268	0.33	Rejected
	1	31	27.42	0.850			
TM3: Disclosure on water quality	0	18	52.78	0.802	0.198	0.38	Rejected
	1	31	37.10	0.815			
TM4: Total water consumption	0	18	41.67	0.924	0.828	0.06	Rejected
	1	31	38.71	0.884			
TM5: Volume of water recycled and reused	0	18	36.11	0.958	0.690	0.11	Rejected
	1	31	30.65	0.844			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is clear from Table 5-8(b) that the companies preparing integrated reports recorded higher mean values than the non-IR group, although the differences are not statistically significant. With this in mind, the differences between the IR and non-IR group are smaller when compared to the materiality and governance constructs. The largest difference of 18.46% (55.56% - 37.10%) was noted in the first element (TM1) where companies practicing IR scored an average of 55.56% when reporting on total water withdrawal from each source, versus 37.10% by the non-IR group. The mean percentages recorded for the remainder elements (TM 2-5) was lower than the first element (TM1). An average disclosure score of 36.11% was reported by the IR-group under the element measuring total water recycled and reused (TM5), against 30.65% for the non-IR group. As an example, Diageo (2018:18) mentioned that:

> *"A recent programme of investments in our distilleries in Maharashtra state has driven further improvements. We have installed new water-recycling equipment, including ultra-filtration followed by reverse osmosis systems at our Nasik, Aurangabad and Pioneer sites. This has enabled us to reuse up to 500,000 cubic metres of water a year – enough to fill 200 Olympic swimming pools."*

In addition to the elements measured above, some companies disclosed water intensity/efficiency ratios, for example British American Tobacco (2017b:35) recorded that they use 3.27 m^3 of water per million cigarettes equivalent produced, a 33% reduction from a 2007 baseline year. Calculating water usage per litre of packaged product, Distell (2018b:48) reported usage of 3.33 litres compared to 4.94 litres used by Diageo (2018:8). Considering that both companies operate in the alcoholic beverage industry, the expression of water efficiency ratios could provide valuable and comparable information to stakeholders.

Referring back to Table 5-8(a), an overall p-value of 0.275 was recorded for the targets and measures construct. This was confirmed in Table 5-8(b), where none of the elements in the targets and measures construct recorded p-values lower than 0.05. In this respect, $H_{3\ (TM1\text{-}5)}$ is rejected with no statistically significant difference between the groups' means.

Analysing the relationship between the targets and measures construct and IR status, the Spearman's correlation coefficient revealed rho = -0.193, which was statistically insignificant (Appendix D). Table 5-8(c) includes the targets and measures construct into the second relationship analysis – the regression model.

Table 5-8(c) reveals that the firms' IR status does not have a unique association with the targets and measures construct. A p-value of 0.974 implies that the relationship between the firms' IR status and targets and measures construct is statistically insignificant within the regression model.

Table 5-8(c): Targets and measures construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta (β)			Tolerance	VIF
(Constant)	-80.761	66.988		-1.206	0.235		
IR (0) / Not IR (1)	**0.495**	**14.862**	**0.007**	**0.033**	**0.974**	**0.265**	**3.773**
Conciseness (pages)	11.777	6.322	0.302	1.863	0.069*	0.437	2.290
Size (total assets)	10.507	7.349	0.301	1.430	0.160	0.258	3.874
Country Australia	-16.439	16.325	-0.234	-1.007	0.320	0.211	4.731
Country Global	1.357	17.057	0.017	0.080	0.937	0.240	4.168

[a.] Dependent Variable: TM_100

($R = 0.713$; $R^2 = 0.508$; Adjusted $R^2 = 0.451$; $F = 8.880$); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

H_3 is rejected.

5.3.4 IR and risk assessment

Water availability and the security of supply has been identified as the Rhodes Food Group's most significant environmental risk (Rhodes Food Group, 2018:49). Considering that the World Economic Forum (2018:1) identified water crisis as one of the top five risks in terms of impact from the years 2015 to 2018, the statement of Rhodes Food Group is not surprising. The CDP's global water report revealed increased water scarcity as the top risk driver – resulting in possible higher operating costs (CDP, 2017d:9). The CDP's guidance document for reporting on water compels the reporting organisation to indicate which contextual issues and stakeholders are factored into their water risk assessments (CDP, 2017c:49). However, the Water Footprint Network criticises that current reporting does not provide enough information for stakeholders to assess the various risks related to water scarcity and quality (Water Footprint Network, 2015:18).

Five elements (RA1 – RA5) were analysed within the risk assessment construct, where RA1 measures whether the company identified physical risks such as water stress, flooding and pollution. Through the second item (RA2), companies should provide detail on regulatory water risks, and disclose reputational risks such as tensions between local communities within the third element (RA3). The fourth element (RA4) requires the company report on procedures and methods used for their water risk assessments, while the stakeholders considered in their assessments should also be identified (RA5).

Premier Fishing and Brands Limited (2018:37) mentioned that the company considers their material matters in framing their approach to risk. Furthermore, the company stated that:

> *"Our approach to risk management evolves and is flexible with the relevant business needs in an ever-changing environment. Our audit and risk committee is tasked with enhancing the effectiveness of our risk management framework, and as such, we rely on a solid governance of risk to maintain the effectiveness of our audit and risk committee's activities."*

Correspondingly, Pioneer Foods (2018:1) stated that their report content was determined by applying the principle of materiality – and that their risk process integrated through all divisions and functions – formed the basis of the materiality process. More specifically, Tiger Brands (2018:27) stated that a risk is regarded as significant when its score exceeds the risk tolerance level set by the board. Moreover, the company acknowledges that the link between risks and material issues are complex, but noted how water supply risk in the Western Cape relates business continuity – one of their material matters (Tiger Brands, 2018:27). This illustrates the integrated nature of reporting on sustainability issues, by taking material matters, the risks involved, and how to govern them into consideration.

In connection with physical water risk disclosure (RA1), Grupo Nutresa (2017:182) stated that:

> *"The risk regarding availability, quality and accessibility of the water resources has been included in the Organisation's risk catalogue as an emerging one due to the fact that its operations may be interrupted by pressures related to the water resources."*

The greater part of South African companies identified the severe drought in the Western Cape as a major a significant physical risk. Identifying physical water risk motivated companies to implement innovative approaches to reduce water consumption, for example:

> *"Responding to the drought conditions in the Western Cape, we are implementing action plans to reduce the use of potable water by 40% in the short-term. This includes realising opportunities for alternative water sources – including, where feasible, substituting potable water with seawater – as well as implementing water use efficiency measures. Given the scale of the water crises, in 2018 the Oceana board agreed to invest R30 million in two desalination plants, one in St Helena Bay that produces 800,000 litres of water per day, and a second produces 600,000 litres of water per day at the Laaiplek facility. This has made a significant contribution to*

enhancing water security, both for the company and neighbouring communities" (Oceana Group, 2018a:68).

As a result of identifying physical water risk and good water governance, the Oceana Group (2018b:43) was able to secure the jobs of more than 2 000 employees.

Costa Group Holdings (2018a:25), Australia's leading grower, packer and marketer of premium quality fresh fruit and vegetables, disclosed their regulatory water risks (RA2) by stating that:

> *"If Costa's existing water rights are reduced by regulatory changes or if Costa is unable to secure sufficient water for the implementation of its growth projects, this could negatively impact on Costa's operational and financial performance. Costa regularly reviews its short and medium term water security and takes steps to secure access to additional water as and when required, together with continuing to invest in technology and growing techniques that improve water efficiency."*

Anheuser-Busch InBev (2018) stated that they are looking beyond their own operations and improving high-risk watersheds in the areas where they operate, with an ultimate goal to ensure water access and quality to the communities (RA3).

Select Harvests (2017:19), an Australian agri-food business, reviewed their water risk assessment (RA4) using the standard Aqueduct[5] water risk atlas which indicated that their northern region has a high baseline water stress. Similarly, Mondelez International (2017:11) utilises the results from the Aqueduct tool to help prioritise sites for focussed water reduction assessments. RCL Foods (2018:14) stated that they will invest in water-smart operations and influence local government and other key stakeholders for collective solutions in higher water risk areas, with the ambition to become a water smart business that continually seek new ways to reduce, reuse and "create" water. Table 5-9(a) presents the t-test for entire risk assessment disclosure construct between the IR and non-IR groups.

Table 5-9(a): Risk assessment construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Risk assessment (RA)	0	18	63.33	23.76354	0.012**	0.65	Supported
	1	31	42.26	32.42527			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

An overall p-value of 0.012 was recorded in Table 5-9(a) for the risk assessment construct, with an effect size of 0.65 – an indication of a medium effect. In this regard, H_4 stating that: "*There is a significant association between IR and water-related disclosure on risks*." is supported. This implies that there is a statistically significant difference on a 5% level between the IR and non-IR groups with regard to the risk assessment construct. The association measured between the difference of the groups' means signifies that the IR group outperforms the non-IR group in terms of risk disclosures. The t-test between the groups for each risk assessment element is provided in Table 5-9(b).

Table 5-9(b): Risk assessment elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
RA1: Disclosure of physical water risk	0	18	86.11	0.461	0.005***	0.67	Supported
	1	31	59.68	0.792			
RA2: Disclosure of regulatory water risk	0	18	66.67	0.686	0.047**	0.58	Supported
	1	31	45.16	0.746			
RA3: Disclosure of reputational water risk	0	18	41.67	0.786	0.418	0.24	Rejected
	1	31	32.26	0.755			
RA4: Procedures and methods of water risk assessments	0	18	63.89	0.575	0.017**	0.60	Supported
	1	31	38.71	0.845			
RA5: Stakeholders identified in water risk assessments	0	18	58.33	0.707	0.047**	0.55	Supported
	1	31	35.48	0.824			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Table 5-9(b) indicates that companies performing IR recorded higher mean values in each element (RA1 – RA 5) in the risk assessment construct, when compared to the non-IR group. The most significant difference originated in RA1 [26.43% (86.11% - 59.68%)], where companies practicing IR achieved an average of 86.11% when disclosing on physical water risks, compared to 59.68% by the non-IR group. The average disclosure rates declined from reporting on physical-(RA1), to regulatory-(RA2), and reputational (RA3) water risks. A notable difference of 25.18% (63.89% - 38.71%) originated between the IR and non-IR group of companies relating to the disclosure of procedures and methods used for water risk assessments (RA4), with an average score of 63.89% recorded by the IR group – opposed to 38.71%.

Considering that an integrated report should link information about strategy, risks and opportunities – and connect these to social, environmental, economic and financial issues – the higher disclosure averages by companies practicing IR is prominent. This is evident in the following statement of Quantum Foods (2018:10): *"Mitigating the risks and capitalising on the opportunities identified per material matter is integral to the execution of the Group's strategy".* Another example of identifying opportunities from water risk assessments in a response from the drought in the Western Cape (RA1), the Oceana Group (2018a:68) realised opportunities for alternative water resources – including, where feasible, substituting potable water with seawater – as well as implementing water use efficiency measures.

To encapsulate Table 5-9(b), $H_{4\ (RA1,\ 2,\ 4\ and\ 5)}$ is supported, indicating that there is a statistically significant mean difference between the groups – with the IR group outperforming the non-IR group. The effect sizes suggest a medium effect and ranged between 0.55 (RA5) and 0.67 (RA1). $H_{4\ (RA3)}$ was rejected with no statistically significant difference between the groups' means.

The Spearman's correlation coefficient revealed rho = -0.347 between the risk assessment construct and IR status – which is significant at a 5% level. From this analysis H_4 is supported. Table 5-9(c) presents the second relationship analysis in the regression model.

Table 5-9(c): Risk assessment construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta (β)			Tolerance	VIF
(Constant)	-131.953	54.536		-2.420	0.020		
IR (0) / Not IR (1)	**2.380**	**12.099**	**0.037**	**0.197**	**0.845**	**0.265**	**3.773**
Conciseness (pages)	7.970	5.147	0.229	1.549	0.129	0.437	2.290
Size (total assets)	18.803	5.983	0.605	3.143	0.003***	0.258	3.874
Country Australia	-32.827	13.290	-0.525	-2.470	0.018**	0.211	4.731
Country Global	-38.025	13.886	-0.547	-2.738	0.009***	0.240	4.168

[a] Dependent Variable: RA_100

($R = 0.767$; $R^2 = 0.589$; Adjusted $R^2 = 0.541$; $F = 12.311$); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

H_4 is rejected.

The IR status recorded a p-value of 0.845. Since the p-value is above the 5% level, there is no unique relationship between the IR status and the risk assessment construct. However, firm size and country global has a unique statistically significant contribution to the risk assessment construct with at a 1% level. The p-value of country Australia lies between 1% and 5%, which indicates a unique statistically significant relationship with the risk assessment construct.

5.3.5 IR and future-orientated information

The strategic approach and future orientation – one of the principles of IR – stipulates that an integrated report should provide insight into the organisation's strategy and how it relates to the organisation's ability to create value over the short, medium and long term (IIRC, 2013b:5). Kamala *et al.* (2016:589) mentioned that stakeholders seek future-orientated information, which displays the integration of environmental issues into core business processes. With this in mind, the Rhodes Food Group (2018:15) stated the following in their IR:

> *"Four environmental issues have been identified which could impact on the group's ability to create and sustain value in the future, namely energy and water consumption, waste and air emissions."*

Four elements were analysed within the future-orientated information construct (FO1 – FO4), where the first element (FO1) measured if the reporting organisation disclosed any forward-looking water information and furthermore quantified any future-orientated information. The second item (FO2) measured whether the company disclosed a long-term water strategy, and provide information on water which could affect value creation over the short, medium and long term (FO3). The final element (FO4) measured whether the company disclosed how their water risk assessments could affect the future success and growth strategy.

Pioneer Foods (2018:77) stated that sustainability KPIs are captured monthly on a dashboard that maps the Group's forward-looking sustainability journey, and that desired outcomes are defined according to goals, measurements and targets. Many reporting organisations utilised their quantified water information under the targets and measures construct (TM1 – TM5) as a basis to provide future-orientated disclosures in terms of water. For instance, Nestlé (2017b:80) aspires to reduce direct water withdrawals per ton of product in every category to achieve an overall reduction of 35% by the year 2020 – against achieved reduction in water withdrawals of 28.7% per ton of product since a baseline year of 2010.

Correspondingly, the Oceana Group (2018b:44) set a September 2020 target of 44% absolute reduction in potable water consumption, and British American Tobacco (2017b:27) aims to reduce water use to 3.17 m^3 of water per million cigarettes equivalent produced by 2025 – 35% lower against their 2007 baseline. Taking cognisance of the discussion and examples, it could be worthy to note that a reporting company at least have to calculate total water withdrawal (TM1), in order to calculate water efficiency ratios or set targets against a baseline year.

Distell (2018a:30) mentioned that they are committed to responsible water stewardship that takes their communities, consumers and the environment they operate into consideration. Furthermore identifying the need for a long term water strategy (FO2), the company stated that:

> *"Our long-term planning includes the implementation of grey water solutions at all sites nationally to reduce dependence on municipal water which will be initiated during the new financial year"* (Distell, 2018a:103).

Applicable to the third disclosure element, Nestlé (2017a:29) reported the following:

> *"Water, identified as a (creating shared value) CSV focus area, is also at the heart of our actions and we continue to reduce withdrawals of water per ton of product and help increase access to safe water and sanitation – our 2030 ambition is to strive for zero environmental impacts in our operations."*

As a result from water risk assessments (RA4), Pioneer Foods (2018:96) disclosed that:

> *"The severe drought experienced in the Western Cape was a major challenge for the Group's operations, compelling Pioneer Foods to implement comprehensive water response strategies aimed at securing business continuity in a water constrained future. The Group has also adopted a 'quick wins' approach to water-saving while, at the same time, investigating longer-term solutions and strategies. Additional water metres are being installed for detailed water audits aimed at driving targeted reductions in future."*

Additionally, the company revealed that in the coming years, they will focus intently on developing appropriate responses to water constraints – which are increasingly being felt across South Africa and the rest of the world.

The disclosures illustrate that a company needs to identify water as a material aspect (M1), in order to understand their context which they intend to govern (G2), with the intention to conduct water risk assessments (RA4) to identify physical water risks (RA1) – in an effort to provide future-orientated water information to manage this scarce resource. This reveals the integrated nature of disclosing on water information. Table 5-10(a) provides the t-test for the entire future-orientated information disclosure construct between the IR and non-IR groups.

Table 5-10(a):Future-orientated information construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Future-orientated information (FO)	0	18	52.78	27.30397	0.002***	0.99	Supported
	1	31	25.81	26.79698			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Table 5-10(a) reveals an overall p-value of 0.002 for the future-orientated information construct, with an effect size of 0.99 – an indication of a large effect. In this regard, H_5 stating that: "*There is a significant association between IR and water-related disclosure on future-orientated information*." is supported. This implies that there is a statistically significant difference between the IR and non-IR groups with regard to the future-orientated information construct. The association between the difference of the groups' means signifies that the IR group outperformed the non-IR group in terms of the future-orientated information construct. Table 5-10(b) displays the quantitative information on each element (FO1 – FO4) within the future-orientated information construct.

Table 5-10(b): Future-orientated information elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
FO1: Reports on future-orientated water information	0	18	77.78	0.616	0.004***	0.80	Supported
	1	31	46.77	0.772			
FO2: Identified the need for a long-term water strategy	0	18	50.00	0.767	0.024**	0.67	Supported
	1	31	24.19	0.677			
FO3: Provides information on water which could affect value creation	0	18	41.67	0.618	0.004***	0.88	Supported
	1	31	14.52	0.529			
FO4: Evaluated how water risk assessments could affect future growth and strategy	0	18	41.67	0.786	0.037**	0.61	Supported
	1	31	17.74	0.661			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is evident from Table 5-10(b) that significant differences were recorded in the mean values ranging from: 23.93% (FO4, lowest) to 31.01% (FO1, highest) – with companies practicing IR outperforming organisations from the non-IR group. The highest disclosure element was FO1, where companies implementing IR scored an average of 77.78% when disclosing future-orientated water information – as opposed to 46.77% recorded by the non-IR group. The average mean percentages declined from the first element (FO1) to the remaining items (FO2 – FO4) – evident of more detailed disclosures being required. For instance, element FO4 evaluates how water risk assessments could affect the future success and growth strategy of the organisation, where the IR group recorded an average score of 41.67% – in contrast to 17.74% scored by the non-IR group. The performance of the IR group of companies could be accounted to the fact that an integrated report requires a strategic approach and forward-looking information.

With reference to Table 5-10(a), the overall p-value recorded for the future-orientated information construct was 0.002, with an effect size of 0.99. This is in accordance to Table 5-10(b), where all the elements (FO1 – FO4) within the future-orientated construct recorded p-values lower than 0.05. In this regard, $H_{5\ (FO1\text{-}4)}$ is supported suggesting that there is a statistically significant difference between the groups' means, with the IR group outperforming the non-IR group.

Spearman's correlation coefficient revealed a statistically significant relationship at a 1% level between the future-orientated information construct and the IR status, with rho = -0.458 (Appendix D) – an indication of a medium effect. Table 5-10(c) includes the entire future-orientated construct within the regression model.

Table 5-10(c):Future-orientated information construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	**Unstandardised Coefficients**		**Standardised Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta (β)**			**Tolerance**	**VIF**
(Constant)	-95.624	49.113		-1.947	0.058		
IR (0) / Not IR (1)	**-19.723**	**10.896**	**-0.323**	**-1.810**	**0.077***	**0.265**	**3.773**
Conciseness (pages)	6.088	4.635	0.183	1.314	0.196	0.437	2.290
Size (total assets)	13.894	5.388	0.466	2.579	0.013**	0.258	3.874
Country Australia	-13.901	11.968	-0.232	-1.162	0.252	0.211	4.731
Country Global	-5.666	12.505	-0.085	-0.453	0.653	0.240	4.168

[a.] Dependent Variable: FO_100

($R = 0.798$; $R^2 = 0.637$; Adjusted $R^2 = 0.595$; $F = 15.119$); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

H_5 is rejected. *Sig $p < 0.1$ implies weak relationship

The IR status within the regression model recorded a p-value of 0.077, which lies between the 5% and 10% level. This signifies a weak, unique relationship between IR status and the future-orientated information construct – although the relationship is not statistically significant on a 5%

level. Moreover, it was found that firm size, with a recorded p-value of 0.013, had a unique statistically significant contribution on a 5% level to the future-orientated information construct.

5.3.6 IR and the supply chain

The focus on sustainability is rapidly increasing for companies along the agri-food supply chain, emanating from increased populations, growing concern from consumers and pressure to produce food (BASF, 2014:3; Rankin *et al.*, 2011:2). Meneses *et al.* (2017:73) reasoned that the challenge of feeding a growing population is intensified, as water is used throughout the food production chain at different stages which includes irrigation, processing, cooling, heating and cleaning. With this in mind, Distell (2018b:44) stated the following:

> *"We understand that our long-term sustainability is intrinsically linked to the natural resources on which we depend, from farm to consumer and back again. We must therefore ensure that our supply chain practices are efficient, agile and protect the environment on which we depend – while meeting our customers' requirements in full."*

The following statement by RCL Foods (2018:39) indicates their understanding of the WEF nexus:

> *"Being a large food company with a multi-tiered and geographically dispersed supply chain, we have an environmental footprint that extends right from raw material production to the end-users of our products. Scarcity of natural resources, limited land and climate change all impact on our ability to survive into the future, which makes it imperative for us to see and do things differently now. This is why we are working to come up with creative solutions to consume less fossil-fuel--based energy and fresh water, minimise our waste, and do more with what we have – including the waste we generate."*

Taking cognisance of these paragraphs and referring back to Chapter 3, the supply chain in the food, beverage and tobacco industry and WEF nexus, as well as the concept of integration emerged as a prominent issue.

Four elements featured in the supply chain construct (SC1 – SC4), where SC1 measures whether the company identified suppliers causing significant water-related impacts, and in addition quantified water withdrawal or discharge. Through the second item (SC2), the company reports whether it has a policy or strategy to manage water-related aspects in their supply chain. Water risk factors in the supply chain should be identified under the third element (SC3), and an understanding of the WEF nexus, by considering upstream and downstream role players in the supply chain (SC4), was measured in the final item.

According to the Ajinomoto Group (2018:55):

> *"Environmental problems cannot be solved merely by the efforts of one company. In all activities, from the procurement stage at the upstream part of the supply chain to development, production, logistics and communication with consumers, the Group acts in partnership with stakeholders while sharing common values and goals."*

This reveals that the Ajinomoto Group realises their responsibility within the supply chain while acting in partnership with various stakeholders – connecting to the stakeholder theory.

Nestlé (2017b:84) stated that their greatest challenge in water stewardship – as well as their biggest opportunity – lies in addressing impacts within their supply chains (SC1). With over 4 million farmers in their supply chain, the company works directly with over 700 000 of them (Nestlé, 2017a:32). Moreover, Nestlé (2017b:84) argued that:

> *"Significant improvements in water efficiency can be made through better agricultural techniques at a farm level. These help our suppliers be more productive and resilient, and ensure a reliable supply of raw ingredients for our products. We train farmers in water-scarce locations on water use, water quality and soil moisture, while our research and development teams develop drought-resistant cocoa and coffee trees. We are currently implementing water management action plans for coffee, sugar, dairy, rice and cereals in water-stressed areas. The farms, plantations and mills in these supply chains need to comply with the terms of our Responsible Sourcing Guideline, and take action to mitigate their impact on local water sources."*

Distell (2018b:29) disclosed the following information applicable to the third (SC3) and fourth (SC4) element:

> *"Our supplier code of conduct further requires all suppliers to care for the environment and ensure compliance with all applicable laws and regulations in the country where products or services are manufactured or delivered. We encourage our suppliers to track their environmental impact and measure things such as water consumption and electricity usage. In the year ahead, these measures will help us shape our risk assessment for suppliers."*

The following statement by Diageo (2018:52) renders an example of a company identifying and engaging with their suppliers:

> *"We continue to engage our tier one suppliers through our CDP Supply Chain Water Programme. This year, we contacted 103 of our largest suppliers to disclose their water management practices through this programme. Ninety per cent responded, with 61% reporting active targets. At the same time, our growing understanding and mapping of water risk in our supply chain, driven by our global water risk assessment of third-party operators (TPOs), is providing greater insight into which of our suppliers operate in water-stressed areas. In 2018 we completed water risk assessments of more than 100 TPOs, identifying more than 20 sites as being in water-stressed areas in 16 countries. This helps us to engage more TPOs with tools for water management, such as the water toolkit we began piloting in India this year. This will help their water management to improve alongside ours."*

The qualitative results above confirm that some companies understand the importance of water within their supply chain – realising that they can have a positive influence on their suppliers. Table 5-11(a) presents the t-test between the IR and non-IR groups for the entire supply chain construct.

Table 5-11(a):Supply chain construct: t-test – mean difference between IR/not IR groups

Construct	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect size	Hypothesis
Supply chain (SC)	0	18	47.9167	24.34812	0.146	0.38	Rejected
	1	31	35.8871	32.07120			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

It is evident from Table 5-11(a) that the overall supply chain construct recorded a p-value of 0.146 and an effect size of 0.38, which indicates a small to medium effect. In this regard, H_6 stipulating that: "*There is a significant association between IR and water-related disclosure on supply chain information*." is rejected. This implies that there is no statistically significant difference between the groups' means in terms of the supply chain information construct.

Table 5-11(b) provides the quantified information of the t-test for each element within the supply chain construct (SC1 – SC4).

Table 5-11(b): Supply chain elements: t-test – mean difference between IR/not IR groups

Sub-theme or elements	IR (0) / Not IR (1)	N	Mean %	SD	p-value	Effect sizes	Hypothesis
SC1: Identifies suppliers causing water-related impacts	0	18	36.11	0.575	0.119	0.47	Rejected
	1	31	22.58	0.568			
SC2: Policy and strategy to manage water-related aspects in supply chain	0	18	41.67	0.786	0.909	0.03	Rejected
	1	31	40.32	0.792			
SC3: Identifies water risk factors in their supply chain	0	18	58.33	0.707	0.206	0.33	Rejected
	1	31	43.55	0.885			
SC4: Understanding of the WEF nexus considering role players in supply chain	0	18	55.56	0.583	0.073*	0.45	Rejected
	1	31	37.10	0.815			

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)

Observed from Table 5-11(b), it is clear that the companies preparing integrated reports recorded higher mean values than the non-IR group. However, the differences between the IR and non-IR group are smaller when compared to the materiality-, governance-, risk assessment- and future-orientated constructs. The most significant difference could be noted under the fourth element (SC4), where the IR-group scored 55.56% and the non-IR group 37.10%. A minor difference (1.35%) was recorded under the second element (SC2), measuring whether the reporting company has a policy or strategy in place to manage water-related aspects in their supply chain.

It is worthy to note that the average mean percentages are quite low – exemplifying much room for improvement. Comparable to Table 5-11(b), the 2017 CDP Water report disclosed that 41% of the companies analysed engaged with their suppliers (CDP, 2017d:13). In agreement with the CDP (2017d:13), engaging with, and requiring suppliers to report on water could drive sustainable behaviour across the supply chain. As an example, Grupo Nutresa (2017:180) stated that 22 sustainability audits were performed on contractors and suppliers to verify aspects related to sustainable water resources.

Referring to Table 5-11(a), an overall p-value of 0.146 was recorded for the supply chain construct. This is confirmed in Table 5-11(b), where none of the elements in the supply chain construct recorded p-values lower than 0.05. In this respect, $H_{6\ (SC1\text{-}4)}$ is rejected, with no statistically significant difference between the groups' means.

Spearman's correlation coefficient – the first relationship analysis between the supply chain construct and IR status revealed rho = -0.209, which was statistically insignificant (Appendix D). Table 5-11(c) includes the supply chain construct in the regression model.

Table 5-11(c): Supply chain construct: regression analysis – relationship with IR/not IR groups

Coefficients[a]							
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta (β)			Tolerance	VIF
(Constant)	-105.269	56.316		-1.869	0.068		
IR (0) / Not IR (1)	**5.262**	**12.494**	**0.086**	**0.421**	**0.676**	**0.265**	**3.773**
Conciseness (pages)	6.689	5.315	0.200	1.259	0.215	0.437	2.290
Size (total assets)	14.461	6.178	0.485	2.341	0.024**	0.258	3.874
Country Australia	-26.540	13.724	-0.442	-1.934	0.060*	0.211	4.731
Country Global	-17.389	14.340	-0.260	-1.213	0.232	0.240	4.168

[a.] Dependent Variable: SC_100
(R = 0.724; R^2 = 0.524; Adjusted R^2 = 0.469; F = 9.475); ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ (two-tailed)
H_6 is rejected.

Table 5-11(c) reveals that the firms' IR status, does not have a unique association with the supply chain construct. A p-value of 0.676, implies that the relationship between the firms' IR status and the supply chain construct, is statistically insignificant within the regression model. Furthermore, firm size recorded a unique statistically significant contribution to the supply chain construct, with a p-value of 0.024.

5.4 SUMMARY

This chapter evaluated whether IR had any significance towards improved water-related disclosure, through testing the various hypotheses developed in Chapters 1, 2 and 4. T-tests, Spearman's correlation coefficient and multiple linear regression were implemented to test the different hypotheses (refer to section 4.8.5). Meaningful, qualitative observations from the analyses informed the quantitative results.

The t-test for each construct (H_1 to H_6) revealed statistically significant differences between the mean averages of the IR and non-IR group with regard to the materiality (H_1), governance (H_2), risk assessment (H_4) and future-orientated information (H_5) constructs. Moreover, the t-test for the main hypothesis (H_{main}) was supported, which explained that the firms who implemented IR outperformed the non-IR, with improved overall of water disclosures to their stakeholders.

Spearman's correlation coefficient was the first relationship analyses test between each construct (H_1 to H_6) and the IR status, and was statistically significant for the materiality (H_1), governance

(H_2), risk assessment (H_4) and future-orientated information (H_5) constructs. Additionally, the main hypothesis (H_{main}) was statistically significant in Spearman's correlation, which implied that when a firm implemented IR, the total water disclosure index score was likely to increase.

Multiple regression analyses were implemented as an extension to Spearman's correlation and controlled for other variables in the second relationship test. The materiality construct (H_1) was supported in the regression model, which expressed that the IR status of a firm had a unique, statistically significant relationship with the construct. This signified that the IR group disclosed improved water-related information applicable to the materiality construct. Furthermore, firm size (total assets) had a unique statistically significant contribution related to the governance (H_2), risk assessment (H_4), future-orientated information (H_5), and supply chain constructs (H_6). This signified that larger companies produced improved water disclosures within the constructs mentioned above.

The findings from this chapter, together with the qualitative observations from the analyses, infer the conclusions and recommendations made in Chapter 7. The following chapter compares the water disclosures of the firms listed on the three indices in the food, beverage and tobacco industry.

CHAPTER 6

RESULTS: COMPARISON BETWEEN COUNTRIES

6.1 INTRODUCTION

The growing trend in sustainability reporting is undisputable, and stakeholders are increasingly concerned with the quality of reported information (Krivačić, 2017:3). Lokuwaduge and Heenetigala (2017:439) mentioned various reporting frameworks that are not comparable between companies in the same or different sectors, and that the information disclosed differs in terms of content, boundary, style and complexity. In this sense, different indices, which represented firms listed on the JSE in South Africa, the ASX in Australia, and global companies listed on the DJGSI, were selected. This chapter compares the water disclosures of the firms listed on these three indices in the food, beverage and tobacco industry.

The food, beverage and tobacco industry was selected as water is the main ingredient for many products (Jones *et al.*, 2015b:117). The food, beverage and tobacco industry represents the integrative approach of this study, which can be explained from two perspectives. Firstly, the prominent role water plays in the food, beverage and tobacco industry – within the concept of the WEF nexus – cannot be ignored. Secondly, the quest for concise, comparable, and holistic water information to the stakeholders of a company, should be provided.

Initially, the overall comparison of all three indices towards the total water disclosure index is provided, followed by comparing the different groups to each construct.

6.2 COMPARING OVERALL PERFORMANCE

This section provides the overall results of the following indices:

- JSE – South Africa
- ASX – Australia
- DJGSI – Global companies

The descriptive results within Table 6-1 intends to provide an overall picture of the performance of all the food, beverage and tobacco companies per index and country. All tables presented in this chapter, are the researcher's own compilation – unless indicated differently.

Table 6-1: Comparing overall performance

Country	N	Mean %	SD	Std. Error	95% Confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
South Africa	16	52.55	21.145	5.286	41.278	63.813	16.67	81.48
Australia	20	19.72	20.780	4.646	9.996	29.447	0.00	61.11
Global	13	64.53	19.063	5.287	53.009	76.050	25.93	94.44
Total	**49**	**42.33**	**27.977**	**3.996**	**34.291**	**50.364**	**0.00**	**94.44**

It is evident from Table 6-1 that 16 companies were listed on the JSE in South Africa, the top 20 companies were selected per market capitalisation in Australia, and 13 companies were listed in the food, beverage and tobacco industry on the DJGSI. The South African companies achieved an overall average of 52.55% measured against all the items in the water disclosure index. The 13 companies listed on the DJGSI, performed the best, with a mean percentage of 64.53%. The companies listed on the DJGSI were selected to serve as a benchmark for best practices, and considering the listing requirements of the DJGSI, this performance could be expected. Australia performed the worst, adhering with 19.72% of the criteria on the water disclosure index. Altogether, the 49 companies recorded an average of 42.33%. Taking cognisance of the importance and use of water in the food, beverage and tobacco industry, this is an alarmingly low disclosure percentage.

In order to explain the differences between the three groups (three indices), the statistical technique ANOVA was used (Pietersen & Maree, 2016a:255). Table 6-2 presents the results, where the sum of squares (SS) explain the total dispersion among the three-sample means. The larger the sample means (SS between groups) differ, the more likely it is that the population means will also differ. In essence, the SS within groups presents the total amount of dispersion within the groups. If all the information is combined a test statistic F could be calculated by dividing the two mean squares. A large F value is an indication that the means of the groups differ substantively and is used to determine whether the test is statistically significant (p-value or Sig). The p-value of 0.000 indicates that there are significant differences among the groups – as illustrated in Table 6-2.

Table 6-2: Comparing the three indices with the total water disclosure index

Index_100					
Description	**Sum of squares**	**df**	**Mean square**	**F**	**Sig.**
Between Groups	18299.066	2	9149.533	21.838	0.000***
Within Groups	19272.950	46	418.977		
Total	**37572.016**	**48**			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

Attributable to significant differences among groups displayed in Table 6-2, additional tests known as post-hoc comparisons were performed to identify where these differences occur (Pallant, 2016:211). Tukey's Honestly Significant Different test (HSD), one of the most commonly used tests, was utilised to indicate significant differences among the groups. Table 6-3 presents the results of the Tukey test for the water disclosure in index in total.

Table 6-3: Results of the Tukey test for the entire water disclosure index

Index_100: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	19.7222	
South Africa	16		52.5463
Global	13		64.5299

It is noticeable from Table 6-3 that Australian companies did not perform in the same sub-group as the companies from South Africa and those listed on the DJGSI. Essentially, companies listed on the DJGSI and the JSE disclosed statistically significant more information when measured against Australia's water disclosure. Table 6-4 provides a holistic view of reporting within the different groups for each construct measured in the water disclosure index.

Table 6-4: Comparison between groups per construct

Construct	Description	Sum of squares	df	Mean square	F	Sig.
Materiality	Between Groups	21426.082	2	10713.041	7.320	0.002***
	Within Groups	67323.918	46	1463.563		
	Total	88750.000	48			
Governance and management approach	Between Groups	22453.830	2	11226.915	15.556	0.000***
	Within Groups	33199.231	46	721.722		
	Total	55653.061	48			

Table 6-4: Comparison between groups per construct (continues)

Construct	Description	Sum of squares	df	Mean square	F	Sig.
Supply chain	Between Groups	15907.427	2	7953.714	13.716	0.000***
	Within Groups	26675.481	46	579.902		
	Total	42582.908	48			
Targets and measures	Between Groups	22522.080	2	11261.040	14.491	0.000***
	Within Groups	35747.308	46	777.115		
	Total	58269.388	48			
Site information	Between Groups	11942.308	2	5971.154	11.912	0.000***
	Within Groups	23057.692	46	501.254		
	Total	35000.000	48			
Risk assessment	Between Groups	17154.327	2	8577.163	13.584	0.000***
	Within Groups	29045.673	46	631.428		
	Total	46200.000	48			
Future-orientated information	Between Groups	20839.543	2	10419.772	22.128	0.000***
	Within Groups	21660.457	46	470.879		
	Total	42500.000	48			

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

As indicated in Table 6-4, the p-values of all the constructs are below 0.05, implying statistically significant differences within each construct. For this reason, further investigation is required to reveal significant differences between the groups within each construct.

6.3 COMPARISON BETWEEN GROUPS WITHIN EACH CONSTRUCT

Each construct in the water disclosure index is presented in order to uncover differences among the performance between groups. Under each construct, two tables containing quantitative information are presented. The first table provides descriptive results per country (index), and the second table presents the results from the Tukey test to reveal significant differences among groups. Meaningful qualitative information from the reports is presented together with the statistical data.

Applicable data from previous studies is provided to compare to the results from this study. For example, ACCA (2010:8) analysed the water disclosures of 32 of the largest Australian companies listed on the ASX from high-impact sectors – with specific exposure to water-related risk or opportunity. The CDP global water report 2017, the CDP European water report 2017 and CDP South Africa water report 2017 are also utilised to compare with the results from this study

(CDP, 2017a; CDP, 2017b; CDP, 2017d). The subsequent sections (6.3.1 to 6.3.7) address each construct.

6.3.1 Disclosure on materiality

Materiality could be considered as the filter to determine whether information is considered important and useful to stakeholders – and connects with the stakeholder theory – as the company should disclose important information that could have an impact on their stakeholders (Ngu & Amran, 2018a:4). Taking cognisance that the companies under investigation operate in the food, beverage and tobacco industry, and within context of the WEF nexus, it could be expected that the companies on these listings identify water as a material aspect for their business. Table 6-5 provides the descriptive results.

Table 6-5: Materiality disclosure per index/country

Country	N	Mean %	SD
South Africa	16	64.06	41.80186
Australia	20	21.25	31.70070
Global	13	63.46	42.83615
Total/average	**49**	**46.43**	**42.99952**

Table 6-5 reveals that South African companies listed on the JSE performed the best, disclosing an average of 64.06%, equivalent to the companies listed on the DJGSI, who scored 63.46%. Australian companies listed on the ASX, operating in a water-stressed country, recorded an average of 21.25% when identifying water as a material aspect (M1) and describing the process (M2). Table 6-6 displays the results of the Tukey test.

Table 6-6: Tukey test for materiality

Materiality: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	21.2500	
Global	13		63.4615
South Africa	16		64.0625

The Tukey test in Table 6-6 exposes significant differences, grouping the DJGSI-listed companies and South African companies together – with Australia grouped separately. Correspondingly, the Australian companies in ACCA's study scored an average of 33% in terms of materiality disclosure (ACCA, 2010:17), related to the reporting rate of 21.25% recorded in this study. The results from Australian companies indicate distressingly low disclosure rates, relative to South Africa and global firms, signalling that Australian companies should consider water as a material aspect – especially in the food, beverage and tobacco industry.

After identifying water as a material aspect and providing a description of recognised impacts (M1), the reporting company should describe the process and identify stakeholders (M2). The following statement by Quantum Foods (2018:10) indicates the process followed to determine material matters:

> *"Senior decision makers of the Group were involved in a structured process to identify and prioritise the following economic, environmental and social matters for inclusion in this report. These matters were presented to and approved by the Board. These matters have further been linked to our strategic themes and to the risks faced by Quantum Foods. Quantum Foods has identified the matters that could significantly impact its value creation abilities. Mitigating the risks and capitalising on the opportunities identified per material matter is integral to the execution of the Group's strategy."*

Danone (2017:1) listed on the DJGSI, disclosed their view on how the company deals with materiality as follows:

> *"Responsible and sustainable business involves engaging with our stakeholders to refine our strategy. This year, we have renewed our materiality matrix, a key tool to define our Corporate Responsibility strategy, identifying our priorities according to their importance for external and internal stakeholders as well as their impact on Danone's business success. The 41 key topics that have been identified in collaboration with our stakeholders are shown in our latest matrix below. Covering environmental, social, societal, business and governance aspects, these topics have been evaluated to determine sustainability risks and opportunities for Danone."*

In order to refine their understanding of the key challenges and address them strategically, Danone (2017:1) conducted a materiality assessment using a three-step process:

- **Identification:** An initial internal consultation and a review of existing literature that enabled us to identify an exhaustive list of topics that are directly or indirectly connected to Danone's business and stakeholders' interests.

- **Assessment:** This step covered both exploratory research which helped to identify the most critical topics for us to address and a quantitative survey conducted worldwide, involving some 130 Danone employees, more than 200 professional stakeholders and 17 key customers.

- **Prioritisation:** Guided by these insights and 360-degree feedback, the final step consisted in defining the relevant thresholds that identify the 14 key topics that Danone must address as priorities. The topics were ranked according to their potential impact on the activity and their importance for the interviewed stakeholders.

Danone (2017:2) refers to the process specified above as their “materiality methodology” – and can be considered as one of the best practices reviewed in the analysis. It also provides an illustration of how the company incorporated their stakeholders into the materiality process in order to produce their materiality matrix – where water management and stewardship, and access to safe drinking water was identified (Danone, 2017:3).

As mentioned by the GRI (2016a:14), by confining to the materiality principles, an organisation is expected to report more consistent over time – which would also facilitate comparability. An overall average disclosure rate of 46.43% was recorded for the materiality construct, an indication of below average performance. Contemplating that identifying water as a material aspect in the food, beverage and tobacco industry could be considered as a first step in determining disclosure items – this percentage is not satisfactory.

6.3.2 Disclosure on governance and management approach

Governance and management systems are required to manage water – therefore, water governance in the boardroom is essential (CDP, 2017d:13). Woodhouse and Muller (2017:226) describe water governance as an all-inclusive framework where objectives are set, targets are formulated, and the outcomes controlled. Consequently, to report on water governance aspects is imperative for companies listed on each of the indices. Water governance aspects that deal with the company’s water strategy, identifies how water fits into the EMS of the company (G1). The reporting organisation should understand the context in which it operates in terms of water stress, flooding, water quality and regulatory uncertainty (G2). Water-related aspect should be included as part of the company’s business model (G3), and there should be board-level oversight reported for water governance (G4). The final element measured under the governance construct analysed whether the reporting organisation has water-related policies, commitments, goals, projects or programmes (G5). Table 6-7 presents the descriptive results on governance for each group.

Table 6-7: Governance disclosure per index/country

Country	N	Mean %	SD
South Africa	16	68.75	30.08322
Australia	20	26.50	26.80829
Global	13	71.54	22.30327
Total/average	**49**	**52.24**	**34.05053**

It is clear from Table 6-7 that companies listed on the DJGSI achieved an average of 71.54% and within reach, the JSE-listed companies scored 68.75%. In contrast, the Australian companies disclosed an average of 26.50% measured against the five elements in the governance construct. Table 6-8 provides the results of the Tukey test.

Table 6-8: Tukey test for governance

Governance: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	26.5000	
South Africa	16		68.7500
Global	13		71.5385

Referring back to Table 6-4, there is a significant difference between the groups with a recorded p-value of 0.000. After performing the Tukey test, the South African firms and companies listed on the DJGSI are grouped together once more. This signifies a higher level of disclosure practices compared to the Australian companies – grouped separately.

Alluding to the study of ACCA (2010:21), the 32 Australian companies analysed scored an average of 25% for the water governance criteria – corresponding to the 26.50% recorded in this study. ACCA (2010:22) argued that there seems to be a lack of strategic water specific management systems on a company-wide basis. Regrettably, this appears to be the case in this research – even 9 years later.

The CDP (2017b:4) report disclosed that 93% of South African companies have board-level oversight for water, and 91% of companies have water management integrated into their business strategy. The lower average disclosure rate by South African companies in this study (68.75%) could be attributed to the intention of water disclosure index to measure the quality of reporting practices, including additional elements for governance within the index, or only applying focus to the food, beverage and tobacco industry.

Mondelez International (2017:24) listed on the DJGSI, stated that sustainability is one part of their three global growth strategies "Grow our Impact". Moreover, the company mentioned that:

> *"Our sustainability goals are part of our strategic planning process, and therefore, progress and key activities are regularly reported to the Board and the business unit leadership teams. Water is a key focus area in our sustainability strategy."*

By disclosing statements resembled above, a company demonstrates that water is included into their strategic planning process.

A company listed on the ASX, and operating in the dairy industry, recognised the following:

> *"Many of the world's sustainability challenges are around food. With a billion more people to feed by 2030, we need to take urgent action. The growing, making and distribution of food across the world has a massive environmental, social and economic footprint"* (Fonterra, 2018a:26).

Furthermore Fonterra (2018b:48) intends to establish sustainable water catchments in the regions they operate, working with others to help protect and regenerate waterways to meet specific environmental aspirations of the local community.

A food production company, Grupo Nutresa (2017:184), stated that it understands the environmental impact of agricultural production – an activity that uses between 60% and 70% of the water consumed on the planet. Moreover, they argued that:

> *"This is a situation that becomes even more significant due to the changes in the availability of this essential resource, which are caused by climate change and the expected increase in the demand by the agricultural sector. That is why the Organisation has actively participated in the workshops and collective work initiatives in Colombia and Peru which address the matters related to water productivity and hydrological risk"* (Grupo Nutresa, 2017:184).

The qualitative disclosures encapsulated in the paragraphs above provide some examples of companies understanding their context within the concept of the WEF nexus and interrelated water issues faced in the food, beverage and tobacco industry. With an overall average of 52.24% for all companies analysed, it is apparent that water governance needs more attention. The results indicate that water governance is not visible in all the companies' boardrooms and can be coupled with the overall disclosure rate on materiality of 46.43%.

6.3.3 Disclosure on targets and measures

Under this construct companies have to record their water withdrawal (TM1) and discharge (TM2) from various sources, preferably quantifying each source. Information on water quality (TM3), consumption (TM4) and total volume of water recycled and reused (TM5) should also be disclosed. Table 6-9 provides the descriptive results for each group.

Table 6-9: Targets and measures per index/country

Country	N	Mean %	SD
South Africa	16	41.25	33.24154
Australia	20	16.00	24.36564
Global	13	69.23	25.64551
Total/average	**49**	**38.37**	**34.84172**

Assessing Table 6-9, it is evident that the companies listed on the DJGSI, with a disclosure score of 69.23% outperformed the South African (41.25%) and Australian firms (16.00%). Table 6-10 presents the results of the Tukey test.

Table 6-10: Tukey test for targets and measures

Targets and measures: Tukey $B_{a,b}$		Subset for alpha = 0.05		
Country	**N**	**1**	**2**	**3**
Australia	20	16.0000		
South Africa	16		41.2500	
Global	13			69.2308

Alluding back to Table 6-4, the recorded p-value of 0.000 illustrates significant differences among the groups which requires further investigation. Accordingly, the Tukey test in Table 6-10 separates the three groups from each other.

ACCA (2010:20) divided targets and measures into consumption and implementation categories. The Australian companies recorded an average score of 50% under the consumption category and 26% for the implementation criterion. ACCA (2010:24) stated that full quantitative disclosure was absent from most companies, especially in the areas of water discharge and recycling. The 32 companies analysed in ACCA's study achieved higher percentages when compared to the 16.00% recorded in this study. The difference could be ascribed to various industries analysed in the study of ACCA, suggesting that companies in the food, beverage and tobacco industry in

Australia have much room for improvement. The CDP (2017d:13) revealed that 466 of 742 of the world's largest publicly listed companies (63%) had a good grasp of measuring and monitoring water withdrawals, discharges, quality and consumption. The companies listed on the DJGSI in this study achieved a higher score of 69.23%. The Tukey test in Table 6-10 verifies that the firms listed on the DJGSI could be viewed as organisations implementing best practices. This signifies that the firms listed on the DJGSI are taking the lead in the food, beverage and tobacco industry with regard to water disclosure on targets and measures – which other firms could utilise as examples to improve.

Examples of best practices observed when performing the analysis, which could improve the comparability of water reporting, was the disclosure of water intensity/efficiency ratios. The companies disclosing water efficiency ratios are utilising their measurements from total water withdrawal (TM1), to calculate an efficiency ratio in terms of water used per kilogram of finished product or per litre of packaged product. For example, ThaiBev (2018:94) listed on the DJGSI divided their water intensity ratios per product line – in order to advance comparability as follows:

> *"In the beverage business, the water intensity ratio was reduced by 1.37 hectolitres per hectolitre of finished product, or 16.72% compared to 2014 as a baseline year. For the food business, the water intensity ratio was be reduced by 0.06 hectolitres per kilogram of finished products, or 22.86% compared to 2017."*

Additionally to water efficiency ratios observed, Grupo Nutresa (2017:182) listed on the DJGSI stated that they are working on the measurement of their water footprint, which measures the direct and indirect water consumption, as medium- and long-term plans. This connects with the supply chain construct in this study, which is applicable to the food, beverage and tobacco industry – measuring water consumption throughout a product's value chain. This illustrates the integrative nature of water disclosure within the industry under investigation. The arguments above relates to the statement of Meneses *et al.* (2017:73) who reasoned that water is used throughout the food production chain at different stages which includes irrigation, processing, cooling, heating and cleaning. In this sense, connecting back to the targets and measures construct, water reconditioning and the reuse of water in the food processing industry could add to the improvement of water management and sustainability in the industry.

The following disclosures by Kellogg's (2018:32) is presented in connection with the discussions in the paragraph above:

> *"Kellogg is committed to implement water reuse projects in at least 25% of our plants by 2020 from a 2015 baseline, with a specific focus on plants located in water-*

stressed areas. Kellogg has committed to responsibly sourcing our ten priority ingredients as determined by environmental, social, and business risk by 2020 by partnering with suppliers and farmers to measure continuous improvement."

Although the firms listed on the DJGSI performed the best with a disclosure score of 69.23%, the overall performance of all 49 firms for the targets and measures construct was 38.37%. Referring back to the literature, Mueller *et al.* (2015:31) stated that quantifying water impacts are key to enable firms to make effective management decisions. However, full quantitative disclosure was nevertheless lacking by many firms within the elements in the targets and measures construct.

6.3.4 Disclosure on risk assessment

The following statement by Mueller *et al.* (2015:41) encapsulates the significance of water risks companies face: "While many water-related issues will stem from lack of adequate quantity or quality of water (physical risks), a deeper understanding of water withdrawal limits and more stringent water quality discharge standards (regulatory risks) and public scrutiny regarding community water needs (reputational risk) is important." With regard to the risk assessment construct, the water disclosure index measured whether firms disclosed physical (RA1)-, regulatory (RA2)-, and reputational (RA3) risks. Furthermore, the procedures and methods used for water risk assessments should be disclosed (RA4), and stakeholders should be considered (RA5). Table 6-11 presents the results for each group in the risk assessment construct.

Table 6-11: Risk assessment per index/country

Country	N	Mean %	SD
South Africa	16	64.38	24.48639
Australia	20	27.50	25.10504
Global	13	66.92	25.94373
Total/average	**49**	**50.00**	**31.02418**

It is clear from Table 6-11 that companies listed on the DJGSI performed the best, with an average disclosure score of 66.92% in terms of the risk assessment construct. Within reach, firms listed on the JSE in South Africa recorded an average score of 64.38%. Conversely, Australian companies only managed a disclosure rate of 27.50%. Table 6-12 displays the result of the Tukey test among the three groups.

Table 6-12: Tukey test for risk assessment

Risk assessment: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	27.5000	
South Africa	16		64.3750
Global	13		66.9231

The Tukey test in Table 6-12 reveals significant differences, grouping the DJGSI firms together with companies listed on the JSE in South Africa. This signifies higher disclosure levels within the risk assessment construct than the Australian firms which are grouped separately.

ACCA (2010:26) addressed water-related risks mostly under materiality in their study of 32 Australian firms. Results revealed that 25 out of the 32 firms identified water as a material issue, however, only 13 firms disclosed details of the areas in their business where water was seen to be an operational risk (physical) (ACCA, 2010:17). ACCA (2010:26) concluded that limited evidence was disclosed on how water-related risks are strategically addressed at management level, with little indication on initiatives targeting risks to communities. The results above uncover the integrated nature of disclosing water-related risks, where a firms identifies water as a material aspect, but should continue to identify the various risks in order to strategically address these risks at management level.

Firms responding to the CDP's global water report of 2017 identified increased water scarcity as the top risk driver resulting in higher operating costs (CDP, 2017d:9). The identification and assessment of water-related risks and opportunities that might affect a firm's financial performance, are crucial elements to communicate to key stakeholders. Taking cognisance of the above, Premier Fishing and Brands Limited (2018:42) stated the following:

> *"Regular communication and consultation took place between those who are involved in the identification and assessment of risks and those who are involved in the treatment, monitoring and reviewing of risks. Effective communication took place among all stakeholders in the risk management process."*

In essence, considering and communicating risk assessments to all stakeholders illustrates the connection with the stakeholder theory.

With reference to the paragraph above, the fifth element within the risk assessment construct in the water disclosure index (RA5) measures whether the reporting firm disclosed positive and negative water-related issues to their stakeholders. As stated by the Natural Capital Coalition (2015:5) a negative impact such as pollution or poor water quality could result in companies experiencing higher risks.

Observed from the literature review – and following previously observed trends – it was concluded that companies mostly communicate positive issues, and avoid the disclosure of negative actions that could damage their corporate reputation (Braam *et al.*, 2016:726; Hahn & Lülfs, 2013:401). Correspondingly, the results from Michelon *et al.* (2015:73) suggest that the use of CSR reporting practices are not associated with higher disclosure quality, but rather symbolic. This relates to the legitimacy theory, where CSR disclosure is utilised as a symbolic legitimacy tool (Cho *et al.*, 2015:29). Sánchez-Hernández *et al.* (2017:16), addressing water reporting in 22 firms in the agri-food sector in South Africa, found few cases of negative disclosures which could damage a firm's corporate reputation.

Acknowledging that the majority of the reported information was positively orientated, this study encountered negative water-related disclosures. For example Fonterra (2018b:47) reported the following:

> *"In the past year, our operational sites had five incidents of non-compliance with environmental regulations which resulted in fines or non-monetary sanctions. All occurred in New Zealand including: a fine of $750 for discharging storm water in an unauthorised manner from our Kapuni site; a fine of $500 for taking more water from a stream than allowed by our permit at our Whareroa site; a fine of $750 for exceeding wastewater discharge consent limits from our Whareroa site; and two fines of $750 each for two separate incidents of discharging milk solids to water at our Whareroa site."*

Similarly, British American Tobacco (2017a:1) stated:

> *"In Russia, a BAT subsidiary received a fine of approximately £1,200 for exceeding regulatory limits for iron levels found in the water discharged from our factory. The site has a wastewater management plan and continues to monitor iron levels."*

The negative water-related disclosures above suggests that these firms did not only focus on their own corporate reputation, but also considered negative issues which could affect their stakeholders. Ernst & Young (2012:1) stressed the need for firms to focus on water-related risks, especially in water-intensive sectors such as agriculture, forestry, and food and beverage companies. The CDP called for water risk to be viewed holistically and in a systematic manner in the South African water report of 2017, however the overriding response of firms was not systematic in nature (CDP, 2017b:3). Referring back to Table 6-11, the overall disclosure average recorded for the risk assessment construct was 50%, which indicates much room for improvement for firms in the food, beverage and tobacco industry in this study.

6.3.5 Disclosure on site-specific information

In connection with the risk assessment construct above, some firms operate in various geographical locations, which calls for site-specific information as illustrated by the following disclosure from General Mills (2018:23):

> *"Water issues are local, so we take a risk-based approach to address the specific challenges facing targeted geographies. We follow our four-phase approach to develop and implement watershed health strategies in eight priority watersheds across our worldwide operations."*

The NBIM has supported the CDP water program since 2009, and is committed to promote transparent water measurements and reporting (NBIM, 2015:5). The NBIM states that sector- and geographic level disclosure expectations are directed at companies with operations in high water dependency areas, and in regions exposed to water scarcity. Moreover, to understand the operational business resilience of companies to local water challenges and the relevance of risk mitigation strategies, sector-level and geographic information could add value (NBIM, 2015:2). Site-specific information within the water disclosure index analysed whether the reporting firm provides total water accounting data and coordinates for each facility (SI1), and disclosed water risk assessments at geographical scale (SI2). Table 6-13 presents the descriptive results for site-specific information for each group.

Table 6-13: Site-specific information per index/country

Country	N	Mean %	SD
South Africa	16	18.75	21.40872
Australia	20	7.50	14.28101
Global	13	46.15	32.02563
Total/average	**49**	**21.43**	**27.00309**

It is noticeable from Table 6-13 that the firms listed on the DJGSI performed the best, with an average disclosure rate of 46.15% for site-specific information. The firms listed on the JSE in South African and the ASX in Australia, performed poorer with 18.75% and 7.5% respectively. Table 6-14 presents the results of the Tukey test between the three groups.

Table 6-14: Tukey test for site-specific information

Site-specific information: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	7.5000	
South Africa	16	18.7500	
Global	13		46.1538

It is evident from the Tukey test in Table 6-14 that the Australian- and South African firms are grouped together. The firms listed on the DJGSI are grouped separately, which signifies improved disclosure on site-specific information, however the JSE- and ASX listed companies performed worse with regard to disclosures on site-specific information.

Leong *et al.* (2014:98) mentioned that firms can show that they are not manipulating their reports by singling out the best stories and results across their operations, by providing consistent information across all sites. The study of ACCA (2010) did not measure whether firms disclosed site-specific information. The CDP requests reporting firms to indicate whether any geographical information and risk assessments at each site has been conducted, but did not include any disclosure percentages in their 2017 water report.

A qualitative contribution with regard to site-specific information was evident in the following disclosure from British American Tobacco (2017b:31):

> *"While our manufacturing processes do not use as much water as other industries, we understand the reality of increasing water scarcity in some parts of the world and this has led us to expand the scope of our water risk assessments. Previously only conducted at our strategic, high-risk sites, these assessments were completed by all our factories and green-leaf threshing sites in 2017. We identified where 13 of our operational sites are based, across nine countries, as high-risk locations for water scarcity. We continue to implement action plans resulting from the assessments."*

British American Tobacco (2017b:31, 33) continued by identifying Chile as a water-stressed region and responded as follows:

> *"Chile is a country where water can be scarce, so our efforts to use it efficiently are all part of being a responsible business. We were one of the first operations across BAT to have conducted a water risk assessment, which helped identify opportunities to improve water efficiency. By applying these simple measures, some sites, such*

as our cigarette factories in Kenya, Chile, Singapore and Bangladesh saw significant reductions in the amount of water withdrawn."

Another firm listed on the DJGSI, Fonterra (2018a:30) identified one of their sites, and stated that:

> *"Our Pahiatua site is in a sensitive water zone, both for the availability of groundwater and the discharge of wastewater. By capturing the water evaporated as steam from milk as it is dried into powder, we can condense it and use it instead of using ground water. Since FY15 we have improved water efficiency at Pahiatua by 64%. With changes made this year, we expect savings of about 500,000 litres per day during the peak season for FY19."*

Kellogg's (2018:36) also listed on the DJGSI mentioned that water is both a global and local issue and assess and determine an overall water risk score for each of their manufacturing facilities. The firm further mentioned that:

> *"Based on our most recent assessment, our locations with the highest water risk are in Brazil, India, Mexico, Russia and Spain; and Nebraska and California in the US While all Kellogg manufacturing facilities have established water efficiency goals and are implementing water-saving initiatives, we are paying especially close attention to water use in these locations. We are updating this assessment in 2018."*

Taking note of the drought experienced in the Western Cape province in South Africa, the Oceana Group (2018b:42) turned their focus to this region, and disclosed the following:

> *"The additional water sourcing at our CCS Epping and Paarden Eiland facilities cater for our facilities in the City of Cape Town and the desalination plants supply our facilities on the West Coast. At each of our operations, we assessed water requirements and compiled a detailed plan to provide potable water for operational and drinking purposes, grey water or potable water for sanitation purposes, and arrangements to provide a daily allowance of water to employees for use in their homes in the event of Day Zero."*

Most of the qualitative contributions were analysed from firms listed on the DJGSI, which is also evident in the results of the Tukey test, grouping them separately from the companies listed in South Africa and Australia. This signifies that the firms listed on the DJGSI – perceived as firms applying best practices – outperformed the other two groups. However, the disclosure score achieved for the DJGSI firms was 46.15%, which implies that even the firms regarded as implementing best practices, have not yet fully comprehended site-specific disclosures on water.

The overall rate for site-specific information for all three groups was only 21.43% – the worst of all the constructs.

6.3.6 Disclosure on future-orientated information

In order to address long-term business-related risks, a company-wide strategy for water management is required (Signori & Bodino, 2013:126). Moreover, Ernst & Young (2012:18) mentioned that long-term water management should be a strategic concern. In this sense, strategic content could provide stakeholders with a more forward-looking vision of the company's intentions. The future-orientated information construct measured whether the reporting firm disclosed any forward-looking water information (FO1) and, in connection with the statements above, if the company disclosed a long term water strategy (FO2). Information on water which could affect value creation over the short, medium and long term (FO3), and how water risk assessments could affect the future success and growth strategy (FO4) was also included in the water disclosure index. Table 6-15 provides the descriptive results for future-orientated information for each group.

Table 6-15: Future-orientated information per index/country

Country	N	Mean %	SD
South Africa	16	48.44	26.56556
Australia	20	11.25	16.17137
Global	13	57.69	22.55691
Total/average	**49**	**35.71**	**29.75595**

Observed from Table 6-15, it is clear that the global firms listed on the DJGSI performed the best, with an average disclosure score of 57.69% in terms of reporting on future-orientated water information. The average rate obtained by firms listed on the JSE, was 48.44% while the Australian companies only recorded and average score of 11.25%. Table 6-16 presents the results of the Tukey test.

Table 6-16: Tukey test for future-orientated information

Future-orientated information: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	11.2500	
South Africa	16		48.4375
Global	13		57.6923

The Tukey test in Table 6-16 reveals significant differences, grouping the JSE-listed firms together with the DJGSI companies. This signifies a higher level of disclosure practices for future-orientated water information when compared to the Australian companies which are grouped separately.

ACCA's (2010) study on Australian firms did not measure future-orientated disclosures on water. The CDP water report of 2017 revealed that 418 of the 742 firms (56%) disclosed future goals, however the majority of disclosures remain short-term in nature and do not adequately account for sustainable thresholds of the basins upon which companies rely (CDP, 2017d:13). The firms listed on the DJGSI recorded an average disclosure score of 57.69%, which can be considered as higher quality disclosure when compared to the CDP's score of 56% which only measured the frequency of reporting.

Some of the best qualitative disclosures observed from the reports was presented by the Ajinomoto Group (2018:77) which aims to reduce its water use versus production volume unit by 80% by the year 2030, using fiscal 2005 as the baseline. Moreover, Pioneer Foods (2018:61) listed on the JSE stated that their groceries division made good progress towards 'future-proofing' their operations by planning and physically preparing for the next drought in the Western Cape. The division invested R5.8 million in setting up reverse osmosis plants and sinking boreholes to keep factories operational in times in drought, while cutting down on water consumption as well (Pioneer Foods, 2018:61).

A firm listed on the DJGSI stated that:

> *"One of Grupo Nutresa's strategic priorities is the reduction of the environmental impact of its operations and products, and the organisation has set a goal for 2020 regarding the reduction of water consumption of – 30% in its operations within the framework of the 2010-2020 term" (Grupo Nutresa, 2017:183).*

It is worthy to note that a firm should understand their context in terms of water, to be able to identify water risks and conduct water risk assessments with the intention to put measurements in place. Only then will it be possible to report on future-orientated water information. For example, in order to set goals against a baseline measurement or plan how water risk assessments could affect the future success of the firm, the aforementioned elements within the water disclosure index should have been addressed. The qualitative disclosures and discussions above uncover the integrated nature of reporting on water information.

An indication of an Australian firm moving in the direction of quantifying water information and setting future goals were provided by Costa Group Holdings (2018b:6), who stated the following:

> *"The setting of specific goals with respect to achieving quantified targets will be developed based on input from across our business. Each category has been tasked with identifying improvement projects which target three initial priority areas – water, climate change and waste (both product and process waste). Upon establishment of these projects they will be subject to quarterly review, with reporting to occur on an annual basis commencing in the 2019 sustainability report. These projects will then inform any goals and targets that are set by the business and the time frames in which these will be achieved."*

Considering the growing population and increasing demand for water and food, the abovementioned intentions of Costa Group Holdings is satisfactory. Referring back to Table 6-15, an overall disclosure average of 35.71% was recorded for future-orientated water information, which indicates much room for improvement within this construct.

6.3.7 Disclosure on supply chain information

Taking cognisance of growing concerns from consumers, and pressure to produce food, the focus on sustainability is rapidly increasing for companies along the agri-food supply chain (BASF, 2014:3; Rankin *et al.*, 2011:2). Considering natural resource scarcities and recognising that water, energy and food are interlinked – brought forth the WEF nexus (Halbe *et al.*, 2015:879; Leck *et al.*, 2015:446). Essentially, water disclosure within the supply chain of the food, beverage and tobacco industry cannot be ignored. However, Bateman *et al.* (2017:126) mentioned that most firms only account for their own operations which does not cover any information with regard to their supply chain. Bateman *et al.* (2017:126) suggest that this could be overcome by reporting the impacts at every phase of the supply chain for each product.

The supply chain information construct analysed whether the reporting firm identified suppliers causing significant water-related impacts (SC1), and if the company has a policy or strategy in place to manage water-related aspects in their supply chain (SC2). Water risk factors in the supply chain should be identified (SC3), and an understanding of the WEF nexus, by considering upstream and downstream role players in the supply chain (SC4) was analysed. The elements within the supply chain construct signifies that a firm should engage with other stakeholders, community groups and regulators – an indication of the stakeholder theory. Table 6-17 presents the descriptive results on supply chain information for each group.

Table 6-17: Supply chain information per index/country

Country	N	Mean %	SD
South Africa	16	46.86	25.61738
Australia	20	20.00	25.45636
Global	13	63.46	19.40625
Total/average	**49**	**40.31**	**29.78496**

It is evident from Table 6-17 that the global firms listed on the DJGSI performed the best, with an average disclosure score of 63.46% in terms of reporting on water-related supply chain information. The average disclosure score recorded by firms listed on the JSE, was 46.86% while the Australian companies only recorded and average score of 20.00%. Table 6-18 presents the results of the Tukey test.

Table 6-18: Tukey test for supply chain information

Supply chain information: Tukey $B_{a,b}$		Subset for alpha = 0.05	
Country	**N**	**1**	**2**
Australia	20	20.0000	
South Africa	16		46.8750
Global	13		63.4615

The Tukey test in Table 6-18 revealed significant differences, grouping the DJGSI firms together with the JSE-listed companies in South Africa. This signifies higher disclosure levels for the firms listed on the DJGSI and JSE indices within the supply chain construct. The Australian firms listed on the ASX were grouped separately.

ACCA (2010:9) averred that reputational risks arise when firms fail to understand the impacts their operations, supply chains and discharges have on water resources. Comparable to this study, ACCA (2010:15) recorded an average score of 17% for disclosures on water supply chain and stewardship for the 32 Australian firms analysed in their research. The percentage of firms requiring supply chain water reporting in the South African CDP water report was 36% while 41% of companies engaged with their supplier according to the CDP global water report in 2017 (CDP, 2017b:5; CDP, 2017d:13). Higher supply chain disclosures were recorded by South African (46.86%) and global firms listed on the DJGSI (63.46%) in this study. This could be ascribed to increased awareness by firms in the food, beverage and tobacco industry of the importance of water in their supply chain. Conducting the analyses on water disclosures within a firm's supply chain, it was found that disclosures were often addressed in case studies, describing food safety aspects and presenting the important role farmers play within the firms' value chain. Some of the best qualitative contributions observed in the analyses are presented and discussed below. On a broader note, Mondelez International (2017:2) disclosed the following:

> *"For many years, we have listened to and worked with smallholder farmers to promote sustainable supply chains. With our partners, we help increase the farmers' output, improve their livelihoods, build thriving communities and protect the environment. We know we can't do everything, so our focus is in those areas where we can have the greatest impact: sustainable agriculture and reducing the environmental footprint of our own operations."*

More specifically, Fonterra (2018b:48) works with farmers to identify their water impact risk in order to prioritise improvement actions specific to their situation.

In connection with the stakeholder theory, Pioneer Foods (2018:85) mentioned that:

> *"Droughts and water shortages in South Africa, particularly in the Western and Eastern Cape, remain a critical point of concern. Pioneer Foods launched a Water Crisis Committee to explore ways to mitigate this risk, conduct readiness exercises and engage with suppliers, specialists and local and national government."*

Moreover, the response above illustrates the integrative attributes of water disclosure, by identifying physical water risks, with the intention to govern and manage these risks though engaging with various stakeholders.

Acknowledging the interrelated elements within the WEF nexus, a firm's reporting practices on water should address their supply chain. The significance of reporting on water supply chain information revealed that firms should engage with their suppliers and incentivise them to disclose water information – which could lead to more sustainable practices and increased water disclosures. Referring back to Table 6-17, an overall disclosure average of 40.31% was recorded for supply chain information, which indicates much room for improvement within this construct.

6.4 SUMMARY

The aim of this chapter was to compare the water disclosures of the firms listed on the JSE in South Africa, the ASX in Australia, and global companies listed on the DJGSI. The water disclosure practices of the three indices in the food, beverage and tobacco industry was compared to each construct within the water disclosure index. Meaningful qualitative disclosures from the analyses contributed to the results in this chapter – as best practices observed. Statistically significant differences within each construct were evident (refer to Table 6-4), which required further investigation through the Tukey test in order to reveal significant differences among the three groups.

The firms listed on the JSE and DJGSI were grouped together within the materiality, governance, risk assessment, future-orientated information, and supply chain constructs – with the ASX listed companies grouped separately. This signified significant differences between the groups, implying that the JSE and DJGSI demonstrated improved water disclosures within the constructs mentioned above. Each group was separated with regard to the targets and measures construct, with the firms listed on the DJGSI placed first, followed by the JSE and afterwards the ASX listed companies. With regard to site-specific information, global firms listed on the DJGSI were separated from the JSE and ASX companies who were grouped together. This implied that the DJGSI-listed firms outperformed the companies listed on the other two indices when providing site-specific water information.

The significant differences among groups confronts the question of comparability, which was visible between countries and firms. Some firms provided more quantitative information, which could enable users to make meaningful comparisons within the firm between different timeframes, by comparing with a baseline year. Additional qualitative information – for example describing collaboration with communities – was provided by means of case studies to illustrate best practices. The methodology of the DJGSI is to measure the performance of selected firms according to economic, environmental and social criteria, by utilising a best-in-class approach. The aim is to provide investors with objective benchmarks for managing their sustainability investment portfolios (DJSI, 2019:1). Taking cognisance of the listing requirements, the water disclosures of the firms listed on the DJGSI which could be perceived as best practices – were evident in their disclosure averages.

The prominent role water plays in the food, beverage and tobacco industry within the concept of the WEF nexus was evident in this chapter. In this sense, the significance of reporting on water supply chain information revealed that firms should engage with their suppliers and incentivise them to disclose water information. The integrative nature of water disclosure throughout this chapter could not be overlooked. One example observed explains that a firm should understand their context in terms of water, to be able to identify water risks and conduct water risk assessments – with the intention to put measurements in place.

The following chapter concludes this study, and provides recommendations, limitations and suggestions for future research.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The primary aim of this chapter is to address the main and secondary objectives formulated in Chapter 1 (refer to sections 1.4.1 and 1.4.2). The discussions are derived from the theoretical findings in Chapters 1 to 3, and the empirical results reported on in Chapters 5 and 6. In this sense, the main objective, and secondary literature- and empirical objectives are evaluated and reported on.

The chapter initiates with an overview of the study, presenting the research problem and purpose of the study – in order to set the scene for the discussions to follow. Henceforth, the main- and secondary objectives are evaluated and reported on. The different hypotheses formulated in Chapter 2 are subsequently addressed, and discussions and recommendations are provided on each hypothesis – based on the results in Chapter 5. This is followed by answering the research questions as stated in Chapter 1, addressed in the literature in Chapter 3, and applicable to the results of Chapter 6. The chapter proceeds by considering the limitations of the research and presenting the contribution of the study. The chapter concludes by providing suggestions for future research.

7.2 OVERVIEW OF THE STUDY

This section presents an overview of the main concepts addressed in the literature review (Chapters 2 and 3), leading to the research problem, purpose of the study, and research methodology adopted. This section aims to provide context to the research objectives (discussed in sections 7.3 and 7.4), and recommendations and conclusions presented in this chapter.

As explained in section 1.1, stakeholders are demanding to be better informed about the social and environmental impacts of business – with deteriorating environmental conditions – heightening their expectations around CSR practices (Boiral, 2013:1036; Dong *et al.*, 2014:59).

With water identified as a global concern, stakeholders have become aware of this scarce resource, and industries such as food and beverages, which are heavily dependent on water – are directly exposed to water scarcity (McKinsey & Company, 2009:3).

Observed from section 2.11 in the literature review, and in connection with above, the continued availability of sufficient water resources is unclear, and as corporate value chains expand globally, water scarcity is creating new business challenges (Mueller *et al.*, 2015:31). Green *et al.* (2017:320) noted the serious challenge of providing sufficient water, energy and food to the increasing global population. In this sense, the problem statement in section 1.3 indicated that policy makers, academics, governments and researchers refer to the interconnection between water, energy and food as the WEF nexus.

Recognising that water is used throughout the food production chain and, the intensity of water use in agriculture – the food, beverage and tobacco industry was purposefully selected in section 4.9.3 – not only for its dependence on water, but also for its contribution towards the WEF nexus. Firms listed in the food, beverage and tobacco industry on the JSE in South Africa, the ASX in Australia, and global companies listed on the DJGSI were selected. South Africa and Australia are perceived as water scarce countries, and the listing requirements of the DJGSI added a global perspective and comparison towards best practices.

Taking cognisance of the importance of water disclosure, and the expectations and pressures from stakeholders – it was noted from section 2.4 that sustainability reporting has become an important mode of communication for firms to report on their economic, environmental and social impacts and performance (Akhter & Dey, 2017:62; Boiral, 2013:1036). The legitimacy- and stakeholder theory report that disclosure by companies is important in meeting the expectations of stakeholders. From sections 2.4 and 2.5, it was evident that the demands from stakeholders for quality information has increased, and that the legitimacy- and stakeholder theories were applied to this study.

It was prominent from sections 2.5 and 2.6, that moving away from individual (stand-alone) sustainability reports, resulted in the combination of financial as well as non-financial information into one report, referred to as an integrated report (Anderson & Varney, 2015:60). The rationale behind IR was to enable stakeholders to view and assess the organisation's capability to create and sustain values over the short, medium, and long term, without depleting the resources of the business (Bouten & Hoozée, 2015:375; Hughen *et al.*, 2014:61). Sections 2.6 and 2.8 noticed that these resources are also referred to as the six capitals, and IR aims to provide insight about how these capitals are used and affected by an organisation. The impact and dependency of water – which is part of natural capital – should be measured and communicated to business and its stakeholders.

The discussion above informed the integrated perspective of this study, as the researcher evaluated whether the concept of IR and integrated thinking had any value in terms of reporting on water-related information. In this sense, the different hypotheses were developed in Chapter 2 and further refined in section 4.8.5, in order to evaluate whether IR had any significance towards water disclosure (Chapter 5).

From the literature review in Chapters 2 and 3, a water disclosure index was developed and refined in Appendix A, B and C. Seven constructs, containing 27 elements were included in the water disclosure index. An assessment scale (0 – 2) measuring the quality for each disclosure element was developed to improve the accuracy towards coding every item (refer to Appendix C).

Utilising the water disclosure index as measuring instrument, content analysis was applied as the research design to analyse the integrated- and sustainability reports of the firms in the food, beverage and tobacco industry, listed on the three indices. After the coding process (analysing the reports utilising the water disclosure index), the means- and relationship analysis described in sections 4.10.3, 4.10.4, 4.10.5 and 4.10.6 was implemented to test the hypothesis (Chapter 5) and differences among groups (Chapter 6). Meaningful qualitative disclosures observed from the analyses were presented together with the quantitative data in Chapters 5 and 6, and informed the abductive reasoning and inferences made in this chapter. The main and secondary objectives are addressed and reported on in sections 7.3 and 7.4 to follow.

7.3 MAIN OBJECTIVES OF THE STUDY

The main objectives of this study were two-fold:

(1) To develop a water disclosure index in order to evaluate whether the concept of IR and an integrative approach is associated with improved water disclosure in the food, beverage and tobacco industry.

(2) To utilise the developed water disclosure index for the food, beverage and tobacco industry to compare the water reporting practices of firms in South Africa, Australia and globally – in order to develop an improved water disclosure index.

Table 7-1 presents the connection between the main objectives in the literature review and empirical study. Each table in this chapter was the researcher’s own compilation.

Table 7-1: Connection between the main objectives, literature review and empirical study

	Literature review	Empirical evidence
Main objective 1	Chapters 2 & 3: Developed water disclosure index as measuring instrument. Chapter 2 (sections 2.9 – 2.14): Developed hypotheses. Chapter 4 (section 4.8.5): Refined hypotheses after developing water disclosure index.	Chapter 5: Evaluate IR and non-IR group through testing hypotheses. Refer to section 4.10.6 for synopsis of data analysis techniques utilised to test hypotheses.
Main objective 2	Chapters 2 & 3: Developed water disclosure index as measuring instrument.	Chapter 6: Compared the three indices. Refer to section 4.10.6 for synopsis of data analysis techniques utilised to compare groups. Developed an improved water disclosure index (see Appendix E).

7.4 SECONDARY OBJECTIVES OF THE STUDY

The main objectives were achieved by addressing the secondary objectives. The secondary objectives are separated into literature and empirical objectives and addressed in this order.

7.4.1 Secondary objectives in the literature review

In order to achieve the main objectives, the secondary literature objectives (refer to section 1.4.2) were addressed. Tables 7-2 to 7-5 present each secondary literature objective and provides reference to where it was discussed and addressed in the literature review. The reference column refers to the main part of the literature discussion, however additional sections where the objectives were discussed could be omitted – as a result of the interrelated nature of the topics. Table 7-2 presents the first literature objective.

Table 7-2: First literature objective

Secondary literature objective 1: To conceptualise from literature the practice of sustainability- and IR, including the need for reporting on water.		
Key aspects	**Reference in literature review**	**Status**
Background on sustainability and sustainability reporting	Chapter 2: sections 2.1 – 2.4	Completed
TBL	Chapter 2: section 2.5	Completed
Integrated reporting (IR)	Chapter 2: section 2.6 (2.6.1 – 2.6.5)	Completed
Environmental reporting	Chapter 2: section 2.7 (2.7.1 & 2.7.2)	Completed
Natural capital	Chapter 2: section 2.8 (2.8.1 – 2.8.4)	Completed

With reference to Table 7-2, the background and evolution of sustainability were discussed in section 2.2. The definition and context of sustainability reporting was addressed in sections 2.3 and 2.4, which revealed the importance of reporting on the TBL in section 2.5. These discussions exposed the legitimacy- and stakeholder theories as the theoretical foundations of this study. Progressing from individual reports on social, environmental or economic information, introduced the concept of IR in sections 2.5 and 2.6. The background-, definition and elements-, important principles-, status- and previous research about IR was discussed in sections 2.6.1, 2.6.2, 2.6.3, 2.6.4 and 2.6.5. The environment as part of the three pillars of the TBL were conversed in section 2.7 (2.7.1 and 2.7.2), which exposed natural capital – also part of the six capitals mentioned in IR. The introduction and background-, the role-, and reporting on natural capital was addressed in section 2.8 (2.8.1, 2.8.2 and 2.8.3). Water – included in natural capital – and most essential to this study, was discussed in section 2.8.4. Table 7-3 introduces the second literature objective.

Table 7-3: Second literature objective

Secondary literature objective 2: To conceptualise from literature the current reporting and disclosure practices on water, with a focus on IR, materiality, governance, targets and measures, risk assessment, future-orientated and supply chain information.		
Key aspects	**Reference in literature review**	**Status**
Reporting and disclosure of water	Chapter 2: section 2.9 (2.9.1)	Completed
Materiality	Chapter 2: section 2.9.2	Completed
Governance	Chapter 2: section 2.10 (2.10.1 & 2.10.2)	Completed
Measuring and reporting	Chapter 2: section 2.11 (2.11.1 & 2.11.2)	Completed
Risks assessments	Chapter 2: section 2.12 (2.12.1 – 2.12.3)	Completed
Future-orientated information	Chapter 2: section 2.13	Completed
Supply chain information	Chapter 2: section 2.14	Completed

Referring to Table 7-3, the focus moved to reporting and disclosure of water in section 2.9 (2.9.1). Each of the following constructs in sections 2.9.2 to 2.14 were introduced and addressed – with particular focus on water disclosure. H_1 to H_6 were formulated from these discussions in order to evaluate whether IR is associated with improved water-related disclosure. Table 7-4 presents the third literature objective.

Table 7-4: Third literature objective

Secondary literature objective 3: To conceptualise from literature the current reporting and disclosure practices on water in South Africa, Australia and globally.		
Key aspects	**Reference in literature review**	**Status**
Characteristics of quality water reporting	Chapter 3: section 3.2	Completed
Different rules and guidelines	Chapter 3: section 3.3 (3.3.1 – 3.3.4)	Completed
Water reporting in South Africa	Chapter 3: section 3.4 (3.4.1 – 3.4.4)	Completed
Water reporting in Australia	Chapter 3: section 3.5 (3.5.1 – 3.5.4)	Completed
Water reporting globally	Chapter 3: section 3.6 (3.6.1 – 3.6.4)	Completed

In relation to Table 7-4, the characteristics of quality non-financial and more specifically water information was addressed in section 3.2. Different rules and guidelines were discussed, which revealed various frameworks and standards to report on non-financial information in sections 3.3.1 and 3.3.2. In connection with the stakeholder theory, an increase in reporting rates were evident in section 3.3.3. The focus moved towards water reporting in South Africa, Australia, and globally in sections 3.4, 3.5 and 3.6, with each of the sub-headings of the aforementioned sections, presenting an introduction, statistics on water, laws and regulations, and previous research on water disclosure. Table 7-5 exhibits the fourth literature objective.

Table 7-5: Fourth literature objective

Secondary literature objective 4: To conceptualise from literature the current reporting and disclosure practices on water in the food, beverage and tobacco industry.		
Key aspects	**Reference in literature review**	**Status**
Water reporting in different industries	Chapter 3: section 3.7 (3.7.1 – 3.7.4)	Completed
Water reporting in the food beverage and tobacco industry	Chapter 3: section 3.8 (3.8.1 – 3.8.3)	Completed

With reference to Table 7-5, section 3.7 (3.7.1, 3.7.2, 3.7.3 and 3.7.4) briefly addressed water reporting in different industries, before turning the lens to the food, beverage and tobacco industry. It was evident from section 3.8 (3.8.1) that the WEF nexus is inextricably associated with the food, beverage and tobacco industry. Sections 3.8.2 and 3.8.3 described the industry classification according to the GICS, and moved towards water reporting in the food, beverage and tobacco industry. The significance of water disclosure within the supply chain of the food, beverage and tobacco was clear and addressed in section 3.8.3. This section (3.8.3) exemplified the WEF nexus and integrated nature of water disclosure in the food, beverage and tobacco industry. Table 7-6 introduces the fifth literature objective.

Table 7-6: Fifth literature objective

Secondary literature objective 5: To identify the research philosophy, -approach, -strategy, -design, sample and data analyses techniques utilised in the study.		
Key aspects	**Reference in literature review**	**Status**
Research philosophy	Chapter 4: section 4.3 (4.3.1 – 4.3.4)	Completed
Research approach	Chapter 4: section 4.4 (4.4.1 – 4.4.3)	Completed
Theories and contextual framework	Chapter 4: section 4.5 (4.5.1 & 4.5.2)	Completed
Research strategy	Chapter 4: section 4.6 (4.6.1 – 4.6.3)	Completed
Research design	Chapter 4: section 4.7 (4.7.1 – 4.7.4)	Completed
Data collection	Chapter 4: section 4.8 (4.8.1 – 4.8.5)	Completed
Research sample	Chapter 4: section 4.9 (4.9.1 – 4.9.5)	Completed
Data analysis techniques	Chapter 4: section 4.10 (4.10.1 – 4.10.6)	Completed

In order to achieve the first four secondary literature objectives, the researcher had to understand and stated the adopted research philosophy as indicated in section 4.3 and sub-sections illustrated in Table 7-6. The research approach in sections 4.4 and related sub-sections, revealed the abductive reasoning applied in this study, which was further discussed in section 4.7.4. The different theories and contextual framework were addressed in section 4.5 and associated sub-sections, which exposed the interrelated nature of the theories. It was concluded that the stakeholder- and legitimacy theories were supported in the execution of this study. In addition, a new integrative theory was proposed based on the interrelated nature and interlinked relationship between water, the food, beverage and tobacco industry, the need for sustainable disclosure, and the intention to evaluate whether IR is associated with improved water-related disclosure. The discussion around the research strategy in section 4.6 and corresponding sub-sections informed the mixed methods strategy, as concurrent and integrative, with a dominant quantitative character. Content analysis as the research design was conversed in section 4.7. The sampling plan for the food, beverage and tobacco firms listed on the three indices was provided in the discussion concerning the research sample in section 4.9 and related sub-sections. This section concluded by providing the data analysis techniques used in this study (see section 4.10).

Tables 7-2 to 7-6 presented where the secondary literature objectives have been addressed in Chapters 2 to 4. A brief discussion subsequent to each table (Tables 7-2 to 7-6) explained the essential findings from the secondary literature objectives. After the secondary literature objectives have been addressed, the focus moved towards developing the water disclosure index – based on the completed literature review. The development of the water disclosure index was included in the secondary empirical objectives which are discussed next.

7.4.2 Secondary objectives in the empirical study

After addressing the aforementioned secondary literature objectives, the secondary empirical objectives (refer to section 1.4.2) were discussed – in order to achieve the main objectives. Table 7-7 to 7-11 present each secondary empirical objective and provides reference to where it was discussed and addressed in the empirical study. Table 7-7 exhibits the first empirical objective.

Table 7-7: First empirical objective

Secondary empirical objective 1: Develop a water disclosure index based on the literature that will be utilised as the measuring instrument.		
Key aspects	**Empirical reference**	**Status**
Data collection and coding process	Chapter 4: section 4.8 (4.8.1 & 4.8.2)	Completed
Developing the water disclosure index from literature review (Phase 1)	Chapter 4: section 4.8 (4.8.1) & Appendix A	Completed
Developing the water disclosure index from literature review (Phase 2)	Chapter 4: section 4.8 (4.8.1) & Appendix B	Completed
Developing the water disclosure index from literature review (Phase 3)	Chapter 4: sections 4.8 (4.8.1 & 4.8.2) & Appendix C	Completed

With reference to Table 7-7, the water disclosure index utilised in the empirical study was developed in three phases (Appendix A to C) from the literature review (Chapters 2 to 3). Section 4.8.2 considered the coding process applied to the water disclosure index. It was decided to measure the quality of disclosure through a three-point assessment scale with scores ranging from 0 (minimum) to 2 (maximum). A quality description specific to each element in the water disclosure index was developed in order to enhance the precision towards coding every element (refer to Appendix C). Table 7-8 presents the second empirical objective.

Table 7-8: Second empirical objective

Secondary empirical objective 2: Identify the current shortcomings and best practices associated with the reporting and disclosure of water, utilising the measuring instrument.		
Key aspects	**Empirical reference**	**Status**
Analyse the target sample utilising the developed water disclosure index	Chapters 5 and 6 (Appendix C)	Completed
Present the quantitative results from data analyses	Chapters 5 and 6	Completed
Present the qualitative results from the reports	Chapters 5 and 6	Completed
Identify shortcomings and best practices	Chapters 5 and 6	Completed

It is evident from Table 7-8 that subsequent to the analyses of the reports, the quantitative and qualitative results were presented in Chapters 5 and 6. The quantitative results were accompanied by meaningful qualitative disclosures observed in the reports, with the intention to reveal best practices. The intention of Chapters 5 and 6, together with the quantitative data analyses techniques utilised in the respective chapters, are explained in the in the third and fourth empirical objectives. Table 7-9 introduces the third empirical objective.

Table 7-9: Third empirical objective

Secondary empirical objective 3: Evaluate and compare the utilisation of IR on materiality, governance, targets and measures, risk assessment, future-orientated- and supply chain information in terms of water disclosure.		
Key aspects	**Empirical reference**	**Status**
Overall performance between IR/non IR group	Chapter 5: sections 5.1 and 5.2	Completed
IR/non IR and materiality	Chapter 5: section 5.3 (5.3.1)	Completed
IR/non IR and governance	Chapter 5: section 5.3 (5.3.2)	Completed
IR/non IR and targets and measures	Chapter 5: section 5.3 (5.3.3)	Completed
IR/non IR and risk assessments	Chapter 5: section 5.3 (5.3.4)	Completed
IR/non IR and future-orientated information	Chapter 5: section 5.3 (5.3.5)	Completed
IR/non IR and supply chain information	Chapter 5: section 5.3 (5.3.6)	Completed

With respect to Table 7-9 – and in connection with the first main objective – the water reporting practices of firms adopting IR were compared to the non-IR group. The hypotheses developed in Chapter 2 were tested in terms of overall performance (H_{main}), for every construct (H_1 to H_6), as well as for the refined hypotheses (refer to section 4.8.5) – formulated after the water disclosure index was developed. The data analysis techniques implemented to test the different hypotheses were t-tests, Spearman's correlation coefficient, and multiple linear regression (refer to section 4.10.6). Table 7-10 displays the fourth empirical objective.

Table 7-10: Fourth empirical objective

Secondary empirical objective 4: Identify and compare the current water reporting practices of the selected companies in South Africa, Australia and globally.		
Key aspects	**Empirical reference**	**Status**
Comparing overall performance between groups (three indices)	Chapter 6: sections 6.1 and 6.2	Completed
Comparing materiality between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.1)	Completed

Table 7-10: Fourth empirical objective (continues)

Key aspects	Empirical reference	Status
Comparing governance between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.2)	Completed
Comparing targets and measures between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.3)	Completed
Comparing risk assessment between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.4)	Completed
Comparing site-specific information between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.5)	Completed
Comparing future-orientated information between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.6)	Completed
Comparing supply chain information between groups (three indices)	Chapter 6: sections 6.2 and 6.3 (6.3.7)	Completed

With reference to Table 7-10 – and connected to the second main objective – the water disclosure practices of the firms listed on the three indices, were compared with one another. In addition, this section aimed to address the research questions in Chapter 1 (refer to section 1.3). ANOVA was implemented to compare the groups in the food, beverage and tobacco industry listed on the three indices with each other. When significant differences among groups were identified, post-hoc comparisons (Tukey tests) were performed to expose these disparities. The groups were compared based on overall performance in section 6.1 and 6.2, as well as for each construct (sections 6.3.1 to 6.3.7) – in order to refine the comparisons. Table 7-11 presents the fifth and final empirical objective.

Table 7-11: Fifth empirical objective

Secondary empirical objective 5: Prepare an improved water disclosure index that could be utilised as a benchmark in the food, beverage and tobacco industry.		
Key aspects	**Empirical reference**	**Status**
Develop an improved water disclosure index	Appendix E	Completed

As is evident from Table 7-11, an improved water disclosure index was developed after conducting the empirical study. Recognising that all 27 elements in the water disclosure index utilised in the empirical analysis (Appendix C) loaded sufficiently, (refer to section 4.10.2.4) and that all constructs were reliable (refer to Table 4-15) – no elements were removed. In this sense, best practices observed from the empirical analysis were added to the improved water disclosure index (Appendix E).

Table 7-7 to 7-11, and the explanations that followed, provided a brief summary of the empirical objectives completed in this study. In addition, sections 7.4.1 and 7.4.2 intend to provide context to the recommendations and conclusions to be conversed next.

Attributable to the structure of this thesis, the recommendations and conclusions are presented in two sections. The first section (7.5) focuses on each construct where the various hypotheses were tested in Chapter 5, in order to evaluate whether IR is associated with improved water disclosure. The second section (7.6) addresses the research questions posted to determine the comparability between the groups.

7.5 CONCLUSIONS AND RECOMMENDATIONS ON THE DIFFERENT HYPOTHESES

Each construct is presented in this section, followed by a discussion and implications. Tables that illustrate the data analyses techniques utilised to test the hypotheses, and the findings on the hypotheses, are displayed as a brief summary. Recommendations, specific to each construct follows.

7.5.1 Materiality

Materiality is an essential concept that is part of IR and consequently to the integrated approach. Table 7-12 encapsulates the data analyses techniques and findings on H_1, as well as the refined hypotheses ($H_{1\,(M1)}$ and $H_{1\,(M2)}$).

Table 7-12: Materiality hypotheses

H_1: There is a significant association between IR and water-related disclosure in terms of materiality.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_1	T-test	Supported
$H_{1\,(M1)}$	T-test	Supported
$H_{1\,(M2)}$	T-test	Supported
H_1	Spearman's correlation	Supported
H_1	Multiple linear regression	Supported

Discussion and implications: The association between a firms IR status and water-related disclosure in terms of materiality, was statistically significant when utilising every data analyses technique. Moreover, the IR status of a firm had a unique statistically significant relationship with the materiality construct (H_1), which implied that companies practicing IR produced advanced disclosures on water as a material matter in their reporting practices.

The mean scores of the IR (70.83%) and non-IR firms (32.26%) implied that both groups could improve within the materiality construct (H_1). In this sense, the recommendations are applicable to both groups (IR and non-IR) – but even more relevant to the non-IR firms.

The connection between water as a material aspect, and the stakeholder theory was evident, with many firms disclosing significant and relevant water-related information, and identifying various stakeholders affected. It was noted that many firms not implementing IR, still applied the materiality principle (central to IR) to identify water as a material matter in the food, beverage and tobacco industry.

Materiality could be considered as the filter to determine if water information is deemed important and useful to stakeholders in the food, beverage and tobacco industry. Taking cognisance of the industry under investigation, and within context of the WEF nexus, the following recommendations were made.

Recommendation 1: Identifying water as a material aspect in the food, beverage and tobacco industry should be considered as a first step and initiation process of water disclosure procedures. In this sense, the identification of water as a material matter is not something a firm can do in isolation – especially not companies in the food, beverage and tobacco industry. The identification of water as a material aspect would clarify the connectivity between the WEF nexus elements (water and food) applicable to the firms under investigation in this study.

Recommendation 2: A firm should explain and disclose the process of identifying material items, an element that not many companies expanded on. The process should consider the firm's strategy, stakeholders and governance structure. Water as a material aspect connects with the stakeholder theory, where firms in the food, beverage and tobacco industry should engage with stakeholders in their supply chain. This could result in a snowball effect if more firms participate in the process.

Recommendation 3: Informed by best practices observed in the empirical study, firms like Danone (2017:2) and the Ajinomoto Group (2018:9) produced a materiality matrix as a tool to identify the level of importance of material matters to their stakeholders and business success. Firms could refer to the SASB's materiality map, which assist companies to categorise sustainable issues related to the food, beverage and tobacco industry.

Recommendation 4: It is recommended that firms in the food, beverage and tobacco industry – irrespective of implementing IR – should identify water as a material aspect which would assist in more focussed, concise, and comparable reporting practices in the future.

7.5.2 Governance and management approach

After identifying water as a material aspect, water governance is a powerful instrument to coordinate advances in areas such as agriculture – in order to lighten the global water crises (WWAP, 2016:59). Table 7-13 summarises the data analyses techniques and findings on H_2 and the refined hypotheses ($H_{2\ (G1\text{-}5)}$).

Table 7-13: Governance

H_2: There is a significant association between IR and water-related disclosure on governance.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_2	T-test	Supported
$H_{2\ (G1)}$	T-test	Rejected
$H_{2\ (G2)}$	T-test	Supported
$H_{2\ (G3)}$	T-test	Supported
$H_{2\ (G4)}$	T-test	Supported
$H_{2\ (G5)}$	T-test	Supported
H_2	Spearman's correlation	Supported
H_2	Multiple linear regression	Rejected

Discussion and implications: Only one element (G1) of the refined hypotheses tested was rejected. Moreover, a weak unique contribution between the IR status (IR or non-IR) and the governance construct (H_1) within the regression model was recorded. Firm size had a unique relationship with the governance construct, which implied that larger firms produced improved water governance disclosures.

The difference between the mean scores of the IR (71.67%) and non-IR firms (40.97%) were statistically significant within the governance construct (H_2). The recommendations are to a greater extent more relevant to the non-IR group, however both groups portray much room for improved water governance disclosures.

As a result of good water governance practices observed from the analyses, many firms illustrated initiatives towards water-related programs, demonstrated board-level oversight through leadership teams, and reduced water usage within their operations. It was noted that when firms understand their operating context in terms of water-related issues – such as water scarcity – water governance initiatives and programmes were evident. Many firms identified water shortages – which is a physical risk – and responded with governance initiatives. For example, the drought in the Western Cape Province in South Africa induced various action plans such as, millions of

Rands invested in desalination plants, substituting potable water with seawater, implementing water use efficiency measures, setting up reverse osmosis plants, and sinking boreholes to keep factories operational in times of drought.

These implications explain the integrated nature of water reporting, which resulted from physical water risks (a separate construct), into water governance practices. Furthermore, firms including water-related information into their business model demonstrated improved strategies for water governance. In order to manage water across large multinational companies is a complex issue and requires strong governance and management systems – consequently, the following recommendations were delegated.

Recommendation 1: Subsequent to identifying water as a material matter, water governance should be addressed in any firm operating in the food, beverage and tobacco industry. A wide range of governance structures are required to manage water, such as environmental management systems, board-level oversight, policies, programmes, strategies, business model information, lines of accountability, and performance standards. These are critical elements which should not be overlooked.

Recommendation 2: The relatively low disclosures of water governance as part of a firm's business model (G3), and the inclusion thereof, should not be ignored. It is recommended that more attention is devoted to water as part of a firm's business model – which should result in an improved water strategy formulation to enhance decision making.

Recommendation 3: Firms should provide evidence that they understand the context of their operations. Although some companies are already acquainted with the relations and trade-offs between water use and energy consumption, the important connection between water and food security should be disclosed more prominently. It is recommended that an important part of water governance is to understand and manage these linkages and trade-offs in order to exploit potential synergies as part of a company's water strategy.

Recommendation 4: Responsible water stewardship should be a strategic priority for all food, beverage and tobacco companies – especially in areas of water stress, which should be identified. In essence, where issues such as drought and climate change have their greatest impact – action should be taken.

7.5.3 Targets and measures

Targets and measures are closely related to the preceding construct in order to promote water governance. In this regard, the expression "what gets measured, gets managed" is applicable in order to make effective water management decisions. Table 7-14 reviews the data analyses techniques and findings on H_3 and the refined hypotheses ($H_{3\ (TM1\text{-}5)}$).

Table 7-14: Targets and measures hypotheses

H_3: There is a significant association between IR and water-related disclosure on targets and measures.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_3	T-test	Rejected
$H_{3\ (TM1)}$	T-test	Rejected
$H_{3\ (TM2)}$	T-test	Rejected
$H_{3\ (TM3)}$	T-test	Rejected
$H_{3\ (TM4)}$	T-test	Rejected
$H_{3\ (TM5)}$	T-test	Rejected
H_3	Spearman's correlation	Rejected
H_3	Multiple linear regression	Rejected

Discussion and implications: The association between the firms IR status and water-related disclosure in terms of targets and measures, was not statistically significant in any of the hypotheses tested. The average disclosure rates on water targets and measures were 45.55% for the IR-group, and 34.19% for the non-IR group, which signified much room for progress, and that the recommendations are equally important to both groups. The results confirmed major gaps in the measuring and reporting of water data – which could lead to poor information available for decision making. It was worthy to note that none of the control variables in the regression model had a unique relationship with the targets and measures construct.

Moreover, the qualitative findings from the reports revealed that many firms experienced problems to measure their impact on water resources and ecosystems. Therefore, data on operational water use such as sources of water withdrawal and wastewater discharges should be collected and translated into measures of impact. These impacts could affect water quality, surrounding ecosystems, local communities, and other firms that depend on the shared resource.

Shortcomings experienced in the literature review, such as a lack of comprehensive overview of withdrawal, consumption and discharge and various metrics, were evident in the results. This could stem from the cost or complexities involved to gather and to measure water-related data. Absent or outdated systems, as well as the variety of methods applied, could add to the problem of comparability. However, the results exposed innovative technologies and appropriate practices in the disclosure of some companies. Many firms disclosed measurable progress on reducing water usage as a result of quantified water information – which illustrated commitment towards water governance. Consequently, the following recommendations were made.

Recommendation 1: It was observed that firms performing the best with regard to quantified water disclosure, utilised the GRI framework. Therefore, it is recommended that firms adopt the new GRI 303-3, 4 and 5 – which is also included in the water disclosure index in this study. With this in mind, it is recommended that the same metrics for measurements (megalitres) should be used by all reporting entities. This would bring about standardised water information and improved comparability.

Recommendation 2: It was detected from the analyses that many firms calculate water withdrawal and discharges in total, however a further breakdown of water withdrawal and discharges per source, was lacking. It is recommended that companies disclose water withdrawal and discharges per source – which would provide more specific information to inform decision making.

Recommendation 3: Recognised from best practices in the analyses, firms calculated water intensity/efficiency ratios (expressing water consumption in an efficiency ratio as input versus output). It is therefore recommended that firms calculate water efficiency ratios in terms of water used per kilogram of finished product, or per litre of packaged product. Furthermore, firms should divide their water efficiency ratios per product line i.e. beverages and food. The disclosure of water efficiency ratios would provide valuable and comparable information to stakeholders.

Recommendation 4: It is recommended that firms should concentrate more on the reuse and recycling of water, as this was one of the least reported on elements (TM5). The advantages observed from best practices in the analyses could not be ignored, where water reuse projects, reverse osmosis systems and water-recycling equipment resulted in millions of litres water reused and recycled. All firms should take cognisance of global water issues and the importance of water in the food, beverage and tobacco industry.

Recommendation 5: Arising from the preceding recommendations, firms should assign a baseline year towards water withdrawal, discharge, reuse and efficiency figures. This should represent thresholds and baseline conditions as an effective tool to verify and compare whether improvement and set targets have been accomplished.

7.5.4 Risk assessment

If water is recognised as a material aspect, it should frame a firm’s approach towards governing various water risks. In essence, risk assessment is closely related to the materiality- and governance construct. Table 7-15 summarises the data analyses techniques and findings on H_4 and the refined hypotheses ($H_{4\ (RA1\text{-}5)}$).

Table 7-15: Risk hypotheses

H_4: There is a significant association between IR and water-related disclosure on risks.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_4	T-test	Supported
$H_{4\ (RA1)}$	T-test	Supported
$H_{4\ (RA2)}$	T-test	Supported
$H_{4\ (RA3)}$	T-test	Rejected
$H_{4\ (RA4)}$	T-test	Supported
$H_{4\ (RA5)}$	T-test	Supported
H_4	Spearman's correlation	Supported
H_4	Multiple linear regression	Rejected

Discussion and implications: One element (RA3) of the refined hypotheses tested, was rejected. Moreover, there was no unique relationship between the IR status (IR or non-IR) and the risk assessment construct (H_4) within the regression model. However firm size had a unique relationship with the risk assessment construct, which implies that larger firms produced improved disclosures on water risks.

The difference between the mean scores of the IR (63.33%) and non-IR firms (42.26%) were statistically significant within the risk assessment construct (H_4). However, both groups represent much room for improved water risk disclosures, although the recommendations are more relevant to the non-IR firms.

The interrelated nature of reporting on water information was evident in the qualitative observations from the reports, especially with regard to water risks. It was noticed that firms acknowledged that their risk committees rely on the solid governance of risks, in order to maintain the effectiveness of the committee's activities. Additionally, it was observed that report content was informed through integrated risk processes, which formed the basis of the materiality process. In this context, the mitigation of risks is integral to the execution of a firm's strategy.

As a result of good water risk assessment disclosures, it was noted that the greater part of South African firms identified the drought in the Western Cape – which was also exposed under the governance construct. It was pleasing to notice companies endeavouring beyond their own operations, towards improving water access and quality in their communities. Furthermore, many firms utilised water risk assessment, or mapping tools to characterise their water risk. Accordingly, the following recommendations were made.

Recommendation 1: Inferred from qualitative observations, companies have access to a number of tools to assist them in their water risk assessments. It is recommended that firms utilise tools such as the WRI's Aquaduct[5] water risk atlas, and the Global Water Tool to evaluate current conditions and future water stress- and supply.

Recommendation 2: It was found that many firms do not provide an overall picture of the various water risks they face, omitting one or more of the physical-, regulatory-, or reputational water risks. In this regard, it is recommended that companies provide a comprehensive evaluation to stakeholders of the various risks confronted by the firm.

Recommendation 3: Whether or not IR is implemented, companies should realise the interrelationship between identifying water as a material aspect, originating from proper water risk assessments, in order to implement water governance practices to mitigate water risks.

7.5.5 Future-orientated information

Together with the business model, and the different capitals that form part of IR and value creation, future-orientated information is considered as one of the fundamental concepts underpinning the integrated approach. In this regard, the literature revealed that stakeholders seek future-orientated information, which displays the integration of environmental issues into core business processes (Kamala *et al.*, 2016:589). Table 7-16 reviews the data analyses techniques and findings on H_5 and the refined hypotheses ($H_{5\ (FO1\text{-}4)}$).

Table 7-16: Future-orientated hypotheses

H_5: There is a significant association between IR and water-related disclosure on future-orientated information.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_5	T-test	Supported
$H_{5\ (FO1)}$	T-test	Supported
$H_{5\ (FO2)}$	T-test	Supported
$H_{5\ (FO3)}$	T-test	Supported
$H_{5\ (FO4)}$	T-test	Supported
H_5	Spearman's correlation	Supported
H_5	Multiple linear regression	Rejected

Discussion and implications: All the elements (FO1 to FO4) of the refined hypotheses tested, was statistically significant. Moreover, a weak unique contribution between the IR status (IR or non-IR) and the future-orientated information construct (H_1) within the regression model was recorded, however it was not statistically significant on a 5% level. Firm size had a unique relationship with the future-orientated information construct, which implies that larger firms produced improved future-orientated water information disclosures.

The difference between the mean scores of the IR (52.78%) and non-IR firms (25.81%) were statistically significant within the future-orientated information construct (H_2). This implies that the recommendations are to a greater extent more relevant to the non-IR group, however both groups revealed substantial room for improvement.

It was noticed from the analyses that desired outcomes and forward-looking information were informed by goals and measurements. In this context, water disclosures applicable to the targets and measures construct, was applied to report on future-orientated water disclosures. Best practices revealed firms setting goals to reduce overall water withdrawal measured against a baseline year and decreasing water use efficiency ratios. These goals resulted in long-term water strategies to increase access to safe water, strive for zero environmental impacts and securing business continuity in a water constrained future.

Additionally, as a result from water risk assessments, comprehensive water response strategies were implemented to respond to severe droughts. Taking cognisance of the discussions above, and the required data to disclose on future-orientated water information – the integrated nature of water disclosures, is repeatedly exposed. Within this context, the following recommendations were made.

Recommendation 1: Companies should realise the 'building blocks' involved to report on future-orientated water information. It is recommended that the firm should have:

- identified water as a material matter;
- addressed water governance practices;
- quantified water information through measurements; and
- conducted water risk assessments and identified various water risks – in order to report on future-orientated water information.

Recommendation 2: Future-orientated water strategies should inform stakeholders about the organisation's water performance, in connection with its short, medium and long-term prospects.

In this sense, it is recommended that quantitative, forward-looking water disclosures are implemented to enhance long-term water management.

7.5.6 Supply chain information

Considering the industry under investigation, and that water is the main ingredient in many products, water disclosure along the agri-food supply chain could not be omitted. Table 7-17 encapsulates the data analyses techniques and findings on H_6 as well as the refined hypotheses ($H_{6\ (SC1)}$ to $H_{6\ (SC4)}$).

Table 7-17: Supply chain hypotheses

H_6: There is a significant association between IR and water-related disclosure on supply chain information.		
Hypothesis	**Data analysis technique**	**Finding on hypothesis**
H_6	T-test	Rejected
$H_{6\ (SC1)}$	T-test	Rejected
$H_{6\ (SC2)}$	T-test	Rejected
$H_{6\ (SC3)}$	T-test	Rejected
$H_{6\ (SC4)}$	T-test	Rejected
H_6	Spearman's correlation	Rejected
H_6	Multiple linear regression	Rejected

Discussion and implications: No significant mean differences were recorded between the groups' means for H_6 or the refined hypotheses ($H_{6\ (SC1)}$ to $H_{6\ (SC4)}$) which signifies that the recommendations are equally important to both groups (IR and non-IR). The relationship between the firms' IR status and water-related disclosure in terms of supply chain information (H_6), was also statistically insignificant. However, firm size had a unique relationship with the supply chain information construct, which implies that larger firms produced improved water supply chain information disclosures.

It was noticed from the qualitative disclosures in the empirical analyses that firms operating in the food and beverage supply chain, understand that their long-term sustainability is intrinsically linked to the natural resources they depend on – from the farm, to consumers, and back again. In this sense, efficient supply chain practices imply that the environment should be protected while meeting customers' needs. This implies that firms should identify water risks in their supply chain and suppliers causing significant impacts, which could affect their operations. In this sense, it was observed that firms engaged and assisted suppliers operating in water-stressed areas, encouraging them to disclose their water management practices.

As conversed in the literature review, the connection between the WEF nexus and the food, beverage and tobacco industry, was evident in the qualitative supply chain disclosures from the reports. Companies recognised that their supply chains are geographically dispersed, and the impacts of natural resources scarcity, resulted in creative solutions to consume less fresh water. It was noticed from best practices, that firms engaged with various stakeholders in their supply chain, from procurement to communicating to consumers – while sharing common values and goals. These partnerships and collaborations with different stakeholders, connects with the stakeholder theory in this study. Henceforth, the following recommendations were made.

Recommendation 1: Firms operating in the food, beverage and tobacco industry should realise the impact they can have on one another to drive sustainable water practices. As the Ajinomoto Group (2018:55) confessed, environmental problems cannot be solved merely by the efforts of one company. Therefore, it is recommended that companies collaborate and learn from one another, to drive sustainable water practices and to disclose all water-related information.

Recommendation 2: Inferred from qualitative observations, firms should engage with farmers to implement better agricultural techniques which would lead to significant improvements in water efficiency. It is recommended that farmers operating in water scarce areas should be trained in water use, water quality and soil moisture, which would mitigate the impact on water sources and for the firm operating in these areas.

Recommendation 3: It is recommended that risk assessments should be performed, not only at company level, but also in the supply chain. The expanding role of the company, to include all role players in the value chain in the risk assessment process, will allow for an intrinsic connection between the firms' sustainability, its stakeholders, and the supply chain.

Allowing for the integration of sustainability performance to be an integral part of how a company manages water in its supply chain, would give rise to the following positive spinoffs for the firm:

- Supply chain management enables the company to manage their scare water resources which could affect their operations.
- Upstream and downstream production processes might be enhanced.
- All the role players in the supply chain would be motivated to drive sustainable, cost efficient, and effective water management.

- The reputation of the firm would be promoted along the agri-food supply chain.

In sections 7.5.4 to 7.5.6, the findings of H_1 to H_6, as well as the refined hypotheses (refer to section 4.8.5) applicable to each construct, were presented in Table 7-13 to 7-18. The discussions and implications, as well as the recommendations that followed (specific to each construct), were grounded on information from the literature review, the results from testing the various hypotheses (IR or non-IR group) in the empirical study, and qualitative observations of best practices analysed from the reports.

7.5.7 Overall performance

After providing recommendations specific to each construct, this section conclude by presenting the overall results of the water reporting practices, comparing the IR and non-IR group. This section is presented in this manner, in order to conclude and recommend on the evaluation between the IR and non-IR group. Table 7-18 presents the data analyses techniques and findings of the main hypothesis (H_{main}).

Table 7-18: Main hypothesis

H_{main}: There is a significant association between IR and total water-related disclosure.		
Hypothesis	**Data analyses technique**	**Finding on hypothesis**
H_{main}	T-test	Supported
H_{main}	Spearman's correlation	Supported
H_{main}	Multiple linear regression	Rejected

Discussion and implications: H_{main} associates with the first main objective and connects to the integrated perspective of this study. There was a statistically significant difference between the IR (55.35%) and non-IR groups' (34.77%) means, which signified overwhelming evidence to support H_{main} when utilising the t-test. In this sense, the recommendations are particularly relevant to the non-IR group, however the mean scores of both groups signified much room for improved water disclosures. Similarly, Spearman's correlation indicated that when a firm implements IR, the index score is likely to increase. When controlling for other variables in the regression model, a firm's IR status did not have a unique association with the total index. However, firm size had a unique relationship with the total index score, which implies that larger firms produced improved water disclosures.

It was evident from sections 7.5.1 to 7.5.6 that water disclosures in the food, beverage and tobacco industry should not be viewed in isolation. The interrelated nature and connection between the constructs addressed above, implies that an integrated approach – with an emphasis on integrated thinking – could be the most effective manner to communicate water disclosures to various stakeholders. Moreover, the significance of water in the food, beverage and tobacco industry, and the concept of integration within the WEF nexus, supports the integrative approach. Accordingly, the following recommendations were conversed.

Recommendation 1: Firms should acknowledge that stakeholders are increasingly seeking the disclosure of strategy, risks and business model information. Additionally, users require future-orientated information that presents the integration of environmental issues into the strategic approach of the company. Recognising the significance of water in the food, beverage and tobacco industry, it is recommended that an integrated approach should be followed in this industry.

Recommendation 2: Arising from the preceding recommendation (s), the findings presented in Chapter 5, and discussed in sections 7.5.1 to 7.5.6, it is recommended that firms in the food, beverage and tobacco industry strongly consider implementing IR, which could lead to improved water disclosures.

The following section addresses the research questions that were posted to determine the comparability between the three groups.

7.6 CONCLUSIONS AND RECOMMENDATIONS ON RESEARCH QUESTIONS

This part of the study refers back to the literature reviewed in Chapter 3, and the empirical results from Chapter 6 – in order to address the research questions (refer to section 1.3). Each research question (RQ_1 – RQ_4) is presented in this section, followed by discussions and implications. Qualitative findings from the analyses, inferred the discussion, implications and recommendations. Tables that present the research question, together with reference to the literature review and empirical study, are included. The recommendations applicable to this section, are conversed after all four research questions have been presented, as stated above.

7.6.1 First research question

The first research question introduces a broad (overall) examination of the current reporting practices on water of South African-, Australian-, and globally selected firms in the food, beverage and tobacco industry. Table 7-19 exhibits the first research question.

Table 7-19: First research question

RQ_1: What are the current reporting and disclosure practices on water in South African-, Australian- and globally selected companies in the food, beverage and tobacco industry?		
Reference in literature	**Empirical reference**	**Findings**
Chapter 3: sections 3.4, 3.5, 3.6, 3.7 and 3.8	Chapter 6: Table 6-1	Overall very low disclosure rates.

Discussion and implications: Before comparing the disclosure practices of the three groups, an overall perspective of current water reporting practices measured against all the elements in the disclosure index, were provided in Table 6-1 (refer to section 6.2). The Australian firms achieved an overall average of 19.72%, and the South African companies an average of 52.55%. The global firms listed on the DJGSI, performed the best, with 64.53%.These disclosure scores implies much room for improvement, considering the importance of water in the food, beverage and tobacco industry.

7.6.2 Second research question

In order to examine the differences among South African-, Australian-, and globally selected firms, the results with regard to each group, applicable to every construct in the water disclosure index, were compared. ANOVA was utilised as the data analyses technique to compare the three groups, and significant differences among the groups were exposed by implementing Tukey tests. Table 7-20 presents the second research question.

Table 7-20: Second research question

RQ_2: To what extent is it possible to make meaningful comparisons about water reported data between South African-, Australian-, and globally selected companies?		
Literature reference	**Empirical reference**	**Findings**
Chapter 3	Chapter 6: Tables 6-2 to 6-18	Difficult to make meaningful comparisons.

Discussion and implications: Significant differences among the groups were evident when comparing the overall performance, as well as within each construct. Considering the overall performance averages of Australian (19.72%) and South African firms (52.55%) (RQ_1), it was noticed that many South African companies prepared an integrated report – which might be the differential aspect between the countries' performance.

The overall, poor performance of Australian firms (19.72%) could be attributed to the materiality construct, which could be considered as the first step and initiation process towards recognising water as a material matter, that should be reported on in the food, beverage and tobacco industry. The Australian firms were grouped separately, with a modest average disclosure score of 21.25% for the materiality construct, in contrast to the firms listed on the JSE (64.06%) and DJGSI (63.46%).

The disclosure scores for the materiality construct for Australian firms are disconcerting, considering that they are familiar with- and recommended by ASX Corporate Governance Council to disclose on material matters, as stated in Principle 7, Recommendation 7.4: "A listed entity should disclose whether it has any material exposure to economic, environmental and social sustainability risks and, if it does, how it manages or intends to manage those risks" (ASX Corporate Governance Council, 2014:30). However, these Principles and Recommendations set by the ASX Corporate Governance Council are not mandatory and appear to be overlooked.

7.6.3 Third research question

During the empirical analyses of comparing the three groups (Chapter 6), attention was devoted to whether or not the principles and methodologies utilised are standardised. Table 7-21 displays the third research question.

Table 7-21: Third research question

RQ_3: Are the reporting principles and methodologies currently utilised standardised per country? If not, what are the current problems and how could it be improved?		
Literature reference	**Empirical reference**	**Findings**
Chapters 2 and 3	Chapter 6	A variety of principles and methodologies are utilised, and difficult to compare.

Discussion and implications: By analysing the companies, the variety of frameworks, rules, regulatory bodies, standard setting entities and different stock exchanges, with their respective requirements, were recognised. The absence of uniform reporting standards adds to the obstacle to compare water-related information, within or between companies and countries. Inconsistent metrics, and diverse definitions for the same term, add to the confusion and a disparity between companies and users of information.

Evidence from the empirical study confirmed that several standard setting bodies and reporting initiatives were utilised to report on water practices. The CDP's Water Disclosure Program and the DJSI, are examples of organisations that provide guidelines and ratings to measure environmental impact. It was noticed that the 'better' performing firm's voluntary participate in the CDP's Water Disclosure Program. Similarly, the firms listed on the DJGSI – which are perceived to implement best practices – reported higher overall disclosure scores in this study. The GRI, IIRC, SASB are more focussed on reporting guidelines. Notwithstanding the efforts from these organisations, sustainability reporting is still voluntary in most countries.

In this sense, it was noticed that the reporting frameworks are not standardised. Moreover, it was observed from the empirical analyses, that the variety of frameworks and standards utilised, explains the difficulty of comparing water disclosures in the sampled firms.

7.6.4 Fourth research question

Specific to the food, beverage and tobacco industry, Appendix F was compiled to illustrate the various principles and methodologies adopted. Table 7-22 presents the fourth research question.

Table 7-22: Fourth research question

RQ_4: What are the reporting principles and methodologies currently utilised in the food, beverage and tobacco industry?		
Literature reference	**Empirical reference**	**Findings**
Chapter 3: section 3.8	Chapter 6, and Appendix F	Various frameworks.

Discussion and implications: The firms represented in the sample group were from Australia (20 companies), South Africa (16) and globally listed companies on the DJGSI (13 companies). The global companies originated from the USA (4), UK (3), Switzerland (2), and one firm per country representing Colombia, France, Japan and Thailand. These firms provided a global perspective to this study, to compare with water scarce countries such as Australia and South Africa.

Observed from the empirical analyses, and compiled in Appendix F, the various frameworks and principles adopted were evident. The results from the empirical analyses, the research questions addressed in sections 7.6.1 to 7.6.4, and the qualitative information from the reports inferred the following recommendations.

Recommendation 1: All firms in the food, beverage and tobacco industry should realise that they have an important role to play in the disclosure of their water practices. Within the concepts of disclosure comparability, the quality and transparency of information are essential parts of a company's communication towards its stakeholders. Adhering to high standards of disclosure can alleviate some inherent risk associated with investments in emerging markets.

Recommendation 2: Stock exchanges have a responsibility towards stakeholders by ensuring that listed companies adhere to the information needs of their investors. Some Stock Exchanges have developed principles and guidelines and refer companies to adopt other sustainability frameworks. For example, the ASX Corporate Governance Council has Principles and Recommendations for material issues. It is recommended that these principles and guidelines should become mandatory, especially for firms with a high impact on the environment.

Recommendation 3: The researcher recognises the diversified standards and frameworks available, which could attribute to confusion among reporting firms. Furthermore, the challenge to set up uniform standardised sustainability guidelines is acknowledged. However, this represents opportunities for accounting and auditing professionals, policy makers' standard setting bodies, academics and researchers to become more active in finding a solution. It is recommended that following actions listed in the bullets below could enhance the journey towards more standardised guidelines:

- Stimulate the dialogue around sustainability disclosure practices through conferences, debates and increased research.
- Collaboration between academics and organisations such as the IIRC, SASB, GRI and CDP is fundamental to produce more standardised guidelines, especially for water disclosures.
- Improved relationships should be established between stock exchanges, listed firms, as well as the private and the public sector, in order to assist with-, and promote comparable and transparent disclosures.
- Within the context to the WEF nexus and the importance of water to the industry, the focus on integrated water disclosures should not be disregarded.

The contributions of the study are discussed next.

7.7 CONTRIBUTIONS OF THE STUDY

The contributions of this study are divided into theoretical- and practical contributions.

7.7.1 Theoretical contributions

In a setting where water management is as much a social concern to stakeholders as an environmental one, this study calls on the request of several authors to engage in this vital area of growing importance (Burritt *et al.*, 2016:73). Furthermore, Scanlon *et al.* (2017:3554) mentioned that the various science disciplines have long histories of working autonomously in mechanisms of the WEF nexus – and underlines that future research should integrate physical, agri-ecological, and social sciences with economics. In this sense, the water disclosure index was developed in an environment where the appeal for interdisciplinary as well as multidisciplinary scientific research is apparent. A unique contribution of this study is the development of the water disclosure index, taking into consideration the principles of an integrated approach, integrated thinking and the WEF nexus environment.

The water disclosure index and the research results highlighted the urgency to move away from providing short-term historical information, to more long-term forward-looking information. The study contributes to the WEF nexus by emphasising stakeholder engagement as an integral part of companies operating in the food, beverage and tobacco industry. The significance of engagement related to water within the supply chain was evident through managing upstream and downstream water and food security aspects.

To the best knowledge of the researcher, this study was the first to evaluate whether IR is associated with improved water disclosures in the food, beverage and tobacco industry. Moreover, this study introduced a global perspective by including firms listed on the DJGSI. This study extended the existing knowledge on IR and contributes to the understanding of water disclosure practices in the food, beverage and tobacco industry. The integrated and interrelated nature of water disclosures were evident in the quantitative and qualitative findings, with the best performing firms progressing on their disclosures from one construct to another.

Based on the findings, noticeable concepts such as materiality, governance, risk assessments and future-orientated information, were associated with improved water disclosures by firms implementing IR. Therefore, the research contributes, and emphasises the need for an integrated approach towards water disclosures, especially in the food, beverage and tobacco industry. Best practices from the IR group disclosed balanced strategic information, which included water governance aspects, how they intend to deal with long-term water risks with regard to resource planning and allocation, and how do they collaborated with stakeholders to ensure sustainable practices and business continuity.

The legitimacy- and stakeholder theory were applicable to this study and viewed as complementary, rather than alternatives. Prior research has mentioned the interrelationship of the theories in the context of sustainability reporting, which was evident in the execution of this study. Endo *et al.* (2017:29) recognised the need for integrated indices and models and stressed that current monodisciplinary research results need to be integrated in order to understand the complexities of water-energy-food systems. Within this context, this study contributed by affirming that an integrative disclosure approach is essential for effective water management in the WEF nexus.

To the best knowledge of the researcher, no studies have been performed in the food, beverage and tobacco industry, with the aim to evaluate water reporting practices between firms implementing IR, as opposed to companies not practicing IR. In this sense, the researcher acknowledges that integrated thinking – within the concept of IR – is a new disclosure philosophy which requires further research.

Considering the discussions above, and in the light of improved water disclosure practices associated with IR in the food, beverage and tobacco industry – a new integrated disclosure theory is proposed.

7.7.2 Practical contributions

Based on the information from the literature review, the water disclosure index utilised in the empirical study was developed in three stages (Appendix A to C). Subsequent to the empirical analyses, best practices observed informed the refined water disclosure index (Appendix E). The following practical contributions are listed below:

- The developed water disclosure index accounted for the integrated nature of water disclosures in the food, beverage and tobacco industry. Consequently, the improved water disclosure index could be applied by firms in the food, beverage and tobacco industry – regardless of whether or not a firm is implementing IR.

- The implementation of the developed water disclosure index would allow the reporting firm to combine the most essential water-related aspects into a holistic, concise and comparable report. This would provide key stakeholders with forward-looking and strategic water-related information which is incorporated into the business model, in order to deal with the challenges from the external environment.

- The developed water disclosure index would contribute to the skills needed to disclose integrative water-related information to the key stakeholders of the firm.

- The various constructs in the developed water disclosure index could contribute to future reporting frameworks, and could be utilised by practitioners, academics, policymakers and standard setting bodies as a benchmark to test, refine or adjust the index.

7.8 LIMITATIONS OF THE STUDY

As with all studies, this research is not without limitations. Consequently, the results, conclusions, recommendations and contributions of the study, need to be considered in light of the following limitations listed below:

- It is recognised that the constructs and elements included in the water disclosure index were compiled from multiple literature sources, applicable to different industries, and that some could be omitted.
- The food, beverage and tobacco industry, was purposefully selected as a water-intensive industry, which plays a significant role in agricultural water use within concept of the WEF nexus – which restricted the sample size. Moreover, only selecting firms in the food, beverage and tobacco listed in South Africa and Australia as water scarce countries, and comparing to global best practices of firms listed on the DJGSI, also limited the sample size.
- The top 20 Australian firms were selected by market capitalisation, which implies that the respondents are not necessarily representative of all firms listed on the ASX in the food, beverage and tobacco industry.
- Applying content analysis as a research design will always involve individual judgements made by coders. Measures taken in this study, together with an experienced colloquium, included a coding discussion of each element within the water disclosure index, pilot coding of 10% of the sample firms, followed by a comparison and discussion of the results – before further coding commenced.
- Due to the data collection process, and time-consuming manual content analyses, the associations and relationships from the sample cannot be generalised – which was not the intention of the study.

7.9 SUGGESTIONS FOR FUTURE RESEARCH

The outcomes from this study presents several future research opportunities, listed below:

- The study was performed on only one industry, and could easily be replicated to other industries – utilising the developed water disclosure index – which implies that the results of other industries could be compared to this study.
- Water practices of various other countries could be incorporated into the food, beverage and tobacco industry, in order to conduct cross-country comparisons.

- The improved water disclosure index (Appendix E) could be utilised by applying a different coding system, or employed in other studies investigating water disclosure practices – and could be further developed and improved.
- This study addressed water disclosures within context of the WEF nexus and investigated two elements of the nexus (water and food). Future research on water disclosures in the food, beverage and tobacco industry could include energy, or the combination of energy and food when addressing the WEF nexus.
- The proposition of a new integrated disclosure theory requires future research in different sustainability settings. In this sense, future research should evaluate whether IR is associated with improved disclosures of any sustainability topics, in any setting (country or industry).
- Further research could also follow a participatory approach, engaging with governments, other academics, regulatory bodies and institutions such as the SASB, CDP, GRI, ACCA or CIMA.

7.10 CONCLUSION

The food, beverage and tobacco industry is progressively experiencing the pressure of scarce water resources, which is escalated by the growing population and rising demand for food production. Moreover, agriculture is the foremost user of water – increasing the burden on this industry.

The interlinked and connected relationship between water, energy and food in the food, beverage and tobacco industry – exposed the WEF nexus. As the focus of this study was on water disclosure in the food, beverage and tobacco industry, two of the nexus elements were deliberated. Firms should address the connectivity of water in their operations and illustrate that they understand the WEF nexus in their water disclosure practices. In this sense, IR or an integrated approach towards the WEF nexus could be a disclosure mechanism to advance the reporting actions and communication of water information to stakeholders. Furthermore, for companies to survive in this challenging environment, they need to ensure proper water governance in their company, but should also account for firms operating in their supply chain.

Within context of the WEF nexus, and the food, beverage and tobacco industry under investigation, this study evaluated whether IR is associated with improved water-related disclosure. The results contributed to the literature and confirmed that firms implementing IR demonstrated improved water disclosure practices. Enhanced water disclosures – due to the integration of noticeable concepts central to IR – were evident in the materiality, governance, risk assessments and future-orientated information constructs. Firms cannot disregard the significance of water in their industry and should identify water as a material aspect as a first step to initiate the disclosure process. The integrated nature of water-related disclosure was evident in the best practices observed, and firms should acknowledge the ‘building blocks’ required to provide future-orientated water information and strategies to their stakeholders. Moreover, the impact of water in the food, beverage and tobacco supply chain, constitutes that firms should engage with suppliers, and conduct water risk assessments in an effort to drive sustainable water practices.

This study also compared the water disclosures among firms listed on three indices. Significant differences were evident in the water reporting practices, which contributed to the literature that the fragmentation in regulatory standards across institutional settings, adds to the problem of comparability across companies and countries. Global firms listed on the DJGSI demonstrated ‘best practices’ and performed the best, adhering to 64.53% of the water disclosure index. South African companies listed on the JSE recorded an overall average of 52.55% and Australian companies listed on the ASX, a modest 19.72%. These results indicated much room for improvement, and it was recommended that sustainability principles and guidelines should become mandatory, especially for firms with high impacts on the environment.

Initially, various theories were deliberated, and the legitimacy and stakeholder theories were viewed as complementary, rather than alternatives to this study. The stakeholder theory distinguished between two branches, namely a managerial and ethical perspective. The managerial perspective as part of the stakeholder theory, focussed on the primary stakeholders of the organisation to receive water information for decision-making purposes. In countries (such as South Africa and Australia) where water is a scarce resource, the stakeholder’s concept could be expanded to include additional stakeholders out of an ethical perspective. The society is included as a stakeholder, as water is an essential resource for the survival of society. This ethical, societal approach is applicable all over the globe where food security and water scarcity are a concern.

Additionally, prior research mentioned the interrelationship of the theories in the context of sustainability reporting – and after the execution of this study of water reporting in the food, beverage and tobacco industry – the integration was more evident. Considering the importance of the WEF nexus, this study confirmed that an integrative approach is associated with improved water reporting practices in the food, beverage and tobacco industry – and proposed a new integrated disclosure theory.

To conclude, the researcher alludes to a qualitative observation of a firm listed on the ASX in Australia:

> *"Feeding this growing population is one of the great challenges of the 21st century. How do we ensure that enough protein is produced when there is limited scope to expand agriculture's use of more land and water resources?"* (Huon Aquaculture, 2018:14).

With this in mind, firms operating in the food, beverage and tobacco industry should realise their ability to incentivise and drive sustainable, integrative water disclosures!

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APPENDIX A

DEVELOPING THE WATER DISCLOSURE INDEX (PHASE 1)

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Governance and management approach	**Materiality** Does the company identify water as a material aspect? **EMS** Establish whether the company has EMS for water-related issues by identifying the following: • Does the company have indications of improving operational water systems by applying internal measures? • Does the company indicate that it understands the context in which it operates in terms of water stress, flooding, water quality and regulatory uncertainty? • Has the company developed its own water strategy? **Governance** Establish the awareness of governance aspects for water by identifying the following: • Does the company have a director or senior staff member responsible for water disclosure programmes? • Does the company have water-related policy/policies?	**Disclosure 103-1 explanation of the material topic and its boundary** An explanation of why the topic is material. The explanation of why the topic is material can include: • A description of the significant impacts identified and the reasonable expectations and interests of stakeholders regarding the topic. • A description of the process, impacts related such as due diligence, that the organisation used to identify the topic. The Boundary for the material topic, which includes a description of: • where the impacts occur; • the organisation involvement with the impacts. Any specific limitation regarding the topic Boundary. **Disclosure 103-2 the management approach and its components** An explanation of how the organisation manages the topic. A statement of the purpose of the management approach. A description of the following, if the management approach includes that: policies, commitments, goals and targets, responsibilities, resources, grievance mechanisms, or specific actions (i.e. processes, projects, programs and initiatives).	Has your organisation experienced any detrimental water-related impacts? Describe the water-related detrimental impacts experienced by your organisation, your response, and the total financial impact. **Risks and opportunities: Risk exposure** How does your organisation define substantive financial or strategic impact on your business? Water-related risks and response. Provide details of identified risks in your direct operations with the potential to have a substantive financial or strategic impact on your business, and your response to those risks. **Business strategy: Value creation** The inclusion of water issues as part of the company's business model were evident in the study by Sánchez-Hernández *et al.* (2017:845), and such inclusion could be considered as one of the best practices. Robust governance and management systems are required to manage water, consequently water governance in the boardroom is essential. Companies that have board-level oversight of water issues are reaping the rewards, which include market differentiation, shareholder confidence and business resilience. Across all your operations, what proportion of the following water aspects are regularly measured and monitored? Recent impacts on your business.

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Risks assessments	**Risk assessment** Establish whether the company has risk assessment actions for water-related issues by identifying the following: • Has the company identified physical risks such as flooding, water stress and pollution? • Has the company identified regulatory risks such as water permits, rates controlling water withdrawal, discharge quantities and other restrictions? • Has the company identified reputational risks such as tensions between businesses and local communities or businesses and other supply chain members?	**Disclosure 103-3 evaluation of the management approach** An explanation of how the organisation evaluates the management approach, including: • the mechanisms for evaluating the effectiveness of the management approach; • the results of the evaluation of the management approach; • any related adjustments to the management approach.	**Business impacts** Recent impacts on your business. Describe the water-related detrimental impacts experienced by your organisation, your response, and the total financial impact. **Procedures** Risk identification and assessment procedures. • Does your organisation undertake a water-related risk assessment? • Select the options that best describe your procedures for identifying and assessing water-related risks. • Which of the following contextual issues are considered in your organisation water-related risk assessments? • Which of the following stakeholders are considered sin your organisations water-related risk assessments?
Interaction with water as a shared resource (supply chain)	**Water sources significantly affected by the withdrawal of water (EN 9)** Does the company report on the total number of water sources significantly affected by withdrawal of water taking the following into account: • Size of water source in cubic metres (m3); • Whether the source is designated as a protected area (national/international); • Biodiversity value (i.e. species diversity and endemism, number of protected species); and • Value or importance of water source to local communities and indigenous people.	**Disclosure 303-1 interactions with water as a shared resource** A description of how the organisation interacts with water, including how and where water is withdrawn, consumed, and discharged, and the water-related impacts caused or contributed to, or directly linked to the organisations activities, products or services by a business relationship (e.g. impacts caused by runoff). Extract: The description of how the organisation interacts with water can include [...] information on what the water is used for in direct operations and elsewhere in the value chain (e.g., for cooling, storage, incorporating in products, growing crops).	Does your organisation undertake a water-related risk assessment? Select the options that best describe your procedures for identifying and assessing water-related risks. Which of the following contextual issues are considered in your organisation's water-related risk assessments? Which of the following stakeholders are considered in your organisation's water-related risk assessments? Describe your organisation's process for identifying, assessing, and responding to water-related risks within your direct operations and other stages of your value chain.

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Interaction with water as a shared resource (supply chain)		A description of the approach used to identify water-related impacts, including the scope of assessments, timeframe, and tools or methods. Extract: When assessing impacts, it is important that the organisation consider its future impacts on water quality and availability, as these factors can change over time. A description of how water-related impacts are addressed, including how the organisation works with stakeholders to steward water as a shared resource, and how it engages with suppliers or customers with significant water-related impacts. An explanation of the process for setting any water-related goals and targets that are part of the organisation's management approach, and how they relate to public policy and the local context of each area with water stress. Extract: Meaningful targets for managing water-related impacts: • Account for the local context where water is withdrawn and discharged; • are scientifically informed by sustainable thresholds and social context of a catchment; • align with public sector efforts (i.e. the water-related targets of the UN Sustainable Development Goals, in particular Goal 6); • are informed by the advocacy of stakeholders (i.e. civil society organisations, trade associations, and action groups). An overview of water use across the organisation's value chain. A list of catchments where the organisation causes significant water-related impacts.	This concern is consistent with findings by the Ceres investor coalition, the financial services firm UBS, and financial data provider Bloomberg, that issued a report that found that many of the 100 publicly traded companies do not include data on water risks, and none of them provided data on water usage or risk for their supply chains (Wilburn & Wilburn, 2013:64). Inequalities such as nutrition, health sanitation and security are at the heart of the nexus and companies play a vital role in ensuring that supply chains are dynamic and able to provide food, energy and water (Whiteman et al., 2013:317). By managing their activities they can make sure that environmental targets and policies are integrated upstream (suppliers) and downstream to the consumer. **Value chain engagement** Do you engage with your value chain on water-related issues? What proportion of suppliers do you request to report on their water use, risks and/or management information and what proportion of your procurement spend does this represent? Provide details of any other water-related supplier engagement activity. Bateman et al. (2017:119) states most companies only report on their own operations, and not for the entire supply chain.

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Targets and measures	**Total water withdrawal by source (EN 8)** Does the company report the total volume of water withdrawn in cubic metres per year (m3/year) from the following sources: • surface water, including water from wetlands, rivers, lakes and oceans; • ground water; • rainwater collected directly and stored by the organisation; • waste water from another organisation; and • municipal water supplies or other water utilities.	**Disclosure 303-3 water withdrawal** Total water withdrawal from all areas in ML, and a breakdown of this by the following sources: (a) surface water, (b) groundwater, (c) seawater, (d) produced water, or (e) third-party water. Extract: Surface water includes collected or harvested rainwater. Total water withdrawal from all areas with water stress in ML, and a breakdown of this by the following sources: (a) surface water, (b) groundwater, (c) seawater, (d) produced water, or (e) third-party water, and a breakdown of this total by the withdrawal sources listed in a-e. When compiling the information specified in Disclosure 303-3, the reporting organisation shall use publicly available and credible tools and methodologies for assessing water stress. A breakdown of total water withdrawal from the sources listed in Disclosures 303-3-a and b in ML by the following categories: (a) freshwater (≤1,000 mg/L Total Dissolved Solids), (b) other water (>1,000 mg/L Total Dissolved Solids). Extract: Other water constitutes any water that has a concentration of total dissolved solids higher than 1,000 mg/L. Other water is therefore all water that does not fall into the freshwater category. Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. A breakdown of total water withdrawal in ML by withdrawal source categories listed in Disclosure 303-3, at each facility in areas with water stress.	**Company-wide water accounting** Provide the proportion of your total withdrawals sourced from water stressed areas. Provide total water withdrawal data by source. • Fresh surface water, including rainwater, water from wetlands, rivers, and lakes. • Brackish surface water/seawater. • Groundwater – renewable. • Groundwater – non-renewable. • Produced water. • Third-party sources **Company-wide water accounting** What are the total volumes of water withdrawn, discharged, and consumed across all your operations, and how do these volumes compare to the previous reporting year? Provide the proportion of your total withdrawals sourced from water-stressed areas.

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Targets and measures	**Percentage and total volume of water recycled and reused (EN 10)** Does the company report on the total volume of water recycled and reused by the organisation in cubic metres per year (m3/year)? Does the company report the total volume of water recycled and reused by the organisation in cubic metres per year (m3/year) as a percentage of the total water withdrawal reported under Indicator G4 – EN 8.	**Disclosure 303-4 water discharge** Total water discharge to all areas in ML, and a breakdown of this total by the following types of destination, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) third-party water, and the volume of this total sent for use to other organisations, if applicable. Extract: Third-party water discharge is when an organisation sends water and effluents to other organisations for use. The volume of this water discharge must be reported separately. Priority substances of concern for which discharges are treated: Number of incidents of non-compliance with discharge limits. Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. The number of occasions on which discharge limits were exceeded. **Disclosure 303-5 water consumption** Total water consumption from all areas in ML. Extract: If the reporting organisation cannot directly measure water consumption, it can be calculated with: Water consumption = Total water withdrawal – Total water discharge Any contextual information necessary to understand how the data have been compiled. Extract: If the reporting organisation cannot directly measure water consumption, it can be calculated with: Water consumption = Total water withdrawal – Total water discharge Total water consumption in ML at each facility.	**Company-wide water accounting** What are the total volumes of water withdrawn, discharged, and consumed across all your operations, and how do these volumes compare to the previous reporting year? Provide total water discharge data by destination: • Fresh surface water • Brackish surface water/seawater • Groundwater • Third-party destinations **Business impacts** **Compliance impacts** In the reporting year, was your organisation subject to any fines, enforcement orders, and/or other penalties for water-related regulatory violations? Provide the total number and financial value of all water-related fines. Provide details for all significant fines, enforcement orders and/or other penalties for water-related regulatory violations in the reporting year, and your plans for resolving them.

	The previous GRI (EN 8, EN 9 & EN 10)	The latest GRI (GRI 303): water and effluents, 2018	CDP, GRI sector guidance and literature studies
Site information			**Facility-level water accounting** For each facility referenced, provide coordinates, total water accounting data and comparisons with the previous reporting year. By providing consistent information across all sites, Leong et al. (2014:98) argued that companies can show that they are not manipulating their reports by cherry-picking the best stories and results across their operations. Another study performed by Fonseca et al. (2012:70) contested the effectiveness of the GRI framework by arguing that GRI-based reports could mislead decision makers because unsustainable practices, particular at site level, is not reported on. Given the differences in organisational types and activities, fluidity and flexibility should be built into the guidelines and standards of IR. This refers to the fact that industry-based or site-level-based metrics should be considered (Dumay et al. 2016:179).

APPENDIX B

DEVELOPING THE WATER DISCLOSURE INDEX (PHASE 2)

	Elements or possible items	Remarks	Coding		
			0	1	2
Governance and management approach (G)	**1. Materiality** Does the company identify water as a material aspect? The explanation can include: • A description of the significant impacts identified and the reasonable expectations and interests of stakeholders regarding the topic. • A description of the process, impacts related such as due diligence, that the organisation used to identify the topic. The Boundary for the material topic, which includes a description of: (a) Where the impacts occur; (b) The organisation's involvement with the impacts; (c) Any specific limitation regarding the topic boundary.	Although materiality is sometimes recognised under the management approach, it will form a theme on its own.			
	2. Environmental management systems (GE) Establish if the company has EMS for water-related issues by identifying the following: Does the company have indications of improving operational water systems by applying internal measures? Does the company indicate that it understands the context in which it operates in terms of water stress, flooding, water quality and regulatory uncertainty? The company developed its own water strategy.	Will remain under governance. Internal measures will be evaluated under targets and measures.	No disclosure.	The company has an EMS for water-related issues.	The company has an EMS for water-related issues. The company illustrates that it understands the context in which it operates and developed their own water strategy.

	Elements or possible items	Remarks	Coding		
			0	1	2
Governance and management approach (G)	**3. Governance structure (GS)** Does the company identify water as a Establish the awareness of governance aspects for water by identifying the following: Does the company have a director or senior staff member responsible for water disclosure programmes? Does the company have water-related policies, commitments, goals and targets, responsibilities, resources, grievance mechanisms, specific actions, such as processes, projects, programs and initiatives. Is the company serious about value creation over the short, medium and long term? The company identified the need for a long term water strategy.	Governance structure will remain under governance. Value creation will move to future-orientated information. Long term water strategy will become part of future-orientated information.	No disclosure.	The company displays awareness of water governance aspects and has appointed dedicated directors or staff members responsible for water governance.	The company displays awareness of water governance aspects and has appointed dedicated directors or staff members responsible for water governance. The company has water-related policies, commitments, resources, projects, programs and initiatives.
Water-related impacts in supply chain (SC)	Do you engage with your value chain on water-related issues? Total water withdrawal by suppliers causing significant water-related impacts in areas with water stress (volume in ML). Percentage of suppliers causing significant water-related impacts from discharge that have set minimum standards for the quality of their water discharge (%).		No disclosure.	The company discloses engagement on water-related issues in their supply chain (suppliers, upwards, downwards).	The company discloses engagement on water-related issues in their supply chain (suppliers, upwards, downwards). The company discloses information on suppliers in their supply chain by quantifying the information.

	Elements or possible items	Remarks	Coding		
			0	1	2
Targets and measures (TM)	**Total water withdrawal by source (EN 8); GRI 303-3** Total water withdrawal from all areas in ML, and a breakdown of this total by the following sources, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) produced water; (e) third-party water. Total water withdrawal from all areas with water stress in ML, and a breakdown of this total by the following sources, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) produced water; (e) third-party water, and a breakdown of this total by the withdrawal sources listed in a-e. A breakdown of total water withdrawal from each of the sources listed in Disclosures 303-3-a and 303-3-b in ML by the following categories: (a) Freshwater (≤1,000 mg/L Total Dissolved Solids); (b) Other water (>1,000 mg/L Total Dissolved Solids). (Other water constitutes any water that has a concentration of total dissolved solids higher than 1,000 mg/L. Other water is therefore all water that does not fall into the freshwater category.) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. Reporting about the quality of the water		No disclosure.	The company discloses total water withdrawal (quantity) and/or the source but does not quantify the source.	The company discloses total water withdrawal, quantifying each source.

	Elements or possible items	Remarks	Coding		
			0	1	2
Targets and measures (TM)	**Disclosure 303-4 water discharge** Total water discharge to all areas in ML, and a breakdown of this total by the following types of destination, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) third-party water, and the volume of this total sent for use to other organisations, if applicable. Priority substances of concern for which discharges are treated, including: the number of incidents of non-compliance with discharge limits. Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. d. The number of occasions on which discharge limits were exceeded. Any fines received or to be paid.		No disclosure.	The company discloses total water discharge (quantity) and/or the source but does not quantify the source.	The company discloses total water discharge, quantifying each source.
	Disclosure 303-5 water consumption Total water consumption from all areas in ML. (If the reporting organisation cannot directly measure water consumption, it may calculate this using the following formula: Water consumption = Total water withdrawal – Total water discharge). Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used, including whether the information is calculated, estimated, modelled, or sourced from direct measurements, and the approach taken for this, such as the use of any sector-specific factors.		No disclosure.	The company discloses total water consumption (quantity).	The company discloses total water consumption (quantity) with contextual information.

	Elements or possible items	Remarks	Coding		
			0	1	2
Targets and measures (TM)	**Percentage and total volume of water recycled and reused (EN 10)** Does the company report the total volume of water recycled and reused by the organisation in m^3/year as a percentage of the total water withdrawal reported under Indicator G4 – EN 8.		No disclosure.	The company discloses total water recycled and reused.	The company discloses total water recycled and reused (quantity and percentage of total withdrawal).
Risk assessment (RA)	**Risk assessment:** Establish whether the company has risk assessment actions for water-related issues by identifying the following: The company identified physical water risks such as flooding, water stress and pollution.		No disclosure.	Discloses physical risk.	Provide detail on physical water risks.
	The company identified regulatory risks such as water permits, rates controlling water withdrawal, discharge quantities and other restrictions.		No disclosure.	Discloses regulatory water risks.	Provide detail on regulatory water risks.
	The company identified reputational risks such as tensions between businesses and local communities or businesses and other supply chain members		No disclosure.	Discloses reputational water risks.	Provide detail on reputational water risks.
	The company indicates the procedures and methods used with regard to their water risk assessments		No disclosure.	The company discloses procedures and methods used for their water risk assessments.	The company discloses procedures and methods used for their water risk assessments, and the frequency thereof.

	Elements or possible items	Remarks	Coding		
			0	1	2
Risk assessment (RA)	The company identifies stakeholders which are considered in their organisation's water-related risk assessments.		No disclosure.	The company discloses stakeholders considered in their water risk assessments.	The company discloses stakeholders considered in their water risk assessments and indicate contextual issues (positive / negative) that could affect the stakeholders.
Risk assessment (RA)	The organisation should state how frequently they undertake water risk assessments, at what geographical scale and how far into the future they consider risks for each assessment.	Three statements in one. Frequency of water risk assessment will be used at the coding (2). Geographical scale will move to site information, and considering future water risks for assessments will move to future-orientated information.			
Future-orientated information (FO)	The company reports on quantitative future-orientated information on water issues.		No disclosure.	The company provides future-orientated information	The company disclose quantitative future-orientated information.
Future-orientated information (FO)	The company identified the need for a long term water strategy.		No disclosure.	The company discloses a water strategy.	The company discloses an long term water strategy.
Future-orientated information (FO)	The company provides information on water which could affect value creation over the short, medium and long term.		No disclosure.	The company discloses future information on water which could affect value creation.	The company discloses future information on water that could affect value creation.
Future-orientated information (FO)	The company evaluated how their water risk assessments could affect future success and growth strategy.	Moved from risk assessment to future-orientated information.	No disclosure.	The company discloses future-orientated information on water risk assessments.	The company discloses evaluations on how water risk assessments could affect future success and growth.

APPENDIX C

WATER DISCLOSURE INDEX UTILISED IN THE EMPIRICAL STUDY

COMPANY CHARACTERISTICS					
Name					
IR/Not IR	IR (0)	Non-IR (1)	**Assurance**	Internal (0)	External (1)
Firm size	Total assets value:				
Country	South Africa (0)		Australia (1)	Global (2)	
Conciseness	0-70 (0)		70-140 (1)	140-210 (2)	More than 210 (3)

	Elements	Coding		
		0	1	2
Materiality (M)	**M1:** The company identifies water as a material aspect, and provides a description of the significant impacts identified.	No disclosure.	The company identifies water as a material aspect.	The company identifies water as a material aspect and provides a description of the impacts associated.
	M2: The company describes the process of identifying water as material, and identifies the stakeholders with regard to water as a material aspect.	No disclosure.	The company describes the process and impacts related, such as due diligence.	The company describes the process, and identifies the stakeholders.
Governance and management approach (G)	**G1:** The company indicates that it has EMS, and developed their own water strategy.	No disclosure.	The company has an (EMS) for water-related issues.	The company has an EMS and incorporated into their water strategy.
	G2: The company understands the context in which it operates in terms of water stress, flooding, water quality and regulatory uncertainty.	No disclosure.	Indicated that it understands the context.	Provide more detail, such as flooding, water quality and regulatory uncertainty.
	G3: The company includes water-related aspects as part of their business model.	No disclosure.	Shows that water is part of its business model.	Provide more detail on the business model and water.

	Elements	Coding		
		0	1	2
Governance and management approach (G)	Establish the awareness of some structure in governance of water by identifying the following: **G4:** The company have a director or senior staff member (board oversight) responsible for water governance.	No disclosure.	The company has senior representatives responsible for water governance.	Very clearly (board oversight) embedded in its organisational structure.
	G5: The company has water-related: Policies, Commitments, Goals and targets, Responsibilities, Resources, Grievance mechanisms and specific actions, such as processes, projects, programs and initiatives.	No disclosure.	Indicates some policies & procedures.	Detail information about policies, commitment, resources, projects, programs and initiatives.
Water-related impacts in its supply chain (SC)	**SC1:** The company identifies suppliers causing significant water-related impacts.	No disclosure.	The company identifies suppliers causing significant impacts. water withdrawal by suppliers in water stress areas (ML).	The company identifies suppliers causing significant impacts by quantifying withdrawal and discharge by suppliers.
	SC2: The company has a policy and strategy to manage water-related aspects in their supply chain.	No disclosure.	The company display policies and strategies for water in their supply chain.	The company display policies and strategies for water in their supply chain by providing detailed information.
	SC3: The company identifies water risk factors in their supply chain.	No disclosure.	The company identifies water risk factors in their supply chain.	The company identifies water risk factors in their supply chain and provides quantified information.
	SC4: The company displays that it understands the WEF nexus by considering the upstream and downstream role players in their supply chain.	No disclosure.	The company indicates that they understand the WEF nexus.	The company indicates that they understand the WEF nexus by identifying role players and their effect on the supply chain.

Targets and measures (TM)	Elements	Coding		
		0	1	2
	Total water withdrawal by source (EN 8) **TM1:** The company discloses total water withdrawal from all areas in ML, and a breakdown of this total by the following sources, if applicable: (a) surface water (i.e. collected or harvested rainwater); (b) groundwater; (c) seawater; (d) produced water; (e) third-party water. Total water withdrawal from all areas with water stress in ML, and a breakdown of this total by the following sources, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) produced water; (e) third-party water, and a breakdown of this total by the withdrawal sources listed in a-d. (When compiling the information specified above, the reporting organisation shall use publicly available and credible tools and methodologies for assessing water stress in an area). A breakdown of total water withdrawal from each of the sources listed in Disclosures 303-3-a and 303-3-b in ML by the following categories: (a) freshwater (≤1,000 mg/L Total Dissolved Solids); (b) Other water (>1,000 mg/L Total Dissolved Solids). (Other water constitutes any water that has a concentration of total dissolved solids higher than 1,000 mg/L. Other water is therefore all water that does not fall into the freshwater category.) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used.	No disclosure.	The company discloses total water withdrawal (quantity) and/or the source but does not quantify the source.	The company discloses total water withdrawal, quantifying each source.

	Elements	Coding		
		0	1	2
Targets and measures (TM)	**Disclosure 303-4 water discharge** **TM2:** The company discloses total water discharge to all areas in ML, and a breakdown of this total by the following types of destination, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) third-party water, and the volume of this total sent for use to other organisations, if applicable. (An example of third-party water discharge is when an organisation sends water and effluents to other organisations for use. In these instances, the organisation is required to report the volume of this water discharge separately.) Priority substances of concern for which discharges are treated, including: the number of incidents of non-compliance with discharge limits. Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. The number of occasions on which discharge limits were exceeded. Any fines received or to be paid.	No disclosure.	The company discloses total water discharge (quantity) and/or the source but does not quantify the source.	The company discloses total water discharge, quantifying each source.
	TM3: The company discloses information on their water quality.	No disclosure.	Statement about water quality.	Provide more detail on water quality.

	Elements	Coding		
		0	1	2
Targets and measures (TM)	**Disclosure 303-5 water consumption** **TM4:** The company discloses total water consumption from all areas in ML. (If the reporting organisation cannot directly measure water consumption, it may calculate this using the following formula: Water consumption = Total water withdrawal – Total water discharge). Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used, including whether the information is calculated, estimated, modelled, or sourced from direct measurements, and the approach taken for this, such as the use of any sector-specific factors.	No disclosure.	The company discloses total water consumption (quantity).	The company discloses total water consumption (quantity) with contextual information.
	Percentage and total volume water recycled and reused **TM5:** The company discloses total volume of water recycled and reused by the organisation in cubic metres per year (m3/year) as a percentage of the total water withdrawal reported under Indicator G4 – EN 8.	No disclosure.	The company discloses total water recycled and reused.	The company discloses total water recycled and reused (quantify and percentage of total withdrawal).
Site-specific information (SI)	**SI1:** For each facility, the company provides coordinates, total water accounting data and comparisons with the previous reporting year.	No disclosure.	The company discloses different site level information.	More detail such as coordinates and comparisons with previous year.
	SI2: The company disclose water risk assessments at geographical scale (each site).	No disclosure.	The company discloses risk assessment at each site.	The company discloses detail risk assessment at each site with quantified information.

	Elements	Coding		
		0	1	2
Risk assessment (RA)	Establish whether the company has risk assessment actions for water-related issues by identifying: **RA1:** The company identified physical water risks such as flooding, water stress and pollution.	No disclosure.	Discloses physical risk.	Provide detail on physical water risks.
	RA2: The company identified regulatory risks such as water permits, rates controlling water withdrawal, discharge quantities, and others.	No disclosure.	Discloses regulatory water risks.	Provide detail on regulatory water risks.
	RA3: The company identified reputational risks such as tension with local communities.	No disclosure.	Discloses reputational water risks.	Provide detail on reputational water risks.
	RA4: The company indicates the procedures and methods used with regard to their water risk assessments.	No disclosure.	The company discloses methods and procedures for their water risk assessments.	The company discloses methods for water risk assessments and the frequency of assessments.
	RA5: The company identifies stakeholders which are considered in their organisation's water-related risk assessments.	No disclosure.	The company discloses stakeholders considered in their water risk assessments.	The company discloses stakeholders considered in water risk assessments and indicate issues (positive/negative) that could affect stakeholders.
Future-orientated information (FO)	**FO1:** The company reports on future-orientated information on water issues.	No disclosure.	The company provides future-orientated information.	The company disclose quantitative future-orientated information.
	FO2: The company identified the need for a long term water strategy.	No disclosure.	The company discloses a water strategy.	The company discloses a long term water strategy.
	FO3: The company provides information on water which could affect value creation over the short, medium and long term.	No disclosure.	The company discloses future information on water which could affect value creation.	The company disclose future information on water which could affect value creation.
	FO4: The company evaluated how their water risk assessments could affect future success and growth strategy.	No disclosure.	The company discloses future-orientated information on water risk assessments.	The company disclose evaluations on how water risk assessments could affect success and growth.

APPENDIX D

SPEARMAN'S CORRELATIONS

Spearman's rho		IR (0) / Not IR (1)	Conciseness (pages)	Assurance	Size (total assets)	Index average (27 elements)	M_100	G_100	SC_100	TM_100	SC_100	RA_100	FO_100
IR (0) / Not IR (1)	Correlation coefficient	1.000	-0.243*	0.173	0.111	-0.368***	-0.429***	-0.456***	-0.209	-0.193	-0.103	-0.347**	-0.458***
	Sig. (2-tailed)		0.092	0.235	0.449	0.009	0.002	0.001	0.150	0.183	0.481	0.015	0.001
	N	49	49	49	49	49	49	49	49	49	49	49	49
Conciseness (pages)	Correlation coefficient	-0.243*	1.000	0.185	0.700***	0.697**	0.466***	0.537***	0.621***	0.702***	0.514***	0.615***	0.681***
	Sig. (2-tailed)	0.092		0.203	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
Assurance	Correlation coefficient	0.173	0.185	1.000	0.008	-0.017	-0.317**	-0.145	-0.015	-0.027	-0.111	0.166	-0.004
	Sig. (2-tailed)	0.235	0.203		0.955	0.910	0.026	0.319	0.921	0.854	0.450	0.254	0.977
	N	49	49	49	49	49	49	49	49	49	49	49	49
Size (total assets)	Correlation coefficient	0.111	0.700***	0.008	1.000	0.664**	0.395***	0.556***	0.636***	0.669	0.624***	0.567***	0.593***
	Sig. (2-tailed)	0.449	0.000	0.955		0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
Index average (27 elements)	Correlation coefficient	-0.368***	0.697***	-0.017	0.664***	1.000	0.721***	0.892***	0.891***	0.835***	0.708***	0.929***	0.934***
	Sig. (2-tailed)	0.009	0.000	0.910	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
M_100	Correlation coefficient	-0.429***	0.466***	-0.317**	0.395***	0.721**	1.000	0.702***	0.583***	0.509***	0.568***	0.640***	0.716***
	Sig. (2-tailed)	0.002	0.001	0.026	0.005	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
G_100	Correlation coefficient	-0.456***	0.537***	-0.145	0.556***	0.892**	0.702***	1.000	0.762***	0.634***	0.592***	0.844	0.853***
	Sig. (2-tailed)	0.001	0.000	0.319	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49

Spearman's rho		IR (0) / Not IR (1)	Conciseness (pages)	Assurance	Size (total assets)	Index average (27 elements)	M_100	G_100	SC_100	TM_100	SC_100	RA_100	FO_100
SC_100	Correlation coefficient	-0.209	0.621***	-0.015	0.636***	0.891***	0.583***	0.762***	1.000	0.768***	0.567***	0.798***	0.772***
	Sig. (2-tailed)	0.150	0.000	0.921	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
TM_100	Correlation coefficient	-0.193	0.702***	-0.027	0.669***	0.835**	0.509***	0.634***	0.768***	1.000	0.536***	0.701***	0.706***
	Sig. (2-tailed)	0.183	0.000	0.854	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
SI_100	Correlation coefficient	-0.103	0.514***	-0.111	0.624***	0.708**	0.568***	0.592***	0.567***	0.536***	1.000	0.590***	0.690***
	Sig. (2-tailed)	0.481	0.000	0.450	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
RA_100	Correlation coefficient	-0.347**	0.615***	0.166	0.567***	0.929**	0.640***	0.844***	0.798***	0.701***	0.590***	1.000	0.875***
	Sig. (2-tailed)	0.015	0.000	0.254	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	N	49	49	49	49	49	49	49	49	49	49	49	49
FO_100	Correlation coefficient	-0.458***	0.681***	-0.004	0.593***	0.934**	0.716***	0.853***	0.772***	0.706***	0.690***	0.875***	1.000
	Sig. (2-tailed)	0.001	0.000	0.977	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	49	49	49	49	49	49	49	49	49	49	49	49

***p < 0.01; **p < 0.05; *p < 0.1 (two-tailed)

APPENDIX E

IMPROVED WATER DISCLOSURE INDEX

WATER DISCLOSURE INDEX FOR THE FOOD, BEVERAGE AND TOBACCO INDUSTRY		
	Elements	**Guidance**
Materiality (M)	**M1:** Identify water as a material aspect, and provide a description of significant impacts associated with water – specific to the company.	The company identifies water as a material aspect and provides a description of the impacts associated.
	M2: Describe the process of identifying water as material, and identify the stakeholders affected and included in the process.	The company describes the process, and identifies all the relevant stakeholders affected.
Governance and management approach (G)	**G1:** Indicate the EMS, and develop an own water strategy.	The company should have EMS incorporated into their water strategy.
	G2: Disclose the context within which the firm operates in terms of water stress, flooding, water quality and regulatory uncertainty.	Provide an understanding of the context and details, such as flooding, water quality and regulatory uncertainty.
	G3: Include water-related aspects as part of the firm's business model.	Water should form part of the firm's business model which would assist in the formulation of the water strategy.
	G4: A senior director or senior staff member should be responsible for water governance (board oversight).	Board oversight water governance should be very clearly embedded in the organisational structure. Established awareness of governance structure of water-related issues.
	G5: Water-related policies, commitments, goals and targets, responsibilities, resources, grievance mechanisms and specific actions, such as processes, projects, programs and initiatives should be disclosed.	Detail information about policies, commitments, resources, projects, programs and initiatives within the context of water governance should be disclosed.
Water-related impacts in its supply chain (SC)	**SC1:** Identify suppliers causing significant water-related impacts.	Significant water-related impacts caused by suppliers should be identified and quantified by water withdrawal and discharge figures.
	SC2: Develop a policy and strategy to manage water-related aspects in the supply chain.	The company should have policies and strategies in place to manage water-related aspects in their supply chain.
	SC3: Identify water risk factors in the supply chain.	The company should identify water risk factors in their supply chain, through conducting water risk assessments at suppliers or seeking the information from suppliers.
	SC4: Display an understanding of the WEF nexus by considering water impact of the upstream and downstream role players in the supply chain.	The company indicates that they understand the WEF nexus by identifying role players and their effect on water in the supply chain.

WATER DISCLOSURE INDEX FOR THE FOOD, BEVERAGE AND TOBACCO INDUSTRY		
	Elements	**Guidance**
Targets and measures (TM)	**Total water withdrawal by source** **TM1:** Disclose t**otal water withdrawal** from all areas in ML, and provide a breakdown of this total by the following sources, if applicable: (a) surface water (includes collected or harvested rainwater); (b) groundwater; (c) seawater; (d) produced water; (e) third-party water. Total water withdrawal from all areas with water stress in ML, and a breakdown of this total by the following sources, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) produced water; (e) third-party water, and a breakdown of this total by the withdrawal sources listed in a-d. (When compiling the information specified above, the reporting organisation shall use publicly available and credible tools and methodologies for assessing water stress in an area). A breakdown of total water withdrawal from each of the sources listed in Disclosures 303-3-a and 303-3-b in ML by the following categories: (a) freshwater (≤1,000 mg/L Total Dissolved Solids); (b) other water (>1,000 mg/L Total Dissolved Solids). (Other water constitutes any water that has a concentration of total dissolved solids higher than 1,000 mg/L. Other water is therefore all water that does not fall into the freshwater category.) Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used.	The company should disclose total water withdrawal, quantifying each source.
	Water discharge **TM2:** Disclose t**otal water discharge** to all areas in ML, and provide a breakdown of this total by the following types of destination, if applicable: (a) surface water; (b) groundwater; (c) seawater; (d) third-party water, and the volume of this total sent for use to other organisations, if applicable. (An example of third-party water discharge is when an organisation sends water and effluents to other organisations for use. In these instances, the organisation is required to report the volume of this water discharge separately.) Priority substances of concern for which discharges are treated, including: the number of incidents of non-compliance with discharge limits. Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used. The number of occasions on which discharge limits were exceeded. Any fines received or to be paid.	The company should disclose total water discharge, quantifying each source.

WATER DISCLOSURE INDEX FOR THE FOOD, BEVERAGE AND TOBACCO INDUSTRY		
	Elements	**Guidance**
Targets and measures (TM)	**TM3:** Disclose information on water quality.	Provide detail on water quality which could affect food and beverage products.
	Water consumption **TM4:** Disclose t**otal water consumption** from all areas in ML. (If the reporting organisation cannot directly measure water consumption, it may calculate this using the following formula: Water consumption = Total water withdrawal – Total water discharge). Any contextual information necessary to understand how the data have been compiled, such as any standards, methodologies, and assumptions used, including whether the information is calculated, estimated, modelled, or sourced from direct measurements, and the approach taken for this, such as the use of any sector-specific factors.	The company should disclose total water consumption (quantity) with contextual information.
	Percentage and total volume of water recycled and reused **TM5:** Disclose total volume of **water recycled and reused** in m^3/year as a percentage of the total water withdrawal reported.	The company should disclose total water recycled and reused (quantify and percentage of total withdrawal).
	TM6: Baseline year Set and disclose a baseline year of total water withdrawal, water discharge, water reused and water efficiency ratios against which comparisons should be disclosed from one year to the next.	Disclosure of different timeframes, and comparisons with a baseline year would assist progression towards more water efficient operations.
	TM7: Water efficiency ratio Calculate water efficiency ratios in terms of input (water consumption in ML) divided by output (kilograms of finished product or litres of packaged product).	Firms should calculate and express their water consumption in an efficiency ratio, and compare this to a set baseline year (as discussed above) in order to determine whether progress is made to more water efficient operations. These ratios could be utilised to compare with other firms.
Site-specific information (SI)	**SI1:** For **each facility** provide coordinates, **total water accounting** data and comparisons with the previous reporting year (or baseline year).	Detail should be presented at each site, such as coordinates and comparisons with previous year.
	SI2: Disclose water risk assessments at geographical scale (each site).	The company should disclose detail water risk assessments at each site with quantified information.

WATER DISCLOSURE INDEX FOR THE FOOD, BEVERAGE AND TOBACCO INDUSTRY		
	Elements	**Guidance**
Risk assessment (RA)	Establish whether the company has **risk assessment actions for water-related** issues by identifying the following: **RA1:** Identify **physical water risks** such as flooding, water stress and pollution.	Provide detail on physical water risks.
Risk assessment (RA)	**RA2:** Identify **regulatory risks** such as water permits, rates controlling water withdrawal, discharge quantities and other restrictions.	Provide detail on regulatory water risks.
Risk assessment (RA)	**RA3:** Identify **reputational risks** such as tensions between businesses and local communities.	Provide detail on reputational water risks.
Risk assessment (RA)	**RA4:** Indicate the **procedures** and methods used with regard to **water risk assessments**.	The company should disclose procedures and methods used for their water risk assessments as well as the frequency of assessments.
Risk assessment (RA)	**RA5:** Identify **stakeholders** which are considered in their organisation's **water-related risk assessments**.	The company should disclose stakeholders considered in their water risk assessments and indicate contextual issues, (positive and negative information) which could affect the stakeholders.
Future-orientated information (FO)	**FO1:** Report on f**uture-orientated** information on water issues.	The company should disclose quantitative, future-orientated information.
Future-orientated information (FO)	**FO2:** Identify the need for a **long term water strategy** and disclose the long term strategy.	The company should disclose a **long term** water strategy.
Future-orientated information (FO)	**FO3:** Provide information on water which could affect **value creation** over the short, medium and long term.	The company should disclose future information on water which could affect value creation in the short, medium and long term.
Future-orientated information (FO)	**FO4:** Evaluate how water **risk assessments could affect future** success and growth strategy.	The company should disclose evaluations on how water risk assessments could affect future success and growth strategy.

APPENDIX F

PRINCIPLES AND FRAMEWORKS FOLLOWED IN THE SAMPLE GROUP

Country	N	Financial reporting rules	Non-financial reporting rules	Sustainability indices
Australia	20	The ASX listing requirements; New Zealand equivalents to IFRS and IFRS.	ASX Corporate Governance code; The only legal obligations on sustainability reporting in Australia are the Corporations Act 2001 including: s299 (1) (f). New Zealand (NZX) corporate governance code and ASX Corporate, GRI.	The Corporate Responsibility Index (CRI); Sustainable Asset Management Australia (SAM).
South Africa	16	Companies Act, 71 of 2008 (Regulation 43), JSE Listing Requirements IFRS Integrated Reporting Framework (IIRF) and King IV™ principles.	Integrated reporting IIRF, King IV, GRI, CDP.	South African Johannesburg Stock Exchange SRI Index.
UK	3	Companies Act 2006; 10-K filings or integrated report.	Mandatory GHG and environmental reporting. Non-financial information must be included in the Strategic Report Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013). The CDSB Framework.	UK's FTSE4Good.
USA	4	SEC. The Financial Accounting Standards Board is responsible for generating rulings under GAAP, and the SEC enforces those standards.	Sustainability reporting in the USA is voluntary. United Nations Sustainability Goals (SDGs); GRI, CDP, OECD Guidelines, UNGC, ISO26000.	USA's Dow Jones Sustainability Indexes.
Switzerland	2	The SIX Swiss Exchange is governed by the IPO laws (Initial Public Offering) which require accounting standards such as Swiss GAAP FER, US GAAP or IFRS.	Voluntary reporting. UN 2030 Sustainable Development Goals; GRI.	SIX Switzerland Sustainability index.
Japan	1	Listing requirements of Japan Exchange Group (JPX) and IRFS.	Mandatory ESG reporting.	S&P/JPX Carbon Efficient Index; Green and Social Bonds Platform.

Country	N	Financial reporting rules	Non-financial reporting rules	Sustainability indices
France	1	IFRS and the French accounting system is based on French GAAP. As a member of the EU, French law is in accordance with European Commission Regulation No. 1606/2002, which requires the application of IFRS.	New French law to require for companies to report on GHG emissions in their supply chains. CSR reporting is mandatory in France for publicly listed and non-listed companies with at least 500 employees and a minimum of 100 million Euros turnover.	Euronext Paris sustainability Stock Exchanges.
Colombia	1	IFRS and Bolsa de Valores de Colombia (Colombian Securities Exchange).	Voluntary framework and guidelines Green Protocol (Protocolo Verde). GRI.	IR Recognition Index (COLIR).
Thailand	1	Thai Accounting Standards are required, IRFS and the listing requirements of Stock Exchange in Thailand(SET).	Thailand, the Securities and Exchange Commission mandates sustainability reporting.	“Thailand Sustainability Investment (THSI).”

APPENDIX G

DECLARATION OF LANGUAGE EDITING

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DECLARATION OF LANGUAGE EDITING

I, Christina Maria Etrecia Terblanche, hereby declare that I edited the research study titled:

Developing a water disclosure index for the food, beverage and tobacco industry: An integrative perspective

for **Martin Botha**

for the purpose of submission as a postgraduate study. Changes were indicated in track changes and implementation was left to the author.

Regards,

CME Terblanche

Cum Laude Language Practitioners (CC)

South African Translators Institute accr nr: 1001066

Full member of the Professional Editors Guild