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**THE ROLE OF INSTITUTIONAL FRAMEWORKS IN PROMOTING GREEN
BONDS TO FINANCE CARBON CAPTURE AND STORAGE IN SOUTH
AFRICA**

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Ethics Clearance Number: H19/05/22

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DECLARATION 1-PLAGIARISM

I, Nomhle Ngwenya, declare that this thesis (data, diagrams, graphs, tables and any other information) is my own original work, except to the extent that has been acknowledged.

This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then their words have been re-written and the general information attributed to them has been referenced. Where their exact words have been used, then their writings have been placed inside quotation marks, and referenced.

The thesis is being submitted for the award of the degree of Doctor of Philosophy (PhD) to the Faculty of Science at the University of the Witwatersrand, Johannesburg, South Africa. It has not previously been submitted for examination or award of degree to any other institution of learning.

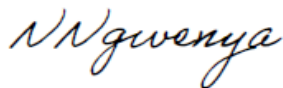
DECLARATION 2-PUBLICATIONS

I, **Nomhle Ngwenya**, declare that I personally undertook all the data collection, analysis, development and writing of the manuscripts and articles mentioned below. I wish to commend my co-author for providing useful advice and comments, as well as editing the manuscripts. Sections of this work have been published or submitted as manuscripts for publication to the following peer reviewed journals:

1. Ngwenya N, & Simatele MD., 2020. 'The emergence of green bonds as an integral component of climate finance in South Africa'. *South African Journal of Science*, 116(1/2), Art #6522, Pp3. <https://doi.org/10.17159/sajs.2020/6522> (Published).
2. Ngwenya, N & Simatele MD., 2020. 'Unbundling of the green bond market in the economic hubs of Africa: Case study of Kenya, Nigeria and South Africa'. *Development Southern Africa*, 37(6), 888 – 903, <https://doi.org/10.1080/0376835X.2020.1725446> (Published).
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Signature: Nomhle Ngwenya



Date: April, 2022

As the candidate's supervisor, I certify the above statement and have approved this thesis for submission. I certify that the above statement is correct:

Signature: Prof. Mulala Danny Simatele



Date: April, 2022

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ABSTRACT

The purpose of this research was to investigate the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. Globally, carbon capture and storage has been identified as a critical technology that if deployed on a wide-scale can mitigate high carbon emissions. In the context of South Africa, the technology has been included in several key national policies and government has embarked on long-term plans to implement the technology. It is argued that carbon capture and storage can play an important role as a transitional technology towards a low-carbon economy and also facilitate in the decarbonisation of the energy sector. In order for the technology to be successfully implemented in the country this will require significant investments in which this study explored the use of emerging climate finance mechanisms such as green bonds which could provide the necessary long-term investments. It is important to note that there was also an investigation of the use of institutional frameworks which are currently operating and what aspects could be reformed to promote and support green bonds to finance carbon capture and storage. The role of institutional frameworks has been identified as crucial in not only supporting the implementation of low-carbon technologies as aligned in the country's climate change commitments but also in facilitating the transparency and accountability of long-term environmental investments.

The context of this study involved data collection on a wider scale. Using both qualitative and quantitative research methods, data were collected to understand the views and perceptions of climate change and climate finance from experts on the potential of positioning carbon capture and storage to contribute to the energy transition as well as how it could be sustainably financed through green bonds. Through the use of semi-

structured interviews and surveys, data were collected in the four provinces of South Africa where massive developments around carbon capture and storage and the growth of the green bond market were observed. These provinces included Gauteng, Kwa-Zulu Natal, Eastern Cape and the Western Cape. It was important that a mixed-method approach was adopted to ensure a deeper understanding and diverse representation of the research participants included in the study.

The findings of this study have both practical and theoretical considerations. One of the biggest challenges to the implementation of carbon capture and storage is competing financial resources. The current financial resources are currently deployed to tackle the country's pressing socio-economic issues such as healthcare, social welfare, education, poverty, unemployment amongst others. The data reveals that amidst the country's socio-economic issues, mobilising financial resources that could contribute to climate finance for environmental projects in the country are constricted. This has resulted in the important role of partnerships with the private sector who have access to and are able to rapidly mobilise the much needed capital to sustainably finance the low-carbon transition in South Africa.

Green bonds are an example of how private capital can be invested into large-scale environmental projects such as carbon capture and storage. The green bond market has grown exponentially since its first introduction in the global capital markets and has been regarded as an important financial mechanism for tackling climate change. In the context of South Africa, the green bond market is relatively smaller in comparison to other regional markets, however, several green bond issuances have proven promising for various climate and environmental related projects. This study has highlighted how green bonds have the potential in financing carbon capture and storage projects. As a

result, high carbon emitting energy companies such as ESKOM as well as several mining companies can largely benefit from these issuances which can reduce their carbon tax and enable them to build up on their ESG (Environmental, Social, and Governance) portfolios.

While it is important that the investment challenge to carbon capture and storage could be resolved, the findings clearly show the importance of institutional frameworks in which green bonds can be pursued and governed in South Africa. The data clearly shows that institutional frameworks such as laws, policies and frameworks are important in ensuring that transparency and accountability is adhered for green bonds. This is because governance through institutional frameworks plays a very important role in coordination of how private capital will be adequately used for national projects such as carbon capture and storage as well as strengthening public-private partnerships for future energy and decarbonisation plans.

There are several key recommendations that emerged from the data that could assist government and industry leaders in financing the just energy transition. This includes a proactive approach from government to partner with business on how financial resources can be pooled specifically for national, regional and local climate change initiatives. Collaborations with the private sector with institutions such as the South African Reserve Bank, National Treasury, Department of Science and Innovation as well as the Department of Environment, Forestry and Fisheries could lead to greater discussions and inter-ministerial committees that are focused on how green bonds can support carbon capture and storage initiatives and how existing policies and frameworks can be adapted to make alternative financing inclusive.

Some of the more poignant points are further discussed in this thesis in the different chapters presented.

Keywords: *Green bonds, carbon capture and storage, institutional frameworks, finance, South Africa*

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LIST OF ABBREVIATIONS

AfDB	African Development Bank
AU	African Union
CBI	Climate Bonds Initiative
CCS	Carbon Capture and Storage
CIF	Climate Investment Funds
CoGTA	Cooperative Governance and Traditional Affairs
COJ	City of Johannesburg
COP	Conference of the Parties
COVID19	Coronavirus
CSIR	Council for Scientific and Industrial Research
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DMRE	Department of Mineral Resources and Energy
DOE	Department of Energy
ECOWAS	Economic Community of West African States
EDTEA	Economic Development Tourism and Environmental Affairs
EOR	Enhanced Oil Recovery
ESKOM	Electricity Supply Commission
EY	Ernst and Young
GARCH	Generalized Autoregressive Conditional Heteroskedasticity

GB	Green Bonds
GBP	Green Bond Principles
GBPK	Green Bonds Programme Kenya
GCI	Green Climate Initiative
GCF	Green Climate Fund
GDP	Gross Domestic Product
GESIP	Green Economy Strategy and Implementation Plan
ICMA	International Capital Markets Association
ICT	Information and Communications Technology
IDC	Industrial Development Corporation
IDTT	Inter-Departmental Task Team
IEA	International Energy Association
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated Resource Plan
NASA	National Aeronautics and Space Administration
NCCRP	National Climate Change Response Policy
NDCs	Nationally Determined Contributions
NDP	National Development Plan
NSE	Nairobi Stock Exchange
OPEC	Organisation of the Petroleum Exporting Countries
Pers. Com	Personal Communication
PPM	Parts Per Million
R&D	Research and Development

RMB	Rand Merchant Bank
RSA	Republic of South Africa
SABS	South African Bureau of Standards
SARS	South African Revenue Service
SACCCS	South African Centre for Carbon Capture and Storage
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute
SANEDI	South African National Energy Development Institute
S&P	Standard and Poor's
SDGs	Sustainable Development Goals
StatsSA	Statistics South Africa
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
ZAR	South African Rand

CHAPTER ONE

FRAMES OF REFERENCE

1.1. Overview of the research

Climate change has been characterised as one of the most unprecedented global challenges (Steffen et al 2007; McDowell et al 2019). It has been widely accepted throughout literature that the world has entered into one of the most dangerous epochs which has been described as the Anthropocene (Pincetl 2017; Leichenko and O'Brien 2020). This is a period where anthropogenic activities such as mass industrialisation resulting in the burning of fossil fuels has resulted in the increased release of global carbon dioxide levels resulting in the warming of the planet (Beg et al 2002; Szulczewski et al 2012; Busby et al 2014; Masih et al 2014; Varotsos and Efstathiou, 2019). The manifestations of climate change have been documented as widespread and manifesting across different scales and geographic boundaries (Mahony 2013). Examples of these manifestations include increasing annual temperatures resulting in drought conditions, loss in biodiversity as well as intense storm and flood episodes (Foley et al 2007; Simatele and Simatele, 2015; Baudoin et al 2017). Climate change has also directly affected different aspects of the economy and society (Andric et al 2019). For example, key economic sectors such as agriculture have been affected in regions such as Sub-Saharan Africa where extreme weather events such as prolonged drought periods have affected yield output (Huang et al 2020). The effects of climate change have further been observed on a societal level where climate change has exacerbated poverty levels and exposed the vulnerability of women and children in the Global South (Gay-Antaki 2020; Azong and Kelso 2021).

It has been argued that of all the countries that really stand to lose from the impacts of climate change are those from developing and poorer regions (Zhou et al 2017; Filho et al 2018; Yadav and Lal 2018). One of the most vulnerable continents to the impacts of climate change is Africa because of the existing climatic conditions which are semi-arid and already climatically stressed due to low rainfall and high temperatures (Dionne and Horowitz 2016; Adenle et al 2017; Abrams et al 2018; IPCC 2018). Amid Africa being climatically vulnerable, the continent's challenges are further worsened by weak economic growth, inadequate and insufficient infrastructural resources as well as the population accounting for the world's highest poverty levels (Serdeczny et al 2016; Christiaensen et al 2019). It has been projected that the combination of these factors will continue to multiply and be further exacerbated by climate change (World Bank 2015; Serdeczny et al 2016; Olayide and Alabi 2018).

One of the most significant discussions that have emerged over the years is the importance of institutional frameworks to effectively deal with a myriad of challenges. Institutional frameworks can broadly be defined as policies, laws and regulations that govern the operations of institutions, judicial systems, business and government departments (Assane and Grammy 2003; Konig 2020). Africa has continuously been described as consisting of weak institutional frameworks (Adenle et al 2017; Filho et al 2018). This is of great concern because such frameworks should be at the forefront of developing policies and strategies that address infrastructural issues, poverty, economic growth and importantly, climate change (Olayide and Alabi 2018; Wiczorek 2018). However, it is argued that effective institutional frameworks can be successfully implemented if African countries place a high priority on the technical and human capital capacity to develop laws and policies that can provide solutions to various socio-

economic and climate change challenges (Conway and Schipper 2011; Chirambo 2016; Leimbach et al 2018).

It is evident that climate change is a wicked problem as it presents various complexities which intersect with social, economic, environmental and political challenges (FitzGibbon and Mensah 2012; Sun and Yang 2016). The role of institutional frameworks becomes even more crucial especially in facilitating evidence-based decision making for climate change measures (Howarth and Painter 2016). This is achieved through policy coordination, research and information sharing to formulate adaptation and mitigation plans which can be effectively implemented across various scales (Howarth and Painter 2016). The success of institutional frameworks in addressing climate change depends on capacity building initiatives such as technical knowledge, monitoring and evaluation processes as well allocating financial resources to existing and future climate projects (Howarth and Painter 2016).

The costs of climate change from a global governance and institutional level has been identified as one of the principal roadblocks in implementing climate projects (Clark et al 2018; Geddes et al 2020). In most countries, such as in the Global South, many government departments and ministries lack the political and economic power to finance their low-carbon transitions (Ciu and Huang 2018). This is because public financial resources are limited and strained due to pressing issues such as socio-economic challenges and healthcare (Adenle et al 2017; Chirambo 2018). Financial assistance through donors and private sector resources to help vulnerable countries prevent and cope with the impacts of climate change has become a critical component to tackle the climate crisis (Galaz et al 2018). As a result of this, there has been a rise in the global importance of climate finance for institutions and governments where financial

resources can be geared to finance large-scale climate adaptation and mitigation projects (Kotchen and Costello 2018; Lopez-Doriga et al 2020).

Climate finance is amongst one of the top international agendas since the Paris Agreement (Dovie 2018; Kotchen 2020). This is because trillions of dollars need to be mobilised annually for countries to meet their climate targets (Dovie 2018; Nyambuu and Semmier 2020). The United Nations Framework Convention on Climate Change (UNFCCC) defines climate finance as "local, national or transnational financing—drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change" (UNFCCC 2021: 1). Furthermore, the UNFCCC highlights how climate finance is under the notion of 'common but differentiated responsibilities' which argues that developed countries should take a lead in providing financial assistance to least developed countries (Wang and Gao 2018). As much as this notion has been set out by the UNFCCC, there are still many debates as to the transparency and accountability of the flows of financial resources from the most developed countries to the least developed countries (Peterson and Skovgaard 2019).

The mobilisation of climate finance has emerged from various sources. These include donor and public funds, asset management companies, pension funds as well as philanthropic initiatives (Ari and Koc 2021). Financial innovation in climate finance has also evolved to allow governments, investors and other stakeholder's greater access and opportunities to fund projects that are in alignment with the aims and objectives of the Paris Agreement (Warren 2020). An example of this has been green bonds, which is one of the most innovative financial instruments in the global bond market to finance climate and environmental related projects (Zerbib 2019). In the observation of global markets, green bonds specifically have expanded exponentially in the past decade. They have been

characterised as one of the few financial instruments that offer public and private stakeholders the opportunity to invest in long-term sustainable climate investments (World Bank 2015). However, it is argued that as green bonds continue to expand globally, it is important for guidelines to be developed that promote accountability, transparency as well as effective impact monitoring and evaluation (Gianfrate and Peri 2019; Li et al 2019). These factors largely rely on the need for appropriate institutional frameworks that can create an environment conducive to expand the green bond market and ensure credibility of the market (Febi et al 2018; Nanayakkara and Colombage 2019).

There are several examples of countries where institutional frameworks have contributed to the expansion of the green bond market (Fatica et al 2021; Flammer 2021). For example, Vietnam is considered one of the leading countries in Asia on green bond issuances for low-carbon projects (Tu et al 2020). This is a result of increased climate awareness on green investment to public and private sectors (Tu et al 2020). This has led to legal and institutional arrangements formulated which have encouraged a wide base of investors to issue green bonds (Tu et al 2020). To further illustrate this point, the European region is one of the leading regional blocks in the green bond market with countries such as Norway and Sweden leveraging on public and private financial resources to fund their decarbonisation agendas (Tolliver et al 2020). A significant enabler to this has been the governments in these countries positioning sustainability and climate change as a core focus in responsible investment plans as well as in legal frameworks and policies (CBI 2018). Similarly, like the Vietnamese government, the Norwegian government has also ensured that asset management companies and pension funds are adequately utilised for divestment plans and therefore supporting a low-carbon transition (CBI 2020).

In the context of South Africa, the impacts of climate change have been severe and as one of the highest carbon polluters in the world, it is crucial that there is an acceleration on investment plans for the phasing out of fossil fuels (Willemen et al 2018; Bohlmann et al 2019). To further highlight the urgency of the just transition, there are several notable impacts of climate change which have been recorded and observed over the past decades. There is strong scientific evidence through data records that show how the country is experiencing increasing annual temperatures which have resulted in severe droughts and intense storm events (Mugagga 2016; Baudoin et al 2017). As a result, key economic sectors such as agriculture, tourism and manufacturing have been affected over time (Knight and Evans 2017; Nkhonjera 2017). Several scientific data and reports have been released illustrating the need for the South African government to invest in the necessary climate adaptation and mitigation projects in which failing to do so will result in frequent and intense climatic disasters (Kgakatsi and Rautenbach 2014; Busayo et al 2019).

On an institutional level, different government departments have collaborated to develop policies and strategies aimed at addressing climate change. These institutional frameworks have also been developed to follow international best practice standards as set out through binding agreements under the United Nations Framework on Climate Change (UNFCCC), the Kyoto Protocol as well as the Paris Agreement. However, the lack of government funding and state resources to address these climate change agreements still remains one of the pressing challenges in the country (Mohamed et al 2014; Van Zyl et al 2018).

The low-carbon and just transition in South Africa involves catalysing new climate finance mechanisms and creating a sustainable financial model for leveraging private sector capital. Recently, in the past five years, South Africa has embarked on the issuing

of green bonds to fund low-carbon projects such as renewable energy and green buildings (JSE 2017). Green bonds are a new source of climate finance in South Africa and offer a unique opportunity for the public and private sectors to collaborate on how to align national policies and create a conducive environment for investors to fund climate projects. In addition, the potential of green bonds can allow for the pipeline of large-scale low-carbon projects such as carbon capture and storage to be successfully implemented which can aid the country in significantly reducing its carbon emissions.

1.2. Thematic considerations

South Africa, like many other countries in the world, is faced with the challenges of climate change (Lukey et al 2017; Sarkodie and Adams 2018). As pointed out above, South Africa is amongst one of the driest countries in the Sub-Saharan region and is subjected to frequent drought periods and extreme climatic events (Baudoin et al 2017). To alleviate and address the impacts of climate change, policymakers across different government departments have formulated key policies which focus on adaptation and mitigation measures (Musango et al 2014). These policies include the National Climate Change Response Policy White Paper, National Development Plan, National Greenhouse Gas Emissions Reporting Regulations and the National Climate Change Adaptation Strategy (DFFE 2011; The Presidency 2012; DFFE 2017; DFFE 2019). Another key policy that was recently approved by the cabinet is the Carbon Tax Bill (National Treasury 2019). The Carbon Tax Bill legally states that high carbon-emitting industries are liable to pay a tax for each ton of emissions released into the atmosphere (National Treasury 2019). The proposed benefit of the bill will compel businesses and industries to reduce their emissions and adopt cleaner low-carbon technologies to avoid paying high carbon taxes (National Treasury 2019).

As much as the country is guided on a policy and institutional level on plans to combat climate change, the transition towards a low-carbon economy in South Africa still faces significant hurdles (Essex and de Groot 2019). High-emitting industries such as mining and industrial activities contribute to the country's economy and also employ millions of South Africans (Corrigan 2019). As a result of this, it is important that the low-carbon transition is gradual whilst also allowing industries to change their operational models and provide the necessary platforms to re-skill workers (Leuw and Mtegha 2018).

One of the low-carbon technologies that has gained traction across the world has been carbon capture and storage (Vinca et al 2018; Wang and Qie 2018; Tcvetkov et al 2019). Carbon capture and storage is a technology that captures carbon dioxide from high emitting industries such as power stations and stores the carbon underground which could be oceanic or geological storage (Selosse and Ricci 2017). The technology has been described as a transitional technology as it can assist high-emitting countries towards significantly reducing their greenhouse gas emissions whilst also implementing the necessary measures to transition away from the dependence on fossil fuels (Vinca et al 2018). It is projected that if carbon capture and storage is implemented on a large scale globally, more than 40% of the world's global atmospheric carbon emissions could be reduced and assist many countries in achieving a net-zero economy and society (Li Fan et al 2019). Several high-emitting countries such as China, the United States and India have implemented carbon capture and storage plants which have also been integrated into national climate mitigation strategies (Kumar et al 2018; Raza et al 2018).

As one of the highest carbon-emitting countries in the world and in Africa, South Africa has also embarked on plans to implement carbon capture and storage (Beck et al 2013). This has been reflected in key policies such as the National Development Plan where

carbon capture and storage is described as one of the country's flagship programmes and important for the country's energy mix (Beck et al 2013). A lot of research and capacity building has been geared to understanding how carbon capture and storage can be implemented. However, one of the biggest barriers to deployment has been the lack of investments (Beck 2014; Beck et al 2017). Insufficient investments is a global problem that has stalled the implementation of several carbon capture and storage projects as the entire process of capturing, transporting and storing the carbon is highly capital intensive (Wilberforce et al 2019).

A potential financial solution for carbon capture and storage in South Africa is exploring the current emerging climate finance mechanisms. One of these has been green bonds which have gained significant traction in the country with several public and private institutions issuing green bonds for low-carbon projects. Green bonds have the potential to mobilise the necessary private capital which can be invested in carbon capture and storage projects and therefore also allow the technology to play a role in the low-carbon transition. However, to allow the development and implementation of green bonds to be a financier for carbon capture and storage, an institutional and policy framework must be developed to provide guidelines and processes for these investments. This position is supported by Kapetaki and Scowcraft (2017) as well as Alberts et al (2017) who argue that institutional and regulatory frameworks can provide the necessary infrastructure to facilitate the expansion of the green bond market and as a result encourage investors to participate effectively in the financing of low-carbon pipeline projects such as carbon capture and storage.

Given the above observations, this study is specifically interested in investigating how institutional frameworks and legislative structures can promote the implementation of

green bonds as a way to facilitate and finance carbon capture and storage in developing countries such as South Africa.

1.3. Research questions

Given the above considerations, the following research questions guided the research process:

- I. What institutional framework and legislative structures exist within which green bonds and carbon capture and storage can be pursued in South Africa?
- II. What barriers and opportunities exist which could potentially promote or hinder the adoption of green bonds and carbon capture and storage?
- III. What current institutional frameworks are operating and can be reformed to promote and implement green bonds to finance carbon capture and storage?
- IV. What is the economic and environmental viability for promoting the adoption of green bonds and carbon capture and storage?

1.4. Research aims and objectives

The aim of the study was to investigate the role of institutional frameworks, policies, legislative structures, and strategies that can be used as tools to promote green bonds as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

In view of this, therefore, the specific objectives of this study were to:

- I. Identify what institutions, policies and legislation can be used as tools for the promotion and effective implementation of green bonds to finance carbon capture and storage.

- II. Identify factors that can contribute to the hindrance or promotion of implementing an institutional framework for green bonds to be adopted to promote carbon capture and storage.
- III. Analyse how current institutional frameworks are operating and what aspects could be reformed to promote and implement green bonds to finance carbon capture and storage.
- IV. Evaluate the economic potential of green bonds to finance carbon capture and storage and in so doing contribute to environmental sustainability.

1.5. Theoretical considerations and literature review

The study of institutions has been extensively investigated in academia for decades (Davis 2000; Khan 2006; Chou et al 2015). Heiskanen (2019) argues that institutions have been theorised differently across various disciplines such as sociology, law, economics, history, political science amongst others. With this understanding, Friel (2017) is of the view that the different conceptualisations of institutions have contributed to a greater understanding of how institutions have evolved and their role in governing society, the economy as well as maintaining law and order. For example, in sociology, North's (1990) definition of institutions is drawn upon which describes institutions as setting the rules for how society should be governed. In legal studies, Ostrom's (2005) definition is illustrated upon which states that institutions consist of formal rules and informal rules. Formal rules are guided by legal structures whilst informal rules are implicit such as intentionally stopping at a red traffic light (Ostrom 2005).

Within institutional theory, there has been an increasing focus in the literature on institutional frameworks and how they are developed and enacted in institutions (Hodgson 2006; Caldentey 2008; Donnellan et al 2012). Moe (2005) and Newell (2018)

argue that institutional frameworks such as policies, legislation and strategies enforce the powers of an institution and ensure the operations of an institution to be effective. Williamson (2000) and Tauhmeed (2013) further support this view by highlighting how institutional frameworks are critical in providing a platform for technical and human capacity to be developed. However, Ajide (2017) draw our attention to the fact that institutional structures vary in different countries due to institutional development and resources which can affect the effectiveness and implementation of policies, laws and frameworks.

This study places a focus on the current literature on institutional frameworks situated within the context of climate change (Griffiths et al 2007; Scott 2008). Climate change is a cross-cutting challenge that requires massive institutional coordination amongst different actors as well as the institutional capacity to implement effective monitoring and evaluation measures (Filho et al 2019; Matewos 2019). Institutional frameworks become an important component for climate change because they act as a driver for capacity building and strengthening institutions mandated to deal with climate change through the implementation of policies, legislation and strategies (Conway and Schipper 2011; Chirambo 2016; Leimbach et al 2018). Several attempts have been made to establish a relationship between climate change and institutional frameworks. Amongst these studies include O'Riordan and Jordan (1999) who argue that institutions can help to contextualise climate change in the broader framework of other national and global challenges. However, institutional frameworks attempt to build networks of action by raising awareness and developing appropriate communication tools for different stakeholders (O'Riordan and Jordan 1999). To further elaborate on the importance of institutional frameworks for climate change, Ng et al (2017) argue that frameworks are

the functional abilities of an institution to support coordination, provide technical capacity as well as enable meaningful action on climate change.

In as much as frameworks create an enabling environment for effective action on climate change, there are significant challenges that persist. Ampaire et al (2017) describe how in the past decade there has been rapid developments in understanding environmental governance and the importance of equipping institutions to deal with climate change. However, there exist key challenges which can delay some of the key international climate change agreements. These challenges include the lack of technical and capacity knowledge on how to implement adaptation and mitigation policies, political interference, struggles to reach partnerships amongst different actors as well as the absence of implementation structures from global, regional, national and local levels (Ampaire et al 2017). This view is further illustrated by Adenle et al (2017), Barasa et al (2017), Ledwaba and Mutemeri (2018) as well as Olayide and Alabi (2018) who use several examples in their scholarly papers to show evidence of how weak institutions and institutional frameworks have caused massive uncertainties and difficulties in tackling climate change projects in various parts of Africa. This is further supported by Duru and Nyong (2016) who point to the fact that regions like Africa require financial investments to tackle climate change but with poor institutional frameworks and issues around corruption this further exacerbates the current challenge. By drawing on the different points made by different scholars, it can be seen how important institutional frameworks are in addressing climate change.

The integration of financial resources and fiscal policies in institutional frameworks has also emerged as a topic of interest in the academic discourse of climate finance (Hof et al 2011; Demertzidis et al 2015; Pickering et al 2015). Within climate finance, there is

growing awareness and literature around climate investments and the role of leveraging private capital from the business community to scale up low-carbon solutions (Banga 2019; Heiskanen et al 2019). This is supported by Glomsrod and Wei (2018) who argue how banks, investment companies and institutional investors have pledged large amounts of financial resources into 'green' projects such as low-carbon technologies and renewables to contribute to the global transition towards a low carbon economy. With increasing flows of capital, Brunner and Enting (2014) claim that there should be a deeper understanding of how climate investments are incorporated into legal, policy and institutional mechanisms at both the international and domestic level. This would be beneficial in outlining governance frameworks around accountability and transparency of capital intended for the use of climate change projects (Polzin et al 2016).

One of the most significant current discussions around how to incorporate climate finance mechanisms into institutional and governance frameworks is through the practice of Environmental, Social, Governance (ESG) practices (Escrig-Olmedo et al 2017; Li et al 2018). Eliwa et al (2019) point to the fact that from an institutional level, ESG has now become a top regulatory agenda. This is because climate change has far-reaching implications for businesses and from a corporate governance perspective, checks and balances need to exist to ensure responsible decision-making with regards to the low-carbon transition. In a study by Fatemi et al (2018), the authors highlight how the incorporation of ESG in institutions and corporates has led to advances in sustainable business practices whilst also upholding strong values of ethics. They further argue that this is a form of an institutional framework that exists in the private sector and can be replicated in the public sector through policies, laws and regulations (Fatemi et al 2018).

Several researchers have reported a rise in different forms of climate finance mechanisms and institutional frameworks which have become an important criterion in the effective expansion of these financial mechanisms for adaptation and mitigation projects (Flaherty et al 2017; Hainaut and Cochran 2018; Ng 2018). Demary and Neligen (2018) point to the fact that one of these popular climate financial mechanisms has been green bonds. It is emphasised that the growth of green bonds in the past decade has been attributed to increasing investor awareness where the first green bond issuances emerged from multilateral institutions such as the World Bank and the International Monetary Fund (IMF) (Demary and Neligen, 2018). Green bonds are still relatively new in the academic discourse and there still does not exist a universal definition (Banga 2019). However, Paraque and Revelli (2019) define a green bond as bonds that are issued by institutions and companies in which the bond proceeds go directly into financing environmental projects such as water and coastal management projects, renewable energy and green buildings. One of the huge advantages identified from green bonds is the long-term sustainable capital for large-scale environmental projects (Banga 2019). In addition, green bonds provide the opportunity for institutions to have capital to invest in the pipeline of various climate projects (Banga 2019; Paraque and Revelli 2019).

Despite the growth and importance of green bonds in the climate finance discourse, there are significant challenges that are worthy to be noted. For example, Pham (2016) highlights the ambiguity of defining a green bond and this poses a challenge for investors on what projects should be considered green and against which international standards. For example, the Climate Bonds Initiative (CBI) is the leading institute that governs the green bond taxonomy on what projects green bond issuances can be directed to. However, there are key projects which have been identified globally as reducing carbon emissions, such as carbon capture and storage, but there are no guidelines for such

projects (Banga 2019). This brings forth a key debate amongst scholars as to which stakeholders and frameworks are involved in regulating what projects should be considered green and environmentally sustainable (Banga 2019). Siano et al (2017) point to the consequences of not having a clear green bond definition and project pipeline structure which can lead to green-washing in the green bond market. This is further supported by Zhang et al (2018) who argue that green bonds could be used inappropriately as a form of green-washing by companies and countries who want to be viewed as having a positive environmental impact yet not adopting the proper regulatory mechanisms and practices within their institutional strategies.

The considerations above point to the need for a well-established green bond framework to promote integrity within the market but also to ensure that a clear process is outlined for governments, investors and other stakeholders to partake in (World Bank 2015). In support of this view, Zerbib (2019) suggests that one of the main requirements for any institution to issue out a green bond is to have a strong financial regulatory environment which implies having a strong institutional framework to facilitate the bond proceeds. Banga (2019: 17) has demonstrated that in developing countries the green bond market has not fully grown due to the lack of appropriate institutional arrangements and various institutional barriers. The scholar further argues that “High transactions costs associated with green bond issuance, are the key barriers to the development of green bonds in developing countries” as well as limited access to international markets (Banga 2019).

The lack of the growth of the green bond market in developing countries can hinder the financing of key projects that can aid in the transition towards a low carbon economy (Jefferson 2018). Kirchherr and Urban (2018) argue that amongst these projects include carbon capture and storage. According to Ramirez et al (2018), the world’s current

energy systems are based on unsustainable fossil fuels and carbon capture and storage is considered a viable option for the future. This is further supported by Budinis et al (2018) who argue that carbon capture and storage is an important transitional technology as it could enable developing countries to gradually transition away from the dependence on fossil fuels and integrate cleaner and renewable sources of energy.

However, it is widely acknowledged throughout literature that carbon capture and storage is capital intensive (Braunreiter and Bennett 2017; Kapetaki and Scowcraft 2017; Durmaz 2018). Budinis et al (2018) point to the fact that the consequence of the lack of financial resources is that there are few large-scale projects of carbon capture and storage operating globally. This is further supported by Yao et al (2018) who highlight how there is no viable business model for carbon capture and storage in developing countries and because of this, public and private entities are reluctant to invest in the technology without any forecasted benefits of profits. Importantly, Kapetaki and Scowcraft (2017) are of the view that the successful deployment of carbon capture and storage projects depends on the clarity of institutional and regulatory frameworks. De Jongh et al (2014) support this by stating key characteristics of frameworks that would facilitate carbon capture and storage projects. These include potential risks and liabilities, how existing regulations and guides can be modified to ensure the expansion and pipeline of carbon capture and storage projects, long-term liability issues, financial viability as well as technical capacity (De Jongh et al 2014).

1.6. Rationale of the study

In view of the above observations, the existing literature has addressed several issues, concerning institutions, green bonds as well as carbon capture and storage. Firstly, the literature has strongly emphasised the far-reaching implications of climate change and

the need for effective institutions and well-established institutional frameworks to address this (North 1990; Ostrom 2005; Scott 2008; Agarwal 2009). It was seen how institutions and frameworks have an important role in advancing the low-carbon transition through the use of technical resources, political will, financial resources and human capital (Conway and Schipper 2011, Chirambo 2016, Leimbach et al 2018). However, there are still uncertainties on the strength of institutions and institutional frameworks as demonstrated by Olayide and Alabi (2018) as well as Duru and Nyong (2016) who argue how weak institutions and institutional frameworks can cause massive delays in tackling climate change as seen in several countries in developing regions. What is still unclear in the institutional framework discourse is establishing what factors should be considered that can create effective institutions and institutional frameworks to address climate change.

Secondly, the literature highlighted the importance of climate finance. It was strongly highlighted how public financial resources alone are insufficient to finance large-scale climate-related projects (Banga 2019). Innovation in the financial sector has increased due to the climate crisis and green bonds have become one of the emerging, innovative financial mechanisms (Banga 2019; Zerbib 2019). Pham (2016) and Fatemi et al (2018) suggest that as much as financial innovation is expanding within the climate finance discourse, a framework that governs and promotes values of accountability and transparency needs to be developed. This would further result in the credibility of these financial mechanisms. It was further noted by Fatemi et al (2018) on how the ESG framework which has been in place in the private sector could be drawn upon as a model to be utilised in the public sector (Fatemi et al 2018).

In as much as green bonds have grown exponentially and have become a popular green finance mechanism, Pham (2016) and Banga (2019) point to the fact that challenges exist within the green bond literature. These challenges include definitions on green bonds as presently there is no universal definition and ambiguity exists over the specific 'green' projects to be funded. It is also unclear in the literature as to how to overcome institutional barriers, especially in developing countries to foster the green bond market. In addition, it was noted how the lack of research is also a contributing factor to the ambiguity around green bonds and their financial purpose in financing the low-carbon transition.

Thirdly, the impacts of climate change highlight the need for investments to be scaled up for low-carbon projects that will drastically reduce carbon emissions (Jefferson 2018). Kirchherr and Urban (2018) as well as Ramirez et al (2018) have identified carbon capture and storage as a key climate change mitigation strategy for developing countries to consider in order to meet the targets for net-zero. As much as this may be a potential solution, the literature points to how the financing of carbon capture and storage remains a challenge and long-term sustainable financing needs to be considered. More so for developing countries like South Africa, which are considering implementing large-scale carbon capture and storage projects in the long-term (Surridge and Cloete 2013; Beck et al 2017).

What is still unclear and missing from the literature is the role of green bonds in financing low-carbon projects such as carbon capture and storage as well as what institutional frameworks exist to facilitate this. This then becomes the focus of the study on investigating how institutional frameworks and legislative structures can promote the

implementation of green bonds to facilitate and finance carbon capture and storage in developing countries such as South Africa.

1.7. Methodology

The philosophical positionality underlying this research emanates from the interpretive tradition. The interpretive research philosophy is based on an understanding of how society is socially constructed (Wisker 2008). Rea and Parker (2012) further illustrate this point by stating how one of the key components of the interpretive approach is premised upon the fact that the world and reality are not objective but rather subjective since the world is socially constructed and given meaning by people. Walsham (2006) argues that by applying an interpretive approach in research, this allows researchers to understand the social world and obtain multiple interpretations of reality. In addition, Walsham (2006) importantly highlights how interpretive research is not premised on dependent and independent variables but rather focuses on seeking to understand the social world from research participants. Kaplan and Maxwell (1994) further espouse that because interpretive research is not dependent on various variables, a mixed-methods research design can be adopted where data is collected using qualitative and quantitative methods.

The research strategy adopted in this study was to conduct qualitative interviews and quantitative surveys based on the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. By employing the interpretive research philosophy enabled the researcher to increase her understanding of the social, economic and environmental feasibility of how institutional frameworks could support the promotion of green bonds to finance large-scale projects such as carbon capture and storage in South Africa. The choice of this research philosophy was

also influenced by the fact that the researcher was local and familiar with her study sites in South Africa. Her proven knowledge on the subject matter influenced various stakeholders (such as policymakers, government officials, private officials and community members) to regard her as an insider regarding the operations of current institutional frameworks, green bonds as well as carbon capture and storage. This led the researcher to describe multiple factors at play, different actors involved as well as complexities faced in influencing the development of institutional frameworks in supporting emerging climate finance mechanisms. The researcher assumes that the social, environmental and economic aspects of institutional frameworks in promoting green bonds for carbon capture and storage remains a subjective reality that needs to be investigated, discovered and assembled through various engagements with different stakeholders as well as individual perspectives from those in different sectors.

Ideally and practically, this study would have interviewed the samples of the population of the four study sites chosen for this study in South Africa, but given the constraints of time, material and financial resources, it was difficult for the researcher to follow such a procedure. Therefore, the study was carried out in specific areas of the chosen study sites for this research (Algoa Basin in the Eastern Cape, Zululand Basin in KwaZulu-Natal, the City of Cape Town in the Western Cape as well as Johannesburg in Gauteng) (see Figure 1.1)

Figure 1.1. Map showing the study sites used for this research



Source: School of Geography, Archaeology and Environmental Studies cartography (2019)

1.7.1. Research design

a. Description of the study sites

The data which forms the basis of this thesis was collected in the four chosen study sites in South Africa as reflected in figure 1.1. The choice of these study sites was justified based on several observations. Firstly, the Zululand Basin and Algoa Basin are the sites selected where carbon capture and storage projects are expected to operate. These are the only two sites where the geology allows for the safe sequestration of carbon dioxide compared to other geological parts of the country (Surridge and Cloete 2009). Secondly, Johannesburg and Cape Town were of significance because these are the only sites in the country where public and private institutions have successfully issued green bonds for

various environmental and climate change projects. The importance of data collection in these two sites facilitated the researcher to gain an understanding of the green bond market in these areas and what institutional frameworks exist or have been developed to guide this.

b. Study population and sampling procedure

For the researcher to have proceeded with conducting semi-structured interviews and the administration of questionnaires, it was important to obtain samples in each of the chosen study sites. The importance of sampling has been reiterated by Leedy and Omrod (2005) who highlight how in a research study, a researcher cannot include everyone they wish to participate in the research study or investigate phenomena exhaustively (O'Leary 2004). This is largely a result of various constraints such as material and financial resources. As a result, a sample needs to be taken of the given population which is a smaller set of cases from the larger research population included in the study. Dawson (2013) further illustrates that the choice of which sampling to employ in a research study largely depends upon the research question, aims and objectives as well as the sample population (Dawson 2013). Different types of sampling methods exist but for this study, a non-probability (purposive) sampling technique was employed. Specifically, the purposive sampling technique was a tool deliberately espoused to select research participants that the researcher was interested in engaging based on their knowledge, expertise or experience (Leedy and Omrod 2005). The research participants knowledge and experience with regards to institutional frameworks, green bonds as well as carbon capture and storage was determined through the years of experience the research participants had as well as expertise achieved and credibility within the various topics of interest.

Prior to conducting interviews and administering questionnaires, the research participants were found and contacted from the different study sites using a rapid web-based search on Google and further through the use of contact details provided on several reports and publications. The next stage was to sample the selected participants in each of the chosen study sites and then administer questionnaires to the identified and selected participants. Considering the fact that some research participants were unavailable and unwilling to participate in face-to-face interviews due to the COVID19 pandemic, an online questionnaire was distributed to these participants. A key advantage of this was that the research participants also employed snowball sampling where the online questionnaire was shared with other participants beyond the researcher's chosen sample. The online questionnaire included both male and female participants and sought their opinions about several critical issues such as the role of institutional frameworks in supporting climate finance mechanisms, the importance of green bonds as a climate finance instrument in South Africa as well as the feasibility of carbon capture and storage to be implemented in South Africa.

In order to obtain the heterogeneity of the selected targeted population, systematic and stratified random sampling methods were employed to obtain a substantial degree of representativeness. The researcher initially made use of stratified random sampling by selecting the chosen study sites and within each of the study sites, selecting a sample group of experts who were knowledgeable on institutional frameworks, green bonds as well as carbon capture and storage. Systematic sampling was also employed in which a systematic sampling interval (k) was calculated which entailed the population size of the chosen study sites (N) to be divided by the sample size (n). The equation employed was as follows: $k = \frac{N}{n}$

With the adoption of this form of probability sampling procedure, it became possible to control the relative size of each selected study sites and the particular sample group of experts. After the general stratification of all the study sites, a total number of 102 experts were included in this study where 80 semi-structured interviews were conducted with experts whilst 12 questionnaires were administered (10 online questionnaires were obtained through snowball sampling). These experts were included in the study between June 2019 and September 2020.

The interviews and questionnaires were administered as follows: In the province of Gauteng, a sample of 30 experts and officials from the Johannesburg region were chosen for this study. This included experts and officials from both private and public institutions which have been involved in green bond issuances as well as policies and frameworks promoting green finance in South Africa. By conducting a rapid appraisal through Google, these experts were identified and sampled from the Johannesburg Stock Market, GrowthPoint Properties, Bowmans Law Firm, the country offices of the International Finance Corporation (IFC), City of Johannesburg, Ernst and Young (EY), Investec, Liberty, Standard Bank and Nedbank. The sampling method was further employed in the Western Cape province within the city of Cape Town where a small sample of only 10 experts and officials involved in green bond issuances were selected.

In the Algoa Basin in the Eastern Cape, a sample of 30 government officials was obtained where interviews and online questionnaires were conducted. These included officials from the Umhlababuyalingana local municipality, Umkhanyakude district municipality, KwaZulu-Natal Department of Economic Development Tourism and Environmental Affairs (EDTEA), Cooperative Governance and Traditional Affairs (CoGTA), Department of Water and Sanitation as well as the Department of Agriculture and Rural Development.

This sampling method was further employed for the Algoa Basin region in the Eastern Cape where only a sample of 10 people was obtained representing officials involved in institutional frameworks for environmental projects as well as carbon capture and storage initiatives.

1.8. Ethical considerations

The protection of human participants through the application of ethical standards is paramount in any research study (Clough and Nutbrown 2002). For a study of this nature, the researcher had to apply for a non-medical ethics application to the University of the Witwatersrand's Human Research Ethics Committee. This process entailed the researcher attending a workshop that comprised of formal training on research ethics as well as a formal written assignment following the workshop. The researcher completed the assignment in which a Certificate of Competence in Research Ethics was obtained. Following this, the researcher submitted an online ethics application on the 10th of April 2019, in which the human resource ethics committee responded on the 24th of May 2019 to the researcher to make the necessary amendments. After all the amendments were completed, an ethical clearance certificate was granted to the researcher on the 12th of June 2019 with the following ethics protocol number H19/05/22.

Once the ethical clearance certificate was granted, the researcher had to send out participant information sheets and consent forms to the research participants. This was an important process for the research participants to be adequately informed about the research and understand what would be required from them. One of the challenges that the researcher experienced during this process was that the participation information sheet and consent forms had to be approved by corporate communication teams from both the public and private sectors. Due to the COVID19 pandemic, this delayed the

process of meeting some of the research participants as the researcher was further required to send the ethical clearance certificate as proof that the researcher was indeed legitimate and would uphold all ethical principles.

In addition, another ethical challenge that the researcher was confronted with was based on confidentiality and anonymity. Clough and Nutbrown (2002) highlight how anonymity and confidentiality are linked to consent. In other words, the research participants need to be made aware of their participation, how their information will be used as data as well as any implications for them should their identity be revealed in the research. The researcher encountered various research participants who several times confused the meanings of confidentiality and anonymity. For example, some research participants wanted to remain anonymous but have their information confidential. The researcher had to thoroughly explain how confidentiality would be guaranteed in the research process whilst anonymity could not be applied since the researcher engaged directly with the research participants. To further elaborate, the researcher also highlighted how all data which was collected through interviews and online questionnaires would be encrypted. To further elaborate, all research participants would have a specific code with reference to any data or publications as well as ensuring that company names and other information that might implicate them are not used in the study.

1.9. Structure of the thesis

This thesis is by publication. The first chapter is a frame of reference that begins with the introduction, the thematic consideration, the research aims and objectives, the research conceptualisation which included thematic considerations, research aims and objectives and the rationale of the study. This chapter also presents the methodology, ethical considerations as well as the overall structure of the study. The second chapter is the

theoretical considerations. This chapter presents two papers. The first paper that was published is based on the emergence of green bonds as an integral component of climate finance in South Africa. It reviews existing literature on the challenges of climate funding in South Africa and how the growth of the green bond market in the country over the years has positioned green bonds to emerge as a promising finance mechanism for various climate and environmental initiatives in the country. This paper also reviews literature that highlights the importance of institutional and cross-sector collaboration in incorporating green bonds as an alternative climate finance mechanism. The third chapter presents the methodology used in the study. It focuses on the application of systems thinking as a methodological imperative for understanding green bonds and carbon capture and storage initiatives. Using systems thinking as a methodological and analytical framework, the paper explores different methodological approaches currently used for green bonds and carbon capture and storage and how systems thinking can provide intervention strategies for implementing these initiatives, especially in developing countries like South Africa. The fourth chapter presents the empirical evidence. It provides an outlook on stakeholder engagement, policy objectives and institutional analysis on how to promote and deploy carbon capture and storage as well as green bonds. The fifth chapter focuses on the analysis. It explores and examines the factors such as the technical and capacity building platforms needed to support the role of green bonds to finance carbon capture and storage projects in South Africa. The sixth chapter is the discussion. This chapter explores the theoretical and practical mechanisms for the adoption of green bonds and carbon capture and storage in South Africa. It also explores the importance of a governance structure that would facilitate the attainment of the development of green bonds and carbon capture and storage in South Africa. The seventh chapter presents the summary of the key findings and conclusions of the study.

This chapter demonstrates that the aims and objectives of the study have been achieved as well as exploring policy recommendations and future research recommendations.

CHAPTER TWO

THEORETICAL CONSIDERATIONS AND LITERATURE REVIEW

Overview of the chapter

This chapter is composed of two published papers which provide an overview of the theoretical considerations and literature review. The importance of this chapter draws upon the theoretical debates on the importance of green bonds as an emerging climate finance mechanism for climate and environmental related projects. Tobin et al (2018) argue that the current sources of financing climate projects are inadequate as most public financing resources in developing countries are directed towards health, education and other socio-economic challenges. Pham (2016) and Banga (2019) discuss how the impacts of climate change will continue to be exacerbated in countries such as in Africa where additional sources of capital will need to be sourced for various adaptation and mitigation projects. It is argued that green bonds can be a key source of private capital that can be directed towards projects which can reduce greenhouse gas emissions such as carbon capture and storage.

The first published paper in this chapter provides an overview of the emergence of green bonds as an integral component of climate finance in South Africa. This paper theoretically brings forth some of the debates around current sources of climate financing in South Africa and evaluates the massive potential of green bonds in contributing to environmental sustainability. Fonta et al (2018) argue that the Green Climate Fund and other financial sources for climate and environmental projects have proven insufficient for the country. To address this challenge, the paper highlights how the success stories of

green bonds in South Africa point to the need to explore such novel financial mechanisms to fund various adaptation and mitigation projects.

The second published paper in this chapter investigates the growth of the green bond market in Africa, using specific case studies from Nigeria, Kenya and South Africa. The paper also draws upon theoretical perspectives which argue on the challenges that African countries face in accessing climate funds. These hindrances are attributed to factors such as weak institutional frameworks, policies, as well as the lack of coordination between public and private sectors. Gianfrate and Peri (2019) argue that in order for African countries to address the impacts of climate change, new financial mechanisms such as green bonds need to be explored, in order to finance large-scale climate and environmental projects. The growth of the green bond market has been observed in Nigeria, Kenya and South Africa with green bonds issued for various climate projects that align to national objectives. The paper concludes with important policy implications and regulatory frameworks that need to be incorporated in order for the green bond market to further expand in these countries and on the continent.

These two papers combined look at the economic and environmental viability for the promotion and adoption of green bonds. In addition, factors are identified that can hinder or promote institutional frameworks such as policies and frameworks for green bonds.

Paper No 1.

The emergence of green bonds as an integral component of climate finance in South Africa¹

Abstract

One of the greatest challenges facing the global community is climate change. Over many years, global leaders have embarked on various platforms in a concerted effort to combat climate change. One of the key platforms has been the annual Conference of the Parties (COP) – a regular meeting in which climate negotiations and high-level political discussions have taken place. In 2015, the 21st COP was the most important because 195 countries agreed to ensure that rising global temperatures do not exceed the safe zone of 1.5 °C, as it is forecasted that temperatures will continue beyond this value between 2030 and 2050 if no action is taken to combat climate change. The parties further agreed that climate investments for countries are critical to make enormous transformational changes to reduce their greenhouse gases by scaling up climate adaptation and mitigation strategies.

Keywords: climate mitigation, climate investment, climate finance mechanism

2.1. Introduction

Developing countries are at a crossroad because they are the most vulnerable to the impacts of climate change and they are highly dependent on climate finance from developed countries in order to finance climate adaptation and mitigation projects (Bowman and Minas 2019). The Climate Funds Update is one of the largest databases on multilateral climate finance initiatives and the Green Climate Fund set up by the United Nations Framework Convention on Climate Change (UNFCCC) in 2010 has now become the largest climate fund for developing regions such as sub-Saharan Africa, Asia and the Middle East (Fonta et al 2018; Bowman and Minas 2019). However, there have been

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challenges facing many developing countries that have tried to access this finance. These challenges arise because developing countries have difficulties in the design and co-ordination of projects due to a lack of effective institutions and expertise (Fonta et al 2018). This also creates challenges in the planning and coordination of projects (Fonta et al 2018).

Furthermore, a 2018 report by the World Bank on climate finance, estimated that more than USD200 million per annum will be required for each developing country to have proper strategies and capacity-building frameworks to build resilience against climate change (World Bank 2018). It is therefore important that, in order to meet their commitments to the Paris Agreement, developing countries explore other finance opportunities for climate mitigation or adaptation strategies, of which green bonds are one (World Bank 2018).

The emergence of green bonds has been explosive over the years as an innovative manner in which to mobilise private capital towards investing in 'green' projects (Pham 2016). Green bonds have been considered an integral component of climate finance because they appeal to investors who can reap financial benefits whilst also playing a role in investing in environmental and climate-related projects (Pham 2016). Green bonds have also appealed to the public sector, where governments and municipalities have begun to issue green bonds to meet their climate-change commitments by implementing their adaptation and mitigation strategies (Pham 2016). To date, South Africa is one of only a few African countries that have been active in the green bond sphere. Both the public and private sectors have issued green bonds – the proceeds of which have gone into renewable energy such as wind and solar projects, energy-efficient buildings as well as low-carbon infrastructure, e.g. low-emission vehicles and electric buses (Ngwenya 2019).

In view of the above, green bonds are analysed here as being an integral component of climate finance in South Africa, with both the public and private sectors involved.

2.2. Green bonds: A new source of climate finance

Green bonds have emerged as one of the most innovative and promising climate finance mechanisms internationally (Ngwenya 2019). The green bond market has had exponential growth of 92% over little more than a decade with a few green bonds purchased from its establishment in 2007 to more than USD200 billion worth of green bonds purchased in 2018 (Ngwenya 2019). Owing to increasing awareness of the benefits of green investments, the first green bonds to be issued were by international development institutions such as the World Bank, the International Finance Corporation, and the European Investment Bank (CBI 2018; Ngwenya 2019). Since then, several commercial banks, municipalities, governments as well as large investment companies have issued green bonds to support and enable the transition towards a low-carbon society (CBI 2018). This is because green bonds fund projects that contribute to reducing carbon emissions such as renewable energy, sustainable agriculture like eco-farming, as well as climate-resilient infrastructure (CBI 2018).

Green bonds have been defined in various ways. Banga (2019: 18) has argued that there is no 'universal definition of green bonds, although a growing consensus has emerged on what they are intended to do. Here we use the World Bank's (2015: 23) definition of a green bond: "a debt security that is issued to raise capital specifically to support climate-related environmental projects". The unique feature of green bonds is that, for the first time in capital markets, there is an actual bond in which proceeds are invested in projects that will bring environmental benefits (World Bank 2015). The Climate Bonds Initiative is a non-governmental organisation located in London that assists governments and

investors internationally to issue green bonds and assists in certifying eligible green projects (CBI 2018). The Climate Bonds Initiative has a selected taxonomy of the range of projects supported by green bonds (CBI 2019). This is very diverse and can cover renewable energy, low-carbon transport, green buildings and infrastructure, as well as improved water efficiency (Gianfrate and Peri 2019). However, it is unlikely that this taxonomy is exhaustive and inclusive because it is anticipated that, as the green bond space grows, more eligible green projects will be included (Paranque and Revelli 2019).

Ameliorating climate change is now considered a huge investment opportunity and investor appetite for green bonds has grown rapidly (Li et al 2019). In the developed region of the world, the growth of green bonds is visible, with Europe and the USA leading the way (Banga 2019). This growth has been supported by governments and various investors to whom climate awareness and climatically responsible investments has become a priority in terms of international agreements (Ngwenya 2019). By contrast, in developing regions, the green bond market has been relatively small, and there is certainly potential for growth (Banga 2019). In emerging markets, including countries in Asia, Africa and Latin America, the issuing of green bonds is increasing steadily (Li et al 2019).

2.3. Climate finance systems and green bond opportunities in South Africa

The 2018 Intergovernmental Panel on Climate Change Special Report that came out of COP24 in Katowice, Poland, has projected that an increase in global temperatures will be detrimental for the sub-Saharan region (IPCC 2018). In particular, South Africa is considered to be one of the hotspots of climate change, with increasing drought periods and resulting water shortages (Enca 2019). Climate change has affected broader South

African society and the economy. Figures are instructive: the prolonged drought from 2014 to 2017 resulted in a decrease in GDP because of the impact on agricultural production (Archer et al 2019). Moreover, and this remains to be seen in the policy arena, the consequences of climate change have accelerated the need to enforce national policies and consider strategies to build social, environmental and economic resilience (DEA 2019). Climate adaptation and mitigation strategies are reflected in various policies and strategies, such as the Draft National Climate Change Adaptation Strategy (2019) as well as the National Climate Change Response White Paper (2011) (DEA 2011).

As part of the Nationally Determined Contributions, which are long-term climate plans to reduce emissions developed by each country at the Paris Agreement, South Africa has established various climate finance systems since 2011 for climate adaptation and mitigation projects (DEA 2015). These include climate finances from development agencies like the World Bank, the International Finance Corporation and the African Development Bank (DEA 2015). These climate funds have supported a range of renewable energy projects as well as climate-resilience projects such as developing community early warning systems for floods and droughts as well as climate-resilient agriculture such as multi-cropping and rainwater harvesting for crops (DEA 2015). It is only since 2014 that green bonds were implemented as a climate finance system in the country by municipalities and companies in the private sector (COJ 2014). The difference between these climate funds and green bonds is that the latter has a specific range of projects that would potentially be funded by investors from different sectors and allow investors an opportunity to benefit from these projects (COJ 2014).

Furthermore, the Green Climate Fund (GCF) – which is a climate finance fund established under the UNFCCC designed to help developing countries reduce their greenhouse gas

emissions – has been the largest source of climate finance (DEA 2018). This fund was set up in 2010 in which more than USD10 billion of climate finance has been committed for more than 100 projects (DEA 2018). These projects include climate adaptation and mitigation projects from a local, national, regional and international level (DEA 2018). In partnership with the Development Bank of South Africa's (DBSA) Climate Finance Facility, the GCF has raised funding of over USD5 billion for adaptation and mitigation projects across the country including the GCF-DBSA Embedded Generation Investment Programme to support the implementation of renewable energy projects (DEA 2018). Other local projects include building capacity for the South African National Biodiversity Institute through the Ecological Infrastructure for Water Security Project (SANBI 2018). This project is currently being piloted by the uMngeni Catchment in KwaZulu-Natal where local communities will be involved as a way to create employment and address current environmental issues (SANBI 2018).

Despite some successes, there is increasing concern that these climate finances are not enough. The Department of Environmental Affairs noted that over the years international climate finances have declined and developing countries have had to shift to using their own financial resources, thereby easing their reliance on outside aid (DEA 2018). A further hurdle is the absence of political will and the unwillingness to implement policies and strategies that have discouraged outside investment (DEA 2018; SANBI 2018). In South Africa too, there is a lack of transparency and accountability as to how the money has been spent that has become of concern to the international community (DEA 2018; SANBI 2018).

Far too little attention in South Africa has been paid to other mechanisms within the country, including green bonds. These may well become integral to finance climate

change projects and there are already numerous success stories. For example, the first South African green bonds were issued by the City of Johannesburg in 2014 (worth ZAR1.46 billion) and the City of Cape Town in 2017 (worth ZAR1 billion) (COJ 2014; CBI 2017). Green bonds have also given the two cities an opportunity to be up to date with the current world strategy on the implementation of green financing and green projects in cities.

Green bonds differ from other climate finances such as those in the international arena in that they not only attract the private sector but also encourage environmental awareness. The Johannesburg Stock Exchange has set up a green bond segment which has been well received and companies such as Growthpoint Properties have issued green bonds for energy-efficient buildings (GrowthPoint Properties 2018; Nedbank 2019). Moreover, Nedbank is just one example of a commercial bank in South Africa that has issued green bonds for renewable energy investments (Nedbank 2019).

2.4. Conclusion: The green bond trajectory in South Africa

Climate finance mechanisms in South Africa need to be adapted to include new emerging mechanisms and this process seems to be occurring. Enabling transformative changes towards a low-carbon country will effectively require large financial resources. Green bonds have proven to be an effective climate finance mechanism globally, and their adoption within existing national financial structures looks promising, even for developing countries like South Africa. If provided with the opportunity to expand – given strong and effective institutions, multiple stakeholders involved as well as proper planning and coordination – green bonds may become an integral component of climate finance for South Africa and fund a range of environmental and climate-related projects.

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Paper No 2.

Unbundling of the green bond market in the economic hubs of Africa: Case study of Kenya, Nigeria and South Africa²

Abstract

Climate change is arguably one of the biggest challenges globally. In order for countries to meet the commitments of the Paris Agreement, climate investments need to be scaled up for adaptation and mitigation strategies. Green bonds are one of the most emerging climate finance mechanisms for large-scale climate projects and offer investment opportunities for many developing countries. Most developing countries are heavily reliant on climate funds which are insufficient. Hence, the urgent need to tap into emerging climate finances such as green bonds. Out of all the regions, Africa is expected to be the worst impacted by climate change and green bonds can contribute to the much needed climate finances. The growth of the green bond market has been observed in the economic hubs of the continent with countries such as Kenya, Nigeria and South Africa demonstrating huge potential in being active and contributing to the growth of the market. However, this paper recommends that for the green bond market to further expand in these countries and rest of the continent, there needs to be public-private partnerships fostered, integrated policies, political will as well as effective institutional frameworks.

Keywords: Green bonds, climate change, climate finance, Africa, economic hub

2.1.1. Introduction

Climate change is one of the greatest long-term challenges that mankind is and will continue to experience (Steffen et al 2007; McDowell et al 2019). Human activities such as the burning of fossil fuels and massive industrialisation have been responsible for the increased greenhouse gas emissions in the atmosphere (Szulczewski et al 2012). The increased release of greenhouse gases into the atmosphere has resulted in climate change causing irrevocable impacts on the planet (Busby et al 2014). These impacts have been

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widely observed on all sectors of the economy, society and environment (Skogen et al 2018). Failure to address these issues, climate change will continue manifesting itself further through adverse impacts on a global level (Andric et al 2019).

Climate change is undeniably one of the most pressing challenges and over the past decades various climate conferences have taken place to address this (Figueres and Streck 2009; Tobin et al 2018). One of the most notable conferences in the mid-1990s was the United Nations Framework Convention on Climate Change (UNFCCC) where the Kyoto Protocol which was an international treaty was adopted (Condor et al 2011). The aim of the Protocol was to ensure legally binding obligations for developed countries to reduce their greenhouse gas emissions (Almer and Winkler 2017). The Conference of the Parties (COP) has been at the forefront of these climate negotiations with the most notable conference being the 21st COP held in 2015 where the Paris Agreement was adopted (Figueres 2016). This agreement was considered historic as 195 countries unanimously agreed to limit global temperatures well below 2°C (Figueres 2016). In order to achieve this global goal, climate investments are critical as countries need to make transformational changes to reduce their greenhouse gas emissions and transition towards a low-carbon society and economy (Hainaut and Cochran 2018).

It has been argued that developing regions are more likely to be the worst impacted by climate change (Filho et al 2018). For example, Africa has been identified as one of the most vulnerable as it is already climatically stressed and climate change is expected to exacerbate this (Dionne and Horowitz 2016). This view has further been iterated by the Intergovernmental Panel on Climate Change (IPCC) 2018 Special Report on Global Warming of 1.5°C. The report highlighted how an increase in global temperatures would be disastrous for Africa as this could be twice the increase in temperatures on the

continent (IPCC 2018). Africa's problems are further worsened by weak institutions to effectively deal with climate change as weak institutions decrease the capacity and resilience of populations to cope with the impacts of climate change (Bisaro et al 2018).

Climate challenge in Africa is complex because billions of dollars investments are required and most African countries are highly dependent on climate finance from developed countries (Bowman and Minas 2019). The Climate Funds Update 2018 report identified the Green Climate Fund (GCF) as one of the biggest multilateral climate fund for several African countries (Fonta et al 2018). However, there are challenges that some of these countries have faced in accessing these finances. Fonta et al (2018) highlight how the Country Readiness Programme which is considered a priority of the GCF has witnessed only 19 out of 54 African countries having the institutional capacity and proper systems in place to access funds and resources. To further illustrate this, the World Resources Institute (2019) highlighted how countries specifically in West Africa such as Senegal and Sierra Leone experienced challenges in accessing climate funds for adaptation and mitigation projects. This is due to a lack of a comprehensive budget on how funds should be distributed and utilised for various climate projects. Other hindrances identified included the lack of stakeholder engagement between public and private sectors, incoherent policies as well as weak government mandates. All these challenges in accessing climate finance emphasise the importance of African countries to explore new finance mechanisms, such as green bonds, if their commitments to the Paris Agreement is to be achieved (Gianfrate and Peri 2019). New finance mechanisms can provide opportunities for African countries to mobilise large amounts of private capital and investments that are readily available and accessible (Chirambo 2016). This is supported by the African Development Bank who argue that innovative investment strategies for climate change are rapidly increasing on the continent and provide the

opportunity for African countries to not be fully dependent on one source of climate finance (AfDB 2018). One of these finance mechanisms has been green bonds which are fast becoming a viable financing option on the continent for investments in large-scale environmental projects (Guha 2019).

The green bond market has proven to be an innovative finance mechanism to mobilise private capital for climate projects (Pham 2016; Glomsrod and Wei 2018). Global green bond issuances are rapidly increasing in both developed and developing countries due to investor awareness on the impacts of climate change (Glomsrod and Wei 2018). It is important to note that the green bond market is much smaller in terms of overall size in developing countries however; there are initiatives which are being taken by developing country governments to ensure that the market continues to expand (Banga 2019). The Climate Bonds Initiative (CBI), which is one of the leading organisations in climate and green bonds, identified an increase in issuances between the years of 2018 and 2019 from emerging markets such as China, Brazil and India (IFC 2018; CBI 2019a). It was further highlighted how the growth of green bonds from these emerging markets has been attributed to the various initiatives by the CBI and these countries to enable and facilitate the expansion of the green bond market (CBI 2019b).

In Africa, the green bond market has been active in the economic hubs of Africa (London Stock Exchange 2018). It is because of this that this paper presents an analysis of the green bond market in Kenya, Nigeria and South Africa as well as the challenges and opportunities that exist for its growth on the continent. This paper also aims to address the gap in knowledge of green bonds in Africa.

2.1.2. Green bonds: A new source of climate finance

Combating climate change requires more finance and resources than governments alone cannot provide. Green investments for climate projects have presented several business opportunities and further allowed investors to adapt their business models to not only have financial value but environmental values in an effort to protect the planet (Doval and Negulescu 2014; Taghizadeh-Hesary and Yoshino 2019). One of the most promising and innovative investment opportunities that have emerged over the years has been green bonds in comparison to blue and sustainability bonds (Paranque and Revelli 2019). These bonds have been described as a key solution to help finance many countries transition towards a low-carbon society and economy (ICMA 2019).

According to Banga (2019) there is a growing consensus on what green bonds are and what they are intended to do although there is no standard definition that currently exists. The International Capital Markets Association (ICMA) defines a green bond as funds 'raised to finance or re-finance green projects, assets or business activities' (2015: 1). While the United Nations Development Programme (UNDP) defines a green bond as not being different from a conventional bond except that the proceeds are 'invested in projects that generate environmental benefits' (2019: 1). These different definitions have similarities in what a green bond is even though there is no universal definition. For the purpose of this paper, the World Bank definition of a green bond will be adopted which is defined as 'a debt security that is issued to raise capital specifically to support climate-related environmental projects' (World Bank 2015: 23).

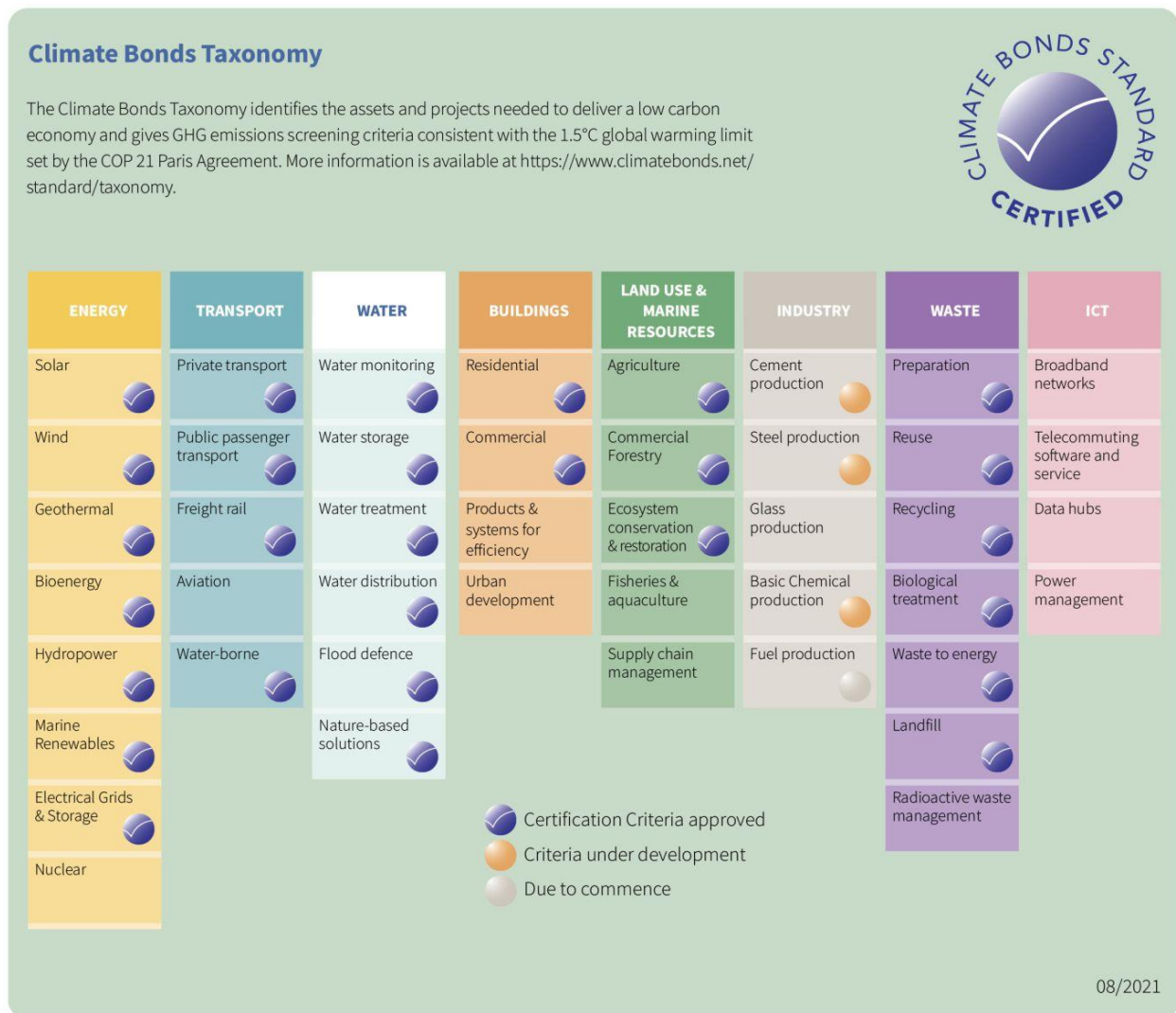
The phenomenal growth of the green bond market has been attributed to increasing climate-awareness from investors about the benefits and impacts of green investments (Pham 2016). The development of the green bond market is evident in developed regions

with the top issuers being in Europe and the United States (Reboredo 2018). Although emerging markets from Asia and Latin America have also demonstrated the huge potential of this market (CBI 2019b). These include countries such as China, India, Brazil, Mexico and Malaysia (CBI 2019b). The CBI (2019b) reported an increase in green bond issuances due to policies and frameworks within emerging markets that are supporting green bond market infrastructure (S & P Global 2019).

However, there are factors that continue to act as barriers to further development of the green bond market in developing regions (Nanayakkara and Colombage 2019). These include high transaction costs associated with green bond issuance, the lack of incentives as well as weak government policies and mandates have acted as key barriers to market growth, especially in regions such as Africa (Moid 2017).

The establishment of the Green Bond Principles (GBP) have been considered an important component of green bonds and can be a potential solution to some of the barriers that the market has had, thus far. The GBP can be described as voluntary guidelines and processes for the issuance of green bonds to promote transparency and integrity in the green bond market (ICMA 2018). There are four key components of the GBP (ICMA 2018). First, there is the use of green bond proceeds where the GBP recognise broad categories of the most commonly used projects for green bonds (ICMA 2018). Some of these common environmental projects for the green bonds are also highlighted under the CBI taxonomy in which the GBP provides space for these projects to be highlighted (CBI 2019a) (Figure 2.1). However, it is important to note that the GBP and the CBI taxonomy are not the same thing.

Figure 2.1. The different projects and categories under the CBI taxonomy



Source: Climate Bonds Initiative (2021).

Second, there is the process for project evaluation and selection in which an external review is recommended to assist issuers with project evaluation and green certification (ICMA 2018). The issuers of green bonds are expected to communicate to stakeholders and investors regarding how the chosen green projects will have environmental benefits as well as how potential environmental and social risks will be managed (ICMA 2018).

Third, there is the management of proceeds in which issuers are expected to track the net proceeds of the green bond for the entire period (ICMA 2018). To further ensure a high

level of transparency, the GBP outline the use of a third party verifier or an auditor to verify and track the allocation of funds to ensure issues around corruption and mismanagement of funds are adequately dealt with (ICMA 2018).

The last component is reporting where issuers are encouraged to make information readily available on the use of proceeds (ICMA 2018). It is also expected from issuers that information be communicated in a manner that is well understood (ICMA 2018). Overall, the GBP are there to provide transparency and accountability and it is hoped that as the market expands and evolves that guidelines and processes become strengthened. In addition, in a policy brief the CBI notes how in areas of financial activities, such as economic hubs, this provides an opportunity for market participants to develop local green bond markets where the GBP can further be developed and integrated (CBI 2019b). This allows for the development of a sustainable green bond market where there is regulation and guidelines on a local and international scale.

2.1.3. Economic hubs

This paper provides an analysis of green bonds in the economic hubs of Africa and hence it is important to define what an economic hub is and the different ways it has been theorised in literature. The theory of economic hubs is best understood within the context of economic geography. Malecki (2017) highlights how economic geography focuses on commercial and economic activities within geographical areas. Economic hubs are specific places and spaces where there is a concentration of economic activities which result in a higher capital output (Malecki 2017). This view is further supported by Poon et al (2015) who highlight how an economic hub is where there is a geographical concentration of wealth through the location of financial services or multinational companies. This is further illustrated by Hayter and Patchell (2015) who discuss how

economic hubs contribute to the broader global economy due to local production, value chains and networks that emerge from different sectors located in a specific area.

On the other hand, Warf (2015) is of the view that in economic geography, economic hubs should be analysed on the dichotomy between society and the economy. The author argues that an economic hub is not just about the high capital output of certain sectors but is about social activities that occur in urban economies (Warf 2015). This is further illustrated by Penco (2015) who argues that economic hubs contribute to a knowledge economy where intellectual contributions become a stimulus for innovation. Furthermore, human capital has also been considered as an important factor in economic hubs. Fertig et al (2009) argue that an economic hub is a network of human capital where the most highly skilled individuals contribute to the flows of knowledge and information.

In addition, by drawing on the concept of globalisation this has also been considered as important in economic hubs. Globalisation has been referred to as the interconnectedness of the world through global networks of capital flows, trade and technology (Harvey 1995). Chaminade and Vang (2008) argue that cities have become important as hubs of economic activities due to globalisation. This is because of the continuous movement of goods and services, diverse economies and development which globalisation has spurred on economic hubs across the world (Chaminade and Vang 2008).

Africa's growth and development has been astounding with emerging markets showing great potential (Asongu 2017). It is important to note that for this paper, the three countries being studied Kenya, Nigeria and South Africa use different criteria for what constitutes as an economic hub. First, Kenya is considered an economic hub due to the country being one of the most economically advanced and industrialised countries in East

Africa (UNCTAD 2018). This is because of the continuous growth the country has had with the Gross Domestic Product (GDP) growing to 5.7% in 2018, superseding all the other countries in the region (World Bank 2018). It is also one of the leading manufacturing and trade hubs in East Africa (McKinsey 2015). Furthermore, Kenya's thriving entrepreneurial workforce has also contributed to the country being a leading economic hub (Pedo et al 2018).

Second, Nigeria is considered one of the biggest economic hubs in West Africa due to the petroleum industry which is the biggest on the continent (Olofin et al 2014; KPMG 2018). According to the Organisation of the Petroleum Exporting Countries (OPEC) in 2018 Nigeria was amongst one of the largest petrol importers in the world (OPEC 2016). The abundance of oil has catapulted the country to be one of the biggest economies in the West African region (Kemi 2019).

Third, South Africa's mineral-energy complex has catapulted the country to be a leading economic hub in Africa. The mining sector has generated huge wealth for the country with an abundance of valuable resources such as platinum, gold, diamond and coal. In addition, the country's agricultural sector is the biggest and most advanced sector on the continent (Scholvin and Draper 2012). Through the use of agro-processing, this sector has created profitable opportunities for the local economy and international investors (Greyling et al 2015; Senyolo et al 2018). Recently, over the past ten years, South Africa has grown towards a knowledge economy hub where a greater focus has been on ICT technology and e-commerce (Blankley and Booyens 2010).

2.1.4. Methodological considerations

This study is qualitative in nature and is based on case study research. Baxter and Jack (2008: 544) describe a case study as 'an approach to research that facilitates exploration

of a phenomenon within its context using a variety of data sources'. A key advantage of using case studies is to explore phenomena or situations where little is known about (Baxter and Jack 2008). Hence, this paper presents case study experiences of green bonds in Africa drawn from the three different countries of Kenya, Nigeria and South Africa in which these countries are also considered the economic hubs of the continent.

The paper relied on secondary data which was collected on green bond issuances in Africa. An extensive web-based search using Google was conducted. Keywords used during the web-based search included 'Green bonds Africa', 'Green bond issuances Africa' as well as 'Green bond market Africa'. Upon getting results from the search it was found that the green bond market was active in only three countries being Kenya, Nigeria and South Africa which were also described as the economic hubs of the continent. To find detailed information on green bonds in these countries, the web-based search became more refined using words such as 'Green bonds Kenya', 'Green bonds Nigeria' as well as 'Green bonds South Africa'.

Published data were available for all the three countries from private companies, government, stock exchanges, media reports as well as reports and publications from different organisations. From Kenya, published data was available from the Nairobi Securities Exchange (NSE), FSD Africa, the Climate Bonds Initiative (CBI) and the Kenyan Green Bonds Programme. Second, from Nigeria published data was available from the Climate Bonds Initiative, the Nigerian Stock Exchange, the Debt Management Office Nigeria, Access Bank and Moody's. Lastly, in South Africa, information was found from the Johannesburg Stock Exchange, GrowthPoint Properties, Nedbank, the International Financial Corporation (IFC), the City of Cape Town, the City of Johannesburg as well as the Industrial Development Corporation (IDC).

The researchers did not come across any academic literature that was published on the green bond market specifically on Africa during the data collection period.

2.1.5. Green bonds in the economic hubs of Africa

In the context of Africa, recent trends and developments of the green bond market have been observed in the three economic hubs and it is also where several issuances of green bonds have occurred. This is shown in figure 2.2 below which presents a map of green bonds located in the economic hubs of Africa.

Case study: Kenya

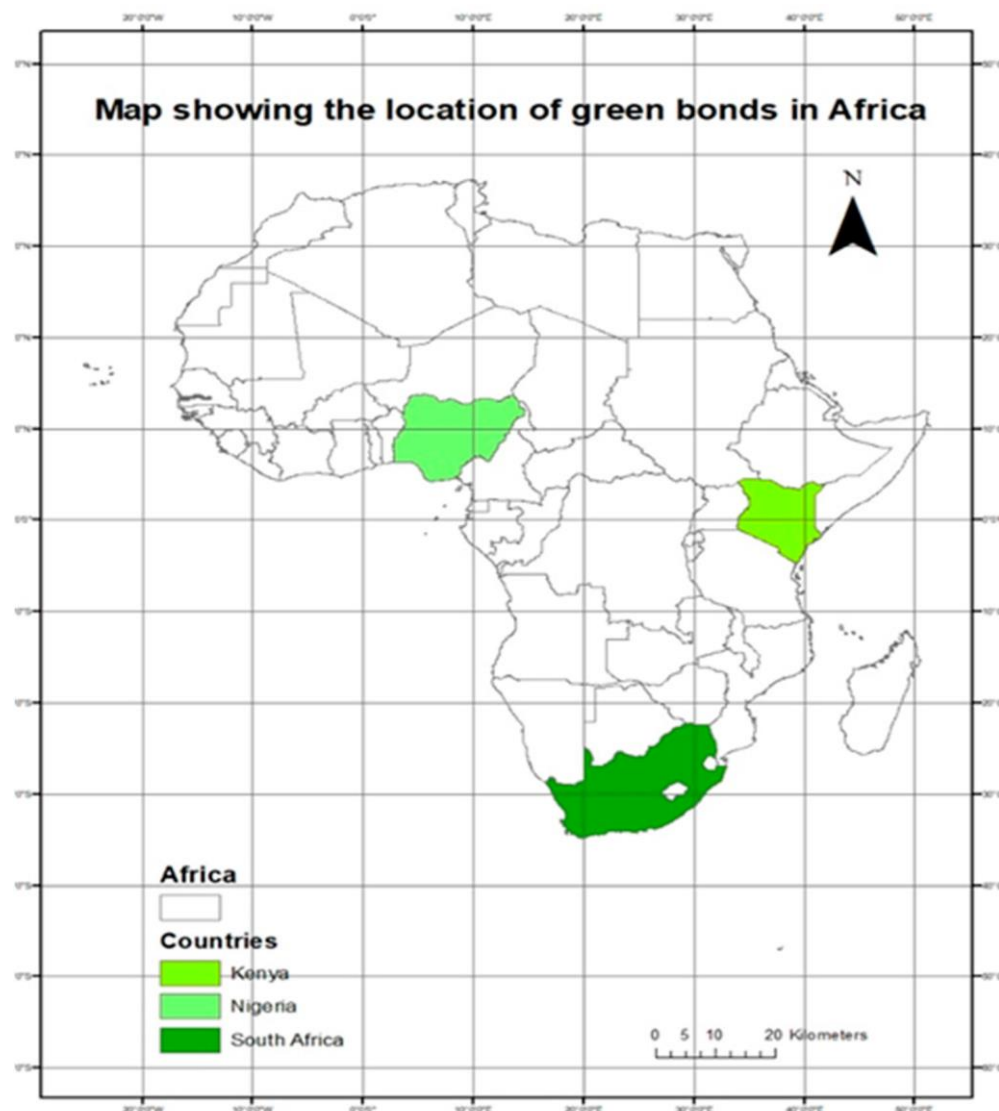
The government of Kenya has set ambitious plans for change in order to transition towards a low-carbon society and this has been reflected in key policies such as the Green Economy Strategy and Implementation Plan (GESIP) of 2016–2030 (GESIP 2016). A significant aspect within the GESIP is identifying green finance mechanisms such as green bonds to support the country's green growth path (GESIP 2016). As a result of this, the Kenyan Green Bonds Programme (GBPK) was launched in March 2017 with the aim to support the development of a domestic green bond market (GBPK 2017).

A central component of the GBPK was a multi-stakeholder partnership (GBPK 2017). This included the Central Bank of Kenya, FSD Africa, the CBI, Nairobi Securities Exchange, Kenyan Bankers Association, Capital Markets Authority, FMO Dutch Development Bank, International Finance Corporation (IFC) as well as the Kenyan National Treasury (GBPK 2017). The outcome of this partnership resulted in an advisory committee established from national treasury and parliament to influence new policy incentives and regulations to attract investors (GBPK 2017). In the private sector, structures were also implemented

by the Kenyan National Treasury and the IFC to create awareness and knowledge with market participants on green bonds (GBPK 2017).

The first corporate green bond was issued in August 2019 worth R4.26 billion by Acorn Holdings which is a real estate development firm (Reuters 2019). The proceeds were allocated to build environmentally friendly student accommodation (Reuters 2019). This green bond issuance demonstrates the effectiveness of multi-stakeholder partnerships in creating platforms to achieve environmental objectives (Reuters 2019).

Figure 2.2. Map showing the location of green bonds in the economic hubs of Africa.



Source: Based on survey results (2019)

This is further supported by the Kenyan Capital Markets Regulator who highlighted how the East African community could leverage from the Kenyan experience on the platforms created to advance an effective green bond market (Reuters 2019). However, Magale (2018) is of the view that further work still needs to be done in developing the Kenyan green bond market. Magale (2018) argues that resources need to be directed to local Kenyan market participants to develop skills and expertise on green bonds. Furthermore, the author highlights that the Nairobi Securities Exchange is required to establish robust reporting guidelines to enforce compliance for issuers and hence maintain the integrity of the market (Magale 2018). This is supported by the CBI (2019b) who argues that local stock exchanges can play an important role in ensuring that issuers adhere to the green bond principles.

Case study: Nigeria

One of the most significant aspects of Nigeria's climate change policies has been the need to diversify funds and access private capital to invest in the country's low-carbon transition (Dioha et al. 2019). In 2016 the Federal Government of Nigeria identified green bonds as a form of sustainable finance where the Nigerian Ministry of Environment and Ministry of Finance collaborated in setting up the Nigerian Green Bonds Framework (CBI 2018). Furthermore, events such as the Nigerian green bond week, investment seminars as well as massive media coverage created platforms to increase awareness from other stakeholders (CBI 2018). These stakeholders included the CBI, the Nigerian local investment community, Access Bank, FSD Africa as well as FMDQ OTC Securities Exchange (NSE 2018).

As a result of this the first green bond was issued in 2017 by the Federal government of Nigeria worth N10.6 billion (Lexology 2017). The issuance of the bond was also highly

supported by the Nigerian investment community as a wide range of investors from commercial banks, asset management firms and pension groups also invested in the green bond. The proceeds of the bonds were utilised in funding three green projects being the Afforestation Project, the Energising Education Project as well as the Rural Electrification Project (Lexology 2017). The Federal Government of Nigeria also highlighted how these projects were specifically chosen as they align with the Sustainable Development Goals (Elum and Momodu 2017). In addition, the CBI rated the country with a positive assessment with regards to how the different projects were implemented (CBI 2018). This was also supported by Moody's in which Nigeria was rated with GB 1 which is regarded as excellent (Moody's 2017b).

The success of the first green bond issued in Nigeria increased investor confidence from local and international investors (ESI Africa 2019). In 2019, Access Bank which is one of the biggest commercial banks in Nigeria issued the country's second green bond (CBI 2019c). The bank also became the first certified corporate green bond in Africa to issue a green bond (CBI 2019c). The proceeds of the bond would be allocated for water infrastructure and solar energy generation facilities (CBI 2019c). Due to the increased investor interest, various departments and institutions such as the Nigerian Stock Exchange have issued regulations on the issuance of green bonds (NSE 2018). These regulations have incorporated the Green Bond Principles and are aimed at promoting integrity within the local green bond market in Nigeria (Lexology 2017).

Case study: South Africa

The South African government has stated its commitment to combating climate change by developing key climate change policies in the past decade. These include the National Climate Change Response Policy (NCCRP 2011), the National Climate Change Response

White Paper (2011) as well as South Africa's draft National Climate Change Adaptation Strategy (2019). In order to enable the transition towards a low-carbon society, the Department of Environment, Forestry and Fisheries (DEFF) and other key departments have highlighted the need to scale up financial resources from the private sector (DEFF 2011). One of these finance mechanisms has been green bonds which has gained significant interest from local and international investors in the past seven years to fund green projects in South Africa.

The first green bond in the country was issued in 2014 by the City of Johannesburg worth R1.5 billion (COJ 2014). The proceeds of the bond were allocated to fund green projects such as low-carbon transport as well as energy saving measures for residents like solar water heating (COJ 2014). The success of this green bond resulted in COJ being acknowledged at the Paris Agreement for tackling climate change as well as receiving the C40 Cities Award for the green bond (COJ 2014).

In 2017, the City of Cape Town became the second city in the country to issue a green bond. This was also the first green bond in the country to be listed on the Johannesburg Stock Exchange (JSE) green segment worth R1 billion (JSE 2017). There was increased investor appetite over this green bond because of the Invest Cape Town Initiative which brought together a range of stakeholders such as the CBI, Rand Merchant Bank, City of Cape Town, the Cape Chamber of Commerce as well as international investors. The proceeds of the bond were allocated to water management, coastal structures as well as other projects in line with the city's climate change strategy (CBI 2017). This green bond was also successful as it was rated by Moody's with a GB1 rating which is considered excellent and the City of Cape Town was also awarded 'Green Bond of the Year – local

authority' by the Environmental Finance Green Bond Awards in 2018 (Moody's 2017a; ESI Africa 2018).

In addition, a few green bonds have also been issued from the South African private sector. This has largely been attributed to the JSE's green bond segment which has allowed investors to contribute in raising capital for sustainable and environmental projects. GrowthPoint Properties was one of the first South African real estate companies in 2018 to issue out a green bond on the JSE of R1 billion in which proceeds were allocated to energy efficiency and green office buildings (GrowthPoint Properties 2018). Furthermore, in 2019, Nedbank became the first corporate bank in the country to issue out a green bond worth R1.7 billion and proceeds were allocated to renewable energy projects in the country (JSE 2019).

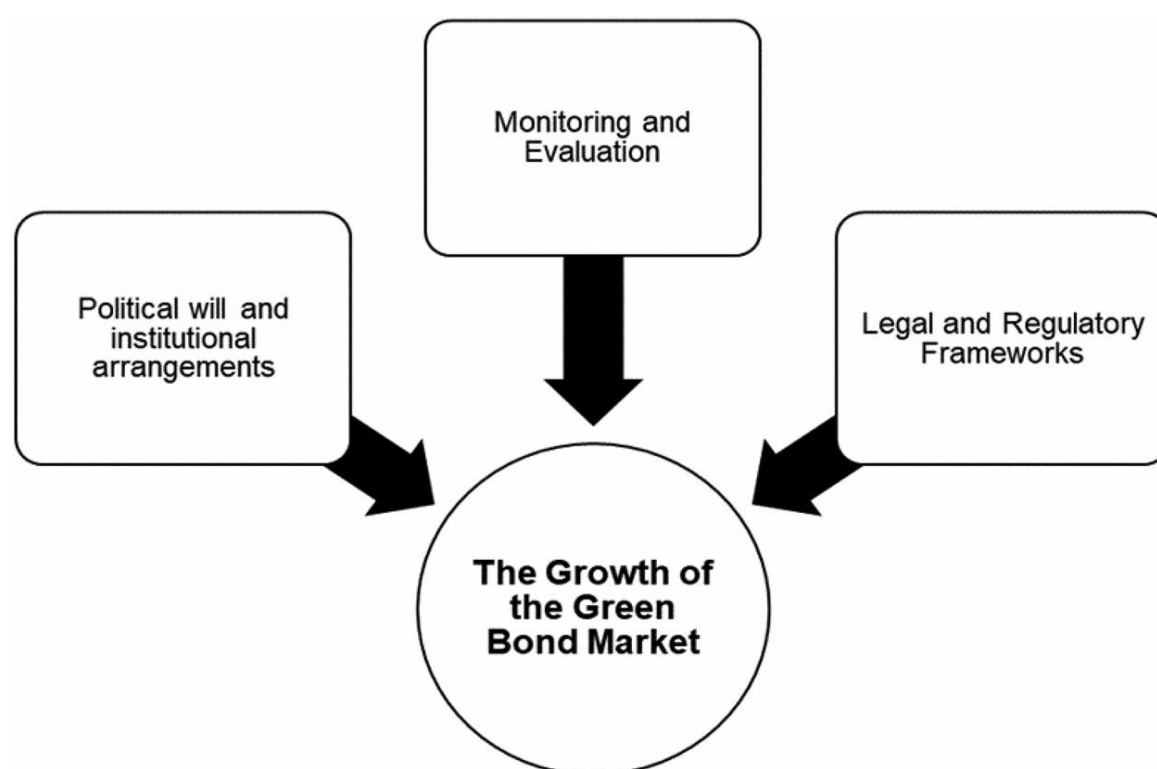
2.1.6. Measures to accelerate the green bond market

It is evident that there is huge potential for the green bond market to increase on the African continent. However, measures need to be in place to ensure that the market is rooted in proper frameworks and systems. Figure 2.3 evaluates factors that can influence the growth of the Green Bond market in Africa. First, there needs to be legal and regulatory frameworks in place to ensure that the green bond market operates in a system where there is transparency and accountability from issuers.

Second, there is a need for continuous monitoring and evaluation of the green bond market on the continent to determine investor behaviour and impact evaluation. This would enhance transparency and accountability which is very important for the integrity of the green bond market and would prevent issues such as green washing.

Third, in order for the green bond market to expand there is a need for political will and proper institutional arrangements. There also needs to be public and private partnerships fostered as well as policies implemented that guide the green bond market. This has already been witnessed with the African Development Bank (AfDB) Green Bond programme which was established to help facilitate green growth through financing eligible green projects (AfDB 2013). Similar strategies can be applied for the three countries as well as other African countries embarking on green bonds in the future.

Figure 2.3. Factors that can influence the growth of the Green Bond market in Africa.



Source: Based on survey results (2019)

2.1.7. Conclusion: The future path of green bonds in Africa

There are a number of important policy implications which should be considered for the development of the green bond market in Africa. The introduction of government policies such as tax incentives on green bonds should be implemented. This can enable green

bonds to become more attractive to investors and enable issuers to get green bonds at a lower interest rate. For example, the government of China introduced a range of tax incentives, supportive policies as well as regulatory frameworks. This highlights the proactive approach that China took as a developing country which African countries can draw from.

African governments should also have policies which promote increased awareness and participation of green bonds. It is important for all market participants to have an understanding of the benefits that green bonds can have in achieving climate goals. With enhanced knowledge and understanding of the green bond market in Africa, this can also enable innovation within this space to further create a pool of new investors. For example, India introduced policies which engaged with the wider financial community on green bonds. This is another example of a developing country making great strides in the green bond market and this can also be applied by African countries.

There should also be established green bond principles and guidelines that are incorporated in the green bond market in Africa. This promotes integrity of the market but also ensures transparency and accountability for issuers. Every African country should implement a green bond segment in the local stock exchanges which are set at international best practice to further promote green listing rules and green issuances. Key lessons can be drawn from the Johannesburg Stock Exchange (JSE) in South Africa which has an established Green Bond Segment that has contributed to promoting the integrity of the green bond market in the country.

If all these factors are considered, the green bond market has the potential to increase on the continent. In addition, African countries can benchmark best practices and draw key lessons from other developing countries, such as China and India, on green bond market

development experiences. There are valuable lessons which can be learnt and applied not only for Kenya, Nigeria and South Africa but for other African countries interested in being involved in the green bond market.

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CHAPTER THREE

METHODOLOGICAL CONSIDERATIONS

Overview of the Chapter

This chapter is composed of a paper that is currently under consideration for publication. The importance of this chapter provides an overview of the methodological considerations. The use of systems thinking is applied as a methodological and analytical framework for carbon capture and storage, as well as green bonds. Dennis (2002) as well as Gregory and Miller (2014) argue how systems thinking has become an important framework in academia for interdisciplinary approaches. Mononen (2017) is of the view that climate change is interdisciplinary, however, the use of different methodologies in climate change studies has been mostly viewed silos. It is further argued that there is a need to have a comprehensive approach to integrate different methodologies used in climate change studies.

This particular paper analyses the different methodologies employed for carbon capture and storage as well as green bonds. These methodologies include media analysis, surveys, mixed methodologies, statistical methods as well as analytical and social frameworks. Although these methodologies have contributed to the understanding of these climate strategies, one of the greatest weaknesses is that they are employed in silos which prevents the implementation of these projects. A systems thinking approach is adopted through the use of a causal loop diagram which demonstrates how systems thinking can be applied as a methodological framework in integrating multidisciplinary approaches for climate adaptation and mitigation strategies. The paper concludes with key policy recommendations such as the need for innovative and comprehensive methodological frameworks applied to understand climate change in developing countries. In addition,

the paper also suggests the need for academics and practitioners to adopt the use of systems thinking which can contribute to integrated methodological frameworks for carbon capture and storage as well as green bond discourses.

Paper No 3.

Application of Systems Thinking as a Methodological Imperative for understanding Green Bonds and Carbon Capture and Storage (CCS) Initiatives³

Abstract

Carbon Capture and Storage (CCS), as well as Green Bonds (GBs), have been identified as two of many strategies with the potential of mitigating the impacts of climate change. It is further argued that they can play an important role in facilitating a sustainable transition to a low-carbon economy. Using systems thinking as a methodological and analytical framework, this paper reviews and identifies the strengths and weaknesses of the different approaches currently employed in the analysis of CCS and GBs. It is argued that by examining the different methodological approaches, systems thinking has potential in contributing to a holistic understanding of CCS and GBs. This understanding would then play a pivotal role in the identification of appropriate intervention entry points and strategies in implementing CCS and GBs initiatives. It is envisaged that this paper will contribute to current debates and discussions revolving around the need to develop a framework within which CCS and GBs can be pursued using systems thinking as a tool and methodology for implementing projects which are aimed at climate change mitigation and adaptation, particularly in the context of developing countries.

Keywords: Carbon capture and storage; green bonds; methodological approaches; systems thinking

3.1. Introduction

Climate change is undoubtedly the biggest global challenge of this century (Knight and Harrison 2014; Pincetl, 2017). The impacts of human-induced activities have caused irreversible changes to the environment, increased biodiversity loss and deteriorations in socio-economic development across the globe (Riahi et al. 2018; McDowell et al. 2019;

³ This chapter has been submitted for publication in its current form: Ngwenya, N and Simatele, M.D. Application of Systems Thinking as a Methodological Imperative for understanding Green Bonds and Carbon Capture and Storage (CCS) Initiatives. Bulletin of Geography. Socio-Economic Series (the paper has been reviewed and is currently awaiting publication)

Steffen et al. 2007; Szulczewski et al. 2012). In order to prevent continued adverse impacts of climate change, global pressure needs to be increased for the preservation of the planet and existence of mankind (Riahi et al. 2018). The 21st COP in 2015, for example, has been hailed as historic because global leaders from 195 countries agreed that climate change is a challenge that needs to be addressed (see Figueres 2016). The 2018 Special Report on Climate Change projected that if the world continues on a business as usual trajectory, global temperatures will increase beyond the safe zone of 1.5°C (IPCC 2018).

The race to achieving a low-carbon society and economy depends on the integration of renewable energy with other low-carbon technologies (Wennersten et al. 2015). One of the key low-carbon technologies identified as a mitigation technology is carbon capture and storage (CCS) (Mabon et al. 2014). CCS has been argued to have great potential for reducing global carbon emissions and helping countries make a transition to a low carbon economy (Budinis et al. 2018). This has been reflected within organisations such as the Global CCS Institute as well as the International Energy Association (IEA) which have outlined scenarios using models that indicate that the inclusion of CCS in climate change strategies can significantly play an important role for a decarbonised world (Global CCS Institute 2019; IEA 2019).

It should be noted that the transition away from dependence on coal and towards cleaner energy alternatives and sources will require massive investments on a large-scale (Galaz et al. 2018). Filho (2018) for example, argues that trillions of dollars will be needed annually to establish the necessary infrastructure and implement mitigation and adaptation measures, especially for developing countries (Filho 2018). It is important that countries find different sources of finance to enable their transition towards a low-carbon society and economy. One of the most emerging climate finance mechanisms that

has gained popularity over the years is green bonds (Banga 2019). GBs have been described as an innovative finance mechanism that mobilises private capital for investments in climate and environmental projects. The growth of the GB market has been exponential and attributed to increased investor awareness on the impacts of climate change. It is further argued that green bonds have the potential to finance many countries low-carbon transition (World Bank 2015).

This paper presents a review and analysis of the different approaches and frameworks which are commonly employed in studies of CCS as well as GBs, identifying their strengths and weaknesses and then making a case for systems thinking. It is argued that for CCS and GBs to be effectively implemented, there is an urgent need to develop a comprehensive approach which will capture the multiple and complex facets of CCS and GBs, in order to equip practitioners with a holistic understanding of what policy instruments and structural mechanisms need to be in place. We position and propose that systems thinking has the potential to contribute to an integrated methodological framework for engaging in CCS and GB discourses.

3.2. Research materials and methods

This paper is based on a rapid appraisal of existing literature focusing on the methodological approaches commonly employed in CCS and GBs studies. According to Fink (2013) and Ganann et al (2010), a rapid appraisal of literature can be described as a systematic attempt to identify and synthesise existing literature on a particular topic. In view of this, an extensive web-based search on Google search engine was conducted from the 14th of October 2019 to the 14th of November 2019 where the researchers went on Science-Direct databases to identify and select appropriate scholarly publications. Keywords such as, 'methodologies in Carbon Capture and Storage' were entered in the

search engines. This action yielded over 60 articles which were then subjected to a rapid appraisal and review using meta-analysis. This process resulted in the selection of 20 peer reviewed journal articles on which the current paper is based. A similar methodological approach was applied for GBs and yielded a total of number of 20 journal articles. This paper therefore, is based and informed by 40 articles, which have used different methodological approaches in studying green bonds and CCS.

3.3. Research results

In the context of CCS, one of the common methodological approaches which are commonly used in these is media analysis. This technique has been used to investigate and analyse public perceptions of CCS and how the narratives around CCS are framed. MacNamara (2005), argues that media analysis has gained prominence as an important research approach to understand how forms of mass communication through news, radio and articles influence public opinion of CCS.

Buhr and Hansson (2011) use media analysis as a methodological approach to compare media articles on corporate CCS activities in Norway and Sweden. They observe that the use of media analysis as a methodological approach played an important role in identifying specific assumptions, controversies and patterns on topics such as CCS and its influences on policy outcomes (Buhr & Hansson 2011). In the same vein, a study on CCS by De Best-Waldhober et al (2012) employed media analysis of news articles in different Dutch newspapers in the Netherlands from 2009-2010. Unlike Buhr and Hansson (2011) where a contrast and compare approach was adopted in their analysis, De Best-Waldhober et al (2012) developed a codebook for the media articles to analyse perceptions and stereotypes associated with CCS.

Similarly, Asayama and Ishii (2013) employed media analysis to investigate CCS projects in Japan using media coverage from 1990-2010. The scholars employed media framing as a technique to analyse social and political views associated with CCS. Through this technique also allowed the researchers to analyse qualitative and quantitative representations of CCS. This included quotations of news sources, policy and technical analysis, metaphors of CCS as well as surveys and polls (Asayama and Ishii 2013). In a complimenting article Asayama and Ishii (2017) explore the narratives of CCS in the Japanese media paying attention to the discourse of analysis, reflecting interpretivist and constructivists in the analysis of how meanings are socially constructed informing public debates and discussions. The purpose of using media analysis was to understand how a problem is socially constructed to form a specific social and moral order and how it is maintained through a media discourse” (Asayama and Ishii, 2017: 52). Collectively, these studies provide important insights on the use of Media Analysis as a methodological approach in understanding how CCS initiatives and projects are represented.

However, as much as media analysis has emerged as a well-established methodological approach, a closer scrutiny of this approach especially in the context of CCS, has several drawbacks. MacNamara (2005) for example, argues that media analysis can overlook issues around propaganda. In the context of the studies reviewed above, information collected from different media platforms and on which the papers are based did not highlight the reliability of their sources. Furthermore, the authors did not mention what measures were taken to minimise and reduce issues around bias of their sources. This is important in the context of CCS because there are opposing views on its implementation which stem from various stakeholders. Toivonen et al (2019) argue that modern forms of social media platforms such as Twitter, Facebook and Instagram have become rich sources of collecting data compared to the traditional sources of media such as

newspapers and radio. The scholars argue that this is because modern forms of social media have enabled platforms for data analytics to be provided, where the user interaction can be monitored to provided behavioural trends (Toivonen et al 2019). This position is further supported by Li et al (2019) who argue that social media leverages a large platform of public opinions and perceptions about issues that can be overlooked in other traditional forms of media. The different positions highlighted demonstrate the weaknesses of media analysis as a methodological approach, especially in an age where there are various forms of media platforms which were not analysed in CCS studies.

One of the other methodological approaches that has been of interest in analysing views, perceptions and opinions of CCS has been surveys. Totten et al (1999) describe surveys as one of the most useful research methodologies as large amounts of data can be collected in a relatively short time. Furthermore, Totten et al (1999) highlight that surveys consist of a sample population that can depict trends and patterns that reflect reality. It is important to note that surveys in CCS research have been an important tool to gather information on views, perceptions and awareness of CCS. An example of this has been illustrated by Kapila et al (2011) where a survey was employed to explore stakeholder views on the development and deployment of CCS in India. These stakeholders included academics, policy analysts, experts and individuals in corporate and the survey comprised of questions that were multiple-choice, ranking questions as well as open-ended questions which aimed to gather information from stakeholders on those who would be affected or influence the development of CCS in the country (Kapila et al. 2011). In another similar study by Stephens et al (2009), the scholars employed the use of a survey to experts in order to investigate awareness and knowledge of CCS. The survey questions were focused on CCS advantages and disadvantages and concerns around CCS (Stephens et al 2009). Collectively, the studies by Totten et al (1999), Kapila

et al (2011) as well as Stephens et al (2009) illustrate how surveys can be employed as a key methodological approach in collecting data from populations about important topics such as CCS.

A significant number of studies in CCS research have made use of online surveys as a methodological approach. A study by Oltra et al (2012) for example, employed an online survey to gather information from the general public to understand individual reactions and perceptions of different information sources on CCS. Similarly, Xuan and Wuan (2012) employed an online survey to evaluate awareness and perceptions about CCS from Chinese University students. This population was specifically chosen by the authors as university students were presumed to have knowledge of new technologies such as CCS and would be able to give valuable input in the surveys (Xuan and Wang 2012). The target universities had a digital forum where interested students were able to participate and this yielded a high number of responses (Xuan and Wang 2012). In the same vein, Boyd et al (2017) used an online survey on a national scale to investigate public perception of CCS in Canada. The survey was administered via internet and phone to a representative sample of the Canadian population (Boyd et al. 2017).

The use of surveys has proven to be an effective methodological framework as it has the ability to collect large amounts of data and can reach a larger audience through different geographic regions. However, just like media analysis, the use of surveys as a methodological framework has its limitations. Oltra et al (2012) highlight that surveys on specialised topics such as CCS that are sent to the general public risk gathering unreliable data as majority of participants in the public may have a lack of awareness or misinformed opinions about CCS. This is further supported by Friedrich et al (2009) who highlights how bias exists in survey methods as there are no control measures. For

example, Oltra et al (2012) had a population sample that was random and the authors did not mention what measures were taken to ensure that controls were implemented to bound the population sample to a specific geographic location. This is also the case with Xuang and Wang (2012) who also did not highlight what controls were implemented to ensure that the surveys were restricted to only Chinese universities and were not shared to universities beyond China. The limitations of surveys as a methodological approach demonstrate the need for researchers to develop surveys that will adequately gather reliable data on cutting edge issues such as CCS.

Besides media analysis and surveys, the use of mixed methodologies has been another key methodological approach applied in CCS research. In particular, social site characterisation has been mainly used in CCS research as a mixed methodology approach as it incorporates a combination of qualitative and quantitative methodologies. Brunsting et al (2013) article is amongst one of the first CCS publications which specifically employed social site characterisation as a methodological approach. In the context of CCS, social site characterisation can be described as the “process of repeatedly investigating local public awareness and opinions of a specific CCS project, changes therein over time, and underlying factors shaping public opinion...” (Brunsting et al. 2013: 7327). The authors specifically used this methodology to collect information from stakeholders involved in CCS and factors that influence opinions and perceptions of CCS (Brunsting et al. 2013).

Similarly, Kaiser et al (2013) also employ social site characterisation as a methodological approach to collect data on public perceptions of CCS with stakeholders and the local community in Poland. The qualitative aspect of collecting data included semi-structured interviews, media analysis on the discourse of CCS technology in Poland as well as desk

research. The quantitative aspect included surveys which were distributed to the local population. However, just like any methodology employed there are limitations. Brunsting et al (2013) argues that the use of social site characterisation requires experts who are skilled in working on qualitative and quantitative methods. The scholars further highlight how this methodology also requires time and effort and if data is not properly gathered this puts the findings at high risk of being unreliable.

From the discussion above, it is obvious that there are a number of CCS methodological approaches which have been used to gather information on perceptions, awareness and knowledge of CCS. In as much as these methodologies have their own advantages, there is still a gap in CCS research on how to further develop these methodologies to gather more reliable data. This view is supported by Miller et al (2007) who argue that the views and perceptions about CCS have evolved over the years and there is a need to understand these different viewpoints so that they can be considered in policy formulation and various global climate strategies.

Despite the different methodological approaches which have been developed to understand mitigation technologies in CCS, far too little attention has been paid to methodological approaches for climate finance (Jacnik et al. 2015). This has been particularly observed with emerging climate finance mechanisms such as GBs which is still a relatively new discourse hence there has not been extensive academic publications. However, there are important insights that can be gained from the methodological approaches applied in the few studies available.

One of the notable studies is by Pham (2016) which employed quantitative methods such as the GARCH model to collect data on the volatility dynamics of the GB market. Data on 'labeled' GBs was collected on the daily closing prices of the S&P GB Index and the S&P

Green Project Bond from April 2010 to April 2015 (Pham 2016). These indexes were specifically chosen as they are tools used to monitor the global GB market (Pham 2016). A similar approach was adopted by Tang and Zhang (2018) where international GB datasets were collected from the Climate Bonds Initiative (CBI) and Bloomberg. Tang and Zhang (2018) highlight how these two datasets were specifically chosen because they have similar criteria in terms of GB criteria, use of proceeds as well as verification and reporting (Tang and Zhang 2018). In the same vein, Nanayakkara and Colombage (2019) collected data from the CBI and Bloomberg database on GB issuances by corporations from 2016 to 2017. One of the advantages of collecting bond data from datasets is that it is widely available and a compare and contrast approach can be applied when analysing the data. This is further emphasised by Rahman (2017) who highlight that quantitative methods applied to collect data allow for greater objectivity and provides data that is reliable.

To avoid generalisation in collecting information about GBs from databases, other studies collect data on specific segments of green bonds. For example, Banga's (2019) paper is one of the first studies published on GBs that builds up on a theoretical approach by collecting data on GBs from datasets in developing countries. Data is collected from the CBI, Bloomberg as well as S&P looking at GB issuances in developing countries and barriers that have hindered the growth of the GB market in these countries (Banga 2019). Tolliver et al (2019) also employ an exploratory factor analysis which is one of the first to be used in GB studies to examine the drivers of GB issuances and the relationships between those drivers. For example, some of the drivers identified by the authors include the size of an economy, regulation and rule of law (Tolliver et al. 2019).

In other studies, complex statistical methodologies have been applied in understanding of how GBs are perceived in the financial market. One of the first studies to employ this methodology was by Febi et al (2018) who sought to analyse liquidity risks of GBs by comparing green bonds to different international stock exchanges such as the London Stock Exchange and the Luxembourg Stock Exchange. One advantage of this methodology is the ability to analyse the competitiveness of GBs in financial markets and also being able to analyse the supply and demand (Febi et al. 2018). Similarly, Zerbib (2019) collected data using regression statistics of GB yields. This approach enables a comprehensive analysis on the market structure of the GB market (Zerbib 2019). The approach was further adopted by Gianfrate (2019) in a study in which data was collected on GB issuances to assess whether these bonds are convenient to vanilla bonds. Samples were collected of GB from January 2007 to December 2017 and Bond Radar was used to provide specific details such as bond characteristics and issuers for every bond. Gianfrate (2019) employed a propensity score-matching technique which uses statistical techniques to compare two study designs where one is controlled and another is random. This technique was applied to make a comparison between GBs and conventional bonds (Gianfrate 2019).

Besides statistical methods applied in GB studies, qualitative methods have also been employed in various ways. For example, Paraque and Revelli (2019) employ an ethico-economic framework as a methodological tool to understand how GBs can have a measurable impact which is ethical and sustainable. Paraque and Revelli (2019) further highlight how the application of this methodology is derived from social theory and analytical frameworks that have been applied in other studies to collect data on factors that influence society, such as economics and other social issues (Paraque and Revelli 2019). A similar approach was also employed by Zhang (2019) where a political

framework was used as a methodological tool to explore Chinese and British political collaborations in promoting green finance such as GBs in China.

However, the methodologies used in the studies of GBs have their drawbacks. Firstly, with reference to statistical methods, Ott and Longnecker (2015) argue that although they are useful for collecting data on analysing trends, one of the biggest disadvantage is that they cannot be applied to understand factors which contribute to positive or negative outcomes. For example, Febi et al (2018) as well as Zerbib (2019) use statistical methods to compare the competitiveness of GBs in the financial market and to assess the supply and demand of these bonds. However, there is a lack of analysis on factors such as investor awareness on environmental impacts or innovation in the bond market that may cause GBs to be in demand or assess their competitiveness (Tolliver et al. 2019). Similarly, Simon (2011) argues that quantitative methods used to collect data require a large sample size and this can be challenging in developing countries where in some countries accessing reliable data can be challenging. To further illustrate this, Pham (2016) as well as Tang and Zhang (2018) highlight that GB datasets were collected from Bloomberg and the CBI but do not mention what measures they took to ensure their samples were representative of developing and developed countries that have issued GBs. This view is further highlighted by Tang and Zhang (2019) who are of the view that the lack of a research sample size can risk the data to be generalised or unreliable.

In view of all that has been mentioned in this section, there are important insights that can be gained from the research methodologies employed in studies of CCS and GBs (Table 3.1).

Table 3.1. Summary of the different methodologies used in CCS and GBs

Topic	Method	Methodological approach	Advantages	Disadvantages	Sources
Carbon Capture & Storage	Media analysis	Collection of newspaper articles on CCS	Identification of specific assumptions and bias; Understanding how different narratives are constructed	The lack of new sources of social media identified as media analysis	Buhr and Hansson (2011); De Best-Waldhober et al (2012); Asayama and Ishii (2013, 2017)
	Surveys	Exploring individual and stakeholder perceptions of CCS	Large amounts of data collected in a short space of time; High representativeness and diverse views; low costs	The lack of accurate and informed data; Bias due to no control measures; Responses are subjective and not objective	Kapila et al (2011); Oltra et al (2012); Xuang and Wang (2011); Boyd et al (2017)
	Mixed methodologies (Social site characterisation)	Use of multiple methodologies on public and community awareness, opinions of CCS	Great depth and understanding a research problem; Strengthens findings of results through triangulation	Time consuming as the researcher would need to apply both quantitative and qualitative research skills in analysing the data	Brunsting et al (2013); Kaiser et al (2013)
Green Bonds	Statistical analysis	Collection of bond datasets	Data that is widely available and comparable to other data sets; Easy to identify trends and anomalies	The researcher cannot check for accuracy and validity of the data; Access to reliable data in developing countries can be challenging	Pham (2013); Tang and Zhang (2018); Nanayakkara and Colombage (2019); Febi et al (2019); Zerbib (2019); Gianfrate (2019)
	Theoretical and analytical approaches	Frameworks to understand the green bond market	Facilitates in the understanding of concepts and variables; Researcher able to	Time consuming by analysing large amounts of data	Banga (2019); Paranque and Revelli (2019)

			analyse phenomena		
	Desk research	Trade relations and the green bond market	Less time consuming; Information is widely available	Data can be unreliable; Difficult to find specific data	Zhang (2019)

Source: Based on desktop data research on CCS and GBs (2019).

There are several advantages and limitations identified in the research methodologies which have also been illustrated in table 3.1. This highlights the need for a comprehensive methodological approach such as systems thinking which can be applied in both studies of CCS and GBs. A systems thinking methodological approach presents itself as an important analytical component in further understanding GBs and CCS within the climate change discourse.

3.4. Discussion

Systems-thinking is one approach that is increasingly becoming popular and has gained traction in academic and policy discussions. This is because the complexity of issues ranging from economic, environmental, social, political and cultural are intertwined and cannot be solved through a linear or silo approach (Dennis 2002). According to Gregory and Miller (2014), systems thinking has become a framework of solving issues by thinking outside of the box through the application of an interdisciplinary approach. Sterman (2000) argues that systems thinking applies a problem-solving approach to complex real-world problems and views these problems holistically.

This paper proposes and positions systems thinking as a viable and potential methodological approach for studying complex and multi-faceted dynamics of CCS and GBs. Climate change is in itself a complex phenomenon which has both explicit and implicit impacts on all sub-sectors of the economy and addressing the different

challenges associated to climate change requires an integrative and holistic approach. With the application of systems thinking as a methodological approach, this would facilitate the development of effective approaches for understanding how CCS and GBs could contribute to the implementation of climate change mitigation and adaptation strategies.

Over the past decade, a growing body of literature has been published on the use of systems thinking as a methodological approach (Cavana and Maani 2000; Arnold 2015; Ribesse et al. 2017; Williams et al 2017). This has been observed in papers where systems thinking as a methodological approach has been employed in various disciplines such as science, engineering and business (Mononen 2017; Mathews and Jones 2008). Schlange (1995) argues that the increased popularity of systems thinking as a methodological approach is attributed to the integration of a range of methodologies and different approaches which can contribute to the development of innovative and creative solutions.

In more recent studies, systems thinking has been applied in the field of climate change (Berry et al. 2018; Rustaman et al. 2018; Ballew et al. 2019). In a study by Mavhura (2017) systems thinking as a methodological approach is applied to examine community disaster resilience of rural poor people in Muzarabani in Zimbabwe. Mavhura (2017) argues that the application of systems thinking as a methodological approach facilitated the examination of different components affecting rural people in Muzarabani through the combination of different data collection tools and from different perspectives. This further allowed for the analysis between the interconnections of droughts, floods and the resilience of the community and further identified adaptive strategies (Mavhura 2017). Mai et al (2019) also adopt a systems thinking methodology to develop a conceptual

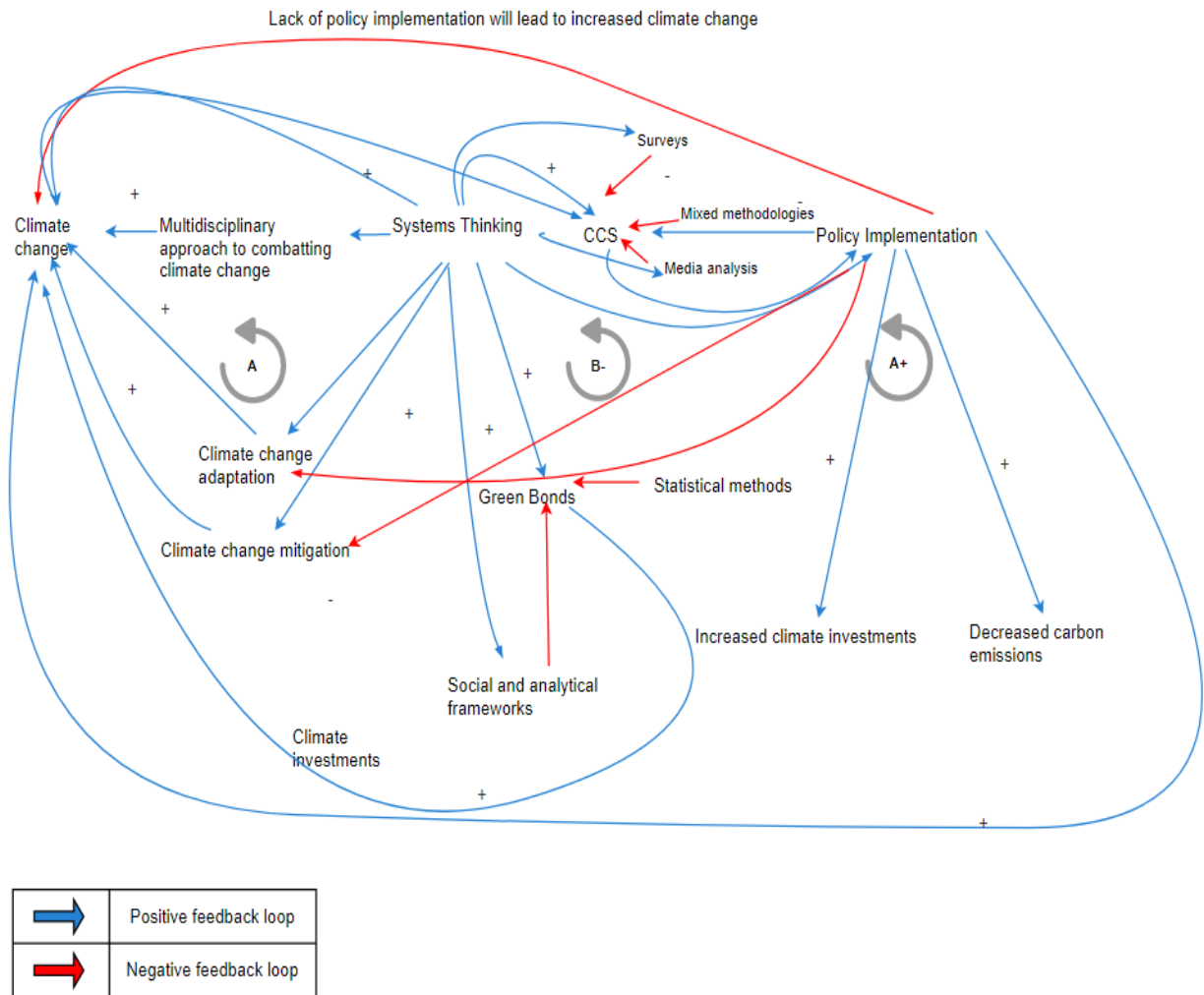
model of a water trade system. Mai et al (2019) argue that previous studies have looked at water trade systems in isolation and not paid attention to the interconnections present. Hence a systems thinking methodology was applied to identify feedback mechanisms that can affect market dynamics, stakeholder engagement and transaction costs (Mai et al. 2019). In a similar manner, Anandhi and Kannan (2018) apply a systems thinking methodological approach to assess the vulnerability of water resources due to climate change. The systems thinking methodology applied in this paper consisted of the use of indicators such as scale, system components such as bio-physical or socio-ecological systems, adaptive capacity as well as internal or external water stressors in order to understand the changes of water resources to climate change (Anandi and Kannan 2018). The scholars further argue that the use of systems thinking methodology was used as an approach to understand other factors that may contribute to an enhanced understanding of the black box effect of the vulnerability of water resources.

According to Maani and Cavana (2007), the application of a system thinking methodological approach consists of five phases. This includes problem structuring, causal loop diagram, dynamic modelling, scenario planning and modelling as well as implementation and organisational learning. It is important to note that not all of these phases need to be used in solving different problems (Maani and Cavana 2007). In the context of the current paper, the first two phases are introduced as a means to apply a systems thinking approach to CCS and GBs. Firstly, the problem structuring of GBs and CCS is that these are two potential climate change mitigation strategies, but which are currently addressed from and analysed using a silo approach. Leiren and Jacobsen (2018) are of the view that the development of climate change adaptation and mitigation measures require moving away from working in silos to creating common approaches that have a mutual benefit for the global society. They further argue that this can be

achieved with the appropriate planning and financing from governments and business. This view is applicable in the case of CCS and GBs which are currently viewed in silos and further work needs to incorporate these strategies together.

Secondly, the adoption of a causal loop diagram can help analyse the different feedback loops present in an existing challenge. Maani and Cavana (2007) highlight that causal loop diagrams are useful in providing a comprehensive picture on the inputs and outputs of variables in a loop. In the context of CCS and GBs the application of systems thinking methodology provides new and informed insights on how we can understand CCS and GBs as integrated solutions for climate change. This is because a systems thinking methodological approach provides a comprehensive picture on the opportunities and gaps which exist in the current methodological approaches. This is represented in figure 3.1 which presents a causal loop diagram illustrating how systems thinking can be used as a methodological approach in CCS and GBs studies.

Figure 3.1. A causal loop diagram illustrating how systems thinking can be used as a methodological approach in CCS and GBs studies



Source: Based on survey results (2020)

Figure 3.1 presents a causal loop diagram illustrating systems thinking as an imperative methodological approach to understanding the dynamics and complexity of CCS and GBs. A scrutiny of the diagram in loop A, suggests that the application of systems thinking can facilitate in the identification of positive feedback into elements which can be used to address climate change. This is because systems thinking advocates addressing a specific challenge from a holistic and multifaceted angel. Thus, the multifaceted approach embedded in systems thinking therefore, requires that wicked problems associated with the implementation of CCS and GBs projects are approached from a multidisciplinary

perspective. A further examination of Figure 3.1 also suggests that application of systems thinking as a methodological approach in studies of climate change can facilitate in identifying appropriate strategies aimed at fostering climate change mitigation and adaptation through increased investments in projects which can result in decreased carbon emissions.

Feedback loop B- suggests that the continued application of the silo methodologies currently employed in studies of CCS and GBs are likely to impede the development of comprehensive strategies and approaches for mitigating the impacts of climate change and will compromise any adaptation efforts. Thus, a closer scrutiny of feedback loop B- suggests that the lack of policy implementation which incorporates CCS and GBs can potentially lead to negative implications on climate change adaptation and mitigation.

3.5. Conclusion

Climate change is one of the world's greatest challenge and urgent strategies need to be implemented to ensure that global temperatures do not exceed 1.5°C. CCS as well as GBs have been identified as one of many strategies to mitigate against climate change. This paper has reviewed the different methodologies employed in studies of CCS and GBs such as media analysis, surveys, mixed methodologies, statistical methods as well as analytical and social frameworks. Although these methodologies have been useful in understanding the developments around CCS and GBs, there are weaknesses present that need to be addressed. It has been argued that the current methodologies used in climate change studies have been viewed in silos and systems thinking can be applied as a key methodological framework which provides a multidisciplinary approach to these methodologies. The causal loop diagram suggests that systems thinking positively integrates the different methodologies used in studies of CCS and GBs and positively

impacts climate change mitigation and adaptation strategies. The use of systems thinking not only makes use of synergy in climate change but can play a pivotal role in the implementation of CCS and GBs initiatives as well as associated policy implementation.

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CHAPTER FOUR

EMPIRICAL EVIDENCE

Overview of the Chapter

This chapter is composed of two papers which are currently under review and form part of the empirical evidence. The importance of this chapter presents key data on the importance and implementation of carbon capture and storage as well as green bonds in contributing to the attainment of climate goals in South Africa. Figueres et al (2016) argue that an increase in global temperatures beyond 1.5°C will be detrimental across the world and even more prevalent for developing regions such as Africa. Filho et al (2018) highlight how developing countries need to swiftly transition away from the dependence of fossil fuels and incorporate renewable energy and low-carbon technologies such as carbon capture and storage. The challenge with the large-scale transition amongst many countries will require financial resources to be mobilised. At present, green bonds have potential in addressing the finance gap. This chapter argues that for green bonds as well as carbon capture and storage to be effectively implemented, factors such as stakeholder engagement, laws, policies and institutional frameworks will be crucial for short, medium and long-term goals.

The first paper provides an overview of the role of stakeholder engagement of carbon capture and storage initiatives in South Africa. Beck et al (2017) argue that the successful implementation of carbon capture and storage relies strongly on how different stakeholders are engaged. Moon et al (2020) highlight that stakeholder engagement is a critical component for any government that plans to implement the technology and the lack of engagement can result in projects being stalled. The paper asserts that South

Africa is in a unique position to evaluate the successes and failures of stakeholder engagement practices of carbon capture and storage from other countries. From this, the country can implement stakeholder engagement practices that can ensure meaningful and effective engagement of all interested parties. The paper concludes by highlighting the need for increased academic research to look at how stakeholder engagement can influence the implementation of low-carbon technologies such as carbon capture and storage. This includes incorporating institutional and capacity building measures.

In relation to the implementation of green bonds as well as carbon capture and storage, the second paper provides an overview of how these two mitigation tools can contribute to continental policy plans such as Agenda 2063. A key component of Agenda 2063 is addressing climate change through innovative measures such as adopting international best practices on green investments and low-carbon technologies. The paper employed the use of a case study of South Africa where the empirical data clearly illustrates how carbon capture and storage as well as green bonds have massive potential in supporting the country's national climate ambitions. It was further emphasised how these climate tools from South Africa can be used as an important benchmark to develop Africa's carbon capture and storage and green bonds in alignment with the aspirations of Agenda 2063. The paper concludes by arguing the importance of policies, institutional frameworks as well as laws to ensure that there is transparency and accountability of CCS and GB initiatives.

Paper No 4.

The Role of Stakeholder Engagement in Carbon Capture and Storage (CCS) Initiatives in South Africa⁴

Abstract

Stakeholder engagement has been identified as an important element for gaining support for CCS (Carbon Capture and Storage). This is because stakeholder engagement has the potential to ensure local involvement in decision-making process and can promote a greater sense of commitment and involvement to the type and level of the outcomes being sought by all interested parties. Using research methods inspired by the tradition of stakeholder engagement research, this paper examines the role of stakeholder engagement in promoting community-led carbon capture and storage initiatives in South Africa. Through the use of semi-structured interviews, the researchers obtained key information on what those involved in CCS perceive to be important for gaining stakeholder support for CCS. It is argued that for any CCS initiative to be successful, there is a need for effective engagement and meaningful participation of all interested parties, especially those for whom an initiative is planned for. In this way, any potential problems can be addressed and resolved without recourse to the misunderstanding and violence which defines many top-down development programmes implemented by many governments in sub-Saharan African countries. These views have been argued within the broader discourse of sustainable development and environmental stewardship.

Keywords: Public participation, stakeholder engagement, carbon capture and storage, South Africa

4.1. Introduction

Climate change and the associated impacts have been argued as one of the biggest challenges that humanity is currently facing and will continue to face in the future (Steffen et al 2007; Nielsen and D’haen 2014). While the causes of climate change are now well documented and known, the extent and depth of the impacts on all subsectors of the

⁴ This chapter has been submitted for publication in its current form: Ngwenya, N and Simatele, M.D. The role of stakeholder engagement in carbon capture and storage (CCS) initiatives in South Africa. Bulletin of Science, Technology and Society (The paper has been reviewed and is currently awaiting publication)

economy, society and environment as well as the adaptation strategies are yet to be fully fathomed (McDowell et al 2019). What is clear however, is that increased emissions of potent greenhouse gases such as carbon dioxide and methane have significantly contributed to the warming of the planet and this has negatively affected (and will continue) socio-economic productivity for poor communities mostly in less economically developed countries (Conway and Schipper 2011; Szulczewski et al 2012). Some of the notable manifestations of climate change have been increased drought and flood episodes which have ensued augmented biodiversity loss and environmental degradation (Riahi et al 2018). The repeated occurrences of these extreme weather events have combined to reduce the adaptive and resilience of many poor people, especially women and children and pose a great threat to the attainment of a number of the sustainable development goals (SDGs) (Skogen et al 2018).

The United Nations Framework on Climate Change (UNFCCC) (2006) argue that climate action through the development and implementation of activities aimed at reducing greenhouse gases and promoting adaptation should be taken as a priority. One such proposed activity is the transition towards a low carbon society through CCS (Andric et al 2019). The literature suggests countries such as China, India and South Africa have a coal-based economy and the continued use of fossil fuels is likely to hinder their individual commitments towards reducing carbon emissions (Kruger 2017). It has however, been argued that the adoption of CCS initiatives presents an opportunity for such countries to transition towards cleaner sources of energy (Kuch 2017).

South Africa as a country has demonstrated massive commitment in combatting climate change by having international binding agreements as well as stating its intentions reflected in various policies (Mugagga and Nabaasa 2016). This has been reflected in the

South African National Determined Contributions (NDCs), the National Climate Change Response White Paper (2011) as well as the Draft National Climate Change Adaptation Strategy (2019) (DEA 2011, 2015, 2019). Key to these agreements has been the emphasis on the adoption of low-carbon technologies such as the promotion and development of CCS technology which will only be successful with the involvement of the public in decision-making processes.

Commenting on the importance of stakeholder engagement and in the context of South Africa, Musavengane et al (2019) are of the view that sensitivity to environmental management and sustainability in South Africa, will only be enhanced through community involvement in the planning process. This is further discussed by O'Faircheallaigh (2010) who observes that the role of communities and the general public is crucial in the planning process of projects such as where CCS will be implemented to ensure successful implementation. Ter Mors et al (2009) state that the successful deployment or abandonment of CCS initiatives has mainly been attributed to the level and extent of stakeholder engagement and public participation. Thus, in a country like South Africa, whose history is entrenched in deep-rooted socio-economic disenfranchisement, segregation and social injustices, it is imperative that any CCS initiatives are implemented on the basis of strong stakeholder engagement. If these factors are ignored, the future of any CCS initiatives will be highly compromised and resisted (DeBest-Waldhober et al 2012).

This paper therefore, discusses the importance of stakeholder engagement in CCS initiatives in the context of South Africa. It is argued that for CCS initiatives to be successful, it is important that before it is implemented there be increased mobilisation, engagement, awareness, education and participation of all interested parties and

stakeholders. Such a process will play a critical role in the identification of CCS priorities and the formulation of strategies and programmes which can lead to sustainable outcomes.

4.2. Contextualising the literature: The importance of stakeholder engagement

Stakeholder engagement has received considerable attention in practice but also in academic literature (van Zyl 2013; Talley et al 2016; Bahadorestani et al 2020). This is because it has been recognised as an important component in decision making processes in various disciplines such as science, environmental studies, organisational transformation as well as engineering (Bahadorestani et al 2020). Stakeholder engagement has also been considered as an important tool in communication of key topics, educating and raising awareness as well as creating an open dialogue (Bahadorestani et al 2020). In order to understand the meaning of stakeholder engagement, Lehtinen and Aaltonen (2020) argue on the importance of first understanding what a stakeholder is. Van Zyl (2013) defines a stakeholder as a person or group of people who have an interest in the activities of a company or organisation. For example, a stakeholder could be individuals, community members, civil society, business leaders, religious groups or politicians. This is further supported by Talley et al (2016) who are of the view that stakeholders should also be analysed by looking at the wider community where there are internal and external stakeholders who have varying levels of power.

A broader perspective of stakeholders has been adopted by Head (2007) who points to the fact that the identification of stakeholders should be the initial focus before any stakeholder engagement processes commence. Head (2007) argues that factors such as

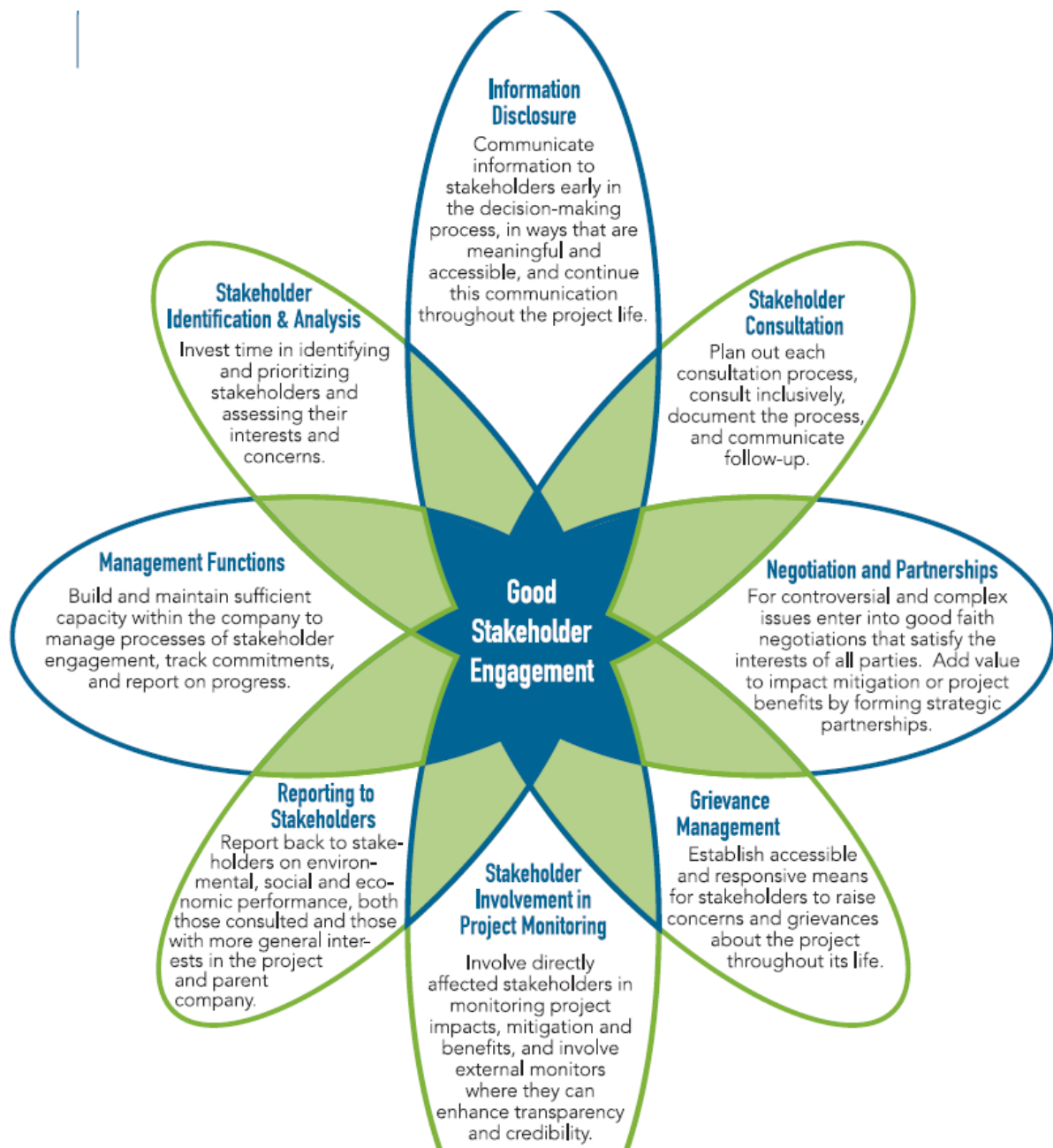
socio-economic status, cultures, occupation, gender as well as geographic locations are amongst many categories which should be considered as they can determine the level and extent of stakeholder engagement with interested parties. In the same vein, Kahane et al (2013) support this view by arguing that stakeholder mapping should be a top priority before any engagement occurs.

In light of understanding what a stakeholder is, Ray and Miller (2017) define stakeholder engagement as the process by which different stakeholders are directly engaged who may be influenced or affected by the implementation of decisions. Huzzard (2020) elaborates on this concept by arguing that stakeholder engagement is the process of communicating with stakeholders to understand their wants and needs and how decisions that are made can affect their development or state of being. Mercer-Mapstone et al (2018) edifies this definition by arguing that a key component of stakeholder engagement is creating a constructive dialogue amongst stakeholders and enabling a space of inclusivity. Mercer-Mapstone et al (2018) are also of the view that a constructive dialogue amongst different stakeholders leads to meaningful engagement and resolves conflicts.

Importantly, there are various processes that have been identified which can lead to good stakeholder engagement practices. The International Finance Corporation (2007) outlines the following eight processes which encompass “stakeholder identification and analysis, information disclosure, stakeholder consultation, negotiation and partnerships, grievance management, stakeholder involvement in project monitoring, reporting to stakeholders as well as management functions” (IFC 2007; 11 – 12). This is illustrated below in diagram 4.1. In addition, Mathur et al (2008) highlight how good stakeholder engagement is attributed to an enabling environment where stakeholders can engage in a collaborative manner without any fear of discrimination or exclusion. They further

argue that good guiding principles of stakeholder engagement foster an environment where there is transparency and accountability throughout all stages of engagement (Mathur et al 2008). Head (2007) edifies this view by arguing that an enabling environment is created where top-down approaches to stakeholder engagement are dissolved and all stakeholders are treated as equal.

Figure 4.1. Illustrating the components of good stakeholder engagement



Source: IFC (2020: 11-12).

Several studies have indicated that following good stakeholder engagement practices has the potential to have desired outcomes (Huzzard 2020). One of these is increased awareness and education amongst stakeholders (Cottrell et al 2015). Gregory et al (2020) are of the view that extensive engagement and information sharing amongst stakeholders increases the level of awareness and education whereby stakeholders can make informed

decisions. In the same vein, van Zyl (2013) highlights how awareness and education can also help stakeholders to identify potential risks and opportunities that they may not have initially thought of. This is illustrated through an example by Silvius and Schipper (2019) who demonstrate how the concept of sustainable development was continuously integrated and trained to project managers in a particular project. The result of this led to increased awareness and education on the importance of sustainable development in contributing to the triple bottom line of that particular project (Silvius and Schipper 2019). They further note how project managers developed their expertise on various sustainability issues through the stakeholder engagement sessions which interestingly led to a behavioural change whereby project managers began to practically apply the concept of sustainable development in existing projects (Silvius and Schipper 2019).

Similarly, Lehtinen and Aaltonen (2020) discuss that good stakeholder engagement can lead to a better understanding of different stakeholder needs. Lehtinen and Aaltonen (2020) further argue that stakeholders are not homogenous and have their own perspective of what needs to be achieved. Good stakeholder engagement not only prioritises an understanding of different stakeholder needs but allows stakeholders to feel that their opinions and concerns are heard (Lehtinen and Aaltonen 2020). This results in effective communication whereby shared values and perspectives can be reached (Bourne 2016). Jaakson (2010) concurs with this by highlighting that the different needs of stakeholders included in decision-making builds a relationship of trust and cooperation which are important factors that can lead to the success of a particular project.

Another key outcome pointed out by Gregory et al (2020) is risk management. Gregory et al (2020) are of the view that increased awareness, communication and different

opinions in engagement sessions allows stakeholders to identify any potential risks and find innovative ways on how to mitigate the risks (Gregory et al 2020). For example, Edelenbos et al (2016) published a paper looking at the outcomes of effective stakeholder engagement in mitigating flood risk projects in the Netherlands. They argue that bottom-up stakeholder initiatives led to interactive decision making which resulted in collaborative approaches on how community management plans to mitigate flood risks could be implemented (Edelenbos et al 2016). The result of this was a co-creation of innovative solutions (Edelenbos et al 2016). The importance of incorporating stakeholders in decision making processes to mitigating risks also enhances stakeholder's sense of ownership of a project.

However, despite its successes, there are existing challenges which continue to hinder effective stakeholder engagement. Kaur and Lodhia (2019) point to the fact that stakeholder engagement can be a resource intensive activity due to the demand of staff, time and money. The lack of resources result in a shortened engagement which may not be constructive (Kaur and Lodhia 2019). Pomeranz et al (2014) also discuss how conflicting interests can occur due to stakeholders not wanting to compromise on their demands and this can delay the extent of engagement. In the same vein, Cottrell et al (2015) highlight that finding a common ground where all stakeholders agree is one of the most challenging aspects of stakeholder engagement especially in cases where there is inadequate representation through factors such as gender or race.

Furthermore, Pomeranz et al (2014) state that the methodology of how engagement occurs is still ineffective. Bahadorestani et al (2020) are of the view that most stakeholder engagement processes adopt approaches to save time and costs such as setting up large meetings which can boost a high attendance of stakeholders or relying solely on

workshops. However, these large meetings and workshops prove difficult in providing opportunities for constructive dialogue and engagement. Lehtinen and Aaltonen (2020) point to the fact that methodological approaches such as questionnaires and focus groups should be more widely used as this can enable more meaningful discussions and opinions obtained. In addition, Lehtinen and Aaltonen (2020) highlight that approaches should focus on actual engagement and not communication as many confuse stakeholder engagement with communication. Stakeholder engagement is a two-way process where there is a meaningful dialogue whilst communication is one-sided and is more for information sharing (Silvius and Schipper 2019). The confusion of the two can result in the stakeholder engagement process becoming null and void.

In view of all that has been mentioned thus far, one may suppose that stakeholder engagement is an important process that can determine the success or failures of projects. As much as there can be many desired outcomes of good stakeholder engagement practices there are still challenges that need to be addressed. It is important to note that stakeholder engagement is a unique process and the same engagement processes cannot be applied in the same manner everywhere.

4.3. Stakeholder engagement in CCS

CCS has been identified as one of the few low-carbon technologies in the world that can effectively reduce greenhouse gas emissions on a large scale (Hund and Greenberg 2011; Chaudhry et al 2013). Stephens et al (2009) and Illinova et al (2018) note that the deployment of CCS projects across the world is crucial for ensuring that global temperatures do not exceed the 1.5°C target as set out in the Paris Agreement. Wennersten et al (2015) are also of the view that the large-scale deployment of CCS will be crucial to maintaining safe levels of atmospheric concentration below 400 parts per

million (ppm). According to the Global CCS Institute (2019) there are currently 51 CCS facilities globally in which “19 currently in operation, 4 under construction and 28 in various stages of development”. The Global CCS Institute (2019) further notes that the increasing number of CCS projects over the past decade illustrates the importance of the adoption of the technology to enable the transition towards a low-carbon society and economy.

For CCS to be fully considered and successfully implemented, stakeholder engagement has been recognised as a crucial component (Terwel et al 2011). Illinova et al (2018) discuss how CCS is still a relatively poorly understood technology and the success of wide-scale deployment involves stakeholders developing an understanding of key concepts, potential risks as well as what opportunities exist (Fischedick et al 2009). In a study by Stephens et al (2009: 4655) which set out to identify how to change stakeholder perceptions regarding CCS, the results from the study indicated that exposure to expert information on CCS technology “increased stakeholder reporting of their level of understanding of the technology and of their level of support for advancing the technology”. Setiawan and Cuppen (2013) concur with this as in their study they investigated what stakeholders perceived to be important for gaining support for CCS. The results of the study indicated that a comprehensive understanding of CCS technology led to the stakeholders supporting the implementation of it.

Similarly, Asayama and Ishii (2013) explore how the framing of CCS in newspapers and social media can be used as a tool to educate stakeholders. In their study, they show how CCS has been positively framed as a promising technology for mitigating climate change in Japanese newspapers. Asayama and Ishii (2013) further discuss the importance of media portrayal for the general public and other stakeholders to gain knowledge on CCS

as this information is widely available and accessible. Moon et al (2020) concur with this as they are of the view that to gain stakeholder support for CCS, media coverage of CCS has been found to be important in influencing stakeholders. In the same vein, Fishedick et al (2009) discuss how media coverage in different regional newspapers in Germany played a key role in educating and informing stakeholders on proposed or deployed CCS projects. Fishedick et al (2009) further highlight that the extent of media coverage included economic, societal and technological aspects of CCS (Fishedick et al 2009).

Another component leading to the support of CCS technology has been the need for stakeholder practitioners to understand the socio-cultural and psychological factors that can influence stakeholder support for CCS initiatives. Moon et al (2020) highlight the importance of understanding social capital especially in communities where CCS is to be deployed. This is because social capital is a great indicator for how stakeholders can be influenced as it factors in connection, inclusion and identities of stakeholders to that particular community or area (Moon et al 2020). They further illustrate in their study how stakeholder support for CCS in eight counties of Texas was largely attributed to social capital whereby they found that “social capital significantly predicts perceived community-level CCS support” (Moon et al 2020: 139). Similarly, Coyle (2015) points to the fact that stakeholder practitioners had to have deliberate engagements with the indigenous communities in New Zealand with regards to the siting of a CCS facility. Coyle (2015) discusses how the Taranaki region in New Zealand was identified as a potential site for CCS but stakeholder engagement had to take into account the socio-cultural context of community members such as the Maori indigenous group. The results of the study assisted the government in a comprehensive CCS plan as the consultation process led to “on the ground knowledge about the local, social, cultural, environmental and

economic context” which would involve local communities in decision making and facilitate co-governance (Coyle 2015: 243)

Although the importance of stakeholder engagement of CCS is crucially important, there are several studies which look at the lack of effective engagement which leads to opposition and CCS initiatives being stalled (Oltra et al 2011; Terwel et al 2011; Einsiedel et al 2013). Part of the opposition that Karimi and Komendantova (2017) highlight is the lack of communication regarding perceived risks of CCS such as gas leakage or environmental damages and if there is no communication and education on this there can be a lack of trust and doubt from stakeholders. Through a case study analysis they discuss how Germany, Norway and Finland witnessed resistance and opposition from stakeholders due to perceived risks of CCS not being adequately communicated. Lofstedt (2015) points to the fact that despite the challenges of perceived risks in contributing to CCS projects being stalled, effective risks communication around CCS can contribute to stakeholder support for CCS. This can be achieved through proactive stakeholder engagement as well as recommendations from scientists and social researchers on how to engage with stakeholders regarding risk communication and by so doing also build trust within the process (Lofstedt 2015).

In the particular context of South Africa, stakeholder engagement of CCS has been highly prioritised. One of the key capacity programmes conducted by the South African Centre for Carbon Capture and Storage (SACCCS) has been to educate and raise awareness on CCS to public and private stakeholders and most importantly to community members where the CCS technology will be deployed in the Zululand and Algoa Basin (Beck et al 2011). Stakeholder engagement has been conducted in several ways such as through the extensive media coverage of CCS plans in South Africa as well as several workshops and

seminars held to educate and inform stakeholders on the importance of CCS as a key climate change mitigation strategy (Chabangu et al 2014).

Beck et al (2013) asserts that even on a national level, stakeholder engagement plans on CCS have been developed. They highlight how two specific stakeholder engagement plans have been created and adopted for local and national government level to assist the South African Centre for Carbon Capture and Storage (SACCCS) in identifying key stakeholders and to further scale down which tools would best facilitate the engagement process such as interviews, focus groups or workshops (Beck et al 2013). One of the benefits that Beck et al (2013) emphasise in their paper with regards to the two stakeholder engagement plans is that “multiple parties have had the platform in which to formulate, articulate and put into practice CCS stakeholder engagement approaches for the benefit of South Africa based in international best practices” (Beck et al 2013: 7386).

While stakeholder engagement has achieved a level of success and buy-in from stakeholders there are still unique challenges for a developing country like South Africa. Modiko et al (2014) discuss how South Africa faces multiple challenges such as differences in literacy levels and socio-economic status as well as inequality. These factors combined have contributed to the delay in stakeholder engagement processes for other stakeholders such as community members where CCS will be deployed (Modiko et al 2013). They further point to the fact that communities surrounding the potential sites in KwaZulu Natal and the Eastern Cape provinces are predominantly rural and unemployment as well as illiteracy rates are very high (Modiko et al 2013). In addition, Modiko et al (2013) support the need for stakeholder engagement to further be integrated in these areas and by so doing the CCS can be communicated in native languages as well as an outline of what would be the perceived benefits of CCS initiatives

which include job creation and skills development for the local communities (Modiko et al 2013).

4.4. Methodological considerations

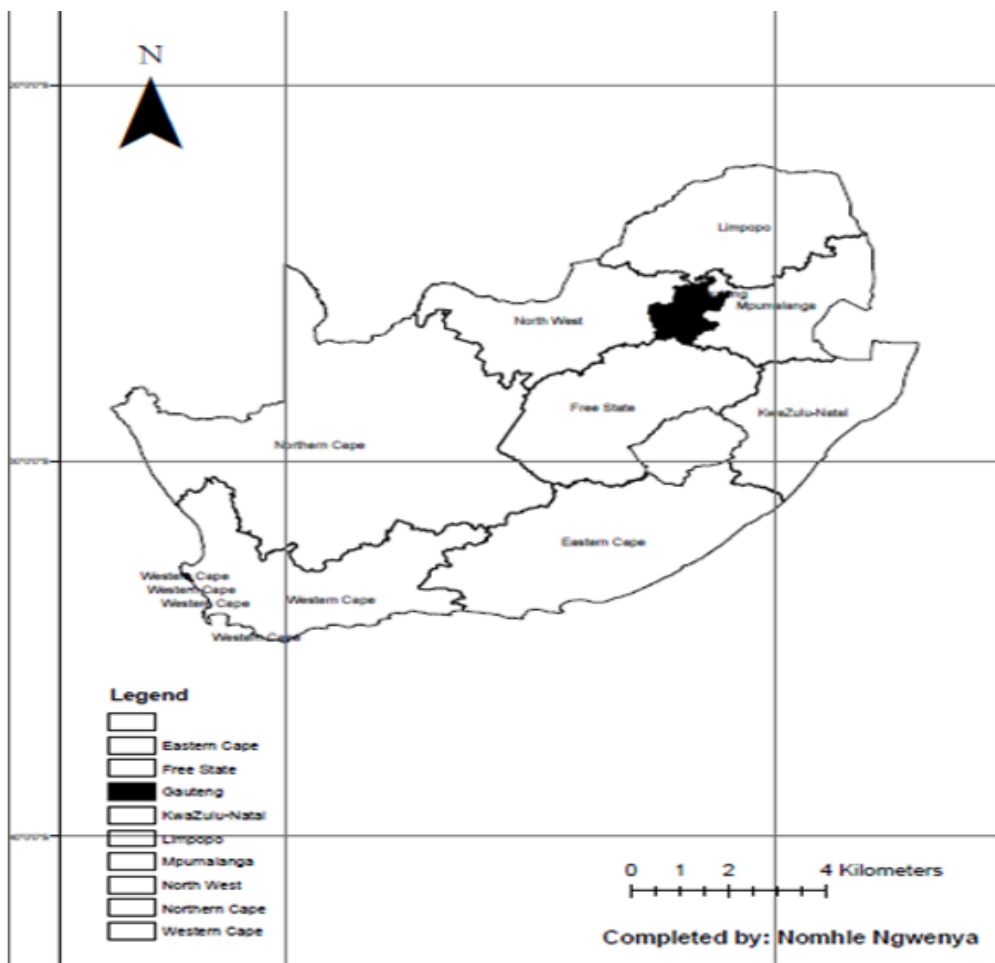
The data on which this paper is based was collected in the Gauteng province from the 27th of May to the 12th of August 2018 through the use of methods inspired by stakeholder engagement and participatory research. The methodology used tried to address the aim of evaluating the role of stakeholder engagement strategies and its importance in an initiative; identifying factors that contribute to stakeholder engagement practices and providing recommendations on how CCS can be successfully implemented.

The research was conducted in the region of Johannesburg as during this period there was a lot of work, seminars and discussions taking place in Johannesburg on developments around carbon capture and storage (figure 4.2). Within Johannesburg, the study population consisted of consultants working in the fields of stakeholder engagement, climate change and energy transitions in the country. In identifying the research participants to be included in the study there was an extensive web-based search using Google. The key words employed in this search included 'CCS in South Africa', 'CCS research in the Algoa and Zululand Basin' as well as 'CCS companies in South Africa'. Forty consultants were identified from this rapid search who were contacted and only thirty six consultants agreed to participate in the study. Semi-structured interviews were conducted with a recording device and notes were also taken during the interview process. The use of semi-structured interviews was used to help the researcher draw on participant's perception and attitudes relating to the research. An advantage of using this type of interview for the research is that the researcher guided the interview process and led the conversation but also maximising on time given to specific topics during the

conversation (Wisker 2008). An additional advantage of semi-structured interviews is that experts will give more detailed information beyond the questions listed in the interview guide.

The interview guidelines covered topics around the importance of stakeholder engagement in an initiative, the processes that facilitate stakeholder engagement and public participation as well as the importance of these processes for a new technology such as CCS. The research participants involved in this study were identified through the Google rapid base search and the following research participants and companies were found to have conducted work, research and seminars on carbon capture and storage. These included senior consultants at Deloitte; stakeholder engagement specialists at Digby Wells Environmental; principal consultants in stakeholder and community engagement at SRK Consulting; senior consultants at Promethium Carbon (expertise in climate change and carbon advisory) as well as senior consultants at Next Generation Consulting (expertise in stakeholder engagement and community participation).

Figure 4.2. A map showing the study sites for the research.



Source: Based on survey results (2018).

The interviews were conducted in person as the research participants were in close range and the researcher had access to where they were based.

The data collected was analysed in various ways. Firstly, all the recorded semi-structured interviews which were on average 30-45 minutes were transcribed manually on Microsoft Word and saved electronically. The same process was conducted where all notes that were taken down during the interview were typed out neatly on MS Word and placed on an electronic file. Secondly, the next step was to code and develop themes from the data. The process used to conduct this was through NVivo which was a very useful software to code the emerging themes from each interview and place them into nodes.

The nodes allowed for a deeper analysis into the emerging themes or concepts. Lastly, statistical analysis of results was applied through the use of Excel. This allowed the analysis of each data sets using charts as well as pivot tables.

4.5. Empirical evidence and discussion

One of the key questions that this research was interested in was to identify the role of stakeholder engagement and how it is important for low-carbon projects such as CCS in South Africa. Thus, the researchers were interested in understanding how research participants understood the importance and value of stakeholder engagement. In view of this, respondents were asked to rate how they viewed stakeholder engagement as an important element in such projects. The findings are captured below in table 4.1. A scrutiny of the information reveals that an estimated 93% of the participants agree that stakeholder engagement is an important element whereas only 7% of the research participants neither agree nor disagree.

Table 4.1. Table illustrating the importance of stakeholder engagement of low-carbon projects such as CCS

Category	Cumulative Number of responses	Percentage of respondents (%)
Strongly agree	24	67
Agree	9	26
Neither agree nor disagree	3	7
Disagree	0	0
Strongly disagree	0	0
Total	36	100

Source: *Based on survey results (2018)*

In view of this, it was also important for the researchers to have an understanding of why the research participants considered the need to have extensive stakeholder engagement (SE) practices with communities where CCS initiatives were being implemented. The

respondents were asked to describe factors that would be a result of extensive stakeholder engagement. The findings are captured in table 4.2. The information reveals that an estimated 45% of the participants considered awareness of CCS technology and knowledge about the nature of technology as one of the most important factors due to extensive stakeholder engagement. Whereas 32% of the research participants identified that extensive engagement leads to communities being informed about potential direct impacts, such as any potential risks like gas leakages or changes to land use due to CCS plants implemented. Only 23% of the research participants considered the opinions of community members as a factor that would facilitate stakeholder engagement such as the perceptions of community members around CCS development in the surrounding areas as well as their concerns on the benefits and risks of CCS.

Table 4.2. Respondents views on the importance of stakeholder engagement (SE)

Category	Cumulative Number of responses	Percentage of respondents
Awareness	45	45%
Direct impacts	32	32%
Opinions	23	23%
Total	100	100

Source: Based on survey results (2018)

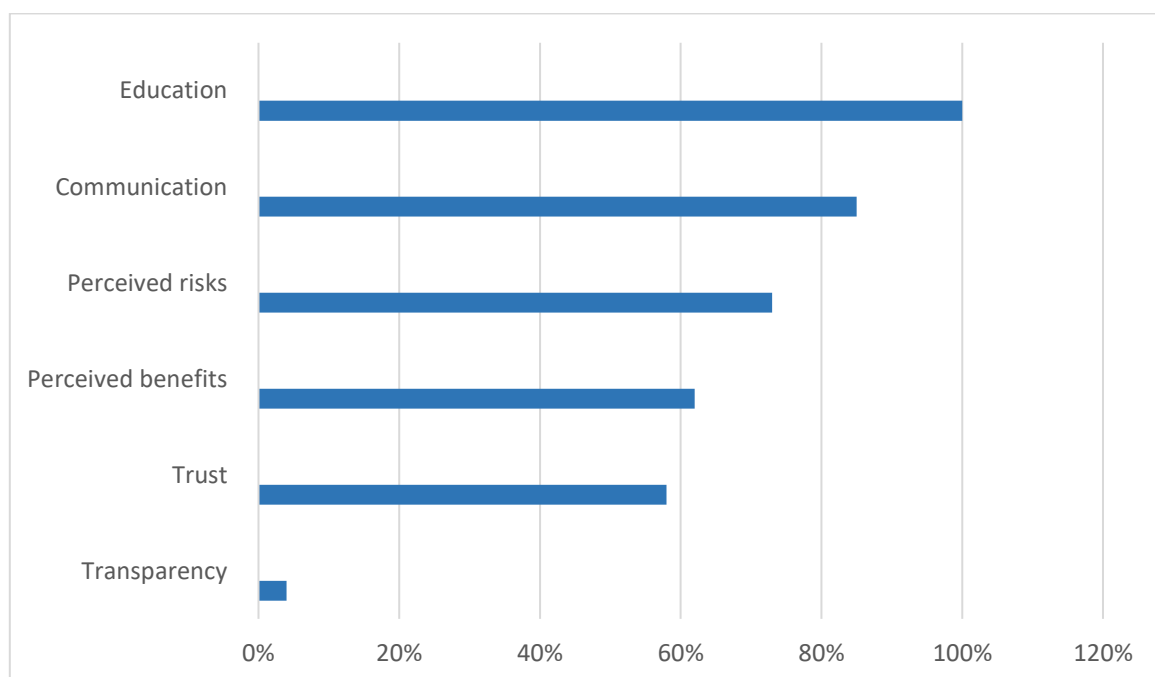
In fact, based on this information the researcher further wanted to understand how this is and some of the research participants views are stated below.

One of the research participants mentioned how the *“lack of awareness can lead to failure either intentionally or accidentally by communities.”* (Pers. Com, 2018a)

Another research participant even mentioned that, *“Not many people are aware of CCS and they will need to be kept in the know about the initiatives like this. It would be more successful with their involvement.”* (Pers. Com, 2018b).

The researcher also wanted to analyse the factors that would be important for stakeholders where CCS would be implemented in their communities. The findings are captured in figure 4.3. A scrutiny of the information reveals that all of the respondents (100%) considered education as one of the most important factors. Whilst communication was also another high ranked factor at 85%. It was also found that 73% of the respondents considered perceived risks as one of the factors that would be important for stakeholders.

Figure 4.3. Bar graph indicating the various factors respondents considered important for stakeholders.



Source: Based on fieldwork survey notes (2018)

One research participant during interviews highlighted the importance of education in the success of CCS. Their response is captured below

"If you want carbon capture and storage to be a success you need to educate people! That's all people want, people just want to know, education wise. Mining started with educating people, till people understood what mining was. They now know it's the extraction of a mineral of some sort. People now get it. It will take you a good ten years to educate the young generation. Make sure carbon capture and storage is educated to them so they understand it." (Pers. Com by participant, 2018e)

"Education was the factor in which 100% of respondents agreed was the most important. "Education is the key. Once people are educated it easy to tackle the issues" (Pers. Com, 2018d).

The next key factor which was amongst the highest was communication in which one research participant stated the following:

"Communication is an important factor as it opens up dialogue between participants. Dialogue has an important power to clarify misunderstanding, teach where there is a lack of knowledge and to ensure everyone is on the same page. Where there are open communication channels there is less room for conflict and promotes solutions." (Pers. Com, 2018f).

This is further complemented by another research participant who stated the following:

"Communication is important if you are to keep good relations with the general public." (Pers. Com, 2018g).

Perceived risks was another key factor research participants considered as important.

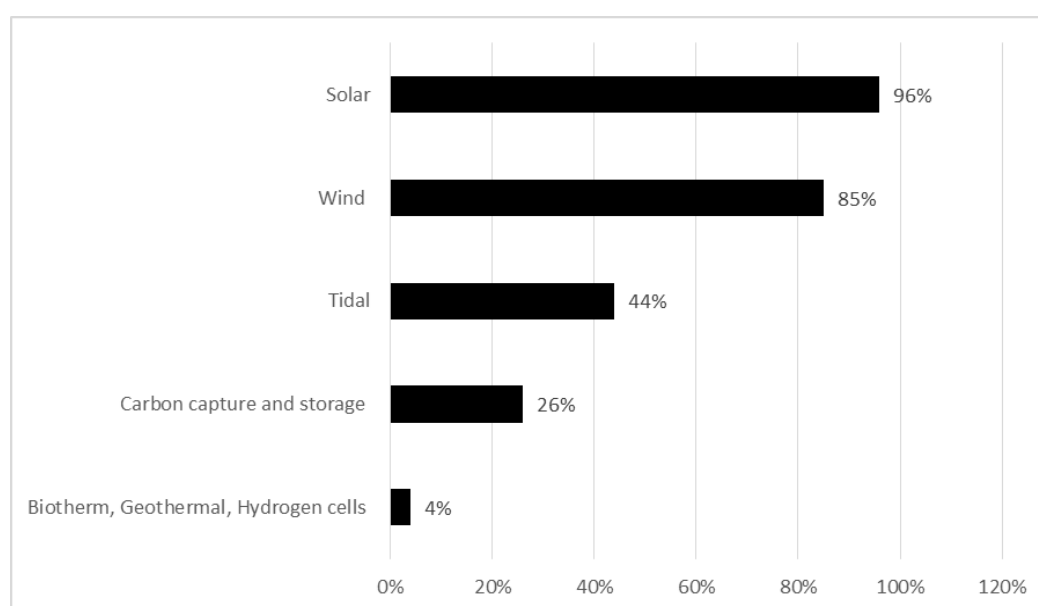
"I would not want to have any risks in my area such as underground explosives, contamination of water or environmental degradation. Natural resources need to be protected at all times." (Pers. Com, 2018h).

"Perceived risks: a lot of emphasis is placed upon the benefits or any new development and/or technology without taking too much consideration for the associated risks. Unfortunately, these risks only come to light when something has gone wrong and often it is too late to fix. So it is important for stakeholders to know the perceived risks early so that they know how best to deal with them should an issue arise." (Pers. Com, 2018i).

4.6. Possible hindrances to carbon capture and storage

One of the things that was important for the researcher was to understand if research participants were aware of the different types of energy sources that exist. In view of this a question was posed that specifically aimed to determine this knowledge among research participants. Based on figure 4.4 below it is obvious that majority of the respondents were aware of solar and wind energy. It was noted that there was lack of knowledge around other sources of energy such as CCS. The lack of awareness of other sources of energy can be a potential hindrance to the implementation of it.

Figure 4.4. Bar graph indicating research participant's familiarity with the different types of renewable energy



Source: Based on survey results (2018)

The researcher was also particularly interested in gaining knowledge from experts as to what possible hindrances could there be to the implementation of CCS. The results indicated that twenty of the research participants highlighted various hindrances to CCS and a few of their responses are captured in table 4.4 according to the themes that emerged.

Table 4.3. Representing possible hindrances to CCS by respondents

Category	Response
Capital	<i>"Long-term investment and meeting basic needs of the community can be a challenge for CCS in the future."</i> (Pers. Com, 2018g1)
Education	<i>"CCS is technical and difficult but start by climate change. And let kids know about climate change. It's education more than anything!"</i> (Pers. Com, 2018h1)

Community structures	<i>"The other complexity is how do you organise the community? That's the first problem it presents. These communities are very fragmented and there are political affairs such as traditional leadership, municipal structures and local businessmen. So, the first challenge is how you organise and I don't think there's a solid starting point there. You may find other structures in place, you may not find structures in place. You may have to put structures in place but you can't go in organising the process, they have to organise themselves. But you have to show them how to do it. It's time consuming. They have never done this before. They are more concerned of whether they disagree rather than agree." (Pers. Com, 2018i1)</i>

Source: Based on survey results (2018)

4.7. Discussion and conclusion

This study sought to establish the perspectives of stakeholder engagement in determining the outcomes which can be applied to the successful implementation of CCS initiatives in South Africa. The results of this study indicate that stakeholder engagement regarding CCS initiatives is an important component amongst the research participants interviewed in this study. This is supported by the findings where majority of the research participants agreed that stakeholder engagement has the potential to increase knowledge, awareness, education and a general understanding of the risks and benefits of CCS to communities and the general public. This is particularly important in the context of a developing country like South Africa where stakeholder engagement of CCS has been prioritised to communities where CCS is to be deployed. The surrounding communities face multifaceted challenges such as poverty, unemployment and varying levels of education hence it is important that stakeholder engagement is further enforced.

It is important to note that as much as the overall goal of stakeholder engagement is to lead to successful outcomes, this is not always the case. This is further supported in literature where several case studies were presented where extensive stakeholder

engagement has been conducted in several suitable sites but communities were able to still hinder or object CCS from being deployed. These case studies also provide a lesson for developing countries such as South Africa to learn from that as much as stakeholder engagement is crucial for CCS initiatives, it does not always lead to the desired outcome.

Based on the findings, there is need for future research looking at how to strengthen stakeholder engagement for the successful implementation of CCS in developing countries such as South Africa. A gap in knowledge identified is that a lot of academic research around CCS has been done in the developed regions however there has been a lack of academic research in developing regions such as in Sub-Saharan Africa and South Africa. Hence the need to understand CCS initiatives in South Africa and how stakeholder engagement can positively influence stakeholder perceptions about the technology which could potentially lead to successful implementation.

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Disclosure statement

No potential conflict of interest was reported by the authors

Paper No. 5

Africa's Agenda 2063: Can Carbon Capture and Storage and Green Bonds contribute to achieving Africa's Climate Change Goals? Experiences from South Africa⁵

Abstract

The Africa-2063 Agenda is Africa's development blueprint for the attainment of social and economic transformation as well as sustainable development for the continent. However, climate change is one of Africa's greatest challenges which possess massive threat to its social-economic development and ecological wellbeing. Global greenhouse gas emissions have reached the highest levels recorded in history and Africa is considered as one of the most vulnerable regions to be impacted by rising temperatures. It has been observed that African countries need to act with urgency to implement various adaptation and mitigation strategies. Using data collected in four (4) provinces of South Africa, by way of fieldwork and online surveys, we discuss the role of carbon capture and storage (CSS) as well as green bonds (GBs), in achieving the Africa Agenda 2063 climate goals. We argue that CCS and GBs can be deployed as innovative approaches with the potential to mitigate and reduce the impacts of climate change and contribute to Africa's sustainable social and economic development. We discuss and analyse these themes within the broader discourse of the sustainable development goals, particularly goals number 13 and 17.

Keywords: Africa; Agenda 2063; Carbon Capture and Storage; Green Bonds; South Africa

4.1.1 Introduction

Climate change is recognised as a serious, worldwide challenge of the twenty first century (McDowell et al. 2019). The past thirty years have seen rapid scientific evidence which has attributed changes in climatic conditions to human-induced activities such as the burning of fossil fuels, large-scale industrial activities as well as changes in land use (Szulczewski et al. 2012). The effects have resulted in the release of potent greenhouse

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gas emissions such as carbon dioxide in the atmosphere (Andric et al. 2019). Currently, global greenhouse gas emissions have reached the highest levels recorded beyond 400 parts per million (ppm) and is expected to continue increasing (NASA 2019). The manifestations of climate change have affected different geographic regions and the most notable impacts in sub-Saharan Africa have been increased and frequent flood and drought episodes leading to events such as water shortages, destructions of infrastructure and crops as well as biodiversity loss (Skogen et al. 2018). The results of this have impacted many economies and widened socio-economic issues such as poverty (Kousser & Tranter 2018). There is increasing concern that the effects of climate change are threatening the world from attaining the sustainable development goals (SDGs) (Hainaut & Cochran 2018).

It has been observed that countries in developing regions, particularly those in Africa which host the majority of the world's poor people will be the most impacted by climate change (Ebhuoma and Simatele, 2019; Filho et al. 2018). This is due to the fact that Africa currently and is projected to experience increased temperatures and reduced precipitation which will combine to subject the majority of the African people to reduced agriculture productivity and increased incidences of poverty (Yadav & Lal 2018; Simatele and Simatele, 2015). In the midst of deteriorations in Africa's social-economic development, climate change is projected to further exacerbate the incidence of poverty and widen the gap between the rich and the poor (Katy Roelich & Jannik Gieseckam, 2019). Its impacts on key sectors of the African economy such as agriculture, tourism, mining and energy are projected to significantly retrogress many African countries' economic growth (Mathetsa et al., 2019; Ngwenya and Simatele, 2020a; Dionne & Horowitz 2016). These impacts have and will continue to be aggravated by an absence of effective institutional and policy frameworks through which to promote and build the adaptive

capacity and resilience of those most vulnerable to changes in climatic conditions and extreme weather events (Olayide & Alabi 2018). Cyclones such as Idai and Kenneth which hit Mozambique in 2019 are reflections of Africa's inability to deal with climate change induced extreme weather events (Adenle et al. 2017). In the absence of political will and comprehensive institutional and policy frameworks to tackle climate change and build the adaptive and resilience of the poor, African people will continue to suffer great damage and loss as climate change is intertwined with political, social, economic and environmental issues (Bisaro et al. 2018).

The impacts of climate change have been increasingly recognised as a serious continental issue and this has been reflected in Africa's blueprint and master plan for transforming Africa into the global powerhouse of the future dubbed, Agenda 2063 (AU 2015). A key component in this strategic plan is addressing climate change by increasing capacity building, financial resources as well as skills development to support the implementation of adaptation and mitigation measures (AU 2015). This aspiration is also aligned to global initiatives and has been echoed in the Paris Agreement where African countries pledged to support the objectives of Agenda 2063 by committing to accelerate decarbonisation and implementing a transformative approach to climate change (Almazroui et al 2020; Figueres 2016). Initiatives to combat and reduce carbon emissions have been embarked on in several African countries among which include; South Africa, Kenya and Algeria to mention but a few, where investments have gone into wide-scale implementation for renewable energy projects such as solar and wind energy (Chirambo 2018).

The transition towards a low-carbon economy in Africa and meeting the goals of Agenda 2063 has grown in importance due to the findings of the Intergovernmental Panel on Climate Change Special Report (IPCC) of 2018 (IPCC 2018; Kissinger et al. 2019). The

report presents a gloomy outlook by arguing that if the world continues on a business as usual trajectory, global temperatures would exceed beyond 1.5°C in which climate change would have an even greater impact (Hainaut & Cochran 2018). This state of affairs has become a cause for concern considering the low adaptive capacity and vulnerability for developing regions, particularly Africa which is compounded with weak institutional and policy framework and is home to many of the world's poor people (Filho et al 2018). To prevent the consequences of increased climate change on all sub-sectors of the economy, emphasis to transition towards a low-carbon society has been suggested (see Figueres 2016). The development and implementation of low-carbon technologies across a range of sectors have been identified as an integral element to enable this transition (Ramirez *et al* 2008). Carbon capture and storage (CCS) and green bonds (GBs) have been identified as key low-carbon technologies, with the potential of significantly playing an important role in reducing global carbon emissions if appropriately planned and implemented (Chen *et al.* 2018).

The Republic of South Africa (RSA) has embarked on plans to implement CCS to reduce its carbon footprint (Ngwenya and Simatele, 2020a and 2020b). The country is ranked as the 14th highest emitter of carbon dioxide in the world due to its heavy reliance on coal-fired power plants for its energy generation (Carbon Brief 2018). However, the government of the RSA has committed to tackle climate change and reduce its carbon emissions through incorporating a mix of renewable energy and cleaner technologies (Ngwenya and Simatele 2020b; Shahbaz *et al.*, 2013). CCS has been identified as an important technology to support this transition and this has been reflected in various policies including the White Paper on Climate Change in which CCS is amongst one of the 8th flagship programmes of the country (DEFF 2011). Significant work to support the development of CCS has been initiated and this has been observed through the

establishment of the South African Centre for Carbon Capture and Storage (SACCCS) and currently hosted by the South African National Energy Development Institute (SANEDI) (Beck et al. 2011; Surridge and Cloete 2011). SACCCS has made great strides in promoting CCS through extensive stakeholder engagement over the years as well as creating platforms for research and development (Modiko et al 2013).

However, a major barrier which exists to CCS deployment has been the lack of financial investments (Ngwenya and Simatele, 2020a; Rammerstorfer and Eisl 2011). The operational costs of capturing, transporting and storing carbon have been identified as an expensive procedure which requires significant investments financially as well as in infrastructure and skills development (IEA 2017). Africa as a continent is characterised by deficiencies in financial resources, deteriorations in the physical infrastructure as well as a general lack of technical skills required to grow its economy. It is however, important to note that if CCS is to be realised as a key-low carbon technology to achieve the climate goals for Agenda 2063, investments in these important areas will require to be increased on a large-scale (Ngwenya and Simatele, 2020a; 2020b). An example of this is Norway which received huge investments from public and private partnerships to implement CCS projects and support the aspirations of the European Union 2050 long-term strategy (Durmaz 2018). As a knock-on effect, innovative investment opportunities in GB have also increased, which many European countries are now utilising to support climate change projects (Pham 2016; Banga 2019).

Although there has been interest in climate change investments to support the climate change goals set out in Africa Agenda 2063, the uptake of these have been slow (Filho et al 2018). To avert the adverse impacts of climate change, there is an urgent need for African governments to create an enabling environment through which public-private

partnerships can be established to promote investments in climate change adaptation and mitigation initiatives and projects (Manuamorn et al 2020). The Climate Investment Funds (CIF) (2019) has observed that Africa is the second highest region which has had the most climate funds approved from different funding agencies such as the Green Climate Fund (GCF), the United Nations Environmental Programme (UNEP), and the World Bank. More recently, other climate finance mechanisms such as GBs have been utilised to fund several environmental and climate related projects in Africa (Banga 2019; Ngwenya and Simatele 2020a). Green bonds, along CCS projects have grown in popularity in the past decade and have been regarded as a key climate finance mechanism to help developing countries fund their climate change schemes (Reboredo et al 2020; Ngwenya and Simatele 2020a). South Africa is currently leading on the implementation of CCS and GB projects on the continent and has to some extent captivated public-private sector partnerships (Ngwenya and Simatele 2020b). Thus, South African experiences in implementing its CCS and GB agenda can benchmark and create a platform through which Africa can develop its CCS and GB strategies and action plans to achieve its climate change objectives and outcomes in the Africa Agenda 2063.

4.1.2. Trends in climate change, CCS and GB in Africa

The adoption of Agenda 2063 in 2015 has been regarded as the blueprint for Africa's development (AU 2015). Maupin (2017) highlights that Agenda 2063 is one of the continent's long-term policies that brings to fore the importance of "a prosperous Africa [which] is based on inclusive growth and sustainable development" (AU 2015: 2). This aspiration accounts for socio-economic development on the continent as well as a holistic approach to how natural resources are managed sustainably (Maupin 2017). It also reflects the importance of mainstreaming climate change into development and planning

policies and frameworks (Ebhouma and Simatele, 2019; Simatele and Simatele, 2014). Besada et al., (2017) is of the view that combatting climate change is one of the central components of the policy. Under aspiration one, goal seven aligns to addressing climate change by stating how measures will be placed to “sustainably manage the continent’s rich biodiversity, forests, land and waters and using mainly adaptive measures to address climate change risks” (AU 2015: 4). This view has further been supported by the Paris Agreement and the IPCC special report on climate change which also emphasises the importance of measures placed to combat climate change on the continent as increasing temperatures will further result in the vulnerability of Africa.

It is important to note that as much as addressing climate change is amongst one of the top priorities in Agenda 2063, Maupin (2017) argues that there have been significant barriers. These are largely attributed to the lack of institutional capacity and resources faced by many African governments. Matewos (2019) concurs with this view by elaborating that the lack of institutional capacity such as financial resources and skills capacity has particularly been amongst the biggest hindrances in implementing climate change projects on regional and national scales in Africa. This view has further been edified by Omukuti (2020) who argues that the delay in climate policy and project implementation by African countries threatens the ability to sustainably manage the continent’s resources in the long-term. This is further elaborated by Dube et al (2018) where rural Zimbabwe is used as an example of how institutional limitations have an impact by the lack of adaptation and mitigation plans. They further argue that if the aspirations of Agenda 2063 are to be achieved within the broader theme of climate change and sustainability there needs to be increased capacity focusing on infrastructure, human as well as financial capacity (Dube et al 2018).

A solution proposed in the literature to address the lack of capacity has been to strengthen multi-stakeholder partnerships (Cintra 2014; Simatele and Simatele 2014). Haywood et al (2013) define multi-stakeholder partnerships as different stakeholders integrating from the public and private sector, civil society, academic institutions and international organisations with the aim of creating a dialogue where decision making, policy goals as well as implementation occurs. They are further of the view that multi-stakeholder partnerships enforce transparency and accountability whilst working towards a common goal (Haywood et al 2013). Cintra (2014) argues, in the context of Agenda 2063, that the role of multi-stakeholder partnerships, are critical in relation to climate change and sustainable development. This is because structural challenges such as institutional capacity and financing are addressed with the use of a multidisciplinary approach (Cintra 2014). Edifying this observation, Okem (2017) highlights how the different Conference of the Parties (COP) have played a role in prioritising the climate change mandates of Agenda 2063. He argues that during COP 21 African leaders and other key stakeholders from different government and the private sector agreed to collaborate with the broader global community to ensure that temperatures do not exceed 1.5°C (Okem, 2017; Ouedraogo 2020). This partnership and concerted collaboration was exhibited during COP 25 where African leaders further emphasised the importance of partnering with the private sector to mobilise private capital to finance climate projects but also to embark on a low-carbon economy and society (Ouedraogo 2020). This initiative included investing in wide-scale renewable energy projects as well as deploying innovative technologies such as carbon capture and storage (CCS) (Ngwenya and Simatele 2020b).

Countries such as RSA, Kenya and Nigeria are amongst the fastest emerging economies in the global south (Ngwenya and Simatele 2020b). These countries are also the biggest emitters of carbon emissions in Africa due to their rapid industrialisation and the heavy reliance on fossil fuel (Ngwenya and Simatele 2020b). A key low-carbon technology which has been identified to significantly reduce carbon emissions whilst transitioning towards cleaner sources of energy is CCS. CCS has been recognised as a climate change mitigation option which can significantly play a role in reducing global carbon emissions (NASA 2019). Oltra (2011) and Einsiedel et al (2013) define CCS as the process of capturing carbon dioxide emissions from large industrial sources and then transported and stored underground in suitable geological sites. The Global CCS Institute (2018), CCS is considered as one of the few technologies able to effectively remove carbon emissions and help the world transition to a low-carbon future. Wennersten et, al, (2015) are of the view that the implementation of CCS globally can stabilise global atmospheric carbon dioxide levels to below 450ppm. Similarly, the IPCC (2018) observes that in order to prevent an increase in global temperatures beyond 1.5°C, CCS can play an important role in combating climate change.

Beck (2017) argues that the implementation of CCS in developing regions such as Asia and Africa can enable these regions to drastically curb their carbon emissions. However, there has been little agreement as to how the low-carbon transition will be financed (Ouedraogo 2020). Mekonnen (2014), observes that more than USA \$100 billion will be required annually for climate financing in Africa and that African countries cannot be dependent on funding from richer nations. He is of the view that African countries will need to tap into innovative financing models by attracting private sector investments into clean energy (Mekonnen, 2014). Chirambo (2017) on the other hand argues that private

sector investments will be crucial in not only financing climate action in Africa, but also in ensuring continuous funding for the next 50 years as proposed in Agenda 2063.

An example of such financing instruments has been GBs (Doval & Negulescu 2014; Taghizadeh-Hesary & Yoshino 2019). Banga (2019) views GBs as proceeds which can be directed into climate or environmental related projects such as renewable energy and green infrastructure. He argues that GBs are specifically marked for green projects (Banga, 2019). Building on this observation, Pham (2016) is of the view that the GB market has grown exponentially due to increased climate change awareness from investors and the role that private capital has in financing adaptation and mitigation projects. Despite this development, Banga (2019) and Reboredo (2020) argue that developing regions have showed a relatively lower GB issuance rate compared to the developed regions. In the context of sub-Saharan Africa, Ngwenya and Simatele (2020b) argue that countries such as Nigeria, Kenya and South Africa are currently leading in the GB space although there is potential for further growth. They further argue that GBs have potential in financing various climate and energy projects on the continent (Ngwenya and Simatele, 2020).

South Africa is one of the few African countries that have embarked on GBs and CCS (Ngwenya and Simatele 2020b). Montmasson-Clair (2013) argues that the country has one of the most progressive climate change policies on the African continent that align with the goals of Agenda 2063. This includes the National White Paper on Climate Change (2011), National Development Plan (2011), the National Climate Change Response Policy (2011) as well as the draft National Climate Change Adaptation Strategy (2019). Recently, the South African government approved the Carbon Tax Bill in 2019. Chersich (2019) and van der Bank (2020) are of the view that all these national policies highlight the

importance of South Africa's commitment in global efforts to addressing climate change by reducing greenhouse gas emissions and increasing climate financing for adaptation and mitigation projects.

To facilitate the inclusion of low-carbon strategies into South Africa's energy transition, CCS has been identified as amongst one of the technologies to support this (Surrridge and Cloete 2011). Beck (2017) argues that because of the country's high carbon emissions and heavy reliance on coal, CCS can play a key role in achieving near to mid-term greenhouse gas emission reduction goals. It is because of this that SACCCS in partnership with the Council of Geoscience has, over the years, mapped potential sites where CCS is to be deployed according to the CCS roadmap (Surrridge and Cloete 2011; Beck 2017). The South African CCS Roadmap was endorsed by cabinet in 2012 which aimed to guide the development of CCS activities over the years (SACCCS 2012). It is important to note that within this roadmap two of the goals have already been met. Firstly, the development of the CCS atlas highlighting the potential of carbon dioxide to be safely stored underground and secondly, identifying suitable geological sites such as the Zululand and Algoa basin in the provinces of Kwazulu-Natal and Eastern Cape, respectively (Beck et al 2011). Beck et al (2011)

However, as much as there have been major developments in CCS research and development in South Africa there have also been several setbacks (Modiko et al 2013). This includes the lack of commencement of the CCS test injection project and demonstration project in 2017 and 2020 respectively. Modiko et al (2013) argues that factors such as multifaceted stakeholder engagement as well as financial factors may have played a role in the delay of implementation. Similar hindrances to CCS projects have also been observed by Brunstun et al (2011) as well as Olga et al (2013) who are of the view

that the Netherlands and Norway have experienced local communities protesting against CCS deployment due to the lack of extensive stakeholder engagement and awareness on CCS. Van Der Bank (2020) is of the view that in a country such as South Africa that is plagued with various socio-economic issues, it is imperative that sites where CCS is to be deployed extensive stakeholder engagement is conducted with surrounding communities and opportunities are presented to make the project a success.

Besides the importance of stakeholder engagement, economic feasibility of CCS has also been identified as an important component for South Africa (Nkoana 2018). Budinis et al (2018) argue that the biggest barrier to global CCS deployment has been the cost of operating and maintaining CCS plants. Rammerstorfer and Eisl (2011) observe how various cost models of CCS demonstrate how the process of capturing, transporting and storing has various costs associated and is considered an expensive procedure. Braunreiter and Bennett (2017) are of the view that with CCS there are huge uncertainties about long-term liability costs and carbon price. The authors further argue that these uncertainties bring about a negative perception on the commercial aspect of CCS. On the other hand, Durmaz (2018) explores the economic drivers of CCS and argues that various energy models suggest that costs of CCS will significantly be reduced if there are policies introduced to facilitate this. The authors are of the view that if tax incentives can be introduced for CCS deployment, this can increase the feasibility of this technology. Similarly, Eide et al (2013) argue that carbon markets need to be inclusive of climate policies and that research and development (R&D) strategies need to be developed by governments to investigate how CCS costs can be reduced. To further substantiate this, Vormedal (2008) and Baker et al (2008) draw on integrated assessment models which show how a comprehensive business case for CCS should be developed to deploy CCS at a reasonable cost.

In a detailed report by the World Bank (2011) on CCS in developing countries, one of the countries that have been provided with massive funding from developed countries like Norway is South Africa (Beck et al 2011). The CCS funding has been allocated on a temporal basis with the purpose of building and strengthening research capacity, as well as skills in the areas of CCS and GB (World Bank 2011). Although this investment has been cardinal to the development and implementation of CCS and GB initiatives, Ngcobo et al (2015) are of the view that CCS and GB projects will need to target investors both locally and internationally to ensure that funds are secured especially for the sustainability of these climate change mitigation and adaptation initiatives.

More recent attention within South Africa's climate change plans has been the need to expand climate finance. A major climate finance mechanism has been the Green Climate Fund (GCF) operating in partnership with the Development Bank of Southern Africa (DBSA) where more than USA \$5 billion of funding has been raised for various adaptation and mitigation projects in the country. Ngwenya and Simatele (2020a) argue that this has been observed through several projects being funded to the South African National Biodiversity Institute (SANBI) for climate change adaptation projects such as building resilience in the UMngeni catchment which is currently being implemented in the uMgungundlovu District Municipality. Furthermore, the Department of Environmental Affairs (2018) has also made use of mobilising funds from multilateral development banks such as the World Bank as well as bilateral finance from countries such as Norway and Germany.

Montmasson-Clair (2013) argue that new and additional sources of climate finances will need to be mobilised in South Africa. A huge focus will need to be on catalysing and mobilising private-sector funding for climate projects (Montmasson-Clair 2013). An

example of this has been green bonds in which the World Bank defines it as a “debt security that is issued to raise capital specifically to support climate-related environmental projects” (World Bank 2015: 23). Banga (2019) argues that the momentum of green bonds has exponentially increased since its inception in 2007 with big investment banks and multinational companies issuing green bonds to invest in climate adaptation and mitigation projects. Li et al (2019) is of the view that this is due to the increasing awareness of the role that the business community can play in addressing climate change.

South Africa has been active in the green bond market over the years, with several green bond issuances from the public and private sectors. The City of Johannesburg in 2014 was amongst one of the first to issue a green bond worth US\$ 96 224 472 (1.5 billion rands) where proceeds went into a range of low-carbon projects such as green infrastructure (City of Johannesburg 2014). The green bonds are funding a range of projects and initiatives in different sectors, such as green infrastructure as well as low-carbon infrastructure and transport (City of Johannesburg 2014). Followed by this the City of Cape Town was the second city in the country to issue out a green bond in 2017 and was also the first to be listed on the Johannesburg Stock Exchange (JSE) green segment with a green bond issued of over US\$ 64 149 648 (1 billion rands) (Climate Bonds Initiative 2017). The green bond proceeds are currently funding water management, waste management as well as other climate adaptation and mitigation projects (Climate Bonds 2017). Corporate companies such as GrowthPoint Properties were one of the first South African real estate companies in 2018 to issue out a green bond of US\$ 64 149 648 (1 billion rands) and bond proceeds have gone into energy efficiency and green office buildings (GrowthPoint Properties 2019). In 2019, Nedbank became the first corporate bank in the country to issue out green bonds worth US\$ 109 054 401 (1.7 billion rands)

and proceeds are expected to go into renewable energy projects (JSE 2019). While this state of affairs is not operating at a full-fledged global level, it demonstrates investor interests in South Africa's ambitions to reduce the country's environmental and ecological footprints.

4.1.3. Methodology

Data on which this paper is based was collected in four regions of South Africa namely; the city of Johannesburg, the Zululand Basin in KwaZulu-Natal, the Algoa Basin in the Eastern Cape and the city of Cape Town in the Western Cape. The choice of these regions was influenced by the following reasons: *Firstly*, the Zululand Basin and Algoa Basin are two sites in South Africa where CCS projects have been initiated and are expected to embark on a full operation. They are the only two sites in South Africa where the geology allows for the safe sequestration of carbon dioxide compared to other geological parts in the country (Surridge and Cloete, 2011). Data was collected by the researchers as soon as the ethics clearance was obtained from the University of Witwatersrand. The data collection period was from June 2019 to November 2019.

In view of this, the researchers identified 20 experts from both sites who had expertise on CCS or had been involved in various projects on CCS. These experts were identified through a rapid appraisal approach on Google where the following terms were typed 'CCS Algoa Basin', 'CCS Zululand Basin' and the following key contacts were identified from the Umhlababuyalingana Municipality, Umkhanyakude District Municipality as well as Nelson Mandela Metropolitan Municipality. Furthermore, the rapid appraisal identified other key participants who had expertise in CCS such as from the South African Centre for Carbon Capture and Storage (SACCCS), the Centre for Scientific and Industrial Research (CSIR), Department of Mineral Resources and Energy, Department of Higher

Education Science and Technology, Imbewu Legal and the World Bank. These participants were identified and contacted explaining what the research entails as well as sent an ethics documentation that the researchers obtained from the university, participant information sheets and consent forms. Once participants agreed to participate in the research, semi-structured interviews were set up to obtain data.

Secondly, the cities of Johannesburg and Cape Town were identified as key study sites for the research as these are the only sites where public and private institutions have successfully issued out green bonds in the country. Thus, all the regions selected provided an in-depth understanding of the green bond market and what institutional frameworks exist within which GB initiatives can be pursued and supported. In view of this therefore, the researchers conducted a rapid appraisal on Google in which the following keywords were typed 'Green Bonds South Africa', 'Green bond issuances public and private sector South Africa'. From this, the rapid appraisal identified institutions that have issued green bonds from the public and private sector or have assisted in the issuance of green bonds such as Nedbank, Johannesburg Stock Exchange (JSE), GrowthPoint Properties, Rand Merchant Bank (RMB), Bowman's Law, International Finance Corporation (IFC), City of Johannesburg as well as the City of Cape Town. Twenty participants were identified and contacted explaining what the research entails as well as sent an ethics documentation that the researchers obtained from the university, participant information sheets and consent forms. Once participants agreed to participate in the research, semi-structured interviews were set up to obtain data.

It is important to note that during the entire data collection process the research participants referred the researchers to additional participants in which online questionnaires were sent to these participants using Google Forms. It was found that the

responses increased to more than 20 participants as other research participants shared the questionnaire with others who had knowledge or expertise on CCS or GBs. The qualitative data collected through interviews was analysed using a software tool called NVivo 12 in which thematic analysis was used to identify and interpret different themes. Quantitative data was analysed through Google Forms which has a built in analysis software tool which produced different graphs based on the data collected. In total, data was collected from 70 participants.

4.1.4. Empirical evidence

A key point of interest in this study was to determine whether experts working within the space of climate change mitigation and adaptation considered CCS and GBs as feasible options or tools for reducing carbon emissions and promoting a low carbon economy in South Africa. As such research actors were asked to indicate by way of indication a predetermined response. The results of this exercise are illustrated in Table 4.5.

Table 4.5. Expert Response on CCS and GB as Climate Mitigation Options in RSA

Category	Cumulative Number of responses	Percentage of respondents (%)
Yes	58	83
No	5	7
Maybe	7	10
Total number	70	100

Source: *Based on survey results (2019)*

The experts in this study were also engaged to outline why they specifically considered CCS as a feasible option for reducing carbon emissions. Their responses are outlined below.

One of the research actors highlighted how CCS can play a very important role in curbing carbon emissions. *“It’s a very big yes because CCS has the potential of curbing CO₂ from industry to about 90% and the role that CCS would play on a global scale would be about 10% efforts put together to mitigate efforts against climate change. Without CCS there would be that gap, there’s a critical role for this technology”*. (Pers. Comm by participant 1a)

This view is also supported by the following,

“South Africa is considered one of the highest emitters of carbon dioxide...so there is need to embark on carbon capture storage”. (Pers. Comm by participant 1b)

Another important component that the research actors highlighted was the technical and financial support for CCS in South Africa. *“Apart from financing the CCS project implementation as a country, we have continuously received international technical and financial support from i.e, Norway (since 2009) which is a clearly indication that we can also take priority in financially investing in this sophisticated technology”*. (Pers. Comm by participant 1c)

Similarly, the experts in this study were further engaged to outline why they specifically considered GBs as a feasible tool for promoting a low-carbon economy and society through financing various adaptation and mitigation strategies. Their responses are outlined below in word cloud which captured the key themes.

Figure 4.5. Word cloud of participant’s responses capturing key research themes



Source: Based on survey results (2019)

Another key point of interest in this study was to determine whether the experts involved in this study were aware of any policies, laws or institutional frameworks relating to CCS as a climate change strategy that could be nationally implemented. As such research actors were asked to indicate by way of indication a predetermined response. The results of this exercise are illustrated in Table 4.5.

Table 4.5. Expert Response on awareness of policies, frameworks or institutional frameworks for CCS in RSA

Category	Cumulative Number of responses	Percentage of respondents (%)
Yes	17	24
No	53	76
Total number	70	100

Source: Based on survey results (2019)

Another point of discussion amongst the experts revolved around understanding what type of laws, policies or institutional frameworks they would like to see developed for the implementation of CCS. A few of their responses are captured below.

“There should be policies that ensure that communities have a say in CCS project implementation”. (Pers. Comm by participant 1d)

“With clearly defined policies, political will, strong leadership and highly skilled professionals which include the involvement of academia and climate experts, South Africa can achieve this”. (Pers. Comm by participant 1e)

The experts were similarly asked whether they considered policies, laws or institutional frameworks as important for the growth of the GB market in response to the need for sustainable climate finance for various adaptation and mitigation projects. Their responses are captured below in table 4.6.

Table 4.4. Expert responses on the importance of policies, laws or institutional frameworks for GBs in RSA

Category	Cumulative Number of responses	Percentage of respondents (%)
Yes	58	83
No	12	17
Total number	70	100

Source: Based on survey results (2019)

The discussion around the importance of policies, laws or institutional frameworks is further illustrated by the expert’s responses below.

“On the regulation side we have the JSE to regulate GB”. (Pers. Comm by participant 1f)

“What you also don’t want to do is stifle innovation by having specific regulatory framework that states that in order to have a GB there must be specific rules. This can contribute to the market stifling from innovation and development. You want things to morph into what the market really needs and by placing too much restriction into the market might prevent growth. However, to address this challenge involves having a strong and independent accreditation body which looks into the form of the instrument and the substance of instruments. It is important to evaluate the market instrument and determine if it is actually green” (Pers. Comm by participant 1g).

“One of the reasons why the CBI developed the GB principles was to ensure that there were certain parameters that GBs meet. I think that’s the way the green bond segment in the JSE works as you need to make sure that you complete independent verifications. You need to have this independently verified to determine if the green proceeds are going into a green asset. Previously you could have a GB and it wouldn’t need to be independently verified however independent verifications are important factors in combatting green washing”.
(Pers. Comm by participant 1h).

4.1.5. Discussion

An initial objective of this study was to identify the feasibility of CCS and GBs as tools to support the promotion of a low-carbon transition in South Africa. The results of the study from table 4.7 support the implementation of CCS and GBs as tools to aid in the low-carbon transition as majority of the research participants (83%) supported this view. Only a small percentage (7%) of participants disagreed whilst 10% of the research participants were undecided. As mentioned in the literature review, South Africa has embarked on various plans to mitigate greenhouse gas emissions through the use of cleaner technologies such as CCS (Shahbaz et al 2013; Beck 2017). Prior studies such as

from Oltra (2011) and Einsiedel et al (2013) have recognised CCS as an important climate mitigation technology especially for countries that are still heavily reliant on the use of fossil fuels. This was further supported by a comment from one of the participants, *“South Africa is considered one of the highest emitters of carbon dioxide...so there is need to embark on carbon capture storage”* (Pers. Comm by participant 1b). This finding is not surprising as the views expressed by the research participant concur with the Carbon brief report (2018) which highlights how South Africa is amongst one of the highest emitters of carbon dioxide due to the heavy reliance on coal mining.

In addition, 83% of the research participants also supported GBs as a tool to support the promotion of a low-carbon transition in South Africa. These findings seem to be consistent with research by Ngwenya and Simatele (2020a) who argue how green bonds have played a significant role in recent years as a source of climate financing for various adaptation and mitigation projects and therefore supporting the low-carbon transition in the country. This is further illustrated in the word cloud figure where key themes emerged showing how research participants positively associated GBs with the low-carbon transition. Themes that were recurring included GBs as ‘financing green projects’, ‘green efficiency’, ‘impact investment’, ‘philanthropy’. This also accords with earlier observations from Li et al (2019) which found that GBs have now also been considered as a form of impact investing due to the role that private capital has played in financing various climate adaptation and mitigation strategies. These findings are also supported by Banga (2019) who argues that even though there is not a universal definition of GBs, the term is largely associated with financing green projects.

The third question in the study was to determine whether the research participants were aware of any policies, laws or institutional frameworks relating to CCS as a climate change

strategy that could be nationally implemented. As indicated in table 4.6, surprisingly 76% of participants indicated that they were not aware of such whilst only 24% indicated that they were aware. This finding was unexpected as the literature shows how CCS has been reflected in key policies such as the White Paper on Climate Change (DEFF 2011) as well as in some of the frameworks developed by SACCCS (Beck et al 2011). However, as much as there have been major developments in CCS research and development in South Africa, Modiko et al (2013) points to the importance of extensive stakeholder engagement to increase awareness and knowledge of CCS. One of the research participants also commented the following, *“There should be policies that ensures that the community should have a say in CCS projects implementation”* (Pers. Comm by participant 1d). This further aligns with what Brunstun et al (2011) and Olga et al (2013) have reiterated in the literature about the importance of engagement and awareness of CCS to prevent projects from being stalled. In addition, Van Der Bank (2020) is of the view that in a country such as South Africa that is plagued with various socio-economic issues, it is imperative that sites where CCS is to be deployed that extensive stakeholder engagement is conducted with surrounding communities and opportunities are presented to make the project a success.

Another point of discussion amongst the research participants was the need to have policies, laws and institutional frameworks for GBs as an emerging climate finance. The findings are illustrated in table 4.7 where 83% of research participants agreed that this should be the case. These findings support the idea of Banga (2019) and Ngwenya and Simatele (2020b) on the importance of regulation to ensure transparency and accountability of the GB market, especially in developing regions. The research participants also highlighted the importance of regulation to ensure that GBs do not become a form of ‘green-washing’, *“One of the reasons why the CBI developed the GB*

principles was to ensure that certain parameters were set up that GBs meet. I think that's the way the green bond segment in the JSE works in that you need to make sure that independent verifications are completed. You need to have this independently verified to qualify green proceeds with a green asset. Previously you could have a GB and it wouldn't need to be independently verified now that independent verification should be factored as a way to combat green washing" (Pers. Comm by participant 1h).

However, 17% of research participants stated that regulation is not important for the GB in South Africa. One of the research participants commented that regulation could stifle the growth of the GB market, *"What you also don't want to do is stifle innovation by having specific regulatory framework that states that in order to have a GB there must be specific requirements. You want things to morph into what the market really needs and placing too much restriction might prevent that. There is a need for a strong and independent accreditation body which looks into the form of the instrument and the substance of it. This will determine if your financial instrument is actually green"* (Pers. Comm by participant 1g). Whilst another research participant commented that there is already a form of regulation provided by the JSE, *"On the regulation side we have the JSE to regulate GB"* (Pers. Comm by participant 1f). These results may be explained by the fact that certain people may be more aware and knowledgeable around regulation around GBs. Ngwenya and Simatele (2020) touch on this by stating that several companies and government departments have been involved in the issuance of GBs in the country.

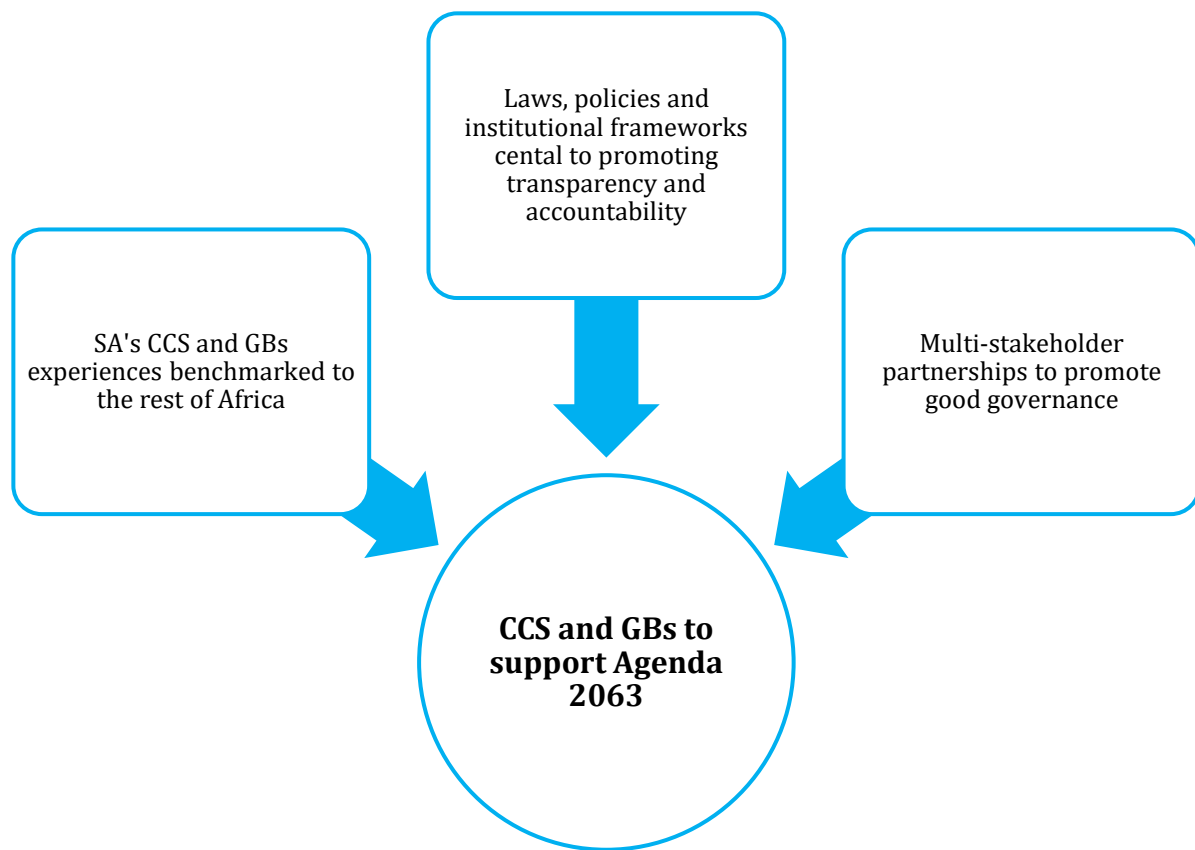
4.1.6. CCS and GBs in achieving Africa's climate change goals

In view of the above observations, the combination of these findings are significant for several reasons. The results seem to suggest that CCS and GBs can support a low-carbon transition in South Africa. For example, there has been the establishment of SACCCS

which is a research centre mandated to increase technical and capacity skills on CCS in the country as well as increase general awareness and education. CCS is also supported in key climate change policies such as the White Paper on Climate Change. In addition, there is an emerging GB market in the country and majority of participants have highlighted how GBs can play a key role in financing various environmental and climate related projects in the country. These findings illustrate that South Africa's experiences of implementing its CCS and GB agenda can be used as an important benchmark to develop Africa's CCS and GBs and align to the aspirations of combatting climate change as outlined in Agenda 2063.

The findings of the research further extend our knowledge of the importance of policies, institutional frameworks as well as laws to ensure that there is transparency and accountability of CCS and GB initiatives. Agenda 2063 outlines the importance of good governance and whilst implementing long-term climate plans it is critical that the necessary measures are in place. If CCS and GBs are to be effectively implemented, there needs to be an increase of institutional capacity and resources on regional and national scales. For example, regional bodies such as SADC and ECOWAS play a role in developing regulatory frameworks for countries that have potential to implement CCS initiatives. Also, different stock exchanges in African countries can form a coalition to ensure that there are regional or continental GB guidelines that promote transparency and accountability for issuers. This further reinforces the importance of partnerships and unity that is reflected in Agenda 2063. Figure 4.6 below further illustrates different factors that can influence how CCS and GBs can support Agenda 2063.

Figure 4.6. Factors that can influence CCS and GBs initiatives for Agenda 2063



Source: Based on survey results (2019)

4.1.7. Conclusion

Climate change is one of the biggest challenges Africa is facing and urgent action is needed on a policy and implementation level. This research has sought to investigate the potential of CCS and GBs as climate tools which can potentially support the aspirations of Agenda 2063. The evidence from the study suggest that CCS and GBs can be tools used to combat climate change. Key lessons from South Africa were that majority of research participants supported the use of CCS and GBs to contribute towards a low-carbon transition in the country. It was also found in the literature that CCS in South Africa is supported through key policies as well as research centres such as SACCCS to facilitate

technical and capacity building. In addition, South Africa is amongst one of the few countries on the continent which has been active in the issuing of GBs.

One of the more significant findings to emerge from this study is that policies, laws and frameworks are needed to ensure good governance, transparency and accountability for CCS and GBs in South Africa and the rest of the continent. If the aspirations of Agenda 2063 in terms of combatting climate change are to be realised, it is important that there are regulatory frameworks for CCS and GB initiatives on the continent. A key policy priority could be strengthening up existing partnerships with the African Union on how to set-up frameworks. As well as partnering up with South African public and private sector entities which have been involved in CCS and GBs and providing an advisory role for the rest of the continent.

A gap in research in this study is that there is a lack of Afro-centric literature on CCS and GBs in Africa. There is abundant room for further progress in determining how CCS and GBs can be applied in other countries and how this can be successfully facilitated and implemented which aligns to key policies such as Agenda 2063.

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Disclosure statement

No potential conflict of interest was reported by the authors

CHAPTER FIVE

RESEARCH RESULTS

Overview of Chapter

This chapter is composed of a journal paper that has been submitted and is currently under consideration for publication. The paper provides an overview of the analysis identifying the economic and environmental viability of the implementation of carbon capture in South Africa. Vercelli et al (2019) argue that the development of the South African carbon capture and storage roadmap was one of the first milestones in determining the feasibility of the carbon capture technology. They further argue that, from an environmental perspective, South Africa has plenty of geological reserves that can capture and store carbon safely (Vercelli et al., 2019). However, one of the biggest challenges to the successful implementation of carbon capture and storage has been the financial viability of the technology. Beck et al (2013; 2017) argue that the lack of financial resources has led to the delay of the projected pilot and large-scale implementation projects. The authors further argue that if carbon capture and storage is going to be included as one of the country's decarbonisation plans, it is important that government and the private sector collaborate to source the crucial funding needed to address challenges associated to carbon emissions.

The paper that is presented in this chapter discusses key findings from a conference that the researcher attended on the opportunities and challenges for carbon capture and storage in South Africa. The conference addressed key factors that would be crucial for the future development of carbon capture and storage. This included the need for institutional frameworks and policies that would guide the safe geological storage of carbon capture and storage underground as well as the need for regulations to guide the

entire procedure. One of the key aspects that was highlighted throughout the conference was the need to scale up financial resources for carbon capture and storage. Currently, the main financial resources are provided by the Norwegian government as well as the World Bank in which the resources are used for capacity and institutional building. It was drawn upon by academics and industry leaders who argued that government resources will be inadequate, and the private sector has a pivotal role to play in mobilising the necessary capital. In addition, it was argued that green bonds could be one of the private capital resources to be explored which could also include tax incentives.

Paper No. 6

Accelerating the implementation of Carbon Capture and Storage (CCS) in South Africa: SANEDI leading the way⁶

Abstract

Carbon capture and storage (CCS) has been identified as one of the carbon dioxide emission reduction mechanisms that could assist South Africa to meet its emissions reduction targets. The technology is included in policies such as the National Development Plan (NDP) as well as the South African National Climate Change Response White Paper. The CCS Roadmap for South Africa was developed in 2004 in which the first major milestones being the potential of CCS in the country and the CCS storage atlas were completed. However, the commencement of the Test Injection CCS project as well as full-scale deployment that were to commence in 2017 and 2020 respectively have been delayed. In a CCS Technical Workshop that was held on the 18th of February 2020, there were several important findings and recommendations which were placed forward. These include the need to develop a carbon tax, increased capacity building, regulatory frameworks developed, mobilising private sector capital for CCS as well as identifying any future liabilities associated with CCS.

Keywords: Carbon capture and storage; South Africa; clean technologies; climate change; South African National Energy Development Institute (SANEDI); National Development Plan

5.1. Introduction

Climate change is one of the biggest global challenges to date (Rockstrom 2009). Over the past decades, studies have shown an increase in greenhouse gas emissions released into the atmosphere which have caused an increase in global temperatures (Steffen 2015). This has largely been attributed to anthropogenic activities such as large-scale industrialisation and the burning of fossil fuels releasing potent greenhouse gas emissions such as carbon dioxide (O'Brien and Leichenko 2020). The impacts of climate

⁶ This chapter has been submitted for publication in its current form: Ngwenya, N and Simatele, M.D. Accelerating the implementation of Carbon Capture and Storage (CCS) in South Africa: SANEDI leading the way. Geography (The paper has been reviewed and is currently awaiting publication)

change have been massive affecting different geographical regions (Zimmerer et al 2019). This has been observed through extreme climate events such as droughts and flood episodes as well biodiversity loss (Filho 2018). Climate change has also resulted in massive socio-economic impacts as vulnerable countries have faced increased poverty levels and economic instability (Walters et al 2019).

Global carbon dioxide emissions have currently reached the highest levels recorded in history which are now beyond 400 parts per million (ppm) (NASA 2019). These levels are set to increase with the demand of energy from emerging economies such as China, India and South Africa (IEA 2019). According to recent estimates, developing countries will account for more than 50% of global carbon emissions by the year 2040 (IEA, 2018). Furthermore, the 2018 Special Report on climate change by the Intergovernmental Panel on Climate Change (IPCC) gives a stark warning on how continued carbon emissions will result in an increase of temperatures beyond 1.5°C which will result in detrimental impacts (IPCC 2019). This is particularly true for vulnerable regions such as Sub-Saharan Africa which is experiencing prolonged drought periods whereby increasing temperatures will continue to exacerbate these conditions (IPCC 2019).

In order to avoid reaching unprecedented and uncontrolled levels of carbon dioxide emissions, developing countries have been identified as playing a critical role in carbon mitigation (Condor et al 2011). The introduction of CCS deployment has been one of the technologies that has been promoted to achieve carbon emission reduction targets as developing countries are still heavily reliant on the use of fossil fuels (Saito et al 2019). CCS can be described as a low-carbon mitigation technology that captures carbon emissions from point sources such as industries, where the carbon is transported and safely stored underground in geological basins (Saito et al 2019). In recent years, CCS has

gained traction amongst academics, policymakers, investors and governments because of its potential to capture large quantities of carbon emissions from point sources and safely store underground (Vercelli et al 2019). In addition, deploying CCS in developing countries can achieve global carbon emission reductions of more than 50% by 2050 and also assist countries in transitioning towards cleaner sources of energy (IEA 2019).

South Africa is amongst one of the highest emitting countries in the world (Carbon Brief 2019). This is attributed to the country's total energy production which is largely derived from fossil fuels such as coal (Karimi 2017). The reliance on coal is expected to continue in the coming decades due to the abundance of coal reserves in the country (IRP 2019). This has even been reflected in the country's latest Integrated Resource Plan (2019) which outlines the country's electricity demand and supply and includes additional capacity for coal-fired power plants (IRP 2019). The International Energy Agency 2019 Coal Report further highlights how coal will continue being part of the country's energy mix and will still remain a key source of energy for electricity generation (IEA 2019).

The South African government has pledged to reduce more than 40% of greenhouse gas emissions by 2025 (DEA 2015). One of the strategies identified to mitigate emissions has been through the implementation of cleaner technologies such as CCS (DEA 2015). Since the establishment of the South African Centre for Carbon Capture and Storage (Beck et al 2017) under the South African National Energy Development Institute (SANEDI), great strides have been made into research on CCS and its potential use in the country (Beck et al 2017). This paper will focus on how the latest CCS workshop held by SANEDI which outlined the challenges of CCS as well as opportunities to further accelerate deployment.

The potential for CCS was first identified in 2004 by the Centre for Scientific and Industrial Research (CSIR) with the Department of Mineral Resources and Energy

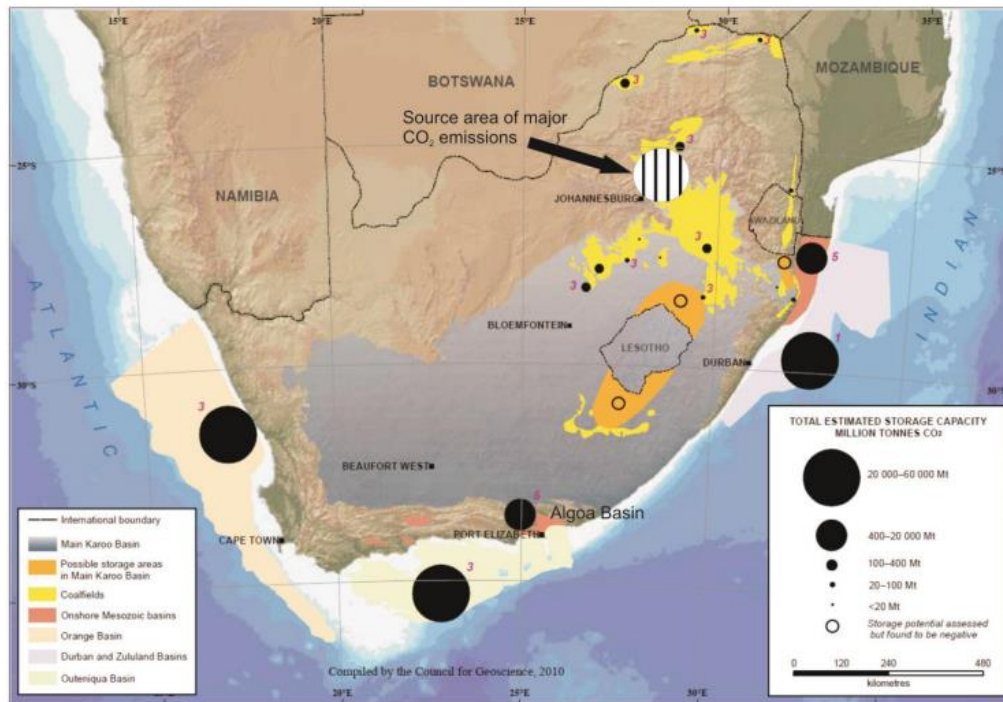
(Munyai et al 2013). An investigation was conducted to determine the potential of CCS where it was found that more than 60% of carbon dioxide would be able to be captured, transported and safely stored underground in geological basins (Beck et al 2013). In 2009, SACCCS was established under the division of SANEDI which would be responsible for building the technical and human capacity of CCS in the country (Munyai et al 2019). The establishment of SACCCS was notable because this was a consortium of various stakeholders (Beck et al 2013). These stakeholders included different government departments, international organisations such as the Global CCS Institute, the World Bank, the European Union and the Carbon Sequestration Leadership Forum as well as from the South African industry with ESKOM and Anglo American pledging their support for CCS (Beck et al 2013). This highlights how various stakeholders realised the importance and potential of CCS as a clean technology to be adopted in the country's energy mix.

The importance of CCS has also been included in key policies. The National Development Plan (NDP) of 2030 is one of the country's policies that has long-term plans to reduce inequality and poverty, enable economic transformation and achieve a developmental state (NDP 2012). The fifth chapter of the NDP looks at ensuring environmental sustainability and an equitable transition to a low-carbon economy (NDP 2012). The NDP recognises how coal is a cheap and reliable source of energy however it is carbon intensive and this can hinder the country's commitments to reduce its carbon emissions (NDP 2012). Furthermore, the NDP states that in order for South Africa to reduce its carbon footprint, clean technologies that are environmentally and financially feasible such as CCS need to be explored (NDP 2012).

The National Climate Change Response White Paper (2011) is another key policy that highlights the importance of CCS as a mitigation strategy (DEA 2011). The White Paper highlights the South African government's vision for a just transition towards a climate-resilient society and low-carbon economy (DEA 2011). One of the Near-Term Priority Flagship programmes within the policy is CCS which is considered as making a contribution to stabilise the country's greenhouse gas concentrations (DEA 2011).

One of the most important technical projects that SACCCS embarked from its launch was the formulation of the South African CCS geological storage Atlas which was completed in collaboration with the Council for Geosciences (CGS) (Beck et al 2013). The purpose of the Atlas was to identify potential geological sites in the country for the safe and secure storage of CCS (Beck et al 2013). Out of all the potential geological sites, the two most promising sites that would be able to store between 10 000 – 50 000 tons of carbon dioxide were the Algoa Basin in the Eastern Cape and the Zululand Basin in Kwa-Zulu Natal (figure 5.1) (Beck et al 2013). From these sites, SACCCS has been responsible for further exploring the geological suitability in these regions, conducting environmental impact assessments as well as engaging with key stakeholders (Modiko et al 2013). These have included officials from surrounding municipalities, local departments, traditional leaders as well as communities (Beck et al 2013).

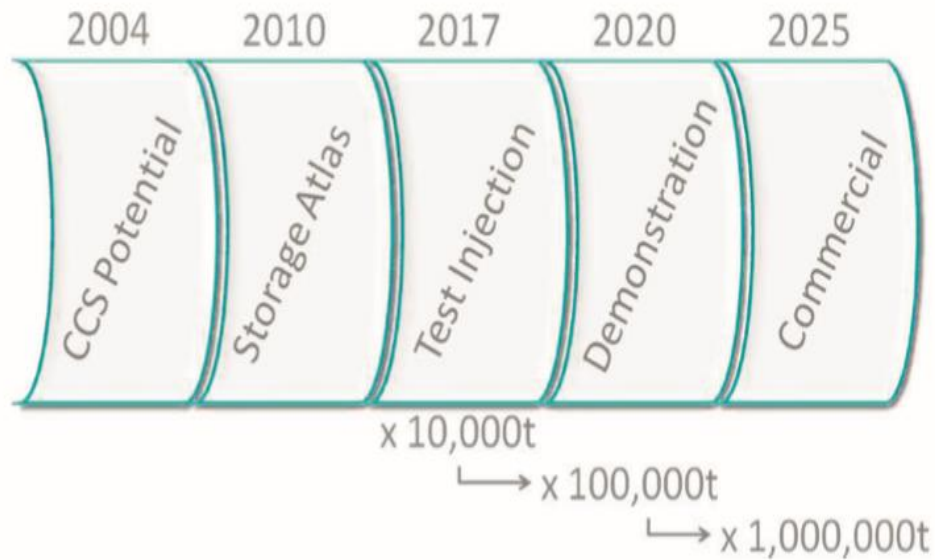
Figure 5.1. Map displaying the potential geological sites for the safe storage of carbon dioxide in South Africa



Source: Beck and Surridge (2013: 3)

The CCS Roadmap was also designed to track major milestones from 2004 to 2025 onwards (Modiko et al 2013). The first two major milestones being the potential of CCS in 2004 as well as the development of the Atlas in 2010 were completed (Modiko et al 2013). In 2017 the test injection CCS project was supposed to commence which would demonstrate the safe injection and storage of carbon dioxide (Beck et al 2017). This has since been delayed as well as the demonstration CCS plant which was expected to commence in 2020 (Beck et al 2017). The roadmap also outlines the implementation of CCS commercial deployment from 2025 and beyond (Modiko et al 2013).

Figure 5.2. The South African CCS Roadmap



Source: Beck et al (2013: 4)

Besides SACCCS being responsible for developing the technical capacity of CCS, it has also been instrumental in building human capacity to create awareness on CCS (Beck et al 2013). Human capacity is important as this is where awareness is created through increasing stakeholder engagement and public participation (Modiko et al 2013). The centre has been responsible for conducting stakeholder engagement activities all over the country with the aim of educating the public about the advantages and disadvantages of CCS and climate change (Beck et al 2017). These activities have targeted the general public as well as industries and education institutes through platforms such as workshops and conferences (Beck et al 2017).

This has been observed through research and development (R&D) on CCS in the country with completed projects such as the business case for the continuation of CCS in South Africa, the impact of CCS on South Africa's national priorities as well as the Carbon Tax and CCS in the country (Munyai et al 2013). In addition, funding has been allocated to individuals from previously disadvantaged communities to pursue their honours,

masters and doctorate degrees to pursue research on CCS (Munyai et al 2013). SACCCS has also played a key role in conducting various school awareness programs in surrounding communities where CCS is to potentially be deployed (Munyai et al 2013).

5.2. Methods

This study relies on information that was presented during the CCS technical workshop which was conducted on the 18th of February 2020. The workshop was held at the SANEDI offices held in Upper Grayston Office Park, 152 Ann Crescent, Strathavon, Sandton. The workshop was facilitated by various technical and policy specialists affiliated with SANEDI which began from 07:00 and ended 16:00. Over 30 participants attended consisting of academics, industry experts and government officials. These officials were identified through the workshop information guide which included the names of the participants as well as their affiliated organisations and companies. The objectives of the workshop were to: give an update of the status of CCS in the country, outline the regulations and standards for CCS, highlight the drivers for accelerating CCS and provide recommendations on measures to address the current challenges. The researcher also used a rapid appraisal of literature in which 30 journal articles were reviewed which focused on the literature pertaining to the environmental and economic viability of carbon capture and storage in South Africa.

5.3. Results

An update was given on the South African CCS pilot project where it was mentioned that SANEDI has completed the basin and site characterisation in the Zululand basin. This is important because according to Gilmore (2016) conducting a basin and site characterisation provides detailed information on the geological suitability and technical

feasibility of implementing CCS. Furthermore, it was noted that the characterisation contributed to addressing data gaps such as old exploration boreholes and collecting new data such as seismic acquisition that would detect any seismic activities underground during injection. This is further supported by Roelefse et al (2019) and Umar et al (2020) who argue that seismic data during characterisation is important in determining geological risks.

In addition, during the workshop, environmental concerns were raised such as the possibility of seismic activity. Experts clarified this by stating that South Africa is located in a fairly stable plate and there are very few chances of experiencing tremors due to CCS related activities.

Final points of the characterisation and geological aspect of the workshop was concluded by experts from SANEDI and the CGS. It was highlighted that the injection process is scheduled to start by 2022 and end by 2024. This process will then be followed by the CCS pilot project in 2025. The project closure is planned to also occur by 2030.

Regulation and standards for CCS has been regarded as very important. During the workshop it was noted that currently there is no legislation dedicated to CCS in South Africa at the moment. However, there are various acts that can be amended to accommodate CCS. Officials from the department of Energy and Communications stated how the Inter-Departmental Task Team (IDTT) was established in 2012 to start the development of CCS legislation. A study was conducted in 2012 with the purpose of analysing gaps and barriers existing in the country's legislation in order to determine the regulatory needs under which to permit the safe development, operation and closure of CCS projects in the country. This study was to assist the Department of Mineral Resources

(DMR) to develop a CCS policy framework to fit into existing legislation which would allow the execution of the pilot project and commencement of large-scale deployment.

It was also noted during the workshop that the DMR is currently embarking on the second phase of the CCS legal and regulatory study. This is to further explore other options such as mineral rights as well as health and environmental issues that would be included in CCS law for South Africa.

A presentation was also conducted by an official from the South African Bureau of Standards (SABS). This presentation was to further explain the process of developing CCS standards in South Africa. To further complement this, another presentation was given explaining the international standards of CCS. Specifically, ISO/TC 265 'Carbon dioxide capture, transportation, and geological storage' was developed and has been recognised as the international standardisation of the geological storage of carbon dioxide.

The importance of regulation and standards for CCS has been justified by various scholars in literature (Ishii and Langhelle 2011; Severinsen 2014). Kerr et al (2009) highlight how in 2008 the International Energy Agency (IEA) launched the International CCS Regulators' Network for CCS regulators to discuss challenges faced in developing comprehensive legal and regulatory frameworks. Kerr et al (2009) further elaborate that the first legislation and regulatory frameworks to emerge out of this network was the geological storage of carbon dioxide and how to regulate the capturing, transporting and storage of the technology. The importance of this has also been argued by Zou and Zhang (2017) who are of the view that geological storage of carbon dioxide should take into consideration environmental risks and be able to safeguard CCS operations.

Severinsen (2014) argues that one of the key primary concerns with countries wanting to deploy CCS is whether it should be incorporated into existing legislative structures or there should be new legislation governing CCS activities. The author further argues that because CCS is a relatively new and novel technology, a number of aspects must be incorporated such as property rights, safety and health, liabilities as well as industry requirements (Severinsen 2014). This is further supported by Dixon et al (2015) who are of the view that there are continuous developments on an international and national level regarding CCS as CCS activities are unique to each country and involve a range of different factors.

Another important factor raised during the workshop was the need to explore additional financial resources to support CCS activities in the future. It was highlighted how cost has been an important barrier to CCS implementation globally, especially in developing countries where there are other competing demands for resources. This has supported by Budinis et al (2018) who argue that despite CCS being viewed as a critical transitional technology towards a low-carbon society there has been a lack of wide-scale deployment due to the lack of financial resources. Herzog (2017) further supports this by arguing that the operation costs of CCS such as capturing, transporting and CCS are capital intensive. However, Herzog (2017) further highlights how various programs such as enhanced oil recovery (EOR), tax credits as business drivers have been used to successfully finance CCS projects. Furthermore, significant financial support from government has also been a driving force.

In the context of South Africa, the World Bank Multi-Donor CCS Capacity Building Trust Fund has allocated millions of dollars to the country to support the development of CCS. In addition, the country has been received international support from the Norwegian

government. However, it was argued that the South African government must increase financial resources to support carbon capture and storage as well as leverage private capital which could be one of the ways to overcome cost barriers.

5.4. Discussion

Throughout the workshop, the participants involved outlined key focus areas that would need to be addressed to accelerate the implementation of CCS in South Africa. One of the first areas of discussion pointed to the need for a carbon tax to support CCS. The Carbon Tax was enacted by the Ministry of Forestry, Fisheries and Environment on the 1st of June 2019 and the purpose of the tax is to reduce the country's high carbon emissions by taxing companies that emit a level of carbon emissions beyond a specified threshold (The Presidency 2019). By enacting the tax this can enable companies to reconsider emitting high carbon emissions and participate in the transition towards cleaner sources of energy to avoid paying additional taxes (The Presidency 2019).

In the workshop, several participants highlighted that the Carbon Tax should be reformed to include CCS. It was argued that the inclusion of the technology could help companies implement small scale CCS projects which could help reduce the high carbon emissions and by so doing avoid paying additional penalties linked to the Carbon Tax. This view is supported by Tarufelli et al (2020) who analyse how in the US, the implementation of the 45Q tax credit included CCS as an incentive to large scale emitting industries. The 45Q tax credit resulted in smaller CCS projects being implemented but also high emitting industries reducing their emissions significantly (Tarufelli et al, 2020). This incentive additionally improved the views on CCS financing as the technology is capital intensive but has long-term benefits such as industries not paying additional taxes. Based on this

perspective, stakeholder representatives from high emitting companies such as ESKOM, Anglo and Sasol supported the implementation of CCS as an incentive to the Carbon Tax.

Similarly, regulatory frameworks were also of note in discussions throughout the workshop. Stakeholder representatives from government, particularly from the Department of Mineral Resources and Energy stated that they are currently embarking on the process of accommodating CCS in the South African regulatory framework. It was further stated that Phase one of the process has been completed which identified four key areas that needed to be considered after extensive stakeholder engagement. This is further supported by Cheng et al (2013) who analyses how the development of a regulatory framework for CCS in Taiwan by the government was crucial for its nation-wide implementation. In their paper, Cheng et al (2013) argue that the development of a CCS regulatory framework was dependent on national and local government levels, policy experts, the public as well as high emitting industries. Factors that needed to be taken into consideration were industry incentives, economic planning, and development as well as environmental protection. Cheng et al (2013) highlight that through stakeholder engagement, a comprehensive regulatory framework was developed that supported the implementation of CCS in Taiwan but also ensured that all factors that stakeholders raised were addressed accordingly. The approach in the study is similarly adopted by the DMRE as risks such as potential liabilities are also being investigated by the Department.

Stakeholder engagement and capacity building were also key points of discussion. With regards to stakeholder engagement, this point of discussion was expected and suggests that stakeholder engagement will always pose a challenge. The participants highlighted that in a developing country faceted with various socio-economic challenges such as

poverty, low literacy levels and inequality, massive work still needs to be developed to educate the surrounding communities on where CCS projects will be implemented. This view has been supported by Modiko et al (2014) who argue that the education and engagement of CCS projects still remain a challenge globally and locally too. The authors highlight that for CCS to be fully incorporated into the country's national policies and energy plans, stakeholders must be engaged and educated on the basic principles of CCS. In addition, the participants present highlighted that there was a current skills shortage in policy experts, technicians, engineers, and scientists that need to be part of the operationalisation of CCS projects in the country. This is supported by Beck et al (2013), where the authors highlight how through national and local stakeholder engagement plans in South Africa, critical skills development areas were identified to enable the successful deployment of CCS. These include technical and economic specialists in the country to drive innovation and financial inclusion, scientists that would work with the surrounding communities to upskill youth on CCS projects as well as technical policy experts from a government level who would be responsible for reviewing legislation and regulation for CCS development in South Africa. It was further suggested that the CCS engagement plan be revisited to incorporate crucial components.

Another important discussion that was brought to the forefront was topic of financing for CCS projects in South Africa. Participants raised concerns that the current financing model for CCS research in South Africa largely relied on government funding as well as international partnerships such as with the Norwegian government as well as the World Bank. The concern raised was that these sources of funding were immediate and not long-term and that private sector partnerships would need to be established. Beck et al (2011; 2013) highlighted that the South African industry would need to contribute funding for

CCS in South Africa as this transitional technology would benefit industry stakeholders as well. It was concluded that SANEDI would engage the industry participants that had gathered at the workshop and facilitate a dialogue on developing a model for private funding for CCS in South Africa.

The value of the discussions held suggest strong support for CCS to further be developed in the country, however, key factors such as stakeholder engagement, financing for CCS, carbon tax as well as regulatory frameworks need to further be expanded. The key focus areas discussed in the workshop are summarised in table 5.1.

Table 5.1. Key areas by research participants

Identified key areas	Status
Carbon Tax	Additional support mechanisms beyond the carbon tax will be required to make CCS viable in the short to medium term
Finalising CCS standards	SABS is working hard to start the process of developing CCS standards
Identifying liabilities associated with CCS	SANEDI together with the DMRE are working towards identifying liabilities associated with implementation of CCS.
Capacity Building	SANEDI is currently embarking on the process of further supporting investing in skills development and knowledge of CCS
Regulatory Frameworks	DMRE is embarking on the process of accommodating CCS in the South Africa regulatory framework. So far, Phase 1 of this process has been completed, which identified four options that need to be considered.
Finance for CCS	SANEDI is exploring options for sustainable finance mechanisms for CCS which include engaging with the private sector and industry
Improving stakeholder engagement	SANEDI aims to continuously engage with relevant stakeholders to educate and inform on CCS technology and the benefits of it

Source: Based on survey results (2020)

5.5. Conclusion

Carbon capture and storage (CCS) has been described as a key transitional technology that will enable many countries to move away from the dependence on fossil fuels

towards a low-carbon economy. South Africa is one of the few developing countries that has embarked on the process of CCS and this saw the establishment of SACCCS which was a dedicated division for CCS under SANEDI. Over the past decade there have been significant developments regarding CCS such as the establishment of the CCS geological Atlas and the CCS roadmap.

The CCS workshop held on the 18th of February 2020 highlights some of the significant milestones regarding CCS but also some of the challenges. These include the reasons behind why the pilot project has been delayed, legal and regulatory requirements, stakeholder engagement as well as costs. Various updates were given and it was concluded that more work still needs to be done but that CCS is still a fundamental technology that should be embarked on in South Africa.

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No potential conflict of interest was reported by the authors

CHAPTER SIX

RESEARCH DISCUSSION

OVERVIEW OF THE CHAPTER

This chapter is composed of a paper that is currently under consideration for publication. The importance of this chapter presents the discussion for this thesis which provides an overview of a sustainable framework for the implementation of carbon capture and storage in South Africa. Asongu (2017) highlights how governance has become a critical component in climate change studies. This is because laws, regulations, policies and good governance can ensure the successful implementation of climate adaptation and mitigation projects. Key to this is the role of non-state actors such as non-governmental organisations, international organisations as well as the private sector who have been identified as key in contributing to governance for climate change.

The paper further draws upon how governance is important in the development of carbon capture and storage as well as green bonds in South Africa. It was demonstrated how non-state actors such as international organisations and the private sector have a very important role for establishing guidelines and regulations for the facilitation of carbon capture and storage and green bond initiatives. The findings of this study further highlighted several factors. These include a need for increased awareness on CCS and GBs in the country, institutional capacity building as well as the need for low-carbon policies and tax incentives that will enable investments for CCS but also reduce the costs and complexities around GBs. The study concluded by highlighting the need for further academic research to understand the opportunities for establishing governance practices for carbon capture and storage as well as green bonds, especially in developing countries.

Towards a sustainable framework for green bonds and carbon capture governance and development in South Africa

Abstract

In climate change studies, frameworks have been considered as important in implementing guidelines, procedures and enforcement of adaptation and mitigation projects. This is even more crucial in the advent of the rise of green finance and novel low-carbon technologies to be implemented in developing countries. South Africa is amongst one of the world's highest carbon emitters. In order to meet the targets set out in the Paris Agreement as well as the country's Nationally Determined Contributions, various strategies need to be implemented. Carbon capture and storage (CCS) has been identified as a critical transitional technology to reduce emissions. In addition, South Africa has also placed an importance on green finance as an important component in financing various climate change projects. Of notable importance has been the rise of green bonds (GBs) to fund adaptation and mitigation projects. In order for the successful implementation of mitigation projects such as CCS and the increase growth of green financing such as GBs there needs to be an effective governance and framework developed for the successful implementation of these mechanisms. This paper argues that South Africa can be one of its kind on the continent in implementing a constructive and sustainable framework for carbon capture and storage technology as well as green bonds.

Key words: green bonds, carbon capture and storage, South Africa, framework, sustainability, governance

6.1. Introduction

Climate change is undeniably one of the most pressing global challenges (Beard et al 2020). Increased scientific evidence has proven that increasing global temperatures are resulting in climate catastrophes which have manifested in several ways such as glaciers melting, prolonged drought periods, lack of rainfall and extreme wildfire events (Yaduvanshi et al 2021). The Paris Agreement of 2015 further highlighted the importance

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of intensifying national and international efforts to curb the effects of climate change as an increase of global temperatures beyond 1.5°C would be disastrous (Bauer and Menrad 2019).

Massive efforts are now focused on the world achieving a net zero society and low-carbon technologies have been placed at the forefront of climate mitigation strategies (Berry et al 2014; Satola et al 2021). Of particular importance has been CCS which has been described as playing a vital role in decarbonisation (Heesh 2021). This has further been reiterated in key reports such as the Intergovernmental Panel on Climate Change Special Report of 1.5°C which highlights the importance of CCS in stabilising global atmospheric carbon emissions (Livingston and Rummukainen 2020). According to the Global Status of CCS Report (2020) there are currently 65 commercial CCS facilities globally with the leading countries including the United States, Australia and Norway. These countries have also ensured that CCS is made a top priority in national commitments to achieve carbon neutral outcomes (Sun et al 2020).

In the context of developing regions such as Africa, South Africa is amongst one of the very few countries that has embarked on plans to implement CCS. It is argued by Beck et al (2013) that CCS is an important technology for the country to consider especially since there is still a high dependence on the coal industry as well as other high emitting industries such as the cement industry. The importance of CCS has been highlighted in national policies such as the National Climate Change Response Strategy White Paper (2011) where CCS is one of the flagship programmes which aims to address climate change.

Besides, the importance of low-carbon technologies to mitigate greenhouse gas emissions, green finance is just as pivotal in financing mitigation strategies (Warren

2020). To ensure the swift transition towards a low-carbon society there has been a huge emphasis on green finance which has been the main objective since the Paris Agreement (Tolliver et al 2019). Green bonds have been identified as one of the signature financial resources where private finance can be directed towards environmentally friendly projects (Banga 2019). The growth of the green bond market has been exponential over the past decade with several global issuances (Pham 2016). South Africa has also been leading in the green bond market with both the public and private sectors issuing green bonds for various climate and environmental projects such as green buildings and renewable energy (Ngwenya and Simatele 2020).

It is important to note that as much as there have been great strides in plans for CCS implementation in South Africa as well as the development of the green bond market there still are concerns around the lack of regulation and standards around these mitigation tools. This paper argues that there is a need for a sustainable framework which includes policies, laws and regulations to successfully govern CCS and GBs.

6.2. The current status of CCS and GBs in South Africa

Developing countries such as China, India and South Africa are reported to be amongst the leading countries responsible for the increase in global carbon emissions (Wang et al 2021). This is of major concern because global atmospheric carbon dioxide levels have already peaked to dangerous levels of over 400 parts per million (ppm) which will lead to continued warming of the planet (Fesenfeld and Rinscheid 2021; Morrow et al 2020).

On the African continent, South Africa has been ranked as one of the leading carbon polluters (Tsikata and Sebitosi 2010; Makgato and Chirwa 2020). Beck et al (2011) highlight that the country is a heavily dependent coal economy with approximately more than 90% of electricity production emerging from coal reserves. CCS has been identified

as a transition technology to drastically reduce carbon emissions and aid in the gradual transition towards a low-carbon economy (Beck et al 2011). This is further supported by the IEA CCS Roadmap (2013) which clearly outlines that in developing countries such as South Africa where high energy intensive industries are dominant, large-scale deployment of CCS is necessary in achieving near and medium-term climate change goals (IEA 2013; Dlamini and Demile 2020; Wright et al 2021).

The importance of CCS in reducing emissions has been reflected in several national policies (Beck et al 2017). Key policies include the South African National White Paper on Climate as well the National Development Plan of 2030 (DWA 2011; National Planning Commission 2012). The inclusion of CCS in these policies further emphasise the importance of CCS in contributing to the country's national objectives of reducing carbon emissions (Beck et al 2017). It is because of this that in 2004 there was an initial investigation conducted by the Centre for Scientific and potential and feasibility for CCS (Beck et al 2011). It was found that there was huge potential for CCS as approximately more than 60% of carbon dioxide captured from industrial sources could be safely stored in suitable geological areas (Beck et al 2011). Given these factors, government in partnership with the local South African industry as well as international organisations worked together to establish the South African Centre for Carbon Capture and Storage (SACCCS) (Beck et al 2011). One of the key mandates for SACCCS was to develop a CCS Roadmap (Beck et al 2013)

The CCS Roadmap was outlined into five key phases (Beck et al 2013). The first phase consisted of identifying the potential for CCS in South Africa. This investigation was successfully completed in 2004 by the CSIR and DMR (Beck et al 2013). The second phase was developing the CCS Storage Atlas in 2010 which identified suitable geological basins

in the country for the safe storage of carbon dioxide (Beck et al 2013). Two sites were identified as suitable which was the Zululand Basin in the KwaZulu Natal province as well as the Algoa Basin in the Eastern Cape (Beck et al 2013). The third phase was planned to be the test injection which would occur in 2017 and this would be a pilot CCS project. This phase has not commenced as yet (Beck et al 2013). The final phases on the map were planned to be the full scale demonstration to occur in 2020 which has also not occurred as well as the commercial phase in 2025 which is also set to be delayed.

Despite, the delay of full scale CCS projects in South Africa, there are still plans to deploy CCS in the country. This was further reiterated in a workshop which was held at SACCCS in February 2020. The aim of the workshop was to identify the barriers in not achieving phase three and four as well as what opportunities exist to rectify this. There was widespread agreement amongst industry leaders, government officials, non-government organisations (NGOs) as well as academics that CCS still remained a critical technology to aid the country in transitioning away from the dependence on fossil fuels.

Besides the importance of investing and implementing low-carbon technologies such as CCS, green finance has also grown in importance over the years in South Africa. Public sector financing for various climate change adaptation and mitigation projects in the country is proving inadequate especially in a developing country like South Africa that is plagued with socio-economic issues (Peterson and Skovgaard 2019; Ngwenya and Simatele 2020). It is because of this that alternative forms of funding and investing from the private sector such as GBs have grown in importance (Ngwenya and Simatele 2020). Green bonds have been described as an innovative financial instrument where investors can invest into climate change adaptation and mitigation projects (Banga 2019).

Deschryver and de Mariz (2020) highlight that GBs have developed to become a key financial instrument to financing the transition to achieving a carbon neutral world.

Ngwenya and Simatele (2020) provide an analysis of the GB market in Africa. In their research paper, they argue that countries such as Kenya, Nigeria and South Africa have the highest number of GB issuances and are key countries to observe as they have the potential to further expand the GB market. More specifically, the authors draw our attention to the several GB issuances that have occurred in South Africa worth billions of rands for various projects such as green buildings, renewable energy, sustainable water projects as well as low-carbon transport and infrastructure (Ngwenya and Simatele 2020). GBs in the country have been issued by the public sector such as the City of Johannesburg as well as the City of Cape Town (Ngwenya and Simatele 2020). This has also been observed in the private sector with issuances emerging from big national banks such as Nedbank and Standard Bank as well as property companies such as GrowthPoint. It is worthy to note that several issuances have also occurred during the COVID-19 pandemic with institutions such as the Development Bank of Southern Africa (DBSA) launching its first GB worth R3.59 billion and also Netcare partnering up with Standard Bank in a GB deal worth R1 billion (Mail and Guardian 2021). These issuances demonstrate the appetite for alternative finance mechanisms such as GBs in financing the low-carbon transition in the country.

6.3. The importance of governance in CCS and GBs

A large and growing body of literature has investigated the theory of governance and its importance in various disciplines such as politics, economics, international relations, law amongst others (Rosenau 1995; Schneider 2004; Griffin 2012). Hye (2000) and Farazmand (2012) discuss how rapid changes in the world such as the forces of

globalisation and the changing power dynamics amongst states have resulted in governance becoming a fluid and dynamic concept. Asongu (2017) further highlights how changing economic and political factors have also created big debates within governance theory on whether to define an agreed-upon definition of governance from an economic or political perspective. In addition to this point, Baird (2012) points to the fact that the different debates have resulted in the definition of governance becoming nebulous and sometimes overlapping with other concepts such as democracy.

However, despite the continuous debates on how governance is defined, there are several attempts found in literature (Graham et al 2003; Asiedu 2006; Chhotray and Stoker 2008). For example, Rosenau (1995) defines governance as the state exercising authority and enforcing compliance to maintain social order. This is enacted through state laws by formal institutions as well as informal arrangements which govern societal behaviour (Rosenau 1995). A broader perspective of governance has been adopted by Baxi (1996: 525) who is of the view that the state is not the only central point of governance but that it is defined as the “sum of the many ways individuals and institutions, public and private, manage their common affairs”. Similarly, Devaney et al (2017) as well as Keping (2017) further illustrate on this definition and argue that governance is defined as maintaining political order and steering society through public and private partnerships in order to achieve particular goals.

It is important to note that as much as governance is defined in various ways, Kurtz and Shrank (2007) draw upon similar characteristics in the types of functions of governance. These include the formulation and implementation of policies to enable social and economic advancements, the use of state resources for development as well as the responsibility to guide administrative and public affairs. This view is further supported

by Griffin (2012) who points to the fact that the functions of governance have been effectively enabled and accelerated through the inclusion of non-state actors such as civil society, the private sector and non-governmental organisations (NGOs). In the same vein, Lemard-Marlow as well as Wilt (2018) discuss how non-state actors have been observed to positively influence the functions of governance of a state through supporting economic and social development as a result of their wide networks and access to resources.

Consequently, Joo-Lee (2016) argues that the proper functions of governance can lead to good governance practices. For example, the author points to the fact that good governance consists of the move away from bureaucracy and top-down approaches to increased participation amongst different stakeholders (Joo-Lee 2016). Similarly, Gould and Rablen (2016) place an emphasis on participation and argue that the desired effects of governance can lead to equitable representation as well as including groups from society who may have been historically and traditionally excluded from decision-making processes. Agne (2016) points to the fact that participation and representation of different stakeholders ensures that transparency and accountability are adhered to. This includes an understanding on who is represented in decision-making processes, governance structures and the way this information is readily available and understandable to the general public (Agne 2016). Woo (2018) further illustrates how increased transparency and accountability demonstrate how a state has control over corruption which places confidence amongst the public and other stakeholders.

Over the past decade, recent trends in governance have led to a proliferation of studies that have largely focused on transnational governance (Barry 2012; Michaelowa and Michaelowa 2016; Di Gregorio et al 2020). According to Andonova et al (2009),

transnational governance can be defined as the shift away from how cross-border issues such as trade and global markets are traditionally governed through formal treaties and international agreements. Transnational governance now consists of opportunities of how things are governed beyond the state through networks consisting of businesses, civil society groups, individuals as well as intergovernmental organisations who form partnerships to achieve public goals (Andonova et al 2009). Importantly, Andonova et al (2009) highlight how non-state actors are influencing the creation of new governance structures and enabling a platform for diverse skills and capacities on how to manage cross-border issues.

Of particular importance has been the growing interest on transnational governance in climate change studies. Hale (2020: 204) highlights how a “host of transnational actors, networks, and governance institutions have emerged to form a critical part of global environmental governance”. Andonova et al (2017) argue how key climate change international treaties, conventions and conferences have ushered in a polycentric landscape of how climate change is governed globally. The World Climate Conference at the World Meteorological Organisation in 1979, the Earth Summit of 1992 which led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) as well as the Paris Agreement are regarded as some of the points of reference illustrating how the climate governance landscape has evolved and become diversified (Deere-Birkbeck 2009; Keane 1982; Saran 2009; Martin 2010; Kraub and Bremer 2020; Thew et al 2021). Streck (2021) further supports this view by looking at how the Paris Agreement saw powerful partnerships and coalitions amongst different stakeholders for climate change adaptation and mitigation projects. For example, the business community was seen as an important non-state actor as they pledged billions of dollars as a form of contributing to green finance flows (Streck 2021).

Deere-Birkbeck (2009) points to the fact of how non-state actors have become increasingly important in transnational governance of climate change due to the many challenges that face governments. The author argues that some of these challenges that still persist amongst governments include access to capital for climate projects, political and institutional barriers, knowledge and awareness as well as technical and capacity issues (Deere-Birkbeck 2009). In the same vein, Kraub and Bremer (2020) argue that many governments, especially those in coal rich countries need guidance on how to move beyond the reliance on fossil fuels and non-state actors become important in assisting the creation of a low-carbon future. This view is further supported by Streck (2021: 1) who highlights how as much as non-state actors have influenced the evolution of transnational governance it is important to point out that they “complement rather than replace government action”.

Slorach and Stamford (2021) discuss how non-state actors will need to further complement government efforts in combatting climate change especially with big targets such as achieving a net-zero world by the year 2050. It is now well acknowledged that funding the low-carbon transition will require billions of dollars on an annual basis (Abbott and Gartner 2011; Hall and Persson 2017; Bowman and Minas 2019). Van Veelen (2021) illustrates that in order for the decarbonised world to become a reality, the private sector will increasingly become a key non-state player because of their access to financial resources. The author argues that there are massive opportunities for private capital to shape and finance climate ambitions and this has already been observed with new forms of green finance tools emerging (Van Veelen 2021). This is further supported by Warren (2020) who illustrates how financial innovation has increased in the bond market with new green investment tools developed such as GBs. Banga (2019) explains how GBs have increasingly become popular over the past decade as massive amounts of private capital

are mobilised to fund various climate and environmentally friendly projects in developed and developing countries. Similarly, Paula and Carola (2016) state how the GB market has so many opportunities to bridge the financing gap in order to achieve the goals set out in the Paris Agreement but also significantly contribute to financing projects that will achieve a net-zero society and economy.

The issue of governance and regulatory frameworks within the GB market has received considerable critical attention. Weikmans and Roberts (2017) are of the view that to yield more opportunities from the explosive growth of the GB market, there needs to be a governance framework that is well established and also supported by global standards and policies. Kawabata (2020) evaluates how transnational non-state actors have become so central in developing governance for the GB market. The author examines how private governance schemes through various transnational private institutions such as the World Bank and International Monetary Fund (IMF) have enabled frameworks and policy guidelines for the GB market (Kawabata 2020). For example, non-state actors such as the International Capital Markets Association (ICMA) developed the first international GB principles which have been described as a form of governance through voluntary contributions on GB standards (ICMA 2018). The GB principles outline key information for issuers on what would constitute a bond being labelled as green such as identifying eligible green projects, certification and criteria processes as well as information on disclosure and verification (ICMA 2018). The aim of the GB principles was also to promote transparency and accountability within the GB market. Other non-state actors that have played a role in developing governance for GBs include the Climate Bonds Initiative (CBI) which have developed tools for capital market development for GBs in developing countries as well as equipping capacity building needs for policymakers (CBI 2021). In addition, credit rating agencies such as Moody's developed a GB Assessment as

well as Standard and Poor's (S&P) GB Evaluation Tool which are other mechanisms aimed at ensuring governance and credibility within the GB market (Ehlers and Packer 2016; S&P 2018).

Kawabata (2020) identifies how private governance standards for GBs globally have been an important catalyst for the development of national and regional governance of GB frameworks. This has been observed in China where the country became the first emerging market in Asia to issue compulsory guidelines for GBs (Cao et al 2021). The development of these guidelines relied on domestic and international frameworks with the GB principles from ICMA as well as other regulatory frameworks from the CBI were used as references to develop local GB guidelines (Cao et al 2021). Similarly, the United Kingdom also launched their own Green Financing Framework which aligns with the core mandates of the GB principles as set out by ICMA (UK government 2021). Similarly, in Europe, the European Union (EU) has made significant strides in the development of an EU taxonomy and GB standard which have been developed at international best practices (EU 2021). The significance of the EU GB taxonomy was that the importance of transnational governance was once again on the platform as this saw member states of the EU extensively engaging on how policies could be adapted and formulated that could allow GB market expansion for companies and financial institutions (Kawabata 2020).

In other emerging markets such as South Africa, the GB principles have also been a guiding pillar for issuer regulations for private and public entities through the Johannesburg Stock Exchange (JSE 2021). The demand for the growth of the GB market in the country has also led to significant developments within the green finance policy making space (National Treasury 2021). One of the most ground-breaking policies thus far has been the development of the first draft of the national Green Finance Taxonomy

for South Africa which has leveraged on existing international governance frameworks (National Treasury 2021). The core mandate of the taxonomy is to govern what is considered 'green' and be used as a tool to direct the necessary investments in green activities in order to support a climate-resilient economy. The taxonomy has been immensely supported by public entities such as various governments and National Treasury as well as the private sector consisting of the National Business Initiative (NBI), different asset management companies and banking associations (National Treasury 2021).

Despite the great strides made in GB governance, Ntsama (2021) argues that one of the biggest challenges that could impede further developments in governing the GB market is the lack of an acceptable taxonomy on what projects are considered green. This view is shared by Deschryver and de Mariz (2020) who highlight how there is a lot of disagreements and confusion in the investor community on what projects are eligible as green and which selection criteria those projects are derived from. For example, the authors highlight how the CBI has a taxonomy of green projects that can be issued for GBs such as renewable energy consisting of solar and wind energy projects (CBI 2021). However, the taxonomy also includes agriculture as well as hydropower projects in which others would consider as not eligible to be green (Deschryver and de Mariz 2020). This is also observed in other frameworks such as the African Development Bank's GB framework which considers CCS as an eligible green project for issuers (AfDB 2013).

The clarification and evolving governance on eligible green projects for GB issuances is important since there is an increasing diversified base of investors who have an appetite for issuing GBs in other low-carbon projects that may not be traditionally considered as green. Flammer (2018) highlights how some projects are directly associated with

emission reductions such as renewable energy, whilst other projects such as CCS which also reduce emissions are considered controversial. Kang et al (2021) opposes this controversy by arguing that CCS is a critical transition technology and is key for the power sector especially for developing countries that are still heavily reliant on fossil fuels. This is further supported by Mikunda et al (2021: 5) who discuss how CCS technology positively contributes to the sustainable development goals (SDGs) as they state that “...the considerable potential for CCS to immediately decarbonise both the power and industrial sector, and the clear expectation that much of the growth in global energy demand will continue to be met by fossil fuels, mean that the deployment of CCS is considered indivisible with SDG 13...”

Despite CCS technology considered as important in the transition towards a decarbonised world, Rubin (2012) highlights how the biggest barrier to wide-scale deployment of projects has been the lack of investments. Budinis et al (2018) further supports this view by stating how CCS is capital intensive and high costs are present in the entire value chain of capturing, transporting and storing the carbon. This has contributed to the technology being regarded as a high risk investment and not entirely feasible for developing countries (Budinis et al 2018). On the other hand, Yao et al (2018) bring forth a different view by arguing how as much as CCS is costly, a business plan for CCS projects can raise investor confidence. They illustrate this point by discussing how tax incentives and policy initiatives can create immediate investment opportunities and accelerate the development of the technology (Yao et al 2018). For example, the 45Q tax policy has been introduced in several countries such as the United States where it is intended to incentivise projects for CCS and therefore encouraging investments and more deployment of projects (Tarufelli et al 2021). Similarly, Fan et al (2018) are of the view

that the introduction of the 45Q tax policy can in the long-term reduce costs for CCS projects and ensure sustainable investments for CCS projects in China.

Heesh (2021) points out that as much as policies and incentives are important for CCS investments, it is paramount that they are combined with green financing mechanism such as GBs to become more attractive to investors. In a report by the World Bank (2021), it has been identified that green bonds jointly with fiscal policies and carbon taxation can support the low-carbon transition. The report further reiterates that “at the current scale, carbon taxation alone cannot deliver the amount of resources and incentives required to meet the challenges of climate protection. The combined use of carbon taxation with green bonds, however, can help meet the financing needs of the green transition as well as create positive interaction effects...” (World Bank 2021: 16). The report further highlights that the combination of low-carbon policies and GBs can enable stable investment returns on green projects. It is from this that we can argue that GB frameworks which include carbon subsidies and taxes can attract a large pool of investors who can potentially issue GBs for CCS projects.

To further elaborate on this point, Deschryver and de Mariz (2020) highlight the importance of how GB frameworks can facilitate collaborations between policy makers and investors for projects that may not be labelled as green such as CCS but fulfil the criteria of reducing carbon emissions. This is further illustrated by Maltais and Nykvist (2020) who highlight how as much as a lot of work has been done to try and standardise the GB market, there should be space for innovation on international standards and frameworks to include projects such as CCS especially for emerging economies who are still transitioning away from fossil fuels. This is further discussed by Cicero (2020) which is a research organisation that provides second opinions on eligible projects. The

organisation highlights that instead of regarding projects as eligible or not, GB frameworks should have shades of green and brown projects for company assessments. An example could be that a dark green shade represents projects such as wind and solar energy whilst light brown could represent projects such as CCS which are associated with fossil fuel reduction (Cicero 2020). In this case, if an investor would like to invest in a light brown project like CCS, a GB framework could facilitate this by ensuring that a carbon tax incentive is given to issuers whilst ensuring that emissions are reduced. In addition, drawing upon the EU GB framework is an exemplar of how a GB framework could facilitate investments in CCS. The EU GB framework includes CCS as important in the decarbonisation plans of the EU and is eligible for any sector (EU 2021).

In the context of emerging economies such as South Africa, Ko et al (2021) highlight how the financial struggles of CCS can be alleviated through the use of policies and incentives that are favourable to investors. The authors also bring to light the importance of governance such as having clear policies, institutional and legal frameworks which contribute to increasing investor confidence for CCS (Ko et al 2021). Besides proper governance measures in place, the Green Finance Taxonomy can be leveraged as a green finance framework upon which local and international investors can finance CCS. For example, CCS can be included as one of the projects in which investors can issue a GB accompanied with a carbon tax. In 2019, the South African government introduced the carbon tax which states that for a certain amount of carbon emissions released, corporates and companies need to pay if they emit more than the threshold. By introducing a GB that is accompanied with a carbon tax this can be a form of incentive or subsidy for investors. For example, if high emitting industries in South Africa such as Sasol or ESKOM were to issue a GB for CCS projects, they would qualify for a reduced carbon tax as an incentive.

It is from these arguments that it can be seen how the development of a GB framework can affect investment in CCS. Importantly, this would rely on policies and incentives offered by governments as well as outlining how CCS can be an eligible project for investors to issue a GB for.

6.4. Methodology

The data for this paper is based on primary data that was collected by the researchers from the 10th of June to the 20th of October 2019. Through the use of semi-structured interviews and online questionnaires, the researchers explored the views of experts in the field of climate change around the importance of CCS as a mitigation technology as well as green bonds as a green investment tool in South Africa. These experts were identified through a rapid appraisal through Google where the researcher typed the following key words 'Carbon capture and storage in South Africa', 'Green bonds in South Africa', 'Green bond issuers in South Africa'. The results yielded various companies which were affiliated with CCS and green bonds in which the researcher reviewed publications and reports in order to contact the preferred research participants. The experts were identified from the South African Centre for Carbon Capture (SACCCS), International Finance Corporation (IFC), African Development Bank (ADB), Johannesburg Stock Exchange (JSE), Public Investment Corporation (PIC), Nedbank, Bowman's Law Firm, UmKhanyakude Municipality. The total of research participants included in this study amounted to 75.

Furthermore, a rapid appraisal of literature through Google was conducted in which extensive literature was reviewed around developments of CCS and GBs globally and in South Africa. A specific focus was on the governance around these mitigation tools and keywords such as 'CCS governance South Africa', 'CCS framework South Africa', 'Green

bonds governance South Africa', 'Green bonds framework South Africa'. Information was retrieved through publications from various Journals such as ScienceDirect, Elsevier and Taylor and Francis, as well as grey literature from newspaper articles published online.

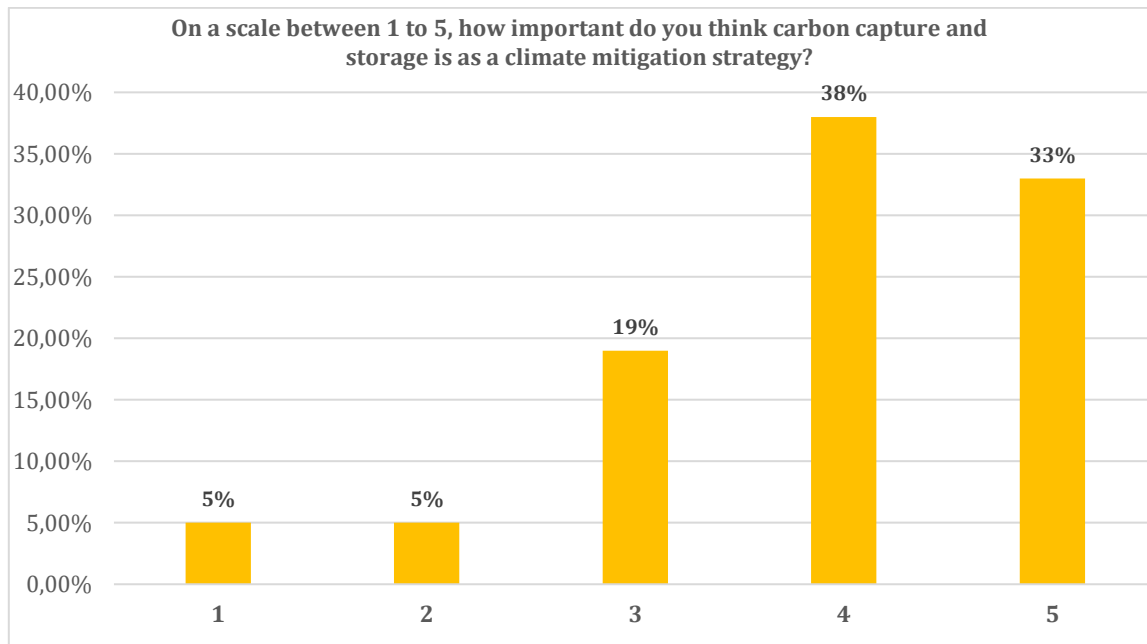
6.5. Empirical findings

The empirical findings are presented according to themes.

a. Green Bonds and CCS contributing to climate mitigation

The researchers were interested in identifying whether research participants considered CCS as a climate mitigation strategy. Their responses are captured in figure 6.1 below where majority of the participants (71%) rated between 4 and 5 whilst 10% rated between the scale of 1 and 2.

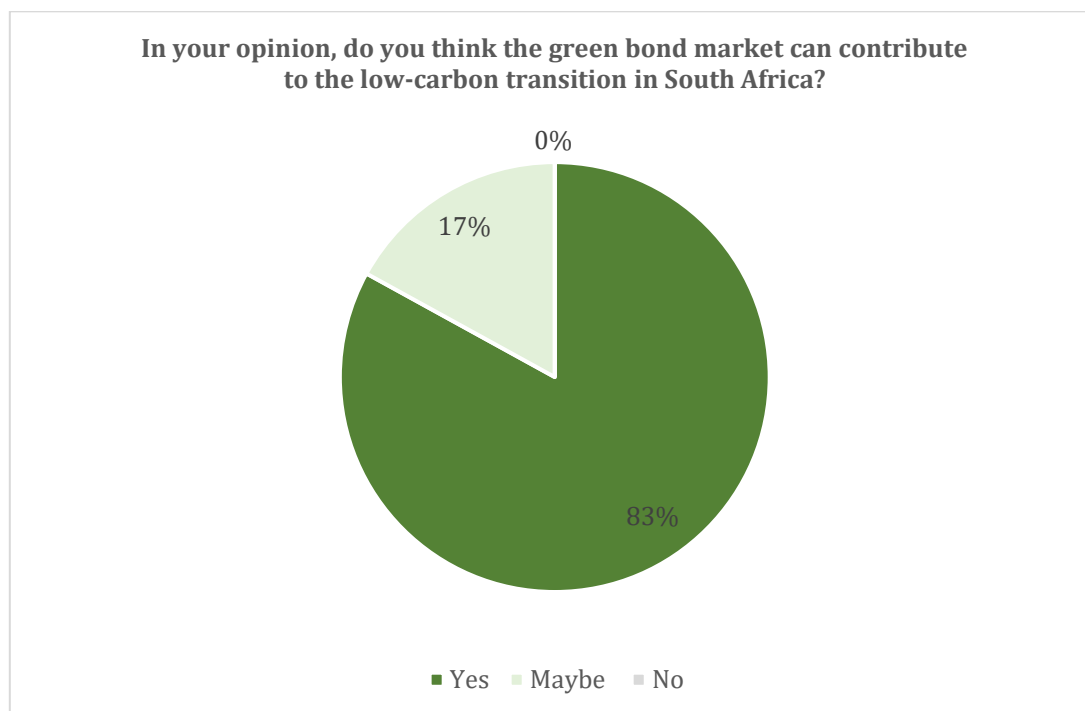
Figure 6.1. Bar graph showing participant's responses on a scale between 1 to 5 looking at the importance of CCS as a climate mitigation strategy



Source: Based on survey results (2019)

The researchers were also interested in identifying whether research participants considered the GB market as contributing to the low-carbon transition in South Africa. Figure 6.2 presents the results whereby 83% of the research participants stated yes whilst only 17% stated maybe. There was no research participant that disagreed.

Figure 6.2. Pie chart presenting research participants responses on whether they considered the GB market as contributing to the low-carbon transition in South Africa

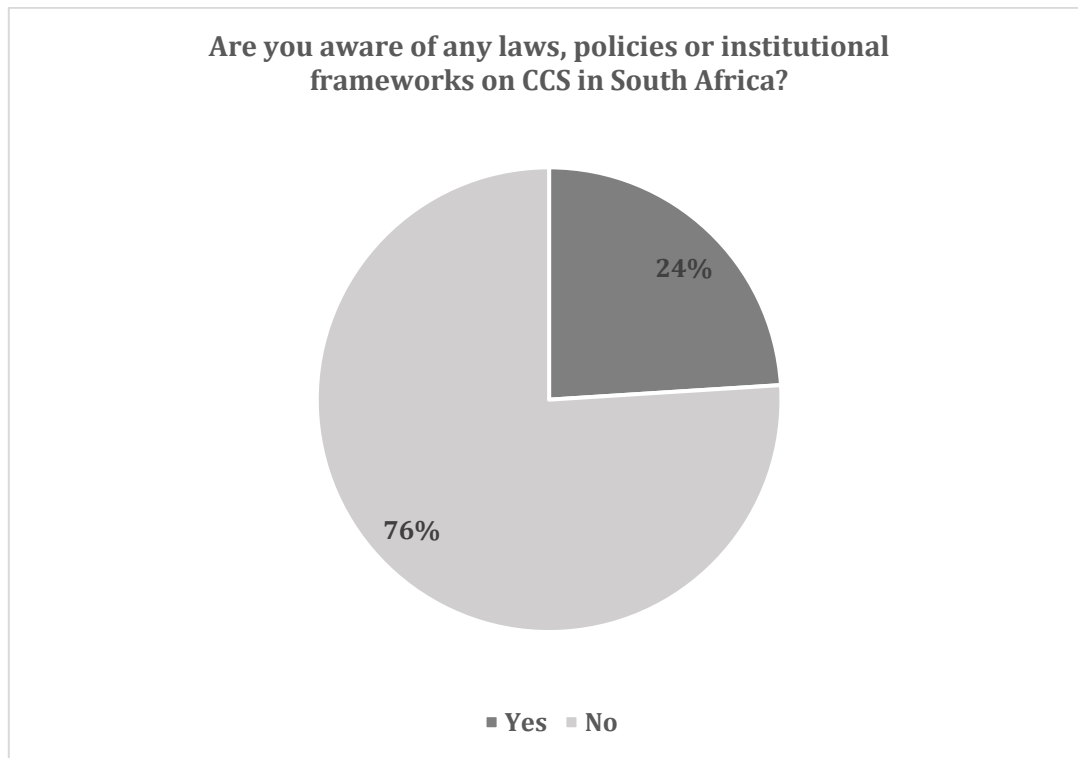


Source: Based on survey results (2019)

b. Policies, laws and institutional frameworks

The researchers were interested in identifying if the research participants were aware of any policies, laws or institutional frameworks for CCS in South Africa. This was important as the researchers needed to understand if good governance was employed in ensuring awareness and transparency on CCS. The results are displayed in figure 6.3 below where 24% of the research participants stated that they were aware of policies, laws or institutional frameworks relating to CCS whilst majority which was 76% stated that they were not aware.

Figure 6.3. Pie chart presenting research participants responses on their level of awareness in relation to laws, policies and institutional frameworks on CCS



Source: Based on survey results (2019)

In addition to this, the researchers further asked the participants what type of laws, policies and institutional frameworks they would like to see developed for CCS projects in South Africa. The researchers wanted to gather information attesting to the importance of governance for low-carbon mitigation projects such as CCS. Some of the following comments are captured below as coded in reference to the participant's responses.

"Financial incentives that shift the risk reward balance in favour of low-carbon assets. This includes strong and sustained price signals on carbon, well designed carbon markets and appropriate incentives to enable private investment in clean energy. An integral part of this should be the removal of fossil fuel subsidies" (Participant A1)

“Clear and well outlined policy document on green investments with good tax incentives”

(Participant B2)

“Policies and Institutions that ensure accountability and strong judiciary standing so that the deficit of trust that most African countries suffer from do not impede investments”

(Participant C3)

“Policies that promote public-private partnerships with regards to climate investments as well as institutional frameworks that foster intergovernmental collaboration” (Participant

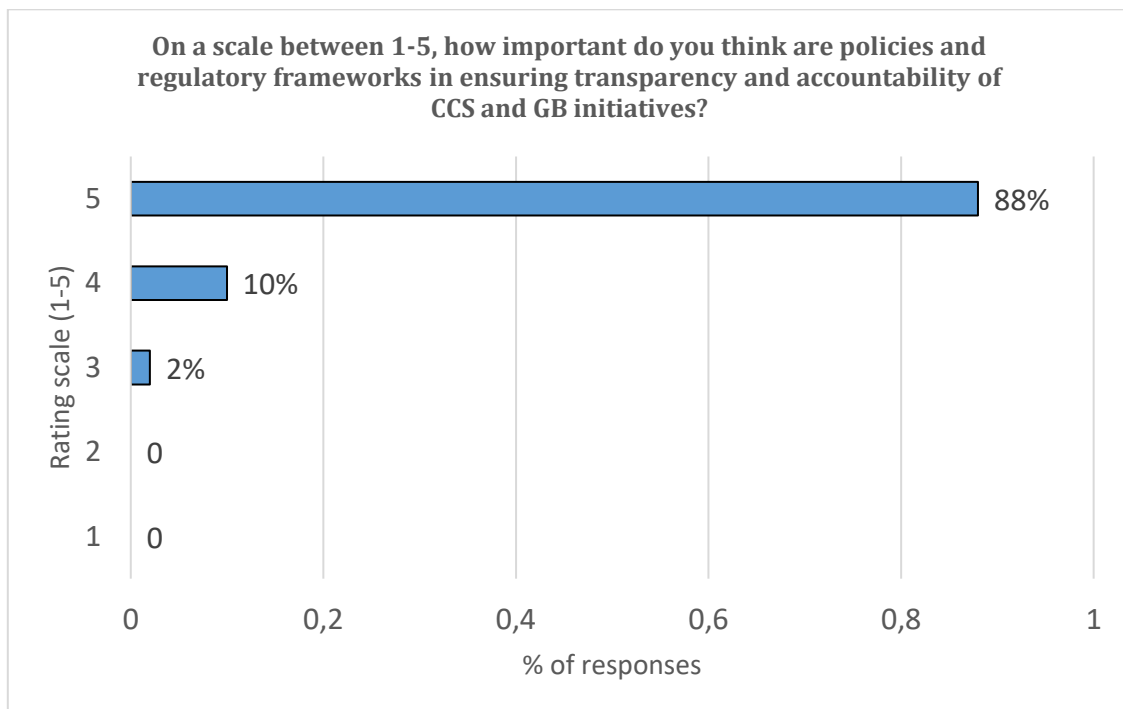
D4)

“If CCS has been identified as feasible solution to mitigating the release of harmful gases into the environment, then I would like to see laws and policy requiring greater obligation for large contributors of carbon emissions to use this method as a tool for reducing carbon emission or allowing for these companies to innovate methods which will reduce carbon in a similar or greater manner in a strict time frame” (Participant E5)

To further understand the importance of regulatory frameworks and governance, the researchers wanted to understand the importance of policies, laws and institutional frameworks in ensuring transparency and accountability of CCS and GB initiatives.

Their responses are captured below in figure 6.4 where 88% stated that this was important.

Figure 6.4. Line graph showing participant responses on whether they considered policies and regulatory frameworks as important for ensuring transparency and accountability of CCS and GB initiatives



Source: Based on survey results (2019)

It was important for the researchers to gather information about what could be some of the governance challenges that a country like South Africa could face regarding policies, laws and institutional frameworks. Some of the participant's responses are captured below and referenced according to how they were coded.

"It's a combination of lack of clear policies and institutional arrangements (i.e, capacity and lack of ability to enforce laws)" (Participant A2)

"Governments in developing countries are corrupt and have a reputation of mismanaging funds. This could be a deterrent for climate investments" (Participant B3)

"Lack of clear and efficient policies, institutional arrangements, lack of skills and knowledge, weak economic environment" (Participant C4)

b. GB governance in South Africa

The researchers wanted to gather from the research participants on the importance of having a well-established legal and regulatory framework for the GB market in South Africa. The questions that were asked included how to enforce transparency and accountability in the GB market, what were some of the barriers facing regulation of the GB market as well as what type of legal and regulatory framework the research participants would like to see developed for GBs. Some of the research participant's responses are captured below.

"On the regulation side we have the JSE to regulate GB which ensures transparency and accountability from issuers" (Participant A3)

"Another thing which is a catalyst in SA is the fact that the JSE has established a green segment. That creates a bit more awareness by corporates and investors around green products. The fact that there is this awareness would obviously drive corporates to say maybe they should also issue green bonds and it would also drive investors to rather invest in green bonds rather than conventional bonds which are not necessarily for green purposes" (Participant B4)

"One of the reasons why the CBI developed the GB principles was to likely to ensure that there were certain parameters that GBs meet & I think that's the way the green bond segment in the JSE works in that you need to make sure that you do independent verifications. You need to have this independently verified to make sure that your green proceeds are going into an asset & its aligned with your green asset. Previously you could have a GB & it wouldn't need to be independently verified now that independent verification should be controlled to ensure that there is no greenwashing" (Participant C4)

“What you also don’t want to do is stifle innovation by having specific regulatory framework that states that in order to have a GB there must specific requirements”

(Participant D5)

Barriers facing the GB market:

“Underlining the bonds, you will hear about many bonds that are called green bonds. But somebody will always say it depends what shade of green because there are different types. The thing to understand is what are you funding and what is it that you are classifying as greena. That can sometimes be a challenge to governance (Participant E5)

“I think the challenge at the moment of why the GB market hasn’t really taken off is that there is no pricing benefit. Clients don’t see a pricing benefit in going green and they would rather issue a vanilla bond. The costs associated and complexities associated with a GB are greater compared to a vanilla bond and if you are not getting a pricing benefit why would you want to undertake those costs? In addition, the GB market is not for everybody. Not all companies have a green asset and can raise a bond. You have to have a whole range of green assets in order to raise a GB and not a lot of companies have significant assets to issue a GB” (Participant F6)

“So, let me say over a period of 6-8 years there has been about 3 or 4 GBs that have been issued. That’s small, very small compared to the rest of the world. From a local perspective, there is a market to be developed but its not developing fast enough but because SA is a global player that’s why I see hope for it” (Participant G7)

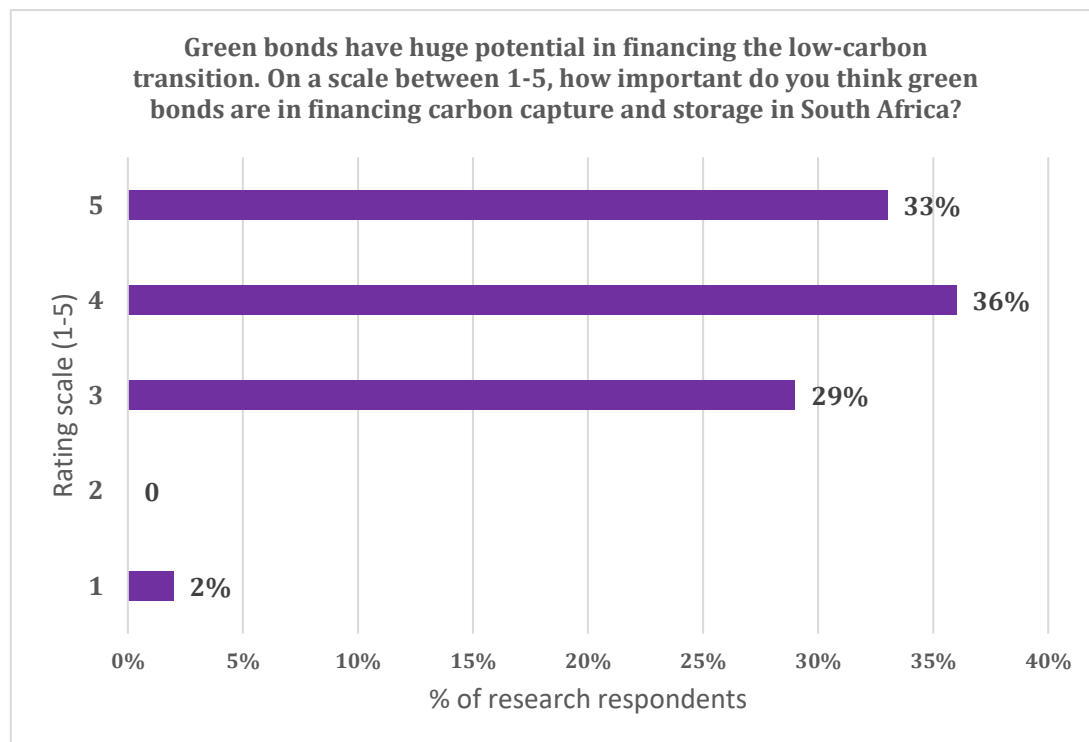
“I still maintain that its still very difficult on the issuer side because of the reporting that needs to go through. Although I say its going to accelerate because of global demand, the admin & the costs of doing that, anyone whose issuing a GB would need to factor whether

or not they are willing to take on the costs. Is it worth what I am getting & what I would pay?” (Participant H8)

c. The potential of GBs in financing CCS projects in South Africa

The researchers wanted to find out the potential of GBs in being a financial mechanism for CCS in South Africa. The results are shown below in figure 6.5 where 69% of the research participants highly rated that GBs could finance CCS in South Africa.

Figure 6.5. Bar graph showing participant responses on their ranking on their views on the potential of GBs in financing CCS in South Africa



Source: Based on survey results (2019)

These views are further captured below in some of the participant's responses during interviews.

"I definitely think green bonds have a lot of potential and I think we would need to see more good news stories coming out of SACCCS to stimulate the investor appetite. I do think

especially with carbon tax coming in now, if there was some way companies could use that as like an offset against their tax or carbon budgets – incentives. Again, that comes through the policies to incentivise CCS but I think if green bonds could potentially be integrated into the carbon offsetting regulations or against the tax budgets – there would be potential there from business” (Participant I5)

“No question, GBs like everything else will have its up and downs. I don’t think it will be a down but I think it will plateau and then increase as we get new green technologies that can be placed into investable asset classes. Renewable energy is one of those. CCS might be one in the future” (Participant J6)

“I think SA has the capability & capacity but it goes back to what is the country’s priorities in terms of right now? Whilst the country has the potential to integrate those kinds of technologies but is it a priority to the country?” (Participant K7)

6.6. Discussion

a. CCS and GBs as climate change mitigation tools

An initial objective of the study was to identify whether CCS and GBs are considered as avenues which can contribute to climate change mitigation in South Africa. The results as shown in figure 6.1 demonstrate that more than 70% of the research participant’s strongly agreed with this view. This finding is consistent with other studies such as Beck et al (2017) and Ko et al (2021) which emphasise the importance of CCS as a transitional technology which can reduce carbon emissions as well as the need for green finance mechanisms such as GBs to finance projects that have a positive environmental impact. Interestingly, this is further supported by figure 6.2 in which 83% of the research participant’s agreed on the importance of the GB market in contributing to a low-carbon

transition in South Africa. This finding corroborates with Ngwenya and Simatele (2020) who suggested that GBs could be a leading green finance mechanism as GBs can mobilise the necessary private capital needed to fund various adaptation and mitigation projects contributing to the low-carbon transition. The observed results could also be attributed to the increased awareness on the importance of CCS and GBs contributing to ensuring that temperatures do not exceed the desired 1.5°C.

b. Governance on CCS

Despite the importance of CCS and GBs as avenues to contribute to the low-carbon transition, it was concerning to find that there is a lack of awareness on governance on these climate mitigation tools. This is apparent from figure 6.3 which shows how 76% which is majority of the research participants stated that they were not aware of any laws, policies or institutional frameworks for CCS, whilst only a minority being 24% stated they were aware. These findings confirm the studies by Beck et al (2013) as well as Beck et al (2017) on how capacity building and technical awareness of CCS projects is still lacking in South Africa. This is also supported by Ko et al (2021) who further highlight the political dynamics of governance in South Africa whereby different non-state actors have not been involved in the planning stages of the value chain of CCS. They further highlight how this has contributed to the delay in the implementation of projects (Ko et al 2021).

In response to the lack of governance for CCS, the research participants during interviews expressed very important views. They expressed that they would like to see policies, laws and institutional frameworks of CCS that are centred around transparency and accountability, promotion of public-private partnerships as well as financial incentives for high emitting companies that implement CCS projects. These views and findings are also confirmed by Woo (2018) who brings forth the principles of good governance which

is ensuring that different stakeholder views are incorporated in decision making processes which ultimately contribute to transparency and accountability. These findings are also consistent with Budinis et al (2018) as well as Tarufelli et al (2021) who have shown the importance of non-state actors such as the private sector being involved in governance processes for CCS. This includes policymakers engaging with investors on how to create low-carbon policies that have incentives, such as tax incentives for industries that would implement CCS projects.

c. Transparency and accountability for CCS and GBs

Strong evidence was further found on the importance of governance and institutional frameworks for CCS and GB initiatives. As shown in figure 6.4, 88% of participants ranked the highest scale of 5 in illustrating the importance of governance in enabling a platform for transparency and accountability. The importance of these findings concur with the report by Deschryver and de Mariz (2020) as well as the report by the World Bank (2021) on the importance of robust reporting and verification for implementers of CCS projects as well as GB issuers. The benefits of reporting demonstrates the importance of these climate mitigation tools in having a positive impact on the environment. This also enables public trust in CCS and GBs, which according to Woo (2018) is one of the principles of good governance.

However, there was a sense amongst research participants that several governance challenges still exist in South Africa that could hinder overall transparency and accountability of CCS and GB initiatives. Some of these include the lack of policies and institutional arrangements, corruption which could be a deterrent for climate investments, lack of technical skills and capacity building. These findings further confirm some of the concerns highlighted by Banga (2019) that emerging markets face challenges

in implementing low-carbon technologies as well as increasing the GB market in their regions. This has largely been attributed to issues relating to inefficient institutions, corruption from political leaders which wards off investments as well as the lack of skilled individuals who have the necessary skills to facilitate and implement climate projects (Banga 2019). In a developing country like South Africa, these are challenges that have been prevalent as Ko et al (2021) have illustrated the political-economic dynamics which have impacted the acceleration of several climate change initiatives in the country.

d. GB governance in South Africa

Green finance through GBs have shown to be promising in South Africa. As much as there has been investor appetite for GB issuances, the results of the study indicate that GB governance is important. In this case, particularly focusing on the legal and regulatory frameworks for the GB market. Again, several research participants highlighted the need for transparency and accountability from issuers. This goes back to Deschryver and de Mariz (2020) point on the importance of reporting and verification from issuers measuring the impact of GBs for green projects. It is interesting to note, how several research participants pointed to the importance of the JSE as a regulator for GBs. This finding is very important because it demonstrates the role of non-state actors in influencing governance for green finance. This finding is in agreement with Slorach and Stamford (2021) who show how non-state actors have a very important role in governance for climate change especially with regards to mobilising capital for adaptation and mitigation projects as well as addressing some of the institutional and technical challenges that developing countries encounter. In this case, it is evident that the JSE as a non-state actor has been addressing these challenges as another participant

even mentioned that the JSE's green segment has been important in creating regulation, local standards and awareness to investors on GBs and green products.

In alignment with the JSE, other non-state actors such as the CBI and ICMA were brought to the forefront as important for regulation of GBs. The research participant emphasised how the CBI and the GB principles by ICMA ensured that issues around green-washing were addressed. This is a notable finding because the CBI and the GB principles aim to ensure transparency and accountability but also keeping the global public up to date with developments on the GB market. The finding further supports Ehlers and Packer (2016) views on the role of international non-state actors such as the CBI and ICMA that are contributing to building credibility within the GB market using international best practices.

It is important to note differences in the responses as other research participants pointed out some of the barriers facing the GB market. Some research participants highlighted the need for clarity on defining a GB and what projects are classified as green. This is in accordance with Flammer (2018) and Banga (2019) who discuss the challenges of the lack of a standard definition of GBs including what type of projects are considered eligible as green. This clarification is very important for issuers especially if there is an increased interest to issue GBs for projects that are not yet classified as green such as CCS. Another barrier that was identified by research participants is the lack of a pricing benefit of GBs and the complexities around this. This finding concurs with earlier observations by Heesh (2021) on the need to include fiscal and low-carbon policies with GBs as they will enable incentives and subsidies for investors. Since the GB market in South Africa is relatively small compared to the rest of the world, the mix of policies and incentives introduced by

public-private partnerships such as the JSE and National Treasury can facilitate further expansion.

6.7. The potential of GBs in financing CCS projects in South Africa

One major finding within this study is reflected in figure 6.5 where 69% of the research participants agreed that CCS projects in South Africa can be financed by GBs. Only 29% of the research participants indicated 'Maybe' whilst only 2% disagreed. This was further supported by research participants who highlighted the potential of GBs for CCS as long as there are policies and incentives in place. Other research participants stressed how South Africa's energy transition will increase investor appetite not only for renewables but also including CCS especially for high emitting companies. It is encouraging to come across these findings as Maltais and Nykvist (2020) demonstrate the importance of innovation in the GB market and how projects such as CCS should be funded especially for countries that are transitioning away from the dependence on fossil fuels.

6.8. Policy recommendations

It is apparent from the research findings on the importance of governance for CCS and GBs and this paper proposes the following policy recommendations:

i. Increased collaboration between non-state actors and government

From the literature review and findings, it is shown how important non-state actors are in climate change governance. In South Africa, government has an important space in creating policies and institutional frameworks that can facilitate the low-carbon transition. This is also seen in the creation of government funded research centres such as SACCCS where funding has been directed into building technical knowledge and skills for CCS. However, this transition will also need various non-state actors. For example, Ko

et al (2021) discuss the importance of the private sector collaborating with state owned power entities in order to bridge the gaps in knowledge and understanding of CCS. Similarly, for GBs, the research has shown how the JSE, is a key non-state actor that is currently leading on regulating the GB market whilst government departments do not have an existing institutional and regulatory framework for GBs. This further highlights the need for increased collaboration between non-state actors and government on how to effectively make use of opportunities that are being presented by climate change mitigation tools.

ii. Standardised GB Framework and taxonomy

One of the other important findings in the research is the need for clarity on defining a GB and eligible green projects. As much as there is international non-state actors such as the CBI, ICMA and the WB who have advanced developments in understanding GBs, it is encouraging to see how South Africa has developed its own regulatory framework. This has been illustrated through the Green Finance Taxonomy for South Africa which uses international best practice standards for developing taxonomy for various climate projects. Whilst this is promising, further collaboration between private and public sectors will help to gain further clarity on GBs and other green financing mechanisms as well as what projects are eligible. This would also facilitate verification and reporting standards to be more robust and transparent.

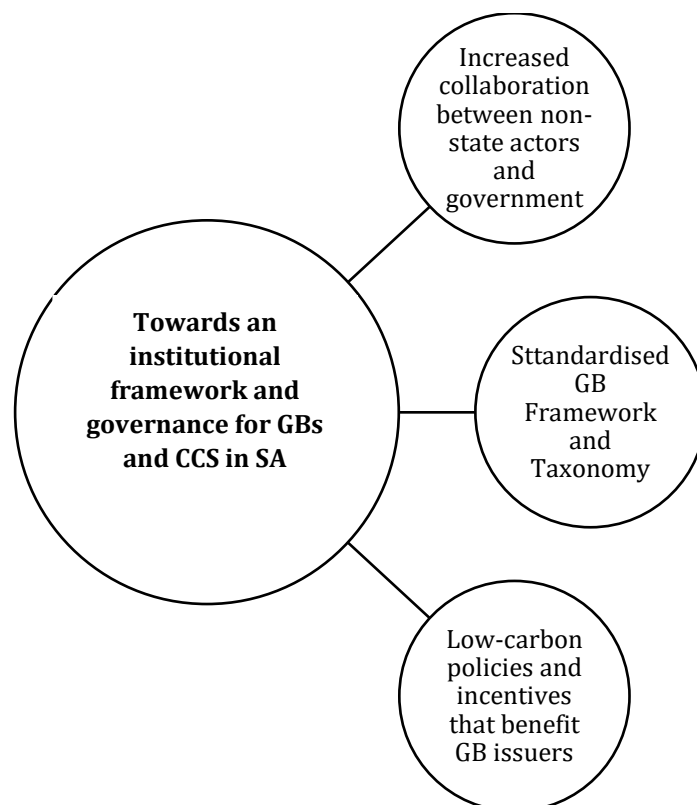
iii. Low-carbon policies and incentives

For South Africa to successfully transition towards a low-carbon society and achieve decarbonisation plans for net-zero, it is crucial that low-carbon policies and incentives are introduced. In the case of CCS which has been described in literature as capital intensive, it is important that policies with tax incentives are introduced. This has the

potential to encourage investments into projects but also stimulate an increase for different companies and institutions to change their practices to become sustainable. However, more work needs to be done in South Africa on how to integrate low-carbon policies that have an incentive to it. This then brings forth the need for strengthened public-private partnerships. For example, ESKOM which is South Africa's largest electricity utility may propose to issue a GB for CCS projects. The advantage of the carbon tax is that investors who invest in the issuance for GBs may be exempt from paying additional carbon taxes. As much as this may be a proposed solution, further work needs to be done on how policies and incentives can influence green financing for climate projects.

These policy recommendations are further shown diagrammatically in figure 6.6.

Figure 6.6 Diagram showing policy recommendations in order to achieve an institutional framework and governance for GBs and CCS in SA



Source: Based on survey results (2021)

6.9. Conclusion

Climate change is one of the twenty first century most pressing challenge and the world is on a race to implement measures that will assist in the transition towards a low-carbon society and economy. One of these has been CCS which is a low-carbon mitigation technology aimed to drastically reduce carbon emissions. CCS has been advocated to be implemented by emerging economies who are still heavily reliant on the use of fossil fuels. In South Africa, developments have been made to implement CCS which has been reflected in key policies and a specific CCS roadmap developed. In addition, GBs which have been identified as an emerging green finance mechanism have grown exponentially globally and has been described as key mechanism to mobilise private sector capital for adaptation and mitigation projects. Within the context of South Africa, several GBs have been issued by the public and private sector for various climate projects such as renewable energy, low-carbon transport and green buildings.

One of the key purposes of this study was to investigate the role of governance in creating a sustainable framework for CCS and GBs to further be developed in the country. An extensive literature review was conducted which highlighted the importance of governance for both CCS and GBs. Governance plays a very crucial component for climate change more especially for the implementation of low-carbon projects and green financing. It was demonstrated how non-state actors have a very important role in ensuring that measures and regulations are in place. For example, it was shown how non-state actors have influenced governments on how to adopt GB frameworks and local taxonomies. Specifically in South Africa this has been seen by the formulation of the Green Finance Taxonomy which was designed and released by National Treasury. The design of this taxonomy was also grounded upon GB guidelines by ICMA and the CBI. The literature

also pointed to important aspects which govern good governance practices such as transparency and accountability as well as public-private partnerships.

The findings of this study highlighted several factors. Firstly, there is a need for increased awareness on CCS and GBs in the country. The implementation of CCS projects and the growth of the GB market are highly dependent on institutional capacity building to raise awareness amongst the investor community and various other stakeholders. Secondly, there is a need for low-carbon policies and tax incentives that will enable investments for CCS but also reduce the costs and complexities around GBs. Thirdly, public-private partnerships will be instrumental in not just only GBs and CCS but for the entire low-carbon transition. The South African government needs non-state actors such as investors for green projects but also non-state actors need government to create an enabling regulatory and economic environment. This further brings some of the research participant's views on transparency and accountability. Lastly, it is promising to see how majority of participant's stated how GBs can be a finance mechanism for CCS, however, this is dependent on the need to get clarification on what constitutes a GB and how CCS can be considered as an eligible project in the country.

This study has a number of important implications for future practice especially for developing countries who wish to implement novel technologies and innovative green finance mechanisms. Further work needs to be established to understand CCS in emerging markets and how they could be included as an eligible project for GBs issuances. In addition, there is a huge gap in CCS and GBs studies in South Africa and the rest of the continent and this provides immense opportunities to understand how these climate mitigation tools can help the country and the rest of the continent in achieving its climate goals.

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CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1. Introduction

South Africa's energy sector has been described as amongst the biggest contributors to global carbon dioxide levels in the world (Seymore et al 2014; Wright et al 2019). The mineral energy complex which is largely comprised of fossil fuels such as coal as well as heavy industrial activities from mining and manufacturing have contributed to the country's economic growth for centuries. This has also catapulted the country to become one of the leading emerging markets in Africa (Baker 2015; Mutezo and Mulopo 2020). As much as the energy sector has brought the country significant economic benefits, it is becoming important on South Africa to transition away from the dependence of high carbon emitting activities towards a low-carbon society and economy (Bohlmann et al 2019).

The low-carbon transition is largely driven by the wide-scale effects of climate change which cut across the environment, society and the economy (Lonngren and Bai, 2008). The Paris Agreement of 2015 was a stark reminder of the need to scale-up efforts towards a decarbonised society with a special consideration given to the scientific evidence of what the world could be with temperatures exceeding beyond 1.5°C (Bauer and Menrad 2019). An increase in global temperatures would be even more disastrous for regions such as Sub-Saharan Africa which are already experiencing the harsh consequences of climate change (Falchetta et al 2019; Olabanji et al 2020). South Africa has already recorded a lack of annual rainfall over the years as well as increasing temperatures which

have exacerbated drought-like conditions across the different provinces (Dube and Nhamo 2020).

The case for a decarbonised energy sector is becoming more profound in South Africa especially since the country has committed to binding international climate change agendas as well as national climate change objectives outlined in the Nationally Determined Contributions (NDCs) (Walwyn 2020). To further support this, there are various policies and institutional frameworks which exist in the country that promote the development and implementation of climate adaptation and mitigation strategies (Musango et al 2014). This research specifically looked at carbon capture and storage which is amongst one of the climate mitigation strategies promoted in policies as a transitional technology to reduce high carbon emissions. Carbon capture and storage has gained traction over the years due to its capacity to capture close to ninety percent of carbon emissions from fossil fuels (Wennersten et al 2015; Kuch 2017). This is further supported by key reports from the International Panel on Climate Change (IPCC) which argue that carbon capture and storage is an important technology to stabilise global atmospheric concentrations of carbon dioxide (Omoregbe et al 2020).

As a country that is still heavily reliant on coal reserves, replacing all coal-fired power plants and transitioning fully into renewable energy is particularly challenging (Ko et al 2021). Therefore, carbon capture and storage technology presents itself as an opportunity to remove carbon emissions from high emitting industries and contribute to the energy mix. The role and importance of carbon capture and storage has been highlighted in several key national policies such as the National Development Plan of 2030 as well as one of the flagship programmes in the National Climate Change Response Strategy White Paper (2011). Besides the policy developments, there have also been

notable institutions established such as the South African Centre for Carbon Capture and Storage (SACCCS) which have been supported by other government departments such as the Department of Mineral Resource (DMRE), Department of Science and Innovation (DSI) as well as the task force for carbon capture and storage technology which included several stakeholders from industry such as ESKOM, PetroSA and Anglo-American.

However, one of the biggest challenges to the implementation and deployment of carbon capture and storage has been the lack of financial investments for the necessary support to fund the project on a long-term basis (Ngwenya and Simatele 2020). There are several factors which have hindered the lack of financial support which include the current economic state of the country where there are pressing socio-economic issues as well as the lack of functioning institutional frameworks which can facilitate the flows of environmental investments for green projects. This study specifically looked at green bonds which have been identified as one of the green investment tools that have the potential in financing carbon capture and storage. Green bonds are a form of a bond instrument where the bond proceeds are invested directly into projects that have an environmental benefit (Banga 2019). The growth of the green bond market has been astounding globally but also within the continent as South Africa is leading with green bond issuances for projects such as renewable energy, green buildings as well as coastal infrastructure (Ngwenya and Simatele 2020). It is argued within this research that if green bonds are to finance carbon capture and storage, it is imperative that strong institutional frameworks exist which can be used as tools for the promotion and effective implementation for green bonds. This is to further ensure transparency and accountability of investments to achieve climate goals in the country.

7.2. Summary of Key findings

Using both qualitative and quantitative research methods, there are several key findings within this research. There is clear evidence that South Africa needs to transition away from the dependence on coal towards cleaner sources of energy. Majority of the climate change experts included in this study agreed that carbon capture and storage technology has the potential to lower emissions from high emitting industries and contribute to the country's energy mix. In addition, it was noted that carbon capture and storage can successfully be implemented from an environmental perspective as the country has suitable geological storage sites which have been proven to safely store and trap carbon dioxide. This further proves the importance of carbon capture and storage and its role as a climate mitigation strategy.

In addition, there is also clear evidence that from an institutional framework level a lot of work needs to be done from national government to ensure that carbon capture and storage is inclusive and reformed in existing policies and regulations or new ones to be implemented. An example of this which was suggested amongst several research participants is for the National Environmental Management Act (NEMA) Waste Act 59 of 2008 to be amended to include guidelines on the safe geological storage of carbon dioxide. In addition, there was also the recommendation to include carbon capture and storage in the Mineral and Petroleum Resources Development Act of 2002 to also guide the process of safe injection underground. Besides reforms being made to existing policies and regulations, it was also found that a stand-alone carbon capture and storage act should be developed which covers the environmental, social and economic guidelines of the implementation of the technology. However, one of the constraints that was

highlighted was that a stand-alone act could be a long process to be approved by the South African parliament and politics could be a hindering factor in the future.

Despite this, there were several recommendations on what a stand-alone carbon capture and storage act could entail. This included the importance of stakeholder engagement and community participation in carbon capture and storage projects. This aligns to one of the papers included in this thesis which looks at how stakeholder engagement is an important component for the successful deployment of carbon capture and storage especially in a developing country like South Africa. In addition, the research participants further highlighted the importance for the act to address issues around accountability and transparency, incentives for heavy polluters, promoting economic development as well as following international standards.

Another important aspect of this study was to investigate the economic feasibility of green bonds to finance carbon capture and storage technology in South Africa. The data demonstrates that a lot of emphasis was placed on climate change as not only an environmental and social challenge but one that was closely intertwined with economics. It was brought to attention that South Africa does not have sufficient climate financing mechanisms and additional finance mechanisms need to be explored to support developing countries like South Africa in implementing various adaptation and mitigation projects. An overwhelming response from the data suggests that green bonds have the potential in leveraging the necessary private capital for climate projects in the country, with an emphasis on low-carbon initiatives, like carbon capture and storage.

In terms of green bond issuances, South Africa is amongst one of the leading issuers on the continent. Since 2013, several green bond issuances have been made for renewable energy projects, energy efficiency projects such as green buildings as well as green

infrastructure. The research participants further highlighted that there is even greater potential for green bonds to be utilised for large-scale environmental projects like carbon capture and storage. It was further highlighted that high carbon emitting companies and organisations could use green bonds to finance carbon capture and storage projects and by so doing gain an incentive and not be liable to pay for a carbon tax. This view would need to be supported with the appropriate policies that can incentivise carbon capture and storage and include green bonds to be integrated into carbon offsetting regulations.

However, one of the interesting findings was that for green bonds to become a potential financier for carbon capture and storage, it is important for green bonds to be adequately defined in terms of what projects are considered green. An overwhelming majority of the research participants agreed that the proceeds from green bonds should be directed into projects that will facilitate the low-carbon transition. The data also shows that more work should go into standardising and classifying the green bond taxonomy and allow investors to decide which projects they would like to finance which they consider as green.

On the question of implementing an institutional framework for green bonds to be adopted to promote carbon capture and storage, there were several important findings. Firstly, it was identified that South Africa should have an institutional framework that is well outlined on green investments with good tax incentives. This would include strong and sustained signals on carbon markets and appropriate incentives to enable private investment in clean energy. Secondly, it was strongly emphasised that institutional frameworks should ensure accountability and strong fiduciary standing so that trust is gained to enable efficient public-private partnerships. Closely linked to this, it was also widely agreed on that institutional frameworks should promote public-private

partnerships with regards to climate investments as well as institutional frameworks that foster intergovernmental collaboration. Thirdly, a widely held view is that the institutional frameworks that need to be implemented to support the facilitation of green bonds to finance carbon capture and storage, largely relies on building the capacity of policy implementers. It was further highlighted that policy makers need to have the necessary resources to be equipped on how to formulate policies around green investments and low-carbon technologies implementation. There was a lot of emphasis that South Africa is compared to other African countries where the institutional frameworks are weak due to the lack of weak institutional arrangements, lack of skills and knowledge, weak political will as well as inadequate human resources.

7.3. Policy and Future Research Recommendations

There are several policy recommendations that this research would like to bring forward.

i. Skills development and human resources to support emerging climate finance mechanisms as well as novel low-carbon technologies

This research has demonstrated that CCS as well as GBs are relatively new climate mechanisms to South Africa. If these mechanisms are to be included in policies and implemented nationally, it is important that there are platforms created for capacity building to ensure the necessary skills are retained. The data from this research noted that from a government and policy level there are still significant challenges regarding integrating different types of technologies and climate finance into policy making due to a lack of skills and knowledge. It is upon this basis that platforms need to be created to stakeholders and policy makers where education and awareness on CCS and GBs are promoted. By improving skills development and human resources there can be effective policies which are in place and implemented.

ii. A new Carbon Capture and Storage Act

To facilitate the deployment of carbon capture and storage initiatives in South Africa, it is evident that a stand-alone act is needed. From a policy level, it should be recommended that an individual CCS act is formulated that covers a range of factors. This includes the safe geological storage of carbon dioxide, the process of safe injection underground, environmental and liability costs as well as guidelines for investor participation for CCS projects. A stand-alone act ensures that all issues and concerns around CCS are addressed.

It was further recommended that the National Environmental Management Act (NEMA) Waste Act 59 of 2008 can be reviewed to include guidelines on the safe geological storage of carbon dioxide. In addition, there was also the recommendation to include carbon capture and storage in the Mineral and Petroleum Resources Development Act of 2002 to also guide the process of safe injection underground.

iii. Carbon tax

In addition, the new Act would also take into consideration components of the Carbon Tax. The Carbon Tax came into effect in 2019 and highlights how high carbon emitting industries should pay for the emissions polluted. Firms and industries that incorporate CCS as a form of clean technology into their business life cycle should qualify to receive incentives. The incentives would be a reduced tax payment by the government for implementing CCS technology and enable high emitting industries to transition towards other sources of clean energy.

iv. Green bond taxonomy and guidelines

If CCS is to be a viable technology which is fully financed by GBs, it is important that it is included in the GB taxonomy and GB guidelines. Globally, the CBI GB taxonomy is the most used but increasingly many countries are implementing their own local taxonomy standards. On the African continent, there has also been the release of the African GB toolkit which aimed to provide direction to African capital markets to leverage private capital through the issuance of GBs.

The research found through an extensive review of literature that there are governance challenges around GBs. There currently does not exist a proper regulatory and institutional framework for GBs which threatens the accountability and transparency of these bonds. This study also found that there is a need for increased transparency and regulation for GBs and this can be achieved by developing local regulations and standards. The data collected points out that the JSE has a very important role to play in governing the GB market in the country by regulating standards and verification for GBs.

Policies were found to be an important component for this research. Recently, the South African National Treasury department issued out a publication on developing a national green finance taxonomy which follows international best practice standards but also including local standards. One of the key accomplishments on this was developing a governance structure for national sustainable finance. This policy is ground-breaking because it provides a platform for other emerging climate finance mechanisms such as GBs to also have their own governance structure. It is also important that public-private partnerships are strengthened to build credibility, foster market and investment opportunities to allocate capital towards a sustainable country.

vi. Research and academia

GBs and CCS are relatively new climate tools adopted by developing countries. This research found that there was a lack of theoretical debates around these topics especially for developing countries like South Africa. For example, in paper two which is a published paper published in chapter two, there is reference to the green bond market in Nigeria, Kenya and South Africa. This is one of the very few papers which have been published thus far which analyses the growth of the green bond market in these three countries. This further highlights the importance of research to expand knowledge on novel topics such as green bonds but to also contribute to awareness and education not only for the academic community but to a range of other stakeholders. In addition, the paper highlights the importance of collaboration between the public and private sector. One of the recommendations this research presents is cross-collaboration between African universities to enhance knowledge and research into GBs and CCS.

If GBs and CCS are to have their intended impact, it is important that key research gaps are identified, and scholars further investigate on how they can be used and implemented successfully. Research has an important role to play, and it is hoped that this thesis inspires future academics to further grow and contribute to theoretical debates on GBs and CCS.

APPENDICES

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APPENDIX A: SUPPLEMENTARY PAPER 8

The current paper included in this appendice emerged out of the current discussions around the coronavirus (COVID19) pandemic. At the time of writing, the researcher reflected on how the pandemic presented massive opportunities to enhance the researcher's understanding for the themes presented in this thesis. These include governance, policies, investments, as well as green bonds. It was further noted how the global pandemic brought forth the overall importance of mobilising financial resources for not only healthcare but also climate change.

Global organisations such as the World Health Organisation, the United Nations and well as the International Monetary Fund placed a huge importance on pandemic bonds. These are bonds specifically issued to assist the worst impacted countries to build resilience against a pandemic, such as COVID19. However, through scholarly research and a further scrutiny of these bonds have proven insufficient. This paper specifically argues how green bonds are an innovative source of funding which could finance not only climate-related projects but sustainable healthcare too. It was further noted how several companies during the pandemic, issued green bonds for the sustainable shipping of healthcare products as well as sustainable production of surgical masks. Green bonds could also facilitate many countries towards a sustainable economic recovery period, post the pandemic.

Can Green Bonds be the new Panacea for Pandemic Investment in the fight against Global Diseases? the case of COVID-19⁸.

Abstract

The CoronaVirus Disease commonly referred to as COVID-19 has now become a human tragedy with more than thirty five million confirmed cases and over one million people confirmed dead. COVID-19 has transformed into an unprecedented global health, geopolitical, social and economic challenge. Both developed and developing nations have encountered massive strain on their healthcare systems and resources and the pandemic has further compromised countries capacity to respond effectively due to the unprecedented rate of infections and deaths. As the global society has struggled to find immediate and long term solutions to the COVID-19 pandemic, there have been calls for concerted efforts to mobilise both financial and human resources to curb the disease. One such avenue has been increased pandemic investments to finance healthcare systems for countries to fight the pandemic. Despite this development, it is argued that existing investments and finance mechanisms such as the pandemic emergency finance units, as well as the pandemic bonds have been identified as inappropriate and inadequate to finance challenges associated to pandemics such as the COVID-19. In view of this, there have been urgent calls to search for alternative financial systems to promote pandemic investments. This paper attempts to explore the potential of green bonds as a finance mechanism which can be used to mobilise the much needed capital base and resources to finance systems, process and mechanisms which can be employed in the fight against pandemics such as the COVID-19. These themes have been explored and discussed within the broader framework of the sustainable development goals (SDGs), particularly SDG 1, 2 and 3.

Key words: COVID-19, green bonds, global pandemic, sustainable development

1. Introduction

The COVID-19 pandemic has been described as one of the most tragic in the history of pandemics. Daily infection rates have increased globally with more than thirty five

⁸ Ngwenya, N & Simatele MD., 2020. 'Can Green Bonds in Africa be the new Panacea for Pandemic Investment in the fight against Global Diseases? the case of COVID-19'. *Journal of Sustainable Finance and Investment* (The first revision based on the reviewer's comments has been submitted and the paper is currently under consideration for publication).

million confirmed cases and over a million lives lost (WHO 2020). The World Health Organisation has estimated that the number of infection and death rates will continue to increase as most countries are only experiencing the first wave of the pandemic whilst others have entered into the second wave (WHO 2020). This is a huge concern as the impacts of COVID-19 have been detrimental to all countries with massive pressure on existing healthcare systems and resources (World Bank 2020). In addition, major societal, geopolitical and economic challenges have been observed. The ways of working, doing business and being socially interactive have been disrupted globally with many countries employing national lockdowns and emphasising the importance of social distancing due to the highly contagious nature of the virus (WEF 2020).

The economic impacts of COVID-19 have been unprecedented with extreme volatility in financial markets and massive uncertainty regarding global economic growth (Nkengasong and Mankoula 2020). The World Economic Forum has predicted that the economic ramifications of COVID-19 will wreak more financial havoc than the 2008 financial crisis (WEF 2020). Already developed and emerging economies have been impacted with key economic sectors such as trade, manufacturing and tourism disrupted (Dube et al 2020; OECD 2020). In addition, the International Labour Organisation (ILO) predicts that more than a hundred million jobs across the world are at risk and the pandemic will exacerbate existing socio-economic issues such as the global unemployment rate (ILO 2020).

In order to tackle COVID-19, emergency economic support has been given to several countries. These include emergency pandemic financing from international development institutions such as the World Bank and the International Monetary Fund (IMF) as well as emergency funding from governments (Erikson and Johnson 2020). Furthermore,

various multinational companies and the world's wealthiest individuals have contributed to this funding through their philanthropic efforts. However, despite the efforts made to increase emergency funding, more needs to be done to assist countries especially in the developing regions who will continue to be the most impacted by COVID-19. It is becoming increasingly important to seek alternative pandemic investments.

This paper argues that green bonds which have been regarded as an innovative climate finance mechanism have the potential to finance pandemics such as COVID-19. In addition, green bond issuances have the potential to assist countries to contribute to their climate change agendas but also ensure sustainable economic recovery post the pandemic.

2. Methodological issues

The information on which this paper is based was collected through a desk study conducted between March and August 2020 and involved a review of anecdotal, grey and scholarly literature on COVID-19, pandemic bonds and green bonds. Key words such as COVID-19, global pandemic bonds, global health investment and green bonds were entered into different web-based academic search engines; google scholar, research gate, Scopus, Cochrane Library, Econ-Biz, Econ-Lit, Global Health, GeoRef, Hub-Med, Science-Open, Science.gov, Informit and Mendeley. In addition to these, other data bases held by international organisations such as the World Health Organisation (WHO), the European Union (EU), the World Bank (WB), the International Monetary Fund (IMF), the United Nations (UN), and the African Union (AU) were consulted in order to compile information relating to the topic under discussion.

An initial search of these databases yielded an estimated 85 academic and grey articles which were then reviewed using rapid appraisal (RA) and thematic analysis (TA) to

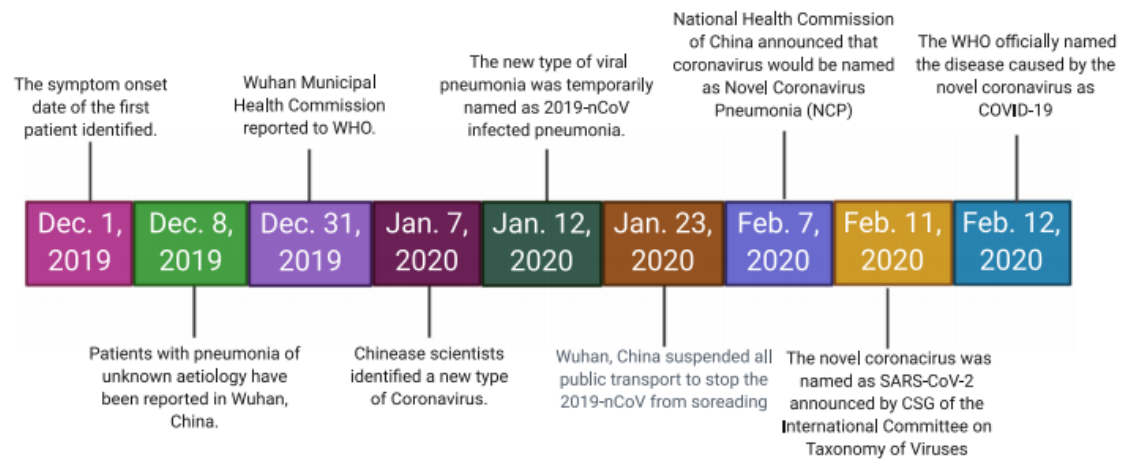
identify key and common thematic issues emerging from these pieces of literature. The emerging themes were subjected to a six (6) step- process of familiarisation, coding, generating, reviewing, defining, naming and writing up of key themes. This process resulted in down-scaling the number of articles to 28 and these were further reviewed using an inductive approach so as to allow the generation of information to determine the themes on which the arguments and conclusions articulated in this paper are based.

3. The COVID-19 induced 'New Global Normal'

The COVID-19, a disease which originated from the Wuhan Province of China in late 2019 has been considered as a 'game changer' in the way the global community conducts its social and economic interactions and activities. Since the advent of COVID-19 (see figure 1), human interactions have, on one hand, been characterised by social-distancing encompassing the wearing of face-masks, and unprecedented levels of hand-sanitizer usage and hand washing. On the other hand, economic and financial engagements and endeavours have been forced to heavily rely on the 'Internet of Things' (IoT) through the use of platforms such as Microsoft teams, Skype, WhatsApp, Zoom and Face-book to mention but a few. The beta-coronavirus, also known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which affects the respiratory tract in humans, has not only been a health crisis, but has to some extent re-ordered the ways in which humanity conducts business (Somma et al 2020; Sohrabi et al 2020). COVID-19 has revealed other potential avenues through which humanity can foster its social and economic developments by leveraging existing technologies and in so doing contribute to reducing society's environmental and ecological footprint (e.g. the work-from-home initiative)..

Fig 1. Timeline illustrating the identification of coronavirus

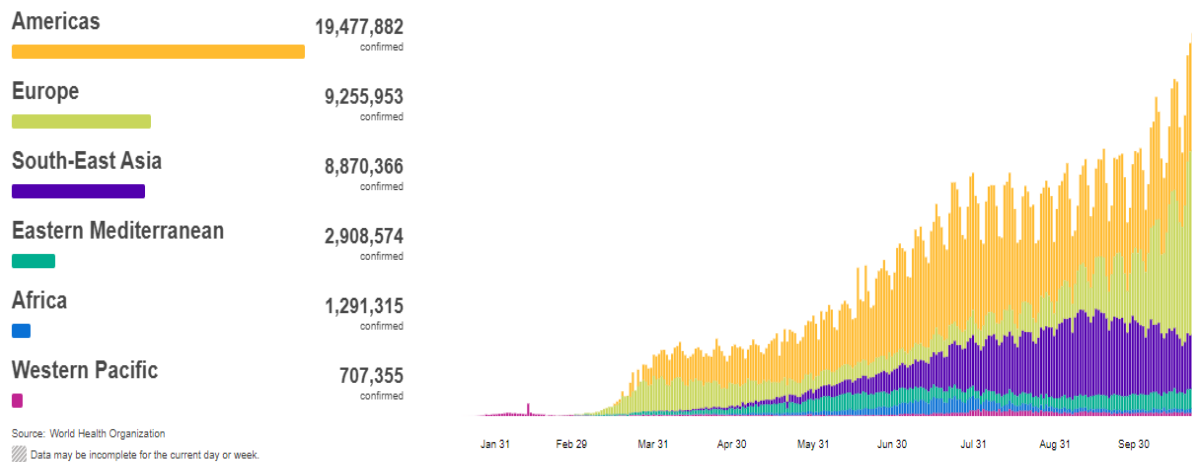
Timeline



Source: Mofijur et al (2020)

Although the full social and economic impacts of COVID-19 on the world's economies have not been systematically tabulated, initial indications reveal that the biggest global economies have reached their lowest points in the recent history due to reductions in economic activities and the adjustments that the global community has had to make to cope with the new norm (Somma et al 2020). In the wake of the 'new normal' and in response to the COVID-19 outbreak, many governments have employed emergency measures such as nationwide shutdowns to curb the spread of the virus (Somma et al 2020). The World Health Organisation (WHO) official report suggests that more than thirty five (35) million cases have been confirmed across the globe with the majority of these occurring in the Americas and Europe (Figure 2).

Fig 2. Confirmed COVID-19 cases by Region



Source: World Health Organisation (2020)

The rapid increase in daily infections from the world's population has become a major public health concern in both developing and developed countries (Chakraborty and Maity 2020). The World Health Organisation (2020) for example, has highlighted the strain that COVID-19 has exerted on the public health services and the socio-economic disruptions it has triggered in many countries. Gilbert et al (2020) further observes that while the impacts of COVID-19 are global, it is the poor people in low-income countries, particularly those in sub-Saharan Africa and the Asianic countries who are vulnerable to the disease. Chakraborty and Maity (2020) observe that this high vulnerability is a function of weak financial positions and the increased deteriorations in national economies as well as poor infrastructure, low levels of capacity and a general lack of available medical resources. Edifying these observations, Nkengasong and Mankoula (2020) are of the view that many African countries have limited financial means for surveillance and laboratory equipment for COVID-19 placing the healthcare systems in a much weaker position to deal with the magnitude of the disease. Iqbal and Chaudhari (2020) also observe that although developed countries are financially better placed than many developing countries, they have also faced unprecedented medical challenges in

responding to the virus due to the amount of aid and medical resources which has been urgently required to curb the rates of infection and mortality .

In addition to the impact of COVID-19 on public health, existing evidence suggests that there has been significant social and economic challenges which many countries in the world have experienced. The International Monetary Fund [IMF] (2020) recent report stipulates that COVID-19 has ushered the global economy into a crisis and has potential to equal the economic crisis of the Great economic depression experienced in the 1930s. The virus has not only threatened financial stability with all markets globally going in a downturn but has also compromised national development and security (IMF 2020). The United Nations (UN 2020) further observe that the global financial crisis has led to massive job losses and an increase in unemployment rates. Roy et al (2020) are of the view that global inequalities will soon become the order of the day as current financial aid will be inadequate to assist in the various health and socio-economic challenges of COVID-19. It is in this context that we argue for pragmatic and innovative ways in which to rethink the current order of resource mobilisation for addressing and fighting health challenges which are transboundary in nature. There is an urgent need for all stakeholders at the national and international levels to engage in open and transparent dialogues and discussions to identify avenues through which concerted and intensified efforts could be channelled to ensure that necessary finances and resources are mobilised to combat COVID-19.

4. The current state of Pandemic investments

In the past three years, various pandemic investments have been launched to support countries to fight against pandemics (World Bank 2017). This has strengthened the objectives of the Global Health Security Agenda (WHO 2015). Furthermore, meeting the

objectives of Goal 13 of the Sustainable Development Goals (SDGs) which is to “strengthen the capacity of all countries, in particular of developing countries, for early warning, risk reduction and management of global health risks” (UN 2015: 7).

Giudice and Paltrinieri (2017) state that the increase in pandemic investments emerged in light of the Ebola outbreak in West Africa where there was a high increase in infection and death rates due to weak public health infrastructure. During this period, the Ebola outbreak also brought to the forefront difficulties in rapidly mobilising funding from the international community to contain the outbreak (World Bank 2017). As a result of this, the World Bank as well as the International Bank for Reconstruction and Development (IBRD) in collaboration with the WHO took initiative to design a finance mechanism called the Pandemic Emergency Financing Facility (PEF). This facility would provide funds over \$425 million against the risk of outbreaks of infectious diseases (World Bank, 2017).

The first ever issuance by the PEF were catastrophe bonds (Ozen and Sahin 2020). These bonds were designed to be paid out to countries that are facing or at high-risk of catastrophes such as volcanoes, earthquakes, floods or any other extreme weather events (Morana and Sbrana 2019). An example where a catastrophe bond has been issued was in the Philippines worth \$225 million (World Bank 2019). The Philippines is considered as amongst one of the most disaster-prone countries in the world and is prone to extreme climate and weather-related events (World Bank 2019). Furthermore, the World Bank issued the biggest sovereign catastrophe bond providing \$1.36 billion for earthquake prone countries in South America such as Chile, Colombia, Peru and Mexico (World Bank 2018).

In addition, it was further observed that catastrophes can also result in the outbreak of diseases. It is because of this that under the PEF there was also the design of pandemic bonds (World Bank 2017). Similar to catastrophe bonds, pandemic bonds were designed to help developing countries tackle pandemics by speedily releasing funds that would finance emergency coordination of healthcare resources and strengthen public health (World Bank 2017). The first pandemic bond was issued in 2017 to assist countries in West Africa that were heavily affected by the Ebola virus (World Bank 2017).

The initial response of the PEF was positive with the World Bank citing an oversubscription of 200% from investors which demonstrated the high level of confidence in the new facility (World Bank 2017). Figure 3 below specifically shows the pandemic bonds investor distribution according to geographic distribution and investor type (World Bank 2020).

Figure 3. Pandemic bonds distribution according to geographic distribution and investor type

Geographic Distribution		Investor Type	
Europe	52%	ILS Specialist Fund	61%
North America	42%	Asset Management	16%
Bermuda	5%	Pension Fund	15%
Asia	1%	Insurer/Reinsurer	8%

Source: World Bank (2020)

It is important to note that pandemic bonds were to be issued under the “capital at risk” program under the IBRD (World Bank 2017). This is because if an epidemic or pandemic occurs this would result in investors potentially losing part or all of their money due to

pay-outs to countries that would be stricken. The World Bank (2017) included specific criteria for the activation of pay-outs to stricken countries and these include the outbreak size if more than 250 people are affected, the number of fatalities beyond 250, cross-border outbreak as well as 12 weeks having passed from the start of the outbreak. Another important component of the PEF were that only six viruses were covered that could result in a pandemic (World Bank 2017). These included “new Orthomyxoviruses (new influenza pandemic virus A), Coronaviridae (SARS, MERS), Filoviridae (Ebola, Marburg) and other zoonotic diseases (Crimean Congo, Rift Valley, Lassa fever)” (World Bank 2017).

However, there is increasing concern that pandemic bonds have not proven effective. Jonas (2019) highlights that the pandemic bonds failed to assist during the Ebola outbreak in West Africa as they benefitted investors more than they did to support public health capacity and resources in Ebola stricken countries. The author argues that investors who issued pandemic bonds received generous interest rates of up to 13% and the World Bank did not explicitly highlight what the terms would be of issuing such a bond (Jonas 2019). It has also been reported that the pandemic bonds failed to deliver sufficient and timely aid to affected countries as the conditions of the PEF highlight that the bonds can only be released after a 12 week period (Bloomberg 2020). Despite the novelty of pandemic bonds, Erikson and Johnson (2020) emphasise how the bonds failed to facilitate the mobilisation of private sector funding for humanitarian assistance.

5. Global response to COVID-19

In light of the COVID-19 pandemic, the response of the international community has been swift with various public-private partnerships pledging support to help countries cope with the impacts of the pandemic (IMF 2020). Furthermore, various multilateral

institutions and philanthropists have scaled up resources to support mitigation and recovery efforts (IMF 2020). For example, the World Bank and the International Monetary Fund (IMF) have increased funds of more than \$14 billion to strengthen public health preparedness and to further help countries in their efforts to provide immediate social, health and economic relief (IMF 2020). Similarly, institutions such as the African Development Bank (AfDB) have raised \$3 billion to alleviate the impacts of COVID-19 on the African continent (AfDB 2020). This has further been supported by the African Union (AU) where the COVID-19 Response Fund was launched with the private sector to raise up to \$400 million to support African countries in their response against the pandemic (African Union; 2020). Globally, there are other institutions which are raising funds in different regions and this further supports how the international community is proactive and responsive to the pandemic.

Despite all the efforts made to increase pandemic investments and funding there have been major criticisms on how COVID-19 has failed to trigger pandemic bonds (Bloomberg 2020). According to a report by the Bretton Woods institute (2020), pandemic bonds have been criticised for being very slow to release funds as there is a 12 week waiting period to countries in need. This can be disastrous in a pandemic like COVID-19 which has spread exponentially since the initial breakout (Bretton Woods Institute). Furthermore, the pandemic bonds have received criticism over their complicated terms and conditions as well as how they have been skewed to favour investors rather than prioritising the millions of lives affected by COVID-19 (Jonas 2019).

Erikson and Johnson (2020) argue that despite the criticism over pandemic bonds, financial innovation is important in transforming pandemic response. They further observe that financial innovation for humanitarian responses is increasing and this has

been observed with new instruments such as the African Risk Capacity (ARC) as well as the Famine Action Mechanism (FAM) (Erikson and Johnson; 2020). The advantages of such financial innovation for pandemics is that there is flexibility for changes to be made such as the how long the waiting period should be for funds to be released. In addition, Erikson and Johnson (2020: 2) are of the view that criteria for these new innovative pandemic instruments can be made available to the public and can “push for disbursement criteria that place the needs of the sick before the demands of investors”.

6. The potential for Green bonds as a new form of pandemic investments

COVID-19 has exposed the vulnerability of the global society and economy (Zhao et al 2020). The pandemic has also jeopardised other development projects such as healthcare and education initiatives (Zhao et al 2020). It has been noted that in order for countries to tackle the pandemic and have resilient economies post COVID-19, there needs to be increased pandemic investments (Erikson and Johnson 2020). In times of crisis such as COVID-19, it is important to move beyond the current discourse and evaluate how innovation can occur in the financial sector to drive change. Wang et al (2020) argue how innovation within the financial sector and investment firms can alleviate the risks caused by COVID-19. This has further been supported by Chesbrough (2020) who edifies this by highlighting how financial innovation will play a very important role in recovering from the pandemic by seeking alternative financial mechanisms that would not traditionally be used.

An example of financial mechanisms that are currently being explored by countries to recover post COVID-19 has been green investments. In order to help countries recover from the impacts of COVID-19, creating a sustainable and resilient economy for the world

will require innovative finance mechanisms such as green bonds to be tapped into. Green investments have been identified as having huge potential in contributing to COVID-19 aid but also in boosting economic growth after the pandemic (WEF 2020). This has already been demonstrated by the European Union (EU) where several countries have urged the need for to adopt green measures (WEF 2020). Recently, EU leaders pledged to support green investments to tackle the pandemic but also to stay committed to the EU's green transition agenda (European Commission 2020). These efforts demonstrate how sustainability is still a top priority for many countries despite COVID-19.

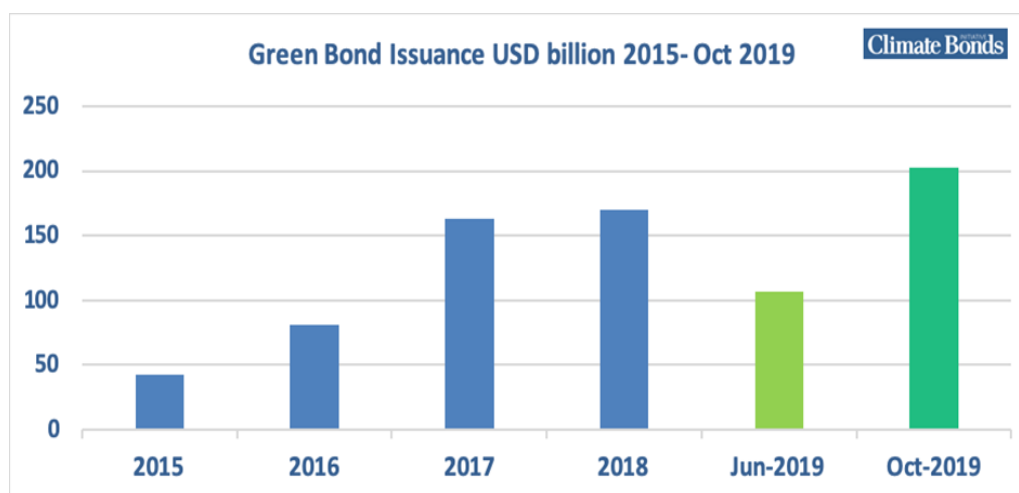
The United Nations Environmental Programme recently released a report looking at the impacts of COVID-19 on global sustainable finance. The report highlights that as much as it may be early to predict the impacts of the pandemic on ESG and sustainable finance, there is a need going forward to further integrate environmental, social and economic issues. Hosseini (2020) argues that holistic investments need to be incorporated that take into account environmental, social and economic factors as the pandemic has drastically affected these areas. The author further argues that green investments should be further explored on how they can be extended to not only environmental projects amidst COVID-19 but also social and health projects (Hosseini 2020).

One of the green investment mechanisms that has experienced less volatility during the pandemic has been green bonds. Green bonds have been regarded as one of the most novel climate finance mechanisms that has emerged in the past decade (Banga 2019). Banga (2019) defines green bonds as a fixed income instrument where the bond proceeds go directly into climate adaptation and mitigation projects. Reboredo et al (2019) further edifies this by highlighting how green bonds are no different from conventional bonds

except the green bonds proceeds are invested in projects that have environmental benefits such as renewable energy and green buildings.

The growth of the green bond market has been phenomenal with a few issuances from its establishment in 2012 to a growth of more than \$200 billion dollars (CBI 2019) (Figure 4). Pham (2016) argues that the growth in green bonds over the years has been attributed to increasing awareness from the biggest investors and asset companies on how they can play a role to combat climate change by directing funds towards projects that have environmental benefits. The leading regions in green bond issuances has been Europe and America although in developing regions such as in Asia and Africa increasing issuances over the years has been observed (CBI 2019).

Figure 4: A graph showing the growth of the green bond market



Source: CBI (2019)

The financial times has reported that green bonds have done quite well in global markets despite the outbreak of COVID-19 (FT 2020). It was also further reported that investors are still willing to provide long-term capital to help countries transition towards a low-carbon economy and also contribute to stimulating economies in the midst of the

pandemic (FT 2020). In another research study by the Inter-American Development Bank (2020), it was noted how COVID-19 is severely impacting the economies and healthcare systems of countries in Latin American and Caribbean regions. Government resources in these countries has been constrained due to weak economic growth and private sector capital has been identified as important in supporting economic recovery in these countries (IADB 2020).

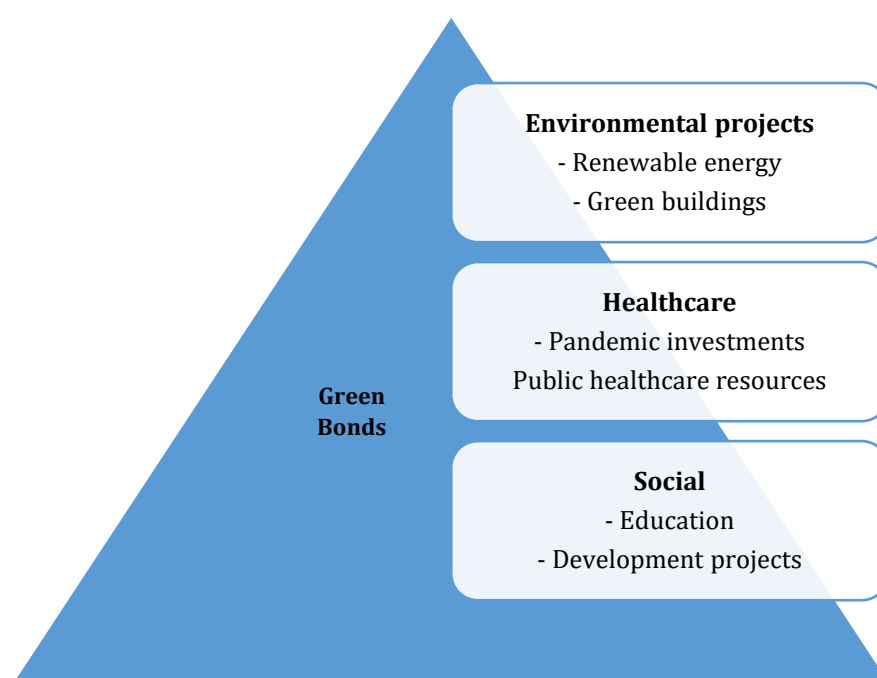
Regardless of the economic, social and healthcare impacts of COVID-19, the Inter-American Development Bank (2020) further highlights how green bonds can be an important financial instrument to mobilise private sector capital to support countries in Latin America and the Caribbean to enable economic recovery and by so doing also create a climate resilient economy (IADB 2020). In addition, green bonds have been included in economic recovery plans to not only support climate and environmental projects but to also strengthen social and health systems (IADB 2020). This highlights how the pandemic has shifted the allocation of green investments such as green bonds into other social projects such as healthcare. Moving into the future, green bonds can be presented as another form of innovate pandemic investments.

To further illustrate how green bonds can be viewed as a new form of pandemic investments, it notable to highlight how green bonds have also been issued by pharmaceutical companies to manage environmental impact and reduce hazardous medical waste (NordSIP 2020). This has recently been illustrated by Pfizer which is amongst one of the biggest multinational pharmaceutical companies where their bond issuance was directed into tackling COVID-19 by increasing support and resources healthcare resources (NordSIP 2020). This is one of the first green bond issuances where proceeds of the bond have been re-directed into healthcare aid during a pandemic.

Erikson and Johnson (2020) make a compelling argument about how the failure of pandemic bonds has the potential to make a radical transformation in aid funding. Green bonds have the potential to do this and by so doing also enable a green post COVID-19 recovery for many countries.

7. Recommendations and Conclusion

Innovative financial instruments for COVID-19 are necessary especially for developing countries who are the most impacted. Despite the pandemic causing unprecedented challenges, the global society can still achieve sustainability by exploring sustainable investments such as green bonds. These bonds can not only achieve climate goals in the midst of the pandemic but can also be extended to social and healthcare projects (Figure 4). Projects that are currently aligned under green bonds can be extended to include other projects such as healthcare and social. It is argued that with innovation in the financial sector, green bonds can be a new form of pandemic investments.



Further work needs to go into how the PEF can be transformed to include sustainable investments such as green bonds. This is further accompanied by having a holistic approach to finance in how environmental, social and economic priorities are aligned in the midst of a catastrophe or pandemic. It is also suggested that governments strategies on how innovative finance mechanisms can be included in emergency planning and policies. In addition, more awareness needs to be placed amongst the investor community on how green bonds can create a green resilient economy but can also be extended as a form of pandemic investments. This will need to be further complemented with vertical and horizontal structures as well as political will.

Overall, existing and various forms of pandemic investments need to be more transparent to the global public. This is to allow for increased stakeholder engagement but also to allow for accountability. For example, pandemic bonds have received immense criticism over their terms and conditions. It is important that if new pandemic investments are introduced that governments, investors as well as civil society have the platform to engage in dialogues on how these investments can be beneficial and how they can also foster development.

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APPENDIX B: SUPPLEMENTARY ARTICLES BY RESEARCHER

In addition to writing and publishing academic research articles, the researcher was interested in contributing to science communication. One of the key aspects in science communication is interpreting complex concepts and communicating them in a manner in which the general public would understand. Concepts used in this thesis such as green bonds or carbon capture and storage are not well known and understood outside of the academic discourse. The researcher had several media articles published online which spoke about key debates and current affairs on the research.

Media Article No. 1

Is carbon capture and storage still a feasible option for South Africa?⁹

Carbon capture and storage is touted as one of the most effective ways of reducing carbon emissions, and South Africa has two perfect sites for this, in the Eastern Cape and KwaZulu-Natal. But progress seems to have stalled. Is this option still on the cards?

Climate change is one of the greatest challenges that society is and will be dealing with in the future. Global carbon emissions have reached an all-time high and if not urgently addressed to reduce these emissions the world will continue to witness an increase in global temperatures.

The 2018 Special Report by the Intergovernmental Panel on Climate Change (IPCC) emphasised the need for collective global action to reduce carbon emissions to ensure

⁹ Ngwenya, N (20 May 2019). Is carbon capture and storage still a feasible option for South Africa? The Daily Maverick. <https://www.dailymaverick.co.za/article/2019-05-20-is-carbon-capture-and-storage-still-a-feasible-option-for-south-africa/>

that global temperatures do not exceed the safe zone of 1.5°C. Worst-case scenario, if temperatures do exceed this limit, is that continuous irrevocable impacts will continue to occur and this time we may not be so lucky in being proactive to prevent the impacts.

According to the World Economic Forum, if the 1.5°C goal is to be met, substantial investments in low-carbon technologies will be necessary. One of the key technologies that have been implemented as a strategy in some countries, and is projected to be a real game-changer in the future, is carbon capture and storage (CCS). The Global Institute of CCS is one of the leading authorities to ensure the adoption and deployment of this technology.

Simply put, CCS is a technology that captures carbon emissions from large-point sources such as power stations where it is transported and deposited in underground geological formations. The International Energy Agency (IEA) expects CCS to contribute about 20% of total emissions reduction by 2040, along with other sources of renewable energy and clean technologies.

South Africa is one of the few developing countries in the Global South and on the continent that has embarked on the potential deployment of CCS. Plans of CCS began way back in 2004 when the then-department of minerals and energy commissioned the CSIR to look into the potential of the country to embark on CCS. The report that followed was very promising as it was found that 60% of the country's annual carbon emissions was sequestrable. This essentially meant that the number of emissions from point sources could be captured and stored underground.

Following this, in 2009, the Carbon Geological Storage Atlas was compiled by the Council for Geoscience. This Atlas identified potential geological storage sites for the deployment

of CCS. The two sites that emerged as the best were the Algoa Basin in the Eastern Cape and the Zululand Basin in KwaZulu-Natal.

The developments that occurred over the years paved the way for the South African Centre for Carbon Capture and Storage (SACCCS) to be established within the South African National Energy Development Institute (Sanedi). The importance of SACCCS was to develop and build capacity – both human and technical. In 2012, the South African CCS Road Map was endorsed by Cabinet which aimed to guide the development of CCS activities over the years.

It is important to note that within this road map, two of the goals have already been met – the investigation of CCS as well as the Atlas. The goal for 2017 was to commence the test-injection project which has not been achieved yet and this has hindered the implementation of other plans such as the commencement of a CCS demonstration plant, which was expected to commence in 2020.

Despite the delay in the implementation of some of the intended goals, SACCCS must be commended on its various and extensive stakeholder engagement activities to ensure that awareness and knowledge are increased around new technologies such as CCS.

In a country that is as diverse as South Africa, but also plagued with various socio-economic issues, it is imperative that at sites where CCS is intended to be deployed, that surrounding communities are consulted and afforded an opportunity to be involved. There have been several instances globally in developed countries such as the Netherlands and Norway where local communities have protested against CCS deployment because of the lack of engagement and lack of knowledge.

This, unfortunately, resulted in massive CCS projects being stalled or completely abandoned. In a country that is as volatile as ours where protests happen frequently, it is not certain that this will not occur where CCS is intended to be implemented, but SACCCS is making great strides to ensure that there is a smooth transition.

It seems like we are on an impressive track with regards to the technical and human expertise around CCS in the country. But the big question lies in whether CCS is a feasible option.

A 2017 technical report by Promethium Carbon highlights that the economic feasibility of the CCS business case is directly related to the high carbon emissions of the country.

South Africa is one of the biggest emitters of carbon emissions due to our intensive coal-based economy. This can be an advantage to argue for the feasibility of this technology as CCS would enable the country to continue to exploit its abundant coal reserves while meeting its climate commitments.

CCS can be that much-needed technology which makes the necessary transition towards a low-carbon society and economy. However, since February 2019 the Carbon Tax Bill came into effect which clearly states that any company or listed entity which releases emissions of greenhouse gases above a certain threshold will have to pay a carbon tax.

Interestingly, even though some companies or entities will think about changing their strategies and operations so that they do not pay another tax, this does not mean that they will stop releasing emissions. In this case, CCS again presents itself as a feasible option.

It is important, though, to reflect on how the feasibility of CCS is not only related to environmental factors, such as the amount of carbon emissions released. Economic

feasibility is just as important because even if a business case exists, who exactly is going to invest in CCS projects? The Norwegian government, as well as the World Bank, have committed to investing millions of rands for CCS projects. The funding, though, has been allocated to give the country a boost and millions will not be injected into the country on a permanent basis. Eventually, CCS will need to target investors both locally and internationally to ensure that funds are secured, especially if CCS projects will operate on a commercial scale in the future.

In any economic context, investors want a secure and regulatory environment to invest their money and ensure that profits will eventually be made. There are a number of obstacles that should be noted that could decrease investor appetite for CCS.

First, South Africa does not currently have a legal and regulatory framework dedicated to CCS and it seems like this has been placed on hold for a number of years. The lack of legislation could signal to investors that the country is not ready for such large-scale projects.

Second, a number of projected goals for CCS have not been reached and this can create reluctance from investors.

Third, there has not been any explicit political mandate on CCS. This is a notable obstacle because political leaders can influence and give much-needed confidence to investors, but their lack of communication can produce the opposite outcome.

With carbon capture and storage, it is vital that the pros and cons of implementing this technology be analysed from all angles. Carbon capture and storage can be feasible given the right political, legal and financial mandate which can be effectively implemented. It is also important to understand that carbon capture and storage is a technology that will

complement our climate policies and will be used in conjunction with renewable energy and other clean technologies. There is no one solution to tackle climate change, it is important that different forms and alternatives are incorporated to help us transition towards a low-carbon society.

Yes, there will be glitches in implementing such new technology in a developing country like ours. But we must also be reminded that we do not have another 10 or so years to decide on the fate of carbon capture and storage. This technology is also about the skills development, expertise and value chains that can emerge in the country in the future while attaining our climate goals.

We cannot afford to miss out on such an opportunity.

Media Article No. 2

SA's green bonds show there are massive opportunities for growth¹⁰

These securities complement the country's policies and strategies on climate change

Climate change is widely acknowledged as one of the greatest long-term challenges facing humanity. To address this challenge, various high-level climate negotiations have taken place over the past decades to find solutions to accelerate adaptation and mitigation strategies.

The Conference of the Parties (Cop) has been at the forefront in the past decades of climate negotiations. After decades of back and forth it seemed like finally a breakthrough occurred with the 21st Cop, where the Paris Agreement was adopted in December 12 2015. The Paris Agreement has been regarded as historic because 195 countries unanimously agreed to limit global temperature increase well below 2°C. However, as ambitious as this agreement was, billions of dollars in investments are required to ensure that every country, particularly those in the global South, have the resources to step up and contribute towards combatting climate change.

¹⁰ Ngwenya, N (20 June 2019). SA's green bonds show there are massive opportunities for growth. <https://www.businesslive.co.za/bd/opinion/2019-06-20-sas-green-bonds-show-there-are-massive-opportunities-for-growth/>

Media Article No. 3

Unlocking the Value of Climate Investments: The Growth of the Green Bond Market in South Africa¹¹

Where do we find the billions of dollars in investments required to ensure that every country, particularly those in the Global South, have the resources to step up and contribute towards combating climate change?

Climate change is widely acknowledged as one of the greatest long-term challenges facing humanity. To address this challenge, various high-level climate negotiations have taken place over the past decades to find solutions to accelerate adaptation and mitigation strategies. The Conference of the Parties (COP) has been at the forefront in the past decades of climate negotiations. After decades of back and forth it seemed like finally a breakthrough occurred with the 21st COP where the *Paris Agreement* was adopted in December 2015. This Agreement has been regarded as historic as 195 countries unanimously agreed to limit global temperatures well below 2°C. However, as ambitious as this was, billions of dollars in investments are required to ensure that every country, particularly those in the Global South, have the resources to step up and contribute towards combating climate change.

It is without a doubt that climate change has affected the global economy. The [World Economic Forum's 'Global Risks Report' of 2016](#) highlighted how environmental risks have and will continue to jeopardise the growth of many economies. The impacts of climate change are expected to increase loss of productivity in areas such as agriculture

¹¹ Ngwenya, N (04 June 2019). SA's green bonds show there are massive opportunities for growth. <https://medium.com/@TheBeamMag/unlocking-the-value-of-climate-investments-the-growth-of-the-green-bond-market-in-south-africa-44b30bd72357>.

and fisheries as well increasing damage to property and infrastructure. As a result of this, private capital has been mobilised in recent years towards green investments for climate change adaptation and mitigation projects. One of the most emerging and growing finance mechanisms has been green bonds. There is no standard definition of green bonds but there is a general consensus on what they are and what they are intended to do. They are generally referred to as bonds whose proceeds go directly into climate and environmental projects. The [Climate Bonds Initiative](#) amongst other organisations have been very instrumental in helping the private and public sector issue and certify green bonds as well as determine eligible green projects to invest in.

In a [2018 Green Bond Impact Report by the International Financial Corporation \(IFC\)](#) reported that the growth of the green bond market began with a couple of issuances in 2007 to a growth of more than 80% of new issuers, amounting to more than 200 billion dollars in 2018. Almost completely unknown a decade ago and now green bonds can potentially offer a pathway forward to transition towards a low-carbon society, backed by government and various investors.

The explosive growth of the green bond market has been mostly observed from developed countries where countries such as France, Germany, the US as well as the Netherlands have been amongst the top issuers over the years. This growth has been backed and highly promoted by governments and investors in these countries. However, it seems like developing countries are slowly lagging behind and not as active in the green bond market. In a 2019 journal by Jose Banga, the author highlights key barriers to the growth of the green bond market in developing countries. Some of these barriers include institutional barriers which are further compounded by market barriers. Though Banga concludes on

a positive note by stating that “appropriate policy measures could help address these challenges and enable the market to take root.”

Despite the various challenges that developing countries face, it is important to acknowledge that there are massive opportunities for the growth of green bonds. South Africa is one of the countries that is leading by example on the African continent and to other developing countries with regard to the growth of green bonds. The country witnessed the first municipal green bond issued by the City of Johannesburg (COJ) in 2014 worth R1.5 billion. The bonds have allowed the COJ to demonstrate its commitment to environmental stewardship and proceeds are currently funding a range of projects in different sectors, such as low carbon infrastructure. Followed by this, the City of Cape Town’s green bond was the first in the country to be listed on the Johannesburg Stock Exchange (JSE) green segment with a green bond issued of over R1 billion in 2017. The resounding success of this green bond issuance resulted in the City being awarded ‘Green bond of the year’ by the Climate Bond initiative. As much as the two leading cities in the country have demonstrated their potential in the green bond market as the public sector, it is worthwhile to ponder why they have not created a ripple effect for other cities to follow. Could it be related to the lack of awareness on climate investment from the public sector or different ministry departments and municipalities not prioritising this?

On the other hand, the private sector has really showed an impressive stance and active in accelerating the growth of the green bond market in the country. The JSE’s green bond segment has been an effective tool set at international best practice, to allow investors to contribute in raising capital for sustainable projects and boosting ESG investment. There have been several success stories of corporate companies such as GrowthPoint Properties

in 2018, being one of the first South African real estate companies to issue out a green bond on the JSE of R1 billion. Proceeds are reported to go into energy efficiency and green office buildings. Recently this year in 2019, Nedbank was the first corporate bank in the country to issue out green bonds of over R5 billion in which all of them were oversubscribed and proceeds are expected to go into renewable energy projects. The fact that there was such a frenzy over these green bonds demonstrates investor appetite and willingness to participate in this market. With the private sector leading in the green bond market highlights how responsible investments have become a top priority, especially with regard to climate investments. Even though the green bond market is still small in the country compared to the rest of the world, it definitely has the potential to increase.

One may ask what the growth in the green bond market essentially means for the country's development? I would be quick to answer that we are definitely a step in the right direction and green bonds could complement the country's policies and strategies with regard to climate action. Moving forward as a country, there would be a need for continuous monitoring and evaluation of the green bond market. This would entail both private and public sectors measuring the impact of green bonds and its contribution to environmental projects in the country. This would give us an indication of the climate goals that green bonds have helped in achieving as well as areas that still need to be prioritised. There is also a need for increased transparency and accountability from issuers to avoid instances of green bonds being labelled as 'green washing'.

With the dawn of a new political era and the anticipation of President Ramaphosa to make the country a hot spot for investments, it would be interesting to monitor the growth of green bonds from various sectors. Green bonds have the potential to unlock the much

needed investments for environmental projects and feed into the broader green economy framework that the country has been trying to stimulate over the years.

Given the right policies and visionary leadership, green bonds can be the necessary investments we have been waiting for to aid us in transitioning towards a low-carbon South Africa.

APPENDIX B

Participant information sheets for research



Good day

My name is Nomhle Ngwenya and I am a PhD student in Geography at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project and I am investigating the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. The aim of this research project is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

As part of this project, I would like to invite you to take part in an online questionnaire. The online questionnaire will take around 10 minutes and your contributions will remain confidential and anonymous. By completing and submitting the questionnaire can be taken to mean consent.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The online questionnaire will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, you are allowed to withdraw or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,

Nomhle Ngwenya

1043519@students.wits.ac.za

074 171 5467

Supervisor: Professor Mulala Danny Simatele

danny.simatele@wits.ac.za

083 383 6884

APPENDIX C

Participants Information Sheet



Good day

My name is Nomhle Ngwenya and I am a PhD student in Geography at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project and I am investigating the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. The aim of this research project is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as an avenue

to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

As part of this project, I would like to invite you to take part in an interview. You were selected due to your involvement and knowledge of carbon capture and storage initiatives in South Africa. The interview will take around 30-45 minutes and with your permission, I would also like to record the interview using a digital device.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,

Nomhle Ngwenya

1043519@students.wits.ac.za

074 171 5467

Supervisor: Professor Mulala Danny Simatele

danny.simatele@wits.ac.za

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Participants Information Sheet

***Interviews with municipal and government officials in relation to carbon capture
and storage***



Good day

My name is Nomhle Ngwenya and I am a PhD student in Geography at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research

project and I am investigating the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. The aim of this research project is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

As part of this project, I would like to invite you to take part in an interview. You were selected due to your involvement and knowledge of carbon capture and storage initiatives in South Africa. The interview will take around 30-45 minutes and with your permission, I would also like to record the interview using a digital device.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

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Yours sincerely,

Nomhle Ngwenya

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Supervisor: Professor Mulala Danny Simatele

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Participants Information Sheet

Interviews with experts (consultants, professionals, lawyers)



Good day

My name is Nomhle Ngwenya and I am a PhD student in Geography at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project and I am investigating the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa. The aim of this research

project is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

As part of this project, I would like to invite you to take part in an interview. You were selected due to your involvement and knowledge of carbon capture and storage initiatives in South Africa. The interview will take around 30-45 minutes and with your permission, I would also like to record the interview using a digital device.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

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Yours sincerely,

Nomhle Ngwenya

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Supervisor: Professor Mulala Danny Simatele

danny.simatele@wits.ac.za

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Participants Information Sheet

Interviews with experts (consultants, professionals, lawyers) in relation to green bonds

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Good day

My name is Nomhle Ngwenya and I am a PhD student in Geography at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project and I am investigating the role of institutional frameworks in promoting green

bonds to finance carbon capture and storage in South Africa. The aim of this research project is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

As part of this project, I would like to invite you to take part in an interview. You were selected due to your involvement and knowledge of green bonds in South Africa. The interview will take around 30-45 minutes and with your permission, I would also like to record the interview using a digital device.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the

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Yours sincerely,

Nomhle Ngwenya

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Supervisor: Professor Mulala Danny Simatele

danny.simatele@wits.ac.za

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APPENDICE C

Consent forms

CONSENT FORM

Experts (consultants, professionals, lawyers)

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Researcher: Nomhle Ngwenya (PhD candidate)

Title of project: The role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa

I agree to participate in this research project. The research has been explained to me and I understand what my participation will involve.

I agree that my participation will remain anonymous YES NO (please circle)

I agree that the researcher may use anonymous quotes

in her research report YES NO

I agree that the interview may be audio recorded YES NO

..... (signature)

..... (name of participant)

..... (date)

For further information about the research and the anonymity of your

participation, please do not hesitate to contact me:

Nomhle Ngwenya

1043519@students.wits.ac.za

074 171 5467

Or my supervisor:

Prof. Mulala Danny Simatele

Mulala.simatele@wits.ac.za

083 383 6884

CONSENT FORM

(Municipal experts)



Researcher: Nomhle Ngwenya (PhD candidate)

Title of project: The role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa

I agree to participate in this research project. The research has been explained to me and I understand what my participation will involve.

I agree that my participation will remain anonymous YES NO (please circle)

I agree that the researcher may use anonymous quotes

in her research report YES NO

I agree that the interview may be audio recorded YES NO

..... (signature)

..... (name of participant)

..... (date)

For further information about the research and the anonymity of your participation, please do not hesitate to contact me:

Nomhle Ngwenya

1043519@students.wits.ac.za

074 171 5467

Or my supervisor:

Prof. Mulala Danny Simatele

Mulala.simatele@wits.ac.za

083 383 6884

Interview guides

Questions for municipal and government authorities:



Interview guide: Interviewing research participants in relation to institutional frameworks and green bonds

Good day, thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

- 1.) What are your roles and responsibilities within this municipality/government?
- 2.) Could you please share with me your academic background and the interests that contributed to where you are now?

Section B: Substantive questions for the study

- 3.) There have been many different definitions of green bonds and what they are expected to do. Could you please provide me your definition and which eligible projects the bond proceeds would go into?
- 4.) May you explain the process of how this municipality/government embarked on the issuing of green bonds?
- 5.) The public sector has been described as amongst the first sector in the country to be involved in the green bond market. What do you think are the factors that contributed to this?
- 6.) What would be the potential impacts of green bonds in helping the country achieve their climate adaptation and mitigation goals?
- 7.) Are there any barriers that the municipality/government has had regarding green bond proceeds going into various environmental projects?
 - 7.1.) If yes, what potential solutions were implemented to ensure that the barriers were addressed?

- 8.) Can you identify an institutional or policy framework present within which green bonds have been pursued in this department?
- 9.) In your opinion, how would these policy or institutional frameworks ensure transparency and accountability in the proceeds of green bonds for eligible projects?
- 10.) Ideally, what type of institutional frameworks (i.e policies, legal structures) would you like to see developed or improved to enable the proceeds of green bonds to finance specific environmental projects?
- 11.) Low carbon technologies have been regarded as important in climate mitigation strategies. Do you think it is economically feasible for green bonds to finance low-carbon technologies such as carbon capture and storage?
- 12.) What are the potential impacts of green bonds on climate investments in South Africa?
- 13.) Are there any other issues around the use of green bonds that are overlooked?



Interview guide: Interviewing Experts (Professionals from JSE) in relation to institutional frameworks and green bonds

Introduction:

Good day, thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time. As a researcher I will not jeopardise the company or yourself in anyway, hence anonymity and confidentiality will be strictly adhered to.

Section A: Questions to establish the rapport

1. What are your roles and responsibilities within the JSE?
2. Could you please share with me your academic background and the interests that contributed to where you are now?

3. Section B: Substantive questions for the study

4. There have been many different definitions of green bonds and what they are expected to do. Could you please provide me your definition and which eligible projects the bond proceeds would go into?
5. May you identify developments that have taken place regarding green bond activities within the JSE?
6. Could you please elaborate on what the JSE is mandated to do to help various sectors issue out green bonds?
7. In your opinion, what may be the factors that have motivated various sectors to issue out green bonds?
8. Are there any barriers the JSE has had in the issuing out of green bonds to companies or institutions?
9. Can you identify any institutional or policy framework within which the development of green bonds could effectively be pursued in the private sector and public sector respectively?

10. In your opinion, how would these policy or institutional frameworks ensure transparency and accountability in the green bond market?
11. What measures has the JSE implemented to monitor and evaluate the green bond market in the country as well as the different issuers?
12. With your expertise and involvement in this market, are there any potential impacts of green bonds you have observed on climate investments in South Africa?
13. Are there any other issues around the use of green bonds that are overlooked?

Questions for Experts (banking institutions):

Interview guide: Interviewing research participants in relation to institutional frameworks and green bonds

Good day, thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

1.) What are your roles and responsibilities?

2.) Could you please share with me your academic background and the interests that contributed to where you are now?

Section B: Substantive questions for the study

3.) Based on the work you are doing, are you in a position to share with me your understanding of what a green bond is and what eligible projects would the proceeds go into?

4.) May you share with me how this particular banking institution has been involved in the green bond market and which eligible projects have the proceeds gone into?

5.) Globally, banking institutions have been at the forefront of the green bond market. Can you elaborate on the factors that motivated this banking institution to issue out a green bond?

6.) What are your views on the growth of green bonds in South Africa and the role that private banking institutions have in contributing to ESG (Environmental, Social, Governance) activities?

7.) Are there any barriers that have been faced with regards to this institutions involvement in the green bond market?

7.1.) If yes, can you elaborate on these barriers and what measures were implemented to overcome these barriers?

8.) In your opinion, can green bonds contribute in raising awareness to clients and investors about the impact of climate investments on various environmental issues?

9.) Can you identify any institutional or policy framework within which the development of green bonds could effectively be pursued in the private sector?

10.) In your opinion, how would these policy or institutional frameworks ensure transparency and accountability in the green bond market to avoid issues of 'green washing' and corruption?

11.) What type of institutional framework can be employed to monitor and evaluate the green bond market in the country to strengthen responsible investments?

12.) Ideally, what type of institutional framework would you like to see developed or improved to facilitate green bonds financing specific environmental projects in the country?

13.) Are there any other issues around the use of green bonds that are overlooked?



Questions for Experts and consultants (multilateral institutions at IFC and WB):

Interview guide: Interviewing research participants in relation to institutional frameworks and green bonds

Good day, thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

1. What are your roles and responsibilities in this institution?
2. Could you please share with me your academic background and the interests that contributed to where you are now?

3. Section B: Substantive questions for the study

4. There have been many different definitions of green bonds and what they are expected to do. Could you provide me your definition and which eligible projects the bond proceeds would go into?
5. IFC/WB has been amongst the first multilateral institutions in creating awareness about green bonds. Could you elaborate on what the IFC/WB has been specifically mandated to do with regards to the green bond market and related activities in the country?
6. What are the potential impacts of green bonds on climate investments in South Africa?
7. Are there any barriers (political, economic) that the IFC/WB has experienced with regards to green bond activities in the country?
8. Can you elaborate on the importance of multilateral institutions, like the IFC/WB in raising awareness to investors about innovative climate finance mechanisms, such as green bonds?
9. Can you identify any institutional or policy framework within which the development of green bonds could effectively be pursued in the private sector and public sector respectively?

10. In your opinion, how would these policy or institutional frameworks ensure transparency and accountability in the green bond market to avoid corruption and issues of 'green washing'?
11. Various reports have mentioned that there is a lack of monitoring and evaluation of green bonds. Ideally, what type of institutional framework can be employed to monitor and evaluate the green bond market in a developing country, like South Africa?
12. The WB/IFC has been involved in funding carbon capture and storage initiatives in the country. Could green bonds be economically feasible to finance large-scale carbon capture and storage initiatives in the future?
13. In your view, do you think there would be an importance of public-private partnerships as the green bond market develops in the country?
14. Are there any other issues around the use of green bonds that are overlooked?



Questions for experts and consultants in the private sector and international organisations

Interview guide: Interviewing research participants in relation to carbon capture and storage and institutional frameworks

 **Keywords: CCS – Carbon capture and storage**

Good day, Thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

1. What are your roles and responsibilities within this company/organisation?
2. Could you please share with me your academic background and the interests that contributed to where you are now?

3. Section B: Substantive questions for the study

4. Carbon capture and storage has been identified as one of the key technologies to reduce carbon emissions. Could you please share with me your understanding of what carbon capture and storage is?
5. South Africa has embarked on initiatives for carbon capture and storage. May you share how you have been involved in some of the activities pertaining to this?
6. In your view, should the country be embarking on such an initiative in order to transition towards a low-carbon society?
7. Do you think carbon capture and storage is economically feasible for a developing country like South Africa?
8. Green bonds have been regarded as a new innovative financing mechanism for eligible green projects. Would you regard carbon capture and storage as an eligible project in which the green bond proceeds would go into?
9. Can you elaborate on any existing or potential barriers that could hinder the large-scale implementation of this technology?

10. Can you identify any existing institutional or policy framework within which carbon capture and storage could effectively be pursued in the country?
11. We have seen developments with regards to the Carbon Tax Bill and the Climate Bill backed by parliament and the private sector. Could we see a similar agreement or partnership between the two sectors with regards to the large-scale implementation of carbon capture and storage?
12. Are there any other issues around carbon capture and storage that are overlooked?



Questions for consultants and experts at government research institutes (SACCCS – South African Centre for Carbon Capture and Storage)

Interview guide:

Interviewing research participants in relation to carbon capture and storage and institutional frameworks

Good day, Thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to stop at any time.

Section A: Questions to establish the rapport

- 1.) What are your roles and responsibilities within SACCCS?
- 2.) Could you please share with me your academic background and the interests that contributed to where you are now?

Section B: Substantive questions for the study

- 3.) Carbon capture and storage has been identified as one of the key technologies to reduce carbon emissions. Could you please share with me your definition of what carbon capture and storage is?
- 4.) SACCCS has embarked on various initiatives for carbon capture and storage. May you elaborate on what this research organisation has been mandated to do regarding carbon capture and storage initiatives in the country.
- 5.) In your view, what have been some of the important strides SACCCS has achieved with regards to carbon capture and storage in the country?
- 6.) Can you share any existing or potential barriers that SACCCS has/will face with regards to the deployment of carbon capture and storage?
- 7.) There have been various critics of carbon capture and storage in the country due to the energy politics. Should the country be embarking on such an initiative in order to transition towards a low-carbon society?
- 8.) In your opinion, is carbon capture and storage economically feasible for a developing country like South Africa that is plagued with various other social issues?

- 9.) Green bonds have been regarded as a new innovative financing mechanism for eligible green projects. Would you regard carbon capture and storage as an eligible project in which the green bond proceeds would go into?
- 10.) Can you identify any existing institutional or policy framework within which carbon capture and storage could effectively be pursued in the country?
- 11.) We have seen developments with regards to the Carbon Tax Bill and the Climate Bill backed by parliament and the private sector. Could we see a similar agreement or partnership between the two sectors with regards to the large-scale implementation of carbon capture and storage?
- 12.) Are there any other issues around carbon capture and storage that are overlooked?

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**Questions for consultants and experts at government research institutes (SACCCS
– South African Centre for Carbon Capture and Storage)**

Interview guide:

**Interviewing research participants in relation to carbon capture and storage and
institutional frameworks**

Good day, Thank you for agreeing to participate in this study. I really appreciate your time
and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to stop at any time.

Section A: Questions to establish the rapport

- 1.) What are your roles and responsibilities within SACCCS?
- 2.) Could you please share with me your academic background and the interests that contributed to where you are now?

Section B: Substantive questions for the study

- 3.) Carbon capture and storage has been identified as one of the key technologies to reduce carbon emissions. Could you please share with me your definition of what carbon capture and storage is?
- 4.) SACCCS has embarked on various initiatives for carbon capture and storage. May you elaborate on what this research organisation has been mandated to do regarding carbon capture and storage initiatives in the country.
- 5.) In your view, what have been some of the important strides SACCCS has achieved with regards to carbon capture and storage in the country?
- 6.) Can you share any existing or potential barriers that SACCCS has/will face with regards to the deployment of carbon capture and storage?
- 7.) There have been various critics of carbon capture and storage in the country due to the energy politics. Should the country be embarking on such an initiative in order to transition towards a low-carbon society?
- 8.) In your opinion, is carbon capture and storage economically feasible for a developing country like South Africa that is plagued with various other social issues?

- 9.) Green bonds have been regarded as a new innovative financing mechanism for eligible green projects. Would you regard carbon capture and storage as an eligible project in which the green bond proceeds would go into?
- 10.) Can you identify any existing institutional or policy framework within which carbon capture and storage could effectively be pursued in the country?
- 11.) We have seen developments with regards to the Carbon Tax Bill and the Climate Bill backed by parliament and the private sector. Could we see a similar agreement or partnership between the two sectors with regards to the large-scale implementation of carbon capture and storage?
- 12.) Are there any other issues around carbon capture and storage that are overlooked?

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Questions for legal specialists

Interview guide: Interviewing research participants in relation to carbon capture and storage and institutional frameworks

 **Keywords:** CCS – Carbon capture and storage

Good day, Thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

- 14.) Could you please share with me your role and responsibilities within this firm?
- 15.) Could you please share with me your academic background and the interests that led you to environmental law?

Section B: Substantive questions for the study

- 1.) Carbon capture and storage has been identified as one of the key technologies to reduce carbon emissions. Could you please share with me your definition of what carbon capture and storage is?
- 2.) South Africa has embarked on various carbon capture and storage initiatives. How have you been involved in some of the activities pertaining to this?
- 3.) We have seen developments with regards to the Carbon Tax Bill and the Climate Bill however there is no existing law for carbon capture and storage. Could you share with me why this has been the case and some of the barriers which exist to implement such a law?
- 4.) May you elaborate on the importance of legal and policy frameworks within which carbon capture and storage could effectively be pursued in the country?
- 5.) Why are legal structures paramount especially with regards to the energy transition that South Africa is embarking on?

- 6.) Ideally, what type of legal and regulatory framework would you like to see developed within which CCS and other low-carbon technologies could effectively be pursued?
- 7.) In your opinion, in drafting a law that would guide carbon capture and storage initiatives in the country who would be the main stakeholders involved in this and why?
- 8.) In some scenarios it has been observed of how laws have been drafted but there has been a lack of implementation. What measures would need to be in place to ensure that a carbon capture and storage law is implemented that ensures transparency and accountability?
- 9.) Are there any other issues around the legal structures of carbon capture and storage that are overlooked?

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Questions for municipal and government authorities:

Interview guide: Interviewing research participants in relation to carbon capture and storage and institutional frameworks

🚦 **Keywords:** CCS – Carbon capture and storage

Good day, thank you for agreeing to participate in this study. I really appreciate your time and effort.

As stated in the consent form and participation sheet, this interview will be maximum 30-45 minutes and you are more than welcome to withdraw at any time.

Section A: Questions to establish the rapport

- 16.) Could you please share with me your role and responsibilities?
- 17.) Could you please share with me your academic background and the interests that contributed to where you are now?

Section B: Substantive questions for the study

- 18.) May you share with me the developments that have taken place regarding carbon capture and storage and what this particular municipality/government has been mandated to do?
- 19.) This particular province has been selected due to SACCCS identifying some of the sites to be geologically suited for carbon capture and storage. How has SACCCS ensured that this municipality/government becomes involved in promoting awareness and knowledge about carbon capture and storage?
- 20.) Have there been any barriers the municipality/government has faced that could hinder the deployment of carbon capture and storage?
- 21.) Can you identify any existing institutional or policy framework within which carbon capture and storage has been pursued through the municipality/government?

- 22.) Can you elaborate on how these institutional or policy frameworks have ensured transparency and accountability of activities relating to carbon capture and storage?
- 23.) How are carbon capture and storage initiatives currently being financed in the province?
- 24.) Green bonds have been regarded as a new innovative financing mechanism for eligible green projects. Would you regard carbon capture and storage as an eligible project in which the green bond proceeds would go into for large-scale deployment?
- 25.) May you share with me who have been the main stakeholders in this municipality/government involved in carbon capture and storage initiatives?
- 11.) Are there any other issues around carbon capture and storage that are overlooked by municipalities/governments?

Interviews with research participants

Interview with Baldwin Properties:

- Largest green Edge registration in the world
- See the media statement. Registering 16 088 apartments. They are busy at the moment. Solid Green is the consultants and helping to do other things – edge certification & once done doing lifestyle centres as well (restaurant, spa, gym)

- When writing define what EDGE stands for
- With GBCSA & EDGE work closely together & EDGE is an entity of IFC. Meeting with IFC regarding green bonds. Very keen & only know more about it. Every development they have now has solar panels on the roof, utilities & lifestyle centers putting in a docking station so you can charge the car – electric car. Putting ATMs – reducing emissions – Solid Green guiding to go environmentally friendly. Laundromat – change blackwater & recycle it to save on water costs.
- Where does EDGE start to get involved? From breaking ground – carbon footprint place?
- Partnered with Solar Africa

STEVE: I want this known out there in the industry, this drive comes from me, we are driving Balwin to save the planet. The reason being is that we are the biggest sectional title developer out there (but we are). We have a massive moral responsibility. We come in here & do 1500 apartments or like 3500. We have a massive role to reduce our carbon footprint & make it a better place for our clients, not only for the immediate development but for the area too. I want it clearly noted in the press about the drive.

- Logo: Green. Our project director came up with this and we moved on this. It is a leaf to remind us constantly that we need to improve & we are driving it flat out. I don't think we can drive it out any harder than now. We are now looking at blackwater harvesting which blackwater means sewerage – we are turning sewerage into water. Our lifestyle centers are all going 6 star graded. To get our grading you have to come up with, its quite interesting – you can almost get a 6 star grading quite easily. You have to come

up with innovation points – now those 10 innovation points – those are the ones we are focusing on because those are the ones that make it better.

- The 75 means things like demolishing the house – did you recycle the material? Its not going to help the client but is going to help the planet. Innovation – blackwater harvesting, ATMs (reduces carbon emissions), electric car charging (entices people to buy electric cars because they know if they are going to the clubhouse you can charge it for free), the solar on the roof (operators will operate much more better & get more profit), the running track

- Wetland – recirculating the water in the wetland. Water stands attracts mosquitoes, diseases. That recirculation will make for a better ecosystem & maybe one day there is a proper system in there. So you can see I am quite passionate about this. I want that noted and Steve is the CEO, its coming from him & all the staff are driven. And we keep reminding ourself through the green leaf.

- Green bonds: Massive wheel to turn – If Balwin is now accredited to the max & cant go any higher – we can keep evolving and keep moving but at the moment we are right at the top. Now how do we get green into a financial benefit? This world runs on money & we have all got bonds. So what we would be working with the IFC is for them to work in partnership with our local banks where if a client, like yourself, walks in to a bank & says I want a 90% mortgage but im buying from Balwin & here is my EDGE certificate & here is my certificate that the clubhouse is 6 star graded – therefore you qualify through your credit rating, Balwin kicks you into what we call a green mortgage. We are trying to create with 1 bank to break (it might be ABSA). Lets say as a good client you would get half a percent below prime – with the different certifications we would try to get you another half a percent (calculate your savings over 20 years – that's massive). We are

trying to link the greening (saving the world & making it a better place) now we are going to save in your pocket. Save on your electricity bill because of solar, save water – reharvest the black. The big number is your bond. So we can get half a percent off the best rate you could get off the rate.

- Next drive – get all the previously disadvantaged people in this country into housing – save money on mortgage
- GrowthPoint Properties – Expect to raise way more than a billion. They did it for a development loan we are doing it for clients. If you can get multiple clients it can go way over a billion. Not for Balwin, its for the clients
- What would the bond proceeds go into? The savings would go into the bonds
- Solar Africa – Part of our greening is to create electricity so part of our roofs have solar & that gives a direct benefit to the client. At this stage – I want a higher improvement for our clients.
- With a lot of greening you have to think about the practical side to it – there are challenges to work out. That’s our next step – greater benefit for the client. In England – power goes back into the grid. Your meter runs backwards. Why haven’t we got that here? What do we have here? LOTS OF SUN (364 days a year)
- Transparency & accountability (becoming more environmentally conscious & ensure that this is not a tick box process) – Hire the best people in the industry – the best people are solid green, partner up with the GBCSA who are internationally accredited & you make sure that whatever you are doing is transparent & is not a tickbox. So you need the right people that are consulting to you and checking. Despite all that you could still not be transparent – you need someone like me, driving this to make sure it is real.

- In the long-term the IFC EDGE's certification is designed to evolve. Its going to become harder and harder to achieve the certification we are currently going through. Overtime in the long run you are going to have to get smarter and become more innovative
- Environmentally conscious (Everyone wins financially by going green) – Massive educational program – Balwin “taking it deeper than green”, all our utilities are pre-paid. I was the big one who drove that – if you haven't paid your utility you haven't run debt. You don't need electricity you can still live with it. All complexes are pre-paid electricity & water
- Education to use the energy
- Education with green
- Green can make it cheaper for you to live
- Big one is education of banks to reduce your mortgage rates. The rest of it is reasonable to quantify, some impossible. Mortgage is crystal clear.

Interview transcript 2: Nikki Fischer (Anglo American)

1.) Is CCS feasible for a country like ours?

No. I think the problem in SA, the pilot project from a capacity building and learning and development aspect has been a good thing to go through, relatively cheap in the grand scheme of things but I think given the storage basins are mostly likely offshore and we have done no research and characterisation offshore yet. We have hardly done the

characterisation onshore yet. Our CO₂ sources are a minimum 600 km away on the Highveld – I think its not going to be economically feasible. Also, with the decommissioning of the ESKOM power stations, Kusile and Medupi would be eligible (Medupi is too far so it would only be Kusile that could potentially be used for CCS) and I think in the state that our economy is in and ESKOM is in there are so many other priorities that CCS will be right at the bottom, unless there is huge multinational funding to pay for it. If not SASOL is a good source but I don't think they will pay for it unless the carbon tax hits them that hard but its not going to be a 1st priority. From that perspective my answer would be a no.

If they were to look at smaller pockets of storage on the Highveld or areas closer to the sources, I think that would be more feasible but it wont happen through an organisation like SACCCS, that SASOL would do themselves. It would be a private project and storing CO₂. On a national level, CO₂ storage wont work.

2.) Anglo – Founding member of CCS and the storage atlas. What is the company's stance on CCS?

We believe that CCS is a pretty good technology and we back it 100%. It's not quite off the shelf yet but it's almost there. From a technical point of view there is no issue with it and we do a lot of lobbying internationally (advocacy around CCS) because it is an absolute critical technology. Our view is that the coal, oil, gas industry – all of those technologies are going to require CCS. If we are going to be carbon neutral by 2050 we need CCS. We do a lot of advocacy work on trying to get governments to put the right policies in place to accelerate CCS.

3.) Policies and frameworks developed to guide CCS?

In SA, at the moment it's very much of a stick approach. In terms of CCS it needs to be more of a carrot approach. The US just implemented their 45Q policy (see documents that she sent). Part of the coal ministry advisory board – reporting to the IEA. Focus on the past 3 years has been on CCS and policies around CCS – Fully articulate enabling policy around CCS). There are different categories – We need something that will sort of incentivise CCS, some sort of tax incentive. We need to try and give companies some sort of comfort regarding long-term liabilities and not that companies don't want to take on that long-term liability (a mining company would take that on any day) but you need to have some sort of certainty around it. Then there's also some regulatory permitting kind of aspect which we haven't gotten to quite yet and even internationally. Permitting the actual project but also pipelines and – in the US (6-7km of pipelines). It's a lot easier to do there and to try and permit every pipeline is not an easy task.

Another thing is that it's not a policy but it's an enabling thing for CCS is transport and storage – you're going to have to collect the CO₂ from various places and then transport. We would then need to see the SA'n government put in the infrastructure to collect all the CO₂, consolidate the CO₂ – that infrastructure is really important.

4.) Infrastructure, resources – Is that something the government implements and takes out of their capacity to do that?

I doubt it. If we look at how much the government has put in this CCS pilot project they are not going to be putting in that infrastructure.

5.) Slogan 'Mining going green'. Is CCS an option for them to implement and reduce their carbon emissions?

No. So, in SA, particularly coal mining is fairly low in terms of our own emissions/footprint. When people think about coal mining and the methane that comes out of coal mines, is actually more relevant in the US & Australia. In SA our geology is really old so a lot of methane is already vented. We don't pre-drain any of our mines, the methane that is so low that we have a ventilation system in our underground mines to ensure that it is safe. If we do get methane pockets they can be explosive so we have our ventilation systems on that. And we are in the process of installing continuous methane ventilation shafts.

Mining companies wouldn't ever implement CCS for our own purposes. With CCS, you would also need a point source of CO₂ which makes SASOL such an ideal candidate. Ours is more diffuse – diesel emissions and our vent shafts quite low. That's a lot of the reason I don't see CCS happening. For us we will never do CCS on our own, we will advocate, we will participate and facilitate – involved in FutureGen Project in the US, unfortunately ended up not happening.

6.) Why isn't there a discussion happening around CCS amongst the important stakeholders?

There is just a complete lack of interest. Even just working with the DOE and having them present in meetings – the guys involved really try but when they have to go back and take it to higher levels there is just no real commitment from government. It is one of the 8 flagship programmes but there is no commitment. There was a intergov task team that was supposed to be putting the legislation together & probably met once or twice in the 8-9 years. You never hear anything coming from them. Even in the SACCCS meeting – you never see water affairs – Deborah Ramalope and there was one person in DEA. There is just very little interest from the government departments and I don't know whether that's

because, its not being promoted in government by the DOE. SANEDI – because of all the delays in the project don't really have new good stories to tell.

From my perspective there has been very little outward communication of whats going on. Also, there was the techno-economic feasibility study and one of the things that I have been punting all the time is that part of SACCCS mandate is to look at whether CCS is feasible or not. And things like that is not just something that people should put on their website and hoping people will find it. It is something that should be taken to the public, parliament and to people high up in the DOE or whoever will be responsible in driving CCS in the end and say to them these are the findings of the study. But those studies are kind of done and they are just kept internal – websites are not enough for that. People are not going to look for it. And I think there has been a serious lack of communication and that's why there is so little commitment from government.

7.) Could green bonds – proceeds – to fund CCS?

I definitely think green bonds have a lot of potential and I think we would need to see more good news stories coming out of SACCCS to stimulate the investor appetite. I do think especially with carbon tax coming in now, if there was some way companies could use that as like an offset against their tax or carbon budgets – incentives. Again, that comes through the policies to incentivise CCS but I think if green bonds could potentially be integrated into the carbon offsetting regulations or against the tax budgets – there would be potential there from business.

But I think in terms of environmental responsibility and awareness, I think the general public would be also contribute. We also need to look at the economic population dynamics, so the people who have money to invest, given our unemployment rates, how much would we be able to leverage? Of the economically active, how many people are

environmentally aware and I think there are a lot. Globally, it is growing as a market. Its going to come down to companies

8.) Embark on CCS – Mining. Key lessons:

Two fold: Even though one is extraction and one is putting in, there is still long-term liabilities to both

And I think we can learn a lot from the mining industry in terms of catering and managing our long-term liabilities. We have come a long long way in mining and there's a whole bunch of new legislation of liabilities. CCS can draw a lot from that and be a little bit cautious – impacts are never going to be that impactful. Even though we don't know in the long-term what the impacts might be. It would not be too onerous otherwise people wont do it. The other thing is the ground below rights. Historically in SA mineral rights, supersede surface rights so if there are minerals in the ground and the surface owner but the law on the side of miners. With CCS you don't need to do that because its sitting underneath – who owns the resources?

CCS storage basins? Who owns that – Gov.

What's the future of CCS in terms of land?

Interview transcript 1: RMB with Angela Mokone

2019/06/19

1.) Roles and Responsibilities

- Investment team and responsible for lending to large corporates, municipalities and corporates

- Debt capital market – arranging funding for corporates, sovereigns from SA and other international companies across the world

2.) How did RMB become involved in the green bond market?

- City of CPT + IFC.
- City of CPT mandated for 5 year period and mandate entitled RMB to be the sole arranger for any of the cities sole debt capital market issuer. During that mandate City of CPT was the one who approached us and indicated that they wanted to do a green bond. The Climate Change aspect is an important part of the municipality's vision and strategy. They were the ones who wanted to kick off.

3.) Private sector is really involved in the green bond market over the years.

What has spurred that has appealed to the private sector to be involved?

- A couple of points: With the likes of Nedbank it would make sense for them to shoot for a green bond because their whole image as a bank is around green.
- GrowthPoint – Buildings and Properties have green star ratings. It seemed a natural route
- City of Cape Town – Strategy around climate change, adaptation.
- 1st thing is corporates identifying where the green is. So there's obviously internationally there's a large profile around green and slowly that's seeping into SA. What we are seeing generally is corporates who are being a lot more conscious of ESG topics. That has drawn in a bit more conscientiousness to these corporates. What are we doing from an environmentally friendly perspective? There's already that awareness that corporates need to play a role and then looking at specific corporates who have a natural fit towards green who are then saying we are

already doing these things. Why not go out and issue a green bond and the benefit a lot of them are seeing is that it creates quite a nice public relation/publicity spin for them. It highlights the fact that the company is committed to environmentally sustainable procedures.

- Another thing which is a catalyst in SA is the fact that the JSE has established a green segment. That creates a bit more awareness by corporates and investors around green products. The fact that there is this awareness would obviously drive corporates to say maybe they should also issue green bonds and it would also drive investors to rather invest in green bonds rather than conventional bonds which are not necessarily for green purposes.

4.) The benefit of GB for public relations. What happens where globally several companies go into the green movement but several backlash from society that this is a scheme of greenwashing and how do we prevent this in SA?

- We were not involved in the city of JHB but from what I have gathered, there was a bit of scepticism around green bonds because the views from the market was that the City of JHB bond was not necessarily green because the proceeds were used for building some of the roads eg: ReaVaya roads and there was a sense that it was not actually green. The city of cape town was asked by investors to get some sort of verification to say that the bond is actually green and is not greenwashing. With the City of CPT we used the CBI (well established, global organisation) and has specific standards as to what would actually be classified as green and went so far to get a pre and post issuance verification of the City of CPT to say that they actually comply with the CBI's standard. Coupled with that the JSE also ensured that the credibility of the bond listed on the green bond segment, the JSE has

specific requirements of which the bond issuer would need to comply with those requirements. One of those requirements is that the bond must actually adhere to the green bond principles or to the CBI's initiative or to another standard, provided that the JSE is comfortable that that standard is sufficient.

- As the market develops, where green financing and green bonds becomes a lot more prevalent I think more people would have a more developed framework of the standards that market see that giving them comfort that the proceeds are actually going towards green.
- You definitely don't want greenwashing as that would damage the credibility.

5.) Do you think that with a developing country like SA there would be a need for us to develop our own regulatory framework for GB's? Nigeria – own Nigerian principles. Would we start to see that in countries like SA moving forward?

- We already have these international standards which I think to an extent fit in with what our domestic requirements are. JSE has their own standards
- Would we need a CBI specifically for SA who would deal with SA'n projects? Possibly because when you look at CBI and the specific standard, for eg: around green buildings, because a lot of countries that the CBI is involved in, the standards are not really achievable for SA so it may be worthwhile to look into that.
- So on that note what we did with GrowthPoint because CBI, their green building standards are not applicable for SA, we then had to go to the GBCSA, we used that as the standard. Because the CBI was not at the SA'n context. It might make sense to say do we need to develop an accreditation for SA where the standards would take into account SA'n dynamics.

6.) Would we need specific legal and regulatory frameworks that would guide the green bond framework?

- On the regulation side we have the JSE to regulate GB.
- What you also don't want to do is stifle innovation by also having specific regulatory framework that says "in order to have a GB there must be a,b,c" and you may find that it actually gives the market from innovating and developing. Eg: Now in the international market you have green sukko bonds. It's a Islamic bond but it's a green bond. You want things to morph into what the market really needs and to put too much restriction into it might actually prevent that but I think to get around it is by having a strong and independent accreditation body who looks into the form of the instrument and the substance of instruments. Look at the form of it and determine if it is actually green, there wouldn't necessarily be any legal framework around it as what would count as green.

7.) Who would be the main stakeholders involved as accreditors?

- I guess Gov somehow would be involved.

8.) Quite disappointed in gov in utilising GBs

- We deal a lot with national gov & esp the team that raises debt, that raises funding. We have approached them a number of times on concepts such as green bonds, social bonds and I agree with you that they definitely have sufficient projects that warrant green. They could definitely use GBs to fund them but their stance is that they don't like raising funding that has a specific sort.
- Eg: National Treasury would go raise a normal bond & the proceeds of those bonds can be used for anything (general & there is no jurisdiction). There wouldn't be

any restriction of what the bond would be used for where as for a green bond on the basis of your proceeds, you need to say what you are going to apply the proceeds for. In a sense it does restrict the use of proceeds and gov doesn't like that.

9.) In your opinion do you think there would be added pressure on gov in the future to consider GBs as corporate sector is really active?

- Maybe the Q comes down to if you look at the likes of ESKOM, I think we see more pressure in that. Eg: Investors might say that they may lend to ESKOM if putting it into green projects. That would put pressure and have no alternative.
- For gov @ this stage I don't think they would get to a point where they are so under pressure. They still have access to so much funding.
- What usually happens in the SA'n gov with capital markets. As part of gov's role they have a role in developing the market too. That would mean they 1st entities to issue entities to set the benchmarks and set awareness to investors. Eg: Nat tras – 1st to issue a sukkok. You would also want NT to also issue a GB to gage the awareness & ideally it would be great for market development.

10.) Is there a lack of awareness/knowledge on gb's?

- Yes I do. When I speak to institutional investors such as Sanlam, Allan Gray, they are managing funds on behalf people like you & me. When AG how would you like me to invest this cash? As long as it is the highest yielding cash but if you and I say 50% of my cash that has a green outcome. That puts pressure on AG to find investors that are green & then AG would go to a corporate like GrowthPoint

(green assets) that would drive the outcome, it would start with us as consumers to start with green and want green assets. ‘

11.) Green eligible projects – are we limited? CCS, CBI taxonomy & its not in what happens in that case?

- I think it goes back to your point, if an investor is adamant that they want an independent body to verify that this is green – I think that whatever the project you are investing in would have to be green otherwise how would you get that accreditation.
- Some investors have inhouse experts who also look at a project and analyse how it meets those objectives
- I do think to the extent that specific form of technology are included in the taxonomy, it does make it easier.

12.) What hindrances and opportunities for GB market?

- The hindrance would be the fact that the if as a corporate eg: City of CPT raise money through the market, why would they go to an extent of issuing a GB
 - There's additional requirements the JSE sets out over a bond & additional req's & reporting for the JSE
 - There's additional cost – you need to get it accredited by a CBI
 - You need to get an assurance post, pre and firm from issuers
 - There's additional costs and reporting requirements, additional cash raised that you need to use for additional purposes. You cant use the cash for general purposes

- These are the challenges that may inhibit the ability of the GB market
- Advantages: Public relations/publicity around, that the company is promoted around good governance
- City of CPT – Cost of funding was actually cheaper than when another municipality would need financial metrics, it can be argued that there is a pricing benefit. More investors want to get their hands on a green asset, scarce commodity & it has a feel good factor to it
- Overtime GBs do result in a pricing benefit – International articles.
- Entities that issue GBs generally have strong corporate governance practices which would mean they can borrow at cheaper rates

Interview transcript: SANEDI with Wiseman Ngcobo

1.) Your roles and responsibilities

Responsible for SE for pilot project for CCS. General CCS awareness and platforms, engaging with stakeholders (Gov, environmental NGOs, companies). I'm the person who sort of knocks and opens doors

2.) CCS key climate change mitigation strategy. In your opinion is it a key technology for countries like SA?

It's a very big yes because CCS has the potential of curbing CO₂ from industry to about 90% & the role that CCS would play on a global scale would be about 10% efforts put together to mitigate efforts against climate change. W/o CCS there would be that gap, there's a critical role for this technology.

3.) Can you elaborate on what SACCCS is mandated to do in raising awareness and engaging stakeholders with regards to CCS?

We are governed by the Public Access to Information Act with that there are guidelines and frameworks. King 4 is one of those that we have to be open and transparent with our stakeholders. Internally we have a plan that drives out how we are going to do that. Our mandate is to make sure that people know the risks and benefits of CCS so that they know that if they say yes they are saying yes to what. What are the implications of having CCS in their backyards, we do work so that people can understand the basics of CCS as well as any associated risks.

4.) What are some of the NB strides SACCCS has made regarding CCS in the country?

There are quite a few but we should be doing more. We have been able to ascertain that CCS can be done in a country. Eg: Atlas shows we have 150 gigatonnes of storage potential but if you read the feasibility and characteristics of different basins this would come down, you would now know how much you should store. However, with the amount of CO₂ stored in KZN. UMkhanyakude has the potential of storing almost 400 mill tonnes.

We also have been able to get experts on an international level and locally to share ideas around CCS and take that to the people in the form of conferences and workshops and we've also been able to analyse all the geological data to make sure we understand the

permeability, porosity and structure of basins. We have done a number of things. We've been able to get CCS endorsed by cabinet in 2012 and CCS named as one of the 8 flagship programmes on the white paper for climate change and CCS mentioned in NDP road to 2030, and developed roadmap even though we are sort of lagging behind (guides us how we will get to a commercial stage of project)

5.) Endorsed by cabinet. No law. What could be some of the potential barriers to CCS in the future?

Legislation is one, however, we just had the Carbon Tax Bill approved and endorsed on the 1st of July which is sort of a plus. How you would want the Ctax to be is for every CO₂ emitted into the atmosphere people would have to pay for a tonne now we are subsidising that to the environment but as industry they should be able to pay off so it's a tax on the environment.

6.) Could things like land reform be a barrier to CCS? Energy politics

Not really a barrier. The current structure right now is owned by the state and is governed by the Ingonyama Trust Board which owns about 75% of the area in KZN in which 25% is privately owned. In the areas of interest, majority of the land falls within tribal land which is managed by amakhosi through the municipalities and they have got the Trust.

How I see things panning out is eventually we are going to have to get permission to occupy so the PTO in place and you pay for your duration of stay/work. Other than that we might just have to enter into an agreement with a private owner (generally how its done globally)

CCS is a very unique project in SA. Globally they are either blessed with oil or gas so they will use CO₂ to enhance or pump out oil & monitor how much CO₂ remains stored. That has a commercial value to it and people can then be able to lease out or buy that land. SA

we own up to 10-50 m of subsurface & everything after then is government. SA'n demographics in the country are so unique. We will have to make sure that the nearby traditional councils are aware of what we will be doing and how long or far away the C02 will be able to migrate in the reservoir once we start injecting. Should it happen that it overlaps and goes over someones jurisdiction you then talk to the person and ensure that there are proper agreements and measures in place (Management Acts). There are many things we should consider as a country and we are fully aware of it and we are taking those things into consideration with our work.

7.) One of the debates of CCS is it likened to mining?

There is some learning from the mining industry as the principles are almost the same because mining is drilling below the subsurface, CCS injecting C02. Depending again what you are mining (eg: oil, similar geological structures). The sandstone holds gas and oil for millions of years w/o it coming out.

With CCS, it gets even interesting, people confuse it with fracking. When you talk about CCS you need to talk about the difference between the two but fracking looks at the rock layer, impermeable rock and force the pores to connect (put pressure). With CCS you need to understand, pressure must be below and not on the subsurface (C02 escapes) – what prevents C02 from escaping is you do your characterisation 1st (characterise the reservoir). This is where the fear comes from but people need to know & understand what you mean.

8.) CCS identified as an expensive project to embark on. Green bonds?

Side note: GB Taxonomy: CCS not on the list

Could we see investor appetite for CCS?

It's a difficult one as there is a big debate on whether CCS should be done at all. So now we are having a risk globally where countries like the US don't want CCS in the country as there is no money available. US though has reviewed their stance on CCS & they are now looking at the financing side of things and they talk about Green Bonds. But this debate is still going to be there on whether do we want to do CCS or not.

Again the moving away from coal completely is a sensitive topic. Eg: Secunda

- 9.) Is the challenge around the lack of climate finances or what exactly we should be investing in to transition towards a low-carbon economy?

CCS is that transition tech, however, there's never been intensive debates or talks in all these conferences how this transition will be funded. When we committed to our CO₂ reduction goals, we then said that it's dependent that we get finance and the right technical support from the developed countries and it never said anything that developed countries have to fund us.

What happens if there's a big global recession & they can't continue funding us? We will have to review our strategies & go back to the drawing board. It will be an unfair situation.

- 10.) What policies and frameworks do we have that will guide CCS in the future?

Investors want to see p&f

We do have guidelines & a framework for legislation & it looks at 5 options:

- a.) 1 we develop CCS specific legislation which will take years and years
- b.) 2 NEMA – You look at that
- c.) 3 You look at NEMA Waste Act

d.) Look at the MPDR – Got to do with mining

Look at these acts and look into the 3 the existing ones one of them talks about CO₂ storage, especially the Waste Act as a hazardous waste but how do you dispose of that waste is not articulated. You will have to then review one of these 3 & incorporate CCS into it or say forget about everything else and just do a specific CCS regulation. That's the guidelines and framework we are using currently

For our work we have a geoscience act which helps the Council of Geoscience to do specific research on geology. Which can take us up to the characterisation phase not the injection. We need now an act to govern the phase from the injection going forward.

11.) Do you foresee this being debated in parliament? We've missed the 2 big goals. When are we going to start having these discussions on a big political level? Anything is possible, you might find that this current minister is supporting CCS or opposing it.

12.) Are there any other issues around CCS that tend to be overlooked? In our case, SA has the issue of the legacy and how people would benefit out of this. It's sort of a chicken and egg situation, you don't want at any point to come across that you are bribing people to drive your mandate which is most likely to happen. It's very tricky.

13.) Is there potential to derive the commercial value? Eg: Canada
Yes & No. Yes in the sense that you have got many prospects in Moss gas, under PetroSA & they have the potential of oil & we can use the CO₂ to pump everything out and petrosa produces the oil to its maximum.

No in the sense that if sasol, eskom, anglo are not initiating that role to finance CCS we are going to be in trouble if industry.

14.) Is industry interested in being involved?

There is an interest & established under the charter consisting of all these companies. It ran for 5 years then we reviewed the process & felt their contribution was not really big but serve in the advisory committee. There is buy in but we can do more (Steel and cement industry).

Interview transcript: Nedbank with Bruce Stewart

2019/06/28

Nedbank – We see money differently. We want to use our natural skills, we have a sustainability unit, we are signatories to everything in the universe that comes to green that is sustainable from the equator principles. We are one out of 106 banks globally that is rated the top in the carbon index. The point is we have done a lot in terms of CSI

operational. Where we haven't been that good is developing a product and managing our services and advisory services to a point where we can meaningfully contribute to the achievement of the MDGs that we have identified as Nedbank. There are 17 and we selected 9 of those that are applicable to a financial institution.

Its incumbent on us as financial participants in the market, we have huge leverage & resources to direct intentional investment, impact investment & also to educate the world around us that impact investment does not necessarily have to be concessionary investment. You can have intentional investment with commercial returns & you can still tick the ESG box in many many ways. Of the 9 SDGs that we identified each one of our members has taken accountability for one of them to implement eg: SDG 7 – RE in whatever form whether it goes to the investment banking space where there is big money or banking or retail banking & we roll out.

How do we support and manage our commitment to a sustainable community, country. On the back of that we said okay we are very big in the RE finance space & spent a lot on the RE projects that are happening in this country which is probably about 90 bill & we've committed 40 bill as a bank just into RE. We are on the path to roll that out, we started on an x number of projects but obviously there are more projects & finance going forward. It is possible for Nedbank to finance a good portion of it but not all. Why don't I crowd in private sector investment? Why don't I create a mechanism where I can get big institutional money to be able to invest in that? With pedestrian economic growth there are not a lot of fixed income investment opp's as our market is not growing. So to go to the asset market class and say Allan Gray & other pension schemes and say you have got deep pockets, the SA'n pension role is huge but we need their money and private capital to be deployed to these projects to drive eg: infrastructure & RE.

So what we did we were like okay we have got to create a framework that will not only tick the operational box but the clients box, we need an internal framework to put money. One has got to understand that there is a need for the capital & classifying something like this as green. How do you do that? You have got to educate investors & say listen okes this is what you will be investing in, this is the credit, this is the green certification, this is why you can invest in, this is why you can claim ESG. Look at your portfolio management and say your portfolio is invested in sustainable related credits or green credits, social credits as there is a whole taxonomy that sits out there then I can show my trustees that. The trustees would say great because more and more we are going to see just like we have credit ratings, we are going to have ESG ratings & not only a credit rating review but the ESG rating review through an ESG committee you are going to get a rating on that this is what we are transitioning towards (This is going to become such a critical aspect in terms of how we direct & manage funds). Its on the back of that that understand the investor universe and what they are needing and what you need to provide them with assets & telling them why they assets will compound. That is sort of the groundwork. But the awareness is growing like exponential just a mere fact that you are here wanting to do a PhD on something like this saying guys best we take cognisant of this. So those are the projects & project benefication. I saw all of this and all of these parts & I was like lets put this together so we can put end to end & use it to create an awareness out in the public about what we do in Nedbank but what we as a financial banking community do as a country are doing to manage everything from climate change to social upliftment. That includes affordable housing & the whole story.

If you understand that SASOL emits more carbon than the whole of New Zealand then you understand that ESKOM emits 5times more Carbon that SASOL. You start understanding

how much work we have got to do & that's all nice when you look at it from a 1st world perspective but when you look at it from a developing country, an emerging market you have got to prioritise what are the important things & so we have to talk about affordable housing, water, infrastructure all of that becomes on Maslows hierarchy of needs that's no.1 & we have got to juggle with this a foot in the 3rd world & another in the 1st world & we have to manage that entire spectrum as we grow and lift ourselves up.

We do our bit, I look after the debt capital markets for Nedbank & we saw this opportunity to drive this message, we have done it & now we are on par, we will be rolling out more RE bonds & down the line hopefully social bonds which will have more impact on affordable housing. But then you get into concessionary finance as to how do you fund these bonds?

We issued a bond – There are a number of ways we can classify this. We called it a use of proceeds. We said the proceeds from the bond that we raised to investors, we issued a green bonds & this is why it is green. The designated use of proceeds, I have got to use those proceeds strictly for the designated projects that are green or RE. We identified 4 projects that are worth about a billion rands worth of projects that still have got to be developed, its not re-financing existing stuff its just new stuff & we raised 1.6 bill to contribute to the financing of that & it was the use of proceeds, we monitor the amount of funds that come in, we track them & apply them to a specific portfolio. All the time monitored and tracked & then get external verifiers that provide us with external opinions eg: Verification agent called C Trust that could say this is what you want to do & how you do it. Because they are a global organisation & universally accepted, it's the credibility you are looking for. CBI provides us with a certificate that says CBI & these guys have the right certification that complies with GB principles etc & they are under

this SDG & you can align it & map it & so CBI would give us a certificate that says you are now certified & these are the green assets. We give this to our investors. Right now there is no material economic benefit, you have got to issue a 5 year insecure bond & a billion raised capital like that for general corporate purposes, we priced at x & we expected this bond to be at the same price, what happened was we got a much broader range of interest & because of the over-subscription, 3.8 bill rands of interest, you would say Id like to buy it and we would allocate that to the cheapest pricing.

Because it was R1.6 bill, the pricing came down a little bit. I have a green bond & the price went down a bit. I don't want to tell you that it was because it was green. We had investors participating where they would not have normally have participated but because this was certified green & it was for infrastructure development & we were adding to the RE mix globally a lot of asset managers that would not have been in our auction participated. This is some of the dynamic & that happened & there has been more publicity & interest from dept of Trade & Industry on how do we have foreign investors investing in our bonds here, bring cash in SA. Dept of T&I talked about how do we work with you to design & attract more capital to SA because ironically foreign capital only comes here due to interest & we have a very liquid market. They hold 400 bill rands of gov bonds listed on JSE but that money comes & goes. What we want is money that stays, they don't invest in corporate bonds as there is no liquidity in that. They would invest in green as they have concessionary mandates & they are not fussy about the price or liquidity. They want to know that where that money is going is for a cause, that it is intentional impact investing. This system is still in its infancy but the whole idea is to have attractive financing assets & alternatives to get that capital into this country & get investors interested in that as well.

We have got to work in reverse & say asset, what assets are we looking for, how does it qualify, what it will fall under & then I can sell it to whoever is out there because I know that that GB market is about 200 bill dollars & we want to be part of that and feed into that. I saw our RE & lets work on moving that into a public green space. You don't have to finance that by yourself and everyone wins.

How do we take our learning that you can put it into your research? And its the framework that we went through, developing the internal framework that allowed us to identify assets & what wont work. Right now everything has got to have a commercial focus angle. Like I said it will move from returns to impact 1st but we are not there yet, we are still in its infancy but that will come.

How do you avoid green bonds labelled as green washing?

I think that will always be a challenge for this market as it develops. I mean globally people talk about additionality & GW. The skeptics will bring out & when you are only using it for profiling, I mean RMB is my most visible competition. It's a very healthy competitive space & ultimately we want to work together to drive & create awareness. Because we have control in finance we should take a leadership role on how this will unfold. This means being at the forefront of convincing the skeptics that its not GW, this wont be an additional cost with no benefit. This a lot of the challenges I face. Last night I was on classic FM speaking about this very same thing

For me this is coming back to your question & your specific focus on carbon. Fortunately we did a RE deal to managing climate change to keep it below 2C by 2050 (Climate Paris Accord). That is pretty much focused on a low-carbon economy, your whole world has got to relate to how do we contribute that commitment of keeping temperatures under

2C for the next 30 years & what is the best way to do that & how do we as all participants to take this seriously.

I had a conversation with the CEO of Sasol, on do you know that the Norwegian sovereign fund is the biggest investment fund in the world & just tagged SASOL as a non-investment credit because of your carbon emissions. They are looking to strategically change. Its changing the way big companies operate. This is starting to influence the mindsets of that level so don't for a second (you will encounter lots of hurdles) don't for a sec think that this isn't where the future is, this is 100%. The next client of mine is SAPPI they run 400000 hectares of cultivated forest tress, now we are talking about carbon management (that may be a whole new area for you to explore). Understand the role of nature in managing carbon flow globally.

Green bonds come in two forms: Adaption or mitigation. Adaption means we restore forest trees, we clean rivers out. Mitigation says we replace coal fired stations with RE power stations. Green is quite a focused area under the umbrella of sustainability. Yours seem as if it is focused on that & very orientated under adaptation & low-carbon economy focus.

The question is, & this is where the biggest challenge will come. What projects are there that we could abide by & add to whatever we have got going on here? Carbon storage, reduction in carbon emissions

List of projects from CBI, quite limited funded?

If the projects were there, the funding would be there. Show me the project, show me the technology & I am happy to fund it.

Should we be having more of a discussion around what type of project they would like & investors with SACCCS exploring opportunities within the space?

Sure, I don't know much about the world of CCS but I am very keen to learn about it. Because just like reducing emissions is absolutely critical & everyone knows about it & its now tangible eg: cut out a power station & put a wind mill or solar & you change the energy mix which is contributing to.

What are the CCS technologies? Who knows about this & how are they? This to me is more like a need to understand the role of CCS technologies – what it can and cannot do. Maybe there is a whole knowledge around tech around CCS & how best you would do it. Because if we can come up with proper CCS technologies that can not only store carbon but deliver another added value because its like when I move from coal powered to wind. Im still producing energy which I can sell – I am just moving a bad source to a positive source. CCS is taking carbon out, am I going to get credits on that? Can I monetise credits? What is the global price for carbon credits? We are not there yet. That is something you would want to implement and discuss and say in the evolution of these initiatives, like I said, we started off with traditional investment then we get into impact investment & our impact investment stage where commercial returns. We are not going to progress in that unless we can start in evident commercial returns, the skeptic hurdle is too heavy and too high to climb up. 5-10 years from now it is a different story. We will be less focused on the return side then there is today. So you talk about ESG, I talk about double ESG. Environmental, Social, Governance but Economics (That's the focus of where we are).

When we talk about carbon storage, we know what the ESG is, tick 100% but what are the economics? And that is what you are really going to unpack because that is in essence what we would like to know.

Find me the CCS technology, it informs me about what is out there and what is possible & I may have an opportunity to say that is a scaleable & eommercial project where we can create an asset class & fund it. And then we have a low-carbon bond

Nomhle: I explain CSS. We are way out of target

Bruce: SDGS goals we are all signatories to it, ESG are all voluntary. Voluntary can only take you so far in terms of getting people to commit. What I am hearing you say is political is that you have got to make these things mandatory. Assuming that the political will was there.

Does the technology exist? Yes

Can I park it next to Kusile and Medupi? Storage part is underground. Special rock absorbs carbon.

All my costs will be on the capturing, transporting and storing. All I see is cost, cost, cost & I am saying that is costing me & where is my commercial return? What you are talking about is very sophisticated & assumes you have got the infrastructure to facilitate that & the access to capital that is philanthropic because the concessionary requirements to fund this kind of technology where there is no visible offtake is going to be really challenging. That is the problem you face.

What do we do now? LOL

Maybe an alternative is not to go the expensive route & say how else can you store carbon? Because we know that storing carbon is good & we want to aim for that. Getting carbon out of the atmosphere is better for our environment so how do we store carbon naturally.

Explore how we can explore carbon naturally. How does we harness nature to store carbon for us? The other thing is you take carbon, you put it under the ground & you are saving the carbon producer a huge amount. Is there a carbon benefit? Do I get a carbon credit for doing this? Can I sell my carbon credit? If I can monetise it, I can pay for it. That model can be done but you have got to understand the parameters of that model. If you are going to use CCS & those 2 basins you have got to understand the financial basis of capturing, storing & transporting relative to the what you can derive from the sale of carbon & you can get monetise from the credits you would have obtained.

You really need to have a business model. This model was done a couple of years ago & it needs to be reformed. Now it's a completely different landscape. I mean look at the awareness of green & sustainability 6 years ago, I was completely ignorant. But when you get into it & you start realising how significant it is you just got to be better at it & we all have to be better at it. Everyone should have a better understanding of how to save the planet. The skeptics may say that there may seem to have an upfront cost in in all of this but the cost of not engaging is going to be magnified so just understand that dynamic. There may be additionalities but by not participating & being part of the solutions you become part of the problem & the world is going to exclude you. Guys will not invest in you, not in equity, not debt. You will not be able to raise capital if you are not aligned to the world & also as an institution for the longevity, you need to connect with everyone around it. There's a whole social dynamic that needs to happen but it's the kind of thinking that we need.

When we talk about CCS its about impacting peoples lives. When you can connect with the people on every level you will see how solutions find themselves very quickly. Something like this you need to do some soul searching & how this is going to unfold.

Why has there been an investor appetite from the private sector & not really from gov?

Both COJ & City of CPT identified projects. COJ (Greenwashing). There are some lessons to be learnt from that. GrowthPoint specifically into buildings. Nedbank went for specific projects. Why is the private sector seemingly taking a more front seat than gov? Gov is so inwardly focused on itself & the drama, corruption & like I said this is like cutting edge 1st world thinking & how does that play out in an emerging market that cant govern out effectively? You look at municipalities & audit reports, how do they even have the credibility to be green? This is a trust deficit that has been built up, there is a trust deficit b/w where institutional money is at & SOE's. Transnet doesn't issue bonds, ESKOM DENEL would like to tap into capital markets & they haven't for the last 2 years because the governance is unequal. If you don't build up the trust and exposre, that money is not going there. In the private sector, we can come up with a private sector project where you can verify every single thing & you have global insight on top of that.

That's why we bought the RE Nedbank GB because we trust CBI & we understand where we are going. I think that is why you may not have seen much come out of gov. They would love to do it from a brand point of view but theres the credibility issue that largely exists & you wont get proper support unless you get the credibility gap closed.

In your view what is the growth of green bonds in our country?

No question, GBs like anything will have its up & downs. I don't think it will be a down but I think it will plateau & then increase as we get new green technologies that can be put into investable asset classes. RE is 1 of those. CCS might be 1 in the future. Its not there yet as the economics don't stack up but you might get the philanthropic side supporting that down the line, if the technologies can support it. There is going to be a

continual growth of green alongside social bonds alongside sustainability bonds (integrated of green & social). When one looks at sustainability bond one has got to look at green. Because often you can have green with a bad social impact or vice versa. Where they both work together you get a sustainability bond.

The green sector absolutely. We were fortunate in SA because we had a focus on RE, it is a natural fit into green & carbon emission reduction. If you are a global investor & you want the best return for your money globally in terms of a dollar & carbon you are saving. Your best bet is to provide an alternative energy source eg: Wind farm or solar farm & they buy a RE bond they are getting the most carbon reduction for their dollar than anywhere else at the moment. And we have a big market here that has put us on the map & we have energy programme, participated by gov, & grateful for them for allowing that to happen that has been significant in the energy infrastructure. For SA that will be ongoing.

Kenya, on the other hand, they are all RE 100%. The governor of the central bank of Kenya is the patron for green. Its all about creating awareness that we all need to do our bit. Everyone will see different asset opportunities & everyone will want to finance different asset opportunities.

We have challenges that are social, political & trust related that will take time to resolve. Not a whole has to go right for this place to change radically. Africa is an amazing place if we can get a couple of things right we can be global leaders in so many ways.

How do we do that? Start with your political leaders? Start with you running for president. Run the country like a management team, like Singapore. Its all possible, you've got to get that mindset in the right space.

Interview transcript: JSE with Thato Matsafu

1.) What are green bonds?

In simple terms, a green bond is a bond that is financing green projects so it would look at issues such as low-climate initiatives around the environment to that point the latest GB that was issued by Nedbank it was to fund renewables, talks to clean energy. Whatever that can be classified as green, GBs are used for that.

2.) What has the JSE been mandated to do to create awareness of GBs?

We do a lot of things but for GBs specifically we had to campaign, especially leading up to the Nedbank issuance (document I will share with you on what is a GB & benefits of issuing one out)

From a JSE perspective we have a dedicated segment on our exchange that is dedicated to GB issuances. The segment was launched in 2017, the 1st issuance that was done on the segment was the City of CPT. The city was raising over R1 bill & the issuance was over-subscribed which shows the demand from the investor community. It just shows how hungry the asset managers are for this type of bond. Subsequent to that GrowthPoint came 2nd & was the 1st commercial enterprise/business to issue out a GB. Their issuance was also over-subscribed. The latest was Nedbank 1st commercial bank to issue out a GB in our market also hugely over-subscribed & also I heard that there was also foreign participation.

3.) What is the difference between a GB & a normal bond? Why has there been investor appetite for this type of bond?

Your normal bond (In the market its called a vanilla bond), the mechanics are the same but the distinguishing factor is the use of the proceeds, what are you using the proceeds for or the money you are raising for because your normal bond you can fund anything across all capital projects. With green bonds it is specific, you address climate issues or climatic risks. So use of proceeds is one key distinguishing factor to a normal vanilla bond & then you would also need an independent evaluator who would then sort of verify the greenness of the project. At the JSE we are not restrictive in terms of the particular evaluator, so it needs to be independent so that we don't kind of like interfere in the process.

If you look at, there were other GBs issued before we launched our GB segment, COJ comes to mind, IFC & the IDC. Those are self-labelled GBs. Why is that? Because the GB segment was not in place & our GB segment was not yet launched.

4.) How would you avoid issues of greenwashing?

Hence the issue around independent evaluators who would then verify the greenness of this so I think that in its fact is to deal with this. An evaluator would then verify that it meets the criteria. Our GB framework is informed by IGMA (GB principles) before that GBs were based on the issuers or requirements but I think post 2014 when these instruments gained popularity IGMA then formulated a framework that deals with the issuance of GBs. Of the key 4 sectors is: The use of proceeds, how do you select a product/project, how you manage because the funds from GB need to be ringfenced because if you are an issuer you cant combine the proceeds, issue around reporting mechanisms and how you monitor.

The GB principles are embedded in our list of req's to ensure that all those 4 key variables are covered.

5.) Why is there a huge growth from the private sector but a lack from the public?

There Nomhle I will share with you my experiences. I was a city treasurer for the City of Ekurhuleni before I came here. At the time we wanted to issue a GB but capacity issues/constraints within the metro. I was running the treasury and didn't have competent staff capable to drive the GB process where we could categorise projects, apply the same principles that I just highlighted. I mean we had a no. of projects but system, capacity issues in terms of categorising them in terms of these are green. These are one of the challenges that I've seen because we needed to have projects like these to fund that are

green. In a case like this, people normally would take a path of least resistance of issuing out a vanilla bond or municipal bond.

I think also the laziness of people to, GB comes with added layer of activities from the issuers side & the reporting side of things unlike your normal issuing of a normal bond. Unlike a GB which keeps you engaged for the life of the bond. So I think what is more visible is the issue around capacity from the public sector & the issue of reporting might be what turns people off and lastly the issue around the awareness is key. There needs to be a lot of education.

6.) How do you go about creating awareness? With something like a GB uses jargon. How do you break it down so that potential investors can be interested in something like this?

The issue is not with the issuers. Investors would love to have green assets in their books as now there is a big drive to be environmentally conscious. So ESG is driving a lot of investment decisions in the market. In terms of portfolio management when you construct your portfolio you want some elements of greenness in your portfolio. The investor community wants this asset hence the oversubscription.

The issue to address is on the issuance side. To say issuers have you looked at this asset class? So a lot of awareness needs to go into that. How we address it from our side we, as I have mentioned issues around marketing before. Just before Nedbank came we would go ahead in punting GBs just to also support the successful issuance of that bond. Creating that awareness, when we are afforded opportunities to speak at conferences or thought leadership then we participate & highlight the importance of these instruments.

7.) What could be the challenges that the GB market may face in the future & the opportunities that lie within this space?

I see more opportunities than challenges to be quite honest. As I have mentioned there is a big growth to most of the investment portfolios to have an element of green.

Challenges is what I have noted: Capacity & just understanding of this instrument & just the awareness & education that goes with that but I see more opp's than challenges because the world is going green.

There is also talk, now as we speak we are formulating a framework for social impact so these things are related in a way. We are part of the National Task Team that looks at social investing. The committee is made up of bankers, regulators, academics to look at this new asset class & it talks to also SDGs as outlined by the UN. We want to be part of the process so when we do finalise the framework it is not only a JSE framework but that we have consulted wisely with everyone.

8.) Is it possible for us to have our own GB framework that is independent from your CBI, that is specifically for our country?

We do have. The framework that we used in terms of the issuances we have a GB framework that is incorporated in our listing BUT it was not a JSE standalone. We consulted wisely & went through different stakeholders (WB. National Treasury & the market in general).

Our approach normally we never go off tangent & do our own thing. We consult. Because whatever frameworks that we are coming with need to be relevant to the markets that

we are trying to sell. It is pointless to do your own thing & there is no buy in because you haven't consulted. So the GB framework is in place.

It also came through when we were looking to formulate the listed project bond framework. As we were busy crafting that there was a need to say hey have you looked at GBs? And it came by that way & we said okay while we do the project bond framework lets also incorporate the GB into that.

9.) Your trajectory of the GB. Would we see more private sector involved or is this going to infiltrate & hopefully gov will also be involved?

Well, I will quote what Bruce shared with me after they issued their GB to say they are expecting other banks to follow in that space. We would like to see as the JSE the growth of this asset class. Globally there is movement in this space to issue out a GB.

We have been trailblazers in this space, since 2002 we came up with the sustainable responsible index (SRI). We also out of the sustainable stock exchanges initiative we also looked at the responsible investing initiatives. We also in 2015 partnered with Footy Russell in the UK for the SRI also looking at ESG, measuring companies on those aspects. Also, our listed companies need to comply with King 4, it does require companies to report on Integrated Reporting & Integrated Sustainable Reporting. We are doing our bit, it is not a new thing. We have been at this game for quite a while. We are also looking at launching an ESG exchange fund. Those are some of the things in the pipeline that we are exploring.

Don't just focus on GBs. It is part of sustainability which is a broader aspect of this. There is a big drive from looking only just at ESG to looking at the entire 17 SDGs. The goals that are more poignant, goal 1,4. GBs is just 1 aspect of sustainability.

80% of the world's investments are on auto-pilot. Meaning there is a move from active management of funds to passive.

This is an exciting space but global growth is a concern at the moment.

**Interview Transcript: Sfiso Zikhali at Umhlababuyalingana municipality
(Transcribed in IsiZulu)**

2019-07-04

1.) Your roles and responsibilities within the municipality

Dept of technical services which has sections that are divided eg: Infrastructure & development, infrastructure finance, environmental management, development planning. Section of LED that goes along with tourism & deals with programmes such as EPWP.

DD in the department. Planning background. Section that deals with environmental management. My background is in town & regional planning.

2.) Involvement in SACCCS, how were you involved & the municipality?

What happened was that to be honest there is not much that has happened on the ground, except consultation, SE & public participation. SANEDI as a company. I joined this municipality last August. I arrived the engagements already started & I was also asked to join the team that deals with this. But in this there are key stakeholders in the province of which combine Economic development & Environmental Affairs in the province. They are obviously who have complete authority in the province to deal with things like these.

SANEDI's stance is to begin CCS from the Eastern Cape all the way to coastal (Khosi Bay & other locations) to check places that are feasible for CCS underground. The suitable place this side is Umkhanyakude.

Umkhanyakude covers basically 2 municipalities which is: Big 5 Hlabisa & Umhlababuyalingana. There is also a need to identify key role players & stakeholders. One is that municipalities cannot be left behind, that's how we got involved.

Two, KZN & land ownership. The land is owned here by ingonyama trust & administered by traditional authorities. So automatically both ingonyama trust & amakhosi are the ones who are affected. They are critical stakeholders that you need to consult.

Obviously the communities. But before communities you need to conduct extensive SE. There was the whole process that SANEDI wanted to organise the different stakeholders & present what is going on.

The 1st they did was to go to the provincial cabinet at their level & there was a go ahead from the provincial gov to go ahead. But since this has never been done before in the country let there be something that will be a pilot. It mustn't just be a large-scale demonstration because studies and experience in some countries show that this thing can be quite dangerous. Now this has to be a pilot. So this was the approach to be developed that can it 1st be piloted just to see its feasibility & then after to see if we go & implement it on a larger scale.

The municipalities, traditional leaders & communities were called & this was explained to them. When they explained obviously they also had to indicate what are the opportunities available because there are quite a number of opportunities that have been identified with this. But also it was raised that the risks mustn't be left behind & people must be educated & made aware of what they are.

Things like this there are always people who will be the activists & there are people who are opposing it & as a result the stakeholders, its like no one is sure about this. There is a lot of research that needs to go into this thing & also looking at elsewhere. As much as people want to venture into this they are quite sceptical.

It was also discovered that legislatively there this is no explicit legislation that exists for CCS. There was also the thing that regulations, pollution tracks (big companies polluting, there are charges & this was going to be one of the strategies/approaches that would be put in place that with these people that are polluting their emissions can be captured &

mitigate the vol of carbon emissions) so they support it a lot as it would reduce their carbon tax.

At the moment things are still at the SE stage. What happened was that SANEDI took these stakeholders abroad in Canada just to expose them to what is this thing & what it does & what potential risks. In our case, fortunately we still have huge tracks of virgin land in the rural areas & that can be used for this thing. We just need to manage that at home there is so much freedom of movement of people & animals & you need to of something of this nature to put it away from the communities and animals. But now if you understand the setting of rural areas & Ingonyama Trust, even the municipalities find it difficult to control where people will settle because the way of settling people happens there in a traditional authority. They just decide they are going to allocate x piece of land for x person. So it ends up with something that says if we identify a place that has potential to implement CCS, no matter how big the place is people need to be kept away.

Experiences elsewhere in the world shows that this thing can be deadly for human beings, livestock & also natural vegetation. The biggest fear is it escaping underground and escaping. We can end up creating a desert unintentionally.

3.) What are comm's saying about CCS? Is there any initiative regarding education & awareness on this?

To tell you the honest truth they haven't reached that level of engaging the masses on this. Because how it works in traditional authorities in rural areas you 1st talk to community leaders in terms of traditional leaders. Make them understand what this is before they can allow you to then go & educate the communities. That's why the chieftancies (amakhosi neyinduna) were involved in this at the beginning so that when that's cleared there can be mass meetings with the communities. Once you get buy in from

the traditional authorities then there is nothing you can change except if there is someone who will be affected by this directly.

But nobody owns the land, the land is owned by Ingonyama Trust The land for CCS has not been allocated yet.

These logistics need to be sorted out 1st before we sell this to the communities. Because the traditional authorities also wanted to understand what is in for them & what is in for the communities, how are they going to benefit? SANEDI took time to explain because there are quite a number of opportunities that will come with this.

4.) Can the land political issue influence the implementation of CCS?

It is feasible because if you remember there was a high level forum led by former president Motlante & that came up with recommendations on the whole question of this land in KZN must be revisited for development. It was also recommended that uKing Goodwill Zwelithini said that was a direct attack to the Zulu Kingdom. Immediately the current president, Ramaphosa, went to apologise and went to give them assurance that Ingonyama Trust will remain.

This is a very complex issue. If you want to touch on Ingonyama Trust you must prepare for a war in KZN.

5.) Has the engagement been positive even though its in the early stages?

Yes, definitely because I think the reception has been positive however others have been a bit sceptical. Nobody seems to be understanding the seriousness of the risks involved. I think the criticism comes from that background hence the pilot project is very important. I do believe that at some point CCS will be implemented, give that interested parties are involved.

There also seemed to be a thing that the people who initiated this thing seemed to be rushing & there were big multinational tenders advertised & others felt that the way CCS is now being approached is not going to accommodate local companies.

Tenders for? Tenders were advertised for the implementation of this thing as I said this will come with many opportunities once it is approved. You are also going to need highly specialised people – environmentalists, scientists, engineers (sought all over the world that must come here for a prescribed period). These people will need to be transported, accommodation & food – all these things were to create opportunities. Now the tenders advertised didn't go to one company they were advertised for everyone & some people did not warm up to that idea. This thing you must unbundle it eg: Catering alone, accommodation alone, transport alone etc. The machine will have to be manufactured & produced to SA & some argued that we were rushing too much.

6.) Why has there been no opportunities to upskill locals?

No, the approach was that if they are available internally in the country they will be used but the reality is that in the country there is no environmentalist or scientist that has worked on such a project before, unfortunately. The approach is to go to these countries and get these people who are driving the implementation of CCS on a global level.

Partnerships also involved institutions of higher learning. Each group would be seconded to work on this project so that this project there would be people in the country having to worked on this project. There was going to be a whole process to ensure their involvement.

There was some sort of agreement that higher learning institutions would second certain groups of students to learn about CCS. Teams of students to stay in those international countries to learn further about CCS (I think 3 years) because this is a lengthy process to

implement. So that when they come back they can take over the operations of this. It was some sort of a mentorship type of program to show them how CCS would work.'

CCS is a very big & complex project & we currently don't have those skills in the country. At the operational level now, we do not currently have the capacity.

7.) Policies like IDPs – Is CCS reflected in this?

To tell you the honest truth, that's one area that we are lagging in a lot, especially in rural municipalities. We are still lacking & failing to respond to issue of climate change in our IDPs. There still needs to be lots of improvement but there is the issue of capacity.

Issues of CCS & IDPs there still needs to be improvement as capacity is low.

Interview transcript with Brandon Beck: Standard Bank

2019-07-05

There is client confidentiality in some of the things so I can't reveal everything to you. A lot is publicly available. I am not going to repeat anything on that.

1.) How was Standard Bank involved in helping COJ issue a GB & what did the proceeds go into?

SB we have a green mandate & it is one of the elements we look at. The opportunity with COJ came up with & they wanted to raise a bond & we suggested a GB & helped arrange their GB. They are used for a number of different things such as water, infrastructure, elements of power & energy efficiency. There was a whole list of probably 50 different items & that they used the GB proceeds for. At the top of my head I cant tell you more than that, this happened a few years ago (2012 I think). It was also for upgrading the ward infrastructure & making sure that there aernt any leaks in pipes

2.) Huge investor appetite for green bonds. In your opinion why has the bond been so popular amongst the private sector?

I think GB's are popular because there is a niche market for them & many interested in green. Investors would like to add this to their portfolio. There is an under supply of them which is a demand for green which is why there seems to be a general appetite for gb's.

3.) Would we see the proceeds of GB's going into different projects in the future besides RE & water?

Yes. There would be lots of GBs going into different projects in the future whether it be energy efficiency, waste, water infrastructure, housing etc. There would be a whole different element.

4.) How do we ensure the GB market doesn't come across as greenwashing & that there is transparency & accountability?

One of the reasons why the CBI developed the GB principles was to likely to ensure that there were certain parameters that GBs meet & I think that's the way the green bond segment in the JSE works in that you need to make sure that you do independent

verifications. You need to have this independently verified to make sure that your green proceeds are going into an asset & its aligned with your green asset. Previously you could have a GB & it wouldn't need to be independently verified now that independent verification should be controlled to ensure that there is no greenwashing.

5.) Challenges & opportunities of the GB market in the country?

I think the challenges at the moment which is why I think the GB market hasn't really taken off is there is no pricing benefit. Clients don't see a pricing benefit in going green & they would rather issue a vanilla bond. Cost associated & complexities associated with a GB than you would with a vanilla bond & if you are not getting a pricing benefit why would you want to undertake those costs? In addition, the GB market is not for everybody. Not all companies have a green asset & can raise a bond. You have to have a whole range of green assets in order to raise a gb & not a lot of companies have significant assets to place a GB.

Green assets? Means green projects whether its RE, enhancements done to your building to make it green or water management or waste management etc. Those would be ringfenced as green & you would place them into a GB. Not many companies have a lot of those that you can justify raising a bond. They don't add up to enough money.

6.) ESG is being taken seriously now amongst companies. Would we see companies having green assets that GB can sort of feed into?

Yes, With ESG there would be green assets but people are still limited to what they can do & I think to some degree there will be green assets but its fundamentally changed in the short term. People will spend money on certain things such as RE, some of those you would quantify & into a gb. But you need to have them scaled to a certain size.

Beck on CCS: I explain

My understanding is that CCS is not a viable technology. But you see if it is not a viable technology we are not going to finance it. That's how finance works. If the technology is not viable people are not going to finance it, simple as that, that's how finance works. People will only finance something that's viable technology, proven technology so you're not going to get any finance for it.

You must understand that a GB is debt capital market instrument. Somebody has to finance it in the 1st place. There are a whole lot of complexities into that. You need to talk about why would someone not finance CCS & not look at why GBs would not be financed for CCS. Because if someone were to finance CCS you would place it in a green bond. They are 2 different discussions all together & you mustn't get yourself mixed up about GBs & CCS.

As I say if there were people financing CCS, they would be able to place it in a GB, I can guarantee you now but the point is that people would not be able to finance CCS because the technology is not sound.

CCS, especially in SA is definitely not being seen as possible (I have done a lot of research on these 2 areas). If CCS was technically available globally it would be a game changer because every single power station that's coal fuelled would just put a CCS plant & it would change the entire industry overnight. But that's not viable as an option.

I would be interested & would like to see what your conclusion is. I am a skeptic so please don't mind me.

I can create 3 or 5 different projects that could finance CCS but I don't believe that CCS works. If you can show me that it works then definitely I can finance that in different

ways. I can create a carbon bond & do all these other things – easy, overnight but the fundamental CCS doesn't work. That's the fundamental issue.

I have that concern. Everybody has talked about CCS. They have built power plants around it but why have they not done it?

Financing is not the issue, the technology doesn't exist.

Interview Transcript with Dr Ganda

1.) Research interests & your roles & responsibilities

Senior lecturer at Walter Sisulu University, teaching finance & management accounting in the accounting department. I specialise in green finance & in issues around sustainability. My responsibilities senior lecturer. Facilitate research – sustainability accounting.

2.) Why has there been a rise in green investment practices especially in the private sector?

There are a lot of factors that have stimulated companies to engage in green investment practices so I remember in my PhD I looked at those determinants of green investment practices & I was looking at JSE listed companies & I found that basically there were quite a number of factors.

The 1st one was profitability & a lot of investors demanding more of green in terms of company operations & you will see that green investors they are having more to pay companies which are engaged more into greening. The other factor could be regulation. There is a growth in regulation on the international market & also on the international level. I think you can see the req's at JSE, for a company to be there it has to meet some of the criteria in terms of social resp, environmental rep as well as ESG issues under the index. There is a lot in terms of regulations & on the country level there are also a no of regulations which are also being improved in terms of their demands.

We also have the issue of image, a company doesn't want to be identified as a company which does not do or implement practices which don't protect the environment because it has a bad reputation. There is a high chance that customers are normally going to decline their products. Companies are also urging for greening so that they can also protect their image & try to get a new & better image on how their operations are going on. And also environmental consciousness, companies have sustainability departments

in their boards so you see that those dep's are slowly evolving towards this. There is a lot of growth on the issues of sustainability so those are some of the factors are motivating private sector companies to be engaged.

3.) Image – How does a company ensure that going into green investment practices & complying with ESG doesn't come across as green washing?

It is quite true that there can be greenwashing & it happens a lot with companies who pretend to say that they are doing x but they are not doing x. These days we have what I call 3rd party evaluators in which they are independent organisations such as the CPD, where companies are expected to give in their carbon emissions & issues of water & environmental key performance indicators. Then CDP will rate those companies on how they are performing so its not just a matter of a company saying they are doing this but they are also challenged by other 3rd parties & other interest groups.

Since this is voluntary, no company is obliged to do it. The fact that we see an increasing number of companies doing that & reporting to CDP about their climate change projects & so forth, you will see that that is where the issues are going to be more magnified because those like CDP are the ones which can certify to say that this company is actually green.

4.) Enforcing transparency & accountability is that where your 3rd party certification then comes in?

Yes it is to enforce t&a. In SA the JSE also does that (JSE has its own index which looks at ESG issues)

5.) How do we promote new emerging climate mechanisms like GBs & ensure that they are being implemented in the proper manner that they are supposed to be?

I think in terms of the issue of greening, most companies are reluctant to engage in greening if you look at it from an auditing perspective because eg: small companies & ask them about greening, its not a top priority because they don't know about those things. Large companies & listed on the international market where I can say like the EU market is more developed than Africa. You see that with the European markets they do practices like emissions trading where they give allowance for those companies which meet a certain curb in terms of emissions compared to those that do not pay an extra amount so that they get credits.

One issue that you can probe into is to offer incentives so that companies are also stimulated to engage more into those practices. For eg: When you decide to offer a GB it must have some kind of discount & different from an ordinary bond. It must have certain benefits so that companies become much more interested.

What companies want is a safety net in terms of benefitting the financial side so there must be a financial benefit affiliated to that GB so that companies are motivated.

Also, the issues of law & order. Law can also be developed for eg the proposed C Tax. (eg: 1 policy to force those companies which do not want to fully commit themselves in terms of acquiring GBs & so forth).

6.) How do we ensure that if the GB market evolves or continues growing that there is a law that regulates how these finance mechanisms operate & that issues around corruption & misuse of funds are lessened?

With the issue of law it is more complex because when you are talking about green you are talking about a lot of things. Greening, emissions, waste management, water, resources so that technologies, infrastructure & services there is a lot of issues that are involved.

When you are developing a law it is a matter of saying that “is this type of a law is it capturing the essential things? Eg: C Tax specifically focuses on carbon emissions so companies must produce this amount of carbon emissions but if you exceed the quota, you will pay a specific amount.

When you are developing a law, there must also be a law that focuses on energy efficiency to say if you are talking about energy efficiency, on this type of a technology we expect this. If that is not implemented then it opens up a gap for corruption because corruptive practices would emerge in the sense that there is no specific law that is handling that specific type of indicator.

7.) With small companies green investments isn't really a priority for them?

The problem with SMEs – they lack finance. The access to finance from the bank itself is quite low. They are not being given attention. They are only given attention once the business has already grow & how can a business grow w/o finance? Most businesses die very early due to lack of finances to start business to do greening, its very difficult. Most of the people there are normally self-independent & don't have expertise to assist them in terms of how to establish sustainability departments as it is not a priority. The 1st priority is to grow the business & then engage in such issues.

We are also not saying that SMEs cannot engage in such green issues. There are various ways they can green their business because when you are greening the business you are

actually using natural ways of sustaining the business so there are various ways in which they can also run their businesses so that it becomes a low-carbon operation.

8.) Gov (public sector) aware of any institutions or policies that are fostering environmental consciousness & green investment practices across the country?

I can say that gov itself has got a lot of dep's which are dealing with issues of sustainability, greening & so forth. Eg: Depr of Energy (name changed) there are a lot of policies – energy efficiency, RE & the dept of DEA there is also a lot of consciousness & activities & policies which they have written since the 1990s eg: White paper on RE, Energy efficiency strategy, the national strategy on SD. These policies are gov's way of tightening CSR governance.

There are also some environmental interest groups which have also been advocating for the issues of greening.

ME: Policies are wonderful but the problem is implementation & lack of enforcement of these policies. Eg: Green development strategies by DBSA & what has been invested

9.) What are your views on this mismatch?

Yes, that is exactly what is happening. SA itself is 1 of highest emitters of carbon & gov has set up a lot of policies to try to reduce the amount of emissions being emitted but there is a lack of enforcement & implementation. It is just policies which are not being implemented on the ground. I think the reason of this is because gov is also focusing on other issues itself which it probably views as more important than the green economy. Eg: Issues of pov, health, education, provision of public goods etc.

A lot of investments have probably been earmarked for those issues. THERE ARE A LOT OF PROBLEMS IN TERMS OF IMPLEMENTATION ITSELF!

10.) Proceeds are going into RE. Why isn't our country investing in other low-carbon technologies?

One thing which I want to tell you is that creating a low-carbon economy is quite expensive & most countries don't have the funds & the technologies to do that. Most countries affected by this are African countries so you will see that in terms of prioritising greening they look at amongst the technologies which are there, which type of investment is much easier for them?

RE has proven to be quite effective in terms of lowering emissions & it is also cheaper than other type of approaches to lower emissions eg: CCS & other cleaner production mechanisms. They are very expensive & SA as a country cannot attest that technology & use it on a level. That will take a lot of years in terms of preparation & setting up the infrastructure. There are a lot of hindrances & importantly one of those is the capacity to do that but once they know that you can use more of wind/solar energy. Yes, they can be expensive at the beginning but that much easier to understand & integrate in our societies. Eg: SA as an emerging economy. Its only those highly developed economies which have the technology to capture the emissions & know where to deposit in a safer way.

11.) Your opinion on whether you think it will be feasible if GBs were to potentially finance CCS in the future?

There's no problem. I don't think from my perspective SA is able to do those kinds of projects & policies where you can say CCS. I think SA has the capability & capacity but it goes back to what is the country's priorities in terms of right now? Whilst the country has

the potential to integrate those kinds of technologies but is it a priority to the country? Are the policy developers in the country serious about tackling or handling the issue of cc? If they are serious & determined then we will have those kinds of technologies coming in because you know it also comes back to the issue of policy.

There are a lot of things that would need to be changed in terms of policy & also the structure to say how they are going to be run. For eg I will give you eg of carbon tax, its just a taxing system but I think you have seen how much it has been postponed.

If gov is like this then it questions the potential of CCS. The potential is there but I think the matter is on priority.

12.) Challenges & opp's on low-carbon & green economy?

With Africa, they are one of the most low-carbon economies that you can find in the world. They are not high carbon emitting countries.

So when it comes to Africa & low emission rates their policy development in terms of sustainability is also low as most countries in Africa are not industrialised & only agro-based economies.

If they move into largely commercialised we would expect gov's in those countries setting up policies to reduce carbon. I think this is one of the reasons in that it can be so hard for Africans to integrate greening. Greening for who? Heavy industries – SA, Nigeria

13.) For SA, how do we promote green skills?

Companies must set up sustainability dep's esp these high carbon emitting companies. It should be mandatory because from that sustainability dept human capital will be conscientised to issues of sustainability they must also set up sustainability courses which must be integrated into the univ curriculum. It helps to educate those learners

about the low-carbon. If you go to some companies they don't know what cc is but they feel the impacts. More stringent & tightened gov poluc in terms of how companies are operating & also issue of disclosure. Companies themselves must report about climate change projects what they are doing to preserve & protect the envir. Gov must also be serious (good policies gov has developed) but those policies are still standing.

Interview transcript: Thabo SANEDI

2019-07-16

- 1.) Skepticism around CCS & don't think it's a viable technology for us to pursue. I would like your opinion in terms of why is CCS deemed as one of the NB low-carbon technologies for CCS mitigation & why should we as a developing country embark on it?

I have a few things that I'm going to talk to you about particularly pertaining to the reluctance, why people are so reluctant to talk about it. What makes people reluctant is exactly what they are doing, whether industry or government. It depends who you talk to. In terms of industries, they are going to be reluctant if they are in carbon intense activities. Gov also doesn't want to be radical because you still need to keep jobs (coal industry) & protect the environment at the same time. What gov will try to do is to deal with this matter sensitively so that they protect both the industry & the jobs of all people. Which is the problem we have here at the moment. At the same time there are environmental issues, to a certain extent touch on international communities. Remember SA is part of the international community & as a country everything you do you are a part of the community, you are a member of the community. If you are not in line with other members are doing or interests of the majority of that particular community then they could sideline you. Some of the things of a country they would be very reluctant to not go with it. Eg, AGOA (trading policies of chickens & they are exporting waste, for them it's like a byproduct for us was affecting our industries. If we are not producing our own products what will happen? Companies close down & people close down jobs, eg textile industry & getting cheap material from China + Steel industry (Cheaper to import steel

than to produce steel in SA). The SA'n gov was to tighten the screws in terms of import policies.

Coming back to your question of reluctance we have two populations. Industry & Gov. They have their own reasons, issues of paying more if producing more & when they pay more the consumers will also pay a price. Gov tries to protect the jobs & protect consumers. If ESKOM will pay for electricity for whatever they are producing in terms of CO₂ in the air, they will relook into their pricing models. The fear to some people, where are we going to plug the cost?

Could cost be a barrier to CCS? It could be however at the moment CCS is more like, many people think there is no business case for it & it needs money from somewhere, there must be drivers. At the moment for the SA'n community energy industry we source our energy from fossil fuels (coal). But now CCS where it is prospering if you look at their models it is where they are producing oil. We don't do much of that in SA, we do more of coal & less of oil & gas. Where it is prospering EOR (Enhanced Oil Recovery) that is exactly where it is prospering. They are using CO₂ to enhance their recovery of oil. In SA people have been arguing that it is not ideal because they were looking at that. From my understanding they were short-sighted.

In SA at the moment we need drivers & one of the drivers is investment from the private sector, from gov & financial institutions, international funders – only for now for the R&D. Remember the technology in SA is still very new, its very young, its at an infant stage. At the moment we can use international or other funders money to try to prepare the technology for SA'n conditions. Going forward, we need to identify other models that we can use, what I came up with in those barriers is 2 things:

- The usage of CO₂ which is what is important, CCUS. We need to explore but haven't done much. Remember at the moment we need to explore the possibilities in SA. I can't blame that it is costly but we need to take it off the ground. We also need to look into models like CCUS. Another model is a certain company (this is now at a commercial stage) dealing in CO₂ whereby they buy from industries producing CCS. I transport it. For it to work in a SA'n environment you asked about the funding but there is a solution to that. In cases where we can have that trading of SA.
- In Southern Africa, one of the barriers to CCS is that geology is area specific and CCS can only work in certain conditions. Explain further: For the technology to work requires specific geological conditions for it to work properly.
- I was reading your proposal & one of the things I appreciate was...ill look for it. CCS is area specific, it cannot just work anywhere, you need specific geological conditions for it to work properly. Hence in the things you've highlighted is Zululand & Algoa & what I commented on that is "at the moment" because that's what we know at the moment for what is suitable storage. We can still have other sites that we are not aware of. Other possibilities we have not been able to explore yet but at the moment it suits certain conditions.
- Another barrier could be that we don't have a suitable storage site in SA. After doing all the basin analysis, we could find that we don't have a suitable storage. Cost is another barrier & how we can overcome. Same with the storage.
- a.) We may find that we don't have what we are looking for, however there are options that SA can explore. Build a rapport in the region. You might find that there is storage in Zim, Tanza etc. When you are highlighting this part, it requires a saline aquifer.

Im not in a hurry because I want to give you as much as I can so that you can be able to answer your q's accordingly.

One of the q's you asked was what is CCS? It is just a technology, a process that captures CO₂ from point sources (industries). If you understand the whole value chain it is from the source point of CO₂. The technology talks about 3 things: Capturing, transport (pipelines, trucks) & suitable storage. What is a suitable storage?

a.) **Saline aquifer** – sandstone that will allow salty water to percolate & then you'll have that sandstone & that will have a caprock to lock it. In the case of water there is no need for a caprock but in the case of gas there is a need for one. A caprock is a rock that is finely packed in terms of particles & don't allow the gas to escape (this is what we call a suitable storage). That is certain conditions. You might find in certain cases you find a sandstone which is beautiful but doesn't have a caprock. You might find a caprock that doesn't have an aquifer. That's why we talk about a suitable storage.

b.) Another one is about **unmineable coal seams** where we use coal to displace methane & CO₂ because coal seams can absorb CO₂. It can still stay.

c.) **Basaltic rock** – They use this rock to store CO₂.

d.) **Ocean as carbon sinks**. Plankton those things absorb CO₂ for iron production. Eg: Greenies will argue that the pH will change. There are different schools of thought. Some people will tell you that the saline aquifer, there may be other geological structures like your faults & other stuff.

Some School of thoughts will talk about unmineable coal seams, it could be unmineable now but tomorrow it could be based on the new technologies. They are saying that CO₂ has a tendency of sterilising coal. In geology this is coal that will no longer be volatile like

it used to be. When you want to mine that coal tomorrow you can't as it has already been sterilised. Those are the different SOT. That's why I'm saying one of the barriers is that where are we going to get these things & the reluctance would be due to "Do we have the storage that is suitable (Pilot project: Have we proved that the storage will work) – As geologists we know it can but we need to finalise our feasibility studies but the reluctance will be that from industry is that they haven't given us anything tangible yet? Do we have the money (Cost will be determined by those 2 SOT – Industry & suitable sites? It's expensive but we can create a business case in SA & argue that we will be using CCUS – Create another product that we can use but at the moment people are saying the products you are talking about you haven't given us something tangible yet. Eg: We are doing research on carbon mineralisation.

We need a product that will compete with the conventional methods. In Britain they are doing very well in terms of CCUS, they are incinerating CCS through waste. It's law that municipalities must burn waste due to space. Now they are taxing for that. For you to develop a business model for the country, you must come up with those legislative frameworks like maybe with their waste, force people to burn their waste & use that waste to create construction materials via carbon mineralisation in that construction material (now you are locking it). Or just develop other products. But what is required at the moment are the drivers, business case to come up with. They are there but we need to explore them to see if they are good for SA.

There are challenges for all those carbon sinks you will come across.

- 2.) Legislative frameworks – there hasn't been any law or framework that specifically speaks to CCS. Why is this the case & what type of law or policy would you like to see developed that could guide CCS to be effectively pursued in the country?

Remember the challenge that we have re C02 to be quite frank is that it is defined in different legislation in different ways. In some countries in their legislation they define it as a commodity & some as a waste. That's the challenge we have at the moment. Some legislation they take it under waste. For instance, a while back SANEDI did a study to try and review the legislative frameworks in SA where they were trying to review which one we can use for CCS. We came up with 4 options:

a.) NEMA

b.) National Environmental Waste Act

One of the options they came up with was to merge. So for NEMA, the waste act to amend NEMA or to combine NEMA & MPRDA. Both address the CCS issue.

The other one, to not waste time was to create a stand alone act.

Those are the options, but at the moment the DOE (new name now) is working on that. They are reviewing it further.

Now, for the sake of our exploration, there are 1 or 2 things we can use that. There are a couple of legislative acts, particularly under MPRDA because they are dealing with exploration. There are acts which we can use specifically for exploration as well as for R&D. Remember SA is still doing R&D – the pilot project is part of that. Some people have a tendency of detaching pilot from R&D. It's still research & we can still use existing acts for research to address the exploration. However, if we are going to go onto the next phase where we are going to inject the carbon underground, we need to start talking to a proper act that will definitely allow this thing to work. DOE is currently working on that. It will take time as we try to understand how the legislation will effectively be implemented. Some of the things that SANEDI is doing is to try & research different things to assist with the body of knowledge. The technology is new & we are trying to improve

the body of knowledge & also something that will suit our conditions as well. You don't want to impose something into the system that is not actually working. For instance we can't take a CCS law from another country & implement it here. What SA needs is its own way of doing things so that it can cover everything. You need to be very careful how you handle this.

3.) Aim of CCS to mitigate CO₂ emissions, how would C tax come into play with CCS?

Clarifying the link between carbon tax & CCS.

Remember, CCS is all about C tax. C tax has been signed, ctax & climate change bill are more like the drivers in this instance, they will enact & supplement the drivers I was talking about. If CO₂ comes into play, whoever is producing or emitting more will be charged more. Now the industries who are emitting more CO₂, they will always try to run away from being penalised. If the Ctax is implemented accordingly, more people will be interested in promoting the development of CCS in SA. They will see it as an easy way out. The more the price increases, the more people will be interested in CCS because at the moment they will evaluate if they will work around the penalties.

The most NB benefit of CCS amongst other emission mitigation technologies is that it has the potential to capture huge amounts of CO₂ relative to other emission abating technologies. That's the most NB thing, now if they run away they will go to CCS, it is easy to divert the penalty. Many companies will start thinking of running away from the tax to something better. CCS is one of those & also CCUS (take CO₂ & develop another market with it). That's where it is going. Its more like a foundation, its building to its success.

4.) Private sector, no dialogue going on between SANEDI. Your opinion?

Remember when we started, there was reluctance, the industry at the moment doesn't see. They are waiting to see if its doable & one of the things that will make them see that

it is doable is the pilot project. Now the industry like many other people will want to see if this is working.

Just to give you a little bit of a history, when SACCCS started there were more people participating from industry. They knew that this is the way to go & this is where the world is going because if you look at the world is going towards a greener economy. Those who are producing more energy & emissions they want something they can use to divert the penalties. They saw this a long time ago. However, what happened throughout is that when SACCCS started out there were more companies & they did the roadmap of CCS (Industries they were participating). With time, they lost steam not because they didn't want to participate because they were no tangible deliverables & those tangible deliverables were a cost of misjudging whereby there were other factors that we overlooked.

One of the factors that I think derailed or reduced the speed of the technology/implementation of the technology was stakeholders. I want you to be aware of this & it is one of the things that reduced the speed. With many other technologies you will understand that stakeholder is key. We thought the process was going to be quick to consult the stakeholders. One of the things I identified is to identify the blindspots & one of the things re stakeholders is that when people identify their stakeholders, they make mistakes. They look at industry as the stakeholders, forgetting that the public are also key stakeholders. I don't know what happened but we thought it is easy to just go within 2 years into the public & tell them this. We underestimated them, that's my understanding. Hence, there was no progress. The industry, remember industry is all about profit. Industry saw nothing for the past 5 years & SANEDI was busy working to build a rapport with other stakeholders, which is the public & it is doing very well. But the industry was

not aware. SANEDI was working towards addressing the key issues that the public is raising which took about 5 years. The past 5 years SANEDI has been working very hard.

I think from industry the reluctance was the lack of tangible deliverables however they didn't know that SANEDI is busy trying to educate everyone about CCS & put everyone affected involved because you cannot come with a technology that nobody has seen & say this is it take it. You have to convince people. When are you are putting something on the table (physics) there are different forces acting on it, your job is to address all the forces, make sure that you put your thing into equilibrium so that it won't derail. Now that's exactly what SANEDI is trying to do is put everyone into equilibrium so that community & industry understands.

Recently, we did a study on industry perceptions those are some of the initiatives we are embarking on so that industry & communities are on board & everyone involved is on board + the international community. That's exactly what we are trying to do. We are doing it very well but we underestimated was the period of SE & I think at the moment things are coming okay & industry lost interest because they didn't see that, hopefully with time, such as concluding the basin characterisation, then maybe they will see the results of that & come back. They want to participate, it's not like they don't want to but they want to see something.

5.) Barriers in us reaching pilot projects & demonstration?

The reason we didn't realise 2017 was because of ironing out the SE issue. It took about 5 years. When you are developing a roadmap for a certain project, a lesson I learnt from this one is that you need to outline each & every activity you need to do there & look at your resources & things you need to interact with. When it comes to SE that's where the mistake was. I think when you do the timelines, it was too short because we thought that

we just go there and teach them for 2 or 3 years where you just go & teach people & come back. Now there were those questions that needed to be answered, some of those questions needed some studies, we needed international experience from countries who have done & experienced this. The preparation time for the pilot, we underestimated the time which required too many activities when coming to SE such as the landuse one of the challenges that we have. How many projects are not moving forward due to the landuse? SE is the key to this project.

6.) Sir, can it happen that the land issue in our country that could stall CCS being implemented?

The SE approach is critical & anything is critical. I don't want to lie to you because you don't know & remember the land is not homogenous. It is owned by different people. You might find that a certain population don't understand what you are trying to do & your job is to ensure that everyone is actually agreeing to what you are trying to do. At the moment, SANEDI is trying to do everything that it can to try & appease or address the hiccups. One of the barriers would be the risk issue, when you go to these communities & tell them about these technologies, what comes into their mind is risk associated with the project.

For instance I am just going to give you a simple eg, if you want to start a mine, it was easy back then lately it is difficult to even build a bakery or a tavern. Today you need to talk to everyone who is going to be involved, who is going to be affected & whatever you are trying to do. For instance if you want to open a mine there are risks you need to be open too. The mine will need water & there will be competition for water, will this affect or contaminate the water or the soil? Those are the things you need to address & give them tangible evidence, proof that its not going to do that. In all minetowns there is the issue

of prostitution, they will tell you that it is a major problem as you are bringing foreign culture into our system now you destabilise peace – you need to address the potential of this & how will you mitigate this. One of the issues is risk & the risk you have identified about CCS is the possibility of it leaking – you need to make them realise if there are any potential dangers to the surroundings & how are you going to address it if it happens & what are the chances of them dying, crops, livestock dying, contamination of water.

LEGACY OF CCS: Those are the things you need to outline when addressing stakeholders, chunk of our work was supposed to be under stakeholders.

If you look into the things that I have identified most of the things is not about the technology, the technology is doable. It has been proven that its working. The chunk of our work was supposed to be under SE.

- a.) What is this technology going to do for us?
- b.) How is it going to affect our health?
- c.) How is it going to affect our crops & livestock?
- d.) Landuse?

Most people honest will tell you that the project under SE was supposed to be given a tangible amount of time so that you can address.

The problem with legacy is that people will think a wishlist. Now what is your job? To identify what is doable, what is affordable. However, the community will give you a list & you only have 1% of money to allocate to that list. They will talk about schools, very expensive things & this is just a pilot project, it is just a research project which wont produce a lot of money & those are some of things you need to identify too & outline. Which is something that we need more time that as much as we want to deliver a legacy behind, what we can do is 1,2,3 – giving students bursaries (skills – give them what you

will need) & then libraries etc. Those are the things you can give to them but they don't see that.

We are not a homogenous society. There are those who have their own ulterior motives & who will want to benefit from this project. For instance, when we go to workshops or places to create awareness, they already have their own picture which has been fed by corrupt individuals. Those are some of the things that you need to be aware of that there are those people who will make your life difficult. Not because they don't want the technology but because they have other things mind that could lead to the tardiness of the project. No you see its going to be delayed & delayed until they reach a certain point where they realise that there is nothing they can do because remember it is a research project. Unless it hits the commercial phase that's where you can talk about proceeds. In the pilot project there are no proceeds. The one thing that can come from this is capacity building.

7.) Green bonds – The potential for GB's for commercial phase. Your views?

I have a simple straightforward answer to this question. Its going back to the definition of a green bond. Now remember if you look at it, if we revisit the definition of green bonds like you have outlined, it actually at the moment identified 1,2,3,4.

What we need in this field of CCS what they need to do going forward is to market the technology to whoever is actually administering the GBs society. This is what they had at the time, you can expand the definition but what needs to happen is to market CCS & to market CCS is to look at the common denominator of CCS & those things outlined then you motivate based on the common denominator of whatever is there. For eg, what is the common denominator of RE & when you do your motivation.

This is more like low-hanging fruit. Its there, you just have to motivate to this organisations & say guys, based on 1,2,3 we think we belong here. Its here for those people to see it fit to advocate this. These are the benefits we are giving to the surroundings & these other projects that they are outlining in that they also give the same benefits.

The definition of a bond you need to pay them back at some point, now we need to consulate the calculation models of CCS. At a certain stage we can apply, for instance for a pilot project there may be no proceeds you only need a grant & I don't think we will be expected to pay back the money. When it comes to a commercial phase, we are producing energy cleaner like these other ones & we can actually be able to pay this much & be granted this much. I don't think that this is something that wont be doable, it is doable but it just needs that wheel from our community to motivate from that community that is administrating that green bonds.

We can have a motivation, write how CCS can fit into green bonds, have a workshop & approach the CBI.

What I like about researchers is that you identify things that were not thought of before. In your research, someone will pick it up & outline exactly what you think & the 1st thing is to review what is a GB & what is it doing & then review how can this thing work that's it. When someone reads your paper they can identify that this can work here why not try it. This is one of the mechanisms we can use through researchers & through people who are in the CCS space who can also motivate to those bodies. Researchers as well as industries can do the same.

8.) Comments on reading my proposal

To be honest with you my young lady, I am very happy. I just had some comments on your proposal:

- a.) What causes Africa to be poor? We do have beautiful policies in Africa, smart people like you & me but Africa we are struggling from is we over analyse things & end up doubting ourselves.

Why the continent is poor in terms of institutional frameworks? They are not poor, they are good but they are tainted, we over analyse our policies, visions & our missions & not knowing exactly what we wanted to do to. We have them there but we don't implement them accordingly. This is because of 2 things, for you to implement a policy or regulation you need:

Resources – If you don't have resources to enforce the implementation or the platform because resources will cultivate the platform you are going to work on then your policy will just be sitting there but its not going to work as there are no resources.

Eg: Carbon tax, beautiful policy but one of the challenges is that if we are not going to implement it accordingly what will be required of carbon tax is resources. You need to implement it accordingly so that whatever you are thinking to be able to be done, however if you do not have resources & doing it accordingly then it will be useless, toothless. How are you going to implement? You have to be able to monitor & be able to have a plan that you can use throughout the value chain. Eg: You exceeded this so you have to pay. Those are things that should be outlined & have resources in each & every point. Resources – skills, manpower, money etc. That's why many policies are not implemented in SA – lack of resources.

One of the questions you asked here is why do we embark on such an initiative – energy politics?

My point there is that it is very simple. We have to do it, like I said we are part of the global community. Eg: Cabinet of SA says we are not going to do it. I had 2 answers for you, yes & no.

Yes part: International community, if we don't conform to the norms then we can be sanctioned & then believe you me for us to be able to keep & create jobs we need to industrialise & you still need other people to participate in the economy & develop the economy. If you are now unbecoming more people are going to lose their jobs & investors will pull out.

If you are not going to conform with the world with the norms then they sanction you.

OPEC – Funding projects, they have clause in their funding mechanisms & one of the clause that I came across was that they are not going to fund projects that emit more CO₂. They will try to fund renewable projects & the like.

Energy politics – If you say no to the international community then you are going to affect the projects that will create jobs. You need to be careful.

The no part: This was solely based on the price. If the technology is going to tap into the consumers pockets what is going to happen?

Thabo going through proposal:

- Funding
- SE
- Land use
- Lack of awareness
- Political will

The works of SANEDI: We have been doing research conducting research to build the body of knowledge as well as capacity skills to execute this accordingly. The awareness & through schools, communities & the like.

Strides – Preparation of the pilot, capacity building, building CCS awareness. Those are the strides.

Is it feasible? If & only if we can explore the model. The models are there & we need to tap into them. CCUS & the likes. Inceneration of waste, there are different things we can do to make it feasible.

9.) Are there any other issues around CCS that are overlooked?

What we are overlooking is that people think there is no business case in SA however if we can broaden our horizon to the whole region for instance area specific. You might find that other areas don't have the storage. We cant store it in SA'n geology. You have to be aware of something: CCS is a very delicate technology. You can only do CCS if you have a specific geology. If Southern African countries collaborate & work together & widen this we can start building CCS network in SA, we are overlooking this by focusing only in SA.

Are we going to potentially explore in Bots? We may be working in silos, you may find that they are doing something like that but we don't know. That's why I am saying we are underestimating. Lets just try to build the region & work as a region & this will flow. We can produce CO₂ & bury it in Tanzania. We can produce CO₂ & bury it somewhere else that's where the business case of CCS will be broadened.

There might be beautiful storages but the thing is the political will, the boundaries we should work on. We are overlooking the boundaries so that we can work together as a region.

10.) Young African entrepreneurs making a mark for CCS

Can we just look at what our neighbours are doing. How can we use our neighbours to assist us? That's it.

Lets build those small margins. Eg: Botz has lots of coal & beautiful coal reserves & they are only producing a certain amount of energy because they have about 2 mill pop. My point is I went to Botz at some point, they are looking into CCS but my point is if we can build this collaboration with our SADC countries, some they don't need more energy like we do but we need to build a beautiful relationship with these countries so that we can be able to tap into anywhere CCS is going to see the light.

We are also overlooking the participation of CCS in private sector & gov – There needs to be a beautiful relationship between the 2. Private sector must not see this as a punishment to them. Gov must not take it as a burden to them. That's exactly why people are reluctant. If we can build that rappoire, a beautiful relationship between private sector & gov & not see CCS as a gov thing or private sector thing then we will actually get somewhere.

Interview transcript 12: DBSA

1.) Background on what we do

DBSA, core mandate is support infrastructure implementation & that we do by concentrating on 4 main sectors – bulk water, ICT, transport & energy. We have a continental mandate – locally we tend to do more local government space & of course we do a lot of private sector work so like your IPP stuff. Outside of the country we do less of municipalities & more of private sector or even funding the sovereigns in terms of the work that they do.

In terms of how we are organised, you have got what we call coverage division & the transaction part. Coverage part the hunt for the deals & then the transaction part they transact. But then a few years ago we realised that there is a gap in terms of sometimes projects not ready or being bankable. Then we introduce what we call a project preparation division. This division takes projects that are at feasibility & transitions them to bankability so that they can be transact. The project preparation division has got 4 units – 1st is planning unit that basically helps municipalities in their plans & have got IDPs & go into council for approval before they can do projects that can be funded such as infrastructure – we also do that part. Then we have got a project preparation unit under the project preparation division. What they do is basically to transition projects from feasibility to bankability.

Some of the projects, when you do them you realise that lets say small projects, you want to do them in a pragmatic manner so you build a programme. For that we have another unit that we call a programme development unit & then lastly ourselves is the climate finance unit & our role is basically we run 3 programs:

- On behalf of DOE we run the Green Fund

- Accredited to 2 global climate mechanisms: Global Environmental Facility (GEF) & Green Climate Fund (GCF) – The bulk of our work is there & the work we do is that projects of a climate nature typically we prefer to mobilise those funds to blend with our own funding so that we can have cheaper funding to help those implementers. Basically that's what we do.

Everything climate finance we do within the bank but the way we do it we limit it to our mandate so if somebody comes with a climate project that is outside of the 4 key sectors that I have mentioned, we still don't do, even though our clients allows us to do more simply because we believe we have the capacity & expertise to handle what we have been dealing with for the past few years.

2.) Climate finance & what the DBSA is mandated to do. There is so much awareness on climate change & the issues around it. In your opinion what has contributed to the rise in climate finance & a huge investor appetite, across the world & in SA for climate finance?

To answer that, climate change has become an urgent issue. I think science tells us that it might be more urgent than we thought so if we don't (according to the Paris Agreement we are trying to have a target of below 2C) but in actual fact the target should be below 1.5. But then how do you do that? I think globally this is coordinated through the UNFCCC but then the implementation requires financing. That's why the UNFCCC has put together climate financing mechanisms including your GEF, but now specifically the GCF. The idea is that the developed countries will be able to pledge funding into these financing mechanisms & these financing mechanisms can support developing countries to implement projects.

But how are those projects done? The projects must link with the NDCs because the idea is that if everybody does their part in terms of the NDCs then the aggregated or consolidated impact should have helped us reach the target. But you need money for the developing countries to be able to do that. Therefore, you are putting together this financing to be able to support those activities. I guess I am trying to answer it this way in that since climate change is urgent there needs to be action & for action to happen you need financing. Therefore, that's why financing & climate financing in particular has become very topical because there is an urgent need to address that but it is more than just the financing that you can get from your climate financing mechanisms, it is how you can use that to leverage private financing. Because the funds that you can mobilise from these mechanisms are insufficient. You really need to start channeling private investment into climate change. You'll hear even big banking institutions that they are no longer going to fund coal into the future so there's a lot of push. That is why climate finance has become an NB topical issue.

3.) What the DBSA is mandated to do in terms of climate finance. Are there specific frameworks or policies that guide how this should proceed?

We have had a journey as a bank typically a few years back, there wasn't much talk about climate change within the bank but what the bank was doing nevertheless was when a project was being taken up, issues around the impact on the environment through what we call environmental & social safeguards was always part of our appraisal projects when we considered projects. There wasn't a specific emphasis on climate so I think from our end we believe the work that the work has done in managing the green fund, started the process of sensitising initially the bank towards the importance of climate change but

then later on starting to embed climate change into the thinking of how we do climate finance. Obviously the idea was not to turn our portfolio into 2 years green but it was always clear that it would always be a journey but I think what is positive is that the journey has started & I think one of the NB things we have done recently is that we, the board, has approved the climate change policy framework

The climate change policy framework is really to say we are putting in place specific targets in terms of the volume of funding that we would provide each year that so much percent will go to climate & go even further to say that this person would go into mitigation, this person would go into adaptation. You can set up these targets but the issue would be how do you get to them? So some of the NB things has been to say from a data collection point of view to see where we are, we are trying to embed that in our process from a reporting point of view, how do you do that? We start to embed that into our processes, that is key, when that is in place, the next phase is to put that into your KPIs (key performance indicators) so that you can measure yourself so that you will no longer be measured just in terms of how many projects are funded & how much of that has gone into climate. That would be the next phase. It is not useful to go into KPIs before you can put in the infrastructure to be able to determine whether you are getting there or not. When you have KPIs you need to measure if you have achieved or not achieved. That's the journey we are going through.

With that obviously, is capacitation in terms of the right skills to be able to do appraisal of these kinds of projects but the other key thing is to say we have in place, in the news, 2 facilities approved by the GCF

- **Climate Finance Facility:** Those facilities are very specific. We are trying to use that to leverage commercial banks but also broadly other private investments.

Basically the way we do it is to say there is a pipeline of projects sitting with private investment if you can provide some de-risking to those projects they can be able to participate so that is what we are doing with that mechanism. If you think about it we have that mechanism in place & we have the targets – now we have the instrument we need to help us reach the target. That is a very NB thing for us.

- The 2nd thing is we also had another approved from the GCF which is the embedded generation which is to say that the country has had a very successful IPP Program but it came with gov having to guarantee purchase agreements, which made it easier for private investment to come in. Now, with ESKOM being where it is & the country's finances being where they are its difficult to continue with that. Now, we are trying to provide an instrument where you can still to some extent provide the comfort that the private investors would have to continue investing in this kind of project. But more specifically embedded generation that a mining house wants to set up a generation plant then we can be able to participate in that & fund it with appropriate funding instruments. If you look at that, it supports our targets to be able to gradually be transitioning our pipeline towards a greener one.

That is what we are doing at a very high level from a DBSA view.

- 4.) With so many projects how do you ensure that you are not overlooking the different blindspots & ensuring that there is transparency and accountability. This comes from developing countries where climate finance, access it challenge into tracing where that money has gone into

It is important in terms of how specifically looking at how the GCF works. The GCF as I said before is that pot of money that is available for your developing countries but a

project sponsor cannot go directly to the GCF & say can I have some money to do this project. He has to go through what we call accredited entities, in which the DBSA is one now to be accredited there are a few things the GCF would look for in an institution – procurement issues, financial controls, track record from implementation point of view, who audits, past record, monitoring & evaluation frameworks – they look for a lot. Also policies. When they are happy they will accredit you & there are different levels of accreditation. You can be accredited to do just small projects, medium or large. DBSA can do everything because of the robust systems we have in place but what the means is that the money from GCF comes through us therefore we have the responsibility.

For eg, if we are implementing a project, lets say in Zim we have the responsibility to ensure that the funds are used for what they are given for, report on the progress around implementation, give input in terms of your M&E. I think in all essence that is what is put in place to ensure that the money is effectively used.

5.) Can GBs be used to support existing climate finance mechanisms? GBs incorporated into the CFF or GCF? Your views?

GCF does have a facility that supports institutions that put together GBs. Eg: Groundwork in terms of feasibilities before you can put together a GB incl the ability for them to invest at favourable terms to ensure that your bond is successful which I guess it is seen as an NB instrument that can be used. That is the 1 thing.

Another NB thing, as I've said before, climate funds that we have through these mechanisms, they are not sufficient. Everybody will tell you that. We need trillions & trillions of dollars to do proper impact from a climate change point of view, so you need to leverage private investments. If you are then able to use bonds to do that, the better. So, what is key is that you need to find a way to use the limited public resources to

leverage significant private investment. If you look at bonds in that manner they are an NB contribution following those principles.

Underlining the bonds, you will hear about many bonds that are called green bonds. But somebody will always say it depends what shade of green because there are different types. The key is what is it that you are really funding & what is it that you are classifying as green. That is where you find a whole lot of variations but there is a lot of work currently to standardise so that people know what it is you are talking about. That is NB for the potential participants in the bonds to understand that this is indeed a gb & that the reporting that comes out of that can sustain your argument that you are putting together a GB. That is an NB factor.

Even more NB, have you got a pipeline to support that? Because you can put it together but if you don't have an appropriate pipeline of projects that can support the money that you are mobilising then you are blowing in the wind. For me those are key NB things but there is no question as to whether GBs are an NB instrument in the arsenal that you want to put together to support funding for climate change. For me, that is definitely a yes!

6.) GBs globally but in SA we have had a few bonds issued out. Is there a difference of climate finance & GBs?

For us when we say get a credit line anywhere from a bank the 1st thing that treasury will ask you is that show us a pipeline. If you cant show a pipeline, there is nobody who is prepared to go mobilise funds for you. The same applies when you want to put in place a GB, 1st of all you are intentionally saying you want to do a GB so show a green pipeline. That becomes an NB consideration but even more is the question of saying, how do you satisfy your potential participants that you are remaining in the area that you said you

would remain in. Not getting to grey areas where its no longer clear whether its green or not.

You are going to attract immediately when you call your bond green. Somebody is going to be looking at what youre doing & assessing if it is really green. You would want to preserve your integrity & say what you really mean it is.

7.) Challenges & opportunities re climate finance in the future?

If you look at us as a country specifically, it is not a question of funding but rather whether its supported through appropriate policy frameworks. Lets say eg: Strategy around coal, for us a bank we are 100% owned by gov so sometimes there could be expectations that we could say if we are serious about climate change why don't we stop supporting coal. But then the Q is can we defy our shareholders. I think the 2 are NB – financing that is enabled by right policy frameworks that allows you to move forward.

There is also the Q around, you will hear this a lot, a just transition for me is key but it must also be driven both sides from a funding point of view & a policy point of view. Lets say eg: If you are to shut down a power station now, what would be the impact? If you look at it purely from saying what is the impact on the comm's but what is the alternative we can do there? Then the Q remains unanswered & can therefore mobilise in a way resistance to what you want to do but I think you intentionally want to say this is what we are faced with, this is the impact, this is what we are going to do to ensure that but a funder cant sit here & decide what his going to do about ESKOM, there has to be both ways, policy point of view what is the direction & how do you then support that.

The other thing NB, to stop & say what are the climate finance flaws in the country? Do we have a good picture of what that is? That is also an NB thing because you need to

understand that & improve coordination around it so that you can achieve maximum impact. That is NB

The other issues is the need to understand from a private sector point of view that you need a lot of money from the private sector to support CC initiatives. You need to be understanding of what it is that needs to be done to unlock that. Those are key things that needs to be in place to increase our efficiency around both mobilising climate financing but also the use of it. I think for me that would be quite key & beyond that we also know that there is a key challenge around funding adaptation because most of your adaptation projects might not have a clear revenue line way where you can see how you will be repaid, therefore, you need to be designing appropriate response mechanisms to deal with adaptation & again coordination with policy side, gov its NB. You need to see how you are going to use your gov interventions such that you can attract more funding into adaptation. So, its not something you can do alone. Its too NB & needs an integrated approach.

Transcript 13: Mineral Resources & Energy with Robert Phupeli

1.) Roles & Responsibilities within the department

My role is to develop the policy to ensure security of coal supply especially to institutions that use coal maybe to mention a few: ESKOM, SASOL, steel plants (they usually use the higher grade than we produce in SA). Our main focus is ESKOM & SASOL. Also, to make sure you know how coal is a fossil fuel & when you burn it releases unwanted GHG so what usually happens is that we are also required to promote technologies to deal with emissions like your SOX, NOX, CO₂ – Any emission that is harmful to the human being to the environment, we are required to address those using our energy (burning coal as an energy resource).

2.) How is it that you & this department became involved in CCS? What are the things you have been mandated to do?

As the dept we have the energy white paper (1998) available on website & indicates that we appreciate that we use coal for electricity generation & other uses & we need to make sure that whatever we do we take care of all the emissions that come out of burning fossil fuels. After that I think about in 2003, so SA as a country we also interact with other countries then SA attended some meeting with the carbon sequestration forum that's where we learn about these CCS – well we can use it as one of the clean coal technologies to deal with the emissions from maybe power plants or your CTL (Coal to liquid) plants or the burning of fossil fuels. Then after that then the dept decided to say ok, look, because we heavily reliant on coal, as you are well aware that 90% of our electricity is based on coal & they suggested we investigate this further to try & find out whether we can address the CO₂ emissions because we are not exempted from it like anyone around the world.

So then there was a study commissioned to CSR to check if SA we do emit CO₂, we do have those emission sources & so on. That study it proves that when we have those emission sources like your ESKOM power plants, your CTL, your steel plants, cement industry & so on & then it assures us that we do have that then we need to take care of our CO₂ & that was regarded as the 1st phase or as the starting point to say we need to do something. It also identifies where those emissions sources are in SA & where they are located. It also differentiates where you can find your sequestratable emissions or not & all those things because the CO₂ is not only coming out from burning fossil fuels, it also comes from maybe agricultural processes but us we have to address the ones that come from burning fossil fuels.

From there, after that study is where we joined the carbon sequestration leadership forum which is an international organisation where I think the secretariat is in the US & with other many countries in Europe & most of the developed countries & few developing countries are part of it. Even China is part of it, to say okay the reason for joining it is for us to learn in terms of the CO₂ as it was a new thing to us. Some of the countries they are already a step ahead but they were still investigating though they were a step ahead for us we said no we don't want to be left behind because we also emit the CO₂ so we need to learn & know what is happening. So we joined the CSLF & became a member & then we started interacting with them knowing what is happening & so on & from there that's when there was a decision that was taken that because it's a new initiative we also need to bring on board our companies like SASOL, ANGLO, ESKOM etc. Then we said how do we then come up with this integrated or working together? Then they decided to form an institution within SANEDI to coordinate everyone, to make sure everyone is on board which is the SACCCS.

SACCCS was established in 2009. Before its establishment, what happened is SANEDI together with the private sector they worked on the atlas to map out & identify the potential within the country to say okay if we have these emissions, where exactly are they, where are they located, if maybe they are here inland or along the coastal whatever, where can we store them & the potential storage areas & then that atlas identifies that & gives some quantification but something that it raises is that our emission sources are located in land & then the storage part of it is more of the coastal (Algoa & Zululand) & you look at the distance from here to there, its far. You'll have to spend a lot.

We identified those areas & said okay we are doing it, these are the emission sources where you need to store it & also it gives you, how can I put it, the storage quantity.

What do we mean by storage quantity? The assumption to say maybe at this basin you can store this much & it has the capacity of storing this much but at a theoretical level as on a practical level we don't know.

Breaks it down to me: Lets say company X says there is coal in this area. They will just do assumptions, they will drill a few holes here & there & say ok they will do their calculations & say roughly we have these tonnes of coal but in the real sense it is not as exactly as it is but those calculations they give you a basis, based on the holes you have drilled, it gives you an indication that maybe we have 300 mill tonnes. Its like now in SA they are saying we have a 100 years of coal reserves, those are theoretical, its not proven. For you to prove that you still need to go there & do a proper drilling. ‘

Let's say if maybe before you were drilling & the holes are far from each other, you need to try & be closer to e/o so that atleast your assumption is perfect. The same as this storage, that one is theoretical, it was based on some drillings that was done but CGS indicated they were done when they were doing the overall exploration for the country.

So they just say, we have this potential at this area based on that but before you do anything, you need to go to that area & do more drillings to make sure that whatever they are saying, the potential storage that is there is the right amount or not so to speak.

3.) What do they mean that before we do our CCS project there needs to be characterisation?

As I indicated, when you do characterisation, if you want to store CO₂ there are certain requirements that you need to meet in a certain basin or certain area. For CCS there must be a caprock in the area, a caprock is the rock that will prevent CO₂ from coming out & number 2, the depth of where that caprock is it must be at the depth (international level is 800m + to km) & the storage must also be porous. Underneath there are some sort of stones (im not a geologist) & that stone must have that capacity of allowing CO₂ to be stored in. So when you characterise, according to my understanding, you go & do a proper drilling, when you do that drilling it will be able for you to assume that in terms of your caprock that it is here at a particular distance, in terms of whether the area is porous or not then it will give you all those indication that I have highlighted. You need to know that it is suitable & meet certain characteristics for you to be sure that this is the place you want the storage to be.

4.) Mr Phupheli, one of the challenges I would assume is this particular topic on that I feel that there have been so many developments that have taken place over CCS – 2017 & 2020. CCS characterisation phase, is there a need for CCS if there will be so many delays?

It's not going backwards & forwards. We need to be sure of what we are doing. Its not like sending someone to go & get me a glass of water because there also unknowns associated with the project, for you to know that we are doing the right thing, you need to make sure

that the characterisation is done properly. Imagine, now Zululand basin, we say we are rushing to the basin & we just do rough characterisation & only to find out that the storage that is there is only going to store 10 mill tonnes or 5 mill tonnes, whilst we want to store 500 mill tonnes. I am just giving this as an eg. So, it will be like you have just rushed for nothing. Delay to me it's a problem but something that also caused delay was finances because as you are aware, SA has other issues that its dealing with – social issues & so on. When the parliament adopted this roadmap to say by 2017 we will be piloting, look when I was also discussing with my principals to explain why we couldn't meet 2017, we didn't take into consideration that there is intense work that needs to be done prior to that, you need to have enough money, you need to do thorough stakeholder consultation & the stakeholder consultation is not a mere thing of asking if you can do the project & everyone else saying yes you can go ahead. No. That's another thing, you need to educate people, you need to get them at the same level as you are, same understanding & you will have objections & once you have those objections & so on you need to deal with them until everyone agrees.

Even like the finances, I remember the donor funding that we got from the world bank, we thought, even SANEDI thought it would take us 3 months just to sign it, it took us almost near a year because you need to go through country legislative processes. Lets say the WB or whoever is saying Nomhle I am giving you R100k & you say deposit it into my account. For a country it doesn't work like that, there are processes & procedures that need to be followed. Its there even in our own constitution. We need to even follow parliamentary procedures, processes. You even need to go to other departments to get certification, you need to go to state laws advisors – those processes also delayed. And now we are saying the money is here, it is available now we are faced with the challenges of consultation, SANEDI had consulted & we were thinking that we are ready & we are

going there. Amakhosi were like no, stop right there before you start doing this thing, even drilling. Here we are not even talking about injecting the CO₂, just to drill & characterise they said no. We want to be up to speed also. We presented to them, they said that's not enough. We want to be taken to a country that is doing CCS, you have to now raise money to fund for the whole crew of the amakhosi to Canada, those are the things that we never envisioned that they will come in place when you are in the process. It is like when you are coming yourself this morning there would be the Bushiri strike. Those are the normal procedures that happen in any project. Its not a smooth ride. If you find a project that is a smooth ride you must ask yourself what is happening.

Especially this one, its new. If its old like we are repeating something that is already been done in SA it was going to be easy & even this one we had to even convince, other gov departments to understand what is this CCS. There are some people that would not believe in CCS, you would need to convince them & get them on board. All the gov deps. There are also environmental issues associated with CCS.

If you don't do your things right, you are likely to, you are saying you are addressing pollution or climate change & whatever but by doing that you'll be transferring the problem to another area. You need to be sure of that because we might say we are taking CO₂ outside from causing climate change whilst we are taking it down to damage the environment, underground enviro eg: water resources etc. Then it comes back to us indirectly, that is where the delay is & that delay it also makes us to also understand & to do a thorough research before. Even your PhD, you cannot just go & say I have found this & this.

The other thing that I also like, there is one professor who always says especially with storage is that the environment is not the same for SA, Botz, Eur, Canada. Myself I have

been to Australia & have seen the CCS plant there, I have been to Norway & US. Look they also caution us to say technology you can borrow but the storage you cant. Even in SA, SA'n geology is full of minerals that's the reason why remember when I was talking about the CSIR study, the atlas map, its not like inland we don't have a storage, we do but its mostly mixed with coal resources. You don't want to tamper with your coal resources. You don't want to store your C02 where there are coal resources, tomorrow you will need that coal to produce your electricity.

You need to put that C02 away where you know that whatever is underground you are not going to use.

If there are mineral resources then why are we embarking on CCS if we know that we are going to store C02 knowing that there is potential for other mineral resources to be discovered?

Look, that is where the characterisation comes in. Lets say your Zululand, when they characterise now & they find that maybe there is coal, oil or gas they need to take out that gas before they store that C02. The advantage with C02 is that its just a gas. If you find that maybe in that particular area there is oil or gas, then it gives you a plus because I have also learned that from other countries like Norway, they use C02 to enhance oil or gas recovery. That's an added advantage. For coal, its not an added advantage & that's our situation. Inland its full of coal but along the coast it is mostly gas or maybe probably oil that we don't know of. If they find that, they remove that oil they can easily inject your C02 & then the C02 will also help to enhance that oil or gas recovery. Its not like we don't have to do it, we have to do it but we must know what is underground.

5.) Mr Phupeli, you touched on a very NB point which I was going to ask you on the stakeholders. My perspective – SE central component of CCS. Private sector. If we

are going to finance CCS it will be very difficult. How do we ensure that we are all speaking the same language?

Look SE is a difficult process. You know, sometimes you can say that you have consulted this & when you are at the end thinking that you have covered the whole scope, someone will say but I wasn't engaged. Look, it does happen & its not an issue of ignorance. Gov always try to cover everyone when engaging with stakeholders.

When you look at CCS & when we started there were lots of workshops. I don't want to say those guys what they are saying is neither here, nor there, there are quite a number of workshops we have conducted. Lucky enough the workshops that we are conducting were in GP. Look & the publications were sent out to everyone, those workshops we were not saying Nomhle company X don't come to the workshop. It was open to anyone. But if you decide to stay & take a backseat you want to be considered as a VIP. That's what I have noticed, it is not only with this project even with other projects. You know people when they see projects going or taking another direction, they will always have answers to any question just to make sure that look thina we have been ignored.

If you run a conference or workshop, if it is advertised lucky enough with SANEDI & DOE, those things were not done in closed doors. They were done in open public & I remember when we started, the ones who were engaged, maybe directly were those who pollutes. Sometimes, its difficult for you to just go to your bank & say I have this project, come on board & whatever because they are dealing with other issues. If I know you pollute, we go to them & say we have this project we are trying to do this thing & even themselves when we advertise & say we have a conference that we are going to deal with C02 emissions, they will come & want to hear because from their power plants they are

required to deal with those emissions. That's why they were part of this, even the funders that were funding this, ESKOM, ANGLO, SASOL contributing & the list is endless with SA.

With the banks well I can't remember us approaching them as VIPs saying we have this & come on board. In terms of publishing, we were fair to everyone, it was open to everyone to say come on board we are starting this. I remember there was one we did, even in this areas where the elites are there, Sandton, Woodmead & that's where they are based & you say no I don't know about this thing. This was also published, lucky enough there was also support from the minister. A call from the minister, if you like know that this is a project I feel like I want to assist, you will hear a call from the minister you can jump into the ship & assist. It's a tough one.

Some of the things it's about the commitment or whether is it your space to come on board & assist or not? Because I think we have tried enough. The only people that I can say initially were not touching them maybe to the level that we were supposed to KZN people if they can complain, I will say they have a right to complain. But immediately after we realised that KZN is the area, that's why we changed the focus & said look SANEDI go & consult them, let's have proper consultation & identify everyone that needs to be consulted. Then you consult.

We didn't start with them but sometimes when you do a project of this magnitude, even yourself, when you sell your product, you don't sell your product without concrete evidence, you need to build evidence. The centre started by building that evidence so that when it goes out to the public then you know what you are talking about. Imagine you are saying that you are promoting CCS & somebody just asked you in front of people, what is this CCS, how is it going to help me? You don't have info about it & somebody says this CCS suffocate CO₂ & suffocate people etc then you haven't done your proper research.

That's why even a number of researchers, there were numerous studies that were done so that we capacitate people.

6.) Sir, on that note, shouldn't we also factor in that some people don't want to know about CCS or already have their own preconceived notions. I personally have received reluctance about CCS & even by stating facts – DEA. They have already made up their minds, so how do we go to the public & convince them otherwise?

What you are saying you are very correct & lucky enough you are gathering this evidence so that you will combine it & everyone will know what is happening. I am happy for that. I am looking forward to seeing the outcome of your study.

Look, even within, when we started with this project, you know a project when you start it, you sell it out to the public & sometimes it is difficult for people to come on board & buy into your idea. The same as CCS, I remember when it even started, most of the people were saying what is this animal? Or how is it going to help us? You start to convince within & they said ok try go & try & lets see how you come up with then you start to expand the scope. We even had interdep task team to make sure that even the affected gov dep's that we see that are relevant, they come on board, they learn & we go with them so that it seems like we are not ahead any other gov, we are together so that they know what is CCS & what is it that we are trying to address. Even DEA they also included CCS as one of the flagship on their climate change response white paper as their mitigation measure to climate issues. Even if they put it you know that there are some people maybe I don't know, as you say you have interviewed, who still don't believe that CCS can be a solution. Its normal.

Let me give you a practical eg: I remember there was a project that was started. There was this one guy, it was the issue of saving electricity. When the energy efficiency thing

comes on board. There were people thinking that energy effic is just a myth. They didn't have that knowl & if you see how SA has transformed from just being reckless & now they are being energy effic. Check your lightbulbs. Before they used to use 100 watts for 1 lightbulb, now you need to change the thinking of the people. It takes years. Even when you talk about solar, we have abundance of sun but somebody will say theres no need for solar.

In Aus, there was one lady who was running the SE, she said she has realised that no matter how hard and how NB is the project to you, you must know that to somebody else it might be regarded as nothing but don't let that to let you know. It took some years, months, day or even a second to convince that person that this is NB. I can take you back to the issue of AIDS during Mbeki's era.

Some other gov dep's with this CCS might say no this thing is not going to help us with anything, its normal. I take it as normal. There was a project I was working on whilst doing my Masters, even though there are people that will analyse the financial benefits out of the project. You know sometimes in a project you need to even take a risk for you to succeed, if you don't take those risks, its not going to work. There are lots of projects that I can give eg's about that people shoot them down & say this is fallacy, its not going to work. Now the country is moving forward with it, it depends who you are & you cant convince anyone. You & I can both be scientists, not everyone will understand issues in a scientific way. That's my opinion & that's why when I try to convince you to buy this pen, its your mentality. Those are the things we are phased with anywhere, in any project. Even in your own family. To convince other people its not easy.

I remember there was also one which we did, SA'n coal roadmap when we started with that project there was no support. Some people are saying why do you want to come with

this. We said no, industry is sort of disjointed we want to put everything together because even in your case. Most of the good professors are leaving at WITS, where is that knowledge? Have they already transferred that knowledge to people? When we started with the coal roadmap we said we wanted to document everything because once you have info in a doc so that when the young ones come in they are able to take this ship forward. People they underestimate, Mark van der reed was a pioneer for underground coal. If that person leaves before what he has done in put in black & white whosoever is going to take over will start from scratch. Do we want that? We don't want that.

There is no direct answer to your Q but to me stakeholder engagement & getting people to approve your project, eish, you cant convince everyone. You cant, all over!

Even here I remember, Mashaba when he was doing the clean up, there was resistance. We all know the truth, deep down. Revamp abandoned buildings. Taking out homeless people in the street. How do you attract investors if you are scared of your own area?

One thing that I have also noticed is that people want projects that will impact today, now. Not tomorrow. Look at the sulphur in Mpumalanga, maybe 20 years ago people were told to move away but they were difficult. Now 20 years down the line they are suffering from different diseases. The impact is coming back late.

Dealing with something like this, like taking care of your climate, there are people, head of states don't believe in cc. 1 Professor I remember said you scientists think youre clever. Don't say because SA is a mess lets continue messing it up! Even China they are doing something. Even RE the pace is not quick enough but if we try to be quick. I love even how the municipalities are approaching renewables, when they approve your new house, you must show that you are going to have solar panels or solar geysers on the house. You are going to have the provision for using gas in your house. It's a good initiative & we should

have started a long time ago. Its never too late, we start now, going forward, things will change.

7.) Tangible policies, IF's in which we are pursuing CCS?

That one is a tough one. After the centre came up with that roadmap what happened was that we realised that there are no policies that talk directly to CCS. But what happened is that as a starting point lets get the roadmap to be approved by cabinet which was endorsed by cabinet which gave us the comfort, going forward. Even when we were busy building capacity within, we were not only building technical capacity, we were also trying to build capacity in terms of understanding the current regulatory frameworks.

There is a study which was done by IMBEWU, funded by the WB, which also assisted us in terms of looking at the current legislative frameworks. They identified your MPRDA which seats with DMR to say we can amend that so that we can include CCS. They also identified NEMA waste to say we can use that, they also identified maybe if the gas act which lies with DOE to look into that & try to amend so that it suits CCS & also there was another option from the same study to say what we can do is lets just have a free standing CCS law. I support this because if you are going to amend other people's legislation, it's a process & will also depend on whether those gov dep's are they willing to come to the part. The process of amending legislation its quite intense & if that particular dept is not dedicated to do that, there is no way that it can.

Even CSG act – doesn't talk about CCS. CCS is a new baby to the SA'n envir but that study identified those acts that if we want to do CCS we can apply those, even in the pilot projects. Lets say you want to do your characterisation, it lies under CSG Act so you need to follow that – the EIA fall under NEMA. You can apply that though the only challenge is that it doesn't talk directly to CCS. For now we need to either amend or to come up with

a new policy that deals with that. You cannot say that even though the cc response paper talks about CCS, it just says this is one of the intervention measures you can use but the how part of it doesn't go into detail because when you talk about policy, law or an act. With CCS its like any other project, there are lots of things that can go wrong. People want to be rest assured that whatever we are doing is within a certain law. Eg: An explosion happens, will people be compensated if their houses, livestock or crops get damaged? We don't have any regulation that is specific to CCS. What we have for now is bits & pieces of legislation that maybe needs to be amended but that process is a long process. Other people were saying why don't we have a CCS specific intergov task team? Even the petroleum act doesn't say anything about CCS. It talks about the petroleum issues & not CCS.

Aus or Norway, used existing legislations like your petroleum legislation, there is room for doing that.

8.) Would we create a new law or amend law to go underground?

Geology differs from one country to another. Aus discovered that when you inject C02 underground, it stays underground. That's their geological conditions. What about SA? Are we sure its going to do the same? That's where you have to pilot, to test it & see if works?

Minerals or anything underground, we don't know how its going to react with our C02. I don't believe that C02 in Aus behaves that way even here it will behave that way. It might behave differently because its going to react with a different type of rock with a different composition & so on then it might behave somehow. There the legislations are not there. There is no legislation.

You must also think of the worst, let's say when you are driving from here you never expected that there are things you will meet on the road, they can surprise you. Even the CO₂ we don't know. If natural CO₂ is coming out what about the one that injected? Will we be able to force it down? That one is coming out with water.

9.) Financing CCS – Do you think that GBs could be a potential investment opp for CCS in the future?

I will say yes & no.

Yes part if its managed well or if we have the funds. To start with if we are going to have green bonds, where are we going to generate that money from?

Nomhle: Engage with banks & importance of CCS (GB segment)

Perfect idea, I can support but whose going to:

a.) Manage it – in SA we do have nat treasury, the reason for me to say that because I was involved in a project when DEA was declaring vaal as a priority area rn. Some companies they raised valid q's – they were saying that they pay penalties if they emissions are high & so on. When they pay those penalties when the money comes to gov they said you guys as gov you don't ringfence that money so that its used back to sort of deal with those emissions or improve the tech. Developed countries do that in SA we have 1 basket where all money that comes in goes to Nat treas. When the new financial year comes in, they don't say you generate this money this is for specific project x it will go to social etc. To me it's a yes or no

If that is managed & not combined with nat treasu where they collect revenue for all the projects then its managed somewhere else then I can say it can work as that money is dedicated somewhere else for your CCS or for clean coal technologies. It can work. But if

it goes to 1 basket that is national revenue how do you then allocate it back to say this is for CCS? Maybe your research will think through those things just understand how national treas operates because those are the complaints we got from the Vaal project.

The other eg, meeting with DEA – They were complaining about in the East problem of air pollution, mine dumps that have been left open. Around Boksburg there are heaps of soil when its not raining & windy it blows dust to peoples houses & my eg to this is that people who were operating those mines there is a fee that you pay for rehabilitation.

CCS – Insurance so that you can run CCS for 10 years w/o any problem lets say 15-20 years down the line then you start experiencing problems. You must have money to deal with that or even to compensate people who will be affected by that. That's something you need to think about before hand.

1 minister asked us a very difficult question, that is one question I will never forget, Sonjika she said to us whats going to happen after 100 years after burying CO₂ underground? You cant predict that far.

Green bonds you are proposing must really address these issues & be ring fenced in such a way that to fund that technology, that it is only for the funded technology. So that in the long run

It must not say CCS only, we are diversifying. There is a move to say lets diversify, lets not only concentrate on coal lets say 10-20 years down the line, the country is no longer generating electricity from coal. That fund are you going to use it for other projects? The eg that I can give is when CCS started, they never thought of, they were saying CCS period. Now there is an element of using that CO₂ which they never thought about & some

organisation they were saying thina we funded for storage not the use. You see those dynamics?

So you must make a case open in such a way that 10 years down the line we do have that funding generating billions, we have it & we can use it for other technologies. Irs not only for CCS. I remember with SANEDI we once had a very robust discussion with them, they were saying whatever they were doing is mostly about storage even then, but we said other countries like China they are exploring the use of C02 because they realise that the storage doesn't have economic value, you are just taking C02 & burying it – theres no value. But if you use C02 for something else that's where you get value.

8.) Diversify funds for gb – law open to other projects

With gov, priorities change every now & then. Last time they were saying Medupi & Kusile are the last big powerplants. If we assume that they are the last are you aware

Interview transcript 14: Fedgroup

1.) Roles & Responsibilities of Fedgroup

Fedgroup is a financial services company that started out about 30 odd years ago in the 90s. The main service they offered was a participation bond where you are pooling money & funds together into commercial & industrial property & it did very well over the last few years. The company was taken over by the Fedsons & I met Grant whose the current group CEO.

We met & I was interested in starting up a fintech company at that time & one of the things about Fedgroup is they built very good backing platforms so we decided to come up with Fedgroup ventures together which brings in investors over an online platform & on the platform itself is an app. So its not a financial product & not regulated by the FSCA & the 1st crop we put on the platform was solar. There is the option for the person to go onto the platform & buy an asset of a solar panel. Those solar panels go onto an industrial roof top which supplies energy to the landlord or the tennets in the building & we bill on a monthly basis, they pay us & we pay the investor & keep our platform fee & we build the landlord & collect from the landlord. It's a very simple model & then towards the backend of last year we launched an app for impact farming & we added 2 new products to the platform – being beehives & blueberries. It is all based on the principles of impact investing so it has to have impact from a peoples perspective in terms of job creation & skills dev, from a planet perspective what impact is it having on the envir & then profit – in terms of what economic returns there are from this. Unless it meets those principles of impact investing it doesn't go onto the platform. Last year it went through very well, successful launch & we managed to raise R78 mill on the platform itself through retail & 120 odd mill through institutional funding.

We've sold out on our solar assets so we don't have solar assets at this point as well as the beehives because the demand is so high. When we went through this process we saw that there is a gap in the market in terms of debt funding & the initial funding that we got was from pension funds that needed to put their money into these kinds of impact assets & we managed to raise probably around 50 mill worth of pension funds. We decided because of the gap in the market, the financial institutions couldn't get their heads around funding for solar assets & that was one of the most consistent assets in terms of returns. We started an SPV called Fedgroup Impact Investing & we are going through the process of doing a debt capital raise of the first 100 mill which we should finalise in the next capital of weeks. Based upon the principles of GBs, the problem with GBs is that you can't raise less than a 100 mill for GB, you have got to raise at least 500 mill. We are also building a portfolio base of these assets so in terms of step 1 or a precursor to the GB issuance that will happen probably Q2 or Q3 of next year depending on how we will finalise these assets.

That is what we see becoming the funder of these assets going forward in terms of pipeline for either solar or blueberries because they all meet the principles of impact investing from our perspective, to that end we have joined the WWF & keep to their principles of sustainability so that is what we have subscribed too & we are trying to PRI as well. Unless those assets meet those principles then we don't go into those assets, so already we know that we have underlying assets that perform according to those principles & it should just be a tick box exercise against those processes but what we found is that there is no, as much as there is WWF & PRI & GIN, there's no consolidation from a SA's perspective in terms of what those principles should be. That's where we are trying to take the best practices from each of these different institutions & trying to

formulate our own frameworks in terms of those principles & making sure that we do meet best practices from a GB perspective.

The pledge we took was just the 1st step in the process that this is what we want to do going forward & we pledge our allegiance & we want to achieve in the near future.

2.) The reception in terms of signing the international GB pledge?

It has been met with positive & negative but a pledge is just a pledge. But your actions behind it are more NB. Like I said, its just the 1st step in the process but you can see & the whole thing is about this triple bottom line reporting that happens.

App – almost real time reporting to individual investors out there so people can see what impact their assets are making via the app on a real time basis. On top of that we built an AI layer that starts to analyse the data & make recommendations to stakeholders on the app & we think that's where the industry is heading for the next 5 years. We have taken that pledge & said this is where we want to take the company & you have probably seen pension providend funds having to put their portion of their funds into impact assets in the future & if you look at pension funds they control 100s of millions of funds that need to be deployed.

The whole thing is finding these assets that really deliver on – impact investing principles. We don't just want this to be a tick box exercise but we want it to be tangible.

3.) 2014 GB – Jhb commotion. No transparency & accountability & seen as a tick box process & investors are asking what is going on with their money & where have the proceeds been used for?

With us, as an investor when you go onto the app, you can see via the app what impact you are having or are making in terms of those measures you have in place. Ours are very

simple at the moment & we don't want to make them complicated because we want to make it understandable to the investors because the investors know the assets & this is what the impact has been from an environmental perspective & CO2 emissions, trees planted & lightbulbs planted. It's a simple way to understand, you can just download the app

4.) In your opinion, why has there been such a huge investor appetite for GBs internationally but also for our country?

I think people want to be different at the end of the day.

5.) What would the proceeds be used for?

6.) Challenges & opp's of green bonds in our country?

Opportunity is that the appetite is there & that's not going to shrink because pension funds have to put their money into something such as the assets. And there's not many of these things available at this point in time so there's – that's the opportunity.

Another is long term money because if you look at it from an asset side, a liability side you have got a 20 year life span & pension funds is one where you can get 20 year returns. They are matching in terms of asset liabilities. You don't want to invest short term money on a long term asset, that's where you find the mismatch. That's what makes it good. For eg, if ESKOM doesn't fix its challenge you are going to have a demand for solar panels & more & more people becoming efficient from an energy perspective. The other opportunity is for battery & the technology approves & we get to a business case for batteries then we will put that reason into the equation as well then we'll further invest into batteries.

From a risk perspective, if you look at it from a political perspective, as long as the regulations don't change then there should be no reason why we couldn't operate within

the current structure going forward so I think if you look at it, no one can change it retrospectively but prospectively what will happen with the unbundling of ESKOM & where is that going to improve because solar can only provide so much & you need that production or the generation from another source & you don't want to do coal. So what would be your alternative from that perspective? Because that doesn't meet your green principles, your impact investment principles.

I think the risk is limited downside risk but there is huge upside risk.

What is good is that financial institutions, if you look at the big 5 banks they are starting to see how this funding model works. They are starting to open up impact investment in terms of the funding models. They have taken a bit of time in terms of trying to come around but eventually they have. So the cost of funding is going to go down & the cost of fuel is coming down but tariffs are going up so its creating that.

Interview transcript 15: Musa Mabuza CGS

It's a very controversial project & it is very emotive. I myself, have extreme opposing views about it & I am going to be very honest with you with your line of questioning. But you must understand that this is an extremely controversial & emotive subject & we must not mislead you & support you either. You will do your own processing based on what you have collected & review. Don't discard even the racist, put it in your processing it will give you a perspective.

- 1.) CCS identified as key technologies to reduce carbon emissions on a global level & why are there still skeptics about CCS? There isn't a general consensus

In reality it comes back to your question to the financing of that technological intervention. The moment you introduce that intervention it means that the costs are going to go high & whose going to pay for the costs? We as a developing nation until around 2008 we used to use our cheap & abundant electricity as our most competitive advantages. Now, climate change is a reality that is confronting us & one day when we have coffee we will talk about my views re that.

The reality is that we are a developing nation, we need cheap energy resources to sustain our developmental trajectory, whether it is industrialisation or general applications of energy & we sit as one of the nations with the most skilled economic distribution with more than half our people living below poverty level. Whereas technological interventions like CCS looks at face value, or atleast the current technology that is looked at but in reality we have to capture the carbon & we have got to store it somewhere. That introduces the cost.

Now the key question is who carries those costs? Do we expect the poorest of the poorest more than half of the nation living below poverty level to carry the cost of this fashionable

thing called CCS? Do we expect that we would be able to remain a globally competitive industrialisation hub with the cost of electricity & energy going up? Now that's a precarious balance we have got to deal with. Its one thing to deal with the subject but its another thing to deal with its material effect on the economy, society, development & the implications of adopting any solution. By the way what I am saying is not only about CCS.

When we are considering other sources of electricity, like renewables, they are not particularly cheap either. They are not cheap at all so all the packages solutions we have got to look at, at the end of the day as a country we have got to come to a decision that says we are adopting either this or a combination of these things on the basis that they are consistent with our developmental mantra.

So, the scepticism that you do see is a function of the cost & of course there is another element which is the efficacy of the technology itself. So, if you capture this carbon where are you going to store it? Now this is where I come in because we are geologists. We have identified 6 basins in the land, you must remind me to send you an atlas of the 6 basins we have identified. We are doing studies on one in Natal, we call it the Natal basin. We are working with SANEDI & the former institute of energy but now we are in the same block. We are doing the geology to make sure that when we store that carbon, it is not going to be re-emitted because the whole exercise becomes a zero sum game. We capture it from the power stations, transport it to the basins, inject it into the valley of mother earth & if we have not done our studies correctly then it can escape the earth & still have the same effect that we are trying to curb. So it is very NB that we consider all of these facts & we are as technologically upped as possible so that when we advise our principals about considering this as a possible option we have sufficient confident that it will not be emitted from the ground where we have stored it. Until we have gained public trust & it

is very NB that we gain that trust. My view is that the only way we can gain that trust is if we have done appropriate tests & shared this information with the public because the public are our keystakeholders – induna, amakhosi, ordinary people & say to them heres your geology, heres what we looked at, here are the structural features & these are seismic implications. If you have some seismic activities, it will not affect the storage of carbon.

If & when we can prove that, then I think we can go a long way in gaining more public trust & that trust must not be a PR exercise. We must be very factual in our approach & be honest & we must do everything that needs to be done to gain that trust & I think we are on the way to earning that trust.

2.) You mentioned a very NB part of when this would be implemented. We've missed all the major goals. What is causing these barriers for CCS to be implemented besides the cost factor?

Well, it is the technology & the gaining of the public trust. I can tell you now that we are sitting with a legal, very strongly worded legal letter from the communities of chiefs in the areas around the Natal basins who are raising fundamental questions. Now, we could say that no we are implementing its 2017 or we could say hold on a bit if the public, the great majority of the public is not convinced that this is not the right instrument then let us engage them more so we are engaging the communities.

So, we delayed, we deliberately delayed but we have also not concluded the geological characterisation of the basins. So there is a seismic study, a basin seismic study that must be done. I could not sign off for SANEDI to start the pilot project until we have done the seismic study. I will not have the confidence to sign off on this basin. So they have gone back to their authorities & now they have got the financials & they have come back to us

& said please go ahead with the seismic study. We are in the process now of bringing the Canadians or Americans to help us with the seismic study of that basin. Because it is not just about pumping, you have got to do a proper geological characterisation so that geological characterisation is not complete yet that's why we have not concluded on implementing the pilot.

3.) Institutional frameworks – policies, frameworks. If we are going to implement CCS what type of policies, laws & different institutions that are mandated to collude to make this a success? 1 thing I have observed with my studies & the people I am interviewing is that they all refer back to the right people being involved – having an intergov collaboration. Your views on this?

You are doing a very very good research. You know we don't yet have the policy landscapes, policy legislative & regulatory landscape for CCS. We are using the US guidelines as the basis for the pilot. But you would not as a country have legislation of something you don't know of whether it would happen or not. So no its not a bad thing.

I am saying, it is good to raise that flag & say there is something that is missing but that thing that is missing is within a particular context that the reason we want to have a pilot, is so that we can use the global best practice to do the pilot & then the pilot will inform us whether we are going ahead or not. One of the things we would have to do in order to go ahead is to develop legislation but that in itself presents some challenges, for instance we have the MPRDA that governs the extraction. We don't have anything that governs the injection. SANEDI then comes to me & says no man can we do this pilot in terms of the Geoscience Act? I said to hell with you. We are not going to do that, we are definitely going to do that. You must go back to your minister & create an interim legislative mechanism

to enable this injection to happen because the Geoscience Act is not in the business of governing the injection. We don't inject anything underground.

In your study, I think it will be very NB to illuminate the importance of the pilot & its basis as informing the policy & legislative framework as it were because CCS is a new phenomenon & fortunately we are blessed as a country with all types of geology incl geology that enables us to do this sort of studies because we had not been confronted with issues of CCS in the past, it is NB that we consider a policy & that policy inunciated by legislation & regulatory frameworks that will guide the implementation if indeed the pilot proves that it is an appropriate intervention.

- 4.) The financing part, the stakeholders who should be involved. Private sector has said show us the technology & we will easily fund it. Why hasn't there been a dialogue amongst SACCS, SANEDI, other organisations & the private sector?
National discussion on CCS & financing part

This is such a difficult question & the easiest thing to do is to say go to SANEDI.

Me: To advance CCS we need a multidisciplinary panel

When it gets to issues of financing this program, you also would not want to have it all over the show. We will have our role to play & of course the knowledge we would be generating would be a basis of the value proposition that the country develops. Because the country must develop a comprehensive value proposition.

But I will say this MaNgwenya that for me it is possibly premature to be...what are we going to engage financiers at this stage? I am saying that we are still developing that base value proposition & the reason I called SANEDI out with the injection was for me to say to them that I don't live in a Banana Republic, I take my country & job very seriously.

There is a concept called CCS we are collaborating in developing a value proposition that we are moving in the direction of GBs & other mechanisms of financing this thing because we don't know what we don't know. I am arguing that the state should fund the initial research that gets us to a certain level of confidence because research, you cant invite us as researchers with a predetermined outcome so I am worried sometimes about the way the politicians are articulating this CCS. It's almost as if we have decided as a country if we are moving in that direction & I am saying that it may not work. So, for instance once we have done the seismics on the Natal basin it may show that the basins are not appropriate for storage so why should we be talking about funding, isn't it premature? Because I need us to get to a point where & our role in terms of your fundamental question, is that for us a country to get to that fundamental question we have got to have a very solid base value proposition that says SA can adopt CCS because our geology is right because you can store carbon in SA safely & some things we must bite a bullet as a nation & put a little bit of financial resources into that & allow that initial studies to happen & only at that point do you start moving in that direction.

The problem MaNgwenya, I don't know how familiar with these funders they don't fund anything for nothing. This GB notion sounds very sexy but we must look at them very carefully because for every dollar that they will fund they will probably make anything between 15-100 dollars in return. You have got to be very careful & the people who are providing those bonds so CCS becomes a new cliché of investment & returns. You have got to be very careful, don't be gullible in that. Africa has been screwed for too many centuries, I think we as Africans have got to embolden ourselves with a bit more confidence on the subject matters & take positions that are Afro-centric in character. I am not overly worried about us not rushing to engage with the financiers & so on because for me when we get to that discussion of the financing we must have brought ourselves as

interested & affected parties, people like yourselves who are academics & thinkers bring the CGS, SANEDI, DMRE, Nat Treasury & so on, have a conversation as SA 1st before we start rushing out to bring in all the big banks.

Can we have pride on this project? A unique SA'n project that has been worked on by SA'ns? And say as SA'ns we have worked on this project & these are the different prisms we have looked at. Instead of talking about the financing at this stage, I am more worried about completing a comprehensive value proposition. That will consider all these factors. Remember when I started with your 1st Q, I said Gog Ngwenya stayed somewhere in a village where they have never had electricity & they have only had electricity under the democratic dispensation, when she begins to have access to the electricity. We now introduce CCS that is going to increase her ability & her affordability of electricity & we take aboGogo Ngwenya & we throw them below the threshold of access to electricity, so the debate we must have as SA'ns is what are the intended ramifications of CCS? To the extent that they are not going to undermine our development?

In addressing the key challenges that are facing us as a country because we cannot take those things for granted MaNgwenya. We should never ever, it doesn't matter how sexy a topic looks or classy & whatever it looks we must always be informed by the sectors that are SA'n specific & that space we must always guard very jealousy with the last drop of our blood. All of us in everything we do. That's why my discussions with SANEDI its almost as if we are always in a battlefield because SANEDI went & found out about CCS & for them its CCS or nothing. And I am saying can we hold on & wait a bit.

For me I don't take these things in a singular prism. We must not look at CCS through a very singular prism to say CCS is a panacea for climate change & therefore it must happen. Even those dates they have set are unrealistic because we must move with our people &

if our ordinary citizens are not convinced of this CCS, we must not move another inch. When these chiefs wrote us that legal opinion, I said good shot I have been telling these guys that no. And they depend on us as the CGS. At the CGS we are guided by the science & nothing but the science. Science is based on evidence & evidence cannot be cooked. So let us allow the science to lead us, if it takes a little bit longer, let it be. Lets not rush to adopt CCS as a solution & I have had this discussion with minister & minister is sold on it so just coming back to your point who should finance CCS? My view is that the coal producers should finance CCS because it is in their interests as they are producing coal.

Me: ANGLO supportive of CCS but wont take money to finance. Climate change strategies are excellent.

MaNgwenya, this is very simple. We have been in this game for a very long time. You cannot ask a criminal for their opinion on the criminality that they are conducting. What do you expect? Gov has the authority & the singular sovereignty authority on the administration of any principle that they believe in. As a former policy maker one of the things I have learnt is that if you want people to change, you introduce legislation that makes it impossible for them not to change. These guys are very short-term focused, they are thinking about this year & thinking about their returns & its all about this year, its not even about next year or the year after. So, I am not surprised that when you talk to ANGLO or talk to any of the coal producers, you can talk to BHP, South32 but I will tell you now that when governments start making it a requirement for them to have their licence, they will oblige. You cant ask a criminal of what they think about their crime. Would you take responsibility for your actions & hand yourself to a prison for these actions that they have taken? Of course they will tell you that no no, I support a crime free SA but I will not go to prison for my actions.

Its good that you have interviewed them & you have a sense of what their positions are. They always behave like this & in the same way you talk about transformation. They always say they support transformation, we are for it but when they are supposed to implement it they make sure that they screw the very transformation & design mechanisms to destroy the transformation that we want to achieve. If you call them into conferences & have discussions with them they are the 1st ones to say they are fully behind this thing.

Final comments: You chose a very interesting topic. Your PhD should not be easy. There are contradictions you are going to deal with & you are going to talk to us & to the standard banks. Even within gov you are going to get some interesting views. It might be useful for you to get a technocrat from SANEDI.

Dr Nigel Hicks – technical lead of SANEDI

Mapholoba is playing a very good role. He is the custodian of translating the technical information & simplifying it so that the public can understand it.

Interview Transcript 17: Investec

Project financing: Its quite a involved field in the sense that you bank the project so the project is located in a special purpose vehicle & this is just basically legal format like a company or so & whatever the project is, whether powerplant or fuel storage facility or whatever it is owned by this purpose vehicle. The issue of that is your financing, the unknown that goes into to make this work. Looks at what will make this project successful or not. Normally, in the corporate field, when Investec wants to borrow money it puts up its balance sheet so we assume that Investec has more assets than that so those assets can be liquidated to pay the debt in case Investec cant meet its obligations. That's a huge difference, it is very very different in terms of raising funding, if you don't have assets & you only have because the equipment which is built here is normally worthless, it is 2nd hand value which is at best maybe 10 or 20% of what it costs. So this costs a billion rand to build, the solar PV plant for whatever reason, you cant sell it for a billion rand. You might be able to...you don't look at the assets in terms of the quality, you look at the off data agreement. That's your primary.

There is always someone who wants to buy the service or electricity in this case, if it is a solar PV Plant so if it is electricity & you look at this organisation here we will buy for it, can they pay for it, do they need it. Is the price competitive & all these sort of stories. When you're satisfied with this off take here before you can satisfy this off take there is of course a lot of other parties which need to play a role here. That means there's a constructor which we call an engineering procurement constructor company which needs to build this, there's an operations & maintenance organisation which needs to operate this because even if you have successfully build this but you don't have a clue what you are doing in the operations like we have so many water outagaes & power

outages, ESKOM has no clue what they are doing. Then it doesn't help if you have got the best asset but you can't keep it up & running, especially if you don't maintain it. This is just a very simple structure.

The loans normally in these structures they vary anything between 65% up to 80%, sometimes even goes higher. So basically it means the person who provides the loan he/she decides on how this whole thing will work. There is always a small portion of what we call equity from the sponsor so there's a sponsor & normally who develops this project & this sponsor must put in his own money so that he can't just walk away. It's like an entrepreneur who starts a coffee shop, he must put his own money in so that when things go difficult you don't just walk out & leave & hand over the key to the bank. Like a lot of homeowners did 10-15 years ago where you could get 100% bonds when interest rates rose they just handed over the keys to the bank & walked away, emigrated or whatever & now you have a house which is worth half the value & the bank can't even recover it. That's really where this type of discussion is about.

This is what we do, we provide the funding into the DSV vehicles & these are our clients. We have got key clients that want to develop projects & put it in SPVs & we provide the funding like Dita said, he who has gold makes the rules, so he will dictate on how the whole structure works. They will present something to us & we will say no that's not good enough & this is not this or that & we also look at the risks. Depending on the type of project you could potentially have 50-60 legal agreements between all these different parties & if for eg, Bernard just closed a major half a Rbillion project here. There were 8 banks involved & there were a huge amount of legal agreements at this level & obviously any project to be built has a lot of permits for a power plant permit to connect to the grid

to transmit power, there needs to be environmental permits, land lease agreement, all sorts of things right so it's pretty complex.

Now, for investors to put in money into these projects because these projects are normally not done by governments, gov's provide offtake guarantees behind. For eg in SA ESKOM buys its electricity but ESKOM is bankrupt so behind ESKOM sits gov & gov provides a guarantee that if ESKOM can't pay, they will pay. That is very fine but that works as long as gov is still credible & gov getting to a point in the next few years that maybe their guarantees also don't mean anything. The problem we sit with is that there are many countries in Africa which you just cant bank, they are just bankrupt. They are sub investment grade so that's why the credit rating with Moody's, once we get downgraded by Moody's, this gov guarantee dictates – the cost goes up, which means the cost of electricity also increases. Everyone will pay more for electricity going forward.

The reason I give you this little story is that...the people who provide the loan finance, they have the biggest say but obviously these projects are not going to be started if the sponsors cant make a return so then they need a return here & therefore there are 2 groups of projects that have to now think in the broader sense of what you are trying to invest. There are projects which are done by lets say private capital, in other words, people who do it for a profit motive. Because they will see that they can get a return on an investment by investing in AngloAmerican shares or put money into a US dollar money market account, at the moment you only get 2% money market account there. It looks at all these sort of things & they of course need to decide where they are going to put their money. For eg, our pension funds (Sanlam, Liberty) they buy this stack here at the bottom for typically 12% returns in R terms. Private capital is one source of funding to start these projects & to be quite honest I haven't seen any of these projects where gov has really

done it right. For eg, we are working currently in Namibia & their local utility is quite well endowed with money & they are going to build some of these projects themselves but because it's a SOE im not quite sure how they calculate their returns.

One reason why gov owned entity would do this is to protect their monopoly. That's why ESKOM is difficult & unobstropulous with signing power purchase agreements because they want to protect their monopoly. Let's assume gov is not funding things like this because in many cases, in most African countries, gov doesn't have the money to fund all these things so its being funded by somebody else & that means these sponsors will only do it if there is a certain amount of return. These projects never make sense by just putting 100% equity in (their own money). There will always have to be a debt component & the problem in many of these projects is because of these weak government off agreements or in many cases there is no gov agreement, you take a market risk eg: A toll road or a border post or any type of these sort of things. What this means in the power industry is that when these companies develop projects, they will then get funding from different sources so if I have to broadly think on the debt side you typically have commercial banks which only give money on commercial terms. Then there's a thing called DFIs (Development Financial Institutions) they are supposed to support projects which have a development role, have an environmental objective all these sort of things. They are supposed to provide you with long tenures of debt & cheaper debt but they don't really do that. We find that they always come into the market & see what we charge (insurance) on that when this thing falls over we get paid out & their margin (interest rate) is the same as ours. But they have a mandate to do that. Here, for eg this project that Bernard just did there are about 5 of them involved. Some of these DFIs, if for eg in SA, a DFI is like the DBSA, IDC, AfDB, FMO, DEG, KFW, ETA.

GB PART: You have these DFIs & then what we have come across is these things you call your GBs. Now these I actually had last week somebody who contacted me with the GBs story. Now these GBs sounds to me that this money being raised from wealthy individuals, family office & who want to do good. Just to understand the def of GB one needs to be very cautious of the word green, there are many people who want to label themselves as green & just to use that as an incentive. For instance that Nedbank GB that was raised but I don't think it had any exposure to green projects, I guess it's a Nedbank guarantee & its basically for them to & they are probably going to use it in the renewable space but the direct link, in my opinion, its not a GB.

For eg the guys now who contacted me last week they claim to have had \$600 mill or whatever of GBs & these GBs are supposed to go into renewable type of projects. The 1 project was an agricultural project in the UAE & the other one was a bioenergy project in Canada & that was almost \$500 mill & \$70 mill was available in SA for waste-energy project. So then I said how is this working & they said well they are going to put up this cash back guarantee & for the \$70 mill project in SA & I said what does this physically mean? Yeah, well, they would somehow take an equity stake in these projects, I think 30% equity stake but they would look at it like your venture capital outfit. That basically means they would probably take about 30% of the equities, so if the equities is 30% they would take like a 3rd of that of the equity & put that up, so you would still have to find somebody else with the other 70% of the equity. That's the 1st point. Then there is the whole story that they would guarantee you a debt which I am a bit suspicious about, cash guarantee your debt why would they want to do that? Why would they not put the cash away? But what I would like to believe is that the true GB that there are organisations in the world, wealth funds, family offices who a portion of their portfolios is saying 5% or whatever to doing good & one of them is actually to promote RE. For eg: I think with Africa's growth

for the next 50-70 years of population we will die with our waste that is being generated because at the moment it is processing waste, municipal waste & something has to be done about this. But these projects are very complex to finance on this basis because they actually cannot be financing the revenue of electricity because electricity is too cheap. They are being financed in Eur, on the basis that the tipping fee for the dispensing of the waste is a very expensive – you pay 2 3rds of the revenue here is earned by the tipping fee & not by the electricity & nobody is paying that. In SA, the highest tipping fee is about R400 whilst in the UK it is close to R1600-R2000. Therefore, these projects will never happen in SA or in Africa for that matter if they are not somehow being subsidised.

That's what I'll expect a GB to do but what they call a GB here ultimately these projects need to make sense, for eg they were now talking specifically waste to energy & municipal waste & the particular project they were talking to me about was to convert old tyres into fuel. Technically, there has nobody that has ever showed me a commercial case that you can actually make money out of it by selling the diesel fuel or the oil & steel that comes out of the tyres. It's also the complexity of getting hold of these waste so the whole GB discussion is in my view almost a red haring in the sense that until such time that people are prepared to put in almost money on the basis of a grant what does it mean? Because if they want a return on it or they want the whole business case to work then it still doesn't mean anything?

Monde: On all these stakeholders? Who is your likely audience because Dita has gone around in identifying a couple of key players? Who is likely to be interested in your paper or research just on this topic?

Nomhle: Private sector – Investors + Gov

Dita continues: That's a very NB Q just to complete this picture, there's a thing called an export credit agency. Every country has got export credit agencies & this is really to promote the exportation of equipment & that normally comes with cheap funding. The moment you say investors then the 1st decision one needs to take is to find out what does that mean? What do these investors expect?

For me, if I was sitting in your shoes I would 1st of all say, anyone who wants to promote green stuff then he must show me what he means. Does he want to his money back – any returns on his money? Does he just want to save the envir? Carbon credits? Profit motive?

I would argue that if you really want to do good then you want to make sure that the money you made is not wasted for eg, if you give somebody a bursary for their studies you want to make sure that they pass & you atleast have paid back & I have helped you. It makes me feel good. Really what I try to achieve is to feel good, I made a difference. I think to me that's the most NB 1st decision. What do the people want to achieve? The moment there's a profit motive, anything other than doing a successful project then I immediately have a problem because if there have to be returns then where does it slot into? What is currently available? The 1st thing in my view is those investors need to be subordinated completely to any other investor. In other words, they must be the last to get money so that when you do your calculations & try to get this off the ground lets take the waste to energy eg because those are the hardest projects to make work. And I think they are the most NB projects.

You see electricity we are getting to the point where tariffs are not yet cost effective but they are getting there in the next few years & generally in Africa as well. With solar power & wind energy becoming so cheap its not an issue anymore. It is more a Q of switching from coal to these energy sources. There in my view that could be one topic for eg to bail

out ESKOM debt is to get them green funding in order to make them commit to closing down the coal-fired power stations but that of course needs to be replaced for something else & what is this something else?

You see we can build today solar power station & wind power stations, cheaper than coal. Irrespective of the carbon credits & the pollution they pose so that's already a no-brainer, it actually doesn't need cheaper funding. What it maybe needs is funding to retrain people to work on this whole debate with the unions where people who work on coal fired power stations retrain & reskilled in order to start working so that investments would go into something like the reskilling but when it comes to a waste to energy project, which is one of the most complex projects to work then a green investment in my view should be the most subordinated one & it should actually be regarded as a grant. You also don't want to have sponsors making super profits because somebody puts in their grant. So I think there is a balance you want – which is a successful project which means you need to have proper sponsors, proper EPCs, proper contractors & offtakers for the electricity or the steam or whatever this plant produces. But these sponsors will not do this work if they cannot earn a reasonable return. I think the gap analysis would have to do what people would regard as reasonable returns? What amount of supportive funding is required in order to get to that return? Because at the moment with the w-e project you cant get there with the electricity not paying it enough, there is the tipping fees which are too low. But if the project costs for eg a \$100 & you could get maybe \$50 worth of grants then it could probably work & the benefit is that you would start processing the waste.

Bernard: From your experience & the work you have done is there different classes of GBs because Dita is speaking towards the philanthropic side of guys who are

subordinated who want to see projects succeed. Is there another class of GB that slot into the commercial phase?

Nomhle: CBI explanation

Bernard: In the REAP space there has only been 1 bond issued out & that was a solar company. That one issued a bond but the problem with bonds is once it is issued, cash needs to flow back into your investors. Bonds can only happen after the construction period when the projects operating. That's what happened in this solar company's case (Soytech). In the REAP space I think there is a big space for GBs going forward. When I am talking GBs going forward it is commercial bonds that are green because whatever the proceeds are used for is green energy. The problem currently is that there is almost a reluctance from the DOE to allow any refinancing of RE projects. We have been looking at a few refinancings where there is this whole debate around what is the benefit to the country? With refinancing obviously more debt goes into the project. Will there be a tariff saving or are you going to declare a dividend because there is more money going into the project? & what share of that dividend is going back to the economy, dept? That's basically preventing that but I do think there is scope for a lot of projects to get refinanced with bonds & it can really be GBs.

Just to add to that, maybe a good thing for you is to go & look at SOYTECH to see who are the actual holders behind those bonds are. I know a big portion of that was taken up by Standard Bank but I think there is a list of people who are invested into those. Our team hasn't done anything on GBs, its quite new but I think it is coming.

Dita: When I think about GB I do think more philanthropically about it but that's something what you also need to decide are you talking about philanthropic support for projects? The other angle is that a lot of banks, corporates have in their mandates that

they have to invest in GBs. The WB & all these international organisations have a mandate to invest x billion of dollars into GB's so there is no shortage of money for GBs. The point is it would be interesting to see whether there is any difference on the returns of those bonds? I doubt it. I think they are in the commercial market like any other bonds because a lot of pension funds, for eg sovereign wealth funds, the Norwegians have got the biggest wealth funds in the world & they build it at the back of their abundance of oil. They are now under big pressure from the Norwegian pop to start changing their investment mandate from oil & gas into more renewable stuff. Norway from 2025 onwards there will only be electric cars, no fuel cars anymore. They are going very heavy down the hydrogen route & starting to divest out of their own national oil. So that is driven by mandates but that doesn't mean they are willing to provide the money at a cheaper rate.

If I was in your shoes & what we can do is send you, I would look at the world of renewables in SA, look at all of the projects that have been banked over the last 6-7 years. There are about 6-7 expedited windows, look at all the projects, analyse them & we can give you that. Go onto NERSA's website – publications

- Then say how much debt has roughly gone in there & sometimes they list, sometimes they don't. The shareholders are there, the banks are there as well as the operation dates when these things came online. If it is not in that doc you can google it
- Label it Q1-Q4 then make a list of all the operational projects so bond holders what are their requirements & then the main thing is they need to see cash. Once the money goes out, a return needs to happen 6 months later

The other reason why GBs is such a topical debate now is what all these projects started off the RE space in SA was new & there weren't no credible parties which could build &

construct & operate & develop projects successfully. So these projects & the banks were very nervous because this was all new & the financiers were at a higher rate. There was a requirement from the DOE that after 3 years, they are allowed to start re-financing so now when you start putting in new financing with an operational track record the financing costs would be lower. The idea is now that to refinance all this stuff at cheaper rates which will to some extent decrease the cost of electricity although the last round of bidding was way below ESKOM rates but initially it was much higher & this was to get people interested in doing this work. If that's the bait of the GBs then that's fine, it will come in at a cheaper debt & there is no shortage of money in the market. There is a shortage of projects. That's the issue.

What's also true maybe what you should think about from an environmental perspective, there are environmental projects which make commercial sense. And then there a lot of environmental projects which cannot be banked commercially because the returns are not there. The ones which make commercial sense like the RE programme now which we have. There you can put a lot of money like GB's & so on & so forth. Whatever the market is prepared to give you the rates at. The other ones will have to be more funded with grants, philanthropic. Those are the 2 applications of GBs.

What I think, we will send you that list & you'll do the other work. Look at that world & think about when GBs come in, there's a form of government involvement because all the debt is being guaranteed by gov, debt & equities. So more debt goes in & the gov guarantee increases. That's why gov is saying oh well we now are more exposed, what are we getting for increasing our guarantee because they either get reduction of the tariff which will be very difficult or normally there is an upfront amount which varies, depending on the size of the project & they get 50% of the benefit of putting this money in but those are all the

kinds of considerations. You need to look at the IRRP & all those things – on the commercial side. On the philanthropic side the actual green stuff, you need to look at the technologies such as waste, energy & biogas those are projects which are difficult for commercial lenders to come in with a philanthropic angle, cheap money & response so that there is appetite for lower returns but they want to see things changing & list all the challenges there. The challenges will be different from the commercial side. The commercial side is very much gov & what are they getting from being more exposed. For the waste scenario, you may end up in a situation where you don't get paid for a year or 2 & things need to be reconfigured or it breaks down & you should be fine with that.

Maybe just another NB point because I feel so strongly about this because we had so much deterioration over the last 10-15 years in the country. Government is just hopeless in terms of doing anything properly. The infrastructure is just getting more dilapidated as time goes by. If we go at the current rate I don't know where we will be in the next 10-20 years from now, we probably won't have roads to drive on anymore. I am very negative about that & it's a combination of funding issues, of just basic competencies & managing things, politicking. What I am saying is the only hope that this country has & for that matter, the whole continent is for government to create an enabling environment – policies etc. This is so fundamental so that the private sector, people who actually know what they are doing can come in & not screw the environment & make super profits but they need to make a profit, otherwise why would you do it? That's what this is about & really it is within that context to promote the bond finance & all this stuff, cheaper finance to get things off the ground but the model of private sector involvement, they need to develop the project, build it & operate it, maintain it which is ultimately fundamental. You see the project finance field is not very old, it is only started in the US in the 60s, 70s it came to SA in early 1990s. Investec was involved in the toll road from Emahleni to

Maputo. Wherever you have those situations, those things work & this is the only model which will work. If we think that gov will do this, no it will not work. We can have public-private participation. If we think that gov will build infrastructure & maintain it it's a farce.

Nomhle: Comment on COJ GB

There is a problem in the way that municipalities are structured. For eg, 1st of all & this is not just municipalities but everything related to gov is that when you put money into a thing, you don't want to put it into a big black hole. It doesn't help to put it in the COJ, you need to put it in a project which is ringfenced. You need to know that if, for eg, a desalination project for CPT that needs to go into a ring fenced entity, the municipality will buy the water from this facility & the private operators have built it & are operating. That is the model.

Interview transcript 18: Gray MacGuire – Western Cape Government

1.) Roles & responsibilities

My title here is director of the green economy which is basically the green economy coordinator of the dept of environmental planning. I work in the sustainability directorate & essentially our key focus as a dept relates to...our single biggest focal area in the green economy unit is sustainable procurement unit. In order to be able to make sustainable procurement happen you need to employ a vast array of tools in order to be able to implement that & it also depends on where it is you are looking at.

If I am looking at a provincial level the kinds of procurement interventions that I would look at would be very different from the kinds of procurement interventions I would look at local gov level & we work in our unit both with provincial level dep's & as well as local gov on this.

I know that your focus is more on GBs & that would pertain more to our work in the local gov space. How much do you know about local gov finance? Not much actually

So basically local gov primarily source their finances for their operations & capital expenditure through ADORA which is a division of revenue act which apportions to them funding, essentially based around their need & their own ability to raise finances for themselves & then what will also happen, in addition to that, they will very often top up what it is that they need to secure their overall finance through the debt capital markets & whats happening now is we are becoming much more dependent upon debt finance. So basically municipalities taking out a loan than we were in the past & this is the fact that as you know, we are in a very fiscally austere environment & it means that the total amount of capital expenditure grants that are coming from national gov are coming very strained.

So from our perspective as a provincial dept that is aiming to support local govts, in particularly sustainable public procurements, it means that what we want to see is that municipalities are implementing infrastructure because that is one of the major spenders that happen with local gov level that is both resilient & does not externalise costs too much. We are trying to internalise costs as much as we can & essentially what that means is that we are trying to develop a total cost ownership approach to the financing, in particular, of infrastructure. Now the thing with the total cost of ownership approach is basically means you are not only looking at the capital expenditure side of things but you are looking at your capital expenditure through the lens of your operating costs because obviously if you go out there & buy an LED light bulb that is 5 watts its going to last 10 ten times longer & its going to use 3times less electricity than a CSL light bulb which will use 15 watts of electricity & last only half as long the LED. That basically means that it gives you an opportunity to figure out what are the uses of your combined expense going to be & the relative rate of return over time.

That means you need to have a projected lifestyle on the assets & figure out what is my net present value around assets based on the depreciation of the capital & in terms of what it is that the operational costs will be at this particular moment in time & this allows you to determine what your most financially sustainable technology option is going to be but also at the same time, it is our opinion that it will also lead to the most resilient climate technology place as well.

Now, the only thing about that is that in order to be able to achieve that it means that we need to take a long-term view about debt because if you are going to & only trying to raise debt that will have a turnover in the next 5 years it means that you need to have paid &

achieved real returns within 5 year period because obviously you need to pay off the debt in that time.

The cheapest way to access debt over a long period of time is through the bond market. Its only been the metros that have been able to get the scale recording to have bond issuances. What do we need? We need to then look at alternative mechanisms to be able to allow for a pool of bond system. Fortunately, national treasury has been updating the municipal borrowing policy & this has been updated to make provisions for pool borrowing. Then now what we have got is capacity to develop at the scale we need to be able to afford the bond issuance & also we know we have a demand at the fact that our allocation from nat treasury around our infrastructure provisions are getting less & less. Then the question becomes, what do we do? Do we go with GBs because you're going to try & cement the climate division or do we just go with the normal vanilla bond? In my opinion, certainly the approach we are taking at the moment is that I don't see any reason why we would want to engage in a GB issuance at this point in time.

The reason I say this is because of the fact that we want a facility that will help to enable that kind of bond issuance. We don't want to be prescriptive around what it intends to finance, from a technology perspective because not every technology is going to be appropriate in every setting. In some cases it may be necessary that we finance brown infrastructure as opposed to green infrastructure & then we don't want to have the situation where we are limiting that borrowing capacity because then we need to try & pool things, as much as possible so that everyone can benefit. However, what we can do is be prescriptive around the enviromnetal & social components that need to be incorporated into the development of individual technology bids. When a local gov issues a tender around a waste water treatment facility or road, etc that we are sitting in &

saying okay guys, these are the things that we are incorporating in terms of reference so that the private sector, people to bid on this tender that they are incorporating these costs over this period in terms of their proposal they are putting.

If there is a premium on GBs...we can expect in the next 5 years that there will be some sort of financial incentive to support GBs as long as the institutions are well developed enough. Then we can see that municipalities would want to refinance infrastructure that have qualified under the CBI taxonomy in order to help them get cheaper debt.

2.) Institutions – if we are going to see the GB market advancing in the country, in your opinion, what type of institutions should be mandated to carry on advancing the market & the different type of policies that should exist?

JSE has got its GB segment which is enormously useful but I think what is also going to be required is that we get more locally appropriate recognised institutions to provide a 2nd opinion because my feeling is that within the developmental environment we have in SA & in SSA generally I think the kinds of prescopes & standards which are appropriate for the CBI taxonomy are not always going to be appropriate within our setting. I really think that sustainability bonds or social impact bonds are going to play a more NB role for all projects that have sort of a blended level of outcome in which case provide a 2nd opinion of the domestic understanding of the context. That would be one.

I also think that another key thing that needs to happen is there needs to be further entrenchment (specifically at gov level) the total cost of ownership approach because that is something that, section 217 of the constitution we are req'd to go out there & seek the best value for money when it comes to state procurement spend. It would be nice to see that we start incorporating that longer term approach in order to be able to drive efficiency & obviously get better returns. I think that is also going to mean that we are

going to need to have a provincial supporting financial facilities that are able to provide project support & financial structuring support in order to ensure bankability & be able to improve the overall market compatibility with the kind of project that could get funded through this form of debt. There's definitely a role for municipal & provincial level. Certainly we are working on one at the moment & we would love to see that getting incorporated in other provinces around the country although we do have a significant advantage in terms of the fact that we are still operating across the WC, whereas the rest of the country is not.

3.) A huge growth of GBs within the private sector but not the public sector. COJ greenwashing. Could this be a challenge in the public sector where there could be cases of coming across as this?

Yeah, I think there is a major concern because one of the problems with this is that & certainly my feeling around the bond market more generally is that people are interested in how you structured your bond in terms of the actual documentation around it but in terms of use of proceeds I think people are more concerned about the use of proceeds in terms of performance.

The market is not particularly concerned about how well the market actually performed once it's been implemented & that diversion is very problematic. I mean even if you look at the City of CPT bond issuance was worth & was essentially refinancing projects & it was effectively refinancing existing projects & if you look at the private sector issuances as well, I know that Nedbank had an issuance now recently but again that's pretty much exclusively for RE projects which I don't think that we need GB issuances for RE. RE is cheaper & easier to integrate into the grid than brown fuels. Honestly, in my opinion, I think that having GBs that relate to RE is pointless.

If it could be something that could be channelled towards more stuck RE technologies, like biogas or biomass or energy storage. Those kinds of things I absolutely agree that there needs to be that level around GB support but it needs to be some catalysing function that it can have.

The other GB issuance that I am aware of is GrowthPoint & in their case it was good. I know for Nedbank they did not receive any financial incentives for issuing. I did an interview on GBs so I can send that to you which was also with Bruce. GP issuance was nice as there was some price incentive for them to be able to engage with them even though it was very small. I think 3 or 4 basis points.

4.) Eligible green projects. In your opinion do you think the proceeds of GB could essentially go into CCS in the future in our country?

In our country, well I hope that...I have some major issues with the concepts of clean coal especially if we look at the fact that ESKOM is really ducking & diving around its level of emissions & they are saying about the fact that they cant possibly engage to be able to meet their air quality req's. So in a situation, they projected R250 mill which I think is considerably conservative. We need to be realistic here, as much as I don't on a moral level I find that CCS is highly controversial. At the same time we are in a situation where 90% of our power is being generated by coal so if we are in a situation where GBs could help to be able to raise revenue that would go towards dealing with R250 mill worth of debt projected to be able to finance the immediate transition from the existing technologies that we have already got in place then I would say that that is money well spent. But I think its very contingent upon the where & for what reason.

5.) Dept mandated to do re sub national GBs?

I need to be careful about what I say here. So what's happening is that dept of env'l planning conceived the initial project & that project has got a name called SIDA (Sustainable Infrastructure Development Facility) & an agreement is that we have supportive finance from the DBSA as well as from AFDB we are in the process of signing off a contract between GreenCape & AFDB at the moment to appoint a financial services provider who will essentially help to structure project proposals & to insure that we have effective bankable projects & that we are able to engage in a capital expenditure framework development process that needs to happen at local gov to be able to effectively identify projects that have a net + impact on the balance sheet as opposed to ones that are non – revenue generating.

6.) GBs could equate to impact investing?

In this case, the proof of the pudding is in the eating & the reality is that vast majority (75%) of GBs are going towards energy, transport & sort of green buildings. Do I feel that those 3 sectors are particularly impact sectors? No, I don't really. I recognise that mobility is an NB concern but from the energy side of things, like I mentioned earlier I don't feel that there is any need to be able to provide additional incentives to invest in a thing that is already the most profitable way to be able to produce energy so why do we need to provide more financial incentives? On the transport side of things, I get concerned about the fact that it's all very well & fine (these are basically mass transit systems) that are going to be responded to GBs. The ones we are talking about natural gas, electric propulsion & propulsion, electric trains. That's the majority of where the money is going. I think there needs to be more scrutiny in terms of who benefits from those. If you look at the Mauritian situation, they have got their own green projects in the form of rail system they are developing which has been widely hailed as the public in the country as being a completely unnecessary system. I think I have reservations about how closely

aligned things should be between GBs & the concept of impact investing. IMPI is more of a niche, specialised approach towards being able to provide maximum environmental & social benefit out of an investment, where as GBs tend to be much more generic in their overall outcome approach.

Interview transcript 18: Pitso at Bowman's law

1.) Why has there been increased appetite for GBs internationally & in our country?

Yes, there might be investor appetite as there are various investment funds that concentrate on environment & environmental sustainability & the future of the world basically & there are various international & even local investors who want to, kind of make sure that tomorrow we are living in an environment where we are able to still live & breathe & the next generation is also able to kind of live in an environment where we have not destroyed either through our use or the way we do business. In that front, not to say that there are not a lot of investors but there are those allocations that some investment houses have made for these type of things.

In our country, investor appetite has not been much, there hasn't been much issuances, there are a few. It is increasing because of the whole environmental consciousness & trying to protect our environment for the future but its not as active as initially I thought the market would grow at from about 2012-2013. It has grown very slowly, in the sense that when I did the 1st GB I was expecting more & more transactions to come through but not as much. I can count them on 1 hand the number of green funding that we have done as a firm. Obviously with the other law firms as well. Obviously it's a small market.

Investors want something lucrative & want incentives for doing that but there are also bigger & better opportunities that they see that whether or not the environment is protected from doing that they just feel actually...the allocations are not that big & then it goes back to appetite. Yes they want it allocated those funds not so much on the company on the issuer side where we are going out to borrow from these investors or get the money from them so the COJ or Growth Point they are also not too keen on them. As much as the time I did this in 2013,2014 COJ it was at a time when the COJ wanted to be seen as

kind environmentally friendly in everything that they do & there was this whole international expo, Parks Tau involved & COJ trying to be seen as world class. At that point it was a good idea & you would have seen after this they haven't done anything. What I have known from these 2 issuers is that it's a headache maintaining the standards.

Why? Reporting back to investors because again as much as investors have allocated these funds they want to make sure that you are able or are using the money for what you said you were. The reporting requirements are very tedious so again there hasn't been as much investor appetite. On the investor side its not too lucrative. On the borrower/issuer side this is admin intensive & I have had both these entities tell me that that they cant do this & not even thinking of doing another one.

Internationally, on the other hand, of course global warming & environmental protection generally is an international phenomenon, G20 countries are required to make sure that the environment is protected & sure that policies are implemented going forward. Kinds of tries to protect the environment. Even internationally theres not, its still kind of building that momentum where corporates are now doing green deals than the normal day to day brown-black deals.

2.) How do you ensure that transparency & accountability is applied in a developing country like ours in the GB market?

Again, investors with these two are the ones who kind of make sure that these issuers comply with the standards that have been set. You will see in the documents I have given you in GrowthPoint, I will speak about COJ separately because they are very special. It goes back to the headache that I mentioned where they said that the reporting is a nightmare. You actually have to employ someone to put all the info together on how the funds have worked, what they have done & this is where we are & all those things.

GrowthPoint perspective because they are a corporate & the funds for such reporting is easier than the municipal entities in this case where there is no redtape or procurement requirements. There's the municipal requirements finance act that requires municipalities to do certain things before being able to proceed.

With the corporate it was much easier, we have an auditor who specifically in the GP case was an environmental team assessments so they would then report on the company on various things that these are the green buildings & req's internationally etc. As a corporate its much easier because they then become part of this board or body of green that kind monitors whether a building is green, goes & certifies that the building is green – 4/5 star green building. And then again, there are various investors that would say that every year you would need to come back to us, every 6 months you would need to come back to us & tell us we have given you a billion rands of our funds to invest in green projects, you must then report to us how you have changed one building & made that building green using these funds.

COJ as I said, hasn't succeeded in doing that because of all the redtape around municipalities & the laws they are required to do. So if they waste this 1.4 bill there are various projects in the municipality with which we are going to use these funds, electricity generation, try & make COJ green in terms of RE projects & engage more but again city power doesn't produce electricity it has to go to ESKOM where that obligation should sit on ESKOM to say we are pushing for RE, & we as city power would buy on the basis of green energy. That relationship is very strainous. ESKOM has its own issues & city power cant really dictate on what electricity they should get. Already there the municipality was struggling then it goes on to say we have got another project of environmental management when we take your trash we are not throwing it in some

sinkhole & letting it sit there & decompose but this is the plan of taking pickup & using that aspect of our municipal services & changing the way in which we discard trash but again there are various restrictions on the DEA & on how they can change.

There are various things that although they received them on the form they technically couldn't use it because there are steps that they had to follow in when investors said we are giving you money for this use for the internal processes as a municipality, you find yourself in a position where you want to do it but various restrictions are there & you find that the money is there but you can't use it because you can't use it for any other purpose. If it was just a normal bond where we are taking this money for general corporate purposes & general municipal services, whatever the municipality needs to do we then don't have to go back to investors to report & then say we have used your funds to change our pickup strategy & xyz. Obviously it is a whole implementation process the municipality goes through to improve a certain plan, not say it is impossible but the term of the bond. You'll see with the COJ its 2024, we still within but as for now there hasn't been any reporting by the COJ because they haven't been able to do any of these things. With the political landscape, Parks Tau the guy who actually pushed for it has been moved. Now he's at local gov so maybe he can force the municipalities to say guys, in 2014 you issued a GB, I know from my own experience that the funds are still available. You guys are still paying interest on something that is available to you, give us your green plans & they will say this is what we have been doing, we have had meetings with gov's & we had internal council meetings.

Again, another thing with municipalities is the opposition parties. There are various approvals within council that COJ needs before implementation. It's the whole management process. ANC – Politics – Difficult to get things approved at council for

management to implement. The 2 docs when you do go through them kind of give you an overview report & the basis of everything. Municipalities are responsible for running various areas within a country. Its not upon corporates, generally municipalities are supposed to be doing things that are environmentally friendly & make sure that the environment is protected in provdinng basic services to the population. Even the construction of infrastructure must be done in an environmentally friendly way where if a road is to be constructed in a certain place, is there environmental construction there where there are trees around the road. In this case, theres no report from the COJ as they haven't been able to do & obviously, I don't know whether or not these funds have been used & investors have followed up. I doubt it because that would be in breach of this contract or arrangement of the reasons the funds have not been found. We will take it that they haven't been used but we understand there are plans in place, that those plans have taken or hindered by virtue of the type of entity we are dealing with. It is easier for a corporate entity where now a corporate needs to bear in mind the environmental impacts of its business but there the approval processes are much easier, you call a meeting & board members decide whether its good for the business & the reputation. The downside is the reporting.

3.) If there is no reporting then cant GBs come across as green washing? That this is more of a tick box process & marketing scheme?

Of course. Not to say that there is no reporting but the city for eg issues this GB there are those expectations that they are going to construct the roads, make sure that the water is purified etc. But again in them doing that the reason we have not seen that is 1stly the redtape but also investors if come 2024 nothing has been done, unfortunately investors would feel hard done by because there hasn't been any reporting specifically from the city where they have shown that they have used these funds for any other reason because

investors in this case didn't require yearly reports like GP. And I guess that is the lesson that the market is learning where the 1st municipality & the 1st corporate.

Going forward, investors after the COJ would know that the manner in which the municipality operates needs to have stricter reporting req's to make sure that whenever our funds are used. We have given them 1.4 bill as in when they use those funds, you can make them available but they need to give us cash flow statements & all of that. At that time no one had the experience to kind of foresee that technically the municipality wont be able to do those kind of things & follow certain procedures. If the funds in 2024 are paid back to investors, investors over time didn't know whether or not these funds were just sitting in a back account or the municipality used them & didn't say anything.

Yes, there is the risk that it might just be a publicity stunt because again it goes back to the reason why this was done by the city. Seen as being pioneer of green in SA & Africa & part of a global player. It might have been a hype thing but implementation was probably something that wasn't thought of & now that we have experience we have seen with the corporate & GP went out to try & market a GB, Investors came back & said they want x,y,z. They are obliged to report whilst municipalities at that time could have argued that they have various red tapes & will report as in when they use the funds but technically speaking investors don't have access to know whether these funds were used. Infrastructure development for BRT they might have used that money to finish off that project or extend the project, investors don't know that that money was not used. BRT was not seen as very NB but we don't know that treasury at the city came & used those funds specifically for that.

As for municipalities, as an investor I am not generally invited to council meetings so I can never know, I can ask city treasury to advise on my concerns. With GP we have

financial statements any investor can go onto the website, look at the financial statements & read exactly what was used in the board COO reports to what happened.

Going back to your Q around greenwashing, there is a likelihood, a possibility, its marketing & makes the municipality look good. It makes the corporate look good but there is a risk but there is also kind of a mitigating factor in the sense that with municipalities it is that the risk is higher but with corporate its lesser but not to say that there isn't that.

4.) In your view what do you think of the growth of the GB market?

I think it will grow, the pace at which it grows is another thing. As I said in 2014 when I did the 1st one for the municipality there was this hype that actually it's the new thing, we were all excited, articles were being written & municipalities were considering us. There was a lot of appetite over time but Ive seen that dwindle over time in SA & the other GB that came through in 2015 was by IFC but that was to do work across Africa (infrastructure stuff). So, let me say over a period of 6-8 years there has been about 3 or 4 GBs that have been issued. That's small, very small compared to the rest of the world. From a local perspective, there is a market to be developed but its not developing fast enough but because SA is a global player that's why I see hope for it in the sense that being a member of the G20, SA will sit there & say that we also need to make sure that our policies & implementation is environmentally friendly & is part & parcel of the global phenomenon. That is one of the reasons why the city did it in the 1st place because they wanted it to be a global player. With the whole 'save the world' done globally, SA is going to form part of that but at this stage its happening very slowly. In the next 10 years it might accelerate. I do see it happening but right now, you & me, as the researchers are kind of putting it out there trying to say there is a hole that needs to be filled & corporates,

municipalities & gov must fill that hole because tomorrow the next generation needs to live in a world that's environmentally safe.

I still maintain that its still very difficult on the issuer side because of the reporting that needs to go through. Although I say its going to accelerate because of global demand, the admin & the costs of doing that, anyone whose issuing a GB would need to factor whether or not they are willing to take on the costs. Is it worth what I am getting & what I would pay? I did say GP paid auditors extra to report on specific things & the guy at GP said its not worth it & is costing them more. They are part of the GBCSA & for them its enough to do that, they don't have to issue a bond. They can issue a normal bond with no conditions & use it for green things where there are no reporting req's on you & you have used the funds for whatever.

That's why I still believe that even if there is a global demand there might be that reluctance because there are aspects or various avenues that can be considered & where we can get funds to push our green buildings w/o the need to incur those other additional reporting costs & costs of auditors etc. It might grow but not necessarily for GBs. The projects & the way they use the funds will be in this normal way of getting the funds but will use it for green projects, we wont call it green although people like to be seen to be doing green & good for the environment.

The world dictates to how SA reacts.

5.) How did you get involved in GB?

It wasn't even something at the time that I was thinking of & the COJ contacted the firm. Standard Bank contacted us at the time & they were bidding to arrange this bond. There was a whole procurement process that happened & via that procurement process we worked with Std Bank.

Im a finance lawyer & when a mode of finance came onto my desk we supported it because it was a new way of getting funding but its something that we saw that you can develop the market even on a legal perspective even on the loan side which. There are loans done on green & we have wanted to develop the market since then. So I kind of fell into it by virtue of my practice.

Online questionnaires

Online Questionnaire

Good day and welcome to my online questionnaire

My name is Nomhle Ngwenya and I am currently a PhD candidate at the University of

Witwatersrand, in the school of Geography, Archaeology and Environmental Studies. My study is looking at the role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa.

You were invited to this questionnaire due to your expertise and knowledge. Your contribution will be highly beneficial to my study.

This survey will take approximately 10 minutes to complete and you are allowed at any time to withdraw from this questionnaire. Anonymity and confidentiality is guaranteed. Please also note that there will be no financial gains from participating. By completing and submitting this questionnaire will be taken as consent.

If you have any questions or concerns please feel free to contact me by email at 1043519@students.wits.ac.za or my supervisor, Professor Mulala Danny Simatele at mulala.simatele@wits.ac.za.

Part 1: Demographic information

1. What gender do you identify as?

Mark only one oval.

- ☐ Female
- ☐ Male
- ☐ Prefer not to say

2. What is your race? *Mark only one*

oval.

Black

- ☐ White
- ☐ Colored
- ☐ Indian Other

3. What is your age category? *Mark*

only one oval.

18-35

- ☐ 35-50
- ☐ 50-65
- ☐ 65+

Part 2: Climate Investments

Climate change has and will continue to impact the global economy. Countries in the developing regions will require lots of financial resources and infrastructure to enable climate adaptation and mitigation strategies. However, there are notable challenges and opportunities.

4. Do you think it is important that developing countries have a strong interest in

investing in climate related activities? *Mark only one oval.*

- ☐ Yes
- ☐ No

5. Should climate investments be an integral component of policies and institutional frameworks?

Tick all that apply.

Strongly disagree

☐

Disagree

☐☐

Neutral

☐

Agree

☐

Strongly agree

6. Who should be key stakeholders in mobilising climate investments for a country?

Mark only one oval.

Public sector (Government)

☐

Private sector (Business)

☐☐

Communities

☐

Other:

7. Most developing countries struggle in accessing climate investments. What factors do you think could influence this? *Mark only one oval.*

☐

Political will

☐☐

Institutional arrangements

☐

Lack of clear policies Weak

☐

economic environment Other:

New Innovative finance mechanisms: Green Bonds

Green bonds have emerged as a new finance mechanism to mobilise private capital into green projects

8. On a scale between 1-5, how important do you think green bonds are in contributing to climate investments? With 1 being the lowest and 5 being the highest *Mark only one oval.*

	1	2	3	4	5	
Lowest	☐	☐	☐	☐	☐	Highest

9. In South Africa both the public and private sector have been active in issuing out green bonds. Which eligible green projects do you think the bond proceeds have gone into *Tick all that apply.*

Renewable energy (solar, wind)

Water management

☐

Low-carbon infrastructure

☐

Waste management

☐

Other:

☐

10. It has been argued that the green bond list of eligible projects is not exhaustive. Do you agree with this or not? *Mark only one oval.*

Yes

☐☐

No

☐

Maybe

11. On a scale between 1-5, how important are policies and regulatory frameworks to ensure transparency and accountability in the green bond market? *Mark only one oval.*

	1	2	3	4	5	

Lowest ☐ ☐ ☐ ☐ ☐ Highest

Part 3: Carbon capture and storage (CCS)

South Africa is among one of the few developing countries that has plans to embark on carbon capture and storage initiatives as part of its climate mitigation strategies

12. **Do you think it is economically feasible for developing countries like South Africa to embark on carbon capture and storage?** *Mark only one oval.*

☐ Yes

☐ No

☐ Maybe

13. **Please elaborate on the answer to the previous question**

14. **On a scale between 1-5, how important do you think carbon capture is as a climate mitigation strategy?** *Mark only one oval.*

1 2 3 4 5

15. **Are you aware of any policy or law that relates to carbon capture and storage?** *Mark only one oval.*

☐ Yes

☐ No

Lowest ☐ ☐ ☐ ☐ ☐ Highest

16. Tick the following of key stakeholders who should be involved in carbon capture and storage initiatives? *Mark only one oval.*

Public sector (Government)

- ☐ Private sector (Business)
- ☐ Communities
- ☐ Other:

17. Please elaborate on the answer above

18. Should carbon capture and storage be included as one of the projects funded by green bonds?

Mark only one oval.

Yes

- ☐ No
- ☐ Maybe

19. Can green bonds as well as carbon capture and storage be key tools for South Africa to transition towards a low-carbon society? *Mark only one oval.*

- ☐ True
- ☐ False

End of online questionnaire

Thank you for your contributions and participating in my questionnaire!

Powered by



Answers to online questionnaires

43 responses



Accepting responses ☒

Summary

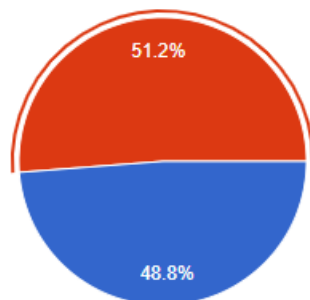
Question

Individual

Part 1: Demographic information

What gender do you identify as?

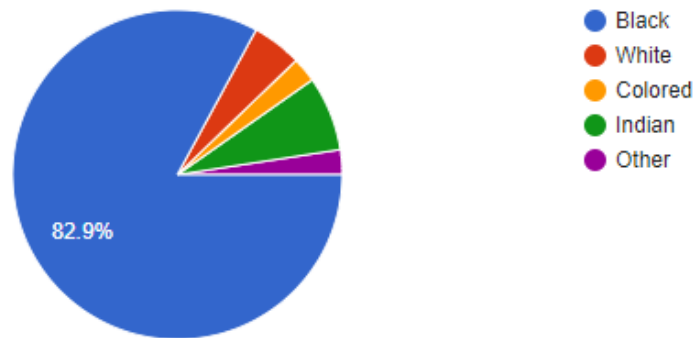
41 responses



- Female
- Male
- Prefer not to say

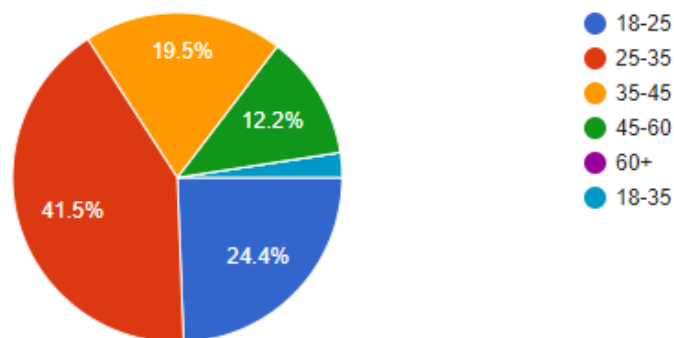
What is your race?

41 responses



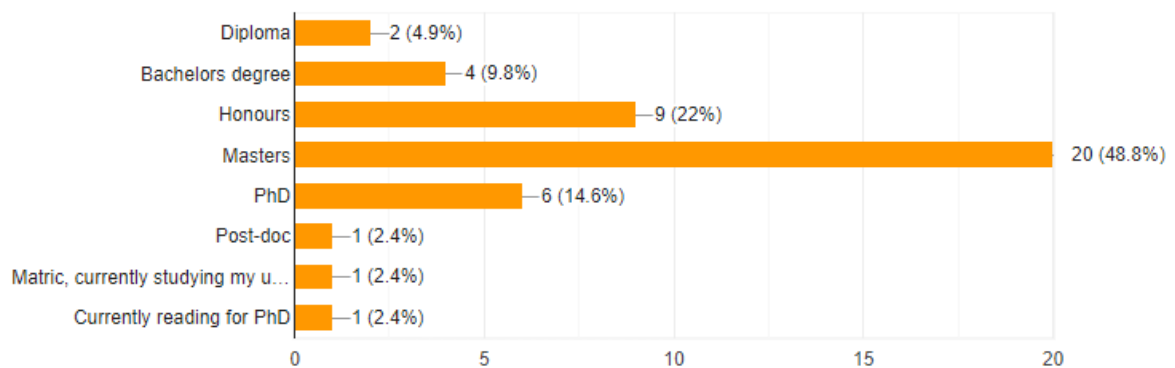
What is your age category?

41 responses



What is your highest educational level?

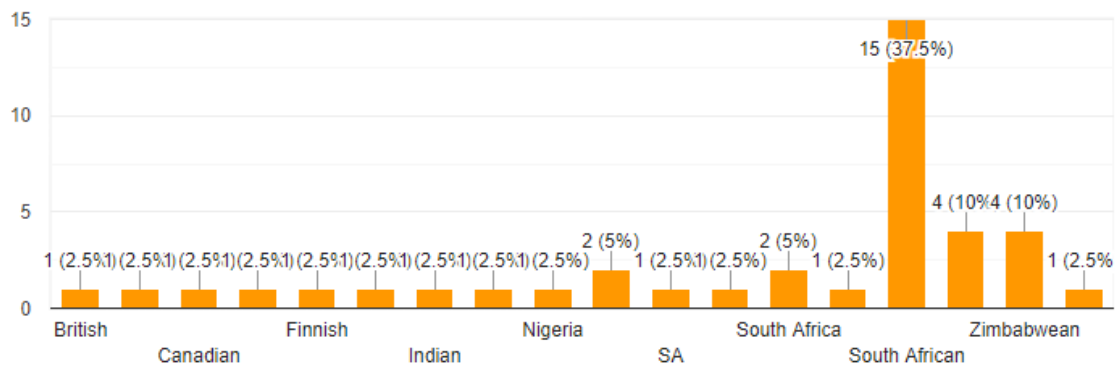
41 responses



What is your nationality?



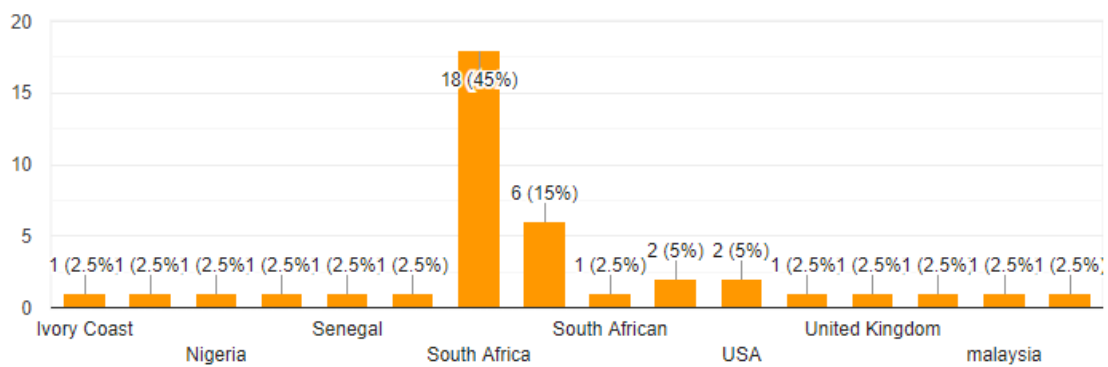
40 responses



Which country do you currently reside in?



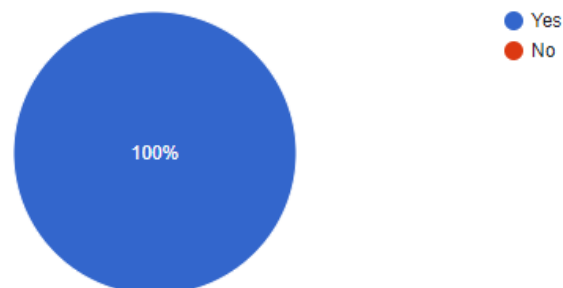
40 responses



Part 2: Climate Investments

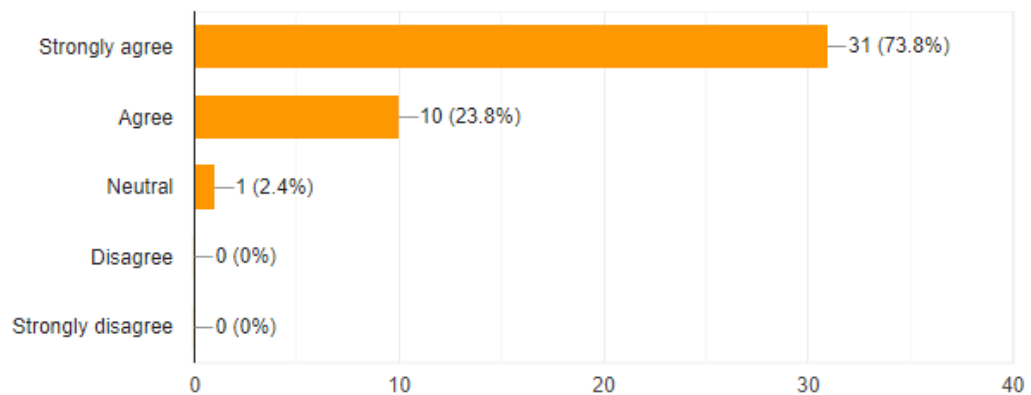
Do you think it is important that developing countries have a strong interest in investing in climate related activities?

42 responses



Should climate investments be an integral component of policies and institutional frameworks?

42 responses



What type of policies and institutional frameworks would you like to see developed that will enable climate investments to be implemented? 38 responses

Carbon emissions tax

Clear and well outlined policy document on green investments with good tax incentives

Green banks; sustainable finance institutes

Green Bond

Every institution should be given its own power to produce clean energy

Every policy to have a carbon tax component clause.

More budget must be allocated to environmental developments. School curriculums have to incorporate more features of environmental lessons and practicals. States must be held to account for environmental damages.

Energy Efficiency, Renewal Energy specifically net-metering, green bonds

I would like this to be included in the constitutional law

Policies that promote public-private partnerships with regards to climate investments as well as institutional frameworks that foster intergovernmental collaboration

I am not familiar with existing policy or frameworks or how they are structured and what they target. However, what I'd like to see more of as a conscious citizen and public participant, are policies and frameworks that are conscious of green sustainability. That aim to grow and develop the areas that they impose their governance over through promoting use of cleaner energy, technologies and the building of green capacity.

development of policies that'll allow developing countries to develop using less carbon intensive technologies.

Financial incentives that shift the risk reward balance in favour of low-carbon assets. This includes strong and sustained price signals on carbon, well designed carbon markets and appropriate incentives to enable private investment in clean energy. An integral part of this should be the removal of fossil fuel subsidies.

Policies that deal with the protection of the environment and prevent activities that could cause adverse impact.

Green building policies (thus green building development laws across all three spheres of government and in all provinces); policies to curb gas emissions and environmental degradation

I would like to see institutional frameworks centred on the notion of justice accountability. By that I mean proportional accountability for those most at fault for emitting harmful emissions into the environment, and making the environment generally unsafe. In addition, I would like to see policy and institutional frameworks centred on responding first to those who are most vulnerable and at risk of harmful climate change impacts.

Taxes and charges. I know they exist but if they may be strict and actually monitor if organisations actually comply to them, that could work.

Policies that provided long term confidence for investors e.g. reliable feed-in or off-grid tariff schemes for renewable energy projects. Simplifies licensing processes especially for decentralised renewable energy in off grid areas. Policies should, however, ensure benefits for local communities, either royalties or in from of access to electricity.

Emission reduction policies

IPCC, UNCCD, Montreal Protocol, CBD, Basel Convention, etc.

Global taxonomy and bond principles mandatory for all UNFCCC signatories. Consistent tracking methodology across all countries.

- Companies should receive credits for being energy efficient. - There should also be investment in low-carbon technologies. - The policies should advocate for the localisation of clean energy production equipment.

A mix of policy types such as taxes, subsidies & incentives (for low-carbon options) and emission trading permits

Incorporating Climate Change policies and practices in power production (CCUS, DAC, energy efficiency), vehicle manufacturing, building efficiency standards, agriculture (reforestation and farming practices), etc.

Climate investments policies integrated and connected with countries priorities, investments bodies to specially address sector, Public and private sectors champions, etc

Good Policies covering Transparency and Accountability with Investment Support from Multilateral Organizations

CCS implementation policy

The climate change bill can be used to set legal framework to support long-term low carbon vision, and enforce implementation of national climate change mitigation and adaptation objectives. The climate related policies may include carbon pricing policies, carbon emissions reporting, carbon budgets for high emitting organizations, energy management policies, renewable energy incentives (REIPP programme) , and energy efficiency tax incentives. Establishment of climate change steering committee that will enable climate related projects eligible for green climate fund.

Environmental legislations and Policies, Public Sector (Government)

Regulations and guidelines for climate investments and various programmes together with Green trusts to assist with investments

Ones that are involve the community, all spheres of government as well as the private sector.

Policies that acknowledge the need to build capacity of policy implementers

Incentives for low-carbon initiatives

Policies and Institutions that ensure accountability and strong fiduciary standing so that the deficit of trust that most African countries suffer from do not impede investments incentives for the private sector, sustainability standards and environmental and social safeguards

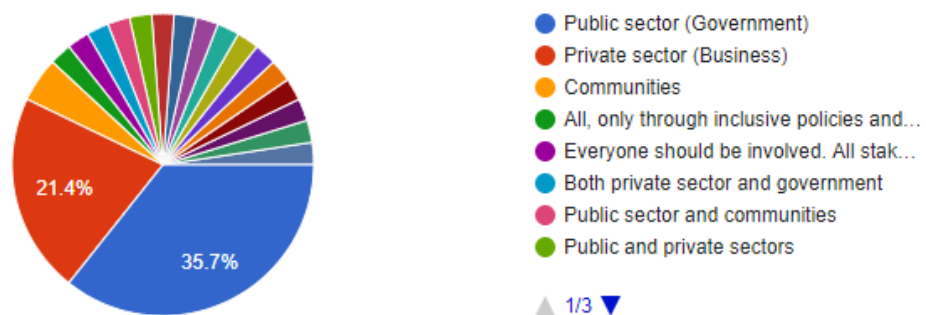
Since South African economy relies heavily on revenue generated from exports, I feel change would be best seen if trade laws are updated to incorporate environmental compliance criteria.

Policies that combat and check CO2 emmissions, Climate resilient technologies
green economy policy

Carbon tax more green energy

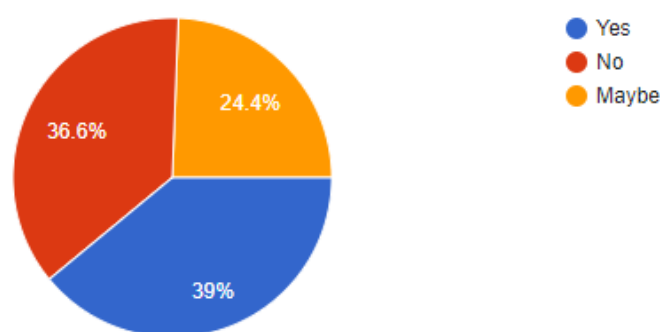
Who should be key the stakeholders in mobilising climate investments for a country?

42 responses



In your view, do developing countries have the capacity to ensure that climate investments are utilised effectively?

41 responses



Most developing countries struggle in accessing climate investments. What factors do you think could influence this?



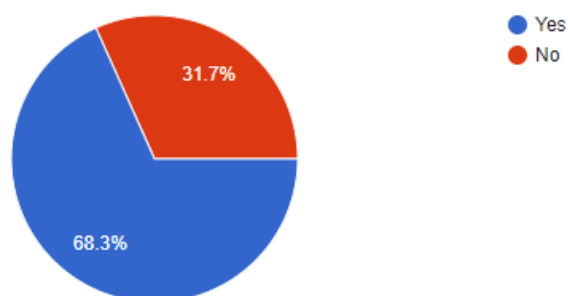
42 responses



Green Bonds: A possible solution to the challenge of climate investments

Have you ever worked in a project/initiative involving green bonds or are you aware of what green bonds are?

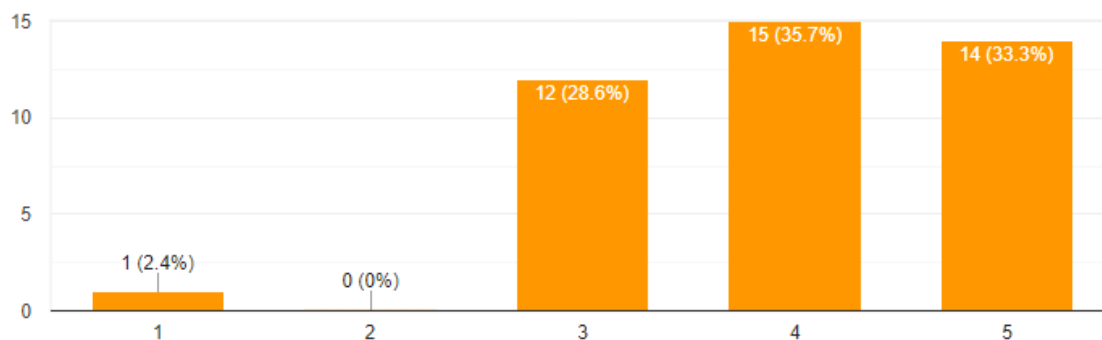
41 responses



Green bonds have huge potential in financing various green projects. On a scale between 1-5, how important do you think green bonds are in contributing to climate investments? With 1 being the lowest and 5 being the highest

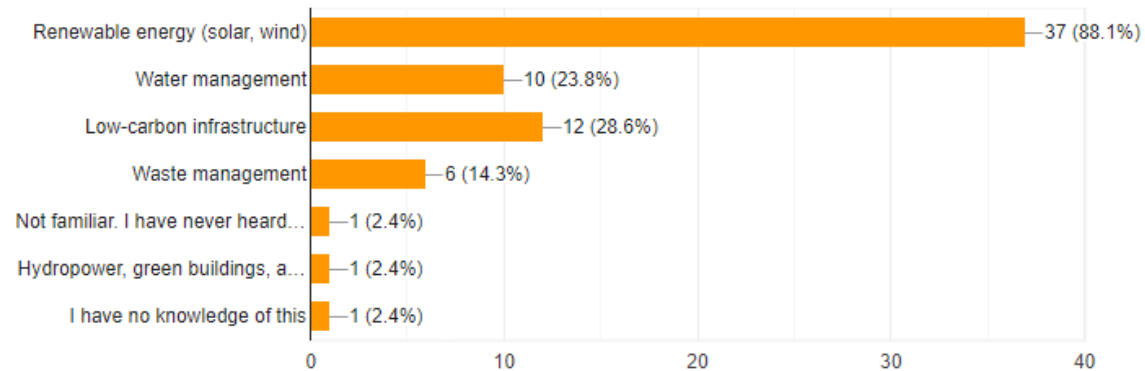


42 responses



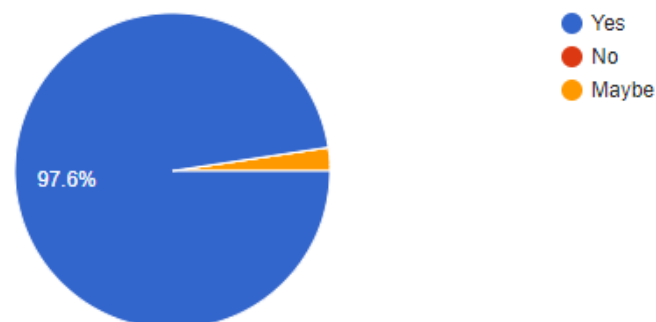
In South Africa both the public and private sector have been active in the issuing and buying of green bonds. Which eligible green projects do you think the bond proceeds have gone into?

42 responses



Renewable energy is the biggest sector that green bond proceeds are currently funding. Do you think it is important that other green projects are funded?

42 responses



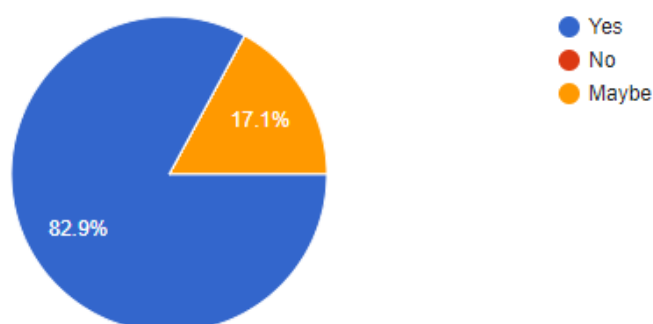
What other projects would you like to see being funded by green bonds? 40 responses

Carbon capture and storage
Waste management
Sustainable homes
Water management and low carbon infrastructure
Energy efficiency, carbon divestment
Waste management
Green houses
Climate preservation related projects
None so far. Green bonds must improve and focus on the current projects first.
Water and Waste management, Low carbon infrastructure
Hydrogen
low-carbon infrastructure and water management

low carbon infrastructure
 green buildings, hydro and wind power
 Minimise waste
 Waste management; recycling and protection of our coastlines and sea harbours
 Projects increasing the resilience of areas/communities that stand to be the most negatively affected and vulnerable to changing climate to ensure that human rights are protected
 can't think of one right now.
 To effectively tackle climate change investments should be direct to renewable energy and energy efficiency projects.
 Cleaner Fossil Fuels (Usage) technologies, eg CCU/S
 Manufacturing processes that emit less greenhouse gases or processes that allow them to capture these gases. Switch to processes that use less water and reuse or recycle water and other resources.
 Electricity T&D, Agriculture, Bioenergy, Interurban transport,
 Off-grid energy projects. Water saving and energy efficiency building (Green Buildings)
 biofuels, carbon dioxide utilisation
 Heavy Industries and Manufacturing CO2 capture, Electric vehicles
 Blue economy, biodiversity
 Low-carbon infrastructure
 CCS
 Climate change adaptation projects
 SEA CLEANING PROJECTS
 Climate education
 Forest sustainable management
 Because energy as part of the emission mix is only a portion of the greenhouse emissions, bonds should also fund other projects in climate smart agriculture, land use and forestry management and resource utilization, green transportation, green building and manufacturing. Basically to cover all areas from which emission emanate
 Low carbon and water efficient irrigation systems
 Water management projects
 Access to Energy companies and Housing
 waste management
 Low carbon and carbon recycling industries

In your opinion, do you think the green bond market can continue growing in South Africa and the rest of the African continent?

41 responses



Please briefly elaborate on your answer above. 35 responses

Because project funded by green bonds assist in the mitigation of climate change on the continent.

Many investors are increasingly becoming Responsible Investors and the African continent still has a huge potential of untapped green resources

I think it can continue growing if it continues being effectively implemented. Exploring and measuring their challenges consistently while seeking solutions of the challenges they face. Implemented accordingly at early stages can lead to its success thereof

The African continent has a competitive advantage regarding clean energy solutions

More people are becoming aware of Greenbonds with time, therefore the market will grow.

With research this can happen

Since I am not conversant with green bonds, I would not really give a definite answer but a 'maybe'.

It's accessible for developing countries and less complicated.

If the issue of corruption can be dealt with, green bond market may have an opportunity to grow

There is a huge investor appetite for the green bond market and I foresee many opportunities within this space

If green bonds could be availed to the influx of investors seeking to invest in the continent this could ensure that the development and growth of the continent, which are at their peak, are both responsible and innovative. Green bonds are a useful investment tool that African governments can use to actualize their commitments to the Sustainable Development Goals 2030, and as well as to promote job creation and infrastructural development - of which the continent is still in dire need - that are sustainable.

Capital is not always allocated to the environmental pillar. Developing countries such as South Africa usually struggle to find the balance regarding allocation of funds for projects. I think Green Bonds have the power to overcome this crisis and with the right amount of awareness and knowledge sharing on the topic - it can successfully continue growing.

Both business sector and government are reluctant at implementing these technologies because they have some degree of mistrust at the potential of these projects to sustainably replace current technology that's working.

This growth will be attributable to both the public and private sector realizing that green bonds can potentially be a key solution to enable Africa to transition towards a low-carbon society. Again, both sectors should take advantage of the green bond market and incorporate it into their existing climate investment strategies. As a start, emerging markets have to be active in issuing green bonds.

Endless potential

I believe the SADC region led by South Africa has the potential to grow the market and to draw other African countries to follow suit. One can only hope the growth of new banking institutions continentally comes with futuristic visions, among them investments in a safer environment

I'm not sure increasing the amounts of financial instruments would be the most just solution. However I do know that more financing is needed. I would be interested to know about the implications of a growing market...considering I do not know much about green bonds. Growth potential for renewable energy and energy efficiency is huge and therefore there is space for direct investment as well as bonds.

If and only if Africa improves the awareness programmes regarding the importance of Green Bonds as well as the benefits thereof.

The reason why I'm a bit sceptical is because a lot of developing countries have one main goal and that is to grow economically. They don't care much about the environment that provides them with resources.

Need AfDB and other development banks to start playing a bigger role in derisking investment. Need to build local currency bond market. Regional cooperation and interstate grids.

Green bonds can only grow if they are implemented in townships and are affordable to the working class. For now investing in a solar geyser costs almost R20k, which makes it unaffordable for most working South Africans.

Green Bonds are becoming very popular in financing climate change mitigation projects, and if managed properly, has the potential to provide the much needed financing for green projects. More countries: Nigeria, Morocco, Kenya, etc are looking at it and more to follow

Investing in Green Bonds market is the right way to go. Countries of the world are geared towards the Paris Agreement of limiting the global temperature increase to between 1.5 and 2 °C. It sure takes improvement in more than one form of production and economic activities.

The renewable energy project in SA setup by DOE is one of the best and successful programme in the world. The Nedbank green bonds are an example of great potential in green bonds market.

I am confident with the progress made so far in South Africa.

If the policies & frameworks around it are strengthened and the required funding is provided then the green bond market can expand even further.

More and more people and organizations know green bonds and its contribution to the fight against climate change.

Most countries are working towards policies that point towards a climate resilient future.

Funding for activities will progressively look to green bonds

Sustainability is the future and the green bond market has the capacity to support such actions on the other hand, climate change is inevitable

Most regions in Africa are water-stressed and the revenue generated via green bonds can be used to fund solutions to this (and many other) issues.

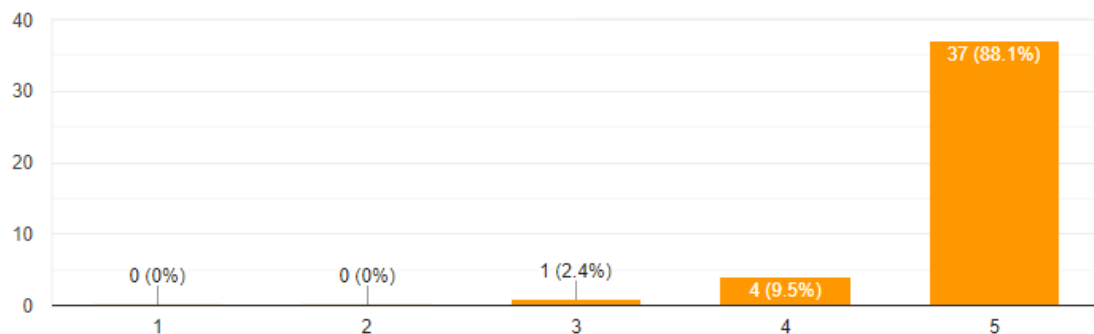
More opportunities in Africa exist for climate change adaptation and mitigation, where Green Bonds can be used.

yes the market is growing considering that green is the way to go... so they will always be need to finance projects and initiatives

Africa has high solar radiation making it good for solar energy. There are also lots of minerals which are used in techs like batteries and fuel cells etc.

On a scale between 1-5, how important are policies and regulatory frameworks to ensure transparency and accountability in the green bond market?

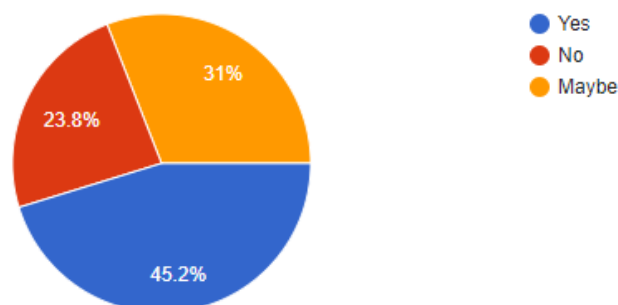
42 responses



Part 3: Carbon capture and storage (CCS)

Do you think it is economically feasible for developing countries like South Africa to embark on carbon capture and storage?

42 responses



Please elaborate on the answer above. 38 responses

South Africa will be greatly effected by anthropocentric climate change, to not take responsibility for our own pollution and to not try and mitigate its consequences would be unethical. Additionally, projects like this grow the economy in multiple sectors. Therefore it is economically beneficial to become green.

Because south Africa has the plan to implement carbon capture and storage as part of mitigating strategies towards climate change.

Carbon capture technology is relatively expensive and many African countries might not be able to afford the cost. Notwithstanding, some countries such as South Africa may afford the technology which will enable them get into the production of goods with high CO2 emissions as the CO2 would be stored away, hence increasing the economic activity of the country. It is a great possible solution however the current economic status of the country would not be able to effectively fund it. More so because the environment is not necessarily top priority although it should.

Developing countries are expected to become the biggest co2 emitters in 2050 following a business as usual scenario

It's all about priority preference

South Africa needs more financial resources, perhaps from donors if not the World Bank. CCS is so paramount that it has to be implemented, but developing countries do not have the capacity.

Technology does a lot and it is an evolving trend that proves effective in developed countries. It saves times and labor.

It is not economically feasible because our economy is not even stable...it seems to be getting worse everytime and the standard of living for many people is on a decline

Currently we do not have the political will to implement it but hopefully with the new government it will be a mandate

According to the clean development mechanism and the nationally determined contributions we do have the capacity to embark on CCS

I am not familiar with the feasibility structure or cost factors associated with CCS

Yes, if it is invested together with renewable energy and energy efficiency.

Investor confidence in the country will have to be high, something we have failed to achieve for quite a while now.

Apart from financing the CCS project implementation as a country, we have continuously received international technical and financial support from i.e, Norway (since 2009) which is a clearly indication that we can also take priority in financially investing in this sophisticated technology.

The benefits far out-weight the cost

With clearly defined policies, political will, strong leadership and highly skilled professionals (the involvement of academia, best practices from experts including environmentalists mainly) South Africa an achieve this.

No I don't believe in ecomodernist approaches to the climate crisis. I believe this would perpetuate a narrative that enables businesses to continue to operate as usual with little to no recourse

all organisations are going green yet shifting in digital technology. those who fail to adapt to such shift of being sustainable and digitalize their organisation, will, in future not be taken

seriously and will run out of business. i'm saying this because carbon capture is the fastest thus far and the cheapest in the long run to maintain sustainable environment.

Because South Africa's total primary energy is sources predominately from Fossil fuels (coal, oil and natural gas); as a result, the country emits high level of GHGs. Most importantly, CCS has a potential to allow South Africa - as well as other developing countries - to use its fossil fuels deposits to grow the economy in order to improve the livelihoods of the people without harming the surroundings.

The process might be costly and developing countries don't want to waste money on things that don't contribute to economical growth.

Economically feasible yes, but we need to see CCS projects that will meet upcoming ISO standards, the DNV standards, and provide full LCA measurement. If you want CCS projects to be labelled green under a taxonomy. Not all carbon capture (end of pipe) should be eligible, only if it allows the elec gen facility to operate below an emissions intensity threshold.

Similarly with manufacturing, the entire facility/project must be under threshold. Cannot comment on CCU market.

Countries like South Africa will find it difficult to prioritise CCS technology as the country battling with socio-economic challenges such as poverty, unemployment and service delivery . The capital cost in terms of infrastructure & operation for CCS is very expensive. To ensure that it becomes cost-competitive with other technologies, the overall business model for embarking on such a project should be considered seriously, looking at both short & long-term return on investments. For instance, will the establishment of CCS projects provide jobs to local inhabitants? It should be both Government & industry-driven. Meanwhile, lessons should be learned from similar projects in other countries to know what worked well and what didn't. This technology is highly capital intensive. My financial modelling of various power assets indicate that the cost of CCUS is about 46 percent of total fixed asset investment of a retrofitted power plant. Investing in CCUS technology should be driven by the private sector and viability is impossible without Incentives by the Government. Even in various developed societies, investment in CCUS is still trying to pick up. Considering the huge cost requirement, delayed expectations of the effects of climate change crystallizing in Africa, as well as the need for channeling scarce resources to critical development sector, I believe that investment in CCUS might take some time to catch on in Africa.

All about what local and affordable technologies could be applied

Business Continuity and sustainability are very important. coming from the definition of sustainable development given by Brundtland report; the subject of carbon capture and storage is beyond the indices of economic feasibility. The importance and benefits of meeting the needs of future generation; unfolds economic viability of engaging on carbon capture and storage.

It is not cost-effective and it is cheaper to implement renewable energy sources. The carbon stored underground may have impact on water resources.

With the right policies in place it can be economically feasible

Depending on the benefits of the CCS and also financial provisions made for it

Provided we have the necessary skills and expertise

Carbon capture is an expensive technology and it is not one of the most efficient ways to reduce GHG emissions.

By way of regenerating and protecting natural vegetation

In the future it can be economically feasible but for now the technology is still new and expensive

Because of the costs associated with CCS it might not be feasible. Unless we find ourselves in a position to exploit more efficient ways of CCS.

The technology is still very expensive and commercially viable in developing countries.

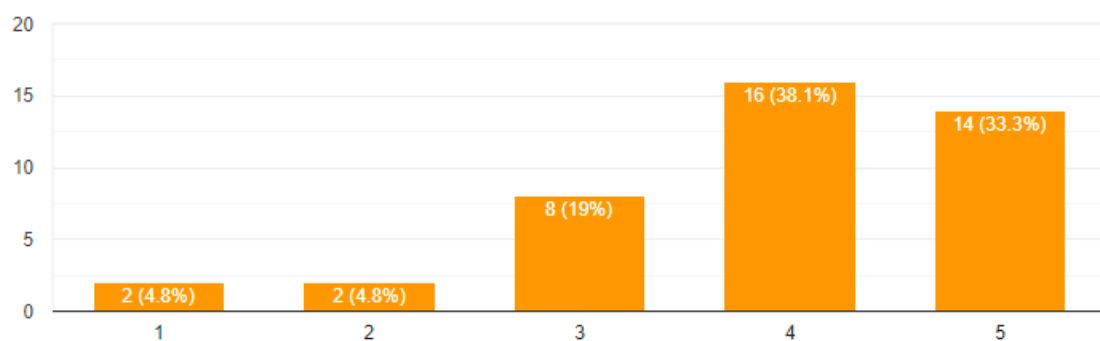
South Africa is considered one of the highest emitters of carbon dioxide.. so there is need to embark on carbon capture storage

We have the necessary minerals to store the carbon

On a scale between 1-5, how important do you think carbon capture is as a climate mitigation strategy?

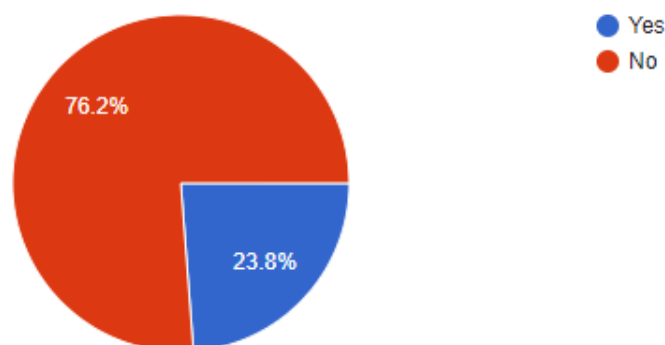


42 responses



Are you aware of any policy or law that relates to carbon capture and storage?

42 responses



What type of policy or law would you like to see developed that regulates CCS activities?

27 responses

I would like to see a policy or law that regulates CCS activities ie. endanger people's lives and the environment. Whereby such activities are conducted in a humanly and safe manner.

A law where all the companies or businesses that emit the highest carbon emissions accordingly fund these initiatives to take care of the environment

N/A

Training of the people

A law that sanctions and punishes contraveners.

Sanctions and punishment should be the technology not take the carbon dioxide emissions underground but to some other uses

Environmental laws

One that regulates CCS activities and ensures economic growth whilst meeting the Paris Agreement

Ensuring economic development through CCS activities

If CCS has been identified as a feasible solution to mitigating the release of harmful gases into the environment, then I would like to see laws and policy requiring greater obligation for large contributors of carbon emissions to use this method as a tool for reducing carbon emission or allowing for these companies to innovate methods which will reduce carbon in a similar or greater manner in a strict time frame

A policy that will ensure environmental safety as well as preservation of natural resources and soil

Ensuring the safety of captured and stored carbon, in line with campaigns to reduce the amount of carbon still emitted

I am not in favour of carbon capture and storage and it poses huge future environmental risks. I believe that in order to sustainably tackle climate change we need to change our production and consumption patterns to more green and efficient ways.

CCS specific policy because current regulations/policies does not fully cover the implementation of the technology. For instance, some treat CO₂ as a commodity while others regard it as waste/hazardous substance.

There is some carbon count policy/law (not sure of what it is called), where the country is limited to emit up to a certain unit of carbon and if they exceed that amount they get penalised or they pay a certain fee.

EU Directive on CCS

- Policy that ensures that CCS is safely implemented. - There should be policies that ensure that the community should have a say in CCS projects implementation. - There should be policies that force large CO₂ emitters to deploy CCS technology

45Q Tax credit carbon capture incentives

Creating several Tax Incentives well tailored to incentivize heavy polluters to invest in CCUS technology

Policy on Carbon Capture and Storage devoted to fossil fuel and other CO₂ which is more dominant in Africa

None

A framework that clearly sets out every aspect for CCS activities

I do not want to see carbon capture encouraged

I would rather countries aim to embark on a low-emission pathway rather than seek to capture carbon. However if capture would occur, policies that support capture that provides adaptation co-benefits would be great e.g. climate smart agriculture or reforestation.

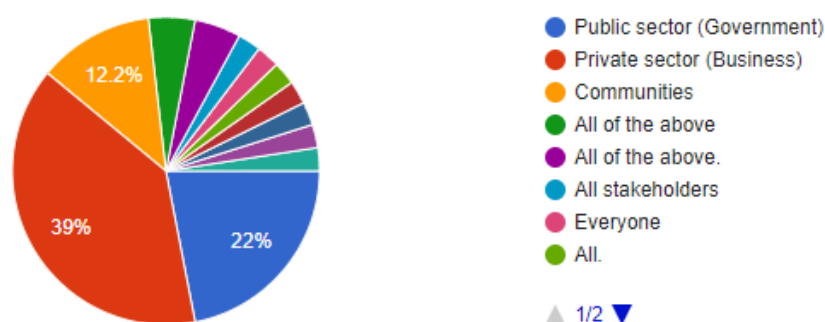
Those practicing CCS should be accountable for any risks that may arise and it should be mandatory to have an insurance

CCS initiatives must be mandated for Energy produces, because of the emissions they produce.
Not sure

Please elaborate on the answer above34 responses

Tick the following of key stakeholders who should be involved in carbon capture and storage initiatives?

41 responses



Please elaborate on the answer above34 responses

This should be a government funded responsibility as crime or infrastructure management should be. It is public safety-for the betterment of all and should be paid for by our taxes. Government is the custodian of such a magnitude of projects and the facilitator amongst stakeholders such as private sector and community.

The private sector seemingly contributes the most to the countries environmental issues. Therefore, involving them would potentially lessen their involvement in harming the environment, if not investing in the solutions in need of funds to help the environment

The government has to set the agenda for carbon capture and encourage the private to do the rest of the job

It is the communities that are greatly affected

I believe private sector will drive this because, change of leadership doesn't happen on like in the public sector

Governments are affected by political will and in my opinion, the business fraternity has a potential to make policies work.

Everybody should be responsible and hold each other accountable

Carbon capture storage initiatives will affect all stake holders, the cost of the technology and how it affects the ordinary citizen is often disregarded in the planning processes

Everyone should be involved to make sure that all parties are pulling their weight. This will increase the chances of the success of such initiatives

Private sector has the financial resources

Private sector has money

It is my belief that private sector is the greatest contributor to the carbon emission crisis we face globally. As the largest stakeholder, I believe that they should be at the forefront of innovating cleaner and more sustainable systems and methods.

All of these stakeholders emit CO₂.

communities need to be informed of the development because they will be directly affected by them.

While I understand that far high costs and risk associated with CCS projects tend to restrict this option to businesses, leveraging finance from the private sector is attractive for implementation of CCS projects.

Government must lead to ensure impartiality

Government is in a strategic position to oversee whatever initiatives in as far as coordination and facilitation of projects and stakeholder involvement - this taking into consideration that the private sector is also key as is the civil society, institutions and other organisations affiliated to such initiatives.

Those who stand to be the most affected, either through being relocated (for example) to make way for a storage site, or those in need of employment in the green sector should be those primarily involved.

private sector are more capable to such initiation because most of them care about their environmental status and are more likely to have such because if one company has one of these, the others are more likely to follow since they are reducing carbon footprint and they will pay less taxes and its a competitive advantage for them.

A comprehensive stakeholder engagement is important in all sectors.

Climate change affects everyone; therefore, everyone should be involved - especially communities because the technology affects them throughout the value chain. Government's role is pivotal because the bond between private sector and communities is important for the successful implementation of the technology. Private sector on the hand, must be involved because of their interest in resources around the vicinity of the communities.

As much as the private sector seem to have more capital, the government has more power and influence.

Companies need to show govs that they can do CCS responsibly, to standard and have the ability to mitigate in the case of a geological hazard. Govs need to define what an acceptable standard for CCS is, and begin preparing tenders for storage site development. But the storage sites need to be compliant with best practice. There's an ISO standard coming out on this.

Communities that are likely to be affected need to be involved in the planning and drafting of CCS regulations. Government departments needs to take a leading role in policy development.

R&D, Adoption and Implementation lies with the Private Sector while Policy creation, Incentivizing and Regulation lies with the Government

The class stakeholders that are more likely to be affected at the event of engaging CCS are mostly communities. Unlike the private sector who are profit oriented, and public sectors that shall dwell majorly on regulations, and policies formulation

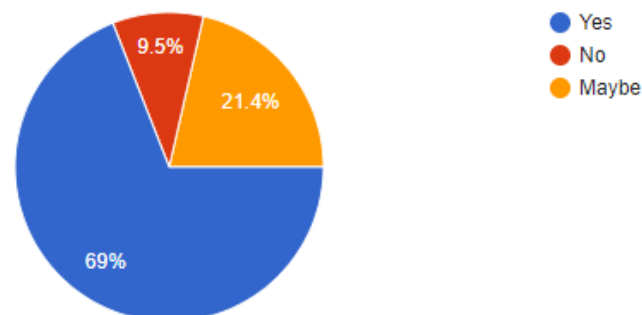
Public sector to enforce legislations and policies involved with the carbon capture and storage initiatives

The private sector should finance the carbon capture technology

Based on the capture strategies i have articulated above. A partnership between both private, public and communities is most viable and sustainable
 When its a business it can be well managed and risks are identified before any investment is done, They have strong due diligence
 This is because of South Africa' energy mix which is largely made up of coal, that is used by ESKOM for the generation of electricity.
 private sector they play a huge role in emitting and polluting and they have the finance to support the initiatives. as some are making abnormal profits
 Industry produces the most carbon. Government needs to implement polices that force industry to capture and store carbon

Should carbon capture and storage be included as one of the projects funded by green bonds?

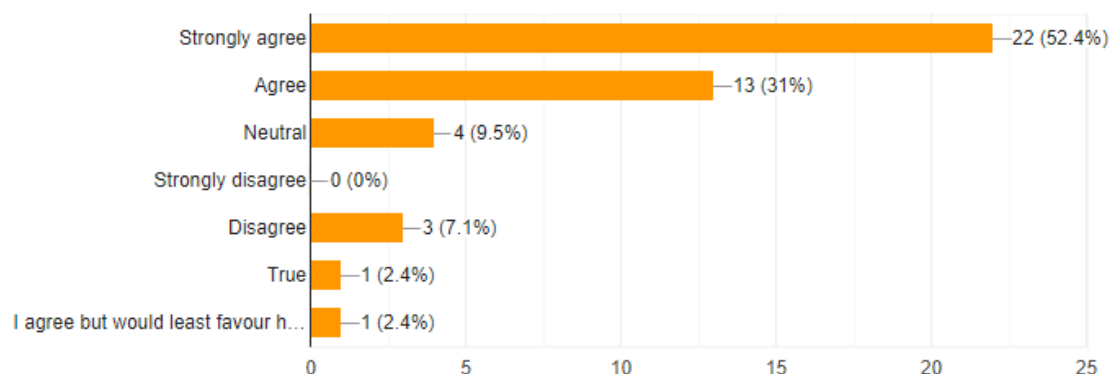
42 responses



Can green bonds as well as carbon capture and storage offer the opportunity for South Africa to transition towards a low-carbon society?



42 responses



End of online questionnaire

Ethics application



Ethics Application for HREC Non -Medical

SECTION A

Complete this checklist to show what documents you have submitted and that you agree with the conditions of application.



Completed *Ethics Application Form*



Copy of the *Research proposal*



Copy of proposed *Research instruments* (e.g. questionnaires/interview schedules).



Participant Information Sheets (for each different sample group and/or instrument used).



Consent forms (for each different sample group and/or instrument used).



Relevant permission letters if required (from, e.g. company's HR department, National authorities such as Government departments, etc.) - consult the *Guidance on the Use of Permission Letters* document.

SECTION B

1. Summary of risk categories of this research project

1.1 I have read and understood the risk categories table: **Yes**

1.2 The applicant must tick the box for the category that best applies to this project :

Risk Category	Tick the appropriate box
No Risk	
Minimal Risk	✓
Low Risk	

Medium Risk	
High Risk	

Applicants must have read the table of risk level category definitions on the final page of this document

1.3 Are participants selected as experts: **Yes**

1.4 Will human participant research involve vulnerable categories: **No** If YES state which ones:

If YES, how will existing vulnerabilities among research participants be addressed:

1.5 Does this research expose either the participant(s) or the researcher(s) to any potential risks or harm to which they would not otherwise be exposed: **No**

If YES, how will potential risks or harm be addressed?

NB: The term 'vulnerable categories' includes, among others, children under 18, orphans, prisoners, persons with cognitive or communication disorders, people who are traumatised or currently in traumatic situations. Where necessary, include details of steps to be taken to facilitate data collection across language barriers (e.g. interpretation or translation). Vulnerable categories do not necessarily include poor or marginalised communities, older people, women, or people with disabilities (unless the nature of these participants results in diminished capacity to give informed consent). Please refer to the notes on vulnerability at the end of the risk table document.

2. Researcher's personal data

Your family name: **Nomhle** Your first name: **Ngwenya**

Title: **Miss**

School: **Geography, Archaeology and Environmental Studies**

Faculty: **Science**

Your student/staff number: **1043519**

Your email: **1043519 @students.wits.ac.za**

Your tel number: **074 171 5467**

Name and Surname of supervisor(s): **Mulala Danny Simatele**

Your supervisor's email: **mulala.simatele@wits.ac.za**

Your supervisor's tel number: **011 717 6516**

3. Research project

3.1 Title of research project:

The role of institutional frameworks in promoting green bonds to finance carbon capture and storage in South Africa

3.2 Is this research for degree purposes: Yes

If so, for what degree?

Full time - PHD,

3.3 Has it been approved by the relevant higher degrees committee or other relevant unit:

Yes

3.4 Will any additional researchers be covered by this ethics protocol (including translators, research assistants, etc. but not including supervisors): **No**

If yes, please specify their names, affiliations and roles:

3.5 What are the aims and objectives of the research? (Please be specific)

The aim of this study is to investigate the role of institutional frameworks, policies, legislative structures and strategies that can be used as tools to promote green bonds as well as an avenue to finance carbon capture and storage projects in South Africa and in so doing address climate change challenges.

The following objectives of this study are;

1. To identify how institutions, policies and legislation can be used as tools for the promotion and effective implementation of green bonds to finance carbon capture and storage.
2. To identify factors that can contribute to the hindrance or promotion of implementing an institutional framework for green bonds to be adopted to promote carbon capture and storage.
3. To analyse how current institutional frameworks are operating and what aspects could be reformed to promote and implement green bonds to finance carbon capture and storage.
4. To evaluate the economic potential of green bonds to finance carbon capture and storage and in so doing contribute to environmental sustainability.

3.6 Summary or abstract of the research:

As a way of responding to the challenges of climate change, South Africa, like other countries in the world has embarked on the program of issuing and buying green bonds as well as establishing carbon capture and storage initiatives. However, despite this development, South Africa has not been able to develop an institutional and policy framework that is specifically targeted at the development and implementation of green bonds, as a way of financing and promoting carbon capture and storage. Therefore, there is a need to identify the barriers and opportunities from the public and private sectors.

3.7 Do you have any financial or material interests or a familial relationship associated with your research participants or with the organisations that you will be involved with in your research:

No

If yes, please explain how you will manage any existing or potential conflicts of interest, if applicable:

4. Formal permission

4.1 Where will the research be carried out? (Please give a specific location)

The research will be carried out in four study sites in South Africa - Gauteng (Johannesburg), Western Cape (City of Cape Town), KwaZulu-Natal (Umhlababuyalingana), Eastern Cape (Algoa Bay)

4.2 Has appropriate formal permission been obtained, if required (e.g. employer, government department, land owner, etc.):

Yes (attached)

NB: Obtaining permission is necessary when conducting research *within the premises* of a particular site such as an ethnographic study of the functioning of a supermarket or a school, or the way staff interact with clients in a clinic. Please note that any research done on Wits University campuses with employees or students of the University requires formal permission from the Registrar. Please read the detailed guidelines on the Ethics website

<https://www.wits.ac.za/research/researchersupport/research-ethics/ethics-committees/>

5. How will data on human research participants be collected (instruments, methods, procedures)?

(tick all applicable boxes) (NB: All applicable instruments must be attached to the application):

Hard copy questionnaires or diagnostic tests, etc.

Online instruments (e.g. questionnaires, surveys)

Individual interviews (e.g. structured, semi-structured, etc.)

Personal communication (e.g. email or informal conversation with experts)

Group interviews (e.g. seminar/discussion groups, focus groups, etc.)

Ethnographic observation, participant observation, other informal descriptive, and/or interactive methods (you must specify in the box below)

✓	
✓	Community-based methods or techniques such as drama workshops, community theatre, training workshops, participant rural appraisal, rapid rural appraisal, etc. (you <u>must specify</u> in the box below)
	Research on/in therapeutic or counselling contexts
	Observation of public performance, and/or public behaviour observation
	Photography
	Video
	Audio recording (e.g. of interviews)
	Other research methods or techniques (you <u>must specify</u> in the box below)
	Explanation of ethnographic/participant observations, or other research methods that are not listed above:
✓	6. Who will the research participants be: 6.1 List the different participant groups (e.g. experts, community members, key informants) you will be working with in your project:

The different participant groups that will be included in this project are experts and consultants from various private companies as well as municipal and government officials.

6.2 Description of these participant groups, including age range and sample size, for each group:

All the participant groups will be male and female and above the age of 18 years from the different study sites. For the experts and consultants, a sample size of 40 research participants will be drawn from the study sites of Johannesburg and Cape Town. The sample will be drawn from experts in private companies and consultancies who have knowledge and experience regarding the green bond market in South Africa. Interviews will be conducted with 20 participants whilst online questionnaires will be distributed to another 20 participants.

For the municipal and government officials, a sample size of 20 participants will be drawn from the study sites of Umhlababuyalingana and Algoa. The sample will include municipal and government officials who have experience and knowledge regarding carbon capture and storage initiatives in the country. Interviews will be conducted with 20 participants whilst online questionnaires will be distributed to another 20 participants.

A total of 80 research participants will be included for the entire study in which 40 participants will be interviewed and online questionnaires distributed to another 40 participants. The aim of using interviews for this research is to collect qualitative data that will give the researcher in-depth information about the phenomenon being investigated. In addition, questionnaires will also be used in order to collect quantitative data to get statistical analysis.

7. How will informed consent be obtained?

7.1 How will potential participants be identified / selected / recruited: **Purposive sampling will be used to select the potential participants on the basis of their knowledge, expertise or experience with regards to institutional frameworks, green bonds as well as carbon capture and storage. The potential participants will be found and contacted using a rapid webbased search on Google and through contact details provided on several reports and publications. In addition to purposive sampling, snowball sampling will also be employed. The potential participants contacted will be requested to participate in semi-structured interviews and online questionnaires. Specifically for the online questionnaires an email list has been made to send to the 40 research participants of green bonds and carbon capture and storage.**

The potential experts and consultants will be selected based on their knowledge of the green bond market in South Africa and the processes their respective companies/institutions have

conducted with regards to issuing and buying green bonds. These will be mostly from private companies and institutions such as the JSE, GrowthPoint Properties, Bowman's Law, Imbewu legal specialists, the country offices of the World Bank and International Finance Corporation, Rand Merchant Bank. As well as few experts from public institutions from the City of Johannesburg and City of Cape Town.

The potential participants of municipal and government officials will be selected and recruited due to their involvement, knowledge and expertise of carbon capture and storage initiatives in the country. These will be officials contacted from the Umhlababuyalingana municipality, Sarah Baartman municipality, KwaZulu Natal Department of Economic Development Tourism and Environmental Affairs (EDTEA), Cooperative Governance and Traditional Affairs (COGTA), Department of Water and Sanitation, Department of Agriculture and Rural Development as well as the Department of Energy.

7.2 Will any incentives be offered to participants: **No** If
YES, please explain:

7.3 How will informed consent be obtained: **Formal**
(Signed form) Other (e.g. online survey) If you cannot
obtain formal written consent, explain why:

NB: Attach Participant Information Sheets and Consent Forms for each sample group (please label these carefully), and/or other related materials. It is essential that participants in research be fully informed (irrespective of the method used) and then be able to agree on this basis to participate in the research.

8. Protecting participant identities

Can confidentiality of participants be guaranteed throughout the data collection process: **Yes**

Can anonymity be guaranteed throughout the data collection process: **No**

Can anonymity be guaranteed in resulting research reports or publications: **Yes**

Explain how you will manage issues of anonymity and confidentiality in your project (What will participants be told in this regard?): **Through the participant information sheets and consent forms, it will be pointed out and explained to the research participants that their contributions will be strictly anonymous and their results confidential.**

Furthermore, through the information sheets the participants will be informed that they can withdraw from the process or skip any question from the interview/and or online questionnaire if they are uncomfortable to answer. They may also stop the interview or online questionnaire at any time, without any consequences.

During interviews and after, the researcher will make use of pseudonyms and at no point will the participants be asked their names and any other information that can be used to identify them later. However, it is important to note that anonymity for interviews with officials from municipal and government officials and organisations (IFC, WB) will not be guaranteed as interviews will be face to face. However, anonymity will be guaranteed in resulting research reports as pseudonyms will be used.

Online questionnaires will also be used where any information disclosed will be confidential. Participants will also be notified that they are allowed to withdraw at any time or skip a question if uncomfortable. However, anonymity cannot be guaranteed as the researcher will distribute the online questionnaire to the research participants and will therefore have access to their email addresses and gather how many participants did the questionnaire. With the use of snowball sampling, the online questionnaire will then be anonymous as the researcher will not know the other participants. Google Forms is also designed in a way that people can be referred to participate in a questionnaire but the researcher cannot track the respondents IP addresses.

Definitions: ***Confidentiality:*** that any information considered confidential by the participant or researcher will not be disclosed to others. ***Anonymity throughout the data collection process:*** that you as the researcher will not be able to identify the participant. ***Anonymity in the resulting reports:*** that the participant's name/identifying data will not be disclosed and that anyone reading your results will not be able to identify the participant. **NB:** While confidentiality may be desirable, it cannot be

guaranteed in, for example, focus groups, or ethnographic observations. Similarly, anonymity should be preserved in questionnaires, but cannot be offered in workshop methodologies, focus group research, etc. Participants should have the right to remain anonymous in the final report and this must be respected in handling of all data relating to them. Participants need to be informed about these issues through the Participant Information Sheet.

9. Protection of data during and after the research

9.1 How will the data be protected while the research is in progress? (This includes how the identities of participants will be protected).

Hard copies such as interview notes and/or audio tapes will be securely locked away, for example in a locked filing cabinet and the key will always remain with the researcher. All information on interview notes and audio tapes will be immediately transcribed in the researchers laptop and pseudonyms will be used throughout. All information on the researchers laptop will be encrypted and will need a password to access the information. In order to reduce risk of theft of information the researcher will ensure that after 1 minute, the laptop automatically locks itself. After all information is used in the research, all the hard copy notes, audio tapes as well as information on the researcher laptop will be disposed and destroyed so that no one else can ever have access to it.

9.2 What is to be done with the research data after completion of the project:

☐	Stored in archives (specify below)	☐	Stored in online database
☒	Stored in password protected computer	☐	(specify below)
☐	Stored for future secondary analysis	☐	Stored in digital form with all
☐		☐	identifying features removed

Destroyed after **0** years

Please specify which archives or online databases will be used (if applicable):

NB: 'Raw' or unprocessed data, especially where the identity or personal data of research participants is included, must be safeguarded and preserved from unauthorised access. Data may

be destroyed after use, but **preservation in an archive or personal collection** may also be appropriate, desirable or even essential. For instance, datasets that contain **historically important information** or information that relates to **national heritage** must be preserved and should be placed in a public archive where possible and appropriate. All data should be preserved in a way that **respects the nature of the original participants' consent**. If you are unsure about the procedure of data management and storage, please contact the Data Services Librarian.

10. Summary CV of applicant

ALL boxes in the following table must be completed by the applicant

10.1 List your academic qualifications. Include dates or current registration status:

1. B.A General (Majored in Sociology and Geography), 2015 - 2017. Graduated in 2018.

2. Bsc in Geography, 2018 - 2018. Graduated in 2019.

3. PhD in Geography, registered January 2019.

10.2 Describe any ethics content training you have previously received (e.g. ethics short courses; online courses; ethics CPD courses; ethical input as part of a research methods course)

In my Honours year I completed a course called 'Advanced Geographic Research Methods' in which ethical input was an important component of this course. In addition, I participated in an ethics content training course called 'Ethics in Research and Applying for Ethics Clearance: Non-medical'. I also completed an assignment, following the training course, upon which I am successful will allow me to obtain a certificate of competence in research ethics.

10.3 List of instruments or methods used in this project, as listed in Section 5 of the application form (Tick the appropriate boxes and describe these specific instruments if necessary)

Hard copy questionnaires or diagnostic tests, etc.

Online instruments (e.g. questionnaires, surveys)

Individual interviews (e.g. structured, semi-structured, etc.)

Personal communication (e.g. email or informal conversation with experts)

Group interviews (e.g. seminar/discussion groups, focus groups, etc.)

Ethnographic observation, participant observation, other informal descriptive, and/or interactive methods (you must specify in the box below)

Community-based methods or techniques such as drama workshops, community theatre, training workshops, participant rural appraisal, rapid rural appraisal, etc. (you must specify in the box below) Research on/in therapeutic or counselling contexts

Observation of public performance, and/or public behaviour observation

✓	Photography
✓	Video
	Audio recording (e.g. of interviews)
	Other research methods or techniques (you <u>must specify</u> in the box below)
	10.4 Describe your previous experience in deploying the instruments or methods of research which you are applying here (refer to Section 5 and table in Section 10.3)
	In my undergraduate final year sociology course called 'Researching Social Life', I made use of semi-structured interviews for a small research project that was a component of the course.
	In my Honours year I made use of semi-structured interviews as well as online questionnaires for my research that was conducted with experts from both the private and public sector as well as government officials. Audio recording was also used in interviews with the permission of the research participants
✓	

