Green Bonds as a more effective way of capitalizing the South African National Green Fund.

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ABSTRACT

Greenhouse gas emissions are said to be on a very dangerous trajectory and the debate around man's industrial activity being the key cause of climate change seem to be receding. Governments around the world are mostly in agreement that something urgent needs to be done but the big question that remains is how to mobilize sufficient financial resources to address the enormous investment requirement to transition world economies towards greener growth and development.

The United Nations through the United Nations Framework Convention on Climate Change (UNFCCC) has rallied countries together for a coordinated global response to the potential negative impact of climate change. The major challenge the UNFCCC through the conference of parties (COPs) is balancing the needs of developing countries with that of developed countries with regard to appropriate climate change response strategies, more especially about who should carry the financial burden.

In its response to climate change, the South African government, through the department of Environmental Affairs has initiated the National Green Fund to assist the country in transitioning to a greener economy. The Green Fund has received R1.1 billion in direct fiscal support to invest in green initiatives for a 3 year period. However, it evident that R1.1 billion, though commendable, is a "drop in the ocean" when compared to the enormous amount of financial resources required to bring about the transition. It is therefore crucial that we explore appropriate financial mechanisms that are able to mobilize the required level of investment.

It is in this regard that this study explored a broader base of potential financial instruments and mechanisms that can attract the much needed private finance. More specifically the study explored green or climate bonds as a more efficient and effective mechanism to use in capitalizing an initiative like the National Green Fund than is current dependent on direct fiscal support.

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GLOSSARY OF TERMS

IPCC	Intergovernmental Panel on Climate Change
DBSA	Development Bank of Southern Africa
MOA	Memorandum of Agreement
IEA	International Energy Agency
UNFCCC	United Nations Framework Convention on Climate Change
WCC	World Climate Conference
COP	Conference of Parties
JI	Joint Implementation
CDM	Clean Development Mechanism
CICERO	Centre for International Climate and Environmental Research in Oslo
SRI	Socially Responsible Investments
JSE	Johannesburg Stock Exchange
MANCOM	Green Fund management committee
GAP	Government advisory panel
ANOVA	Analysis of Variance
RFP	Requests for proposals

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CHAPTER 1: INTRODUCTION

1.1 Study Context

According to Stern (2006) the level of greenhouse gas emissions observed are continuing at an alarmingly dangerous trajectory. If the world economies do not adopt a low carbon growth and development path and continue with the "status quo" the temperatures are estimated to rise above two per cent per year for the next thirty years, which would have disastrous consequences especially for communities in developing countries and their way of living. Therefore an urgent global response to curb this rise in temperatures is required. (Stern, 2006)

To address this very grave climate change challenge, enormous investment resources will be required. Various experts estimate that the need could be as much as trillions of dollars which raises questions about where the funds will come from. The view of banker and financial analysts and bankers it that fiscal support from government alone would not be sufficient and that significant bulk of the financial burden would have to be sourced from private sector sources. (Platt, 2010).

South Africa is not exempt from this challenge as it also faces enormous development challenges associated with natural resource constraints such as water and arable land. This has in turn resulted in high levels of unemployment, poverty and inequality. The transition to a green economy is therefore not only viewed as a pathway to a sustainable future, but also as the driver to overcoming South Africa's development challenges. It is in this regard that the government of South Africa initiated the National Green Fund in 2012, to contribute towards a transition to a greener economy.

The South African National Green Fund's fiscal allocation of R1.1 billion for the National Green Fund, though commendable, is a drop in the ocean compared to the need as per Eliasch review (2008) estimates. The South African government like others has many competing priorities and is thus limited with regard to funds that can be made available for transitioning the country's economy towards a greener one. To achieve the required environmental impact with regard to climate mitigation and adaptation, more funds will be required, therefore the

most efficient and effective funding mechanism need to be explored beyond the limited fiscal support (Eliasch review, 2008).

As already stated, fiscal support alone will not be sufficient to achieve the level of impact required with regard to challenges posed by climate change. This study therefore seeks to explore a broader base of potential financial instruments and mechanisms, more specifically green or climate bonds as a more efficient and effective mechanism to use in capitalizing the National Green Fund, as compared to the current direct fiscal support.

The Green Fund sits at the nexus of various sources of funding. Even though the Fund has to date been mainly supported through direct fiscal support, there is potential to tap into other sources of funding, either from international climate finance, innovative private sector finance or donors and philanthropy. The main challenge is how the Green Fund can channel these resources, to the level where it can make significant impact on the ground, and this is where innovative financing mechanisms need to come into play. (Amis, 2014)

1.2 The problem statement

Reichelt (2010) states that fiscal resources need to be urgently complemented by a significant private sector investment participation in order for to tackle climate change effectively. (Reichelt, 2010)

The Development Bank of Southern Africa (DBSA) like other development banks is well positioned to explore various funding mechanisms, such as issuing green bonds to support green initiatives. An institution like the World Bank which is also a development bank has to date issued billions of dollars in bonds and continues to do so. To date the majority of investment has gone into renewable energy and energy-efficiency initiatives but ways need to be found to extend this to other types of green investment. (Caisse des Dépôts Group, 2012)

Robins and Knight (2012) also states that the bond markets can be accessed through various financial institutions in order to mobilise the significant resources required for the Climate Economy, this financial institutions include development banks, commercial banks and other investment institutions as potential vehicles. (Robins & Knight, 2012)

The Climate Bonds Initiative has is also encouraging governments around the world to consider guarantees as other forms of credit enhancement tools to attract private sector

investment into climate initiatives, in order to encourage investment. This could for example take the form of a combination of government-backed guarantee and tax incentives in a way that could potentially promote private sector financing. (Caisse des Dépôts Group, 2012)

Globally and for South Africa and other developing countries, fiscal support alone is clearly not sufficient to achieve the level of impact required with regard to challenges posed by climate change.

Therefore this study explored a broader base of potential financial instruments that can attract the much needed private finance. More specifically the study explored green or climate bonds as a more efficient and effective mechanism to use in capitalizing the National Green Fund than the current direct fiscal support.

1.3 The research objectives

1.3.1 Purpose of the study

The purpose of the study was to determine if the use of Green Bonds would be a more efficient and effective funding mechanism for the South African National Green Fund, as compared to the current fiscal allocation used to support the fund.

1.3.2 Research Objectives were as follows:

- To explore if fiscal support is the most appropriate financing mechanism to support the National Green Fund in order to achieve its objectives.
- To explore if Green Bonds would be more effective and efficient funding mechanism for the National Green Fund compared to the current fiscal support.

1.3.3 Research Questions were as follows:

- Is fiscal support the most appropriate financing mechanism to support the National Green Fund in order to achieve its objectives?
- Is Green Bonds a more effective and efficient funding mechanism for the National Green Fund compared to the current fiscal support?

1.4 The study's hypothesis was coned as follows:

- **Ho**: Fiscal support is a more effective and efficient financing mechanism than green bonds for supporting the South African National Green Fund in order to achieve its objectives.
- **Ha**: Fiscal support is a less effective and efficient financing mechanism than green bonds for supporting the South African National Green Fund in order to achieve its objectives.

1.5 Justification and Significance for the study

To significantly reduce emissions and slow down the eminent environmental disaster, huge investments amounts are necessary if the world economies are to make the required transition to renewable energy. This study will contribute significantly towards an understanding of the most appropriate funding mechanism or instruments that will contribute towards a sustainable and impactful National Green Fund or other similar initiatives

Voica *et al* (2014) indicates that the main obstacle in pulling together the huge investment required to achieving the transition from a high-carbon emission economy to a low carbon one is the lack of effective promotion of green investments. Various mechanisms like carbon tax or carbon trading have been explored but one of the most important evolution was the promotion of environmental friendly investments, also known as green investments which includes green bonds. (Voica, Panait & Radulescu, 2014)

South Africa is one of the few developing countries that has implemented an instrument such as the Green Fund and many other developing countries especially in sub-Saharan Africa have shown interest in learning from the South African experience. This study's exploration of green bonds as a more effective financing instrument has the potential of adding to the body of knowledge that could impact how such instruments are financed in the future, which could result in enhanced climate change financial response strategies.

Furthermore, this study contributes towards the understanding of creating an appropriate balance between supporting base of the pyramid models (BOP), see Diagram 2 below, that

promote inclusiveness and interventions that promote low carbon development. To address the issue of base of the pyramid challenge, it is crucial for the Green Fund to consider using other forms of credit enhancements to help attract private funding. This arrangement makes it possible for a wider range of projects including those at an early developmental phase which are not yet bankable, to be supported through instruments such as grants or technical support. This is another important learning that could be useful especially for developing countries. (Amis, 2014)

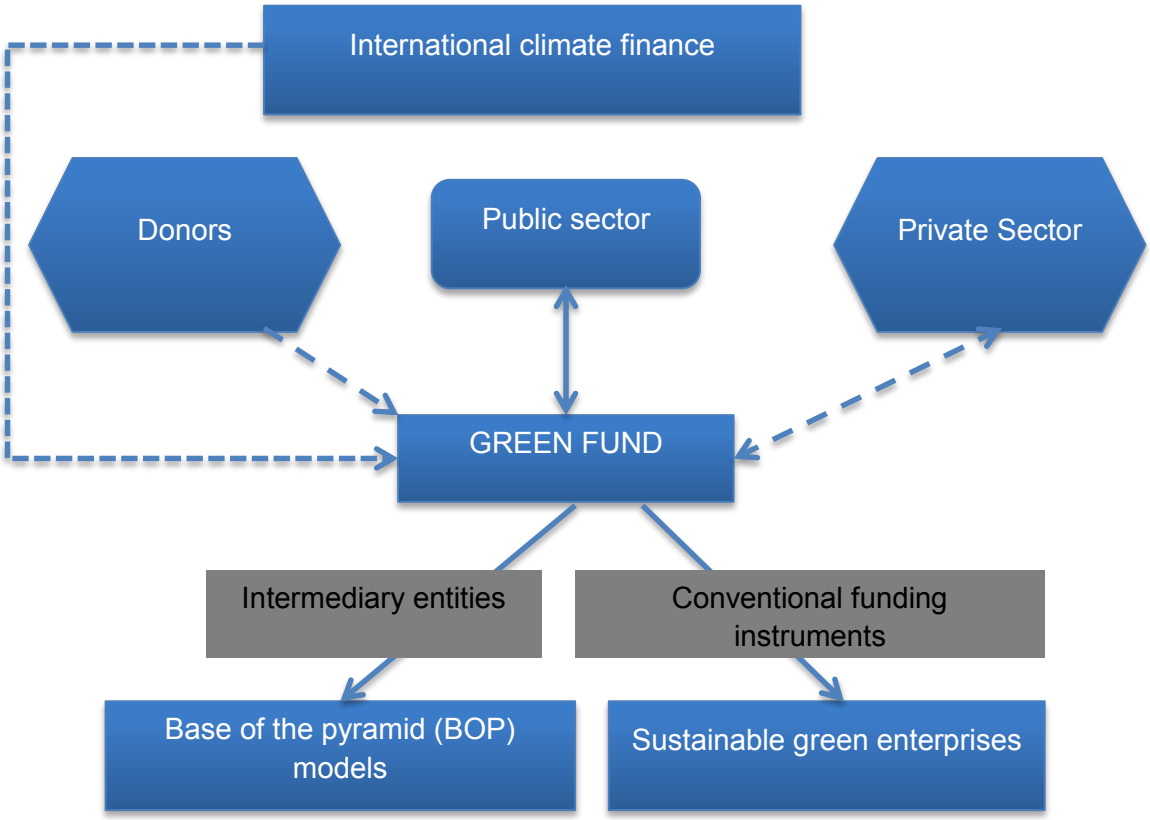


Diagram 1

1.6 Structure of the study:

The study is structured into five chapters. The following Chapter (chapter 2) focuses on literature review, which covers the various sub topics that provides an appropriate context to the study. Chapter 3 provides a description of the research methodology and the rationale behind the choice of the research design. Chapter 4 presents research findings, analysis and discussion and lastly Chapter 5 provides a discussion of the research conclusions, policy implications and some ideas around possible topic for future research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of literature to contextualize the study. A very comprehensive literature review is presented in this chapter covering the various sub topics. The chapter begins with some background and then delves into the challenge of climate change, how governments around the world including South Africa are responding to climate change, the enormous financial requirements to address climate change, limitation of existing financial instruments in addressing climate change, the need for new and innovative financial instruments, the use of fiscal support for green investment ,the importance of Government support, ways to attract financial markets to invest in Green projects, challenges private sector faces when considering investing in green projects. This is followed by a look at the rise of Green Bonds as an appropriate instrument to support climate change initiatives and lastly a review of advantages and limitations of Green Bonds and then a summary of the key gaps identifies in literature with regard to financing climate change initiatives.

2.2 About Climate Change challenge

The serious consequences of climate change on life as we know it and the role attributed to human activity is becoming more visible. Governments around the world and various institutions like the United Nations are making efforts to understand the potential impact on human life. It was in this regard that the World Meteorological Organization (WMO) and the United Nations Environmental Programme jointly established the Intergovernmental Panel on Climate Change (IPCC) in 1988 (Griggs & Noguer, 2002).

Stern (2006) states that climate change is a serious and urgent issue. There has been varying opinions about the role of human activity in causing global warming but now there seem to be an overwhelming body of scientific evidence that confirms it. (Stern, 2006)

Due to the uncertainty of the enormous estimates around what it would cost to reverse climate change and the timing, critics of the Stern Report argue that serious action to limit carbon dioxide (CO2) emissions is not justified. They argue that Stern's model does not fully and properly account for either uncertainty or futurity. There is call for further sensitivity analysis

as much disagreements still surrounds Stern's estimates, however, the urgency of putting in place policies to combat further emission increases cannot be argued against. (Arrow, 2007)
For developing countries' climate change response strategies to work effectively, there should be considerations on how to appropriately link it with the allocation of resources for development. The current international debate on climate change should go beyond just "reducing emissions", that is, mitigation, but should include adaptation which is most pressing for developing countries. (Shalizi & Lecocq, 2009)

However, the discontent among developing countries is with regard to the fact that developed countries emit more but the effect are felt more by them. This is the reason why there is a call for more international funds to support adaptation and not just mitigation. However, any effective response to the challenge of climate change would require both developed and developing countries to urgent action that is global and collective. To achieve a workable international agreement, a significant number of countries would have to fully commit in a legally binding manner. (Stern, 2006)

2.3 The urgent need to transition to a green economy

A transition to greener economy which is an appropriate response to climate change require significant level of financial resources to be pulled together. It has already been indicated that resources would need to mainly come from the private sector, which means that innovative financial instruments such as green bonds which can attract private sector need to be explored.

Ocampo (2015) notes that the move to a green economy is a significant transition, on par with other grand transitions in human socio-economic history. This transition differs from previous ones as it is intentional and also considers the impact it will have on the welfare of various communities. However, the transition could potential usher in a new economic growth paradigm that could improve the livelihood of poorer communities without negatively impacting our ecosystem. (Ocampo, 2015)

This is supported by Lefèvre (2014) as he also notes that the transition to a greener economy could potentially lead to economic growth. It could result in the creation of new markets in areas such as biofuels and renewable energy sources. However, Lefèvre (2014) argues that

while transitioning to a low carbon economy has clear benefits for communities, a cost benefit analysis with regard to benefits versus the risks needs further consideration, especially for developing countries. (Lefèvre, 2014)

Lefèvre (2014) further points out the challenge faced by those governments whose immediate response to climate change would seem to negate economic growth prospects. Therefore trade-offs between immediate transition to a low carbon economy and the concomitant potential slowdown in economic growth need to be carefully considered. (Lefèvre, 2014)

Kaggwa *et al* (2013) asserts that the transition to a green economy could accelerate economic growth in South Africa and create new green jobs. The Development Bank of Southern Africa (DBSA) estimated about 35 000 jobs that could be created by 2013. The estimates for the renewable energy sector with regard to its contribution to GDP was around $500 million and an income of approximately $68.7 million for people with fewer economic opportunities. It is difficult to demonstrate how the country has performed against this estimates as there is no credible documented proof. (Kaggwa, Mutanga, Nhamo & Simelane, 2013)

Kaggwa *et al* (2013) further argues that while South Africa has developed effective policies that are in line with international trends, it is not ideal that this is done in a way that undermines policies that champion the reduction of socio-economic challenges such as poverty and unemployment. For example, it would be difficult from an energy point of view to abandon the use of coal which directly contribute to GHGs, due to the immediate negative impact it would have on economic growth. (Kaggwa, Mutanga, Nhamo & Simelane, 2013)

2.4 Financing the transition to a green economy

There is an enormous need for investment in order to address the challenges brought about by climate change. Various experts estimate that the need could be as much as trillions of dollars which raises questions about where the funds will come from. Private sector participation is key in providing the required liquidity levels for supporting low-carbon initiatives. (Platt, 2010).

Nobuo Tanaka, the executive director of the International Energy Agency, states that public finance is important but private sector investment will play a much bigger role. The question is about how the finance will be mobilized (Platt, 2010).

The above seem to be consistent with the experiences of the South African Green Fund which has been capitalized through public funds to the tune of R1.1 billion but clearly requires a lot more to achieve its envisaged impact. It is for this reason that one of the objectives of the fund is to mobilize among others private sector resources to complement its fiscal allocation.

There are of course many ways of financing the development of infrastructure and in particular the new infrastructure required by renewable energy and low-carbon technologies. The simplest and most straightforward, as the pure forms of equity and debt investment structures, are equity investments, by the project promoters or by energy investment houses or both, and bank loans. In between are various kinds of intermediate financing, mezzanine finance, tax credits and different kinds of subsidies, as well as various forms of insurance to reduce the risks involved in investing in novel energy projects. Green bonds as a private and public sector financial instruments can be uniquely suited to facilitating green infrastructure investment projects (Mathews and Kidney, 2012).

Basic structural features for a 'climate bonds' market to flourish is that all participants need to make a return, and should meet levels of risk no greater than those of conventional government and corporate bond markets. This means that assets backing the bond issues, and government guarantees, must be carefully structured, and the payments (whether coupon interest or tax credits) must be regular and founded on relatively certain income streams deriving from the energy projects themselves. These are fundamental and irreducible elements without which no financial instrument can be expected to succeed (Mathews and Kidney, 2012).

Other structural features mentioned by Mathews and Kidney (2012) include the following:

First, the climate or green bonds are designed as an intermediary between wholesale (institutional) investors and desirable low-carbon investment projects. The point is that the institutional investors need a financial aggregating vehicle to provide the bridge. The climate bond is intended as just such a bridge, and is designed to attract primarily institutional investors such as pension funds.

Second, the bonds are intended to be 'asset-backed' to the extent that they channel funds into real investment projects that generate real assets based on low-carbon industrial activities. These activities are intended to generate the income stream required by the bond-issuing institution to meet its coupon-payment obligations on the bond. But in case of failure guarantees must be provided – by the government that stands behind the issuing institution, or by multilateral institutions such as the Multilateral Investment Guarantee Agency of the World Bank, or both.

Third, the maturity of the climate bonds needs to be extended as far as is practicable, to give the underlying green projects time to move from loss-making to making better profits than fossil fuel energy projects. There is an inherent trade-off here: the longer the time to maturity, the more risk perceived by the investor, but from the point of view of the energy project promoter, the longer the time to maturity, the greater the prospects for revenues to overtake up-front costs.

Fourth, the debt instruments need to be as closely modelled on existing 'vanilla' bonds as possible. Specific innovations and assorted 'bells and whistles' (such as varying interest repayments) need to be minimized, in the interests of appealing to as wide a class of institutional investors as possible. Thus it would seem to be counterproductive to attempt to make a link between climate bonds as A grade investment vehicles and carbon credits, to be traded on existing or future carbon exchanges. The carbon credits market is one thing, and attracts participants who wish to offset their carbon emissions; this is a very different clientele from the institutional investors likely to be attracted to climate or green bonds issued in large denominations.

Green or climate bonds can be seen as the financial instrument of choice in channelling funds from the vast investment pool represented by institutional investors in the developed world to the equally impressive array of attractive, low-carbon investment

projects in the developing world. In doing this, the bonds play the role that financial instruments have always played – channelling funds from where they are pooled to the projects where they are needed. The climate bonds proposal simply adapts and updates this old idea to the new situation. The world is searching for climate-friendly and low-carbon investment projects in the developing world, and development banks in emerging markets want to play a positive role in the financial intermediation of such projects (Douste-Blazy, 2009).

2.5 The debate around the causes of climate change

It is becoming clear that human activity in the last decades especially in the form of industrialization has had a significant impact on our environment. This has led to increased effort to explore new ways of doing business that could bring about economic growth with minimum environmental impact. It is in this regard that various players around the world including Governments and international institutions are starting to come up with strategies to achieve low carbon growth strategies. The goal of this strategies is to transition economies towards a low- carbon, climate resilient and resource-efficiency trajectory. (Voica, Panait & Radulescu, 2014)

The complexity around the subject of Climate change is a compounded by its impact on a plethora of global issues such as poverty, economic development, population growth, sustainable development and resource management. It is in this regard that various research areas are being explored to find lasting solutions. (United Nations Framework Convention on Climate Change, 2015)

The debate that has been raging among scientists and environmental commentators alike about the causes and impact of climate change seem to be receding. There is now a growing consensus internationally and also among policy-makers that a united effort to move towards a low carbon growth path is urgent if the risks arising from climate change brought about by human activities is to be significantly reduced. (Bowen, Fankhauser, Stern & Zenghelis, 2009)

Bowen, Fankhauser, Stern and Zenghelis, (2009) further indicate that action by policy makers to combat climate change cannot be postponed until it is forced top of the

political agenda by the impacts of climate change. If the current level of emissions are allowed to continue building up in our atmosphere, it would bring about severe and increasing risks for decades to come. (Bowen, Fankhauser, Stern & Zenghelis, 2009)

Timbers (2014) indicates that global atmospheric carbon is now beyond the 350 ppm threshold of climate safety. Therefore, continuing with "business as usual" in our energy systems will only increase the magnitude of climate risk, with growing negative repercussions for people and economies across the world. To change this direction new low energy systems and infrastructure need to be accelerated in order to reduce the production of greenhouse gas emission. However, this new systems would require robust planning, significant level of funding, capacity and appropriate skills to develop, and expedited implementation. The International Energy Agency (IEA) estimates that approximately USD $1.2tn in annual clean energy investments will be required to facilitate the transition from the current carbon intense economy to a low carbon economy. (Timbers, 2014)

It is becoming clear that climate change could be "the greatest market failure the world has ever seen." To raise the required level of funding to fund lower-carbon infrastructure projects, innovative financial instruments need to be explored. Lanz (2014) indicates that green bonds could potentially be useful policy tools for reducing GHG emissions. (Lanz, 2014)

In support of Lanz's view about the potential for green bonds, Robins and Knight (2012) indicates that Bonds will play a crucial role in financing low-carbon and resilient infrastructure investment to reduce impacts of a changing climate. (Robins & Knight, 2012)

2.6 Global response to climate change

Climate change response require a coordinated effort by the international community, with core mission being the reduction in carbon emissions. In this regard governments around the world in 2010 agreed to limit global temperature increases to below 2 degrees Celsius. (United Nations Framework Convention on Climate Change, 2015)

This followed previous agreements in the past, for example in 1992, “various countries joined an international treaty, the United Nations Framework Convention on Climate Change, to cooperatively consider what they could do to limit average global temperature increases and the resulting climate change, and to cope with whatever impacts were, by then, inevitable”. (United Nations Framework Convention on Climate Change, 2015)

“The first time climate change was recognized as a serious problem by an international gathering was in 1979. The First World Climate Conference, held in February of that year, was a major scientific meeting. It issued a declaration calling on the world's governments to foresee and prevent potential man-made changes in climate that might be adverse to the well-being of humanity." (United Nations Environment Programme, 1990)

The table 2 below provides some historical background and context regarding the international response to climate change. (United Nations Framework Convention on Climate Change, 2015)

Table 1

1079	The first World Climate Conference (WCC) takes place
1988	The Intergovernmental Panel on Climate Change is set up.
1990	IPCC's first assessment report released. IPCC and second World Climate Conference call for a global treaty on climate change. United Nations General Assembly negotiations on a framework convention begin.
1991	First meeting of the Intergovernmental Negotiating Committee (INC) takes place
1992	The INC adopts United Nations Framework Convention on Climate Change (UNFCCC) text. At the Earth Summit in Rio, the UNFCCC is opened for signature along with its sister Rio Conventions, UNCBD and UNCCD. More about the two other Rio Conventions: UNCBD and UNCCD

1994	UNFCCC enters into force. An introduction to the United Nations Framework Convention on Climate Change.
1995	The first Conference of the Parties (COP 1) takes place in Berlin
1996	The UNFCCC Secretariat is set up to support action under the Convention.
1997	Kyoto Protocol formally adopted in December at COP3.
2001	Release of IPCC's Third Assessment Report. Bonn Agreements adopted, based on the Buenos Aires Plan of Action of 1998. Marrakesh Accords adopted at COP7, detailing rules for implementation of Kyoto Protocol, setting up new funding and planning instruments for adaptation, and establishing a technology transfer framework
2005	Entry into force of the Kyoto Protocol. The first Meeting of the Parties to the Kyoto Protocol (MOP 1) takes place in Montreal. In accordance with Kyoto Protocol requirements, Parties launched negotiations on the next phase of the KP under the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). What was to become the Nairobi Work Programme on Adaptation (it would receive its name in 2006, one year later) is accepted and agreed on.
2007	IPCC's Fourth Assessment Report released. Climate science entered into popular consciousness. At COP13, Parties agreed on the Bali Road Map, which charted the way towards a post-2012 outcome in two work streams: the AWG-KP, and another under the Convention, known as the Ad-Hoc Working Group on Long-Term Cooperative Action Under the Convention.
2009	Copenhagen Accord drafted at COP15 in Copenhagen. This was taken note of by the COP. Countries later submitted emissions reductions pledges or mitigation action pledges, all non-binding.
2010	Cancun Agreements drafted and largely accepted by the COP, at COP16. More on the Cancun Agreements.
2011	The Durban Platform for Enhanced Action drafted and accepted by the COP, at COP17.

2012	The Doha Amendment to the Kyoto Protocol is adopted by the CMP at CMP8. More on the Doha Amendment. Several decisions taken opening a gateway to greater ambition and action on all levels.
2013	Key decisions adopted at COP19/CMP9 include decisions on further advancing the Durban Platform, the Green Climate Fund and Long-Term Finance, the Warsaw Framework for REDD Plus and the Warsaw International Mechanism for Loss and Damage. More on the Warsaw Outcomes.
2014	COP 20 featured the first-ever "multilateral assessment" of mitigation efforts by developed countries, part of a new set of transparency procedures established under the 2010 Cancún Agreements. Seventeen developed country parties, including the United States, the European Union, several EU member states, and New Zealand, provided brief presentations to the Subsidiary Body on Implementation (SBI) on progress toward achieving their 2020 emission pledges, and fielded questions from other parties
2015	The Paris negotiations were launched in Durban, South Africa, in 2011 with the aim of producing a new legal agreement among national governments to strengthen the global response to climate change. This new global agreement is expected to include commitments to reduce greenhouse gas emissions, adapt to the impacts of climate change, and provide assistance to countries that need it.

While developed countries emit a lot more than developing countries, the impact of climate change will surely be felt by every community but with a disproportionately burden on poorer ones. This will perpetuate and even exacerbating the current global health disparities. Adaptations efforts would need to be accelerated more especially in developing areas as they would be more vulnerable to climate change. (Wiley & Gostin, 2009)

The world will await the outcomes of the COP 21 discussions in Paris with great anticipation. It is said that even if the current mitigation targets are met it might not be sufficient enough to stop the devastating impact envisaged on the public's health in coming decades. It is in this regard that while efforts are made to reduce global emissions, parallel efforts to deal with the effects are also starting to be prominent. It

is in this regard that the UNFCCC is starting to place more attention to adaptation initiatives, which is quite key in ameliorating the consequences of climate change for especially poor communities. (Wiley & Gostin, 2009)

2.7 South African Policy evolution in response to climate change

In response to the development challenges, the government of South Africa developed various policies and strategies to promote the transition to a green economy, with a strong emphasis on job creation. A number of policies and strategies have already put in place at national and local level with aim of combating the negative trends caused by climate change in a way that is consistent with building a strong South African economy (Table 1).

Table 2: Evolution of the main green economy related policies and strategies in South Africa (Amis, 2014)

Policies and measures	**Main goals**
Framework for Environmental fiscal Reform (NT, 2006)	Provides principles and guidelines for fair and effective environmental taxes.
10-Year Innovation Plan (DST, 2006)	Includes safe, clean, affordable and reliable energy supply and climate change as priorities.
Medium-Term Strategic Framework (2009- 2014)	Notes the need for sustainable livelihoods and sustainable resource management and relates this to various other policies including energy, water, housing, technology and competitiveness.
Industrial Policy Action Plan (2014)	Specifically targets growth in green industries, focusing on solar water heaters, solar and wind energy, and organic farming.
New Growth Path (2010)	Targets the growth of a green economy, resulting in green jobs.
Integrated Resource Plan 2010- 2030 (DoE, 2011)	Limits emissions from electricity generation to 275 mt per year, expects renewable energy to make up 42%.

National Climate Change Response (SA 2011)	Endorse and quantifies South Africa's GHG's limits/commitments.
National Strategy for Sustainable Development (DEA, 2011)	A large variety of indicators and goals spanning social, economic, environmental issues.
National Development Plan (NPC, 2011).	This is a vision document for South Africa that sets a long term development trajectory for South Africa

The various strategies and policies outlined above are a clear indication that South Africa has made significant strides towards the transition to a green economy. Even though the effective implementation of some of these strategies still needs to be strengthened, South Africa's intention to transition to a low carbon and resource efficient pathway remains steadfast.

In addition to the broad policy frameworks outlined above, there are numerous sectoral policies that complement each other. For example there are policies that relate to biodiversity conservation, waste management, energy efficiency, water conservation and demand management among others.

2.8 Creation of the National Green Fund as a catalytic mechanism

The above efforts by the South African government culminated with the establishment of the National Green Fund, which is an innovative catalytic fund inspired by the Climate Change Summits and initiatives and placed under the custodianship of the Department of Environmental Affairs in the fulfilment of its mandate to drive the climate change agenda. Implemented by the Development Bank of Southern Africa (DBSA), with the advisory support of relevant Government Departments, such as National Treasury and the Department of Science and technology, it was envisioned that the Green Fund would serve as a catalyst for the transition of South Africa to a low carbon, resource efficient and climate resilient development path resulting in economic, environmental and social benefits. The unique attribute of the fund pivots on the vision that the fund will establish an evidence base consisting of lessons

garnered from the Green Fund's funding interventions, which will drive future initiatives towards a green economy.

The Green Fund was established through the initial allocation of R1.1 billion and a Memorandum of Agreement (MOA) set out the governance processes of the fund. The objectives outlined for the Green Fund are as follows:

- Promoting innovative and high impact green programmes and projects;
- Reinforcing climate policy objectives through green interventions;
- Building an evidence base for expansion of the green economy;
- Attracting additional resources to support South Africa's green economy development.

Diagram 1 below indicates the focus of the fund with regard the thematic windows that define the areas the fund supports, how the allocation is split among investment, research and development and capacity building projects, lastly the financial instruments that are deployed by the fund in supporting green initiatives.

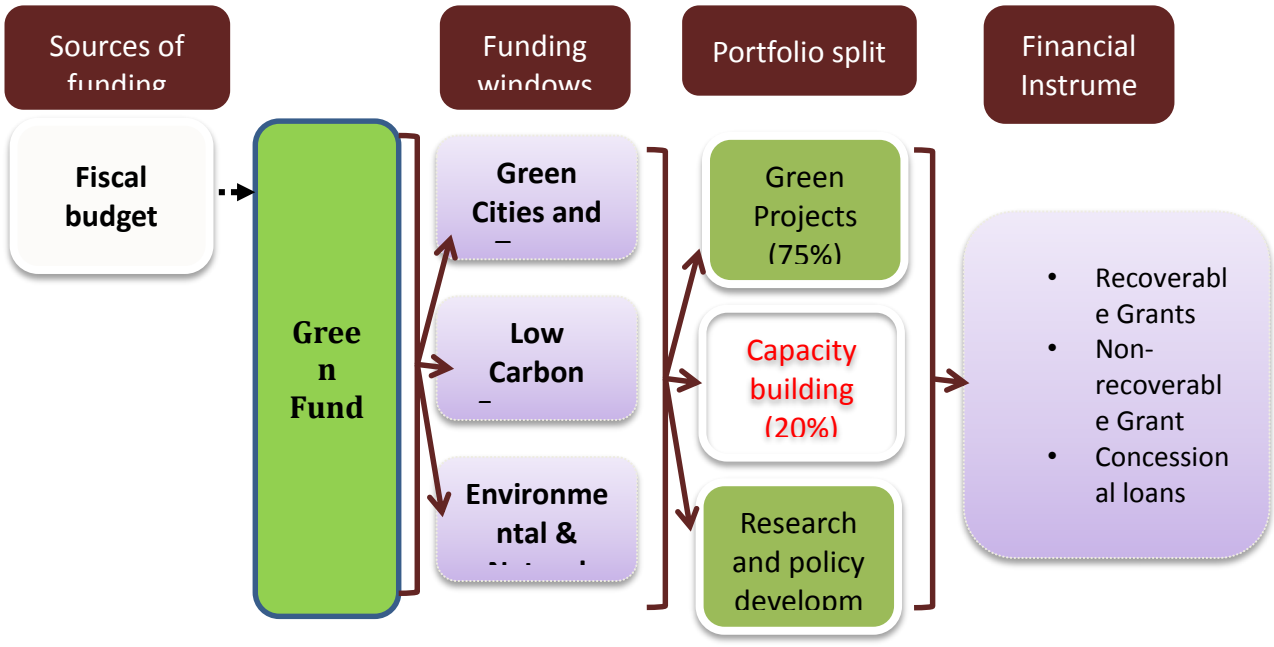


Diagram 2

2.9 Resource mobilization required to address the enormous investment need

The biggest challenge in transitioning to a greener development path is the large amount of funding required to move from a high-carbon emission economy to a low carbon one. Various financial instruments including carbon tax or carbon trading have been explored to come up with the most appropriate funding mechanism, but Voica et al (2014) argues that one of the most important evolution was the promotion of environmental friendly investments, also known as green investments. (Voica, Panait & Radulescu, 2014)

The Climate Bonds Initiative estimates that cumulative capital investments of around USD10trn will be required globally between 2010 and 2020 just to drive low-carbon energy alone. If the historical 60:40 debt and equity split is taken into account, it would amount to approximately USD6trn in the form of bank loans and bonds. (Climate Bonds Initiative, 2013)

This estimates are corroborated by Robins and Knight (2012) who write that the capital intensive climate economy is requires cUSD10trn in investments between 2010 and 2020 for low-carbon energy alone (Robins & Knight, 2012)

This view is aligned with the International Energy Agency (IEA) estimates, which indicate that the reduction of energy-related carbon emissions to meet and maintain the 2°C scenario target out to 2050 would require an additional $36 trillion investment. (Kidney & Oliver, 2014)

Other estimates by the International Energy Agency's *World Energy Outlook* (2011), suggest that in order to limit the greenhouse gas concentrations in the atmosphere to 450 ppm, we would require US$25,000 billion invested in climate change initiatives between now and 2035. (Caisse des Dépôts Group, 2012)

Since the significant funding requirements cannot be made from public resources alone, ways to crowd in private finance need to be found. The Green Investment Report shows that Governments around the world need to create an enabling environment which would attract private finance. (Voica, Panait & Radulescu, 2014)

Alexander *et al* (2013) also mention that green investment gap is made even more obvious by the risks and impacts of environmental degradation which cannot be covered by public funds alone, and thus require the participation of private capital. In spite of green bonds being a relatively new financial instrument without any standard format, it is still regarded as a frontrunner among financial instruments that could assist in plucking the identified green investment gap. (Alexander, Gulati& McDonald, 2013)

However, Timbers (2014) indicates several challenges that will be faced in accessing capital at the scale needed to finance a transition to a low carbon, such as

- Lack of political support for the required investments

- Inadequate availability of public funds to match the significant financing requirements, especially with the many economies that are still recovering from the recession.

- The increasingly stringent bank regulation such as BASEL III are not conducive to long term investment requirements for green investments (Timbers, 2014)

Caldecott (2012) asserts that without a liquid market, finding the capital required to finance green investment will be significantly harder and also more expensive. (Caldecott, 2012)

2.10 Limitations of existing financial instruments

Most of the existing financial instruments are not adequate in addressing the identified green investment gap. This is compounded by the current financial downturn that has increased liquidity problems, which makes it difficult to access finance. The challenge is about how to solve these liquidity problems by attracting a broad range of funders through appropriate financial instruments that are suited for low-carbon initiatives (Caisse des Dépôts Group, 2012).

There is an urgent need to design customized financial instruments that are able to attract larger sums of capital into green initiatives. For this new financial instruments to appeal to investors with large volumes of assets under management, innovative

approaches are critical. The investors with large financial reserves are mainly pension funds, endowments, asset managers and sovereign wealth funds. (Reichelt, 2010)

With the stringent regulatory regime that is being introduced such as Basel 3, the banking sector is finding it even more difficult to support long term green investments. The Caisse des Dépôts Group (2012) is of the view that green bonds could enable issuers to diversify their sources of funding. This could then provide a platform for alternative financing instrument that can attract investors, especially those that are tempted by their SRI aspects. This could then facilitate support for green projects that have struggled to obtain funds (Caisse des Dépôts Group, 2012).

To reach the required financing scale needed to effectively support green investments, the funding would have to be generated through the global financial markets, with innovative solutions across asset classes. An understanding of the needs of the global financial markets with regard to the right financial incentives and credit enhancements through the efficient use of public credit is crucial in designing new financial instruments and products that can attract private investment. (Reichelt, 2010)

According to Timbers (2014) green bonds are an appropriate financial instruments for large scale, capital-intensive, green infrastructure projects that can be repaid by steady, modest, long-term cash flows. Green projects are often high risk in that new technologies that are still experimental and have not been fully tested in the market are often used. However, Bonds, including green bonds, are less appropriate for funding new technologies with higher default risk. This is a challenge for bond investors with less risk appetite. The majority of green bonds issued to date have been rated as investment grade, which means they are safe, secure investments, and most of the projects financed have been in renewable energy or public transportation. While renewable energy and public transport are mostly investment grade, most other green investment projects are not investment grade, thus may not be suited for green bonds (Timbers, 2014)

While credit rating of investments is an important tool to facilitate lending by investors in that it allows them to compare risk and return metrics for competing investment opportunities, it could be a huddle for other green investment if it is applied

without considering externalities. Timbers (2014) mentions that leading credit agencies, such as Standard & Poor's, Moody's, Fitch, and Kroll, have begun to review and rate green bonds using the same credit ratings used to rate regular bonds, making the financial credibility of the underlying asset and/or institution directly comparable. This is important as it allows green bonds to receive investment grade ratings such as double or triple A (AAA) ratings which help validate new, creative bond products. The concern however is that green projects that are rated less than investment grade will not qualify for green bond support. (Timbers, 2014)

2.11 Need for innovative financial instruments

The need for significant amount of financial support and innovative financial instruments has already been mentioned several times in this study. The World Nuclear Association (2015) highlights three "flexibility mechanisms" which were introduced to improve the economic efficiency and make it easier to support climate change initiatives. The three mechanisms are emissions trading, Joint Implementation and the Clean Development Mechanism. (World Nuclear Association, 2015)

World Nuclear Association (2015) defines the three mechanisms as follows:

- "Emissions Trading: A market-based approach to achieving environmental objectives that allows those countries or entities reducing greenhouse gas emissions below what is required to use or trade the excess reductions to offset emissions at another source, inside or outside the country. In general, trading can occur at the domestic, regional (EU), international and intra-company levels. A precedent is the USA acid rain program, which successfully trades permits for sulfur dioxide."
- "Joint Implementation (JI): A project-based mechanism, whereby one developed country – with emissions caps – can work with another to reduce emissions or enhance sinks, and share the resulting emission reduction units accordingly".
- "The Clean Development Mechanism (CDM): A project-based mechanism where certified projects proposed by developed countries – or companies from those countries – can be used to reduce emissions in

> developing countries. The developed country – or company – earns certified emission reduction units, which may be used against the country's own reduction commitment. CDM is primarily focused on development aid and secondly on emission reduction".

While the above mechanisms are quite innovative and have been useful, they have not been as successful as envisaged. Part of the reason for the lack of success has been the recent financial market crush that has led to many developed economies going into recession.

Innovative financial instruments would require appropriate changes within the regulatory framework to support its successful implementation. This study has already indicated how new financial regulations (such as Basel III) "discourage banks from holding longer-term loans on their balance sheets, prompting increasing costs, reductions in the term of loans and introducing greater refinancing risk". (Climate Bonds Initiative, 2013)

This is corroborated by Robins and Knight (2012) who mentions that "Basel III could discourage banks from holding longer-term loans on their balance sheets, prompting increasing costs, reductions in the term of loans and introducing greater refinancing risk" (Robins & Knight, 2012)

2.12 The use of fiscal support for green investment

The estimates regarding the amount of funds required to fund climate change initiatives are clearly too great for government resources alone to tackle, this is even more so for developing countries with limited resources. (Reichelt, 2010)

This is supported by Alexander *et al* (2013) who states that governments can only do so much to contribute to the large environmental investment gap that has been identified. This is further compounded by the fragile global economic conditions that is due economic recession (Alexander, Gulati& McDonald, 2013)

Alexander *et al* (2013) further notes that governments do not have sufficient financial resources to meet current and future climate finance needs. (Alexander, Gulati& McDonald, 2013)

According to the World Bank (2010) studies various forms of green funds including fiscal green funds (such as the Dutch Green Fund) have been explored as possible ways to fund green investments. The study indicates that the launch of new funds peaked in 2007 with 47 new funds being launched, however the number decreased by more than half by 2008, and the trend kept on declining. (Voica, Panait & Radulescu, 2014)

Platt (2010) agrees that public finance is important in funding green investments, but notes that mobilising private sector investment is key as it will play a much bigger role. (Platt, 2010)

Private investment in green projects however require support from policy makers to thrive. This is often hindered by the misalignment with regard the different decision making horisons of the investors versus that of policy makers. For example, investors make their investment decisions based primarily on anticipated quarterly and annual performance. While, policymakers typically focus their agenda on policies that enhance re-electability which is tied to election cycle, (which is typically four to five years). These often result in public policies that are short-term in nature, which is not compatible with the requirement for large-scale infrastructure investments. (Lanz, 2014)

Policy maker's support initiatives such as policy guarantees, tax incentives and credit enhancements is crucial in addition to financial support for emissions reduction to be met. (Climate Bonds Initiative, 2013)

This is supported by the World Economic Forum (2013) which states that reform policies and incentives are crucial in providing the right signals to private investors to consider green investments. Private sector investment can further be attracted by using a range of proven instruments and mechanisms including public finance to help reduce the cost of capital and investment risks. (World Economic Forum, 2013)

Caldecott (2012) states that “Measures to reduce policy risk and improve the revenue certainty of low Carbon assets will improve the credit rating of a bond and lower the average Cost of capital.” (Caldecott, 2012)

2.13 The importance of Government support

Targeted public expenditure and policy reform can be used to catalyse and support investment in the green economy which could potentially contribute towards economic growth, job creation and reduction in environmental degradation. This could then have a positive impact on poverty eradication and broader socio economic benefit as investments focus more towards clean and efficient technologies, natural capital and social infrastructure. Government have at their disposal a variety of fiscal instrument including taxing various sector emissions from fossil fuel use; reviewing energy subsidies based on identified negative impact with regard to factors such as wasteful and environmentally harmful economic activity; while on the other hand promoting the use of clean technology and sustainable production through fiscal incentives (UNEP, 2013)

This is consistent with the GGKP (2014) report which states that fiscal measures such as taxes, charges, subsidies, incentives and budget allocations could be useful is raising capital to support low-carbon activities and also in factoring in environmental externalities into pricing. One of the notable initiatives that have been successful is the implementation of feed-in tariffs as a support measure to incentivize investment in renewable energy. (GGKP, 2014)

“There has been growing recognition that fiscal policy plays a crucial role in transforming economies to become greener and more inclusive. By reflecting the cost of externalities from natural resource use in the prices of goods and services, fiscal policy sends the right signal to the market. Such signals then stimulate a shift in production, consumption and investment to lower-carbon and socially inclusive options. Moreover, fiscal reforms aimed at removing perverse subsidies to polluting activities and unsustainable use of limited resources can not only create fiscal space

for investing in development priorities, but can also generate revenues for nurturing the environment". (GGKP, 2014)

2.14 Ways to attract financial markets to invest in Green projects

Attracting private finance to support green technologies can be quite challenging due to the real or sometimes perceived risks associated with new technologies. This is especially the case as potential investors would compare their risk/return profile with that of proven conventional technologies. Investors often do not factor in externalities in their comparison and with green technologies often requiring higher initial capital costs, this further deters investors. (World Economic Forum, 2013)

There has been a significantly high reliance on banks in funding power or energy projects in the past. However, a number of banks are nearing their exposure limits to the power sector, this will impact lending for both fossil fuel-based power and renewable energy. Renewable energy projects like many green projects require long tenor repayment structures which is not compatible with limited tenor associated with bank loans. Therefore, to attract financial markets to fund green investment there needs to be alignment with regard to tenor but also with factors such as interest rate and the general terms of debt. (Shrimali, 2015)

Regarding the long tenor required to support green investments, institutional investors such as pension funds and insurance companies would be ideally suited. Their risk/return profile is also well aligned with green investments. Therefore efforts should be made to crowd in institutional investors to support green investments, especially as this kind of investors are increasingly attracted by ESG credentials of projects (Shrimali, 2015)

Furthermore, ESG consideration could be a useful tool to attract investors. As investor interest in ESG matters increase, green bonds could provide an opportunity for institutional investors to divest and diversify from fossil fuel-intensive portfolios. This could open an avenue to attract institutional investors into green investments. (World Bank, 2015)

This is in line with the World Economic Forum (2013) report which indicates that "green bonds are widely believed to have significant potential as a means to access deep pools of relatively low-cost capital that is held by institutional investors for green and climate change-related projects".(World Economic Forum, 2013)

"At the World Economic Forum in Davos in early 2014, World Bank Group President Jim Yong Kim urged more investors to get involved and called for doubling 2013's annual green bond market issuances by the UN Secretary-General's Climate Summit in September". (World Bank, 2015)

A World Economic Forum (2013) 's review of various project case studies and initiatives from members and partners of the Green Growth Action Alliance and the past performance of different mechanisms and instruments indicated how different interventions can be used to attract private investment and targeted public investment to support climate change initiatives. The following lessons for good practice have emerged: (World Economic Forum, 2013)

- "Targeted government support is crucial to unlock commercial green finance (Dialogue with the private sector, stakeholder engagement and capacity building are all examples of government support that enabled the projects to develop.)"
- "Overarching policy support enabled most projects to attract private-sector involvement (Governments need to develop investment-grade national policy frameworks to create a supportive business environment that enables attractive returns for investors in green technologies)"
- "Public interventions can be successful when tailored to local requirements, involving end-users (scrapping incentives for conventional technologies to remove unfair competition to greener technologies)"
- "Early-stage funding and grants can mobilize private finance(initial research, feasibility studies, capacity building, policy design and technical assistance, are a core catalyst for further private-sector investment)"

- "Investment capital can be de-risked through innovative models (De-risking tools, such as guarantees and insurance against policy, regulatory and macroeconomic risk, are underused and offer significant potential for mobilizing private investment.)"

2.15 Challenges Investors face when investing in green projects

As already mentioned, some of the less mature green investments tend to use untested technologies, they have unattractive risk/return profiles and thus carry a low credit rating. Credit rating agencies are understandably comfortable with projects that demonstrate a reliable credit history and credit performance which most green projects do not have. Other challenges have got to do with investor requirement regarding deal size and liquidity which is also a shortcoming of most green projects, excluding most renewable energy and sustainable transport projects. The successful use of green bonds is funding green investment is also limited by this challenges. (Kidney & Oliver, 2014)

Kidney and Oliver (2014) notes that major players in the bond markets, including pension funds and insurance companies, will only consider deals that are greater than $300 million to be comfortable with the liquidity of a fixed income investment. As mentioned above, many green investments are small in size and are at an early stage of development and thus most are unable to match the size and liquidity requirements. They also exhibit poor risk/return profiles and struggle to achieve investment grade credit rating. It is said that most of the wind and solar power projects funded are below $300 million in size and are rated investment grade. (Kidney & Oliver, 2014)

Another main challenge in investing in green projects has to do with the lack of clarity regarding definitions of what green projects are and by extension what green bonds are. The raging debates about the range of "green" projects that may be included in green bonds for example is still on-going. For green investments to have credibility

that is required by investors, this debates will need to be settled and replaced by standardized products that are accepted in the market. (Wood & Grace, 2011)

Timbers (2014) also identified this challenge and emphasizes that gaining consensus regarding what constitutes a green bond is the most significant obstacle facing the green bond. For investors to know what they are buying, they need to be able compare products against their investment criteria and mandates, this therefore requires clear standardization of investment terms for green projects. (Timbers, 2014)

To encourage growth in green investment, the whole process around the evaluation of projects, due diligence processes, monitoring and evaluation among others have to be robust enough to answer critical questions such as:

- who is responsible for measuring 'greenness',
- the metrics used to measure 'greenness',
- what information is provided to investors,
- and the relevance of whether a project would have been funded without a green bond.

Due to lack of standardization, potential for "green washing" which could undermine the credibility of financial products is always there. (Timbers, 2014)

It is therefore imperative that an agreed definition that is endorsed by both the government and the financial industry is in place and is ratified by regulators. This would make it easier for acceptance by investors and reduce the potential for misinterpretation. (Kidney & Oliver, 2014)

Ideally the market requires a credible self-policing verification and enforcement system which should be based on agreed standards. The market itself would then lead verification review and policing process through relevant market actors. (Kidney & Oliver, 2014)

For an organization to change its portfolio from brown to green is a process that would take time. The tricky question then is when do you consider an organization's bond issue green if they would take time to dispose of their non-green portfolio. This are

some of the unanswered questions that affect the credibility of the green bond market. (Wood & Grace, 2011)

The other issue that plague efforts to grow the Green bonds is liquidity. Green bonds require a liquid market to ensure credible, lower cost exit, and longer repayment terms. The challenge is that green investments have not reached the scale required by institutional investors which result in few issuers that leads to less interest from potential buyers. This becomes a vicious cycle as it then result in less liquidity. (Caldecott, 2012)

Lastly, green projects that are funded individually tend to be unattractive to institutional investors as transactional costs become unreasonably higher compared to the size of the projects. This type of investors also do not have the time to concentrate on individual projects as it does not help them to move the quantum of funds that they have. (Caldecott, 2012)

2.16 The rise of green bonds

Bonds as a financial products have been around for quite some time. Elmer (2009) defines a bond as "an interest bearing certificate issued by an organization in order to borrow money. A bond is a loan between the borrower or *issuer*, and the lender or *investor*. Bonds are similar to a promissory note—a promise by the issuer to repay the investor the principal of the loan by the end of a fixed period of time plus interest". Green bond are similar to regular bonds in many respects but do not have a standard definition (Elmer, 2009)

Alexander *et al* states that "regardless of their label, green bonds are similar to traditional bonds, except that their proceeds are exclusively used to finance approved environmental projects". Traditional bonds however are not necessarily limited to financing green initiatives and investors usually do not monitor what they are used for. However for green bonds, investors require effective and transparent monitoring and verification to ensure that funds are used for the intended purpose. (Alexander, Gulati& McDonald, 2013)

The term green bond has a myriad of definitions and come in various forms. They are referred to as "green" or sometimes "climate" bonds. Some forms of this bonds are called green infrastructure bonds, green retail bonds, green gilts, multilateral development bank green bonds, corporate green bonds, green sectoral bonds and index-linked carbon bonds. They are seen as potential financial product that could assist in raising the level of funding required to support green investments. (Caldecott, 2012)

Timbers (2014) defines climate bonds as a variation of the green bonds theme, with the use of proceeds linked to projects that specifically address climate solutions. (Timbers, 2014)

The Caisse des Dépôts Group (2012) states that "the term "green bonds" applies to bonds aimed at financing investments with an environmental benefit or a focus on reducing vulnerability to environmental changes. This definition also includes bonds known as "climate bonds", which focus on investments relating to mitigating or adapting to climate change". (Caisse des Dépôts Group, 2012)

According to the Green Bond Principles, green bonds are defined as "Instruments in which the proceeds will be exclusively applied (either by specifying Use of Proceeds, Direct Project Exposure, or Securitization) towards new and existing Green Projects — defined here as projects and activities that promote climate or other environmental sustainability purposes" (Timbers, 2014)

While accepting that there is still a lack of a universally accepted definition for green bonds. Voica *et al* defines it as "a green investment that is considered to be a low-carbon or climate resilient investment made in companies, projects and financial instruments in the field of climate change, renewable energy, clean technologies, etc." (Voica, Panait & Radulescu, 2014)

Due to the lack of a standard definition for green bonds, others simply base their definition on project contribution to emission reduction while others look beyond

emissions and include conservation or even sustainable agriculture. (Wood & Grace, 2011)

Voica (2014) further notes that some of the definitions are broader and technical while some are based on ecological context. He further observes the intersections that exist among the various definitions, the major controversies around sectors such as nuclear energy and the ambiguity around green IT or even financial services.

The challenge caused by the lack of a consistent and common definition of green bonds is that it negatively impacts the types of projects that could be funded in order to meet the identified green investment gap. Financial markets are weary of the potential risk of "green-washing" investments that this poses, leading to lack of market take up. (Alexander, Gulati& McDonald, 2013)

As a contribution towards solving this lack of standard definition for green bonds, the World Bank with the assistance of the Centre for International Climate and Environmental Research in Oslo (CICERO) has established the principle of expert and independent review inclusion criteria. This forms the basis of a certification and verification scheme that certifies bonds. The scheme is quite useful in giving some credibility to green bonds and also ensures that issuers and buyers are more assured of the quality of the product. (Kidney & Oliver, 2014)

"The motivations to realize green investments are diverse, but the literature groups them in four classes: Financial considerations: return, risk, diversification, long-term risk consideration, internalization of externalities; Extra-financial considerations: ecological, scientific, religious, ethical, political; Reputational: reputation of the investor, reputation of the company, marketing tool, pressure from media; Compliance and fiduciary duty: domestic law and regulations, international conventions, voluntary industry codes, disclosure codes, good governance codes." (Voica, Panait & Radulescu, 2014)

On the other hand, the rise of the "Socially Responsible Investments" (SRI) interest among investors has been a boost for Green bonds. There is an increasing interest shown by many institutional investors in "Socially Responsible Investments" (SRI).

The green bonds are seen as a better placed financial mechanism to allow issuer to access SRI aligned investment than conventional bonds. “In fact, the European SRI market increased from more than 20% between 2007 and 2009 and reached €1,2 trillion in 2009” (Caisse des Dépôts Group, 2012)

In addition to their growing interest in SRI based investments, the need for portfolio diversification and long term financial products by Institutional investors such as pension funds, mutual funds, insurance companies and sovereign wealth funds makes them the most natural client-base or buyers of green bonds. The issuers of green bonds can be governments, private corporations, commercial banks and international financing institutions (e.g., the World Bank). (Alexander, Gulati& McDonald, 2013)

The Caisse des Dépôts Group (2012) notes that green bonds have been developed to attract institutional investors to invest in green projects which support climate change initiatives. A big part of the funding needs for green projects is for the high risk projects that are at an early stage of development. To complement the existing instruments such emissions trading systems or carbon offsetting, green bonds holds some promise as a follow-on financing instrument. (Caisse des Dépôts Group, 2012).

2.17 Advantages and Limitations of green bonds

Bonds as a fixed investment term allow the matching of cash flows with the maturity periods. This helps to avoid the potential mismatch and thus reduces the risk of short term deposits being used for long term investments. (International Capital Market Association, 2013)

The long tenor of green projects is suitable for bonds issuance. Green projects such as renewable energy mostly require large front loading and then provide regular positive cash flows in form of an annuity. (Caisse des Dépôts Group, 2012).

Green bonds are therefore well-suited to financing the scale up of low-carbon and climate resilient infrastructure. (Robins & Knight, 2012)

Lanz (2014) also states that the prevailing green bonds maturities of ten, twenty, thirty, or even more years, could enable issuers to raise sufficient capital for investments in

large-scale green infrastructure projects while amortizing cost over a longer period. This long tenors positions green bonds as suitable instruments that can potentially reduce the common problem of political and economic short-termism. He further states green bonds could generate positive employment and positive macroeconomic effects (Lanz, 2014)

According to the Climate Bonds Initiative (2013) bonds are best placed for providing the capital for the long-term environmental infrastructure required to build a low-carbon, climate-resilient economy. Although upfront capital requirements are huge, this is mitigated by much lower operating costs. (Climate Bonds Initiative, 2013)

"Another advantage of green bonds is that they give investors an opportunity to effortlessly integrate environmental initiatives into their portfolios. This means green bonds can fit into existing asset structures and bolster environmental responsibility profiles without requiring additional effort on the part of the investor". (Alexander, Gulati& McDonald, 2013)

Green bonds are also proofing useful for institutional investors who are looking into extending the integration of sustainability factors of the investment portfolios beyond listed equities into other asset classes, thus creating appetite for bonds linked to climate change (Climate Bonds Initiative, 2013)

However, the growth of green bonds is limited by a less favorable market reputation leading to unfavorable ratings. The limitations are also exacerbated by the additional cost represented by the implementation of a monitoring system to certify that the funds raised have actually been used for the intended purpose. (Caisse des Dépôts Group, 2012)

Rating agencies use various forms of ratings like letter categories such as AAA or BBB among others to rate long term debt, with the highest rating called "investment grade" and the lowest "junk bonds," (Elmer, 2009)

The risk-return expectations of investors as a selection criterion for financing is also a limitations as some green investment cannot offer the required level of returns. This

limitation is also evident in green bonds, with most of the successful issuances coming from AAA rated (Investment grade) entities such as the World Bank. (Caisse des Dépôts Group, 2012)

Another serious limitations for green bonds is the potential reputational risk due to green targets. This limitation could also involve resource fungibility which may raise economic effectiveness issues. This becomes even more apparent where the issuer's conventional bonds attract responsible investors. (Caisse des Dépôts Group, 2012)

The other limitation for Green bonds which has already been mentioned is liquidity. Green bonds issuers often find it difficult to meet the kind of volumes required to meet market expectations. Liquidity remains an important measuring stick for the success of bond. (Caisse des Dépôts Group, 2012)

The Climate Bonds Initiative (2013) estimate shows that "the climate-themed bond market is not niche and lacks scale or liquidity. At USD346bn it is almost double their previous estimate. In addition, about USD163bn of the bonds follow index type rules for currency, credit rating, and greater than USD100m issuance size, and are broadly available across different themes". (Climate Bonds Initiative, 2013)

Wood and Grace (2011) further highlight an important liquidity factor regarding the need for investors to see a more robust secondary market. (Wood & Grace, 2011)

Timbers (2014) further notes that the near absence of a secondary market for green bonds has led to supply and liquidity challenges. "As noted, there is currently an insufficient volume of green bond issuances to meet investor demand—many green bond issuances to date have either been oversubscribed or increased due to high demand. Without new issuances, prices may increase and yields can remain artificially low. This scarcity benefits issuers, but not consumers". (Timbers, 2014)

This is also apparent in Duncan Ritchie study which concludes that the main reasons why green investment are on the losing side are: transactions are smaller, development activities are mainly led by other project developers than the traditional ones,

resources are available depending on project, usually projects rely on regulations and carbon pricing mechanisms, and on new emerging technologies". (Voica, Panait & Radulescu, 2014)

"Barriers to growth have a chicken and egg quality, with a limited number of issuers and liquidity in the market paired with a relatively small scale of demand resulting from smaller retail investors and larger investors slowly entering the market. Some of this difficulty with supply and demand will be addressed by additional publicity of the emerging field and its developing track record". (Wood & Grace, 2011)

The other serious challenge to consider is the ability for green bonds to compete with conventional bonds with regard to yield is crucial. This is because the ability for green bonds to hold their value relative to other bonds as interest rates rise is in doubt and the potential for investors to retain interest in green bonds even when yield remain low is very unlikely. (Timbers, 2014)

Green investments such as renewable energy and sustainable transport projects are financially viable but this is not the case for the majority of green projects that tend to be costly, the high cost are often due to the use of new untested technologies and high transactional costs. The result is that the majority of green investments require much higher return rates to offset the cost. Investors are looking for viable returns will not finance projects which do not have acceptable risk-return profiles. Furthermore green projects utilizing untested technologies will be rated very low due to uncertainty of receiving revenues, which makes then unattractive for investors. (Voica, Panait & Radulescu, 2014)

To alleviate this challenge, credit enhancements in the form of the carbon market could be a useful tool that could underpin the success of green bonds. Voica et al (2014) states that unless the price of carbon became more stable, predictable and reliable, it will not be an attraction for investors. (Voica, Panait & Radulescu, 2014)

Development of a pipeline of green project also need to be noted. Wood and Grace (2011) argue that from the issuer's perspective, the limitation of green bonds is pipeline development. They are of the view that the more stringent standards may

create additional costs in sourcing deals and verifying their impact, potentially limiting market liquidity and investor demand. (Wood & Grace, 2011)

Lastly, the challenge regarding lack of standard definition of green bonds has also been mentioned. Green bond market today lacks standardization in definitions or products, making assessing its size problematic. (Alexander, Gulati& McDonald, 2013)

2.18 Summary conclusion:

In conclusion, a clear gap that seem to emerge from the brief review of the literature is as follows: Most green projects are still within the early stage, high risk phase using untested technologies, which means financial returns from this projects are unlikely to be realized. Literature does not address how to balance the inherent requirement for financial returns that is expected from green bonds with this high risk profile that characterizes most green projects.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction:

This chapter presents the study approach, methodology chosen and the rationale behind the choice. It details the data collection and analysis methods, limitations and constraints of the study, ethical issues and lastly present a brief summary.

3.2 Research Approach and Methodology:

The research design and methodology has to do with the translation of the research question into variables, choosing appropriate sampling and data-collection methods and choosing appropriate analysis methods (Page and Meyer, 2006).

A survey research is a method of collecting information by asking a set of pre formulated questions in a predetermined sequence in a structured questionnaire to a sample of individuals drawn so as to be representative of a defined population (Blaxter, Hughes & Tight, 2006:77).

This study followed a positivist research method, a quantitative research strategy is used with the view to test the relationship between variables in order to test the objectives of the research. The relationship with regard to how respondents view "Fiscal Support" versus "Green Bonds" as an appropriate funding mechanism for the Green Fund was tested. The study used a structured questionnaire survey with closed-ended questions to collate the views of respondents, the choice of the type of questionnaire was in light of the high number of respondents which could only be done through limited involvement of the researcher if it was to be fully covered within the limited time. A Likert scale was used to determine the overall measurement of sentiment of the respondents with regard to the research question, which is to determine if "Fiscal Support" is the most appropriate financing mechanism for the Green Fund and to also determine if "Green Bonds" would have been a more effective and efficient instrument than fiscal support.

To gather data from key stakeholders with sufficient exposure to green investment instruments and mechanisms including green bonds, organisations that have already issued green bonds and those with extensive climate change investment knowledge within South Africa where identified and a questionnaire was developed and tested with a smaller group of this relevant stakeholders to enhance its effectiveness. For efficiency and time management, a questionnaire was then send to 40 key stakeholders within the identified organisations using "monkey survey" which is an online survey instruments to collate responses. The response rate was 45% with a satisfactory spread across the diversity of organisation that responded.

3.3 Data collection

"Studies made by others for their own purposes represent secondary data. It is inefficient to discover anew through the collection of primary data or original research what has already been done and reported at a level sufficient to make decisions". In this instance secondary data in the form of existing Green Fund experiences and lessons in conjunction with primary data collected from key stakeholders with the Green Investment space. (Cooper and Schindler, 2011).

- Secondary data in the form of historic information regarding the National Green Fund portfolio performance and its current and envisaged impact was explored. This information was compared with the outcome of the survey to determine consistency and to explain unexpected outcomes of the study.
- Primary data was collected by means of a survey using a structured questionnaire. Key representatives of the organisations identified within the sampling framework completed the questionnaire. As already mentioned, an online survey instrument was used to improve efficiency and for effective use of time.

Due to green investment and climate change being subjects that are still understood differently by various sectors within the economy, the potential limitation of the study's data collection method was that the questions could be understood in an inconsistent manner. To mitigate this potential limitation, interviews were considered but due to time limitations with regard to the 40 respondents that had to be covered and the unavailability of respondents, questionnaires were used. However, the testing of the

questionnaire with a small number of key stakeholders helped in enhancing the effectiveness of the questionnaires to ensure common understanding.

3.3.1 Population

"An important step in planning the research project is to identify the target population, this entails the people, events or records that contain the desired information and can answer the measurement questions and then determine whether a sample or a census is desired" (Cooper & Schindler, 2011).

The population in this study includes national financial institutions that have raised green bonds or provided transactional advice to organization that raise green bonds (e.g. Commercial Banks), National institutions such as Development Finance Institutions (DFIs) that have already successfully raised green bonds, Johannesburg Stock Exchange (JSE), Department of Environmental Affairs that is the custodian of the National Green Fund, National Treasury which is responsible for fiscal allocation and lastly DBSA and Green Fund employees. The population also includes members of Green Fund governance structures such as Green Fund Management Committee (Mancom) members and its Government Advisory Panel (GAP) members.

The choice of the population was informed by the study research questions and hypotheses, in that the above population is best placed to understand the context of climate change, government response mechanisms and how private finance and development finance plays a role in supporting climate change initiatives and instruments such as the Green Fund.

3.3.2 Sampling

"Sampling is the process of selecting a sufficient number of elements from the population, so that a study of the sample and an understanding of its properties or characteristics would make it possible for us to generalize such properties or characteristics to the population elements" (Sekaran, 2003).

The sample comprised up to three key representatives from each of the organisation listed below:

- Key representatives of financial institutions that have raised green bonds or provide transactional advice to organization that raise green bonds (e.g. Commercial and Development Banks). However, very few financial institutions have raised or helped raise green bonds to date, as such only institutions that have successfully raised bonds were part of the sample.
- Representative of the Department of Environmental Affairs, the custodian of the National Green Fund, together with other departments that are part of the Green Fund Mancom form part of the sample.
- Representatives of other National Treasury who are also part of the Green Fund Mancom form part of the sample.
- Representatives of various Government Departments that are also GAP members are also part of the sample, and
- Representatives of the JSE.

The responses received indicated that not all institutions responded to the questionnaire, however the response rate of 45% was spread across all the sectors (i.e. Government, Financial Institutions, JSE etc.) in a satisfactory manner.

3.4 Data analysis

According to Shamoo and Resnik (2003) Data analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data. Various analytic procedures provide a way of drawing inductive inferences from data and distinguishing the signal (the phenomenon of interest) from the noise (statistical fluctuations) present in the data". (Shamoo & Resnik, 2003)

The study collected mixed data consisting of qualitative data in the form secondary data and quantitative data in the form of primary data. Conducting mixed methods research involves collecting, analysing, and interpreting quantitative and qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon. Because of its logical and intuitive appeal, providing a bridge between the qualitative

and quantitative paradigms, an increasing number of researchers are utilizing mixed methods research to undertake their studies (Onwuegbuzie and Leech, 2006).

This study analysed quantitative and qualitative data within a mixed methods framework, through the following seven stages: (a) data reduction, (b) data display, (c) data transformation, (d) data correlation, (e) data consolidation, (f) data comparison, and (g) data integration. Data integration was the final stage, whereby both quantitative and qualitative data are integrated into a coherent whole (i.e., qualitative and quantitative) of coherent wholes (Onwuegbuzie and Leech, 2006)

3.4.1 Summary of data analysis process followed

- Descriptive statistics were used to summarise the question responses and to evaluate respondents' views of the different areas of the questionnaire. The questionnaire has three different sections, the first section covered questions regarding the effectiveness of the Green Fund as it is currently set up, the second set covered the effectiveness of Fiscal Support as an appropriate funding mechanism for the Green Fund and the third one covered the effectiveness of Green Bonds as an alternative funding mechanism for the Green Fund.
- The descriptive statistics with the help of graphs where then used to give an indication of how respondents have answered based on a Likert scale and the outcome was evaluated in relation to the research questions.
- With the help of the descriptive statistics, various tests were grouped to determine if the hypotheses are accepted or rejected by the entire respondents from the sample or by a certain group of the respondents from sample.
- As the study is relying on the data results obtained to either reject or accept the hypotheses, it is crucial to ensure that data collection methods are reliable and not erroneous as this would lead to erroneous analysis. Due to ease of computation, the study used Cronbach's alpha to test the reliability and validity the responses.
- The data was further tested for normality using histogram to determine if study should employ parametric or non-parametric methods to test the

hypotheses. Non normality was observed hence non parametric statistical tests were used.

- However, this study went further and run both parametric and non-parametric tests in order to compare the results, and the numbers converged to the same conclusion with regard to hypotheses testing. This is consistent with study conducted by Murray (2013) which indicated that both parametric and non-parametric can yield similar interpretation. (Murray, 2013)
- Since the tests done by the study were grouped into three as stated above, the Kruskal-Wallis test was preferred above other non-parametric tests such as the Mann-Whitney test. This is because Kruskal-Wallis test enables the comparison of three or more groups rather than just two for Mann-Whitney test.
- To test the study's hypothesis with regard to whether green bonds are a more effective funding mechanism than fiscal support, a parametric test in the form of the Pearson's correlation was used to test if there is positive , negative or no relationship between the variables. This was also tested using Spearman correlation which is a nonparametric test and in line with Murray (2013) the outcomes were found to be consistent.
- The study also used the ANOVA test to see if there is any significant difference between the means of the question grouping, which is "Green Fund Support", "Direct Fiscal Support" and "Green Bonds" for hypotheses testing.
- The study further uses linear regression to test the relationship between the dependent (Green Fund support) and independent (i.e. Direct Fiscal support and Green Bonds) variables. This again is to determine if one variable can be explained by the other, in line with the study objectives.
- Both parametric and non-parametric test were used to test the hypotheses and the outcome was consistent.

3.4.2 Data Analysis Methods

3.4.2.1 Demographics of the participants.

"Demographics are characteristics of a population. Characteristics such as race, ethnicity, gender, age, education, profession, occupation, income level, and marital status, are all typical examples of demographics that are used in surveys".

- The demographic parameters of the respondents includes:
    1. Age
    2. Job level
    3. Type of organization and
    4. Years of working experience

- The purpose of producing the demographics.

  The purpose of the demographics was to test the reliability and quality of the responses on the basis of how the respondents are characterized. Respondents that are highly experienced, occupying high level jobs in their organisations and also working in relevant organization with regard to subject being explored were considered to be of good quality.

3.4.2.2 Descriptive statistics:

Descriptive statistics were used to describe the basic features of the data in the study. They provided basic summaries about the sample and the measures such as central tendency and the spread of the data.

The study calculated the means and standard deviation of each of the questions and for the three variables which are "Green Fund", "Direct Fiscal Support" and "Green Bonds". The most popular measure of central tendency is the mean. The study used the mean to measure which of the questions indicated the highest or lowest mean so as to be able to drill down for further understanding of the underlying reasons. In addition the study also used the standard deviation to measure how spread out numbers are around the mean.

3.4.2.3 Generated reliability test

The study uses the Cronbach's alpha to measure the internal consistency and reliability of the data. "Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency)". (Gliem & Gliem, 2003)

According to George and Mallery (2003), the following rules of thumb apply: "any score above 0.9 is considered Excellent, above 0.8 is Good, above 0.7 is Acceptable, above 0.6 is Questionable, above 0.5 is Poor, and below 0.5 is Unacceptable" can be used to determine the appropriate level of reliability. Therefore a score of 0.7 and above was considered acceptable by this study. (Gliem & Gliem, 2003)

3.4.2.4 Correlation analysis:

A correlation analysis was conducted between three variables which are "Green Fund Support", "Direct Fiscal Support" and "Green Bonds". Correlation analysis measures the relationship between two items. The resulting value shows if changes in one item will have an impact on changes in the other item. The study used Pearson's correlation coefficient which is a statistical measure of the strength of a linear relationship between paired data. (Camm, Cochran, Fry, Ohlmann and Anderson, 2013)

"Positive values denotes positive linear correlation, negative values denote negative linear correlation and a value of 0 denotes no linear correlation. The closer the value is to 1 or –1, the stronger the linear correlation". (Camm, Cochran, Fry, Ohlmann and Anderson, 2013)

When comparing the correlation between two items, one item is called the "dependent" item and the other the "independent" item. In this study the dependent item is "Green Fund Support" and the independent items are "direct fiscal Support" and "Green Bonds". The goal is to see if a change in the independent item (i.e. "direct fiscal Support" and "Green Bonds") will result in a change in the dependent item ("Green

Fund Support"). This information helps us understand the predictive abilities of both "direct fiscal Support" and "Green Bonds".

3.4.2.5 Normality test:

The study tested the data for normality using histogram in order to ensure that appropriate statistical tests are applied in analyzing the data. For example, parametric tests can be used when data is normal but for non-normal data non-parametric tests are more appropriate.

Even though the normality test showed that the data was not normal, for comparative purposes the study went further and run both parametric and non-parametric tests in order to compare the outcomes, and the outcomes though different converged to the same conclusion with regard to hypotheses testing. As already stated, this is consistent with study conducted by Murray (2013) which indicated that both parametric and non-parametric can yield similar interpretation. (Murray, 2013)

3.4.2.6 Non-parametric tests:

The study used the Kruskal–Wallis test by ranks or One-way ANOVA on ranks which is a non-parametric method for testing whether samples originate from the same distribution. The used this test to compare the three independent samples of equal sample sizes.

3.4.2.7 Parametric tests:

Parametric statistical test is one that makes assumptions about the parameters of the population distribution(s) from which one's data are drawn. This study uses the Analysis of Variance (ANOVA) which is a statistical method used to test differences between two or more means. The reason for doing an ANOVA is to see if there is any difference between the question grouping, which is "Green Fund Support", "Direct Fiscal Support" and "Green Bonds".

The study also run a regression analysis. A regression analysis is a statistical process for estimating the relationships among variables. It is quite useful in understanding how

the typical value of the dependent variable ("Green Fund Support") changes when any one of the independent variables (i.e. "direct fiscal Support" and "Green Bonds") is varied, while the other independent variables are held fixed.

3.5 Ethical Issues

It was to be expected that most organisations and government departments would not want any negative perception about them to be created due to the information made available. Therefore critical ethical issues such as informed consent, confidentiality, anonymity and discontinuance were considered in this research (Gall, Borg & Gall, 1996).

The objective of the study was clearly explained to all participants and consent was obtained. Confidentiality and anonymity was contractually guaranteed where necessary.

3.6 Constraints and Limitations of the study

The study could not cover all potential financial instruments available for climate or green finance but was mainly limited to green/climate bonds.

Another limitation encountered was the willingness of the sample institutions to release data that has a potential of creating a negative perception of the organization, this resulted in some of the key organization not responding to the questionnaire.

3.7 Summary:

The study explored the use of green bonds as a more efficient funding mechanism for the National Green Fund that the current direct Fiscal Support, through a survey of key players within Development Finance Institutions, relevant Government departments and the private sector among others. Relevant data analysis techniques are applied to deduce key findings, while also acknowledging the ethical challenges and the limitations of the study.

The key finding and analysis of the data is presented in the next chapter.

CHAPTER 4: RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the results of the study. The chapter includes the characterisation of the data, the various tests that were carried out and the rationale as per chosen research methodology, and the analysis of the outcomes. The chapter provides the basis on which conclusions and recommendations of the study are formulated.

4.2 Sample description

The sample was drawn from a population that is made up of national and international developmental financial institutions that have raised green bonds or provided transactional advice to organization that raise green bonds, National institutions that have already successfully raised green bonds, department of environmental affairs that is the custodian of the National Green Fund, the Johannesburg Stock Exchange (JSE), the National Business Initiative, Private companies that have worked with the Green Fund, National Treasury which is responsible for fiscal allocation and lastly DBSA/Green Fund employees and Green Fund management committee (Mancom).

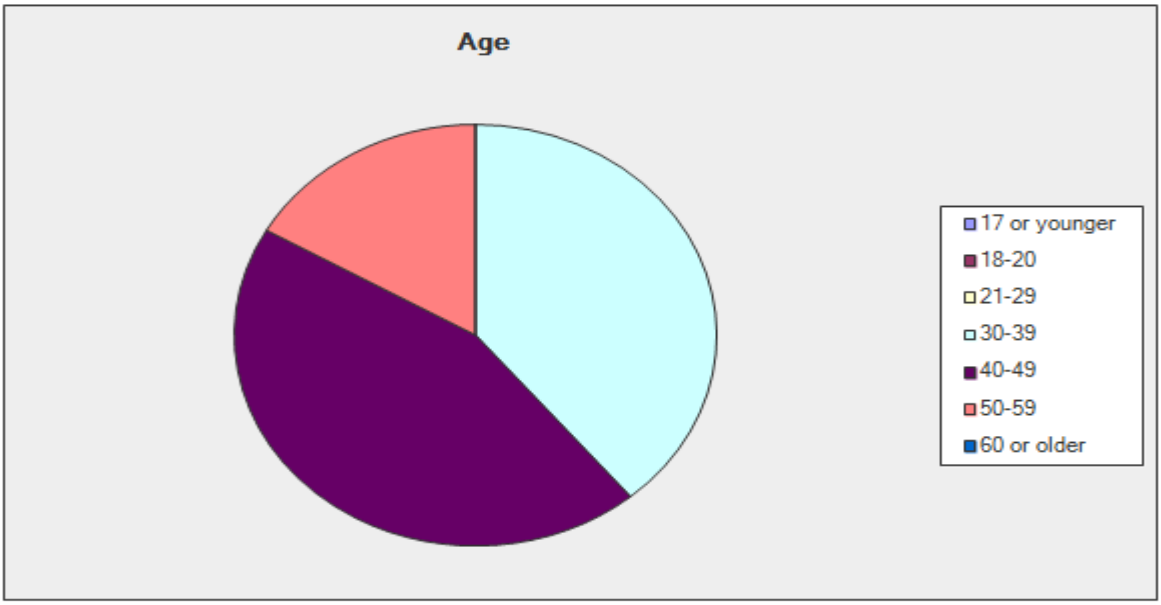
A total of 40 key personnel from the institutions listed above was sampled. Out of the 40 sampled, 18 responses where received which constitutes a response rate of 45%.

4.3 Age statistics

We will first report on the age of the 18 respondents as per figure 4.1 below.

- None of the respondents were 29 years or below
- 7 respondents were between 30 to 39 years of age
- 8 respondents were between 40 to 49 years of age and lastly
- 3 respondents were between 50 to 59 years.

Figure 4.1: Age statistics

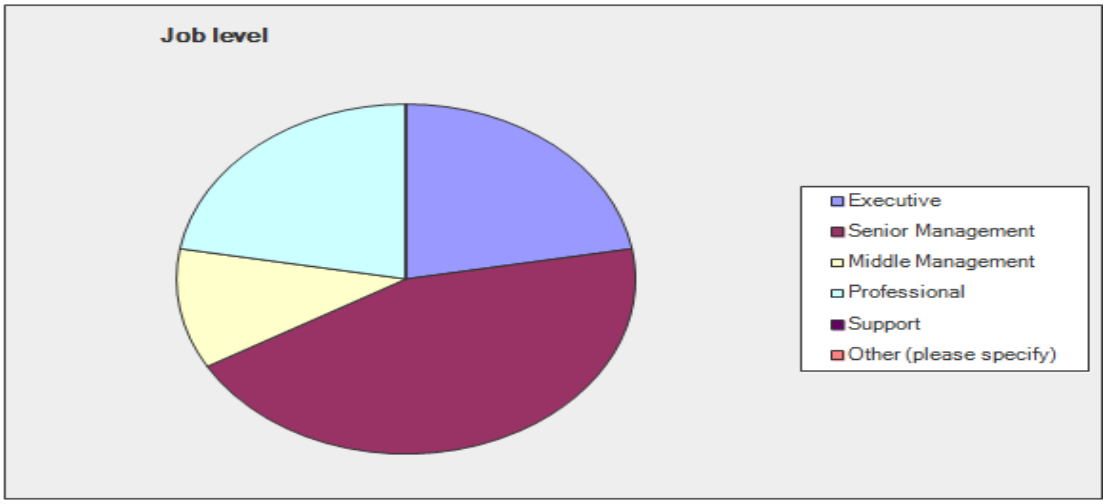


4.4 Job level statistics:

As per figure 4.2 below we now report on the job level of the 18 respondents.

- 22% of the respondents were at an executive level in their organisations
- 45% at a senior management level
- 11% at middle management level and lastly
- 22% at professional level

Figure 4.2: Job level statistics

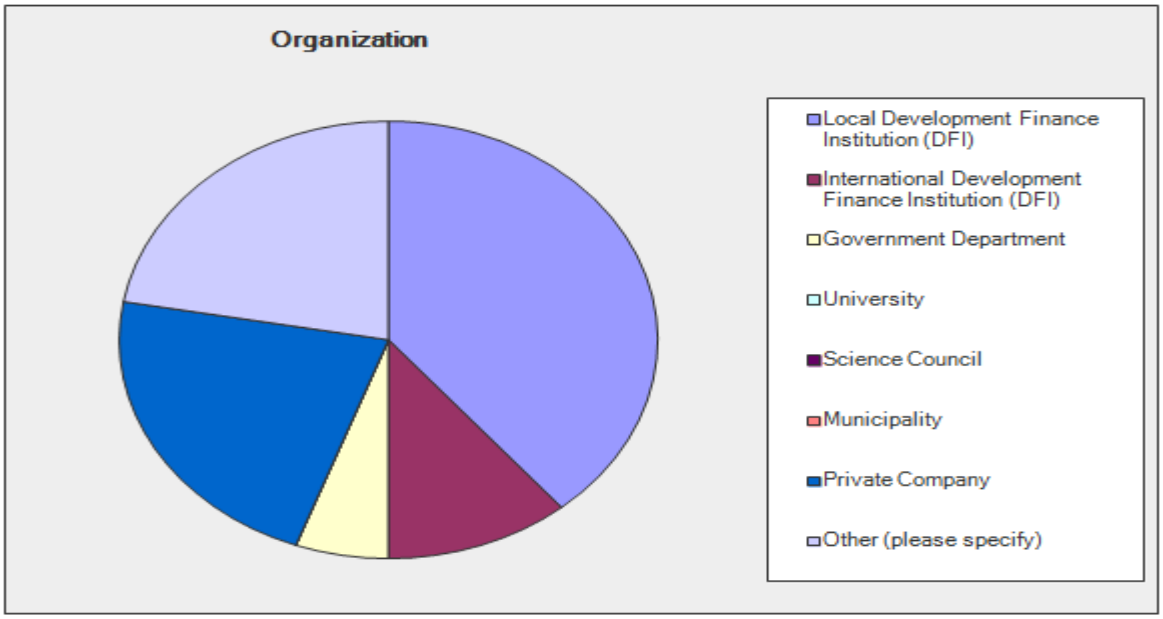


4.5 Organisation type statistics:

As indicated in figure 4.3 below, we now report on the statistics regarding the type of organisation that the 18 respondents came from.

- 39% came from local Development Finance Institutions (DFIs)
- 11% came from international DFIs
- 6% came government departments
- 22% came from private companies and lastly
- 22% were classified as other (this includes JSE)

Figure 4.3: Organisation statistics

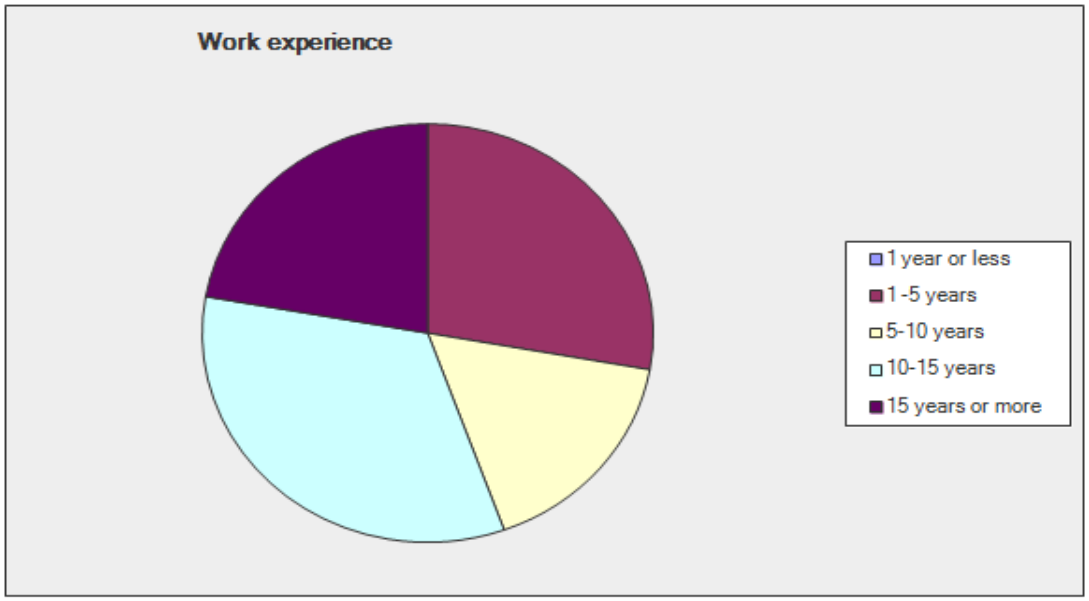


4.6 Work experience statistics:

As per figure 4.4 below, we are now reporting on the number of years work experience of the 18 respondents.

- 28% of the respondents had between 1 to 5 years' experience
- 17% between 5 to 10 years
- 33% between 10 to 15 years and lastly
- 22% 15 years or more

Figure 4.4: Work experience statistics

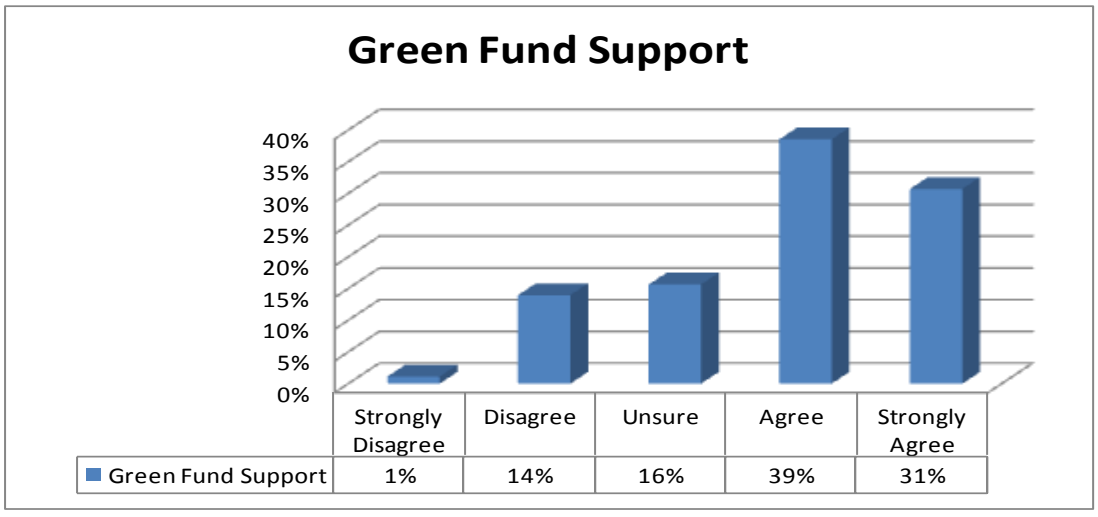


4.7 Green Fund support statistics:

As per figure 4.5 below, we report on the general answering tendencies of the respondents with regard to their support for the Green Fund as an appropriate funding mechanism for transitioning to a green economy.

- 31% of the respondents strongly agreed
- 39% agreed and
- 16% were unsure and
- 14% disagreed

Figure 4.5: National Green Fund Support Statistics

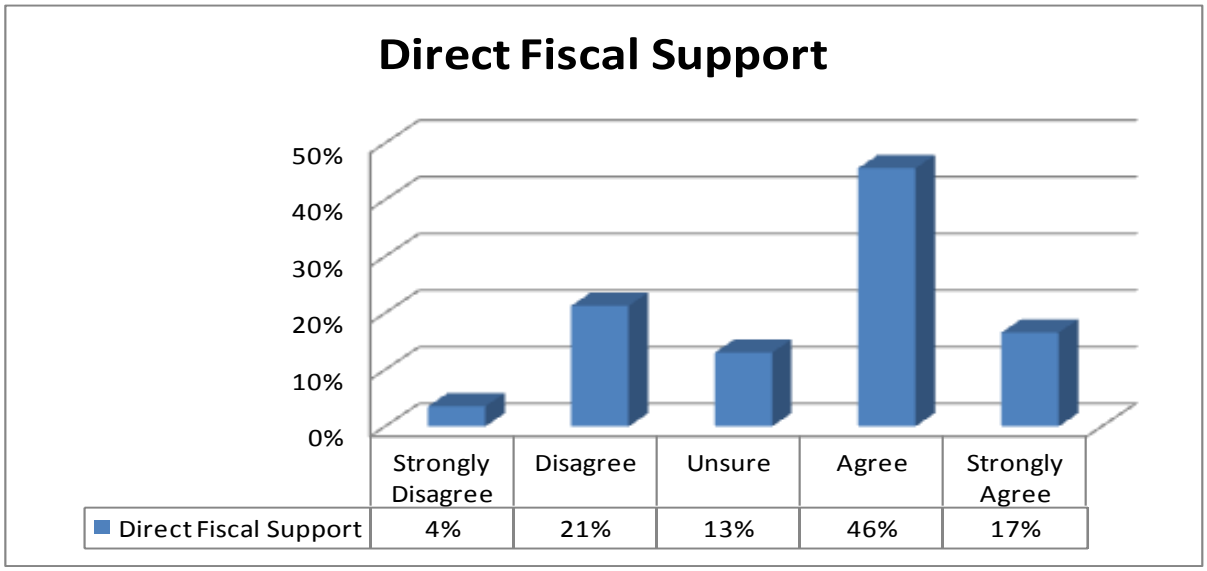


4.8 Direct Fiscal Support statistics

As per figure 4.6 below, we report on the general answering tendencies of the respondents with regard to their support for the Direct Fiscal support as an appropriate way to capitalise the transition to a green economy.

- 17% of the respondents strongly agreed
- 46% agreed and
- 13% were unsure and
- 21% disagreed

Figure 4.6: Direct Fiscal Support Statistics

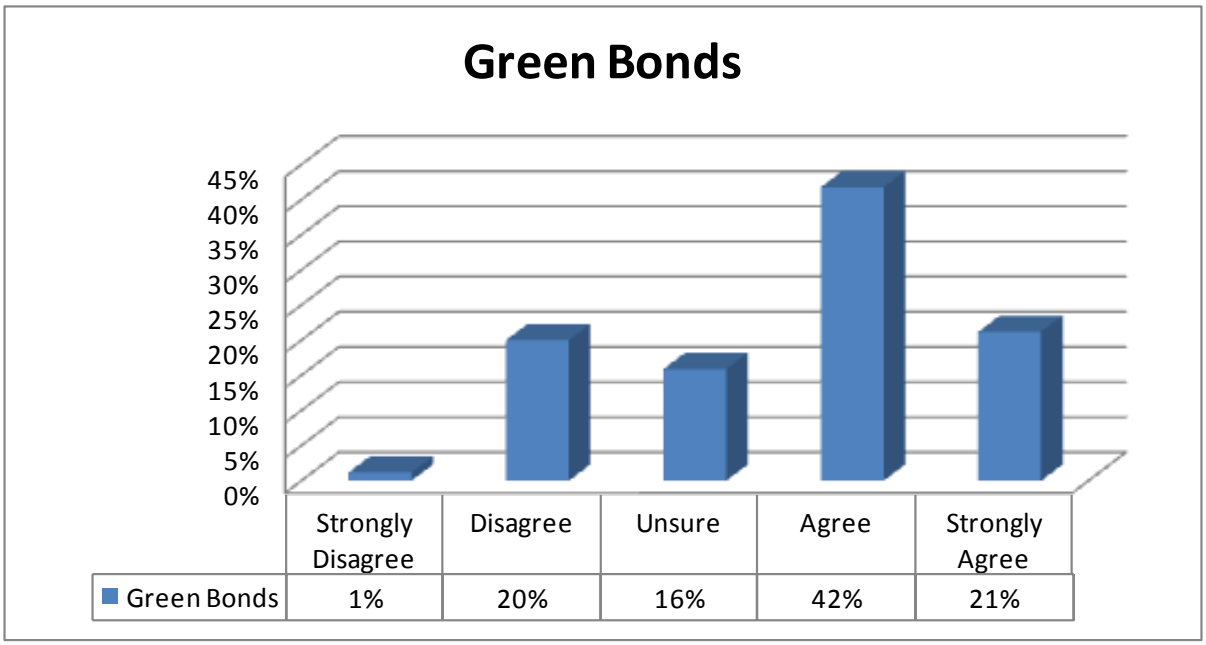


4.9 Green Bond support statistics

As per figure 4.7 below, we report on the general answering tendencies of the respondents with regard to their support for the Green Bonds as an appropriate mechanism to finance the transition to a green economy.

- 21% of the respondents strongly agreed
- 42% agreed and
- 16% were unsure and
- 20% disagreed

Figure 4.7: Green Bonds Statistics



4.10 Descriptive Statistics of Variables

We will now present the descriptive statistics of the variables. The statistics are presented per item in Table 4.1 below and we will further present the highest and lowest mean and standard deviation scores per group of questions (as per attached questionnaire).

4.10.1 Descriptive Statistics: National Green Fund Support

- Question number 5 (GFS5) in this section indicated the highest "measure of central tendency" with a mean of 4.1667. However, its "measure of dispersive tendency" was the lowest with a standard deviation of 0.7071.

- Questions GFS2, GFS8 and GFS9 in this section indicated the second highest "measure of central tendency" with a mean of 4.1111 and a "measure of dispersive tendency" that was higher than that of GFS5 with a standard deviation of 0.9003, 1.0226 and 1.0226 respectively.

- Question GFS7 displayed the least “measure of central tendency” with a mean of 2.7778 and the highest “measure of dispersive tendency” with a standard deviation of 1.1660.

4.10.2 Descriptive Statistics: Direct Fiscal Support

- Question number 5 (DFS5) in this section indicated the highest “measure of central tendency” with a mean of 4.0000. However, its “measure of dispersive tendency” was the lowest with a standard deviation of 0.7071.

- Questions DFS8 and DFS10 in this section indicated the second highest “measure of central tendency” with a mean of 3.9412 and a “measure of dispersive tendency” that was higher than that of DFS5 with a standard deviation of 0.8993 and 0.8269 respectively.

- Question DFS7 displayed the least “measure of central tendency” with a mean of 2.6250 and the highest “measure of dispersive tendency” with a standard deviation of 1.3101.

4.10.3 Descriptive Statistics: Green Bonds as financing mechanism

- Question number 2 (GBS2) in this section showed the highest “measure of central tendency” with a mean of 4.3529 and a “measure of dispersive tendency” indicated by a standard deviation of 0.6063.

- Questions GBS3 and GBS1 in this section showed the second highest “measure of central tendency” with a mean of 4.2353 and 4.1176 respectively and a “measure of dispersive tendency” indicated by standard deviation of 0.6647 and 0.7812 respectively.

- Question GBS10 showed the least “measure of central tendency” with a mean of 2.3529 and a “measure of dispersive tendency” indicated by standard deviation of 0.9315.

Table 3: Descriptive Statistics per Item

Item	N	Mean	SD
National Green Fund Support			
GFS1	17	3.8235	1.0146
GFS2	18	4.1111	0.9003
GFS3	18	4.0556	0.9376
GFS4	18	3.7778	0.8782
GFS5	18	4.1667	0.7071
GFS6	18	4.0556	0.9984
GFS7	18	2.7778	1.1660
GFS8	18	4.1111	1.0226
GFS9	18	4.1111	1.0226
GFS10	18	3.3889	1.1448
Direct Fiscal Support			
DFS1	17	3.1176	1.1114
DFS2	17	3.4118	1.2277
DFS3	17	3.0000	1.2247
DFS4	17	3.5294	1.0676
DFS5	17	4.0000	0.7071
DFS6	17	3.6471	1.0572
DFS7	16	2.6250	1.3102
DFS8	17	3.9412	0.8993

DFS9	17	3.7647	0.9034
DFS10	17	3.9412	0.8269
Green Bonds			
GB1	17	4.1176	0.7812
GB2	17	4.3529	0.6063
GB3	17	4.2353	0.6642
GB4	17	3.5882	0.9393
GB5	17	3.1176	1.2187
GB6	17	3.0000	1.2247
GB7	17	3.9412	0.6587
GB8	17	4.0588	0.7475
GB9	17	3.4118	0.9393
GB10	17	2.3529	0.9315

4.11 Descriptive statistics and Cronbach's alpha coefficient:

We will now present Cronbach's alpha values as per Table 4.2 below for the different group of questions to determine the internal consistency or average correlation of the items in the survey instrument to gauge its reliability.

The reliability coefficient (Cronbach alpha) for **National Green Fund Support** was 0.7683, which is acceptable considering the 0.7 minimum threshold as per (Gliem & Gliem, 2003).

The reliability coefficient (Cronbach alpha) for **Green Bonds** group of questions was 0.7684, which is also acceptable considering the 0.7 minimum threshold as per (Gliem & Gliem, 2003).

The reliability coefficient (Cronbach alpha) for **Direct Fiscal Support** group of questions was highest at 0.8303, which is even more acceptable considering the 0.7 minimum threshold as per (Gliem & Gliem, 2003).

Table 4: Descriptive Statistics and Cronbach's alpha Coefficient per Group

Sub-scale	**Mean**	**SD**	**Range**	**Cronbach Alpha**
Total	3.8379	0.9792	1-5	0.7683
Direct Fiscal Support				
Total	3.4978	1.0336	1-5	0.8303
Green Bonds				
Total	3.6176	0.8712	1-5	0.7684

4.12 Correlation Analysis

As per Table 5a and 5b below, we now present the correlation between dependent variable which is Green Fund support with the independent variables which are Direct Fiscal support and Green Bonds. The different sets of data are correlated as a measure of how well they are related or what is the strength of the relationship. Both Pearson and Spearman Correlation stats is used to show the linear relationship between two pairs of data sets. A 95 significance level is assumed for this study.

- **Pearson Correlation**: The correlation of both pairs of data sets is quite strong. However, the Green Fund and Green Bonds data sets display a slightly stronger relationship than the Green Fund and Direct Fiscal support data set at 0.9197 and 0.8313 respectively.

Table 5a and 5b: Correlation matrix of National Green Fund Support, Direct Fiscal Support and Green Bonds

Table 5a

Pearson Correlation	National Green Fund Support		Direct Fiscal Support		Green Bonds	
	Correlation	Sig.	Correlation	Sig.		
National Green Fund Support	1		0.8313	0.081	0.9197	0.027
Direct Fiscal Support	0.8313	0.081	1		0.9749	0.0048
Green Bonds	0.9197	0.027	0.9749	0.0048	1	

- **Spearman Correlation**: The correlation of both pairs of data sets is quite strong. However, the Green Fund and Green Bonds data sets display a much stronger relationship than the Green Fund and Direct Fiscal support data set at 0.9 and 0.7 respectively.

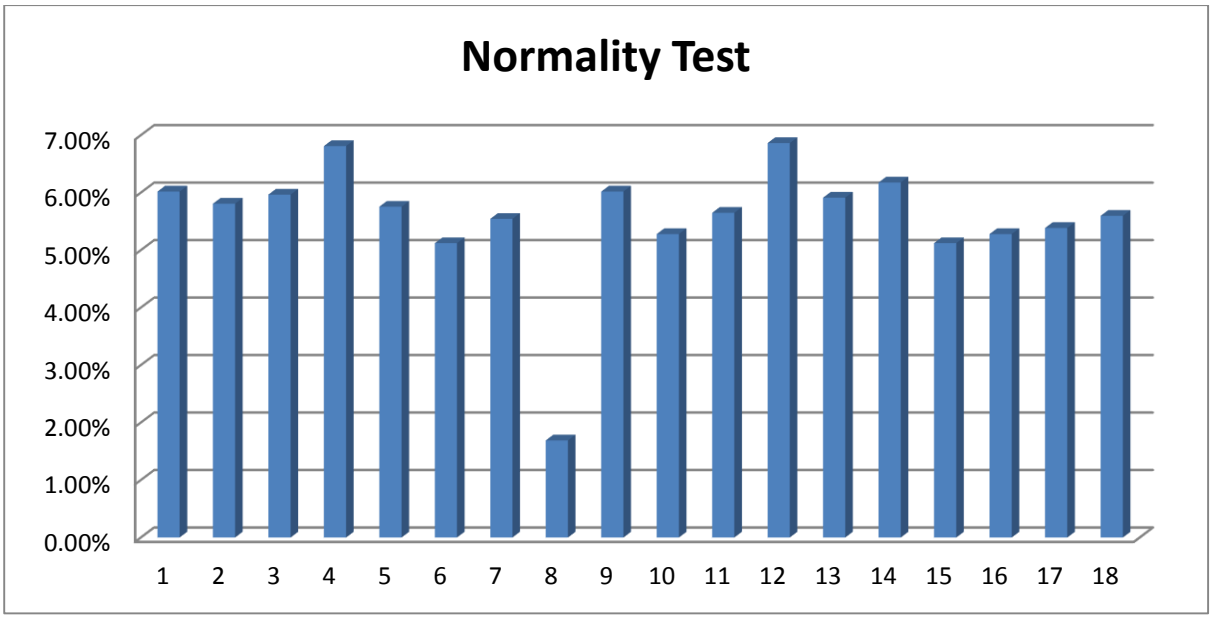
Table 5b

Spearman Correlation	National Green Fund Support		Direct Fiscal Support		Green Bonds	
	Correlation	Sig.	Correlation	Sig.		
National Green Fund Support	1		0.7	0.1881	0.9	0.0374
Direct Fiscal Support	0.7	0.1881	1		0.9749	0.0374
Green Bonds	0.9	0.0374	0.9	0.0374	1	

4.13 Inferential statistics

To test for normality of the distribution, we will now present the inferential statistics of dependent variable versus that of the independent variable. The histogram in Figure 4.8 below shows the distribution of the data

Figure 4.8: Normality Test



From the distribution of the data on the table above, it can be noted that the data is not normal. For that reason we are not justified to use parametric statistical methodology.

However, according to Murray (2013) parametric and non- parametric tests such as Pearson and Spearman rho conducted on Likert scale data do not affect the conclusions drawn from the results. Therefore, both parametric and non-parametric test were done and compared to see if there is any difference with regard to the outcomes. (Murray, 2013)

We will now present the outcomes of both tests:

4.14 Dependent variable: National Green Fund Support

Independent Variable: Direct Fiscal Support

4.14.1 Non parametric Tests:

Kruskal-Wallis Test	
Chi-Square	15.5135
DF	14
Pr > Chi-Square	0.344

At 95% significance level, the P value of 0.344 indicated in the table above is a lot greater than 0.05 which indicates that there is insufficient evidence to reject the null hypothesis.

4.14.2 Parametric Tests:

The ANOVA Procedure
Dependent Variable: National Green Fund Suppot

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	14	486	34.7142857	2.71	0.2239
Error	3	38.5	12.8333333		
Corrected Total	17	524.5			

R-Square	Coeff Var	Root MSE	TOTAL1 Mean
0.926597	9.386107	3.582364	38.16667

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Direct Fiscal Supp	14	486	34.7142857	2.71	0.2239

At 95% significance level, the P value of 0.2239 indicated in the table above is greater than 0.05 which again indicates that there is insufficient evidence to reject the null hypothesis.

4.15 Dependent variable: National Green Fund Support
Independent Variable: Green Bonds

4.15.1 Non parametric Tests:

Kruskal-Wallis Test	
Chi-Square	12.8749
DF	11
Pr > Chi-Square	0.3016

At 95% significance level, the P value of 0.3016 indicated in the table above is a lot greater than 0.05 which also indicates that there is insufficient evidence to reject the null hypothesis.

4.15.2 Parametric Tests:

The ANOVA Procedure
Dependent Variable: National Green Fund Support

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	383	34.8181818	1.48	0.3285
Error	6	141.5	23.5833333		
Corrected Total	17	524.5			

R-Square	Coeff Var	Root MSE	TOTAL1 Mean
0.730219	12.72384	4.856267	38.16667

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Green Bonds	11	383	34.8181818	1.48	0.3285

At 95% significance level, the P value of 0.3285 indicated in the table above is greater than 0.05 which again indicates that there is insufficient evidence to reject the null hypothesis.

4.16 The relationship between predictor and predicted variable, as well as mediation

In this section, we will now present the relationships between predictor and predicted variable with reference to Pearson's correlation, and linear regression.

As per Table 4.3 above, the correlation between "Green Fund support" with "Direct Fiscal Support" and also that of "Green Fund support" and "Green bonds" seem quite strong with correlation figures (R value) of 0.8313 and 0.9197 respectively. The correlation between "Green Bonds" and "Direct Fiscal Support" is also quite strong with an R value of 0.9749. This figures are close to 1 which indicates near perfect correlation.

We will now compare the R-squared, Adjusted R-squared and the standard error of the estimate for three different linear regression models. The three models are shown below.

We will present "percent of variance explained" as per R-squared indicated in each model. R-squared indicates the proportional level of variation in the response dependent that is due to the independent variables in the linear regression model. A bigger R-squared indicates that more variability is explained by the linear regression model

To mitigate the limitations of the R-squared, we will also present the adjusted R-squared which adjusts the statistic based on the number of independent variables in the model. The adjusted R-squared compares the explanatory power of regression models based on a numbers of different predictors.

We will further present the "standard error of the estimate" which is a measure of the accuracy of predictions. The "standard error of the estimate" tells us how close our sample mean is to the true mean of the overall population. The smaller values are better because it indicates that the observations are closer to the fitted line, which means that the prediction are more accurate.

Model 1:

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: National Green Fund Support

Number of Observations Read	18
Number of Observations Used	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	59.60093	59.60093	2.05	0.1713
Error	16	464.89907	29.05619		
Corrected Total	17	524.5			

Root MSE	5.39038	R-Square	0.1136
Dependent Mean	38.16667	Adj R-Sq	0.0582
Coeff Var	14.12327		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	32.21462	4.34572	7.41	<.0001
Direct Fiscal Sup	1	0.18097	0.12636	1.43	0.1713

Model2:

Model: Linear_Regression_Model
Dependent Variable: National Green Fund Support

Number of Observations Read	18
Number of Observations Used	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	33.56142	33.56142	1.09	0.3112
Error	16	490.93858	30.68366		
Corrected Total	17	524.5			

Root MSE	5.53928	R-Square	0.064
Dependent Mean	38.16667	Adj R-Sq	0.0055
Coeff Var	14.51341		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	33.29753	4.83531	6.89	<.0001
Green Bonds	1	0.14251	0.13626	1.05	0.3112

Model3:

The REG Procedure
Model: Linear_Regression_Model
Dependent Variable: National Green Fund

Number of Observations Re	18
Number of Observations Us	18

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	61.89276	30.94638	1	0.3899
Error	15	462.60724	30.84048		
Corrected Total	17	524.5			

Root MSE	5.55342	R-Square	0.118
Dependent Mean	38.16667	Adj R-Sq	0.0004
Coeff Var	14.55045		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	31.49351	5.20024	6.06	<.0001
Direct Fiscal Su	1	0.15488	0.16159	0.96	0.353
Green Bonds	1	0.04623	0.16957	0.27	0.7889

4.17 Comparison of the three models:

Table 6

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.8313	0.1136	0.0582	0.12636
2	0.9749	.064	.0055	0.13626
3		0.118	0.0004	0.16

4.17.1 R square values:

- The comparison of the R values has already been presented in section 4.3
- The R squared values indicates that for Model 1 only 11% of the variation in the response dependent variable is explained by the independent variables.
- The R squared values indicates that for Model 2 the values are even lower with only 6.4% of the variation in the response dependent variable is explained by the independent variables.
- The R squared values indicates that for Model 3 only 11, 8% of the variation in the response dependent variable is explained by the independent variables.

4.17.2 Adjusted R square values:

- The adjusted R-squared value for Model 1 is 5.8% which compares the explanatory power of regression model 1 with that of Model 2 that is 0.5% and that of Model 3 that even lower at 0.04%.

4.17.3 Standard error of the estimate:

- For Model 1 the "standard error of the estimate" of 0.12636 is small enough and thus indicates a good measure of the accuracy of predictions.
- For Model 2 the "standard error of the estimate" is 0.13626 which is also a good measure of the accuracy of predictions
- For Model 3 the "standard error of the estimate" is approximately 0.16 which is still a reasonable measure of the accuracy of predictions

4.18 Summary

The chapter presented the results of the study and an analysis of the outcomes. An initial data characterisation including an analysis of the demographics was carried out. This was followed by descriptive statistic tests and the Cronbach's alpha coefficient to test for data reliability. A correlation and linear regression tests were also carried out following a normality test to determine if the distribution of the data. Lastly inferential statistic tests were conducted and the hypothesis was tested.

This has laid a good foundation to discuss the recommendations and conclusions of the study in the next chapter.

CHAPTER 5: RESEARCH CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction:

This chapter summarizes the main findings of the study, drills down into the unexpected outcomes, assesses how the findings relate to both literature and the experiences of the Green fund in the last three years of implementation. A presentation of the findings against the objectives of the study and the stated hypothesis is done followed by recommendations, policy implications and suggested areas of future research.

5.2 Demographics of respondents

The demographics showed that the respondents were mainly matured individuals (majority from 40 to 49 years of age), 70% occupying executive and senior positions in their organisations, with many years working experience (majority 10 to 15 years work experience) and about 50% coming from local and international Development Finance Institutions. It is therefore reasonable to deduce that the responses given would be based on sound judgment which enhances reliability.

5.3 Main findings of the study

This study sought to explore **green or climate bonds** as a more efficient and effective mechanism than the current **direct fiscal support** in capitalizing the **National Green Fund**.

The key finding were as follows

- A total of 70% of the respondents (i.e. combination of those who strongly agreed and those who simply agreed) agreed that the **National Green Fund** in its current form is an appropriate funding mechanism for transitioning the country to a green economy. Only 14% disagreed and the balance were unsure.
- A total of 63% of the respondents (i.e. combination of those who strongly agreed and those who simply agreed) agreed that **Direct Fiscal Support** is an appropriate way to capitalise the transition to a green economy. Only 21% disagreed and the balance were unsure.
- A total of 63% of the respondents (i.e. combination of those who strongly agreed and those who simply agreed) agreed that **Green Bonds** are an appropriate way

to capitalise the transition to a green economy. Only 20% disagreed and the balance were unsure.

5.4 "Deep dive" into the key findings

The unexpected outcomes of the study was that both Direct Fiscal Support and Green Bonds seemed to be equally supported by the respondents, in spite of their significant differences as forms of financing mechanisms. The expectation was that at least one of the two mechanism would come out as the preferred one, with regard to capitalising the National Green Fund. But a "deep dive" analysis into the reasons behind this outcome yielded the following:

5.4.1 Direct Fiscal Support:

- Question number DFS5 (i.e. *"Direct fiscal support makes it possible to **extend grant funding** to support **high risk innovative green projects** that would not be able to carry **repayment obligations**")* indicated the highest "measure of central tendency" with a mean of 4.0000.
- Questions DFS8 and DFS10 *(i.e. "Direct fiscal support is better positioned to attract and **"crowd in" private sector** participation in funding green projects" and "Direct fiscal support is limited by **political and economic "short-termism**" that is tied to election cycles")* indicated the second highest "measure of central tendency" with a mean of 3.9412
- Question DFS7 *(i.e. "The use of direct fiscal support to provide non-recoverable grant funding for green projects is **sustainable**")* displayed the least "measure of central tendency" with a mean of 2.6250

The above analysis indicates that respondent support for **Direct Fiscal Support** as an appropriate way to capitalise the transition to a green economy was based on the following key issues:

- Its ability as funding mechanism to extend grand funding in support of high risk green projects which would not be able to carry repayment obligations.
- Direct fiscal support was also seen as better positioned to "crowd in" private sector support.

However, most respondents indicated that **Direct Fiscal Support** as a mechanism to capitalise the transition to a green economy displayed the following key shortcomings:

- direct fiscal support as a financing mechanism was not sustainable and
- could be limited by political *"short-termism" that* is tied to election cycles

5.4.2 Green bonds:

- Question GBS2 *(i.e. "A more effective role for Government in transitioning to a greener economy could be through the **guarantee** of Green Bonds")* showed the highest "measure of central tendency" with a mean of 4.3529.
- Questions GBS3 and GBS1 *(i.e. "Green bonds could be a more effective mechanism to use in **supporting multiyear green projects**" and "Green bonds are better positioned as a mechanism to raise the **significant levels of funding required** to transition the country's economy to a greener one")* showed the second highest "measure of central tendency" with a mean of 4.2353 and 4.1176 respectively.
- Question GBS10 *(i.e. "Green bonds are limited by **political and economic "short-termism"** that is tied to election cycles")* showed the least "measure of central tendency" with a mean of 2.3529.

This indicates that respondent support for **Green Bonds** as an appropriate way to capitalise the transition to a green economy was based on the following key issues:

- It could provide a platform for Government to use guarantees to support green investments.
- It is best positioned to support multiyear green projects due to its long tenor and could thus mitigate against the potential for political and economic "short-termism" that is tied to election cycles that "direct fiscal support" could be prone to.
- Could also be quite useful in raising the significant levels of funding required to support the transition to a greener economy.

However, most respondents indicated that **Green Bonds** as a mechanism to capitalise the transition to a green economy could be constrained by the following key shortcomings:

- Green bonds are not suited to support high risk green projects which would not be able to carry repayment obligations.
- They could also be limited in their ability to "crowd in" private funding, especially for high risk green projects (which are not yet bankable) that need financial support the most. Mostly this type of projects require some form of grant funding or technical support that Green Bonds are not able to provide due their risk/return expectations.

5.5 How the finding relate to the reviewed literature and the experience of the National Green Fund in the last three years of implementation.

- Supporting high risk projects

The national Green Fund has in the last three years run 3 public requests for proposals (RfP), with a total of 590 applications received in the first RfP. Only 25 proposals out of the 590 were recommended for consideration by the Green Fund Management Committee, which means that most of the proposals could not be considered for funding. This serves as some indication of the number of very high risk green projects that are out there seeking funding but are still at an early stage of development and as such not bankable.

The Caisse des Dépôts Group (2012) indicates that a big part of the funding needs for green projects is for the high risk projects that are at an early stage of development. To complement the existing instruments such emissions trading systems or carbon offsetting, green bonds holds some promise as a follow-on financing instrument. (Caisse des Dépôts Group, 2012).

However, Timbers (2014) contradicts the Caisse des Dépôts Group's assertion that green bonds could be used for high risk projects. Timbers (2014) indicates that green bonds are a more appropriate financial instruments for large scale, capital-intensive, green infrastructure projects that can be repaid by steady, modest, long-term cash flows. This is obviously not applicable to early stage, high risk projects which uses new sustainable technology that are still experimental and have not been fully tested in the market.

Timbers (2014) further mention that bond investors have less risk appetite for high risk projects. The majority of green bonds issued to date have been rated as investment grade, which means they are safe, secure investments, and most of the projects financed have been in renewable energy or sustainable transportation. While renewable energy and sustainable transport projects are mostly investment grade, most other green investment projects are not investment grade, thus not suited for green bonds (Timbers, 2014)

According to the World Economic Forum (2013) attracting private finance to support green technologies can be quite challenging due to the real or sometimes perceived risks associated with new technologies. This is especially the case as potential investors would compare their risk/return profile with that of proven conventional technologies. (World Economic Forum, 2013)
There is therefore alignment with both literature and Green Fund experiences with regard to "direct fiscal support" being better placed than "green bonds" to support early stage, high risk green projects.

- Supporting multiyear green projects

The National Green Fund provides concessional loans and recoverable grants with payment periods of up to 15 years. The Green Fund is currently a three year program which means its time horizon is not aligned to that of the projects, which makes the fund unsuitable for long term multiyear projects.

Renewable energy projects like many green projects require long tenor repayment structures which is not compatible with limited tenor associated with bank loans. Therefore, to attract financial markets to fund green investment there needs to be alignment with regard to tenor but also with factors such as interest rate and the general terms of debt. (Shrimali, 2015)

Lanz (2014) also states that the prevailing green bonds maturities of ten, twenty, thirty, or even more years, could enable issuers to raise sufficient capital for investments in large-scale green infrastructure projects while amortizing cost over a longer period. He further states that green bonds could generate positive employment and positive macroeconomic effects (Lanz, 2014)

Therefore, long tenor of green projects is suitable for bonds issuance. Green projects such as renewable energy mostly require large front loading and then provide regular positive cash flows in form of an annuity. (Caisse des Dépôts Group, 2012).

Robins and Knight (2012) corroborate this assertion by stating that Green bonds are well-suited to financing the scale up of low-carbon and climate resilient infrastructure. (Robins & Knight, 2012)

Shrimali (2015) further notes that the long tenor required to support green investments are ideally suited for institutional investors such as pension funds and insurance companies who holds large reserves of funds. Their risk/return profile is also well aligned with green investments. Therefore efforts should be made to crowd in institutional investors to support green investments, especially as this kind of investors are increasingly attracted by ESG credentials of projects (Shrimali, 2015)

There is therefore alignment with both literature and Green Fund experiences with regard to “green bonds” being better placed than “direct fiscal support” to support multiyear green projects.

- Crowding in private finance

The national Green Fund received R1.1 billion in direct fiscal support to fund green initiatives over a three year period. The intention was that this initial capitalization will allow the fund to leverage addition funds from various sources including private sector.
To date there has been a lot of interest from other sources of funds to support the Green Fund which has necessitated a restructure of the fund such that it is positioned to receive the funds. It would seem that direct fiscal support can indeed help attract additional funding.

Voica *et al* (2014) states that Institutional investors need a financial aggregating vehicle to provide the bridge. The climate or green bond is intended as just such a bridge, and is designed to attract primarily institutional investors such as pension funds. (Voica, Panait & Radulescu, 2014)

According to the World Economic Forum (2013) government should consider reform policies and incentives in order to provide right signals for private investors to consider green investments. Private sector investment can further be attracted by using a range of proven instruments and mechanisms including public finance to help reduce the cost of capital and investment risks. (World Economic Forum, 2013)

There is therefore alignment with both literature and Green Fund experiences with regard to "direct fiscal support" being best placed to support the crowding in of private finance. The misalignment with literature is observed where respondents seem to suggest that "green bonds" are not suited for crowding in private finance. Literature indicates as seen above that green bonds are best positioned to attract the large pool of funds that are in the hands of institutional investors such as pension funds and insurance companies.

- Political and economic “short-termism”

  Based on the last three years of the implementation of the National Green Fund, the potential of political and economic “short-termism” being a challenge with regard to green investment is quite realistic. As an example, the long investment tenor are not aligned with the five year election cycles which can be problematic when newly elected political heads wishes to follow a different strategy from that of their predecessors.

  Lanz (2014) states that the prevailing green bonds maturities of ten, twenty, thirty, or even more years, could enable issuers to raise sufficient capital for investments in large-scale green infrastructure projects while amortizing cost over a longer period. This long tenors positions green bonds as suitable instruments that can potentially reduce the common problem of political and economic short-termism. He further states green bonds could generate positive employment and positive macroeconomic effects (Lanz, 2014)

  Lanz (2014) further notes that private investment in green projects require support from policy makers to thrive. This he asserts is often hindered by the misalignment with regard the different decision making horizons of the investors versus that of policy makers. For example, investors make their investment decisions based primarily on anticipated quarterly and annual performance. While, policymakers typically focus their agenda on policies that enhance re-electability which is tied to election cycle, (which is typically four to five years). These often result in public policies that are short-term in nature, which is not compatible with the requirement for large-scale infrastructure investments. (Lanz, 2014)

  There is therefore alignment with literature with regard to “green bonds” being better placed than “direct fiscal support” to mitigate against Political and economic “short-termism”. Green Fund experience confirms the potential “Political and economic short-termism” challenge that is associated with “direct fiscal support”.

- Sustainability

Sustainability with regard to supporting climate change initiatives requires adequate financial support to be available on a long term basis. However, most of the existing financial instruments are not adequate in addressing the identified green investment gap. This is compounded by the current financial downturn that has increased liquidity problems and made access to finance harder. Most government are experiencing very tight fiscal environment and are therefore not in a position to financially support climate change initiatives in a sustainable manner. (Caisse des Dépôts Group, 2012).

This is made even more difficult when one considers the estimates regarding the amount of funds required to fund climate change initiatives which are clearly too great for government resources alone to tackle. This is even more so for developing countries with limited resources. (Reichelt, 2010)

Alexander et al (2013) also notes that governments can only do so much to contribute to the large environmental investment gap that has been identified. This is further compounded by the fragile global economic conditions that is due economic recession (Alexander, Gulati& McDonald, 2013)

Alexander et al (2013) further notes s that governments lack the financial resources to meet current and future climate finance requirements. (Alexander, Gulati& McDonald, 2013)

The National Green Fund has also been grappling with sustainability issues especially now that its initial R1.1 billion allocation has been fully committed. With the current tight fiscal environment South Africa finds itself in and the potential credit rating down grading, the government will find it difficult to replenish the fund.

There is therefore alignment with both literature and Green Fund experiences that “direct fiscal support” might not be sustainable as a financing mechanism for green projects. The respondent views that “green bonds” are better

positioned for sustainable financing of green projects is also aligned with literature.

- Use of guarantees by governments

  The National Green Funds has in the past entertained the use of guarantees but never really got to implementation.

  According to World Economic Forum (2013) ‘s review of various project case studies, initiatives from members and partners of the Green Growth Action Alliance and the past performance of different mechanisms and instruments has demonstrated how different Government interventions can create attractive investment conditions for the private sector, and enable targeted public investment for green-growth projects. Guarantees are probably another mechanism that governments should explore (World Economic Forum, 2013)

  Mathews and Kidney (2012) states that basic structural features for a ‘climate bonds’ market to flourish is that all participants need to make a return, and should meet levels of risk no greater than those of conventional government and corporate bond markets. This means that assets backing the bond issues, and **government guarantees**, must be carefully structured, and the payments (whether coupon interest or tax credits) must be regular and founded on relatively certain income streams deriving from the energy projects themselves. (Mathews and Kidney, 2012).

  There is therefore alignment with literature regarding the use of guarantees by governments to support climate change initiatives.

- Raising significant levels of funding

  The Green Fund’s first public RfP attracted 590 applications with a total of R10.9 billion in requested financial support. This was against the fund’s allocation of R1.1 billion which was way below the requested amount even taking into consideration that not all projects would be fundable. It became quite

clear that fiscal support alone would not be sufficient to support the transition to a greener economy.

Voica *et al* (2014) indicates that the biggest challenge in transitioning to a greener development path is the large amount of funding required to move from a high-carbon emission economy to a low carbon one. Since the significant funding requirements cannot be made from public resources alone, ways to crowd in private finance need to be found. The Green Investment Report shows that Governments around the world need to create an enabling environment which would attract private finance. (Voica, Panait & Radulescu, 2014)

World Bank Group President Jim Yong Kim seem convinced that green bonds are an ideal vehicle to raise the significant amount needed to support climate change initiatives. He urged at the World Economic Forum in Davos in early 2014 that more investors should get involved and c double the 2013's annual green bond market issuances by the UN Secretary-General's Climate Summit in September of that year. (World Bank, 2015)

There is therefore alignment with both literature and Green Fund experiences that "direct fiscal support" might not be suitable for raising the required level of funding needed to support climate change initiatives. The respondent views that "green bonds" are better positioned raise the large amounts needed seem to be aligned with literature.

5.6 Analysis of key finding against the objectives of the study

The Research Objectives of the study were as follows:

- To explore if fiscal support is the most appropriate financing mechanism to support the National Green Fund in order to achieve its objectives.
- To explore if Green Bonds would be more effective and efficient funding mechanism for the National Green Fund compared to the current fiscal support.

The key findings indicate that both “direct fiscal support” and “green bonds” are useful financing mechanisms to support the National Green Fund in the transition to a greener economy. They both exhibit different strength and weaknesses but overall they should not be considered on a “either or” basis but should rather be seen as mechanisms that could potentially complement each other.

5.7 Review of the hypothesis in relation to the findings

The hypothesis for this study was formulated as follows:

Ho: Fiscal support is a more effective and efficient financing mechanism than green bonds for supporting the South African National Green Fund in order to achieve its objectives.

Ha: Fiscal support is a less effective and efficient financing mechanism than green bonds for supporting the South African National Green Fund in order to achieve its objectives.

Both parametric and non-parametric statistical tests carried out indicate that there is insufficient evidence to reject the null hypothesis. This is consistent with literature and the experiences of the National Green Fund in that “direct fiscal support” with its identified shortcomings is still a very useful mechanism is supporting

- The many early stage, high risk projects that require grant funding and in
- crowding in private finance by acting as some form of credit enhancement

However, “green bonds” could potentially complement “direct fiscal support” in that

- it is best placed to provide sustainable large amount of funding from institutional investors and support multiyear projects
- Could provide a platform for government trough guarantees to attract private finance
- Could assist in reducing the impact of Political and economic “short-termism”

5.8 Conclusions and recommendations

5.8.1 Conclusion:

Both “direct fiscal support” and “green bonds” are very effective and useful financing mechanism that are suited to support the National Green Fund in fulfilling its mandate of transitioning the South African economy to a greener one.

5.8.2 Recommendations:

- A hybrid financing mechanism that includes both “direct fiscal support” and “green bonds” (or even other financing mechanisms) should be explored.
- Government should further explore the use of guarantees to enhance the Green Bond market in order to reduce the liquidity challenges that exists.
- Government should seek to align policy incentives with financial mechanisms to ensure and increase the likelihood of success.

5.9 Addressing limitations to enhance future research:

- One of the limitations of the study was the approach that sought to contrast direct fiscal support with green bonds. This introduced an “either or” thinking among respondents. The study should be designed such that this kind of biases do not contaminate the findings.
- Green investments as a relatively new subject was not understood in a consistent manner by respondents. Interviews could have been a better approach than surveys is it would afford the researcher the opportunity to explain, which would enhance quality and accuracy. This was however mitigated by the high caliber of survey respondents.

5.10 Recommendations for further research:

The study forms a basis for exploring various other potential areas of research that could assist in the transition to a greener economy, more especially around the area of innovative financing mechanisms.

The specific are of interest that could flow from this research has to do with **"how to create effective government backed credit-enhancement instruments and schemes in partnership with private finance that would act as facilitators to improve access to private funding."**

This should be done with the view to raise the credit standing of green projects that are currently not bankable, enabling them to attract various other sources of financing.

The Institute of Sustainable Development review (2015) considered the credit-enhancement schemes provided by multilateral development banks (MDBs) and international financial institutions (IFIs). Governments could consider ways to bring about coordinated credit enhancement schemes that combine direct fiscal support and policy incentives including tax breaks etc. (Aravamuthan, Ruete & Dominguez, 2015)

"Credit-enhancement schemes respond to the demand to mitigate the risks of the project and attract further financing and investment to the project. It is an external mechanism that seeks to increase the credit rating/credit worthiness of the financeable aspects of an infrastructure project. The main objective of a credit-enhancement mechanism is to ameliorate the credit quality of infrastructure projects that have already achieved a certain minimum threshold." (Aravamuthan, Ruete & Dominguez, 2015)

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