Developing a business model for sustainable water management in South Africa

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In the words of President Nelson Mandela, he eloquently expressed a responsibility toward ourselves and our fellow man:

“For to be free is not merely to cast off one’s chains, but to live in a way that respects and enhances the freedom of others.” – Long Walk to Freedom.

It was indeed a privilege to perform this study and I would like to express special thanks to:

• My husband Gunther, for your understanding and continued support;
• My mom Rose and my dad Coen, my family, friends and colleagues;
• Prof Christo Bisschoff, from the North-West University School of Business and Governance, for continued guidance and patience;
• Antoinette Bisschoff, from the North-West University Dynamic Language and Translation Specialist;
• Respondents who completed the questionnaire.
ABSTRACT

South Africa (SA) has a water security risk and not displaying actions of a good custodian over its water resources. Currently, SA does not have an acceptable water management system in place. There is noted concern over lack of internal control in terms of shortages of standardised operating procedures/processes to ensure reliability, verifiability, accuracy and completeness of the performance information of local authorities. The main research objective is to develop a business model for sustainable water management in South Africa. Sustainable water management is possible if local authorities are involved in the implementation and control processes as part of the long-term strategy. Due to lack of funding or infrastructure South Africa cannot successfully implement a sustainable water management system based on the existing models. The research uses this study’s results as a foundation to support why it should be considered to develop a business model on which to base a sustainable water management system for South Africa. The model that is suggested for the basis of the framework is the Osterwalder business model canvas. The research question was answered by means of semi-structured questionnaires and interviews with available individuals were used to collect the data. As the basis to begin the hypothesis, a study was completed on sustainable water management systems of other countries, and the elements that were prevalent in those systems. Questions put forward to respondents were to test the relevance and fit, of each sustainable water management element on the business model canvas. In order to determine successful implementation of the business model, a second round of research questions and interviews can explore with further hypotheses, how to overcome the implementation challenges successfully. Another challenge will be to determine whom the independent governing body will be and how that regulator will be encouraged to take up the task. This study identified the need for a sustainable water management system in South Africa and the framework that the business model canvas offers as a basis to develop a model for sustainable water management. By superimposing results from findings onto the business model canvas, it became clear that the model provided a useful framework on which to base focus points for decisions and planning for implementation purposes. The research results suggested that a contributing factor toward the high risk of water security in South Africa is due to inadequate water management systems, therefore, it would be necessary for South Africa to develop a business model for sustainable water management.

Keywords: Business model canvas, sustainable water management system, water security.
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• “Children” are defined as participants younger than 18 years of age.

• “Minimal risk” is defined as “… the probability and magnitude of harm or discomfort anticipated in the proposed research are not greater, in and of themselves, than those ordinarily encountered in daily life” (Code of Federal Regulations, 2005)

• “Water footprint” is defined by the Water Footprint Network (2017) in the Netherlands as the volume fresh water needed to produce a product, considering the volumes of water used and polluted in the various steps of the supply chain.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BOD</td>
<td>Biochemical oxygen demand</td>
</tr>
<tr>
<td>CDM</td>
<td>Clean development Mechanism</td>
</tr>
<tr>
<td>DAFF</td>
<td>Department of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved oxygen</td>
</tr>
<tr>
<td>DWS</td>
<td>Department of Water and Sanitation</td>
</tr>
<tr>
<td>ECI</td>
<td>Ecological Condition Index</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>JSE</td>
<td>Johannesburg Stock Exchange</td>
</tr>
<tr>
<td>LCA</td>
<td>Lifecycle Assessment</td>
</tr>
<tr>
<td>MFR</td>
<td>Managing for results</td>
</tr>
<tr>
<td>NH3-N</td>
<td>Ammonia nitrogen</td>
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<tr>
<td>RPI</td>
<td>River Pollution Index</td>
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<td>SAFEX</td>
<td>South African Futures Exchange</td>
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<tr>
<td>SAGIS</td>
<td>South African Grain Information Service</td>
</tr>
<tr>
<td>SS</td>
<td>Suspended solids</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
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CHAPTER 1
NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION
South Africa classified as a water-stressed country, is currently facing a serious water security problem due to pollution of rivers and water resources as well as drought conditions due to rainfall patterns (South Africa, 2016). Depicted below in Figure 1, are the drought conditions of South Africa, (2016). According to Water Wise (2016), the amount of water on earth is unevenly distributed; the amount of water is constant and there can be no influence on the amount of water to increase or decrease. Rand Water (in Water Wise, 2016) discussed some major causes of water pollution are amongst others, deforestation, clearing land for use in for example agriculture, which causes soil erosion and introduces additional chemicals and insecticides to crops, which in turn again filter into rivers. Other factors include industries disturbing the chemical balance in the water, mines that produce waste such as chemical waste and heavy metals deposits, which dissipate into the available water resources. Figure 1 highlights the precipitation index for October 2014 to September 2016.
1.2 SOUTH AFRICA IS FACING A FAILING WATER MANAGEMENT INFRASTRUCTURE

According to the Annual Report 2015-2016 for the Department of Water and Sanitation (DWSSA), the Auditor General of South Africa reported on supply chain findings that the Department does not have an adequate internal control system to ensure tender processes conducted on behalf of the Department were adhered to (DWSSA, 2016). South Africa has a failing wastewater infrastructure and intensification of agricultural activities, which is a major contributor to the decline of water quality across the country. In-stream modification in the Olifants and Limpopo Water Management Areas have been likely contributors to the eutrophication problems caused by the failing waste water infrastructure which is intensified by the increase in agricultural activities (Nel & Driver, 2015). All industries affect water resources in South Africa, directly or indirectly. According to South Africa Info (2017), some of the largest economic sectors in South Africa include the automobile industry, contributing 6% to GDP, mining 18% and agriculture only 2%. Crop
production can only use 12% of the land area in South Africa. Only 22% of this is arable due to lack of available water. Weather SA (2017) has indicated that South Africa has experienced severely dry to extremely dry conditions over most parts of the country. The agriculture sector is one of the largest producers of the important white maize grain crop, important because of its staple food status (DAFF, 2010), and contributor of export produce in the South African economy (NAMC, 2016), contributes to pollution and overuse of water resources. This study explores the possibility of improving sustainable water management in South Africa by means of the development of a business model. This was done by considering water management systems in other countries or systems that encourage pollution prevention and what the important elements of such systems. This study explores the possibility of implementing a sustainable water management system in South Africa, by means of developing a business model. The study attempts to highlight the requirement for the effective implementation and control of water management systems as can be seen in models successfully implemented by other countries.

1.3 THE IMPORTANCE OF WATER MANAGEMENT IN SOUTH AFRICA
Sustainable water management is important for South Africa because South Africa does not have sufficient water resources due to rainfall patterns, pollution and contamination that is predominant. In addition, local government does not properly maintain the current infrastructure and water wastage is common. Scarce water resources are not managed sustainably (Nel & Driver, 2015). The Water Services Act (no. 108 of 1997) (SA, 1997) and the National Water Act (NWA) (no. 36 of 1998) (SA, 1998), govern water in South Africa. The foundation principle of the NWA is that governing of all water should be under consistent rules because it forms part of a unitary, interdependent water cycle. It contains comprehensive provisions for the protection, use, development, conservation, management and control of South African water resources. The National Water Resource Strategy (DWAF, 2013), stipulates strategic objectives. Transformation in the water resource sector includes a shift from central management to decentralised institutions, including the establishment of Water Management Areas, defined largely by hydrological catchment borders, and administered by Catchment Management Agencies (Dugmore, 2016). Placed end-to-end, South Africa’s rivers would encircle the earth 4 times with a total length of 163 533 km, calculated from the river network data layer
mainstreamed by the DWS. Main rivers make up 47% of this total length while tributaries (smaller rivers) constitute the remaining 53% (SA, 2016). The density of South Africa’s river network, as well as the volume of water carried, increases as we move across the country from the arid west to the wetter east. Nine water management areas, as depicted in Figure 2, were established to allow the effective management of rivers and water resources that differ across the country.

![South African Water Management Areas](image)

**Figure 2:** South African Water Management areas

**Source:** South Africa, 2016.

According to Statistics South Africa (2017), 89% of our rivers are foothill streams. There is a striking difference between South African and European rivers, namely traffic. Many European rivers are major shipping routes, used to ferry both freight and passengers throughout the region. The South African river network, on the other hand, is not suited to accommodate large-scale transport. An important factor to consider is that lowland rivers – large, meandering waterways – make up only 9% of South Africa’s total river length. The remaining 91% consists of mountain streams (4%), upper foothill streams (45%) and lower foothill streams (41%) (Statistics SA, 2017). Not only are large rivers useful for transport, but they are also a rich agriculture resource prone to overuse. With only 9 km of every 100 km of South
Africa’s river network consisting of lowland rivers, the river network is a scarce resource that should be protected. South Africa’s rivers were worse off in 2011 than they were in 1999, according to the Ecological Condition Index (ECI, 2011), introduced for the first time as a pilot index in this document. The index provides an indication of overall ecological health on a scale between 0 to 100, where 100 is the reference condition prior to human modification, and 0 is where natural ecosystem function has become totally lost. The DWS conducted a large assessment of the condition of rivers in 1999, with a follow-up assessment in 2011. Data from these two surveys resulted in a host of indicators on various aspects such as river flow, riverbank habitat and water quality. The ECI is an attempt to aggregate all these indicators into a single figure. River health as depicted in Figure 3 below, declined overall, with the ECI falling from 83 in 1999 to 72 in 2011. The graph below shows that lowland rivers have withstood the worst of the decline, exhibiting the largest drop in the ecological index compared with other river types.

Figure 3: Decline in River Health by type of river, 1999-2011

The Limpopo experienced the largest fall in river health. All of South Africa’s nine Water Management Areas experienced a drop in river health between 1999 and 2011, as shown in the map below in Figure 4.
The Limpopo Water Management area experienced the most dramatic fall, with its ECI dropping by 21 points, from 83 in 1999 to 62 in 2011 (ECI, 2011). This Ecological Condition Index suggests that increased pressure from mining activities and agriculture in that region, as well as poor wastewater management, contributed to the decline. The fall in river health highlights the significance, referred to as the water-food-energy security nexus (ECI, 2011). The three elements of water, food and energy are, intimately linked. Not only is water a vital resource for industries that drive the energy sector, such as mining, but it is also essential for the agriculture sector that produces food. Yet the expansion of agriculture and mining, which are often harmful to rivers, presents us with trade-offs that must be weighed when deciding on development priorities.

1.4 PROBLEM STATEMENT

South Africa has a Department of Water and Sanitation, which according to the Annual Report 2015-2016, had to design a strategy to overcome areas of underperformance (DWSSA, 2016). In the internal audit reports as well as Auditor General of South Africa’s Audit reports, deficiencies were reported on the system of
Management did not have documented policies and procedures to guide the operations of the department with regard to commitments on the Regional Bulk Infrastructure Grant (RBIG) and the Municipal Water Infrastructure Grant (MWIG). A manual / policy did not exist for the year under review to support payments in having a proper reconciliation system per project in place to ensure all information pertaining to the project are reconciled on a monthly basis (DWSSA, 2016). “Greener models for growth”, are a viable alternative to achieve sustainable economic growth in South Africa. This includes the long-term changes of economic structures and the way in which short-term opportunities are captured in terms of reforming government policies which could be considered inefficient or harmful to the environment (Beltramello et al., 2013). Economic incentives or penalties are pivotal in this process. In the United States, for example, a carbon emissions tax system has already been successfully implemented (Devarajan et al., 2009:3). The goal is to propose the development of an effective model, resulting from controls like external
audits to mitigate the extent to which organizations pollute water sources. Typically, a control system needs to be implemented, as well as maintained from organizational level where penalties and fines are not only a financial factor considered for non-compliance in environmental management accounting, but the long-term implication on revenues. A mitigating control, which would encourage compliance for sustainable water management would be re-enforced by a qualified audit report.

1.5 SPECIFIC RESEARCH QUESTIONS

The nine elements of the business model linked to research questions as follows:

1.5.1 Value proposition

Definition: Value propositions are products and services that create value for a specific customer segment (Barquet et al., 2013).

Application: Business model for sustainable management of water supply through introducing tradable credits available to organizations for increased financial position and investor confidence.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.2 Key activities

Definition: Key activities are activities involved in offering and delivering the value proposition (Barquet et al., 2013).

Application: Trading through SAFEX and managing the organizational market-to-market trading account. Measurement of water pollution levels and reporting of compliance through annual audits.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.3 Key partners

Definition: Key partners include a network of suppliers and partners that support the business model execution (Barquet et al., 2013).
Application: Organization annual audits through audit firms which can include water pollution measurements during the audit alternatively through South African Water Research Commission and Statistics SA staff as well as SAFEX administration staff managing the trading accounts, Statistics SA staff and resources from the South African Water Research Commission measuring and reporting on pollution levels.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.4 Key resources

Definition: Key resources are assets required to offer and deliver the aforementioned value proposition (Barquet et al., 2013).

Application: Administration staff from SAFEX providing daily trade information and managing credits on market-to-market accounts. Data collection and reporting through an independent body like Statistics SA and South African Water Research Commission. Organization representatives appointed for health, safety, internal controls that can provide transparent, and accurate, independent reporting.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.5 Customer relationships

Definition: Customer relationships include types of relationships a company establishes and maintains with specific customer segments (Barquet et al., 2013).

Application: Daily trader relations with SAFEX and consultation on compliance strategies with South African Water Research Commission and Stats SA.

Question: Do you think the application will be possible or not, motivate your answer?
1.5.6 Channels

Definition: Distribution channels are the company's interface with its customers (Barquet et al., 2013).

Application: Audit reports of organizations that are easily available on company websites, annual reports from Stats SA and South African Water Research Commission on sustainability and pollution levels achieved within the organizations.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.7 Customer segments

Definition: Customer segments are groups of people or organizations a company aims to reach and serve (Barquet et al., 2013).

Application: Organizations and citizens in South Africa that are all users of water and have a right to cleaner water.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.8 Cost structure

Definition: Cost structure includes costs incurred when operating a business model (Barquet et al., 2013).

Application: Administration of online trading account subscriptions, monthly administration fees. Implementation fees for annual measurements of baseline allowable pollution levels. Resources and staff appointed by the South African Water Research Commission.

Question: Do you think the application will be possible or not, motivate your answer?

1.5.9 Revenue streams

Definition: Revenue streams include revenue a company generates from each customer segment (Barquet et al., 2013).

Application: Registration, transaction and market account management fees, pollution rights credit account funding through SAFEX.
1.6 RESEARCH OBJECTIVES

The main research objective is to develop a business model for sustainable water management in South Africa.

The secondary objectives of the study are then to:

- Theoretically study the elements that should be incorporated in such a business management model;
- Test these elements for inclusion in the model; and
- Apply these elements into a business model for sustainable water management in South Africa.

1.7 IMPORTANCE AND BENEFITS OF THE PROPOSED STUDY

The benefits of the proposed study are that sustainable water management in South Africa can be realised through the implementation of a business model. The proposed model can be implemented using available systems and controls from external audits that will abate pollution in the production processes. The proposed model could contribute to reducing water pollution in production processes and increase the positive environmental contribution effect of organizations involved. These results can be used to increase the organization’s positive environmental contribution in the environmental and organization’s impact on society reporting for those organizations, which will increase their credibility and legitimacy to society. Environmental costs in the form of penalties and fines that are usually included in the environmental cost analysis can be reduced over time, if the organizations are compliant and the innovation from these organizations can be rewarded through a credit system. As an overview, the rest of the document consists of detail pertaining to the scope, limitations and assumptions made in the paper. A literature review follows as a basis to support the objectives the research aims to achieve with reference to relevant sources used. The research design and relevance of methodology is explained and elaborated.
1.8 DELIMITATIONS (SCOPE)

Firstly, the study shows that sustainable water management is only possible if local authorities are involved in the implementation and control processes as part of the long-term strategy. The paper explores the sustainable water management systems that are used by other countries. Secondly, if it becomes evident that, due to lack of funding or infrastructure South Africa cannot successfully implement a sustainable water management system based on the existing models, the research uses these results as a foundation to support why it should be considered to develop a business model on which to base a sustainable water management system for South Africa. The model that is suggested for the basis of the framework, is the Osterwalder business model canvas (Osterwalder & Pigneur, 2010). Exploring the Osterwalder business model components, is a method to substantiate why this is a viable option or not, and to link components to sustainable water management elements. In conclusion, the study then determines whether or not these components are prevalent in South Africa and use these findings to motivate that the business model can or cannot be used as a basis for a framework for sustainable water management systems in South Africa.

1.9 ASSUMPTIONS

The study assumes that South Africa is facing a water crisis based on the research findings in the literature review and that the current water management systems in South Africa are not effective or sustainable due to the prevalent levels of pollution. In South Africa, the pollution of water resources is at critical levels and corrective measures are required.
CHAPTER 2
WATER MANAGEMENT

2.1 INTRODUCTION
The study proposes to develop a business model for sustainable water management in South Africa. This was done by determining how other countries have managed to successfully implement sustainable water management systems or systems that encourage pollution prevention and what the important components are that have made the implementation of such a system possible. The study then attempts to identify these same elements within South Africa and link them with components of a business model. The study then further explores existing business models, credit systems and investigates the possibility of using the framework of such systems as a baseline to implement a business model for sustainable water management in South Africa. The study investigates the components of the models and credit systems to determine whether such components are available in South Africa. The findings of the research could help to decide if the rationale exists for implementing such a business model onto the various elements for South Africa in terms of developing a business model for a sustainable water management system.

2.2 SUSTAINABLE WATER MANAGEMENT
Competitive strategy is a choice an organization would make between the attractiveness of the industry and the factors in that industry. Such an organization should also consider determinants of its relative competitive position in its industry (Porter, 2011). Sustainable water management is a challenging strategy to implement and control without an existing framework to assess pollution levels. The possibility for water reuse in different industries is possible by means of alternative treatments like wetlands and slow sand filtration, but the problem is that the generalisation of these experiences are difficult due to local differences and because there is no assessment framework in place (Aalderink, 1999). An ideal model would require an ecological and environmental section as well as an economic and admin section that needs to culminate under the cover of government, as an integral part of their overall strategy. For implementation and control, the model, management needs to be performed by an independent governing body. The model proposes an immediate impact on the environment. Sustainable water management can only be
workable with the support of local authorities. It is important to study the systems implemented successfully by other countries in terms of elements for sustainable water management systems. It is valuable to include environmental reports in the annual financial statements but the extent of environmental impact only becomes evident during and after production. It will add value and will be more affordable for an organization to pay the environmental impact fees over a period rather than to restore the environment at the end of the organization's life cycle. The impact on the environment is continuous and therefore recovery should be continuous and credits are then continuously required in order to monitor and manage compliance. In Taiwan, a study has been conducted (Chen et al., 2006) on how authorities can improve water quality management by implementing a framework incorporating management thinking into the planning stages of decisions during the first phase. During the first phase where the volume of pollution discharge generated in each draining zone of the river is determined and in the second phase devising the abatement plans for each pollution source according to the respective organizations. The second phase abatement plans should be based on strategies generated during the first phase.

Authorities have begun implementing the strategies and action plans developed in this study, such as budgets based on the devised strategy. According to Chen et al. (2006), it shows that it is the task of authorities to manage water quality. The analytical results indicate that the objectives, strategies and actions plans developed based on the sustainable management framework and strategy planning system can effectively support authorities to fulfill their role in the water quality management for a river basin. In the study done by Chen et al. (2006), the degree of water pollution in the river is based on a River Pollution Index (RPI), where four levels of pollution are defined: none, slight, medium and serious. RPI calculations are based on four water quality parameters: dissolved oxygen (DO), biochemical oxygen demand (BOD), ammonia nitrogen (NH3-N) and suspended solids (SS). An average of the four sub-indicators is then defined as the RPI value. Managing for Results (MFR) is a process developed for the future where development of resources to achieve meaningful results is emphasized (Drucker, 1964). MFR is a model that bases desired results on the needs of stakeholders which is then used to improve quality and cost-effectiveness of services (Maryland State Government, 1997). In the United States of
America (USA), the Government Performance and Results Act has been legislated in 1993 (no. 306 of 1993) (Chen et al., 2006). According to Chen et al., (2006), the water quality management action plans are based on the strategies. The strategy design is based on the integrated considerations of environmental, social, economic and institutional phases. The action plans indicate for each government department, which work it would be responsible for, the work and resources required to complete the work as well as the budget and required human resources. The strategy must include performance-measuring plans, to ensure the goals and objectives are being met. Performance indicator values are used to evaluate whether water quality management results are in line with the anticipated goals and objectives. If these targets are not met, the previous planning and implementation must be modified.

It is very clear from the study conducted by Chen et al., (2006), that strategies and action plans of the three-year remediation period for the Shetzu River basin water quality management system, that the various government departments of Taiwan are an integral part of the process. In the action plan detailed in the research done by Chen et al., (2006), in terms of the industrial pollution abatement, the Environmental Protection Bureau was appointed to be responsible for the functions of performing regulatory control, technical support and investigation and the Economic Development Bureau is appointed to perform administrative and economic support to abate pollution loads of specific factories in specific years. According to Hilson (2000), smaller organizations would need government to take greater responsibility due to the financial impact pollution prevention processes would demand. The authorities would need to drive the change toward cleaner production and that it is of national interest.

Priorities for governments include:

- Outlining the economic goals, obtaining and analysing the information concerning cleaner technologies and strategies;
- Providing information and educational support for economic development based on cleaner technologies;
- Providing documented results of successful cases;
- Demonstration projects arranged by government;
- Ensuring banks, insurance companies and other institutions favour cleaner technologies in their investment decisions;
- Developing a cleaner technology certification system for products, processes and services and implementing the system;
- Technical assistance provided to firms; and
- Encouraging collaboration from universities and the private sector to develop managerial accounting systems for cleaner production (Hilson, 2000).

2.3 WATER MANAGEMENT MODELS

One of the biggest goals in an economy is to encourage and maintain sustainable economic growth. Each organization is a strategic role-player in the pursuit of the positive contribution toward growing the country’s gross domestic product (GDP). The organization’s shareholders appoint directors to maximize shareholder interests and maximize profits for the organization. Often, there is an environmental cost element of pursuing these profits, which organizations need to report on in order to be compliant according to King IV reporting requirements. The King Code has been introduced as a mechanism to ensure organizations are held accountable for their operations decisions and to encourage reporting on the impact the organization has on society and the environment. King III sets clear guidelines that organizations need to report according to and provides guidelines on how the decision for non-compliance need to be reported (King Code III, 2012). King IV, which supersedes King III, requires reporting on how compliance has been implemented. Corporate governance recognizes the need for accountability and prescribes requirements for triple bottom line reporting, on how organizations need to account for social, economic and environmental impact (IODSA, 2016).

Corporate governance has intertwined in the South African legislation through the introduction of King IV, which serves as a guide for organizations to comply with sustainability issues. Often organizations and regulators focus on costs of eliminating pollution, but the opportunity cost of wasted resources, effort and diminished customer value should also be taken into account. The United States focuses their efforts on damage control or clean-up instead of prevention methods and mandated strict emissions goals and established very tight compliance deadlines. Countries
like Sweden initially had more relaxed standards with the intention of increasing the compliance requirements over time. Resulting from these regulations, the United States companies installed secondary treatment systems and stopped there. Swedish producers continually incorporated innovative environmental technologies, since they were expecting stricter compliance requirements to follow in future. With these future compliance requirements in mind, Japanese and German car manufacturers focused on product design that included more fuel-efficient cars in response to new fuel consumption standards, (Porter, 2000) as contrasted by the United States car manufacturers who resisted the possibility of such strict compliance requirements and naively hoped they would go away. “Managers must start to recognize environmental improvement as an economic and competitive opportunity, not as an annoying cost or an inevitable threat.” (Porter, 2000). The strategic perspective should shift from regulatory compliance, and find opportunities through innovation to achieve competitive benefits (Porter, 2000). According to the Companies Act no. 61 of 1971 (Act and ACT, 1973) (SA, organizations are required to accept responsibility for the impact of their operations “it should, in addition, indicate in its sustainability report the positive and negative impact of its operations on the environment” (Naidoo, 2015:34).

To contribute to sustainability, the study suggests the possibility of creating a tax credit contact for water use traded in an open market, similar to contracts traded on the Johannesburg Stock Exchange's (JSE) South African Futures Exchange (SAFEX), where active buyers and sellers affect the equilibrium market price of the commodities (Bernstein, 2000:148). According to Janse van Rensburg et al. (2015:358), equilibrium occurs at the price level where output demanded equals to output supplied. The viability of trading water credits in an open market would have to be supported in terms of the demand and supply options available for users. The proposal is based on the premise that during slower production times when fewer emissions are produced or less water is consumed, any excess or unused water credits purchased could be sold in an open market. This study would support, based on the Osterwalder business model, (Osterwalder & Pigneur, 2010) whether or not a credit system would create a product in the market, which could be traded in order to manage and reduce liabilities which organizations, would become subjected to. In this way, the organization would be held accountable for using the natural water
resources in the processes of production. Applying the results obtained from data collected, the end goal if the research study is to establish the rationale for the need of implementing a sustainable water management system, taking into account the fact that organizations such as those in the agriculture industry are very important role-players in South Africa (SAGIS, 2011). The research would determine whether imposing such a limiting factor would be viable in terms of implementation possibilities and sustainability that encourages participation from organizations.

2.4 ELEMENTS PREVALENT IN A SUSTAINABLE WATER MANAGEMENT SYSTEM

The water management system implemented for sustainable management needs to be supported by an effective operational management system. Van Zyl (2006) researched the knowledge needed for an Operational Management System (OMS) and the development framework for the implementation of such a system that was required for the sustainable management of water supply by the local Water Board. The study identified features that need to be in place for such a system such as:

- **Combination of decision processes**: The ability of the system to combine human judgement and computerised information, supporting a variety of decision processes and styles.

- **Various levels of the organization**: The system would need to support managers at all levels of an organization.

- **User friendliness**: The system would have to be user friendly to enable users of all levels within the organization to use the system effectively.

- **Adaptability**: Since managers would need to adjust their strategies according to changing conditions, the system would need to be adaptive over time.

- **User integration**: The system needs to be designed in such a way that it enables end users to make changes and modify the system themselves if required.

- **Data integrity verification**: Data integrity needs to be verified by the system.

- **Integration of systems**: It should be possible to integrate the system into other applications, employ the model to a network or use it as a stand-alone unit.
The ideal model would constitute the environmental section, which according to Nel and Driver (2015), proposes the following priorities for the national river ecosystem accounting work:

- “Producing a full set of physical ecosystem accounts for rivers, which include extent and condition accounts as well as ecosystem service generation and use accounts”.
- “Linking the ecosystem accounts for rivers with national water accounts. These differ from ecosystem accounts because they focus on water resource as where ecosystem accounts focus on the underlying river ecosystems. Initiatives are underway to develop South Africa’s national water accounts, which will include physical (volumetric and quality), and monetary accounts for the water resource. The accounts will present water availability and quality for specified reporting units, sector and population water use and monetary value. The ideal would be if the national river ecosystem and national water accounts could complement each other.”
- “Developing land accounts for key ecological infrastructure features related to rivers like strategic water source areas, riparian zones and wetlands”.
- “Developing an integrated map of ecosystem types across the terrestrial and freshwater realms”.
- “Analysing ecosystem condition trends for rivers in relation to other socio-economic indicators, exploring links to census information for poor communities that rely on use of water directly from rivers, links to GDP and other aspects of the economy and Sustainable Development Goals in South Africa”.

A sustainable water management system can be implemented by collecting relevant data relating to river water from areas nearby production facilities in that geographical area that use water as part of their manufacturing processes that contribute to pollution or usage of those water resources. According to the study done on the Shetzu River (Chen et al., 2006), data was collected from agricultural organizations and wastewater quantities of pollution sources were collected from authorities. It is important to apply water quality monitoring data to the model for calibration.
Visual Basic software and MS Excel tools were used to develop the strategic planning systems. The three main categories of data input were drainage zones where pollution is filtering into the river, reaches and headwater (Chen et al., 2006). The quantity of wastewater, pollution load and location data of every factory by the Shetzu River basin were collected. Each factory was located using a Global Positioning System (GPS), and investigated. Data collected from the factories were modified and established using ArcView as attribute and spatial data. The data from the drainage zones and the factories are overlapped and clipped to identify all the factories in the river basin and their relevant drainage zones (Chen et al., 2006). Pollution levels can be monitored by implementing the methodology as with the Eastern Snake Plain Aquifer (ESPA), by determining how the Eastern Snake Plain Aquifer (ESPA) will respond to future variables, by first developing a base-case scenario. The base-case defines the existing system as if it continued operating in its current condition. This provides the basis against which future system performances will be evaluated (Ryu et al., 2012).

According to a discussion document by Nel and Driver (2015), South Africa is currently participating in a global initiative called Advancing SEEA Experimental Ecosystem Accounting. The project is funded by the government of Norway and in South Africa the participating bodies are Statistics South Africa, the South African National Biodiversity Institute (SANBI) are working in partnership with the Council for Scientific and Industrial Research (CSIR), the Department of Water and Sanitation (DWS), the Department of Environmental Affairs (DEA) and Ezemvelo KZN Wildlife. The discussion document is part of Phase 1 of Advancing SEEA Experimental Ecosystem Accounting that took place from mid-2014 to May 2016. Sustainable water management can be achieved by implementing a system that can be used to quantify data that has been collected to generate a report that shows the impact of pollution and whether the pollution abatement is effective over time. Chen et al. (2006), found that by employing a Modified Bounded Implicit Enumeration (MBIE) algorithm as a solving method, a strategy planning computer system for water quality management can be developed. The system tool is very important for processing large volumes of data and considering the system integrity and also in view of satisfying objectives and constraints. The objective of the system is to achieve maximum assimilative capacity while adhering to regulatory standard constraints as
well as social equity and available technologies. A study was done regarding the system dynamics to sustainable water resources management in the Eastern Snake Plain Aquifer in the state of Idaho in the United States (Ryu et al., 2012). The study found that using coding recharge and discharges within the aquifer system into an environmental modelling framework, enabled researchers to identify long-term behaviour of aquifer responses to uncertain variability. According to Ryu et al. (2006), the study showed that the system dynamics is an effective modelling tool in developing sustainable water resources planning and management within a collaborative decision-making framework. Simulation models are commonly used for monitoring, planning and managing water systems (Fisher & Palmer, 1997). The simulation model is complex and versatile which often results it in being most commonly used for evaluating alternative water management options (Sigvaldason, 1976; Palmer & Holmes, 1988). Simulation models are used to aid water resources planners to monitor systems and evaluate optional policies and alternatives to those policies (Ryu et al., 2012).

System Dynamics (SD) is a computer simulation technique that provides more options with which to identify problems and solutions by enabling extrapolation and interpolation in a meaningful manner and broader context Winz et al. (2009). According to Ryu et al. (2012), the biggest advantage of system dynamics is the ease with which one can identify the relationship between cause and effect. The simulation technique applicable to large water systems is distinguished from other modelling approaches by explicit representation of the system, transparent modelling building blocks and management potential to resolve water conflicts amongst stakeholder groups (Ryu et al., 2012). Research conducted in South Africa, identifies key trends in the condition of the river ecosystems, informing further ecosystem accounting work (Nel & Driver, 2015). The systems to collect data on the quality and stock levels of the rivers are therefore already in place and in use. The ecosystem is measured in terms of the length of the entire river network that is expressed in kilometres. The data collected indicated the river length is stable at an approximate length of 160,000 km divided roughly equally among main rivers and tributaries (Nel & Driver, 2015). Below, in Table 1.
### Table 1: Ecosystem extent account for rivers in South Africa – adapted from Nel and Driver 2015

<table>
<thead>
<tr>
<th>Kilometres</th>
<th>Main rivers</th>
<th>Tributaries</th>
<th>All rivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening stock 1999</td>
<td>76 310</td>
<td>87 223</td>
<td>163 533</td>
</tr>
<tr>
<td>Opening stock as % of total river length</td>
<td>47</td>
<td>53</td>
<td>100</td>
</tr>
<tr>
<td>Additions/reductions</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Additions/reductions as a % of opening stock</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Opening stock 2011</td>
<td>76 310</td>
<td>87 223</td>
<td>163 533</td>
</tr>
<tr>
<td>Opening stock as % of total river length</td>
<td>47</td>
<td>53</td>
<td>100</td>
</tr>
</tbody>
</table>


In the figure below a map is depicted showing the Water Management Areas (WMA) in South Africa, highlights the administrative units for management of water resources.

**Figure 5:** Water management areas of rivers in South Africa

Source: Adapted from Nel and Driver (2015) SA, 2016.
According to Nel and Driver (2015), modifications made to rivers, which can be due to urbanisation impact the ecological indicators such as, river flow, water quality, in-stream habitat and stream bank habitat. In Figure 6 below, the change in river length per Water Management Area due to modifications over a period from 1999 and 2011 in the Limpopo region is indicated, blue is no or small modification, orange is serious or critical modifications – adapted from Nel and Driver (2015). This region is representative of an ecological system affected in a developing country with low-income rural households that use the untreated river water for domestic consumption.

**Figure 6:** Change in water length of the Limpopo Water Management area for each of the four ecological indicators

**Source:** SA, 2016.
Success can be derived by means of a model for knowledge management (KM) derived from observations KM and such factors for success found in the literature (Jennex and Olfman, 2009). Van Zyl (2006) researched the knowledge needed for an Operational Management System (OMS) and the development framework for the implementation of such a system that was required for the sustainable management of water supply by the local Water Board. The study identified features that need to be in place for such a system as:

- **Combination of decision processes**: The ability of the system to combine human judgement and computerised information, supporting a variety of decision processes and styles.
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- **User integration**: The system needs to be designed in such a way that it enables end users to make changes and modify the system themselves if required.
- **Data integrity verification**: Data integrity needs to be checked by the system.
- **Integration of systems**: It should be possible to integrate the system into other applications, employ the model to a network or use it as a stand-alone unit.

The ideal model would constitute the environmental section, which according to Nel and Driver (2015), “proposes the following priorities for the national river ecosystem accounting work:

- Producing a full set of physical ecosystem accounts for rivers, which include extent and condition accounts as well as ecosystem service generation and use accounts.
- Linking the ecosystem accounts for rivers with national water accounts. These differ from ecosystem accounts because they focus on water resource as where ecosystem accounts focus on the underlying river ecosystems. Initiatives
are underway to develop South Africa’s national water accounts, which include physical (volumetric and quality), and monetary accounts for the water resource. These accounts present water availability and quality for specified reporting units, sectoral, population water use, and monetary value. The ideal would be if the national river ecosystem and national water accounts could complement each other.

- Developing land accounts for key ecological infrastructure features related to rivers like strategic water source areas, riparian zones and wetlands.
- Developing an integrated map of ecosystem types across the terrestrial and freshwater realms.
- Analysing ecosystem condition trends for rivers in relation to other socio-economic indicators, exploring links to census information for poor communities that rely on use of water directly from rivers, links to GDP and other aspects of the economy and Sustainable Development Goals in South Africa”.

2.4.1 Regulatory requirements
If a sustainable water management system can be implemented based on the Osterwalder business model canvas with a carbon tax emissions system base for measuring compliance, then organizations that use water in their production processes would be required to comply with specific regulatory requirements, for example in the King IV Report (IoDSA, 2016), which will form part of annual audit requirements. Mining facilities have upgraded water treatment processes to comply with stricter discharge requirements. At the point where producers upgrade or make changes to their water treatment processes, it is advisable to check whether product recovery is also possible together with the advanced water treatment process for that particular mine (IMIESA, 2013). According to the journal on resource management, IMIESA, 2013 reported that water security and water shortages are receiving much focus and economic development, population growth, food security and climate change and were all identified as factors contributing to water shortages and degradation of water supplies and ecosystems in the developing world. Goods and services require water in the production processes. Water shortages could lead to production interruptions and organizations could face reduced production volumes and reduced profits as a result. The consequences that are becoming a reality are
regulatory and reputational consequences (IMIESA, 2012). The fresh water sources in Africa are severely polluted by chemicals and pathologically due to weak infrastructure where heavily populated areas lack adequate sanitation and waste disposal systems, as well as mining discharges and industrial effluent and agricultural run-off. It was recognised that companies would need to find innovative solutions to optimise available water sources to ensure operational endurance. Another point was that the responsibility of urban and industrial water supply is not typically a priority for government. The conclusion was that companies operating in Africa would ultimately be responsible for ensuring sustainable water source quality for use in operations (IMIESA, 2012). The process needs to be legalised in order to become enforceable and the business model privatised. As part of a competitive business strategy, quality of management is essential because it determines success of the model through capabilities, ability to acquire, combine and utilise valuable resources in ways that deliver a value proposition to customers (Beltramello et al., 2013). This is a very important point to note in terms of the linking process with the business model in order to achieve implementation.

2.4.2 Trading credits
Sustainable water management in South Africa can be encouraged by trading available credits, like in other countries. The methods and elements of the system should be examined for duplication purposes. It is important to identify whether the system can be duplicated based on similar elements for South Africa. In the USA, it was proposed that a tax should be levied on carbon tax emissions based on the marginal cost of carbon dioxide emissions and increased on an annual basis in correlation to the pollution effects of the carbon dioxide emissions (Avi-Yonah & Uhlmann, 2009). According to Avi-Yonah and Uhlmann (2009), the one element that was identified was a tax that needed to be levied and this can be applied to the water pollution situation in South Africa. Another element identified by Avi-Yonah and Uhlmann (2009), was the incentive for any organization that would contribute toward carbon dioxide emission reductions in the form of tax credits. In the same way, any organization for example a mining facility that is making technological advancement or improving the water quality used in their production processes, as compared to pollution levels in the previous year of assessment, a tax credit incentive should be issued. By contrast, if pollution levels were higher than the previous year, the tax
imposed would be increased. Internal Revenue Service and the Energy Departments would implement and enforce the carbon tax through existing programs within the departments (Avi-Yonah & Uhlmann, 2009). Companies that are making a large impact on sustainability and reducing the impact of their production processes must be rewarded for their efficiencies. For example, the breweries in South Africa use four litres of water to each litre beer of production output. Any efficiencies within the process that have already been audited and labelled as “green”, should be rewarded with credits and on the contrary, any inefficiencies or pollution levels outside the parameters must be measured as a ratio of the basis, and credits will need to be added to the account. If the organization efficiencies put the company in a position, where it has a net amount of available credits, then these can be traded or transferrable to other companies that are less efficient. These other companies can buy tax credits at a premium on the SAFEX market and fund their account for inefficiencies or to improve their ratings. These credits must be recognised as a legal obligation, though government, which must be monitored like any tax in order to create a market where the organizations are legally required to comply. In order to create a terrain where there is a market with buyers and sellers, all organizations should be able to participate of the trading floor. In order to encourage participation, tax and legislation through audits should be the enforced like with for example carbon tax emissions. Taxation on pollution as a basis line measurement must be based on a “per unit of production” concept to fund a market account. These pollution levels and parameters can be set as a baseline (Stackleberg Game Theory) (Yu et al., 2009).

2.4.3 Encouraging compliance

Other countries are encouraging compliance to preventative measures through the carbon emissions tax system to curb pollution, which requires compliance of organizations to stricter regulatory standards. Different elements identified for the carbon tax emissions system to be effective are:

- **Compliance**: More stringent compliance standards that were imposed; and
- **Competitiveness**: Change of strategic plan and products in order to remain competitive under the new standards.
Often organizations and regulators focus on costs of elimination pollution, but the opportunity cost of wasted resources, effort and diminished customer value should also be taken into account. The United States focuses their efforts on damage control or clean-up instead of prevention methods and mandated strict emissions goals and established very tight compliance deadlines. Countries like Sweden initially had more relaxed standards with the intention of increasing the compliance requirements over time. Resulting from these regulations, the United States companies installed secondary treatment systems and stopped there. Swedish producers, continually incorporated innovative environmental technologies, since they were expecting stricter compliance requirements to follow in future.

Organizations in the mining industry in Canada and the United States improved their production efficiencies and water treatment by investing large amounts of capital into the processes (Hilson, 2000). In order to encourage participation and compliance the initial measurement should be a pure measurement with no initial payment requirements. The organization will need to register on the database similar to for example the SARS VAT registration process and pay the registration fees and be allowed to fund the credit of the account over the next year from implementation SARS, 2012). On assessment, after financial year-end audits, the adjusting tax credit or payment will then be required. Regulatory measures should be considered carefully, and be well designed to ensure efficiencies in order not to unnecessarily burden organizations in the process (Beltramello et al., 2013) Companies that are making a large impact on sustainability and reducing the impact of their production processes must be rewarded for their efficiencies. If the organization efficiencies put the company in a position where it has a net amount of available credits, then these can be traded or transferrable to other companies that are less efficient. These other companies can buy tax credits at a premium on the SAFEX market and fund their account for inefficiencies or to improve their ratings. These credits must be recognised as a legal obligation that must be monitored like any tax in order to create a market where the organizations are legally required to comply. In order to create a terrain where there is a market with buyers and sellers, all organizations should be able to participate on the trading floor. In order to encourage participation, tax and legislation through audits should be the enforced. The government needs to buy into the concept in terms of the role as enforcer and legislation activities since it
will gain additional tax revenue. Taxation on pollution as a basis line measurement must be based on a litre per unit of production concept to fund a market account. These pollution levels and parameters can be set as a baseline (Stackleberg Game Theory) (Yu et al., 2009). For organizations to buy into the concept, buying and selling rights to pollute and the use of the underlying commodity in production processes needs to be contractual like with for example a futures account.

According to the King IV Report, corporate governance is defined as “the exercise of ethical and effective leadership by the governing body towards the achievement of ethical culture, good performance, effective control and legitimacy”. Companies are expected to have complied with good governance principles, since an “apply and explain” approach is used in the new King IV Report, as opposed to the prior King III Report, emphasising “apply or explain” principles, (IODSA, 2016). The King IV Report requires companies to create value in a sustainable manner with business models that positively affect society and the environment. Governing bodies need to be critical about outcomes of their products and consider the sequence of each of their processes and whether these products are having a positive or negative effect on value creation. An outcome which is inconsistent to what society expects to be good corporate citizenship, would have a negative impact on the reputation of such an organization and threaten its operational legitimacy which could in turn result in destruction of the value in the organization (IODSA, 2016). With organizations affecting the environment, their role as good corporate citizens raises the question whether South Africa is in need of a sustainable water management system, what elements are prevalent in such a system and how the governing body could implement sustainable water management by means of a business model.
CHAPTER 3
BUSINESS MODEL

3.1 INTRODUCTION
According to Brocken et al. (2014), the business model is described as a series of elements: the value proposition (product/service offering, customer segments, customer relationships), activities, resources, partners, distribution channels (such as value creation and delivery) and cost structure, and revenue model (Bocken et al., 2014). According to Beattie and Smith (2013), value is created by firms acting together with external parties to the firm through formal alliances or informal arrangements and the business model may then be viewed as a new unit of analysis in business, taking into account these collaborative ties (Zott et al., 2011). A business model is defined by three main elements (Bocken et al., 2014): the value proposition, value creation and delivery and value capture. At the centre of the business model is value creation; businesses capture value by seizing new opportunities, new markets and new revenue streams (Beltramello et al., 2013).

While the value proposition is concerned with the product and service offering to generate economic return, in a sustainable business, the value proposition would provide measurable ecological and/or social value as well as with economic value (Boons and Lüdeke-Freund, 2013). Value capture is regarding how revenue will be generated (i.e. capture value) from the provision of good, services or information to users and customers (Teece, 2010). Literature and industry increasingly suggest that business model innovation is a key to business success (Chesbrough, 2010; Lüdeke-Freund, 2010; Zott et al., 2011). With the rising global sustainability pressures, collaboration between firms and other key stakeholders is becoming more important (Lowitt, 2013). Value is no longer created by firms acting autonomously, but by firms acting together with parties external to the firm through informal arrangements or formal alliances (Beattie & Smith, 2013). The business model may be viewed as a new unit of analysis in business, which takes into account these collaborative ties (Zott et al., 2011; Beattie and Smith, 2013).
3.2 WHY A BUSINESS MODEL IS IMPORTANT FOR SUSTAINABILITY

According to Bocken et al., 2014, delivering long-term sustainability requires an integrated approach where a business model can be used as a tool to coordinate technological and social innovation with system-level sustainability. This opinion is based on research (Lüdeke-Freund, 2009), describing a sustainable business model as a model creating competitive advantage through superior customer value which contributes to sustainable development of the company as well as society. This also adds to the views of Garetti and Taisch (2012) on sustainable manufacturing that business models preserve the environment while continuously improving the quality of human life. Business model innovation requires a shift of focus away from developing individual technologies to creating new systems (Johnson and Suskewicz, 2009). According to Sommer (2012), a business model involves a wider set of stakeholders than only that of the company. A broader value-network perspective for innovation and transformation is required for this business model. Sustainable business models include social, environmental and economic value for a wide range of stakeholders (Bocken et al., 2014) Infusing sustainable water management into a business model, as a starting point, considering that access to water is a human right, so the question that arises is how can anybody be held accountable or who should be held accountable for water management if it belongs to everybody and essentially nobody really owns it? Many debates and arguments have ensued the suggestion of commoditising and privatising water, since it will become too expensive for everyone to afford the right to use the basic right (Bakker, 2007)

3.3 COMPONENTS OF A BUSINESS MODEL

Alexander Osterwalder is a Swiss business scientist, entrepreneur, author and strategy consultant. He was the founder of the Business Model Canvas (BMC) theory and the Value Proposition Canvas (VPC) (Van Vliet, 2014). He was the co-founder of Strategyzer.com, his book Business Model generation sold a million copies in 30 languages. Osterwalder’s Business Model as discussed by Osterwalder (Osterwalder & Pigneur, 2010). A business model is a conceptual tool to help understand how a firm does business that can be used for analysis, comparison and performance assessment, management, communication, and innovation.
(Osterwalder and Pigneur, 2010). Below in Table 2, the basic business model canvas is depicted.

Table 2: Osterwalder Business Model Canvas

<table>
<thead>
<tr>
<th>BUSINESS MODEL CANVAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY PARTNERS</td>
</tr>
<tr>
<td>KEY RESOURCES</td>
</tr>
</tbody>
</table>

| COST STRUCTURE | REVENUE STREAMS |

The business model is a conceptual tool to help understand how an organization does business that can be used for analysis, comparison and performance assessment, management, communication and innovation (Osterwalder and Pigneur, 2010). According to Brocken et al. (2014), the business model is described as a series of components: the value proposition (product/service offering, customer segments, customer relationships), activities, resources, partners, distribution channels (such as value creation and delivery) and cost structure, and revenue model (Bocken et al., 2014).
3.3.1 Value proposition

The firm faces an increasingly turbulent and complex competitive environment. The face of the marketplace is changing rapidly due to the unprecedented magnitude of demographic and socioeconomic shifts. Customers are very demanding. In general, they want ever-increasing levels of quality and service at lower costs. More specifically, markets have fragmented into numerous segments, each with its own unique value equation. Accompanying the fragmentation is the emergence of new media and distribution channels (Osterwalder et al., 2014). The central organizational challenge in the customer value-based theory of the firm is to maximize the effectiveness of the firm’s customer value-creation activities. Activities are most appropriately viewed as processes that cut across multiple functions in the organization. In contrast to the transactions cost economics perspective, which requires that the decision to perform a process internally or to contract for its execution is based on cost minimization. The choice in the customer value-based theory is based on which alternative produces superior value. Both benefits to the customer and costs must be considered (Slater, 1997). The value proposition as depicted in Figure 7 below (i.e. the offer and the target customer segment), consisting of the value creation and delivery system, and the value capture system (Bocken et al., 2014). Value propositions: products and services that create value for a specific customer segment (Barquet et al., 2013).

![Figure 7: Value Proposition](image_url)

Source: Osterwalder et al., 2014
3.3.2 Key activities
Key activities: activities involved in offering and delivering the aforementioned elements (Barquet et al., 2013).

3.3.3 Key partners
Key partners: network of suppliers and partners that support the business model execution (Barquet et al., 2013).

3.3.4 Key resources
Key resources: assets required to offer and deliver the aforementioned elements (Barquet et al., 2013).

3.3.5 Customer relationships
Customer relationships: types of relationships a company establishes and maintains with specific customer segments (Barquet et al., 2013).

3.3.6 Channels
Distribution channels: company's interface with its customers (Barquet et al., 2013).

3.3.7 Customer segments
Customer segments: groups of people or organizations a company aims to reach and serve (Barquet et al., 2013).

3.3.8 Cost structure
Cost structure: costs incurred when operating a business model (Barquet et al., 2013).

3.3.9 Revenue streams
Revenue streams: revenue a company generates from each customer segment (Barquet et al., 2013).
3.4 THE BUSINESS MODEL PROPOSITION: LINKING THE BUSINESS MODEL COMPONENTS TO ELEMENTS OF A SUSTAINABLE WATER MANAGEMENT SYSTEM

Business models are often seen as an intermediary between a company’s strategy and its business processes (Morris et al., 2005; Di Valentin et al., 2012). Thus, while strategy focuses on how to prevail over competitors, the business model depicts the logic of value creation and the effective coordination of business resources. The business model elements will link up with elements of sustainable water management systems, which will align with good corporate governance. A key mechanism that could be implemented is that every organization must pay a benchmark fee in the form of a credit for the allowable pollution level. The allowable level is determined by populating data using the Stackelberg Game Theory (Yu et al., 2009), to determine the achievable parameters to earn credits. If the annual allowable pollution level is exceeded, then additional credits will be levied each year. If the pollution levels are within the benchmark, then no credit is payable and if pollution levels are reduced, then a positive credit will be available which could be traded. The organization will consume and pollute the water resource as long as it is profitable. In order to be effective, the proposed limiting factor must frustrate profit if it is not implemented and regulations not adhered to.

As part of the business model components, the concept is put forward to build on current pollution limitations and to not only include the environmental impact studies for compliance in the audit report, but to immediately be liable for a right of use payments in the form of penalties or credit system. Compliance must be encouraged and therefore a tradable credit contract is proposed. Annual audit should include water pollution emissions testing and measured for compliance. If the organization is non-compliant an audit report could be qualified if remedial action is not taken and proof of credits paid when imposed. This process would require regulatory compliance, which will need to be included in audit requirements and legislation, which is beyond the scope of the research. Arguments continue about water privatisation impinging on human rights, therefore the suggestion is that it should be considered as a commodity in a production process. Everyone still has access to the underlying commodity but there is an instrument which comes into existence as a result of corporate governance compliance or non-compliance in terms of triple
bottom line reporting toward the commodity in the environment and society. In terms of implementation or measurement, one can consider to adapt the sustainable water management elements into a business model, where pollution measurements are limited to a certain level, that can be determined by using a method like for example the Stackelberg Game Theory where parameters are set. If the company trades within parameters, it receives a basis point of credit and if it is outside the parameter, it has to pay in on a market account. The initial measurement will state, like with a trading account, that a minimum amount of funds needs to be deposited for the allowable level of pollution. This account must be maintained on an annual basis like any trade account that needs to be topped up if the credit balance is below the minimum required allowance. Companies that are effectively making a substantial impact on sustainability and reducing the impact of their production processes could be rewarded for their compliance. The efficiencies within the process that has been audited and labelled as “green” can be rewarded with credits and the inefficiencies or pollution levels outside the parameters must be measured and additional credits will need to be funded to the account.

If the organization efficiencies put the company in a position where it has available credits these should be tradable or transferrable to other companies that are less efficient. These less efficient companies can buy credits at a premium on the market and fund their account for inefficiencies that they may be penalised for. These credits must be recognised as a legal obligation that must be monitored in order to create a market where the organizations are required to comply. The research proposition is that, instead of continuing arguments about water privatisation impinging on human rights, to rather consider the concept of a constructive instrument, like a futures contract, created as a result of efficiencies and inefficiencies in a production process. Everyone still has access to the underlying commodity but there is an instrument in the market, which comes into existence as a result of corporate governance compliance or non-compliance in terms of triple bottom line reporting. The organizations that will benefit from the instrument is the organization that is compliant and will receive credits, which can be traded on a platform like SAFEX. In terms of implementation or measurement, one can consider to adapt the concept of carbon emission systems where pollution levels are limited to a certain acceptable level, which can in my hypotheses, be determined by using a method like the
Stackelberg Game Theory where achievable parameters are set and equilibrium levels can be measured. The acceptable pollution levels are rated like when the credit rating agencies which as a standard measure rates a company as AAA or BBB, which will entitle the company to a certain level of pollution. If the company trades and pollutes within the set parameters, it receives basis points of credit and if it operates and pollutes beyond the parameter it has to deposit funds into the market-to-market account. If the company operates and pollutes below the original parameter, the rating can be improved. This rating will give the organization a qualified standing, where the organization’s compliance level can be measured and quantified. This will add weight to financial reports that investors would review for investment decisions. Any increased compliance can contribute toward improved market share and reduce risk for shareholders.

The initial measurement should require, like with any trading account that a minimum amount of funds need to be deposited for the allowable level of pollution rating. This account will be similar to that of a market-to-market account, which must be maintained on a periodic basis like any market trade account, that needs to be topped up if the required minimum credit balance is below the minimum required levels. In order to encourage participation and compliance the initial measurement should be a pure measurement with no initial payment requirements. The organization will need to register on the database similar to for example the SAFEX trading account registration process and pay the registration fees and be allowed to fund the credit of the account over the next year from implementation. On assessment, after financial year-end audits, the adjusting credit or payment will then be required. Regulatory measures should be considered carefully, and be well designed to ensure efficiencies in order not to unnecessarily burden organizations in the process (Beltramello et al., 2013). Companies that are making a large impact on sustainability and reducing the impact of their production processes must be rewarded for their efficiencies. For example, the breweries in South Africa use four litres of water to each litre beer of production output. With this example, any efficiencies within the process that have already been audited and labelled as “green”, should be rewarded with credits and on the contrary, any inefficiencies or pollution levels outside the parameters must be measured as a ratio of the basis, and credits will need to be added to the account. If the organization efficiencies put
the company in a position where it has a net amount of available credits, then these can be traded or transferrable to other companies that are less efficient. These other companies can buy credits at a premium on the SAFEX market and fund their account for inefficiencies or in order to improve their ratings. These credits must be recognised as a legal obligation, which must be monitored in order to create a market where the organizations are legally required to comply. In order to create a terrain where there is a market with buyers and sellers, all organizations should be able to participate on the trading floor. In order to encourage participation, audits should be the enforced like with carbon tax emission regulations. Credits payable on pollution as a basis line measurement must be based on a litre per unit of production concept to fund the market account. These pollution levels and parameters can be set as a baseline, according to the Stackleberg Game Theory. For organizations to buy into the concept, buying and selling rights to pollute and the use of the underlying commodity in production processes needs to be contractual like with for example a futures account that can be traded on SAFEX.

As part of a competitive business strategy, quality of management is essential because it determines success of the model through capabilities, ability to acquire, combine and utilise valuable resources in ways that deliver a value proposition to customers (Beltramello et al., 2013). The proposed business model consists of various parts, which was based on the Osterwalder business model canvas concept (Osterwalder and Pigneur, 2010). Linking the Osterwalder business model components with elements for sustainable water management as depicted in Table 3 below, it is evident that the value offering in the business model became the implementation of good corporate governance by implementing for example the business model for sustainable water management. The customer segment was society and revenue streams became longevity assurance of the organization. The key partners were the organizations, audit firms and SAFEX traders who act as the regulators of policies and procedures. The shift in the model points to organization self-preservation by means of adhering and implementing prescribed business practice and the positive impact the organization will have on society.
Table 3: Linking Business Model components with elements for sustainable water management systems

<table>
<thead>
<tr>
<th>BUSINESS MODEL: SUSTAINABLE WATER MANAGEMENT ELEMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KEY PARTNERS</strong></td>
</tr>
<tr>
<td>Organizations, audit firms and SAFEX traders, Stats SA and the South African Water Research Commission</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>KEY RESOURCES</strong></th>
<th><strong>CHANNELS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Management, organization internal functions, SAFEX traders, Staff from SAWRC</td>
<td>Audits from organizations, annual reports from Stats SA and SAWRC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>COST STRUCTURE</strong></th>
<th><strong>REVENUE STREAMS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of King IV requirements, Funding resources and staff for baseline measurement and annual audits of pollution levels as appointed by the SAWRC</td>
<td>Pollution rights credit account funding through SAFEX.</td>
</tr>
</tbody>
</table>
Linking the business model components to the elements of sustainable water management systems in terms of the business model components for an organization are as follows:

### 3.4.1 Value proposition
Credits for increased financial position – increased investor confidence. Business model for sustainable management of water supply with OMS factors and environmental elements.

### 3.4.2 Key activities

### 3.4.3 Key partners
Organizations, audit firms and SAFEX traders, Stats SA staff and resources from the South African Water Research Commission.

### 3.4.4 Key resources
Management from organizations, organization internal functions, SAFEX traders and staff from SAWRC.

### 3.4.5 Customer relationships
Society views organization as legitimate and acceptable.

### 3.4.6 Channels
Audits from organizations, annual reports from Stats SA and SAWRC
3.4.7 Customer segments
Organizations, Citizens in South Africa.

3.4.8 Cost structure
Trader’s commissions, online trading account subscriptions, monthly administration. Implementation of King IV requirements. Funding resources and staff for baseline measurement and annual audits of pollution levels as appointed by the SAWRC.

3.4.9 Revenue streams
Registration, transaction, and market account management fees, pollution rights credit account funding through SAFEX.

In Table 4 below, a proposed business model for sustainable water management in South Africa depicted.
Table 4: Proposed business model for sustainable water management in South Africa

<table>
<thead>
<tr>
<th>BUSINESS MODEL: SUSTAINABLE WATER MANAGEMENT IN SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY PARTNERS</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Environmental auditors, health and safety officers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEY RESOURCES</th>
<th>CHANNELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders, SAFEX daily trade information, time</td>
<td>Email, audits, management meetings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COST STRUCTURE</th>
<th>REVENUE STREAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trader’s commissions, online trading account subscriptions, monthly admin</td>
<td>Registration and transaction and market account management fees</td>
</tr>
</tbody>
</table>

There must be a model that can be used as a foundation, to base and implement a sustainable water management system that can function as an integral part of systems that are already in place. A study has been conducted in Taiwan (Chen et al., 2006), on how authorities can improve water quality management by implementing a framework incorporating management thinking into the planning stages of decisions during the first phase where the volume of pollution discharge generated in each draining zone of the river is determined and in the second phase devising the abatement plans for each pollution source according to the respective organizations. The second phase abatement plans should be based on strategies generated during the first phase. Based on these studies performed in Taiwan (Chen
et al., 2006), it highlights the need for a combination of Government support in terms of environmental measurement and control as well as economic measurement and control through budgets and resources, within a framework to enable sustainable water management in a country. In South Africa, we do not have an existing model for sustainable water management and therefore the research conducted in this paper develops such a model. As a starting point, it is important to see that a model for sustainable water management comprises of the top tier, Government with two, second layer tiers; environmental and economic measurement and controls. Referring to these two elements as part of a framework, currently in South Africa, environmental impact measurements are being performed on South African rivers, as part of a sustainable global initiative called Advancing SEEA Experimental Ecosystem Accounting. Statistics South Africa (Stats SA) and the South African National Biodiversity Institute (SANBI) are working in partnership with the Council for Scientific and Industrial Research (CSIR), the Department of Water and Sanitation (DWS), the Department of Environmental Affairs (DEA) and Ezemvelo KZN Wildlife.

The measurements are being performed in a reliable manner by these institutions, which can be used as the bridging data set that should be otherwise performed by Government as part of the environmental subsection of the framework. Therefore, these measurements are, to a certain extent, bridging the environmental gap part of the framework and the data gathered can be used to determine the baseline as well as pollution levels of each river section. The economic section of the framework is, as identified from the studies in Taiwan, performed by Government with allocation of budgets and the required resources (Chen et al., 2006). In South Africa, there is no economic structure besides current maintenance budgets that are insufficient and unsuccessful. This is evident from the increased decline of water quality as determined by ecological research of South African rivers (Nel & Driver, 2015). South Africa has a failing waste water infrastructure and intensification of agricultural activities which is a major contributor to the decline of water quality across the country.

In order to bridge the gap for the model, the economic section of the model must be developed. As a basis for the economic section of the model, this study will determine whether the carbon tax emission tax system that is already being implemented in other countries can be used as a basis for a business model for
sustainable water management system in South Africa. According to Mare, 2014 we have seen the carbon taxes being raised on new vehicle purchases as an amount based on the amount of carbon that the specific vehicle emits. Where this concept is widely knows as the carbon footprint the new concept raising interest is the “Water footprint”, which is defined by the Water Footprint Network (2017) in the Netherlands as the volume fresh water needed to produce a product, considering the volumes of water used and polluted in the various steps of the supply chain. The water footprint impact is based on a measurement of the actual footprint based on one of two methods. The first approach is categorising the total water footprint into three classes, namely green, blue and grey water. Green water is rainwater, blue water is fresh water from rivers, dams and underground sources, and finally grey water is used to dilute polluted water to acceptable levels. The quantities of water used is then expressed as a litre per product unit (Mare, 2014).

The alternative approach is the Lifecycle Assessment (LCA) used in Australia. This approach determines the source of the water being used without considering the pollution factor. This approach focuses on the water equivalents per unit (H2Oe). In other words they focus on the consumption and stress the scarcity of water supply within a certain area (Mare, 2014). According to Mare (2014), in South Africa the agriculture industry is the largest user of water which leads to the need for analysis of information on water consumption of agricultural products. The Water Research Commission funded projects on this subject, one done by the University of Pretoria on vegetables and fruit and the other by the University of the Free State on grain and forage crops. The Department of Agricultural Economics at the University of the Free State held a water footprint seminar where world leaders on the subject talked on the matter to South African researchers and where the validity and application of the approaches were debated. Matsuhashi et al. (1999) conducted a study on systems for clean development mechanisms to reduce CO2 emissions. A clean development mechanism (CDM) was researched to facilitate technology transfer from developed to developing countries, as well as to reduce green house gas emissions in a economically viable way. The data found that financial support from developed countries increase efficiency of the industrial energy use in developing countries. Characteristics of the game theory were explored in their research as well as actual marginal cost curves of the countries in order to determine cost effectiveness of CO2
reduction options. This methodology will be explored to determine whether it can be applied as a basis to bridge the economic gap in the new model for sustainable water management in South Africa. In the study conducted by Matsuhashi et al. (1999), the CO2 reduction level of the developed country was denoted by the area X1 down to X0 and the developing country CO2 reduction level denoted by XT down to X1. Functions f0(x) and h0(x) are defined as functions of marginal cost of reducing CO2 in a developed and developing country. It is assumed that h0(XT-x) as g0(x). This is depicted in Figure 8 below.

![Figure 8: Basic scheme of CDM – source adapted from Matsuhashi et al 1999](image)

It is important to understand that a base line level of pollution must be measured in advance. This is already in place as studies have been conducted as parts of the on-going sustainable global initiative, Advancing SEEA Experimental Ecosystem Accounting. The existing data of pollution levels from this study can be applied as a base line measure. It is envisioned that a standard level of pollution will be permissible per organization on a unit of production scale. This permissible pollution should be paid for by the organization in the form of a standardised tax or right to pollute the water resource. Therefore, increased production, which increases use of the natural resource, will result in increased taxes for right of use of the natural resource. Using the base line and the pre-determined standard, this study aims to duplicate this model by denoting the base line level of pollution as X0, standardised
levels of pollution as XT. It must be the organization’s goal to function within the X0 to XT pollution level. Any reduction below X1, denoting the 80% mark of pollution level, will result in a tax credit and any reading above XT will result in a tax penalty. The X1 level is debatable, but it must be an achievable target to encourage the organization to reduce its pollution levels. Sackleberg’s Game Theory is used as a reference point to measure allowable pollution levels in this paper and not discussed in further detail. Below in Figure 9, is the basic scheme of CDM, adapted for the water pollution hypotheses.

![Diagram of CDM adapted for sustainable water management in South Africa](image)

**Figure 9:** Basic scheme of CDM adapted for sustainable water management in South Africa
CHAPTER 4
RESEARCH METHODOLOGY

4.1 INTRODUCTION
The research methodology will be qualitative. The philosophy categorisation of the qualitative methodology is Critical Theory with the aim of the research to analyse, emancipate and to transform.

4.2 RESEARCH DESIGN
In this paper, action research using the case study approach was used as the type. According to Brydon-Miller et al. (2003), action research is a participatory and demographic process which attempts to combine action and reflection, theory and practice in participation with others for practical solution to issues of pressing concern and the flourishing of persons and their communities.

4.3 POPULATION
Semi-structured questionnaires issued to accountants, lawyers, geologists, senior management in organizations that use water as part of the production process and SAFEX traders. The population consists of seven individuals from different geographical areas, both male and female. The population is a combination of professional individuals who can make a meaningful contribution. Semi-structured questionnaires and interviews with available individuals were used to collect the data.

4.4 STUDY POPULATION AND UNIT OF ANALYSIS
The study population and unit of analysis constructed as follows:

- As a case study, qualitative data was collected to determine the methods on how sustainable water management is being implemented in other countries and what the elements are that have been put in place to enable the system’s functionality. The sustainable water management in South Africa explored in order to create a basis for comparison and to determine if any of the factors exist in South Africa and highlight why the same system was or was not effective.
The data was obtained from online internet based resources and legislation in order to establish requirements for the system to be implemented.

The case study used as support of inferring a hypothesis on the viability of implementing the same type of system in South Africa.

The study investigated the possibility of measuring an organization’s compliance during annual audits, and whether it would support the King Code IV reporting requirements. The research purpose is to improve the organization’s accountability, sustainability and economical contribution to corporate governance requirements. “Good corporate governance is essentially about effective leadership characterised by the ethical values of responsibility, accountability, fairness and transparency” (Naidoo, 2002). Qualitative data were collected using semi-structured questionnaires. Semi-structured interviews conducted based on the same questionnaires from willing participants within the population.

This study set out to determine the possibility of implementing a business model for sustainable water management in South Africa, based on components of the Osterwalder business model that could link to a sustainable water management system.

For the validation of the business model, the elements for sustainable water management were suggested and responses taken into account of whether application can be implemented in the South African context. If these suggested applications were or were not viable, then it was argued whether it would be possible to create a system based on the business model framework.

The viability of trading water credits in an open market would have to be supported in terms of the demand and supply options available for users. The proposal based on the premise that during slower production times when less water is consumed, any excess or unused water credits purchased could be sold in an open market. This study attempted to support, whether or not a trading credit system would create a product in the market that could be traded in order to manage and reduce liabilities which organizations would be subjected to. This system would contribute to enforcing accountability on the organization as it would be liable for the use of natural water resources in its processes of production.
• Applying the results obtained from data collected, the end goal of the research study was to establish the rationale for the possibility of implementing a limiting factor on the right of use of water resources. The research determined whether imposing such a limiting factor would be viable in terms of implementation possibilities and sustainability, which encourages participation from organizations.
• Data collected from internet-based resources was used as supporting information to convincingly conclude, whether or not such a limiting factor could be imposed on organizations.

4.5 SAMPLE SIZE
Qualitative data were collected in the form of semi-structured questionnaires to guide interviews with accountants, lawyers, geologists, and senior management in organizations that use water as part of the production process and SAFEX traders. Semi-structured questionnaires were used to conduct interviews directly with available individuals.

4.6 SAMPLING STRATEGY
The sampling strategy is constructed as follows:
• Theoretical sampling strategy: The sampling strategy that was followed is theoretical sampling for collecting and analysing information and developing the theory as it emerges.
• Judgement sampling strategy: A judgement sample strategy was also used by selecting specific respondents to respond to the research questions. The research questions will be specifically relevant to the respondents’ field of expertise to ensure a usable result can be obtained. This is a key informant sample which is when subjects have special expertise. During interpretation of data, the respondent’s responses will be used to support the idea of the research proposal or to oppose the idea. The subjects that have disagreed will be used to find explanations or solutions for identified shortcomings or loopholes in the suggested research proposal (Marshall, 2006).

4.7 GEOGRAPHICAL DETAIL RELATING TO RESPONDENTS
Geographical details relating to respondents were as follows:
• Internet: The information is available on the public domain and the documents are available on the internet.
• Interviewees: The interviewees selected across the North West, Gauteng, Free State and Western Cape Provinces.

4.8 ACCESSIBILITY OF RESPONDENTS
Accessibility of respondents was as follows:
• Internet: The data is freely available to the public on sources like the internet and therefore no special permissions are required at this stage.
• Interviewees: Access should be moderately straightforward in terms of the interviewees.

4.9 SUITABILITY AND RELEVANCE OF RESPONDENTS
The suitability and relevance of respondents are set out as follows:
• Viability: The research question is exploring a possibility of developing a method and the information needs to be collected to substantiate why the suggested method may or may not be viable.
• Meaningfulness: The available information provides meaningful answers to the research question.
• Credibility: The respondents are all professionals in their field in terms of qualification and experience, which relate to the research problem and can address to some extent the objectives of answering the question.

4.10 AN ALTERNATIVE UNIT OF RESPONDENTS
The alternative unit of analysis could be done in the form of a survey issued to managers of various large organizations that rely on water consumption in their operational processes. The survey was analysed to obtain a larger sample of data and standard deviations of responses.

4.11 DATA COLLECTION
4.11.1 Data collection for theoretical sampling strategy
Data collection for the theoretical sampling strategy will be as follows:
The focus will be on generating a hypothesis from the qualitative data collected. Data were collected from literature reviews.

- Qualitative data were collected in the form of legislation relating to corporate governance and compliance.
- Government reports are available on the internet and are a reliable source of secondary data.
- The process for data collection for the theoretical sampling strategy would follow a logical order where the general research question was used as a basis to obtain theory around the topic. Data were collected and analysed and correlations or arguments against the research proposal will be identified. The process will repeat itself until the theoretical saturation is achieved where a satisfactory amount of data has been collected to answer the research question.

A data collection process for theoretical sampling is depicted in Figure 10 below.

![Diagram](image)

**Figure 10:** The process of data collection for sampling – adapted from Bryman and Bell 2014
4.11.2 Data collection for judgements sampling strategy

Data collection for the judgements sampling strategy will be as follows:

- Additional qualitative data were collected in the form of semi structured questionnaires and or interviews with a chartered accountant, a lawyer, a CEO at a large organization, SAFEX traders and a geologist.

- A list of semi-structured questions is included in Appendix A at the end of this document.

4.12 DATA ANALYSIS

4.12.1 Analysis of data collection from theoretical sampling strategy

Analysis of data collection from theoretical sampling strategy is performed as follows:

- An interpretive process was used as an analytical technique, including interviews and electronic documents to facilitate cross-referencing.

- The analytical approach was a deductive approach, relying on theoretical propositions reflecting the set of research questions.

- The research design was in the form of a cross-sectional study with the research approach taking on a qualitative form in order to analyse the content of documents relating to a specific event.

- Qualitative data were collected to determine the application of the existing business model framework onto suggested water management and also to determine the effect the planned application would have.

4.12.2 Analysis of data collected from the judgment sampling strategy

An interpretive process was followed to analyse the case study using the following stages (Bryman & Bell, 2014):

Stage 1 – Insight – Read each case
Stage 2 – Sense-making – Diagnose each case separately
Stage 3 – Categorization – Develop within case themes
Stage 4 – Pattern recognition – Develop cross-case themes
Stage 5 – Interpretation – Writing up
Stage 6 – Explanation and abstraction – Enfold theory
4.13 ASSESSING AND DEMONSTRATING THE QUALITY AND RIGOUR OF THE PROPOSED RESEARCH DESIGN

4.13.1 Quality of the proposed research design
The study is qualitative in nature due to the principal orientation of the theory in relation to the research, which is interpretive (Efundi, 2017). The focus was on generating a hypothesis from the data.

4.13.2 Relevance of the proposed research design
Qualitative data collected in the form of semi-structured questionnaires and or interviews relating to the possibility of enforcing the compliance to the suggested contract or credit as an audit requirement for King IV and to discuss the impact such a regulation could have on an industry.

4.14 RESEARCH ETHICS
Annexure B contains the document signed by the interviewees to indicate their consent to partake in this study. Annexure C contains the approved application for ethical clearance that is required by the Faculty of Economic and Management Sciences. The study classified as a low-risk study and approved on faculty level.

4.15 RESULTS
The demographic profile of the interviewees consists of six females and one male. Their ages vary from 20-29 (3 respondents), 30-39 (2 respondents), 40-49 (1 respondent) and 50-59 (1 respondent), indicating that almost half of the group are in the younger age group demographic. In the semi-structured questionnaire, respondents are requested to consider the suggested application of each of the business model elements on the business model canvas and to state whether or not they agreed with the application and whether they had other application suggestions or reservations about the application.

4.15.1 Value proposition
Some six of the seven respondents agreed that the application of the value proposition as suggested using the business model for sustainable water
management through introducing tradable credits available to organizations for increased financial position and investor confidence. Only one respondent disagreed with the suggested application arguing that NEMA already regulated water supply, there would not be enough enforcement infrastructure, and regulatory framework will not allow such an implementation. Themes identified in the data collection are initial capital investments, detailed and effective implementation, use of reliable detail and compliance rewarded with a contract with credits. The demographic profile of respondents showed that only two of them in the 20-29-year age group, and the rest of the respondents in the 30-39, 40-49 and 50-59-year age group, agreed on the application of the value proposition as suggested. The application suggested using the business model for sustainable water management through introducing tradable credits available to organizations for increased financial position and investor confidence. Only one respondent in the 20-29-year age group demographic did not agree with the application.

4.15.2 Key activities
Some six of the seven of respondents agreed that the application of key activities application as suggested using the business model for sustainable water management through trading on SAFEX and managing the organizational trading account. Respondents also agreed that key activities include measurement of water pollution levels and reporting of compliance reported during annual audits. Only one respondent disagreed with the suggested application, stating that compliance could not be enforced since there was no motivation for compliance. Themes identified in the data collection include trustworthy reporting through audit firms, effective risk management, effective control and implementation, criteria to be set for contracts by independent and reliable institution. Again, only two of the three respondents in the 20-29-year age group and the rest in the 30-39, 40-49 and 50-59-year age group agreed that key activities included trading on SAFEX and managing the organizational trading account.

4.15.3 Key partners
The demographic profile of respondents showed that six of the seven respondents agreed that the application for key partners as suggested using the business model for sustainable water management through annual audits conducted by reputable
audit firms could include water pollution measurements during the audit. An alternative suggested application could be through South African Water Research Commission and Statistics SA staff as well as SAFEX administration staff managing the trading accounts, Statistics SA staff and resources from the South African Water Research Commission measuring and reporting on pollution levels. Only one respondent disagreed with the suggested application stating that partners would not be motivated to participate since the suggested application would require additional staff within the organization. Respondents also pointed out existing partners do not function effectively. Themes identified in the data collection include well-established organizations with existing resources, reliable and independent enforcement for compliance. Here two of the three respondents in the 20-29-year age group were in agreement with the application and all other respondents in the 30-39, 40-49 and 50-59-year age group were in agreement with the application. Only one respondent was in disagreement with the suggested application.

4.15.4 Key resources
Here five from the seven respondents agreed, that the application for key resources as suggested using the business model for sustainable water management through administration staff trading on SAFEX providing daily trade information and managing credits on market-to-market accounts. Data collection and reporting through an independent body like Statistics SA and South African Water Research Commission. Organization representatives appointed for health and safety purposes as well as internal controls performed, that can provide transparent, accurate and independent reporting. The demographic profile of respondents showed that two of them disagreed with the suggested application arguing that additional staff would be required that would require additional funding. Themes identified in the data collection include independent institutions, reliable employees for effective implementation, job creation, accurate and timely reporting. Again, only one of the three respondents in the 20-29-year age group, as well as all the other respondents in the 30-39, 40-49 and 50-59-year age group was in agreement with the application.

4.15.5 Customer relationships
The demographic profile of respondents showed that five of them agreed that the application for customer relationships as suggested, using the business model for
sustainable water management through trader relations with SAFEX administration staff and consultation on compliance strategies with South African Water Research Commission and Stats SA employees and representatives. From all the respondents, two of them disagreed with the suggested application arguing that customers are any willing buyer or seller of the contracts that would not be limited to a specific group of people or staff. Another point was that a relationship needed to establish within the organizations otherwise compliance would not be enforceable. Themes identified in the data collection include continuous communication, accuracy and completeness, sustainable relationships, increased trust and communication, and social development, willing buyers. As much as two respondents in the 20-29-year age group, as well as all respondents in the 30-39 and 50-59 year age group were in agreement with the application. In contrast, the respondent in the 40-49-year age group disagreed with the suggested application.

4.15.6 Customer segments
Some five of the seven respondents agreed that the application for customer segments as suggested using the business model for sustainable water management through organizations and citizens in South Africa that are all users of water and have a right to cleaner water. The demographic profile of respondents showed that two of them disagreed with the suggested application arguing that it would be large organizations that paid for the contracts and not necessarily citizens directly. Another point was that speculators would be buying the contracts and not necessarily only companies. Themes identified in the data collection include large organizations, citizens, and speculators. In the age group demographics, two respondents in the 20-29-year age group and all of them in the 30-39 and 50-59-year age group were in agreement with the application. In contrast, the respondent in the 40-49-year age group disagreed with the suggested application.

4.15.7 Channels
From all the respondents, five of them agreed that the application for channels as suggested using the business model for sustainable water management through audit reports of organizations that are easily available on company websites, annual reports online from Stats SA and South African Water Research Commission on sustainability and pollution levels achieved within the organizations. In contrast, two
of them disagreed with the suggested application arguing that not everyone has access to the internet and not all companies use websites. Another point was that willing buyers could acquire contracts and then channels would be SAFEX or the company website where information would be available to communicate or reach the customer segment. Themes identified in the data collection include easy access, improved success. Some, two of the three respondents in the 20-29-year age group and all respondents in the 30-39 and 50-59-year age group were in agreement with the application. The respondent in the 40-49-year age group was not in agreement with the suggested application.

4.15.8 Cost structure
Five respondents agreed that the application for cost structure as suggested using the business model for sustainable water management through administration of online trading account subscriptions and monthly administration fees. Implementation fees for annual measurements of baseline pollution levels. Staffing costs and resources for employees appointed by the South African Water Research Commission. The rest of them disagreed with the suggested application arguing that if compliance and regulation were not captured into an act or legislation, it would lead to voluntary compliance, which would then be insufficient to support such costs. Employee costs could be very high. Themes identified in the data collection include trustworthy staff needs to be in place as well as reliable systems. It is important to understand all costs and to use audits to enforce compliance. One of the respondents in the 20-29-year age group and all respondents in the 30-39, 40-49 and 50-59-year age group were in agreement with the application.

4.15.9 Revenue streams
The demographic profile of respondents showed that five of them agreed that the application for revenue streams as suggested using the business model for sustainable water management through registration, transaction and market-account management fees, contract credit account funding through SAFEX. The rest of them disagreed with the suggested application arguing that it is not an easy process for a company to obtain a water use license, why then would the organization agree to buy into such an idea that can risk take back or withdrawing licenses and will possibly add more expenses to the company. Another point raised was that it would
depend on compliance, which if not captured into an act or legislation will result to voluntary compliance, would not be enough to support the cost. Themes identified in the data collection include audit fees and understanding all costs. The demographic profile of respondents showed that one of them in the 20-29-year age group and all respondents in the 30-39, 40-49 and 50-59-year age group were in agreement with the application. From the research, there are elements of independence, trustworthiness, enforceable and compliance themes that came to the fore. Themes mapped to the business model framework indicated in Table 5 below.

Table 5: Proposed business model for sustainable water management in South Africa based on themes identified from results

<table>
<thead>
<tr>
<th>BUSINESS MODEL: SUSTAINABLE WATER MANAGEMENT THEMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KEY PARTNERS</strong></td>
</tr>
<tr>
<td>6 respondents agreed, Well-established organizations with existing resources, reliable and independent enforcement for compliance</td>
</tr>
<tr>
<td><strong>KEY RESOURCES</strong></td>
</tr>
<tr>
<td><strong>CHANNELS</strong></td>
</tr>
</tbody>
</table>
In Table 6 below, the business model expanded into a combination of sustainable water management elements and themes classified into each element of the business model where themes support the required elements for sustainable water management elements.

**Table 6: Business Model Expanded as a combination of sustainable water management elements and themes for the business model elements**

<table>
<thead>
<tr>
<th>KEY PARTNERS</th>
<th>KEY ACTIVITIES</th>
<th>VALUE PROPOSITION</th>
<th>CUSTOMER RELATIONSHIPS</th>
<th>CUSTOMER SEGMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Themes: 6 respondents</td>
<td></td>
<td>Themes: 5 respondents agreed, Initial capital</td>
<td>Themes: 5 respondents agreed, Continuous communication, accuracy and completeness, sustainable relationships, increased trust</td>
<td>Themes: 5 respondents agreed, Large organizations, citizens, speculators</td>
</tr>
</tbody>
</table>
agreed, Well-established organizations with existing resources, reliable and independent enforcement for compliance

map of ecosystem types across the terrestrial and freshwater realms (ENVIRO) +
The system would need to support managers at all levels of an organization (OMS) +
Combination of decision processes (OMS) +
User friendliness (OMS) +
Adaptability (OMS) +
User integration (OMS) +
Data integrity verification (OMS) +
Integration of systems (OMS) +

Themes: 6 respondents agreed, Trustworthy reporting through audit firms, effective risk management, effective control and implementation, criteria to be set for contracts by independent and reliable institution

investments, detailed and effective implementation, use of reliable detail and compliance rewarded with a contract with credits

communication, and social development, willing buyers
**Table 7:** Business Model Expanded as a combination of sustainable water management elements and themes for the business model elements (continued)

<table>
<thead>
<tr>
<th>KEY RESOURCES</th>
<th>CHANNELS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elements:</strong> Management, organization internal functions, SAFEX traders, Staff from SAWRC</td>
<td><strong>Elements:</strong> Audits from organizations, annual reports from Stats SA and SAWRC</td>
</tr>
<tr>
<td><strong>Themes:</strong> 5 respondents agreed, Independent institutions, reliable employees for effective implementation, job creation, accurate and timely reporting</td>
<td><strong>Themes:</strong> 5 respondents agreed, Easy access, improved success</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COST STRUCTURE</th>
<th>REVENUE STREAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elements:</strong> Implementation of King IV requirements, Funding resources and staff for baseline measurement and annual audits of pollution levels as appointed by the SAWRC</td>
<td><strong>Elements:</strong> Pollution rights credit account funding through SAFEX.</td>
</tr>
<tr>
<td><strong>Themes:</strong> 5 respondents agreed, Trustworthy staff and reliable systems, understand all costs, audits to enforce compliance</td>
<td><strong>Themes:</strong> 5 respondents agreed, Audit fees and understanding all costs</td>
</tr>
</tbody>
</table>

From the analysis in the aforementioned section, a business model can be developed for sustainable water management in South Africa, to a certain extent. The elements of the business model that applied to the implementation of the sustainable water management were separately analysed. From the demographic, between five and six of the seven respondents were in agreement with suggested implementations. The respondents which were in disagreement noted mentioned implications and risks which were brought into the model as additional themes such as additional staffing and regulations that would be required as well as enforcing compliance.
CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION
The research paper identified the problem that South Africa’s water security is at risk and this is because South Africa is a country with low levels of rainfall, high water consumption, specifically in agriculture, mining and other production industries. Another factor contributing to the problem is the fact that the Auditor General reported poor governance and maintenance of water management infrastructure by the Department of Water and Sanitation. The hypothesis put forward was to develop a business model for sustainable water management in South Africa by following a lean-start up approach (Blank, 2013) of each business model element. The lean startup approach puts forward the hypotheses and secondly considers each element of the business model based on feedback from customers or research participants in this case and providing a feedback loop to the hypothesis to test whether it is viable to implement it on each of the nine elements. In order to refine the hypothesis results, the feedback that is most relevant and constructive, can be re-applied to the model. As the basis to begin the hypothesis, sustainable water management systems studied from the perspective of other countries, which have implemented successful water management systems and the elements that were prevalent in those systems. Each element was then plotted to what seemed to be the most relevant element on the business model canvas to suggest it is either a key partner, key resource, key activity, value proposition, channels, the customer, customer relationships, key resources, cost elements and revenue elements. Questions put forward to seven participants were to test the relevance and fit, of each sustainable water management element on the business model canvas.

5.2 CONCLUSIONS
The results of the research show that the hypothesis, based on a set of sustainable water management elements, were successfully superimposed onto a business model canvas. Some elements were easier to classify but the biggest challenge identified for the model during the research was the actual implementation of the
process. A business model was therefore developed for sustainable water management.

5.2.1 Conclusion - SA has a water shortage and risk of water security
SA has a water shortage and risk of water security and in conclusion, there exists a need for a sustainable water management system.

5.2.2 Conclusion - SA is not displaying actions of a good custodian for its water resources
SA is not displaying actions of a good custodian over its water resources and in conclusion, as part of the business model, there is a need for an independent custodian to oversee and enforce such a water management system.

5.2.3 Conclusion - There is not an acceptable water management system in place in SA
SA does not have an acceptable water management system in place and in conclusion, as part of the business model, there is a need for an effectively managed and enforced water management system.

5.3 RECOMMENDATIONS
From the results, it is evident that SA has a high water security risk with no reliable water management system in place.

5.3.1 Recommendation - SA has a water shortage and risk of water security
The recommendation is that because SA has a water shortage and risk of water security, a sustainable water management system needs to be developed, using a business model as a framework, enforced and managed by an independent custodian.

5.3.2 Recommendation - SA is not displaying actions of a good custodian for its water resources
The recommendation is that due to the fact that SA is not displaying actions of a good custodian over its water resources, a sustainable water management system
needs to be developed, using a business model as a framework, enforced and managed by an independent custodian.

5.3.3 Recommendation - There is not an acceptable water management system in place in SA

The recommendation is that due to the fact that SA does not have an acceptable water management system in place, a sustainable water management system needs to be developed, using a business model as a framework, enforced and managed by an independent custodian.

The recommendation is that an independent regulator will need to head up the implementation process of the suggested hypotheses. An overseeing, enforcing body needs to be in place in order to contribute toward the successful implementation of the business model. An evaluation of the business model elements need to be completed and then, prioritised in terms of certain criteria and an implementation strategy will have to be developed.

5.4 AREAS FOR FURTHER STUDIES

In order to determine successful implementation of the business model, a second round of research questions and interviews can explore with further hypotheses, how to overcome the implementation challenges in a successful manner. Another challenge will be to determine whom the independent governing body will be and how that regulator will be encouraged to take up the task.

5.5 SUMMARY

In chapter 1 the nature and scope of the study were put forward with the problem statement that South Africa is facing a failing water management infrastructure and at risk of water security. The importance of water management was identified and the value proposition of a business model for sustainable water management was put forward as a hypothesis. Chapter 2 explored the water management in South Africa and investigated by means of literature reviews the water management systems in other countries and the elements that were prevalent in each of them. The success of the water management of each country was due to the government in that country that was a major contributing role player. Funding received from
governments contributed toward water management infrastructure and government was a large role player in implementing and managing those systems. The challenges that existed were that the financial and operational departments of the government did not have a shared vision that meant that budgets and timeframes did not always align. The crux of the issue for South Africa is that the government is not a successful role player and in order to find a starting point, a system needs to be in place in order to address the problem South Africa is facing in terms of water security. This system needs to be independent in order to avoid possible corruption and mismanagement. Then in chapter 3, the paper examined the Osterwalder business model canvas, as a basis to model a system for sustainable water management in South Africa. The elements used as the basis of the hypotheses are key partner, key resource, key activity, value proposition, channels, the customer, customer relationships, key resources, cost elements and revenue elements. Sustainable water management systems elements superimposed onto relevant business model elements were the basis set to formulate research questions, which in turn tested the hypotheses. Furthermore, in chapter 4 the research paper used the case study research design to test the hypothesis. A relevant sample of seven respondents who responded to semi-structured interviews made up the population. In chapter 5 the conclusions and recommendations are discussed, together with areas for further studies. The results of the research show that the hypothesis based on a set of sustainable water management elements superimposed onto the business model canvas is possible. From the results, the recommendation is that an independent regulator will need to head up the implementation process of the suggested hypotheses. In conclusion, the research supports that development of a business model for sustainable water management in South Africa is possible.

Acts see South Africa.


DAFF see South Africa. Department of Agriculture, Forestry and Fisheries.

DWAF see South Africa Department of Water Affairs.

DWSSA see South Africa Department Water and Sanitation.


Efundi. 2017. Designing Qualitative Research
http://efundi.nwu.ac.za/access/content/group/a5ebbc12-b817-472e-8920-202d79a6644b/Reader/Berg%202931.pdf Date of access: 27 Jul. 2016


King III. 2012. Chapter 6: Compliance with laws, rules, codes and standards


SARS 2012 External guide mineral and petroleum resources royalty


South Africa Info 2017


South African National Biodiversity Institute


APPENDIX A

- Data collection instrument(-s) –
SEMI STRUCTURED INTERVIEW QUESTIONNAIRES

The questionnaire was set up with initial demographic questions regarding each respondent’s age, geographical area and industry. The questionnaire further explored business model components, with concepts put forward to build on current pollution limitations and to not only include the environmental impact studies for compliance in the audit report but to immediately be liable for a right of use in the form of a credit contract. The nine business model components that were explored are the value proposition, key activities, key partners, key resources, customer relations, customer segments, channels, cost structure and revenue streams. Each component was put forward with its definition according to (Barquet et al., 2013), and a suggestive example of how it could be implemented as part of the semi structured questionnaire format to encourage detailed feedback from respondents and for each respondent to consider whether or not the implementation would be possible.
APPENDIX B

- Summary of results –
<table>
<thead>
<tr>
<th>Name</th>
<th>MF</th>
<th>Age</th>
<th>Area</th>
<th>Industry</th>
<th>Value Proposition</th>
<th>Key Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>F</td>
<td>30-39</td>
<td>North West</td>
<td>Accounting, accountant</td>
<td>I think in the beginning it will be a bit of a struggle because the new entity will not have the capital available to ensure trade capital, but in the long run I think it is a possibility that will encourage business to become a part of the innovation.</td>
<td>I think it will be as long as it is done yearly through a trustworthy reliable audit firm.</td>
</tr>
<tr>
<td>JVDM</td>
<td>F</td>
<td>30-39</td>
<td>Western Cape</td>
<td>Agriculture, Commodities trader</td>
<td>Yes, if the business model is rolled out meticulously and managed in an effective manner. Fund management is definitely the right place to start and the possibility to increase funds is always a motivator.</td>
<td>Yes, I believe trading on SAFEX is a handy way to manage risk and to add value.</td>
</tr>
<tr>
<td>MF</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Geologist</td>
<td>No, there will not be enough enforcement infrastructure. Regulatory framework will not allow such an implementation. NEMA regulates pollution already.</td>
<td>Not suitable for companies big or small, they will have no motivation to comply. Regulatory framework does not allow for such implementation. Even if it is regulated, implementation will lack such as current regulations and legislation.</td>
</tr>
<tr>
<td>AE</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Remote Sensing CIS</td>
<td>Yes and no. If it can be enforced it may have a positive effect. However, the current standing of infrastructure and corruption in SA will most likely prevent such a business model to be successfully employed.</td>
<td>Again, if it can be enforced it may prove useful or be possible but the current &quot;climate&quot; is not suitable for such an application. I do however think that in a perfect world it will be not only possible but a very successful manner of controlling water use and pollution.</td>
</tr>
<tr>
<td>JG</td>
<td>F</td>
<td>20-29</td>
<td>Gauteng</td>
<td>Law, Lawyer</td>
<td>Maybe- Good principle in theory – however: Is execution practical outside of a government entity. Who owns the right to water and water management – and if not the government how will the mandate be transferred. I cannot sell or make an agreement over I product I do not own? Reference is made to a credit contract. What will compel companies to be a party to such a contract – and how will compliance be enforced.</td>
<td>Yes I believe a system can be devised where 4-monthly tests are done, depending on the result an internal SAFEX effect will activate. However how will compliance to buy and sell be ensured – as members are not receiving a tangible asset but rather the right/fine to abuse a general resource.</td>
</tr>
<tr>
<td>HH</td>
<td>F</td>
<td>50-59</td>
<td>Free State</td>
<td>Agriculture, General Manager</td>
<td>I think it is possible because I think the main problem on pollution is that they don’t really know the consequences of the problem. The expertise is not always available. If the program can give expertise to help every business and it must be a big impact on their financials and if they do comply that a tender is positive for them that can help a lot.</td>
<td>What they must do to get the process of the ground are key activities, therefore it is important to know what the value is that the organisation will gain from the process and then it will be possible to decide what key activities are required to implement the process. If trading is done on SAFEX it can be linked to tenders and similar advantages. It is usually the larger organisations that cause the water pollution.</td>
</tr>
<tr>
<td>WB</td>
<td>M</td>
<td>40-49</td>
<td>North West</td>
<td>Mining, CEO</td>
<td>Perhaps it will be applicable to an organisation that does not pollute. Why would an organisation buy into the idea of they already pay for water licenses? Perhaps the credit contract should be put onto the table first as a reward for compliance. The right to pollute may have a negative connotation.</td>
<td>There are many programs that would be able to support this. But how do you implement quality control and who would certify the contracts or credits that are purchased? There must be some structure in order to qualify the contract to be tradeable and it should comply with certain prerequisites. It should be an independent institution.</td>
</tr>
</tbody>
</table>

**THEME:**
- Reliable detail
- Effective implementation

**SUPERTHEME:**
- Reliable institution
- Effective implementation
- Compliance acknowledged
- Effective control
<table>
<thead>
<tr>
<th>Name</th>
<th>MF</th>
<th>Age</th>
<th>Area</th>
<th>Industry</th>
<th>Key Partners</th>
<th>Key Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>F</td>
<td>30-39</td>
<td>North West</td>
<td>Accounting, accountant</td>
<td>I think the key partners involved will definitely work as the organizations is well established.</td>
<td>Yes, as resources will be up to date because it will be updated daily by members.</td>
</tr>
<tr>
<td>JVDM</td>
<td>F</td>
<td>30-39</td>
<td>Western Cape</td>
<td>Agriculture, Commodities trader</td>
<td>Well established organisations</td>
<td>Relevant and informed, daily reporting</td>
</tr>
<tr>
<td>MF</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Geologist</td>
<td>Agree</td>
<td>Yes, but it will only work if market information and data is accurate and timely.</td>
</tr>
<tr>
<td>AE</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Remote Sensing CIS</td>
<td>Agree</td>
<td>Accurate and timely data</td>
</tr>
<tr>
<td>JG</td>
<td>F</td>
<td>20-29</td>
<td>Gauteng</td>
<td>Law, Lawyer</td>
<td>Agree</td>
<td>Agree, additional staff require extra funding</td>
</tr>
<tr>
<td>HH</td>
<td>F</td>
<td>50-59</td>
<td>Free State</td>
<td>Agriculture, General Manager</td>
<td>Agree</td>
<td>No. Will the venture generate enough cash to sustain the salaries of the abovementioned individuals and infrastructure?</td>
</tr>
<tr>
<td>WB</td>
<td>M</td>
<td>40-49</td>
<td>North West</td>
<td>Mining, CEO</td>
<td>Agree</td>
<td>Agree, additional staff require extra funding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Use existing resources</td>
<td>Job creation</td>
</tr>
</tbody>
</table>

**THEME**
- Well established organisations
- Relevant and informed, daily reporting
- Agree
- Accurate and timely data
- Disagree, additional staff require extra funding
- Reliable employees and effective implementation
- Disagree, additional staff require extra funding
- Reliable trustworthy and independent enforcement
- Independent institution

**SUPERTHEME**
- Reliable detail
- Effective implementation
- Compliance enforced
- Independent enforcement
<table>
<thead>
<tr>
<th>Name</th>
<th>MF</th>
<th>Age</th>
<th>Area</th>
<th>Industry</th>
<th>Customer Relationships</th>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>F</td>
<td>30-39</td>
<td>North West</td>
<td>Accounting, accountant</td>
<td>Yes but the organizations has to uphold a sustainable relationship.</td>
<td>Yes because the democratic you would like to be involved will have access to the web as larger companies will be involved</td>
</tr>
<tr>
<td>JVDM</td>
<td>F</td>
<td>30-39</td>
<td>Western Cape</td>
<td>Agriculture, Commodities trader</td>
<td>Yes, continuous communication is important. All instructions must be recorded in writing or on tape. Confirmation of daily transactions is just as important.</td>
<td>Agree</td>
</tr>
<tr>
<td>MF</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Geologist</td>
<td>Yes, any customer relationships built is good.</td>
<td>No. What about small or even large companies without websites.</td>
</tr>
<tr>
<td>AE</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Remote Sensing CIS</td>
<td>Yes, if you have all the facts better decisions can be made. Informed decisions can lead to better management practices. Good customer relations will result in trust and better relationships thus ensuring cooperation.</td>
<td>Yes, companies don’t have time to follow up on paper work. Thus quick and easy access to reports will be beneficial.</td>
</tr>
<tr>
<td>JG</td>
<td>F</td>
<td>20-29</td>
<td>Gauteng</td>
<td>Law, Lawyer</td>
<td>No. This will only happen if a relationship of compliance can be build. If not companies will continue business as usual.</td>
<td>Yes, I believe that a system can be devised for this application – it can maybe run publically to motivate companies as the customer will be able to view its non-compliance, being bad publicity here the opposite can result in a marketing opportunity.</td>
</tr>
<tr>
<td>HH</td>
<td>F</td>
<td>50-59</td>
<td>Free State</td>
<td>Agriculture, General Manager</td>
<td>Yes, there are so many people with a passion for water. I think it is important for social development.</td>
<td>Yes, it is important to use the channels in order to improve success of the business.</td>
</tr>
<tr>
<td>WB</td>
<td>M</td>
<td>40-49</td>
<td>North West</td>
<td>Mining, CEO</td>
<td>No. Customers is willing buyers of the contracts, this can be organisations or speculators. Goeie diens of slegte diens is irrelevant.</td>
<td>No. Channels can be website or SAFEX through traders. Audit report is not a channel, it leads to a certificate to become a tradeable contract.</td>
</tr>
</tbody>
</table>

**THEME**

- Sustainable relationships
- Continuous communication kept on record for accuracy and completeness
- Increase trust and communication of all information
- Disagree, how to enforce compliance
- Social development
- Disagree, any willing buyer and seller
- Disagree, traders at SAFEX
<table>
<thead>
<tr>
<th>Name</th>
<th>MF</th>
<th>Age</th>
<th>Area</th>
<th>Industry</th>
<th>Customer Segments</th>
<th>Cost Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>F</td>
<td>30-39</td>
<td>North West</td>
<td>Accounting, accountant</td>
<td>The larger group of the citizens will be able to participate but the is groups that will not be reachable.</td>
<td>Yes as in all business there will have to be billing involved for it to work because no non-profit organization will be able reach and do what is necessary</td>
</tr>
<tr>
<td>JVDM</td>
<td>F</td>
<td>30-39</td>
<td>Western Cape</td>
<td>Agriculture, Commodities trader</td>
<td>Agree, I think we all realise the importance of clean water.</td>
<td>Agree, but only by means of reliable staff and accurate systems otherwise it will not be successful.</td>
</tr>
<tr>
<td>MF</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Geologist</td>
<td>No. The constitution states that all citizens have the right to a clean and healthy environment, water included. You cannot redistribute water allocated to human consumption to sectors such as industrial and agriculture. This is not in accordance to the NWA and general laws, NEMA, etc.</td>
<td>No. Pollution must be monitored daily on specific sites. Will be extremely expensive. Again who will fund the employees and analysis.</td>
</tr>
<tr>
<td>AE</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Remote Sensing CIS</td>
<td>In a perfect world yes. A structured approach may be better example starting off with organisations and then moving into the general public. It may prove difficult to apply this to informal settlements and rural areas. Also not all citizens have access to online reports, mail etc.</td>
<td>Corporations and organisations yes, easier to implement. Citizens no, difficult to implement and report. Enforcing will be a challenge.</td>
</tr>
<tr>
<td>JG</td>
<td>F</td>
<td>20-29</td>
<td>Gauteng</td>
<td>Law, Lawyer</td>
<td>Yes I believe this to be true.</td>
<td>No. This will depend on compliance – which if not captured into an act or legislation will result to voluntary compliance, which I believe will not be enough to support the cost.</td>
</tr>
<tr>
<td>HH</td>
<td>F</td>
<td>50-59</td>
<td>Free State</td>
<td>Agriculture, General Manager</td>
<td>Yes, companies are big customers and citizens will gain. Citizens will probably not pay for this but it will be advantageous for companies.</td>
<td>Yes. I think the cost is difficult because it must be kept as low as possible. Know all cost involved before the time.</td>
</tr>
<tr>
<td>WB</td>
<td>M</td>
<td>40-49</td>
<td>North West</td>
<td>Mining, CEO</td>
<td>No. Customers is willing buyers of the contracts, this can be organisations or speculators. Internal are the role players that make sure we do not exceed the limits.</td>
<td>Hourly rates can be paid for staff who are doing the work. Organisations can pay per volume of water used in their production. Participation must be enforceable and an audit will definitely be a viable option to support the proposition where compliance can be a point of criteria.</td>
</tr>
</tbody>
</table>

**THEME**

- Reliable systems
- Larger organisations
- Audit enforceable
- Trustworthy staff and reliable systems
- Agree, large organisations
- Disagree, additional staff require extra funding
- Agree, not according to current legislation
<table>
<thead>
<tr>
<th>Name</th>
<th>MF</th>
<th>Age</th>
<th>Area</th>
<th>Industry</th>
<th>Revenue Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>F</td>
<td>30-39</td>
<td>North West</td>
<td>Accounting, accountant</td>
<td>Yes it will be it is a business with business expenses that needs a steady flow of income for it to work.</td>
</tr>
<tr>
<td>JVDM</td>
<td>F</td>
<td>30-39</td>
<td>Western Cape</td>
<td>Agriculture, Commodities trader</td>
<td>Agree</td>
</tr>
<tr>
<td>MF</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Geologist</td>
<td>Agree</td>
</tr>
<tr>
<td>AE</td>
<td>F</td>
<td>20-29</td>
<td>North West</td>
<td>Agriculture, Remote Sensing CIS</td>
<td>Disagree, possible extra costs</td>
</tr>
<tr>
<td>JG</td>
<td>F</td>
<td>20-29</td>
<td>Gauteng</td>
<td>Law, Lawyer</td>
<td>Disagree, how to enforce compliance</td>
</tr>
<tr>
<td>HH</td>
<td>F</td>
<td>50-59</td>
<td>Free State</td>
<td>Agriculture, General Manager</td>
<td>Understand all costs</td>
</tr>
<tr>
<td>WB</td>
<td>M</td>
<td>40-49</td>
<td>North West</td>
<td>Mining, CEO</td>
<td>Audit fee</td>
</tr>
</tbody>
</table>

**THEME**

- Agree
- Disagree, possible extra costs
APPENDIX C

- Informed consent form –
Dear Participant

You are invited to participate in an academic research study conducted by Jacqueline Steinschaden, Masters student from the School/Department of Business and Governance at the North-West University-Potchefstroom.

The purpose of the study is to develop a business model for sustainable water management in South Africa.

Please note the following:

- This is an anonymous study interview as your name will not appear on the questionnaire. The answers you give will be treated as strictly confidential as you cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- Please answer the questions from the interview as completely and honestly as possible. This should not take more than 30 minutes of your time.
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my study leader, Prof C Bisschoff, Christo.Bisschoff@nwu.ac.za, if you have any questions or comments regarding the study.

Please indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis. (Please tick)

Date of consent:
APPENDIX D

- Application for ethical clearance –
Statement about Ethics for a follow-up evaluation or study / research

(to be completed as part of the Research meeting submitted by the student or supervisor)

**NWU Ethics checklist**

*Please answer each question by ticking the appropriate box*:  

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. children, people with learning or other mental or physical disabilities, people who are incarcerated, unemployed or otherwise compromised in responding to your questions)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>2. Are you planning on making use of NWU students or direct and secondary/contracted staff members in this research?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>3. Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited? (e.g. students at school, members of self-help groups, residents of a nursing home, the Minister of Education, a tribal chief or village elder)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>4. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g. covert observation of people)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>5. Will the study involve discussion of or questions about a sensitive topic? (e.g. sexual activity, drug use, crime, harassment, violence)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>6. Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind or any physical, psychological or socio-economic intervention?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>7. Will blood or tissue samples be obtained from participants?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>8. Could the study induce physical, psychological or social stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>9. Will the study require the identification of individuals for follow-up evaluation?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>10. Will financial inducements (other than reasonable expenses and compensation for time) or inducements of any other kind be offered to participants?</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>11. I have read the NWU’s Manual for Postgraduate Studies and am familiar with the Guidelines for Research Ethics contained therein.</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>12. Could the image of the NWU, the relevant academic department, your employer, or any other institution however affected by/involved in the project be negatively affected by this research or put in a bad light?</td>
<td>☑</td>
<td></td>
</tr>
</tbody>
</table>

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1 Adapted from Economic and Social Research Council (2005). Research Ethics Framework (REF). www.esrcsocietytoday.ac.uk

2 Vulnerable groups raise special issues of informed consent and potential risk. “Vulnerable” participants are not clearly described, but have been noted to include “…children, prisoners, pregnant women, mentally disabled persons, economically or educationally disadvantaged persons” (Common Federal Policy, 1991). Weijer and Emanuel (2000) consider participants to be vulnerable if they are not in a position to provide informed consent, due to their position (such as being in prison), or not
possessing adequate intellectual faculty (such as children or the mentally ill). "Children" here are defined as participants younger than 18 years of age.

3 **Risk.** These possible risks are described as an "...invasion of privacy, loss of confidentiality, psychological trauma, indirect physical harm, embarrassment, stigma, and group stereotyping" (Oakes, 2002: 449), and also risks posed to "...a subject’s personal standing, privacy, personal values and beliefs, their links to family and the wider community, and their position within occupational settings, as well as the adverse effects of revealing information that relates to illegal, sexual or deviant behaviour" (Economic and Social Research Council (ESRC), 2005: 21). Minimal risk may be defined as where "...the probability and magnitude of harm or discomfort anticipated in the proposed research are not greater, in and of themselves, than those ordinarily encountered in daily life" (Code of Federal Regulations, 2005).
If you answered no to all questions, submit the completed and signed form with your title registration. Students should retain a copy of the form and submit it with their dissertation/thesis.

If you answered yes to any of the questions, you will need to describe more fully how you plan to deal with the ethical issues raised by your proposal. **This does not mean that you cannot do the research, only that your proposal will need to be approved by the Research Ethics Committee.** You will need to submit your plans for addressing the ethical issues raised by your proposal using the Ethics Approval Application Form. This may be obtained from: [http://www.nwu.ac.za/library/documents/manualpostgrad.pdf](http://www.nwu.ac.za/library/documents/manualpostgrad.pdf) Alternatively, you may attach a fuller description of the specific issue to this declaration, for discussion by the panel at the Proposal Meeting.

Please note that it is your responsibility to follow the NWU’s Guidelines for Ethical Research as set out in the Manual for Postgraduate studies and any relevant academic or professional guidelines in the conduct of your study. **This includes providing appropriate information sheets and consent forms, and ensuring the confidentiality in the storage and use of data.** Any significant change in the question, design or conduct over the course of the research should be notified to the Supervisor and may require a new application for ethics approval.

**Candidate**

Name and Surname: ________________________________

Signature: ________________________________

**Supervisor**

Name and Surname: ________________________________

Signature: ________________________________

**Chair: Research Proposal Committee:**

Name and Surname: ________________________________

Signature: ________________________________

Date: ________________________________
ETHICAL CLEARANCE

This letter serves to confirm that the research project of STEINSCHADEN J has undergone ethical review. The proposal was presented at a Faculty Research Meeting and accepted. The Faculty Research Meeting assigned the project number EMSPBS16/06/03-01/41. This acceptance deems the proposed research as being of minimal risk, granted that all requirements of anonymity, confidentiality and informed consent are met. This letter should form part of your dissertation manuscript submitted for examination purposes.

Yours sincerely

Prof CJ Botha

Manager: Research - NWU Potchefstroom Business School