The Ability of Renewable Energy Assets to Attract Private Investment

Factors and considerations that influence an investor's decision to invest into South African assets with a renewable energy exposure.

A Thesis
presented to

The Graduate School of Business
University of Cape Town

In partial fulfilment
of the requirements for the
Master of Commerce in Development Finance Degree

by
Sarah Vicki Napier (Marot)
(**MRTSAR005**)

December 2016

Supervised by: Tom Ryan

PLAGIARISM DECLARATION

Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. I have used the APA referencing convention convention for citation and referencing. Each contribution to, and quotation in, this essay/report/project/dissertation from the work(s) of other people has been attributed, and has been cited and referenced.

3. This dissertation. is my own work.

4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

5. I acknowledge that copying someone else's assignment or essay, or part of it, is wrong, and declare that this is my own work.

Signed by candidate

Signature Removed

Sarah Vicki Napier (Marot)

Abstract

The Ability of Renewable Energy Assets to Attract Private Investment Capital

Factors and considerations that influence an investor's willingness to invest into renewable energy

This paper aims at facilitating, through research and increased understanding, the inflow of investments into renewable energy (RE) assets. The private sector represents vast pools of funding that is needed for RE capacity to be unlocked on a sustainable and large scale rate. Through using a grounded theory research design methodology, the drivers and restraints identified were the risks and rewards involved in investing into a RE asset, specifically the macro-economic and microeconomic risk and reward factors involved.

Renewable energy assets were found to closely be affected by government policies and the stability thereof. Return attributes to renewable energy were a high cash yielding, long term in nature and inflation indexed payments - all attractive attributes to pension funds, the largest private investment group with regards to assets under management.

Through the grounded theory methodology process a causal loop diagram (CLD)is built, representative of the insights of RE as an asset class- gained from the literature. One leveraging factor identified in the CLD to increase investment is government policy stability which will substantially decrease perceived risks to investors.

Executive Summary

South Africa is currently facing an energy security shortage which can and has had devastating effects on the economy. The capacity to produce power needs to be increased before further electricity outages become necessary. Carbon emissions that result from the process of producing electricity from fossil fuel is also a national and global problem. Additionally, a lack of job creation and economic strength contribute to South Africa's economic challenges. These challenges are not exclusive to South Africa, however this study is focused on an application and review specific to South Africa.

Renewable energy (RE) is a possible solution to increase energy production capacity, with the potential to reduce carbon emission production, increase job creation and stimulate the economy.RE technology frequently has new breakthroughs and is fast competing with conventional electricity produced from fossil fuels. Setting up and establishing RE systems requires financing. Projects that manage to attract mainstream or private sector investments on a financial basis alone will have vast pools of financing available to them in contrast with projects drawing only impact investment or public sector investment and support.

The concern then is how to close the gap between what investors of RE projects are investing in and the number of projects seeking investments. The research focus, therefore, is how to attract mainstream investment by assessing RE projects on a risk and reward or risk-adjusted basis.

This qualitative research paper is conducted using grounded theory methodology. The outcome of this research is a theory presented in a causal loop diagram (CLD), providing insights into the mechanisms of attracting investment into RE's asset class. The validity of the findings are also considered and discussed.

The manner in which the research was carried out was ethical and without negative impact on any party as the research conducted was through open ended meetings. No confidential information was divulged in this research paper.

Table of Figures

Table of Tables

Table of Acronyms

Acronym	Acronym stands for
RE	Renewable energy
Crisa	Code for Responsible Investing in South Africa
CV	Concern Variable
ETF	Exchange Traded Fund
FF	Fossil Fuels
FFE	Fossil fuel produced electricity
FIT	Feed in Tariff
GT	Grounded Theory Methodology
kWh	Kilowatt hour

MWh	Megawatt hour
Nersa	National Energy Regulator of South Africa
REIPPP	Renewable Energy Independent Power Procurement Program
RM	Research Methodology
SMIPPP	Small Independent Power Producer Programme

Table of Definitions

Term	**Definition**
Core categories	A core category is the main theme, storyline, or process that subsumes and integrates all lower level categories in a grounded theory, encapsulates the data efficiently at the most abstract level, and is the category with the strongest explanatory power.(E. F. Wolstenholme, 2003)
Diversification	In finance, diversification is the process of allocating capital in a way that reduces the exposure to any one particular asset or risk. A common path towards diversification is to reduce risk or volatility by investing in a variety of assets.(Bent, Williams, & Gilbert, 2004)
Grounded Theory Methodology	Grounded theory (GT) is a systematic methodology in the social sciences involving the construction of theory through the analysis of data. (Maxwell, 2008)
Mainstream investment	Synonymous with private sector investors. Driven by profit.(Liam, 1960)
Municipal tariff	The amount charged by relevant municipality for 1 kWh of electricity.(Grant, 2015)
Private sector	The private sector encompasses all for-profit businesses that are not owned or operated by the government.(Clyde & Karnani, 2015)
Securitization	Securitization is the process of taking an illiquid asset, or group of assets, and through financial engineering, transforming them into a security.(Sebitosi & Pillay, 2008)
Solar Irradiance	Solar irradiance is the power per unit area received from the Sun in the form of electromagnetic radiation in the wavelength range of the measuring instrument. Irradiance may be measured in space or at the Earth's surface after atmospheric absorption and scattering.(Pegels, 2010)
Solar PV asset	Interchangeable with Solar PV system when invested into by investor
Solar PV system	A photovoltaic system, also solar PV power system, or PV system, is a power system designed to supply usable solar power by means of photovoltaics.(Branker, Pathak, & Pearce, 2011)

Yieldco's	A yieldco is a dividend growth-oriented public company, created by a parent company (e.g., SunEdison), that bundles renewable and/or conventional long-term contracted operating assets in order to generate predictable cash flows.(Gregory F, Jenner. Edward, 2015)

Acknowledgements

Thank you to my supervisor, Tom Ryan for providing guidance and being a lighthouse through the stormy patches.

Thank you to my mother, for always encouraging me and thank you to my husband for his loving support.

"It is more fun to talk with someone who doesn't use long, difficult words but rather short, easy words like 'What about lunch?"
- Winne the Pooh (A.A Milne)

"To truly transform our economy, protect our security, and save our planet from the ravages of climate change, we need to ultimately make clean, renewable energy the profitable kind of energy."
– Barack Obama

TABLE OF CONTENTS

Page

Chapter 1. Introduction

1.1. Introduction

In this chapter, a background of current literature is discussed in order to give context to the topic's relevance and discuss identified trends to assist in forming the tentative theory. An introduction to Grounded Theory is also given to form the process from the start and set out the research design.

1.2. Introduction to the Empirical Research Problem and Concern Variable

South Africa's energy supply shortage and consequent power outages area national problem, costing South Africa's economy R3.4 billion in 2008 alone (Pegels, 2010). Access to electricity is vital for poverty eradication through employment and provision of basic living standards. (Martinot et al 2002; Popp, 2006) Bill Gates argues that if one thing was to change in order to reduce poverty it should be the price of electricity (Gates, 2013).

Due to the combustion of fossil fuels, the concentration of carbon dioxide and other greenhouse gases is causing a heating in our atmosphere known as global warming (Cherry, 2014; Karmali, 2015; Popp, 2006). Climate change due to carbon emissions is an environmental challenge that South Africa and the world needs to address, many countries have recognised this have pledged to reduce CO2 output (Badi & Pryke, 2016; Hall, 2013; Mezher et al 2010). Countries such as Germany, Denmark and Dubai (Mezher et al., 2010; Papazu, 2016) have been successful in increasing installed capacity of renewable energy production and provide lessons on how to achieve this.

Research indicates investment into RE can be encouraged by many things. One being government programmes, giving government debt backing such as South Africa's Renewable Energy Independent Power Producing Program (REIPPP) (Eberhard, et al. 2014; Energy Intelligence, 2016) Feed in tariffs such as implemented in the UK(Elway et al 2014) or stricter regulations on carbon emissions (Daim, Harell, & Hogaboam, 2012). Many reports describe that successful change starts with a change in government policy (Oliva & Sobra, 2014). Karvonen describes this support can come from many sources such as reduction in tax, subsidies, feed in tariff and confirmed tariff of electricity produced(Karvonen, & Tuunanen, 2012) The stability of government often affects the perceived risks and expected returns which

in turn affects private financing (Badi & Pryke, 2016; Ka, 2017). Empirical research points to government policy to affect perceived risks and expected returns of RE assets.

South Africa and its government needs to assess and implement these governmental tool policies to change our current trajectory of relying on fossil fuels as our main energy source. From a natural resource perspective, South Africa ranks third in the world on renewable energy resources available with 2500 hours of sunshine a year and a total high radiation area of 1 940 000km (Pegels, 2010). Irradiation is a term which refers to an area with strong solar power potential given to the conditions such as sunlight and air quality that equate to the level of suitability for solar renewable energy harnessing (Eskom, 2002). If a mere 1.25% of this high radiation area was utilised to harness energy it would produce 80GW, the equivalent to South Africa's entire energy demand forecasted for 2025, double the current usage of 36GW (Eskom, 2006).

A possible solution to both the electricity shortage and climate change as a result of carbon emissions is the harnessing of renewable energy. However, to achieve this requires financing up front to set up the infrastructure to harness, store and transport this electricity (Dg, Eltantawy et al 2014; Manoukian & Odabashian, 2015; McGilligan, et al, 2008). Mnoukian points out that our biggest obstacle is no longer engineering but finance.

The research problem centres on the gap between the current investment into renewable energy assets and the optimal investment into renewable energy. This research aims to understand the drivers and restraints in order to understand how this gap could be closed.

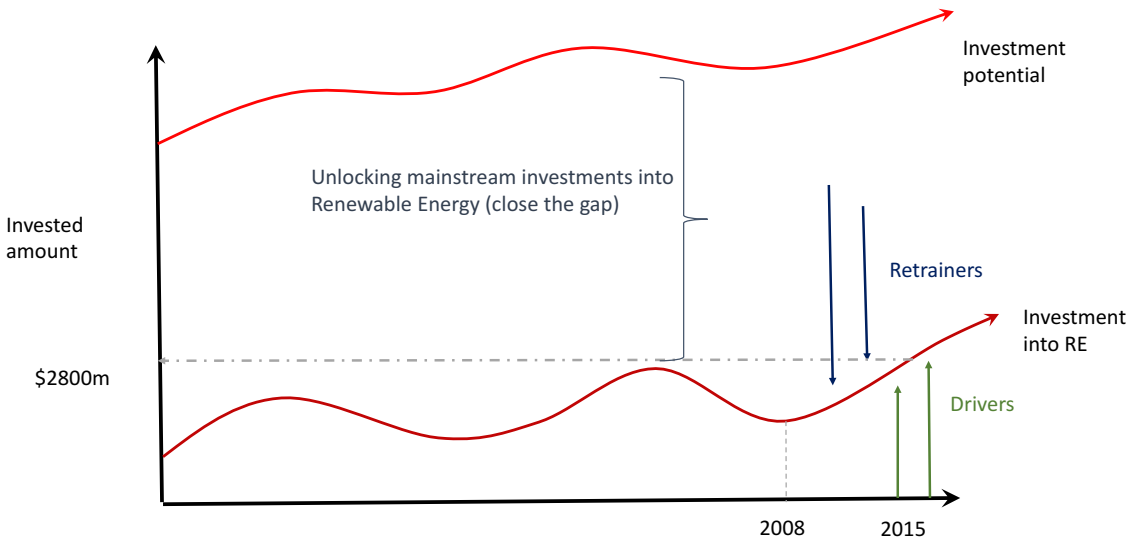


Figure 1: Identifying the Investment Gap.

Figure 1 is an original graph and depicts this gap. The top red line indicates the potential investment into RE assets, driven by the availability of assets to invest into. The bottom red line indicates the actual investment into RE, world-wide (Bloomberg New Energy Finance & UNEP, 2015). Renewable energy as an asset class has indicated sensitivity to financial turmoil, with decreased investments in 2008 (along with most financial assets)(Timilsina et al 2012). There are drivers and restraints to this amount, indicated by the arrows, which is where the study locates itself, in order to understand the influences on closing the gap. As shown on the Y-axis on the graph, in 2015, investment into RE was the highest ever recorded at $285.9 billion(Bloomberg New Energy Finance & UNEP, 2015)including developed and developing countries. This proves that RE is not only for developed nations but also developing which will increase demand and demand for investment. The aim is to understand and study this investment gap and find influencers on increasing the bottom red line in order to bring it closer to the investment potential line.

1.3. Background to Researcher

In Grounded Theory, it is acknowledged that the author cannot be 100% subjective and does make personal judgements over the research process.(Charmaz et al., 2014; Hyland, 2001) Therefore to be aware of researcher bias, an understanding of the researcher must be given to facilitate in the assessment of this bias.

In this research paper, the first person is used in writing. Although the third person is usually used because it is accepted as anonymous and neutral, Webb (Webb, 1992) argues that in qualitative research the first person is more appropriate because the author is giving personal judgement and this is impossible to mitigate. For example, right from the beginning of the research process in selecting data points, personal judgement is involved. Additional arguments describe that academic writing is not impersonal research and the use of the first person displays confidence and connection to evaluations and contributions of the study and can help to strengthen arguments and clarify perspectives. (Hyland, 2002)(“The First Person in Academic Writing,” 1918)

I became interested in this topic through starting a new role as an analyst for a renewable energy fund. I was interested in the fact that the RE investment fund was set up for purely financial gain and the clean energy benefits were secondary. I am passionate about impact investing and facilitating in providing socially uplifting, profitable solutions with the resources needed to be sustainable. Renewable energy is on its way to becoming self-sustainable in attracting the financing it needs. I was therefore interested in researching this further and perhaps even gaining insight for other more socially impactful solutions.

I am a financial Investment Analyst. I analyse and guide investment into solar renewable energy projects which form part of a fund. Consequently, this topic is of great personal interest and practical use. I am aware that my close contact with this subject generates potential bias in my research, which I will discuss more in detail in the methodology

1.4. Research Goals

This study seeks to understand the potential of the renewable energy investment landscape in order to find influencers in RE investments. It aims to examine in detail whether returns to renewable energy projects can compete with mainstream investments on a risk to reward financial basis, taking into account any tax credits or subsidies provided to achieve this. The most broadly accepted financial metrics, which directly affect the ability of developers to efficiently raise the capital needed in South Africa is risk adjusted return(Arfsten, 2013).

I wish to study and understand the dynamic forces of drivers and constrainers on the ability of renewable energy investments to attract funding and investment capital in order to explore what is needed in the future for RE to be an attractive investment option and to increase the research knowledge on renewable energy investing. My current work on growing a renewable energy fund enables me to learn from developments on the ground, such as what we as a fund assess with regards to risk and reward and how developments within this sector affect the decisions that we (and the companies we work with) make. Thus an additional goal is to gain deeper insight into risks in order to mitigate and manage them.

Ultimately, the project seeks to unlock mainstream capital for increased investment into renewable energy projects.

1.5. Research Questions

The research questions that guide this study are:

What are the macro specific risks and rewards affecting RE investments?

I want to explore what specific environmental and political risks and rewards influence a solar PV project. For example, I ask what risks and rewards do government policies have on RE assets. What has been done in different countries and how have these different political and regulatory environments supported or restrained investments?

What are the project-specific risks and reward factors at play in a RE solar PV project?

How are project-specific risks, that is the micro factors specific to the project, interrelated, and what are their effects on the attractiveness of projects regarding investments? My aim is to understand how project-specific risks and rewards are managed and mitigated and determine whether these management and mitigation tools can be shared between projects when removed from their contexts.

1.6. Background to Relevancy of Research in Renewable Energy

There has been a recent surge in the renewable energy investment sector, with new drivers and retainers changing the market and investment landscape at a rapid and innovative pace. Costs have been decreasing (Eberhard et al., 2014), technical skill levels rising through experience and better engineering efficiencies in the PV solar systems(Zindler et al., 2015).

The interest in RE has been so widespread that there are examples on-line of many companies have invested in it even though it may not be their core business. For example, Samsung has partnered with Canadian Solar Inc. a leading solar PV panel manufacturer to set up a manufacturing plant in London, and in 2015 Samsung invested $150 million into Scottish offshore wind power project (Kaye, 2013). And Google, who is now the largest corporate purchaser of RE and has invested in 22 renewable energy projects (Lozanova, 2016). However, there are many commercial investors and investment management houses that have not yet invested into RE. Is the market waiting for risks to diminish, or are the opportunities not inviting enough?

Depending on the main restrains identified, what policies or reforms would have the greatest cost effective influence in drawing mainstream toward RE? For this sector to be self-sustainable and self-driving we need to reach a level where the capital needed for a proven profitable project is raised via the public markets. Capital cannot only be provided by the environmentally mindful funders and funding groups as this funding is limited but needs to compete with regards to risks and rewards of commercial investments. That is, competitive investments are not 'green focused' but come from 'mainstream commercial or private sector capital. This research paper also aims at raising much needed awareness on the potential for investing into RE as a competitive and attractive asset class. Once large scale private funding pools are unlocked, many more renewable energy projects will be developed and financed; lending to a paradigm shift towards renewable energy usage over fossil fuel energy.

Understanding this risk and reward landscape from an investor's perspective and revealing what factors are given in current available literature as well as at the ground level, will bring insight into what factors will increase investments into RE. Presenting the risks and rewards of specifically solar PV projects is relevant to investors and stakeholders in this sector, for them to have access to educational factors on the technology / concept and be equipped to understand it as a very real solution and not a 'yet to be proven' technology.

1.7. Research Background to Arguments Against Renewable Energy

A common argument brought against renewable energy uptake is that it will equate to a loss of jobs, specifically in the mining sector. Coal mining currently creates7 million jobs worldwide. However, implementing a world solar plan which is entirely run on renewable energy would provide an estimated 8.4 million jobs over forty years (Karmali, 2015). Currently, renewable energy projects are employing 2.3 million people(BNEF, 2016) and numbers are rising faster than employment in coal mining, which is decreasing.

Another argument, raised against the use of RE is that renewables can be intermittent and unreliable. This can however, be overcome by the right mix of renewable sources, as well as better storage of energy (Greenpeace, 2016). Each renewable energy source offers its own reliability, extraction requirements, localisation of the supply chain and storage ability. This helps in that it provides the opportunity to build a diverse and lower risk energy supply with sustainability (Beck & Martinot, 2004). Conventional fossil fuels can be stored indefinitely in

the ground with finite reserves that require costly infrastructure for extraction. By contrast, RE is freely available, constantly replenished, does not require extraction and can be produced at a localised level. Interconnectivity between grids poses an extra expense, but would help to stabilise supply and demand surges. As mentioned previously, coal power stations such as Eskom in South Africa have also not been without fault in terms of reliability. This trend is expected to increase, due to rising demand and lack of maintenance to Eskom's power stations(Krupa & Burch, 2011).

Renewable energy is often regarded as expensive. This is simply not true. A unit of electricity from Eskom's new coal plant will cost R0,80 / KWh, nuclear costs R1,00 / kWh and electricity from solar PV costs R0,64 / kWh and wind R0,6 / KWh (Bischof-Niemz, 2015). South Africa's coal electricity is relatively cheap at R0.3 / KWh at off-peak times because of indirect subsidies and inefficient pricing, yet this figure does not take externalities and upkeep into account. These tariffs make it difficult to compete with. However, the relative decrease in PV costs, due to reduction in manufacture costs and improvements in technology, is a recent breakthrough. In addition, once the renewable energy system is set up, there arevery low upkeep costs and virtually no further input costs .Therefore RE prices are much more stable than fossil fuel electricity which is subject to price changes of coal and the labour mining component related to mining.

Another argument raised against solar PV panels is that they produce carbon emissions in production. Depending on where and how they are made solar panels offset their carbon footprint in just four years (Greenpeace, 2016), whereas coal electricity production releases emissions on a constant basis.

Thus, renewable energy largely makes economic and logical sense however turning this solution into a viable capital attracting investment product is the challenge.

1.8. Conceptual Framework

1.8.1. Renewable Energy Makes Sense

My framework thinking is that RE makes sense at a number of different levels, it is financially astute because it brings savings to the user of renewable electricity from the RE asset. It is cheaper than fossil fuel produced electricity which in the long term, translates into returns which can be divided amongst the off-taker(user of electricity) and the investors.

RE makes economic sense, once the system is set up it will continue to produce electricity for 25+years with little maintenance. The electricity does not have to be transported and as there are no additional inputs, the price is not volatile.

RE makes strategic sense in that the world is viewing responsibility towards the planet as of growing importance. All trends and parliamentary discussions are pointing to carbon taxes being implemented as well as regulations as to rooftop usage.

RE makes environmental sense, as the alternative that RE is replacing is fossil fuels. Fossil fuel production creates harmful carbon emissions that cause climate change and destruction.

1.9 Introduction to Grounded Theory

In this research a Grounded Theory Methodology (GT) was applied. GT is a systematic methodology involving the discovery of theory through the analysis of data (Glaser, 1995; Maxwell, 2008). Documentary research – the analysis of documents that contain information about the phenomenon of the study (Bailey, 1994) – was conducted. A core element to GT is the interactive research design model. This methodology was chosen as it aligned with want I wanted to achieve- a practical and relevant qualitative study, grounded in data and observations. Potential limitations of Grounded Theory are that as the process is highly qualitative the outcome can be prone to researcher- induced bias (Charmaz et al., 2014; Glaser, 1995) This has been attempted to be managed by identifying Researcher Bias in section 1.11. Another argument is that GT has a tendency to be presented in a manner that is unusable to practitioners, this paper aims to overcome that by fitting the model and theory into the validation criteria presented in section 6.4.

According to Charmaz (Charmaz et al., 2014), an author and contributor to modern Grounded Theory, the grounded theory process aims to use qualitative research to construct a new theory and generate new knowledge. Rather than being bound by a pre-conceived hypothesis, Charmaz encourages flexibility and open ended interpretive enquiry regarding the final results. I therefore do not have a set hypothesis to which to direct my research but a tentative theory based on background research.

In this research paper, the first person will be used in writing. Although the third person is usually used because it is accepted as anonymous and neutral, Webb (Webb, 1992) argues that in qualitative research the first person is more appropriate because the author is giving personal

judgement and this is impossible to mitigate. For example, right from the beginning of the research process in selecting data points, personal judgement is involved. Additional arguments describe that academic writing is not impersonal research and the use of the first person displays confidence and connection to evaluations and contributions of the study and can help to strengthen arguments and clarify perspectives.(Hyland, 2002)("The First Person in Academic Writing," 1918)

1.10. Research Design

This research paper makes use of a research design presented by Maxwell (Maxwell,2009) the research process is driven by the data and was chosen because it does not demand a pre conceived hypothesis but lets the data form the hypothesis. Grounded Theory was chosen because a focus on a qualitative research is desired, with a research methodology that allows for innovation under a guided process. The design procedure is not linear but interactive, as is graphically depicted in Figure 3, below, taken from Maxwell's '*Qualitative Research Design; An Interactive Approach, pg 7*' the relational structure and sets the blueprint for the research design process or 'design-in-use' of the actual relationships among the components of the research (Maxwell, 2008).

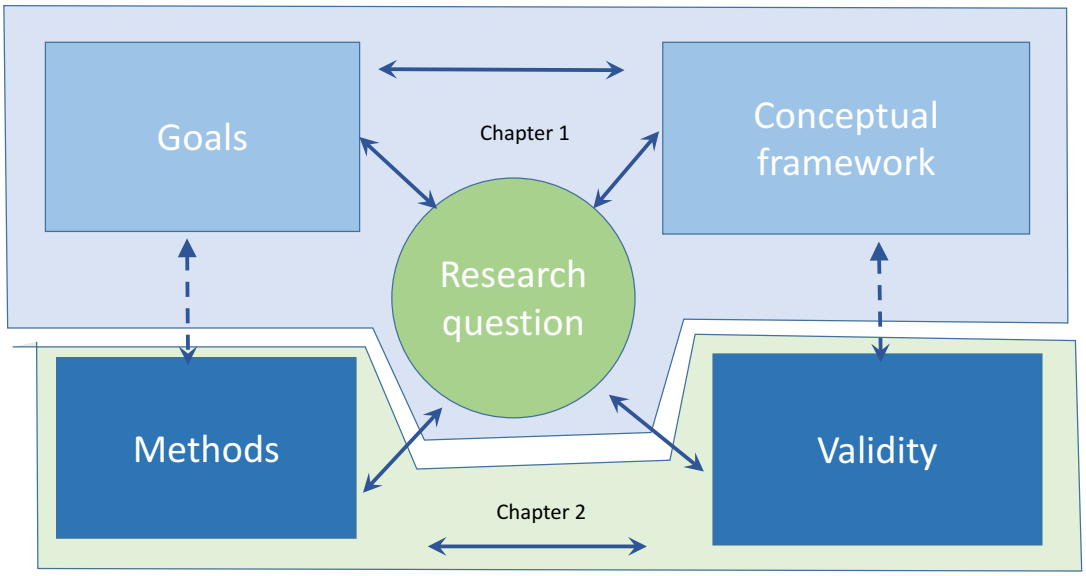


Figure 2: An Interactive Model of Research Design by Maxwell. Chapter 1.

Source: From Qualitative Research Design; An Interactive Approach, by J. A. Maxwell, 2009. Copyright by SAGE These five components of my research design are adapted from Maxwell's paper; Designing a Qualitative Study (Maxwell, 2008)

This research process is important as;

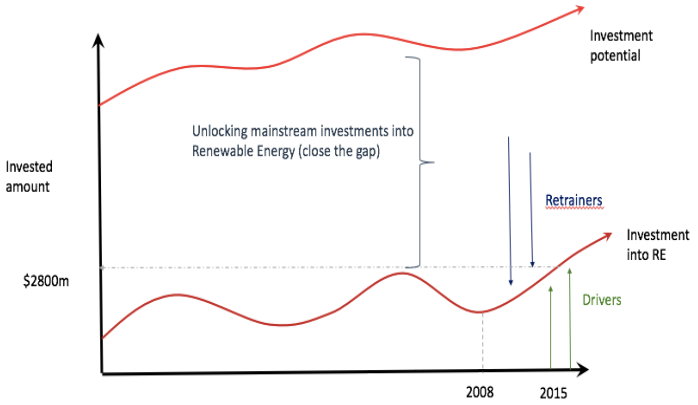
1. It clearly identifies the key components of the research design in order to be aware and address each of these components.
2. It emphasizes that these components are connected and relational, illustrating a dynamic process.
3. It provides structure to qualitative research and addresses these components as decisions and factors within the research process.

1.11. Tentative Theory

As argued in the conceptual framework, RE makes sense from all decision influencers- financial, strategic, economic and environmentally. Therefore the question is, why is there not more of a pull demand from potential clients and investors?

My tentative theory to restraints of RE attracting investment capital is that investors shy away from this asset class as they have a biased view that RE investing is only for the green minded and that it is still too new and risky. Potential off-takers do not allow or seek out solar on their rooftop because they are uneducated to and unaware of the benefits.

There may be general incorrect thinking and myths that need to be uncovered to break down these barriers. I believe that when the clear benefits of RE are laid out with all combating myths explained and uncovered, RE will be utilized at a greater capacity and so investments into RE will also increase. If a product shows market demand and superiority, investors will be drawn because of the opportunities. Figure 3 (a repeat of Figure 1 with additional information) depicts this theory, giving insight into the theoretical drivers and restrains. This is not cited from anywhere but an original depiction.



The restrainers are that investors and the general public are unaware of the benefits of RE. This may be due to misconceptions or false facts. Once there is increased awareness and higher acceptance. This will be a drive in usage (demand) and a drive in investment.

The drivers are when the financial strategic, economic and environmental factors are made known and attract users and general acceptance. I therefore think greater education is needed to drive RE investments

Figure 3: Tentative Theory Regarding the Concern Variable

1.12. Researcher Bias

My own conceptual framework was as a financial analyst with impact investing close to heart. My academic background has enabled analytical thinking which will help to derive and extract the risks and rewards mentioned in academic articles, blogs and journal articles as well as meetings and boardroom discussions. I hope to gain experience in alternative investments for positive impact.

I am aware of having a bias coming from practical knowledge and understanding of these risk factors and then going into the research. However, by engaging with material from sources of varying positions, I hope to present a strong, critically astute argument

1.13 Conclusion

In this chapter I demonstrated that this research is relevant because investments into RE is necessary in order to transition to a predominantly renewable energy using nation. This transition will help to solve key problems such as energy capacity shortage, carbon emissions and economic growth. I also aim to bring awareness to investors of the potential financial return opportunities available within RE asset investments. I established my research goals as understanding drivers of investment into RE focusing on the risk and returns inherent in RE as an asset class as well as studying what is needed to bring actual investments in line with investment potential, my concern variable. This enables me to explore the question, what are the risk and return drivers to

renewable energy? Chapter 2 will continue with the research design and discuss the research methods and validity.

Chapter 2: Research Methodology

2.1. Introduction

Chapter 2 discusses the research design methodology used and describes the steps as to how the research was conducted, what processes were followed and how threats to validity of the research were managed. The research methodology is set out in order to demonstrate clarity, order and a disciplined process, helping to validate the research. This is done through giving an overview of the steps followed in GT research, defining key concepts and giving insight as to how research was conducted.

2.2. Qualitative Research

Research can be divided into qualitative and quantitative research. Qualitative research focuses on an inductive, which focuses on generating a new theory as opposed to a deductive method which focuses on testing an existing theory, therefore qualitative research was more applicable to this study as I did not wish to assess the research outcome against a pre constructed hypothesis. This research is also text based as opposed to a number based study and more in-depth focused research is applied as opposed to less depth, large quantity of examples, which quantitative studies typically follow (Johnson et al. 2008).This study is therefore follows a qualitative research process.

2.3. Overview of Methodology Process Followed

The methodology and specific process is described below, with each step in the process explained.

The process began with data collection first, unlike traditional quantitative research which usually begins with a hypothesis then gathers datarelating to the hypothesis. The collected data wasmarked with a series of codes –specific data points extracted from the text. From these codes, general concepts appeared and wereused to link and group the data into propositions (Glaser, 1995). From these proposition concepts, categories eventually formed from following a four cycle process of data gathering and proposition entering. From this four cycle research process core categories formed, which is the basis for creating a theory relevant to the concern variable of increasing investments into renewable energy

Both inductive and deductive thinking needed to be employed with the goal of formulating a hypothesis based on conceptual ideas (Strauss, 2009). Inductive thinking was used in the categorisation and coding of data points found according to the relationship to the concern variable. This process of collecting and categorising data was done in parallel with analysis of the data, thereby building the strongest form of grounded theory possible. The advantage of grounded theory is that it 'builds from the bottom', which is useful and excludes effects of bias, by letting the data form itself (Glaser, 2013).

While the categories were forming, data gathering was still performed by simultaneously going back in each of the four cycles of research in order to test and assess what data was missing. This adds to the strength and completeness of the research (Maxwell, 2009). It is important to constantly and rigorously compare data otherwise the categorization which is central to GT will not be truly representative. Following this process builds a theoretically strong form of theory by researching until the categories were saturated. Saturation occurs when researching for a category yields no new insights. GT is not prescriptive but understands the complexity of qualitative data and relationships between variables.

2.4. Data Collection and Methods used

Data research conducted was through participation observation; largely used in social science and anthropology, this is the process of gathering data through being submerged and involved in the research subject. Schensul,(Schensul, 1999) defines participant observation as "the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting" (p.91). The participant observation was not due to directly studying people I was in contact with but through day-to day activity and experiences in the field as a renewable energy asset analysis. Therefore, data and practical insight and understanding could be gathered through exposure to meetings, interactions and discussions with stakeholders and participants in the RE industry from the developers of RE projects, the clients and the investors into the RE fund.

Literature study was also used in data collection, a study of journals, good quality online blogs and websites helped gain relevancy and new developments and scientific, peer reviewed journal papers were studied to gain theoretical and grounded substance. Combining and comparing the

two “groups” of research will hopefully result in research with both experiential and theoretical backing.

Regarding the data that is taken into consideration, a fundamental property of GT is ‘all is data’, that is, data is collected from all available sources including journal articles, accredited websites, research papers, seminars, presentations and open ended interviews as well as anything that helps the researcher generate concepts for the emerging theory. This property of GT is applied in the research gathering process.

The practical steps of the four cycle data gathering and core category building process inherent in GT is presented below to lay the foundation for documentation of practical completion described in Chapter 3.

2.5. Practical Process of Four Cycle Data Gathering Process

2.5.1 Cycle 1- Open Coding

Open coding refers to conceptualizing on the first level of abstraction. This means that data gathering and concept building was taken directly from research. Open coding starts to categorise codes into common themes and concepts through making comparisons and looking for similarities. In cycle one of the research process all relevant data incidents were gathered and conceptualized into data pieces or codes that had the same key points(Malterud, 2001). Coding refers to defining the key point of the data and reducing the rest of the ‘noise’. A process of taking the data, understanding its relevance to the concern variable, how the data impacts on the concern variable and if it is a driving or restraining factor to the CV was a process that is applied to each data point in order to cultivate a disciplined and systematic coding process (see Annexure A for propositions gathered).

2.5.2 Cycle 2- Axial Coding

Axial coding explores the relationship between the data, thereby making connections between categories. At this stage, interactional strategies and consequences were explored (Glaser, 1995). Constant comparisons were drawn between new and previously collected, if new data did not fit into categories that existed, new categories were formed. Through axial coding categories began to morph and feed into one another at different levels of abstraction.

2.5.3 Cycle 3- Selective Coding

Selective coding was utilized once initial core variables are identified. This is the process of defining the core categories that connect multiple secondary categories. In this cycle, the research direction changes. Here the categories drive the research process. A mini literature review was performed for each category to refine each category by defining key input and outputs that emerge through a closer and more detailed study. This is a deductive process, called theoretical sampling, which was continued in cycle 4. Selective coding was done by finding new research or going over research again with the categories in mind.

2.5.4. Cycle 4- Theoretical Sampling

Theoretical sampling is a process of collecting data to generate a theory whereby the researcher jointly collects codes and analyses data and decides what data to collect next and where to find in, in order to develop a theory as it emerges. Cycle 4 is aimed at collecting data that is pertinent to the core categories developed with the aim of achieving a level of saturation in each category meaning new research yields no new insight. Again each cycle making use of constant comparison

2.5.5. Summary of the Applied Methodology

In summary, the key research stages, derived from the process of conducting grounded theory research involved coding data, building propositions, theoretical sampling, and constant comparison. This enabled me to identify the key points within the data and generate a proposition table to build propositions. These were then used to build concepts, and through interrelationship mapping formed categories. Once these categories were developed, theoretical sampling was used into find saturated core categories.

2.6. Threats to Validity

During research and subsequent theory building, validity needs to be taken into account and the researcher needs to be mindful of threats to validity in order for the research results not to be rendered effectively useless.

Maxwell (Maxwell, 2009) describes validity as the "the correctness or credibility of a description, conclusion, explanation, interpretation, or other sort of account". Validity is proven through evidence not methods. It is important therefore to base research on evidence and to keep going back to a ground-up research process. It is argued by Glaser & Strauss, the original developers of GT, that validity should be judged by fit, relevance, workability and modifiability.

- Fit refers to how closely concepts fit with the incidents in the available data they are representing.
- Relevance is determined not only for academic interest but deals with practical and real concerns of participants such as are the findings really applicable in reality
- Workability refers to whether a theory can be applied to solve different problems.
- Modifiability refers to whether the theory can be modified and updated with new data.

GT is never wrong or invalid only more or less fitting with varying degrees of fit, relevance, workability and modifiability. (Glaser, 1995)

The process of cyclical research is followed to avoid the risk of deriving a conclusion before taking into account as many data points as possible that contradict or saturate your themes. By researching while simultaneously writing one's research findings this reduces human interpretation error. It also reduces the risk of only taking validating data into account. Theoretical sampling was the process followed rather than random sampling. The study was open to and sought out contradictions to the theory

Validity is important to create credibility. The main goal is not to prove that research is the ultimate truth about the phenomena but that it "gives people reading it a reason to believe your research is creditable" (Maxwell, 2004 pg. 122). Our threat to validity refers to the conclusion we put forward as being misinformed distorted and ultimately wrong.

Strauss gives three basic elements every GT approach should include;

- Theoretical coding sensitivity, generating theoretically strong concepts to explain the phenomena that is being researched
- Theoretical sampling, deciding in what order to gather data and from where.
- Identifying between phenomena and context in order to build theoretically strong concepts.

Ideally, the researcher should be sensitive to coding and data capturing to remain true to the essence of what the literature is conveying. Data was gathered from available literature originally from reputable blogs and journal articles and in later stages scientific research papers. Some research was gathered from first account meetings and board room discussions. These discussions are open ended and with the researcher not leading the meetings or discussions and therefore were not steered towards the researcher's biases. Phenomena were noted to be taken in context and assessed on relevancy to the concern variable and research questions.

As I am a practicing investor in this field I want to place emphasis on the research remaining relevant and practical. In order to attain relevancy, current investment research was found to be the most informative. Scientific journals were used but in some incidences were outdated within context of the RE current investment landscape -changing at a fast pace. I started this research before becoming an investor into RE assets. This allowed me to begin the literature research with an unbiased and relatively low knowledge on the topic. This was a parallel learning in research and practically, through field studies. I believe it was beneficial to have the two data gathering approaches running simultaneously.

2.7. Conclusion

An overview of qualitative and quantitative research was discussed in order to define and provide insight to the applicable qualitative research process. Types of data collection methods to be applied were discussed and well as an overview of a detailed process that will be followed and key concepts of the GT methodology were discussed. Threats to validity were also assessed to remain aware of potential biases that will undermine research and the blueprint that will be applied in order to assess the theory formed in Chapter 6, was given.
Chapter 3 will apply the process and concepts discussed in Chapter 2, to the practical research.

Chapter 3. Research Process and Results.

3.1. Introduction

The research cycles described in Chapter 2 are implemented in Chapter 3. Research was taken from online articles as a lot of the developments are recent and may not have full journals available, as well as presentations, books and journal articles. The data was taken from Google Scholar, online Journals available to me such as Ebso, Sage and Emerald were exhausted as well as presentations and working papers available on line. The process has been documented and discussed in order for the reader to access and be included in the thought and research process. This is also documented to build credibility and provide the journey of the ground up methodology.

3.2. Cycle 1 -Open Coding

This cycle was focused on current literature data gathering. I found an abundance of articles and practical examples such as funds and investment companies in the RE investment space. 115 propositions were gathered in Cycle 1. The topic has many facets and interest groups. The following 28 initial propositions formed. I initially found many articles on the trends in renewable energy pertaining to a green focus and had to seek out examples of RE assets and Power Purchase Agreements (PPA) offerings. I sampled these documents by taking relevant points out and tracking them, that related to my concern variable and research questions.

Table: Categories from Cycle 1	
Cycle 1 Categories	**# Props**
1. Green focus	4
2. Technology risk	8
3. Eskom reliability	2
4. Selling carbon taxes	6
5. Price of electricity	2
6. Potential of the resource	2
7. Accessibility of RE as an investment class	9

8. Successful countries examples common traits	3
9. South Africa's government	7
10. Tax benefits	3
11. Investment vehicle examples	9
12. Revenue attributes for RE projects	2
13. Investors into RE	6
14. Acceptance in developing countries	2
15. Investments made practically	5
16. Investment driven groups	1
17. Asset classes within RE	6
18. Practical investment vehicles	8
19. Institutional investor presence	4
20. Risk management	1
21. Carbon taxes	2
22. Competition in the industry	3
23. Size of investment	4
24. Location as a driver	5
25. Large corporations interested	1
26. RE asset classes	6
27. Costs of investing into RE	1
28. Population trends	3

Table 1: Initial propositions resulting from Cycle 1

Challenges, Thought Process and Understandings

Cycle 1 was overwhelming with a lot of information available, not many repeats of data points and little understanding of the industry or practical insight yet. In hindsight I should have been much more specific about the data I collected and should not have spent so much time on tangent arguments- but again this is hindsight that the data collection cycles provided. My original focus and tentative theory was on arguing the benefits of RE- and there was plenty of research available on this. However, I realized none of the research really brought in anything about financing or investors.

3.3. Cycle 2 Axial coding

In research Cycle 2, more data from literature sources were gathered. I simultaneously started my role as a renewable energy asset analyst which added further practical training and information to the research. Through initial understanding gained from research Cycle 1 I had a base knowledge of some of the nuances and issues present in the RE asset class which I took into my role. I gathered information and insights from meetings, trainings and office discussions. Being a new employee meant I did not steer the meetings and conversations, therefore the field work was open ended and uninfluenced by my research process and agenda.

Data was gathered with the intention of adding to the initial categories formed in Cycle 1. From Cycle 1 to Cycle 2, I included various stakeholders' views into the data capturing. I found Cycle 1's categories largely either not relevant or fed into a bigger concept. Practical data points where gathered from meeting with industry stakeholders, such as the engineers installing the solar PV systems. As the engineers quote the cost of the completed systems, their inputs and concerns affect the investors. Additionally, I met with potential off-takers of solar RE and could gather insights as to what their deciding factors are of entering into a PPA with us, the investors. I also met with other investors and discussed their expectations for the future. Taking all stakeholders into account helped with triangulation of data which adds to the strength and validity of the research. My practical submergence started to drive the research process.

Through coding and categorizing the additional data, seven categories emerged. The initial propositions from Cycle 1 were grouped under common themes.

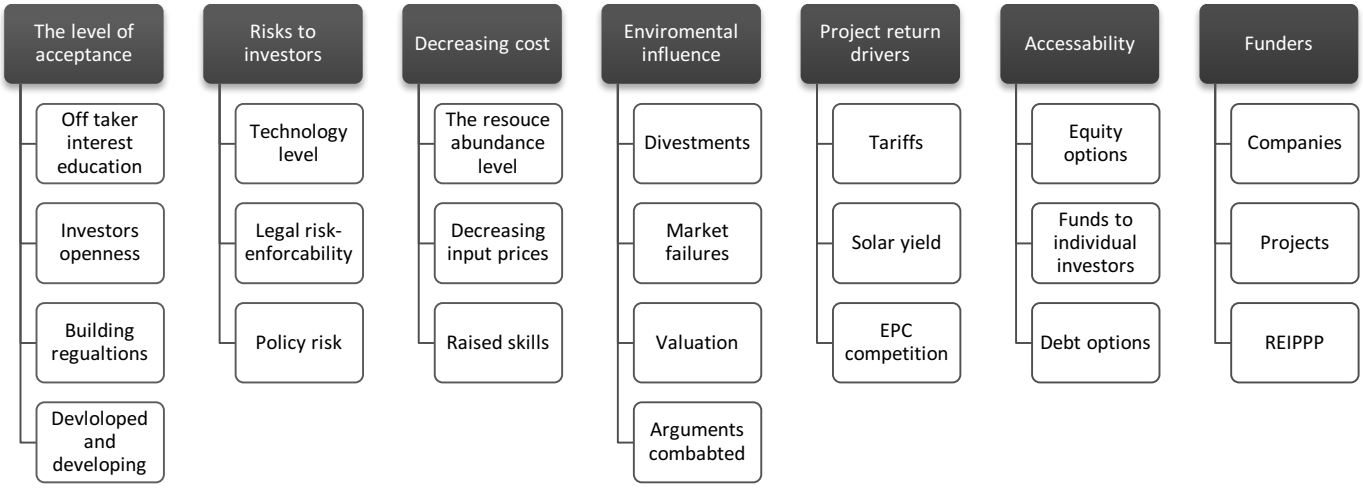


Figure 4: Cycle 2 Core Categories

Challenges, Thought Process and Understandings

In Cycle 2, I realized that I knew even less than I thought knew in Cycle 1. Without specifically realizing, my thinking started to change towards an investor's approach. Most of the research in this phase was directed by what I heard in meetings and in analyst training. I used this information as starting points for further research on, for example, government policies. Most of Cycle 2 therefore was practical insights and original propositions I realized were relevant and interesting within the subject of renewable energy, however were not relevant towards attracting investments such as green focus and project examples. Because of these practical insights, many of these categories from Cycle 2were retained to the end, just under different headings or built into other categories. I also realized that renewable energy was a very broad category and would need to be focused to one type of renewable energy- I chose PV solar projects as that was the projects I was analysing and is the most widely accepted technology for solar energy. Although Cycle 1 generated less specifically applicable information, both Cycles 1 and 2 contributed to a broader understanding of the field, while also indicating nodes at which I could and should be more specific in my research focus.

3.4. Cycle 3 Mini Literature Review

At this stage in the research process, I aimed at refining and reduction. Reduction was achieved through analysing if "A is a part of B?" meaning, could a category fit within another category also identified as well as assessing which categories are identifying the same themes at different levels of abstraction.

This then reduced the core categories. For the sake of briefness, I have cut down or taken relevant exerts from my mini literature review.

3.4.1. Input prices of PV solar projects

Key concepts: Prices of RE projects are becoming cheaper due to favourable trends

From 2009 to 2015, solar panel prices dropped by 70% despite developments to become more efficient in energy harnessing (Christina Numez, 2015). These lower costs are a major driver towards an increase in renewable energy's investment potential. In a report released by Deutshe Bank in 2014 (Vishal Shah, 2014) which proposed electricity prices falling by 40% in the next 3 years, a prediction for which it is roughly on target. Reasons described are: economies of scale in production, expansion in the number of rooftop panels installed, reduction in processing costs, reduction in polysilicon costs (the main input into PV panels) and improvement in conversion efficiencies (Giles Parkinson, 2015).

Key takeaways: Decreasing projects costs drive up project returns

3.4.2. Governments Promoting Private Sector Involvement

Key Input: Different governments deploy different mechanisms to encourage RE investments

The South African government has taken measures to promote investment into RE. Some of these strategies are taken from successful projects implemented in other countries.

Examples of other projects utilized to increase renewable energy supply by the private sector are feed-in tariffs. Germany was the first to implement this program successfully. The feed-in tariff is a guarantee for producers of energy because this represents an off taker contract at a fixed rate for on average of 10-20 years. This enables long term planning and reduced risk due to known

revenue stability. South Africa's similar tender awarded REIPPP program has had many positives effects but on the downside has added to the fragmented nature of the renewables project economies. Investing into renewable energy holds the risk of political decisions changing and politicians breaking their word because of submission to the big private party interests and corruption. This is therefore a risk that is volatile and unpredictable and consequently hard to price.

Key takeaways: Government policies affect return as well as risk through stable policies

3.4.3. Investments Unlocked in Developed and Developing Countries

Key Inputs: Developing nations have increasing energy demands

Renewables investments into developing countries was higher in 2015 than developed countries for the first time ever. In 2015 developed and emerging nations' net investments reached a record $16 billion, up by 19% compared to 2014, and investments into developed countries totalled to $130 billion, down 8% from 2014 (UNEP News Centre, 2016)

This was largely driven by investments into China of $102.9 billion, or 36% of the world's total. In China more than 150 million people heat at least some of their water using solar hot water systems. Other developing countries taking the spotlight were India with $10.2 billion (up 22%), as well as South Africa with $4.5billion. This represents a massive329% increase since 2014 – an increase largely driven by the government REIPPP. Investors seek out developing countries due to their growth in economy and demand leading to higher returns. This is specifically true for energy usage relating to high potential for RE investments in growing economies.

Key takeaways: A country's macroeconomic level affects potential returns due to increasing demand and risks due to level of expertise and stability

3.4.4. Risks

Key Input: There are several risks involved in RE asset building

Technology risk forms part of this risk due to projects using technology which has not been repeatedly tested and implemented, producing known results and performance. Being a first market mover and potentially failing is naturally avoided as it leads to reputational risk. These are all factors incorporated into the cost and therefore increasing the required returns of investing into a renewable energy project.

The risk of investing in renewables or a specific renewable energy project depends on the underlying asset as well as the environment in which it operates. Investor's exposure depends on the design of the contract, which part of the project the investor is investing into and how this exposure is structured.(Norges Bank, 2015).

Key Takeaways: Risk levels depend on the country and the project (macro and micro risks)

3.4.5. Negative externalities

Key input: many non-financial benefits exist through utilizing RE over FFE

It is a market failure that fossil fuel prices do not take into account the Green House Gas emissions (negative externalities) as these costs to society and the environment are not accounted for results in fossil fuel energy being consumed above optimal level (Brown, 2001).

Another negative externality of fossil fuel energy is the supply vulnerability and its price associated along national security risks (Owen, 2006). Costs associated with these risks are military and diplomatic expenditures which again are not factored into the true costs of fossil fuels.

Key takeaways; Unless these non-financials are internalized into the financial factors they will not make a difference.

3.4.6. Practical options to invest into Renewable Energy

Key Input: Many different RE asset products exist in the market.

Investment vehicles and options for investors are crucial in obtaining investment capital and ultimately unlocking funding. These are the connectors between investors and fund raisers. Risk and return needs to come in the correct packages for investors to buy into. RE assets are currently available in debt and equity instruments which has innovative offerings such as EFT's Yieldco's, securitized products and derivatives.

Key take-always: Choice is important to investors as the underlying asset is not the only risk-return driver, cash flow yield and financial market changes affect debt and equity differently

3.4.7. Government Intervention

Government intervention is needed to tip the scale

Government needs to step in to level the playing field, as energy is considered a public good that empowers communities and improves the standard of living (McGregor, 2011).

Carbon taxes are needed to drive the price of coal electricity well beyond that of renewables, and this may be the tipping factor. The lack of this tax is encouraging an inefficient system as coal electricity is not taking into account their full social negative externalities cost and therefore producing coal electricity above efficient level and under-producing renewables below efficiency. Tax incentives play a large role in returns to RE projects.

Key takeaways: government intervention does not need to cost the budget. Carbon taxes or incentives will tip the scale for RE to compete with FFE

3.5. Changes in Categories from Cycle 2 to Cycle 3

Through sensitivity and insight gained from the miniature literature review, the tentative categories that emerged in Cycle 2 along with their sub-propositions were refined and the 'noise' was reduced. Even though more research and data was added, the categories were expanded to incorporate more factors and were simplified.

Through following the GT methodology and starting with data gathering instead of a pre-conceived hypothesis my research changed and ultimately simplified into over-arching themes or factors. It became clear that in order to attract mainstream capital to invest into renewable energy assets, only two factors were important- risk and return. It did not matter how much economic, strategic and environmental sense RE makes. What is important to companies, investors and off-takers is the expected return given the perceived risk.

I therefore divided the categories and renamed them into micro and macro risks, and micro and macro returns in order to concentrate and focus in on the actual drivers and restrains on the amount invested into RE. I found this helped to focus the quantity of research as well as the analysis of this research. With a focus on remaining practical another two categories re-merged; assessing accessibility and choice of RE assets for investors to choose from as well as studying current investors into RE to understand their forecasts, expectations of the future and reasoning for investing. Although these last two categories were in the end too broad to cover appropriately and insights gained from current investors' investment factors were absorbed into the risk and reward categories.

Cycle 3 Changes and condensing from Cycle 2 outcomes	
Changed from:	**Changed to:**
"The Level of Acceptance"	Dissolved into other core categories such as macro and micro returns
"Risks to Investors"	Incorporated into "Micro Risk Factors" and "Macro Risk Factors"
"Decreasing Costs"	Was incorporated into "Micro Project Return Drivers"
"Environmental Influence"	Divided into "Macro Return Drivers" and 'Micro Project Return Drivers"
"Project Return Drivers"	Renamed "Micro Project Return Drivers"
"Accessibility"	Renamed "Accessibility and Range of Investment Products"
"Funders"	Renamed "Current Investors"

Table 2: Cycle 3 Category Name Changes

3.6. Cycle 3 Categories and Proposition Inputs

Table 4 below summarizes the reduced and renamed categories and well as the propositions that build each category.

Core Category	Key concepts
Micro Project return Drivers	• Tariffs • Decreasing Input Costs • Revenue Factors
Macro Return Drivers	• Externalities • Carbon Taxes • Policies
Micro Risks	• Legal Risk • Technology Risk • Asset risk
Macro Risks	• Unfavorable Policies • Policy changes • Technology level risk
Accessibility in Range of Projects	• Risk reward packages • Asset Class Options • Innovative product Offerings
Current investors	• Current Investor Groups

	• Other Factors specific to Investors • Appetite for RE assets

Table 3: Propositions Reduced into Core Categories of Cycle 3

Cycle 3 Challenges, Thought Process and Understandings

This cycle really did help to bring focus and research into specific factors. During this cycle a great deal of renaming and reduction was performed as I realised that many of these factors could be divided into risk-reward factors within macro and micro environments. My aim was always to understand practical options available and who is investing and why. However, research on actual returns to private funds was difficult as this is private information that is sensitive to competitors and therefore the people I contacted were not willing to share funds details. I realised in the Literature Review write up stage, the categories on Current Investors and Asset Accessibility were beyond the scope of my research. Thus I chose to narrow my focus to the four remaining key categories of macro and micro risk and return.

3.7. Cycle 4: Theoretical Sampling

Cycle 4 makes use of theoretical sampling. Each category was researched with specific focus. Propositions that added to the defined categories were sought out. This was done until a level of saturation was achieved. In total, 285 propositions were gathered and there were no changes to my core categories from Cycle 3. My final categories are presented below in Table 3.

Table 3: Categories from Cycle 4

Cycle 4 Categories	**# props**
Micro Project Return Drivers	64
Macro Return Drivers	35
Micro Risk Factors	41
Macro Risk Factors	55
Accessibility and Range of Investment Products*	43
Current Investors*	47

Total Propositions	285

Table 4: Final Core Categories Resulting from Research Cycle 4

* These categories were reduced into risk and return factors in the write up stage.

Challenges, Thought Process and Understandings

Cycle 4 I found the least messy and most insightful. Because of the discipline that the core categories gave me, each new piece of data I could assess to see if it had anything new to add to the core categories. I found the "Accessibility and Range of Investment Products" category difficult to saturate and ended up researching different RE shares until realizing it was too broad. "Current Investors" was also a very broad category as they ranged from developers to fund holders to pension funds that were two or three degrees away from direct ownership. I continued with these categories right up to the write-up phase but realised it was beyond the scope and focus of my research to thoroughly engage with these topics. I do not find that to be a loss in insight as the factors given by investors could be directly incorporated into the risk and return categories.

3.8. Interrelationship of Final Core Categories

Micro project returns and **macro return factors** need to be combined in order to provide an acceptable level of expected return given the combination of **macro environment risks and micro project risks**. The combination of risk and returns available from projects are driven by the **accessible range of RE assets** to invest into in the market. Investors that have accepted these risk reward packages are **current investors** and they have their own beliefs and forecasts that make them current investors in RE assets while other investors have not made this choice yet. Figure 5 is a graphical depiction of these relationships.

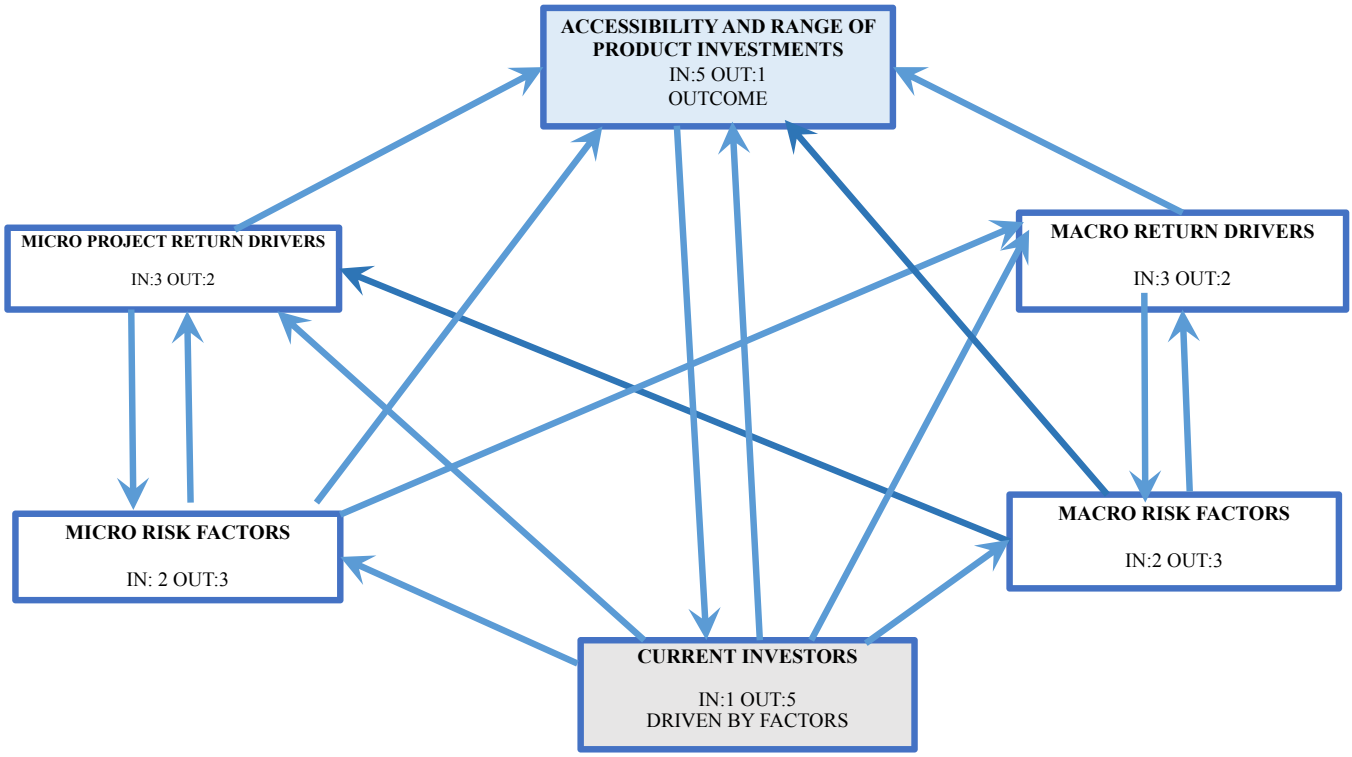


Figure 5: Interrelationship diagram between Core Categories

3.9. Discussion of the Research Results

My research focus and thought process changed over what I thought I would be researching and what I found to be my final core categories. My initial hypothesis and conceptual framework was based on the belief that I could potentially study and relay in an argumentative report the positive attributes of implementing RE to appeal to mainstream financially driven investors.

My initial question in this research process was: how are we going to drive mainstream investments towards investing into RE? Through the research process it become clear that

- The investment world is efficient- where there are returns financing will follow
- One cannot attract mainstream capital with drivers that would relate to impact investing. My thinking was flawed in that I was thinking through the lens or motivation of an impact investor.

- As an investor within this space, we are investing for the returns. The side-effect of being in renewables may drive some off takers to want to take part in a green focus (effects stakeholders) and therefore is still relevant but not a key driver.
- If mainstream capital is what I hope to understand and attract to RE, I need to assess it on a mainstream capital matrix.
- Ultimately mainstream capital is attracted by two matrices: risk and return. These are therefore the new drivers and restrainers to my concern variable.
- Even companies that are portrait as being 'environmentally responsible' and open to public investment ultimately only have one mandate- to make money. How they position themselves to investors may be with an environmentally responsible stance in order to enjoy the public image of this. However, they are investing and involved in the RE space primarily to earn money.
- There are environmental factors, such as campaigning groups, divestments from fossil fuel and the case for fossil fuel negative externalities. These factors however, either feed into making RE relatively cheaper or drives positive image for RE firms, both drive back into return terms.
- This may be seen as a cynical view but I believe this is not the case. We should learn how to speak in mainstream finance terms if we wish to attract mainstream finance.

3.10 Conclusion

Chapter 3 concludes with the key output being the core categories developed from the research process. The chapter discussed the research process and described how the core categories were dynamically formed as well as documenting the change in the researcher's approach to achieving the goals set out in Chapter 1. These categories will be studied in greater depth in Chapter 4 - The Literature Review.

Chapter 4: Three Stage Literature Review

4.1. Introduction

Chapter 4 discusses findings and insights gained through the research and data collection process described in Chapter 3. The literature review is given in three stages all in relation and at different levels of abstraction to the core categories that formed in Chapter 3. The core categories; Micro Project Risk factors, Micro Project Return Drivers, Macro risk factors and Macro Return Drivers are discussed, given context and key attributes are defined in detail. Antecedents are identified as the variables that come before the fact, attributes are regarded as being caused by or attributable to a variable and consequences are the result or effect, these are key terms used to identify cause and effect relationships between identified factors. The literature review is conducted in order to gain sensitivity to the topic, the antecedents, attributes and consequences which assist in building a CLD theory in Chapter 5 are summarized at the end of each core category.

4.2 The Structure of the Literature Review.

This literature review will be conducted as a Grounded Theory, three staged literature review. Level 0 reflects on the 'parent disciplines 'or contextual environment in which the concern variable operates it also gives the background to some of the key research themes. In Level 0, an introduction to current investment through the development of solar PV assets and an introduction to the concept of risk and return are discussed.

Level 1 discusses in more detail the key concepts and how these become the core categories. The next level of micro and macro elements with regards to risk and return are described and the research design is brought into line with the core categories fitting into the concern variable, how this will help to answer the research questions and achieve the research goals.

Level 2 of the literature review discusses and fleshes out the core categories defined as well as the concepts within the core categories. Each level goes more in-depth into the grounded literature gathered from the four cycle research gathering process. Each core category will be summarized into a table of antecedents, attributes and consequences.

4.3. Level 0: Context and Background

Level 0 builds the foundation of the three-staged literature review. In order to invest into a RE asset the investor needs to be satisfied with the risk/ return profile of a RE specific asset. Risks and returns are first theoretically defined and then in relation to RE assets, background has also been provided on how solar PV projects are restructured to RE assets. Level 0 is the highest level of abstraction, Level 1 and Level 2 zoom closer into the detail of the grounded data research and literature. Level 0 is graphically depicted in Figure 5 below, and this figure will then build on through the research levels.

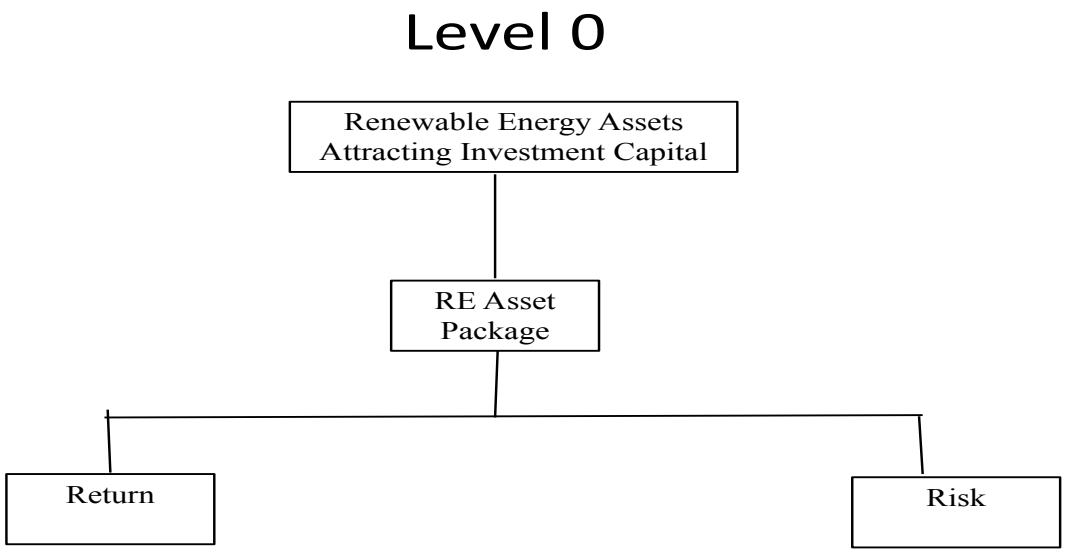


Figure 6: Graphical Representation of Level 0

4.3.1. Defining Solar PV Projects as Renewable Energy Assets.

In order to invest into solar PV assets there need to be solar PV projects developed that are repackaged as assets. Renewable energy is derived from natural processes that are replenished at a faster rate than they are consumed. RE encompasses solar, wind, biomass, geothermal and

hydro energy. For the purposes of this research paper, the focus is on solar. Solar energy is harnessed via two different processes. The first is called Concentrated Solar Power (CSP) plants, which mirrors reflected and concentrated light to a central water boiler that creates steam, which converts to electricity. The other is by Photovoltaic Power (PV) plants (Jasper Lemmens, 2014). These are commonly referred to as PV solar panels. For the purpose of this study, I will be focusing on PV panel projects because in South Africa and worldwide this is the more developed and widely used technology and this is primarily the technology we use to invest into RE assets.

A Power Purchase Agreement (PPA) is the agreement between the asset owner / electricity producer and the energy user or off-taker. This contract is important and is the basis of turning a solar system project into a RE cash returning asset. The PPA specifies all the terms and conditions to the agreement such as costs, escalations and lifetime of the agreement.

PPAs are the tool to convert PV projects into PV assets. PV projects and PV assets are therefore used interchangeably. These assets can then be broken down on a project level between senior debt and equity financing for a specific project or can be pooled to form securitized structures. All of these factors vary the risks and returns of an investment. An investor needs to analyse these risks and returns and decide on an asset with a suitable combination given the investor's preferences. The antecedent is that PV projects have a supply and demand. With the use of a PPA these can be turned into PV assets which can be packaged with different attributable levels of risk and return. The consequence is the decision to invest.

4.3.2. Introduction to Risk

Risk is defined in many ways, Frank Knight (1921), suggested that statistical probabilities used to define risk reflect 'measured uncertainty' and business decisions based on opinions represent 'unmeasured uncertainty'. Keynes (1921) proposed risk can be divided into two categories- 'objective probability' and 'subjective probability'. Knight's(Holton & Knight, 2004)definition of risk continued to describe the term risk as to describe the level of 'measured-ness' and uncertainty for the latter part of the term. Harry Markowitz introduced portfolio theory and proposed that expected returns are desirable and variance in returns as an undesirable thing. This suggests that variance in returns, may be a proxy for risk. Uncertainty is a state of not knowing

whether a proposition or statement is true or false. Exposure relates to whether not knowing if a proposition is true or false could have material significance for example a certain outcome may result in financial loss. All of these definitions of risk relate to the unknown or variance of returns.

The risk is that returns may not materialize as expected and the question of the probability of that happening. Risk is subjective as there is no certainty in uncertainty and can only therefore be referred to as expected or forecasted risk.

Antecedents to risk are uncertainty, uncertainty and lack of control of the returns materializing as forecasted. The attributes of this is that higher risk means greater chance of loss and a higher promise or chance of return needs to be offered to compensate for the increased level of risk and visa-versa.

4.3.3. Introduction to Return

Returns can be described as the benefits derived from owning an asset. Financial returns usually have a risk element involved as to whether the returns expected will materialize and are therefore referred to as expected returns as they can only be guaranteed to a level of certainty. Returns can be divided into payments received from holding the asset and capital appreciation of the asset. When dealing with an equity asset the payments are called dividends and in the case of a debt vehicle such as a bond the payments are referred to as coupon payments.

In the case of solar PV assets, the payments are produced from selling electricity. These payments can be referred to as the asset's cash yield profile and materialize on a monthly basis which is more frequent to the typical cash yield profile of a bond-like or equity asset. This frequent and fairly predictable cash yield profile is beneficial to solar asset owners because of two reasons. Firstly, the concept of 'Time Value of Money' money received today is worth more than money received in 6 months. Secondly and most importantly, this steady stream of fairly predictable payments is alluring to investors who may be liable to steady streams of outflows such as pension funds or funds with pledged monthly contributions to, for example, charities or foundations. This allows the investor to asset-liability match, subsequently reducing liquidity risk.

Another source of return is capital appreciation of an asset, for example a share of equity or a building may appreciate in value over time, resulting in a return from selling the asset at a higher

price than paid to buy it. Solar PV assets do not appreciate in value over time-they depreciate over the life of the asset, rendering it almost worthless as it is non-functional or needs parts replaced to produce electricity after 25 years. This decrease in value may be accelerated as technology is changing to make solar PV equipment comparatively cheaper.

Solar PV assets with the use of a PPA agreement form the basis of the assets discussed. However, these assets can be pooled, restructured and portions within a project divided into debt and equity stakes. This depends on the investor and their risk reward appetite. Equity in the case of RE can be shares to a company or assuming the equity portion of a solar PV project. Generally, the risk is greater for equity and so are the potential returns, as equity shares in both the risk and reward of the project. Debt is generally perceived as less risky with known coupons and future value. Debt does not share in the risk and return of the project except for being compensated with a higher yield if the project is perceived as riskier.

The antecedents to return is that the RE project's asset needs to produce a return, this return in comparison to the level of certainty to the return materializing is assessed. An attribute to the return of the asset is the profile of returns for example frequent payments to the asset or payments received linked to inflation. Given these attributes an investor may invest into RE assets or choose not to invest as consequence.

4.4. Level 1- Literature in Relation to the Researcher

4.4.1. Introduction

This section discusses the key concepts introduced in Level 0 in relation to the research design. With the key concepts being risk and return. Micro and macro factors mentioned in Level 0 are theoretical defined. Level 1 is depicted in Figure 6, building on from Figure 5.

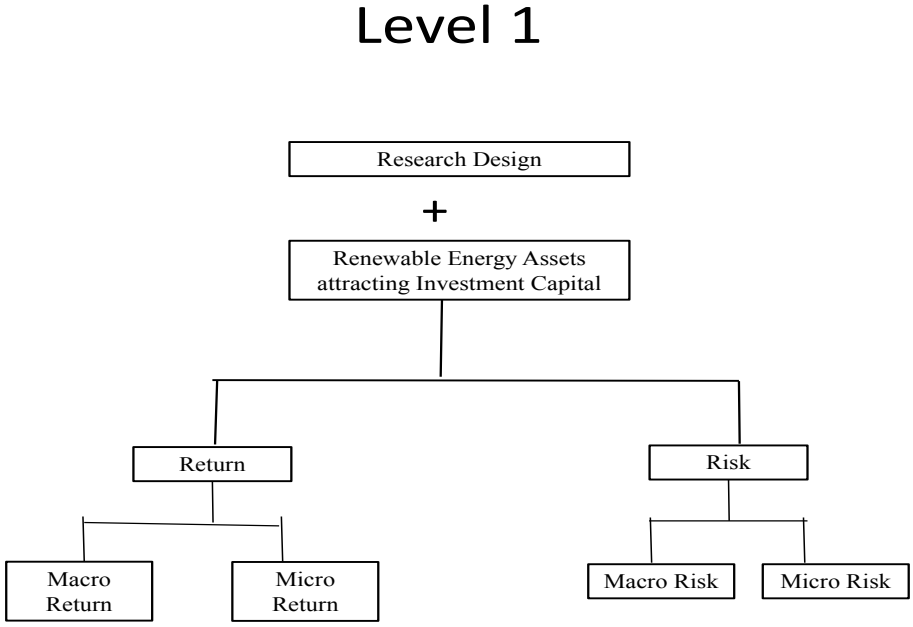


Figure 7: Diagram of Level 1

4.4.2. Micro and Macro Elements

Risk and return make up the backbone of an investment decision. Because the data and literature was so rich and these are such key concepts to understand, risk and return was divided up into macroeconomic and microeconomic (macro and micro) factors, stemming from microeconomics and macroeconomics. 'Microeconomics is the study of decisions that people and businesses make regarding the allocation of resources of good and services'(Henderson & Quandt, 1980). This division helps to separate project specific factors which may or may not be able to be managed or mitigated depending on the project versus the macroeconomic factors that may change depending on which country the RE asset originates from.

Macroeconomics is the field of economics that studies the economy as a whole, government policies' effects on markets and economic behaviour (Silverstone, 1988) in this case macro factors in relation to RE assets is studied. Environmental factors are used interchangeably with macroeconomic factors, referring to the RE investment environment of one country over another and not on an environmental impact level.

Macro antecedents to risk is that the country and the asset has a historical pathway relating to economic factors that either reduce or increase risk around investing into RE. Whether a country is a developed or developing nation, their natural level of coal reserves and their policies all factor in to the macro risk antecedent factors of a solar PV project. Antecedents to micro risk is dependent on cumulative research and development and the pathways of input costs. Antecedents to return is the probability that the risk will not materialize favourably.

Risk is attributable to factors that are influenced by the specific antecedent's level. For example, a developed nation may have less technology risk, a higher level of experience within a project and more stable national policies. The level of cumulative research and development going into RE projects drives the cost of inputs and input costs changing is an attribute of micro risk and return

The consequence of these attributes is that there is a level of risk when investing into solar PV assets. The level of risk depends on the macro project risk attributes and the micro project risk attributes. Depending on how these attributes change, this will drive the level of risk and return. Investors need to a) understand the risks, b) formulate opinions on the future of these variables and c) assess what can be managed, mitigated or accepted, given the level of return provided.

4.4.3. Key Concepts and the Research Design

The key concepts are briefly assessed in relation to the research design in order to validate their insights and contribution to achieving the research goals and potential to answer the research questions.

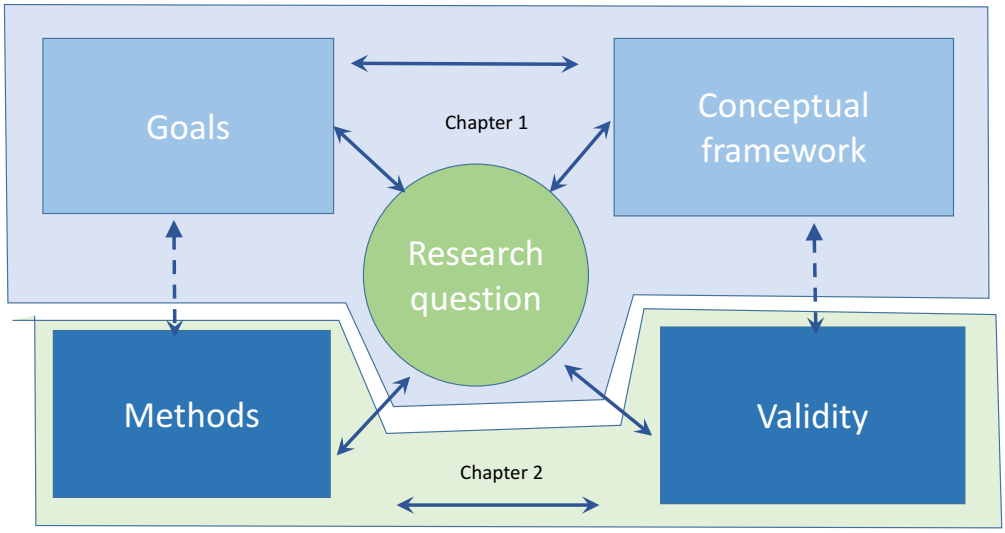


Figure 8 (repeat of Figure 2 seen previously in Chapter 1):
An Interactive Model of Research Design by Maxwell.
Source: From Qualitative Research Design; An Interactive Approach, by J. A. Maxwell, 2009. Copyright by SAGE

The concern variable of this research was to understand the drivers and retainers of renewable energy's ability to attract mainstream capital. The drivers and restraints were identified to be risk and reward as these are the key metrics used to make investment decisions. These drivers and restraints are therefore the key research areas of this paper. The goals of this research therefore became to understand risks and rewards inherent in RE assets and through cycles of data research, micro and macro factors emerged. Understanding these concepts in greater depth in the literature review will help to build a theoretical CLD model and find a leveraging factor that will come full circle into positively impacting on the concern variable (CV). My original conceptual framework was to argue the benefits of RE and therefore why it should be invested into but as discussed this is an impact investors' mind set and not a mainstream investment mind set to which I needed to shift in order to understand mainstream investment capital. The validity of the findings will be assessed in Chapter 6.

4.4.4. Conclusion

The key concepts of risk and return from Level 0 were expanded to micro and macro risks and returns. How these key concepts tie into and will help to achieve the research goals and potentially answer the research questions is assessed. Macro and micro factors within the key concepts were discussed which gives way to defining the core categories for Level 2 as: Macroeconomic Risks, Microeconomic Risks, Macroeconomic Returns and Microeconomic Returns.

4.5 Level 2- Core Categories

4.5.1. Introduction

The core categories developed in Chapter 3, and given ground up context in Level 0 and Level 1 of the literature review will be discussed in greater detail in Level 2. This is done through the knowledge and insights gained from the four cycles of data collection. The insights and concepts are discussed for each core category. Figure 8 and 9graphically represent Level 2 of the literature review to summarise the key factors to be discussed and concepts that make up the core categories again building on from Level 1, Figure 7. In each category's conclusion the key antecedents, attributes and consequences will be summarized in table format for brevity and focus.

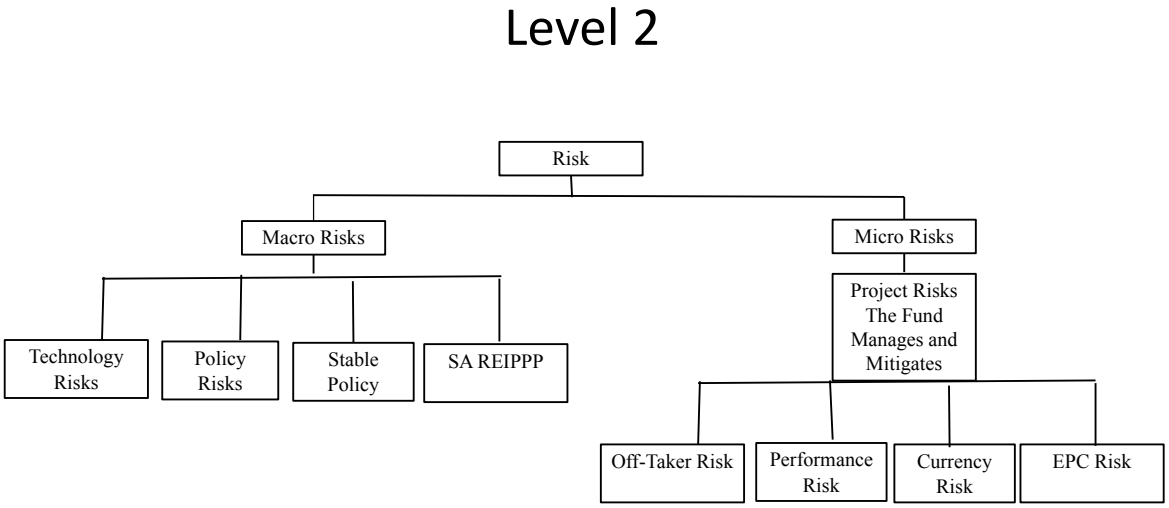


Figure 9: Risk Core Categories and Key Concepts

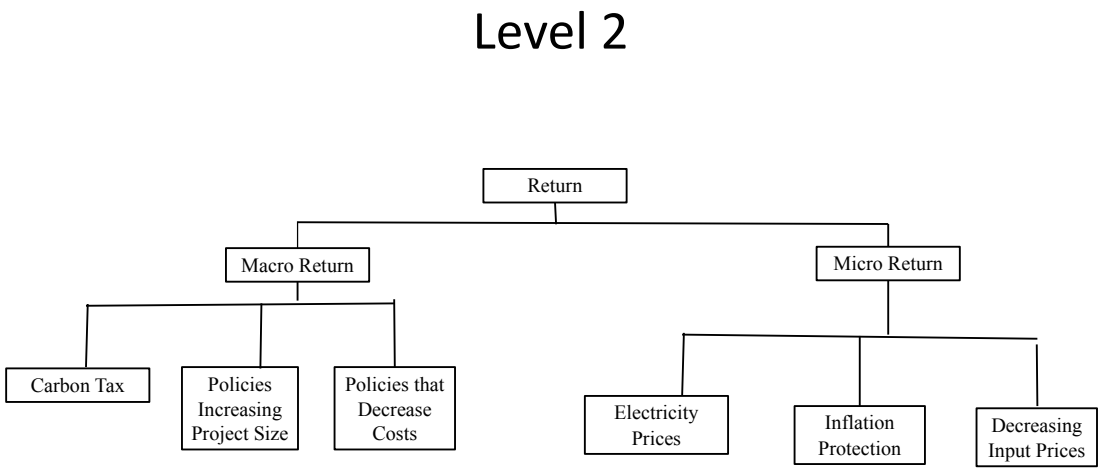


Figure 10: Returns Core Categories and Key Concepts

4.6. Microeconomic Returns Factors

4.6.1. Introduction

Micro project returns, are specific factors of a RE asset assessed by investors that feed into the returns to owners and investors of the project. Factors identified and discussed in this section are decreasing prices of solar, the ability of solar returns to increase with inflation and competition by municipalities, using grounded data from the data collection cycles. This is done in order to gain further insight into microeconomic return factors

4.6.2. Decreasing Prices of PV Solar

From 2009 to 2015, solar panel prices dropped by 70%, as well as successful developments were achieved to become more efficient in energy harnessing (Christina, 2015). These lower costs are a major driver towards an increase in renewable energy's investment potential. A report released by Deutsche Bank in 2014 (Shah, 2014) proposed renewable electricity prices falling by 40% in the next three years, which appears to be roughly on target; reducing by 20% in 2016 alone. Reasons described are economies of scale in production, expansion in the number of rooftop panels installed bringing a reduction in processing and installation costs, reduction in polysilicon costs (the main input into PV panels) and improvement in conversion efficiencies (Parkinson, 2015).

Other drivers are a reduction in inverter prices (the first part of a PV solar system which needs replacement, adds a significant cost to the overall project), which have declined by $5c-$10c on average per year over the last five years(Christina Numez, 2015). New entrants and ongoing price competition also helps keep margins competitive. China is competing to be the main supplier of PV panels(Diner, 2011) which has competitively driven prices of panels down. Installation has also become cheaper as the number of trained technicians and installation efficiency has increased, creating jobs on competitive tenders.

At the UN investor Summit on Climate Risk, Al Gore pointed out that the cost of solar power has been dropping by 10% a year (Gore, 2016) If this trend continues renewable energy will soon be cheaper than fossil fuels. In many countries this is already happening. Worldwide examples include Dubai, where in 2015 a solar project went online offering electricity at a rate of $0.058 per kWh(McCrone *et al*. 2015). This future planning by the Middle East, owners of the largest oil reserves in the world, was a global statement. Other countries such as Morocco, who announced in February 2016 that an offshore wind farm produces electricity at $0.03 per kWh; estimated to be the cheapest clean energy available in the world. (UNEP News Centre, 2016).In

Nevada USA, energy generators are selling solar electricity for $0.03 cents per kWh, a price well below fossil fuel generated electricity. At Renewable Energy Utility in Texas, they are charging low rates during peak times and then giving away free renewable electricity during off-peak hours, as it is costly to turn off the turbines(Chase, 2012). Recently Chile reported free renewable electricity for 113 days and South Australia and Germany have gone over to negative rates for renewable electricity (Al Gore, 2016). These all represent the accumulated tipping point of renewable energy being a more viable source of energy than fossil fuels and thus, in setting up this new paradigm, attracting and unlocking mainstream capital.

4.6.3. Inflation Linked Asset

The project return profile of renewable energy assets can be compared to that of infrastructure projects under the umbrella of real assets because of their capital nature and semi-fixed asset characteristics (Inderst, 2011). This is an important sub class as real assets characteristics are more physical in nature and have less correlation to financial markets. This is referred to as a defensive asset. Defensive assets are not focused on growth appreciation and do not fluctuate with the market. These assets along with financially cyclical assets pair well in a portfolio to reduce risk through diversification (Ferreira, 2011) This potential diversification benefit creates demand and investment into RE.Jean-Pierre du Plessis, a portfolio manager of a R700m renewable energy fund at Prescient Investment Management in Cape Town comments, “It’s very hard to see investors getting stable returns like that (of renewable energy) in other asset classes where there’s a lot of uncertainty and yields are relatively low,”(du Plessis, 2016).The fund is up 14% in 10 months, due to their long dated RE debt linked to inflation.

RE income is not dependent on the the financial market cycle or economy. Electricity is a consumer staple good and therefore demand is relatively stable with predictable seasonal fluctuations in different regions. The electricity price charged- cash payments can be linked to inflation. The benefits of having an inflation linked asset, hedging against unexpected changes in price levels is a very beneficial return profile especially in South Africa with volatile prices.

4.6.4. Municipalities Involvement

Municipalities are protective over their electricity sales as this is their major income producing commodity. Three quarters of South Africa’s 234 municipalities sell electricity (Grant, 2015) Of

the municipalities that sell electricity, it comprises between 20-39% of revenue income, for the majority of municipalities (Grant, 2015). The National Energy Regulator of South Africa (Nersa) sets by how much municipalities are allowed to increase the prices by every year. The last escalation was 12.2% (Muller et al 2011). This affects the returns to solar PV projects as higher escalations means increased revenue from selling solar electricity. While government might understand the benefits of RE IPP's, municipalities are largely not supporting this change. Municipalities are showing reluctance and a lack of cooperation regarding improving policies such as bringing in wheeling policies and feed in tariffs (Euston-Brown, 2014). The change in escalations as well as municipality behaviours affect the project returns.

4.6.5. Conclusion

Under the core category of micro project return factors such as decreasing project input costs, the ability of the asset to be inflation linked and the influence of municipalities was discussed. The key concepts are summarized below, picking out pertinent antecedents, attributes and consequences relevant to the factors within micro project return factors, these will then be used in theory building, Chapter 5.

	Decreasing Prices of Solar	**Inflation Linked Asset**	**Municipalities Involvement**
Antecedents	Several factors such as decreasing costs of panels, increased efficiency and increased installer's experience	Returns come from selling electricity which is a public good and a consumer stable	Municipalities set electricity prices which affect the returns to selling electricity. Municipalities are also protecting their interests
Attributes	Prices of solar assets are coming down and competing against FF	Escalations apply each year to electricity which can be set to increase with inflation	Returns are linked to prices of electricity and municipalities' policies
Consequences	Increasing returns and increased demand for RE assets as becomes cheaper than FF	Cash returns are linked to inflation, a valuable return characteristic	Municipalities' behaviour affects possible project return

Table 5: Micro Return Antecedents, Attributes and Consequences Summary

4.7. Macro Economical Return Drivers

4.7.1. Introduction

Within the core category of macro economical return drivers, driving factors such as carbon taxes and policies that support the development of RE assets are discussed.

Whether it is through taxes or subsidies or both, government needs to assist in helping RE compete with FFE, as energy is considered a public good that empowers communities and improves the standard of living and RE has other national benefits(McGregor, 2011). Incentives are needed when the marginal investments can be pushed over to bankable investment projects that provide sufficient required returns (Van Parys, 2009). Macro return factors assess how a country's policies will drive RE and why some investors may choose to invest into a specific country over another.

4.7.2 Carbon Tax

Government policies that help RE tariffs compete with fossil fuel tariffs can be achieved through a multitude of tax and other incentivizing solutions.

Taxes that help to take into account the negative externalities of fossil fuel production and upkeep of power stations help to level the costs between RE and FFE. South African coal electricity costs do not take into account the full social negative external costs they create; thereby producing coal electricity above an efficient level and under producing renewables below the efficient level. Carbon taxes can be used to internalise the costs of emission damage. Increasing the price of electricity would unfortunately have a negative effect on South Africa's economy as well as poverty eradication.

The Kyoto Protocol enacted in 1997,is an international treaty that commits state members to reduce greenhouse gas emissions, based on the premise that global warming exists and human made $C0_2$ emissions have caused it(Timilsina *et al*, 2012). Since the Kyoto Protocol the number of countries taxing fossil fuels has tripled (McGregor, 2011). Carbon credits or alternatively

carbon taxes have been discussed by politicians and petitions for years. Prior to the 2008 financial crisis they were traded and had gained acceptance in the US. In 2008 and 2009 the world economy fell into financial crises and carbon credits were no longer an area of concern as they were dwarfed by the crises and toppling economies.

In South Africa carbon taxes were again brought into parliamentary conversation. On 20th June 2016, the South African National Treasury published a draft Carbon Offset Regulations (ENS Africa, 2016). This is intended to propel carbon taxing by taking the next step towards bringing the proposed legislation into fruition by early 2017. Treasury intends to submit a second draft of the Carbon Tax Bill in August 2016, to submit the Bill to Parliament. This will have a huge impact on S.A's energy market; with additional costing on fossil fuels, as well as the offsetting benefits of clean energy, this will be a major driver of RE competitiveness. The implementation of carbon credits has been anticipated and planned for by various stakeholders. I have seen this in the role of investment, that investment houses are anticipating the opportunity for increased returns and thereby have increased exposure to RE assets, in anticipation to this change in legislation.

Carbon taxes will drive the price of coal electricity well beyond renewables, and help to unlock the clients who do not qualify because of low tariffs that are hard to compete with. However, in South Africa as well as the rest of the world this is opposed by strong interest groups and the general public due to perceived increased costs.

4.7.3. Policies Increase the RE Project Size

There is often a restraint on the investable solar projects size due to the client's usage, as unused electricity causes inefficiencies and reduces returns. Some buildings such as warehouses or schools have large roofs but the tenants inhabiting the buildings do not have high energy usage or have seasonal usage such as schools who close over school holidays. During these holidays the electricity produced by a solar system would not be used. Warehouse buildings may have large flat roofs, perfect for solar panels but the tenant's usage demand does not match, therefore the system will be downscaled below what is possible. In other words, roofs conducive to solar projects are restrained through smaller size projects in order to not over produce electricity- to not overproduce renewable energy because of the lack of ability of private producers to resale electricity.

To solve this restraint municipalities, need to support and implement net metering or wheeling. Net metering is when a producer can feed excess electricity into the grid and receive payment for this from the municipality (Winkler, 2005). In cases where this does happen, all users usually still need to be net users. This is enforced in order for municipalities to ultimately protect their revenue stream of selling electricity.

Municipalities that offer net metering are naturally the most conducive municipalities to solar PV investments. Municipalities offering net metering; include, for example, the Drakenstein Municipality (Paarl, Wellington area) and we therefore would seek out projects and be much more likely to accept them due to increased returns and lower constraints. The City of Cape Town Municipality is not as conducive, currently they are offering R0.59 kWh (City of Cape Town, 2016) as a feed in tariff (FIT); while the typical fixed rate tariff is at R1,2925 kWh (City of Cape Town, 2016). This offers a reduced return of 45% on excess electricity produced, this alone will not cover costs and we would typically reduce the size of the installed system to reduce excess energy production.

Another benefit government can and does use to incentivise private energy production is referred to as wheeling. Wheeling is when energy producers can utilise Eskom's installed infrastructure to sell on produced electricity directly to a counterparty (as opposed to back into the general grid) by paying a low rate fee to Eskom for the use of this infrastructure. This is beneficial for numerous reasons, firstly the producer can set a PPA with specific terms and at a tariff of their deciding, as well as choose a counterparty that has 'opposite' energy demands to the first energy user. Therefore, it will use all the energy produced by the grid, and obtain maximum financial benefits. The wheeling process provides exclusive licensing and is only awarded scarcely. For example, Nelson Mandela Bay has a wheeling license and this makes projects in this municipality much more desirable(Winkler, 2005).

Municipalities that allow net metering (feed into the grid at a one for one rate) provide large incentives. As an investor developing renewable energy assets, this is a very enticing factor. To get optimal returns from your PV system you want all energy that is produced to be used by the client. This therefore deletes the restraint of finding projects that have aligned energy usage in proportion to their rooftop space, as well as energy consumption that follows in line with energy production from sunlight (peak mid-day).

4.7.4. Policies that Decrease the Upfront Cost

Financial incentives through taxes can also be used to effectively bring down the cost of a system. These tax incentives differ across countries and include but are not limited to, investment tax credits, investment allowances, accelerated depreciation, tax holidays and deductions for R&D spending (McGregor, 2011).

Investment allowances are when the investor can make tax deductible investments into renewable energy investments. Accelerated depreciation allows the owners of the system to depreciate the entire system in year 1-3, therefore creating a tax advantage.

Tax holidays are when the project is exempt from tax for a stated number of years. This benefit does not depend on the amount invested, as with other percentage based credits, namely tax credits, production based credits and accelerated depreciation(Timilsina *et al*, 2012). Therefore, tax holidays can be used to support smaller projects.

In some cases, incentivising policies may result in unintended consequences or inefficiencies, such as examples discovered through rigorous research by the World Bank Group on the Investment Climate into Renewable Energy (Van Parys, 2009). Flaws they found were: tax exemption for renewable energy investments is designed to facilitate inflows into renewable energy, however large pension funds are usually tax exempt, therefore project funders may seek out equity investors by selling this benefit. Even though relatively speaking, this is the most expensive form of funding.

4.7.5. Conclusion

The key category of macro-economic return discussed driving factors such as different policies and the potential of governments using carbon tax to balance the 'electricity playing field'. These factors are summarized in the table below by identifying key antecedents, attributes and consequences to focus in on core issues to this category and use them in Chapter 5's theory building.

	Carbon Tax	**Policies that Increase the Size of Assets**	**Policies that Decrease the Costs**

Antecedents	Fossil fuel energy production emits harmful GHG's (negative externality) Therefore FF is overproduced and RE under produced	RE projects are confined to the Off-takers' usage and roof space because of prohibiting rules against electricity resale by private producers	Electricity is a public good and government recognises it as a solution to energy shortages and economic development
Attributes	Carbon taxes are a tool to internalize the negative externalities of FFs	Wheeling power or feed-in tariffs are tools to decrease these limitations	Government can use incentives to increase investment into RE through tax breaks and subsidies
Consequences	Carbon taxes therefore need to be implemented, also increasing returns to RE	Municipalities and Nersa need to change policies to help RE investment increase	Subsidies and tax breaks increase returns to RE assets, increasing investment

Table 6: Macro Return Antecedents, Attributes and Consequences Summary

4.8. Renewable Energy Project Specific Risks

4.8.1. Introduction

Project risks are discussed in this section most of the content is drawn from practical insight gathered from my role as a RE asset analyst. The funds activities are therefore referred to as 'we'. The risks discussed are what we as a RE fund have to assess and try to manage or mitigate as far as possible. Performance, default risk, currency risk, force majeure and operation and maintenance risks are all discussed in order to provide insights into antecedences, attributes and consequences of this core category.

4.8.2. The Risks the Fund Manages and Mitigates

Performance risk is that the asset will not perform as expected. This could result from incorrect designs, incorrect installations or outside factors that are not accounted for by the engineer. We manage performance risk of the asset by having a third party engineer approve the design of the system as well as sign off that the system was constructed according to design. We also link compensation of the designing engineers to be based on performance of the system through minimum performance ratios. This is not directly linked to electricity produced as this is a factor

of the weather risk – which we do not mitigate beyond taking past weather into account in design phase as these variations tend to average out.

Operation and Maintenance contracts (O&M contracts) are put into place at initiation and specifications of fixing broken panels within certain service level agreements (SLAs) as well as cleaning schedules are set. Cleaning the panels is important, especially in areas with dusty roads or areas near the sea as sediment and salt will collect on the panels and decrease the electricity produced or solar yield. The O&M contracts are also linked to performance and SLAs. These contracts all help to mitigate performance risk.

Once of the biggest risks we have as owners of PV solar system assets is default risk. This is that the off taker of electricity will enjoy the benefits of the system but does not or cannot make the monthly payment required. PPA agreements are usually either a 'take or pay' agreement or a 'take and pay' agreement. The take or pay comprises a small fixed monthly payment, which helps the funder cover their fixed costs as well as a payment in respect of the energy delivered and used by the off taker. The take and pay agreement, stipulates all energy delivered must be paid for by the off taker. This is often done in wind and solar agreements, where energy is expensive to store.

We therefore mitigate default risk through pre-screening clients and doing credit checks. Expected longevity and financial strength is taken into account through assessing potential clients financial statements and performing due diligence on site. One of the biggest dilemmas we face is that companies with strong financial health could possibly pay for the system themselves, while companies that not only do not wish to own the system themselves but cannot own it, will most likely not be financially strong off-takers. There is a struggle to balance these two factors in order to find suitable solar projects.

Default risk is partially offset because PV systems are removable assets we could and would go and remove them from the site. This however would result in large financial losses due to the initial set up costs such as installation, design and legal costs. The assets also drop in value being second hand and in some cases specific to site.

One of the biggest misconceptions with renewable energy that we have to explain to clients who are fed up with Eskom's load shedding is that when there is load shedding, the system also needs

to be turned off as there are strict regulations regarding this. The reason being, technicians may work on the power lines with the knowledge that they are not electrically live. The system will only be allowed to remain live if the entire system is off the grid. Therefore, what some believe is a driver to RE (power cuts) is actually a restrained that needs to be taken into account as when there is a power cut we cannot sell electricity, bringing down project returns.

Currency risk is also a risk involved, when the engineers do the analysis and provide the system specifications and costs, it is in some cases months before the system is purchased and installed. These panels are generally imported and quoted in US dollars. Therefore the exchange rate affects the cost of the system over time. Panels are only ordered once the client has signed and the project is going ahead as panels are specific to a project and expensive to store. Contracts may be settled and signed with clients months after the initial costing, and the price of the system may have risen due to a change in the exchange rate and therefore margins decrease. This needs to be mitigated through having a 30 day option over the equipment. Some manufacturers offer this in order to be more competitive.

Other project risks are Force Majeure as well as man-made damage. The panels are easily cracked and need cleaning and maintenance monthly as well as daily monitoring. They can withstand hail but, depending on the engineering quality and conditions, they are installed for, they may be compromised. For example, some PV solar modules are mounted on racks to be in direct sunlight and may even follow the sun's rays to achieve a higher yield capacity. These racks can create wind resistance through a greater surface area, resisting wind force. This creates pressure on the modules to either crack or in extreme cases, be blown off the roof. Other risks taken into account are protestors or acts of crime. Solar panels are an array of solar modules and if one is out none of them work, much like Christmas tree lights. Therefore, insurance and site security needs to be taken into account.

Reducing risk relating to RE investments can also be done through the private sector. Third party insurers that reduce risks, make the project a lot more attractive. For example, the US Overseas Private Investment Corporation (OPIC) who provides US investors with financing, guarantees, political risk insurance and support for private equity investment fund, help mobilise private capital (Norges Bank, 2015).There is opportunity for specific insurance products to develop for effective and comprehensive insurance on solar projects and other renewable energy technology in order to reduce risks and facilitate inflow of investments.

4.8.3 Conclusion

The Microeconomic or project specific risks were discussed in a combined context with mitigation and management procedures. The antecedents, attributes and consequences are again summarized in the table below.

	Asset Performance Risk	**Default Risk**	**Force Majeure and Acts of Crime**
Antecedent	There is a risk that the asset will not perform as expected	There is a risk that the off taker will not or cannot pay for the electricity	There are risks that the panels will be damaged due to weather or acts of crime
Attribute	This will increase the risk and decrease the return	Panels will need to be collected and legal action will increase costs and decrease returns.	This will destroy the value of the asset or electricity production
Consequences	This can be mitigated through engineering performance ratios	Off takers financial position needs to be assessed and seen as good loan party	Insurance needs to be taken out. There are innovative insurance products emerging

Table 7: Micro Risk Antecedents, Attributes and Consequences Summary

4.9. Macro-Economic Risks

4.9.1. Introduction

The macro-economic or environmental risks relate to the risks of investing into solar PV which change from country to country. In some cases, the micro and macro risks are so intertwined and relate to both cases. The factors contained with macro-economic risks are assessed in order to provide insight and possible ways to decrease risks. Technology risks and risks relating to policies with a mention on South Africa's REIPP Program are discussed.

4.8.2. Technology Risks

The technology involved in the RE sector is fairly young, which translates into lower past cumulative funding of research & development. This results in lower technical skills and a lack of expertise on a country level. This lack of countries expertise feeds into increased risk and

lower funding available which circles back to lower cumulative funding into RE. This therefore becomes a harder and slower process to get projects off the ground, as business development and market education is needed. A country's specific technology risk depends on the domestic markets technology stage reached as well as its global market technology experience and stage (Beck & Martinot, 2004).The relatively infant state of renewables in SA leads to higher risk in project success projections or perceived risk. Technology risk forms a large part of South African specific macro risk, due to projects using technology which has not been repeatedly tested and implemented; producing known results and performance (Krupa & Burch, 2011). To manage this technology risk, diffusion is needed and information sharing helps to mitigate risk as global market technology has advanced especially among developed markets and lessons and skills learnt through this progression can be studied and leveraged by developing nations.

4.9.3. Policy Risk

Other non-economic barriers are regulatory and policy uncertainty, which can be an outcome of bad policy design, discontinuity and insufficient policy transparency. Institutional and administrative barriers can be managed by supporting institutions, through offering help and assistance in applying for the required permits and documentation as well as simplifying and streamlining the process. An example of this was in Netherlands, where government commissioned a service team to support administration between the public and private parties(Muller et al, 2011). Market barriers increase the risk of RE through inconsistent pricing structures and varying incentives offered over time. Market power of a monopoly, as seen in South Africa through Eskom's monopoly power also increases risk as the producer can easily be driven out of the market. Governmental policies which do help to drive and improve the financial numbers and economics may also change over the lifetime of the project. A change to an unfavourable policy could squash the project economics. An example of this was in Spain, where there was a reduction in feed in tariffs (FIT) in 2010(Bloomberg New Energy, 2016) and in 2012 FIT was cancelled completely, negatively impacting investors.

4.9.4. Stable Policies

While the actual policies do have a big part to play, the predictability of policies plays an important role in reducing risks to investors. This was cited as a major risk to many investors as

a reason for not wanting to invest. (Beck & Martinot, 2004; Dick, 2016; Johnstone et al 2010; Moodley, 2016)Government needs to commit to stable policies and predictable policies for investors to trust and enter into the market. Topics such as carbon taxes or REIPPP programmes need to be discussed and set out as publicly available and transparent information. There should be follow through with claims, to build reputation and trust between the public and private sectors. As the investor is often required to make twenty year or more capital commitments into countries. Especially in cases of emerging countries, where government is often seen as more volatile with regards to actions and policies, government needs to commit to keeping agreements and policies with regards to renewables stable and consistent, including transitioning through differing ruling parties(Bergmann, at al. 2008).Insurance products have also emerged to help mitigate or "de risk" investments in greenfield investments. Guarantees as well as innovative insurance products help to align investors. Political risk insurance is important for emerging and developing markets. A case for building trust between SA government and investors is the REIPP Program, largely seen as a success different lessons were learnt and included in the section below.

4.9.5. South African REIPPP

The South African government committed R192 billion (Energy Intelligence, 2016)to the energy and procurement sector through the REIPP Program (Renewable Energy Independent Power Procurement Program) an auction for independent power producers to provide electricity to government as the off-taker in response to South Africa's need for increased energy producing capacity. Since REIPPP was announced, 92 projects which produce roughly 6 328MW have been awarded contracts. Private financial institutions funded R91 billion, or 47%, foreign investors contributed R53 billion (Energy Intelligence, 2016). R32 billion was invested by the state and R54 billion invested by Development Bank of South Africa and the Government Employees' Pension Fund proving that private investments towards RE assets are indeed being unlocked. According to McClelland (McClelland, 2016) the R196 billion secured since 2011, will attract another R550 billion by 2020.

In less than three years, South Africa has signed up more investments from independent power producers than has been procured over the entire African continent in twenty years (Eberhard et al., 2014). With 64 successful projects, this has involved more than 100 stakeholders and formed many agreements and a large amount of skills formation around renewable energy procurement,

a momentum that will hopefully not disseminate but feed into the teams and skills being used for private investment renewable energy projects.

Energy sector investments are long-term in nature (roughly twenty years for PV solar systems) and therefore projects undertaken today lock in capital for decades into the future. The REIPPP brought RE onto the map for private investors through effectively government backed bonds, transparent commitment, drawing foreign investments and increasing expertise and skills of the country all contributing to lowering the risks and lower costs (Cairns Patrick, 2015) of investing into RE in S.A.

The REIPPP projects are, however, not open to private individual investors. According to Rentia van Tonder, head of renewable energy power at Standard Bank, the only investors able to get into this investment space are banks, pension funds and asset managers. With no opportunity for individuals to get 'a piece of the action'(Cairns Patrick, 2015).

Renewable energy projects in South Africa are some of the biggest projects available to invest into, offering equity and debt stakes. Mike Goldblatt, a fund manager at Metier has invested into a 12% equity stake of the R11 billion, 100MW solar project with the off-taker of Anglo Americans Sishen Iron Ore. Goldblatt comments in an interview with Fin24, "Renewable energy is going to dwarf vanilla private equity options, because of its capital intensive nature" (McClelland, 2016). Hesees the capital intensive nature of renewables as a positive, drawing investors and mainstream capital in as a vital part of renewables taking off.

The Small IPP Program (SMIPPPP) aims to fund 400MW of electrify procurement, with the objective to facilitate in SME participation in the procurement programme. This is important as the entire procurement programme has an emphasis on economic development. SMIPPPP projects have a maximum capacity of 1-5MWs with 4 bid submission windows. Senior analyst at Mergence, Peta Chennels says the SMIPPPP is an important part of the overall REIPPP, as it facilitates in boosting small businesses and is important in involving them in the renewable energy plan (Moodley, 2016).

It is evident that investors and financiers are willing to invest into renewable energy when the procurement process is well designed and transparent (Eberhard *et al*. 2014). Lead financiers and investors are needed to adequately feed-back to government issues and negotiate outstanding factors, communicate between stakeholders and negotiate with the private sector. The government buy-in is encouraging to investors as policies will hopefully remain stable. These

large scale projects attract more than double the funding as the original projects are leveraged. This also encourages and develops the needed expertise to the renewables sector, more specifically to South Africa. These teams that are assembled to complete projects do not necessarily disseminate after project completion, but may continue to seek out private opportunities. Private investors may not be able to participate directly in REIPPP, however they may choose fund managers who have been awarded REIPPP projects or they may seek to get into the SMIPPPP arena.

4.9.6. Conclusion

The macro-economic and environmental concept was discussed with considerations on key factors identified within: technology risk, policy risk and a short case study on the government REIPPP were all assessed. These sections' key concepts with regards to the antecedents, attributes and consequences are summarized in the table below again to be brought into chapter 5.

	Technology Risk	**Policy Risks**	**Stable Policies**	**SA REIPPP**
Antecedents	Track record of the technology and countries expertise effects risk	RE has high exposure to policies and regulations due to the public nature of electricity	Policies can change at government enforcement and different ruling parties	SA government recognised the need for increased electricity capacity and the opportunity for Foreign investment
Attributes	Cumulative development and investment drives further development and investment	High exposure to policy and the probability of unfavourable policies increase RE risks	The rate of change of policies and the uncertainty involved increases the perceived risk	Key reasons given for the success of REIPP: Transparency, commitment and un-corrupt procedures and treasury backing
Consequences	Low experience can be turned around	Favourable policies and transparent, stable policies decrease risks	Policies need to be stabilized through commitment periods	Government can be successful in increasing investment to RE

Table 8: Macro Risk Antecedents, Attributes and Consequences Summary

4.9.7Chapter Conclusion

This chapter started with well-known metrics of risk and return. These were then broken down into macro and micro risk and returns and the concept of solar PV projects restructured as a RE asset was introduced. In Level 2 these core concepts were further zoomed into, to assess specific macro and micro risk and return factors within investing into RE assets.

Key take-always were that RE as an asset is very closely tied to municipality and government policies as electricity is a public good. Examples of this exposure in risk is linked to policies changing unfavourably and the rate of change of policies. Return is linked to the price of electricity (set by Nersa), electricity price increases, policies that enable power producers to resale electricity and tax incentives that help increase returns. Carbon tax was discussed as a tool to internalize the negative externality of GHG emissions from FF produced electricity and possibly increase the return profiles of RE assets. The South African REIPP Programme was discussed as a case study for governments interventions and success through transparent, treasury backed and incorrupt procedures. There is also a reinforcing loop of cumulative experience and track records decreasing risk and therefore further increasing cumulative investments. These insights gained with regards to antecedents, attributes and consequences identified at the end of each category discussion will be used to build a CLD theory in Chapter 5.

5.Chapter 5: Theory Building

5.1. Introduction

Archetypes are introduced and applied in Chapter 5in order to develop a Causal Loop Diagram which aids in visualizing how different variables in a system are integrated. This is done through building onto the insights and theoretical sensitivity gained in Chapter 4 of the core categories' antecedents, attributes and consequences as well as using theory on CLD generic archetypes. This chapter will define the key concepts to be applied in the theory building, describe the steps to be followed and an application of the process to achieve an outcome of a CLD specific to the concern variable in order to answer the research question.

5.2.Key concepts underlying the Analogical Reasoning Process

The design of analogical reasoning is discussed by Tsoukas (1991) in *A Transformational view of Metaphors in Organizational Science by H. Tsoukas* (Tsoukas, 1991) and a diagram is cited from his paper that graphically represents the process that is conducted.

Metaphors and analogical reasoning assist in the process below of constructing a scientific model with insights into the ability of RE assets to attract private capital.

A defining characteristic of analogical reasoning described by Tsoukas (Tsoukas, 1991) is the transfer of an expansionary structure from the source structure (the known domain), where the researcher is more familiar with to the target structure (the studied domain), where there is less familiarity but the researcher wishes to gain insight. Like metaphors, similes involve the transfer of information from the source domain to the target domain (Tsoukas, 1991). Similes are a much more direct comparison between the target and source domain than metaphors. Analogies help to operationalize metaphors and similes by focusing on the relationships between variables. Analogies are only useful if the analogy can be used to describe both parties that the analogy is used to provide insight into the target domain.

As Keeley argues metaphors, similes and analogies do not simply describe an external reality; they help to constitute that reality and prescribe how it ought to be viewed and evaluated" (Keeley 1980). Literal language manifested in scientific theories attempts to re-describe the world in order

to formulate and establish identities. I make use of comparative language below to transition understanding from known insight to the studied subject.

5.3. The Theory Building Process

The process set out below is adapted from Tsoukas (1991) his paper on metaphors in organisational science.

The theory modelling process is set out below in the steps represented in Figure 9.

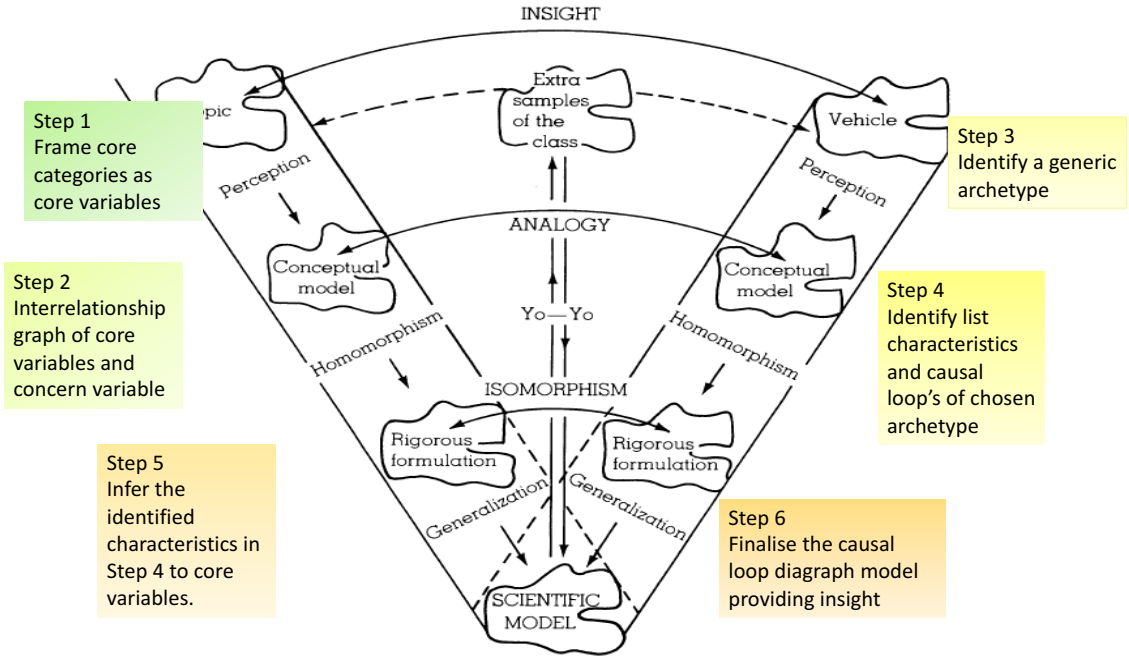


Figure 11: The Process in Building a Scientific Model .Adapted from H. Tsoukas 1991 *The Missing Link: A Transformational View of Metaphors in Organization Science*

Step 1: begins by using the core categories refined in the empirical results chapter and discussed further in Level 2 of the literature review, using these core categories as well as the insight gained through the literature review on applicable antecedents, attributes and consequences, I will frame them as variables.

Step 2: Uses the core variables identified to map out a interrelationship diagraph to assess and explain the relationship between core variables.

Step 3: selects an appropriate archetype from insights gained from Wolstenholme on generic archetypes and Braun's flowchart (given below in Figure 10) in order to identify the process in selecting an archetype by starting with the concern variable.

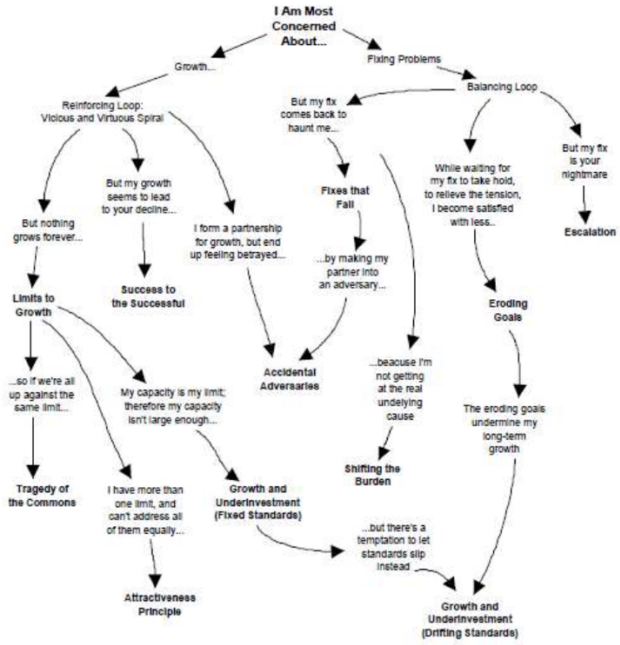


Figure 12: Braun's (2002) Flowchart for Selecting Systems Archetypes

Step 4: Once the archetype is identified, the characteristics and causal loop diagrams are presented and discussed in order to gain insight into the chosen system.

Step 5: With the characteristics of the chosen archetype identified and causal loop diagraph presented. I will infer insights gained from the research into the causal loop diagram structure.

Step6: Discusses insights and new findings from presenting research in a structured causal loop diagraph, through developing a causal loop diagraph that speaks to the concern variable.

5.4. The Theory Building Process in Application

5.4.1. Step 1: Framing the Core Categories as Variables.

Through following GT process four core categories emerged and were refined through Chapter 3 and 4 relating to the concern variable. The core categories identified and discussed were: macro environmental risks relating to RE assets, the micro project specific risks relating to a RE project

investment. The returns driven by macro environmental factors that the asset exists in and the micro project specific return drivers.

A concept analysis was performed for each variable and antecedents, attributes and consequences were discussed in the literature review. From this sensitivity gained in the literature review two defining characteristics were selected from each core category to frame as a variable for additional insight. These attributes are framed as variables in order to be able to increase and decrease due to forces. Table 10 below, summarises these findings.

Core Category	**Attribute Selected**	**Framed as Variable**
Macro Risks	Rate of change of policy	Rate of change of policy or incentive
Micro Risks	Asset performance	Forecasted risk
Macro Returns	Policies that increase the size of the project, decreasing of-taker restrain	Suitability of solar projects
Micro Returns	Returns are linked to inflation	Required returns
Macro Risks	Favourable macro policies	Returns delivered
Micro Risks	Insurance and contracts help to mitigate developers risk, increasing supply	Level of supply of RE assets
Macro Returns	Technology risk decreases and causes an increasing force in further projects developed	Time delay in developing assets given changes in system

Table 9: Framing Core Categories as Variables

5.4.2. Step Two: Interrelationship Graph of Variables.

The interrelationship diagraph is illustrated below. Using the variables selected from the core categories. The direct relationships are mapped only, and indirect relationships are not taken into account to remain specific and avoid double counting. This interrelationship diagram was formed by assessing which factors drive other factors (depicted by an inflow arrow) and which are driven by other factors (outflow arrow), this is represented graphically in Figure 13.

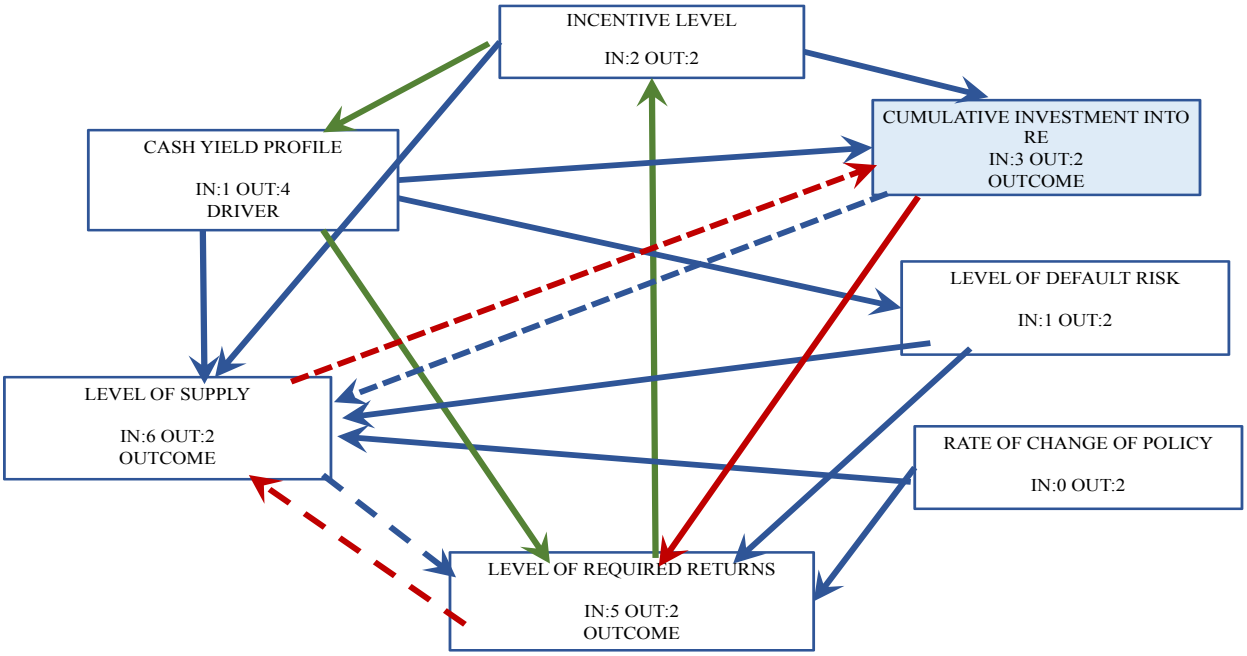


Figure 13: Interrelationship Diagram of Variables

The key outcomes from the relationship diagraph is the cumulative amount invested into RE which is the concern variable and the level of supply of RE assets. The level of supply has two direct interrelationships with the required returns and the cumulative amount invested into RE. Supply is both restrained and drives investment, as investors can only invest if there is investment choices and supply to invest into.

A loop forms, as an increase in the level of supply will increase the cumulative amount invested into RE. The level of supply in the market will decrease illiquidity risk and therefore decrease the required return. A reduced required return will mean more projects make the accepted level of risk return and there will be a greater level of accepted projects supplied to investment vehicles within the market.

Another loop identified is between the cash flow profile, the incentive level and the required returns. The cash flow profile of the project specifies the profile of returns in relation to the time

profile and time value of money as well the certainty of which they will be paid. Incentives can as discussed be an upfront incentive that reduces the capital required or a tax deduction which will increase the cash flow profile and reduce the required return level through higher cash flow yield certainty due to government policy regarding tax deductions. The correct archetype now needs to be selected to model the interlinking factors.

5.4.3. Selecting an Archetype

System archetypes are patterns of behaviours of a system. Systems expressed by circles of causality therefore can be transferred to similar structures. Identifying the system at play enables the researcher to find the correct leverage to efficiently change the system.

E. Wolstenholme (2004) suggests that there are two ways to change an organization's achievement: through actions to attempt to control the organisation by using balancing feedback loops or actions taken to improve achievement through reinforcing feedback loops. He develops and proposes system archetypes that can be condensed into 4 generic problem / solution archetypes named underachievement, out of control, relative achievement and relative control.

Braun (2002) addresses how to specifically select the archetype that is present in the organization's or system's research. With the tools taken from Wolstenholme (2004) and Braun (2002) one can identify the relevant archetype as well as the structural aspects.

My concern variable is increasing investments into RE assets. Therefore I am concerned with increasing a variable. From Braun's flow chart, I have highlighted the path I find most relevant to my concern variable.

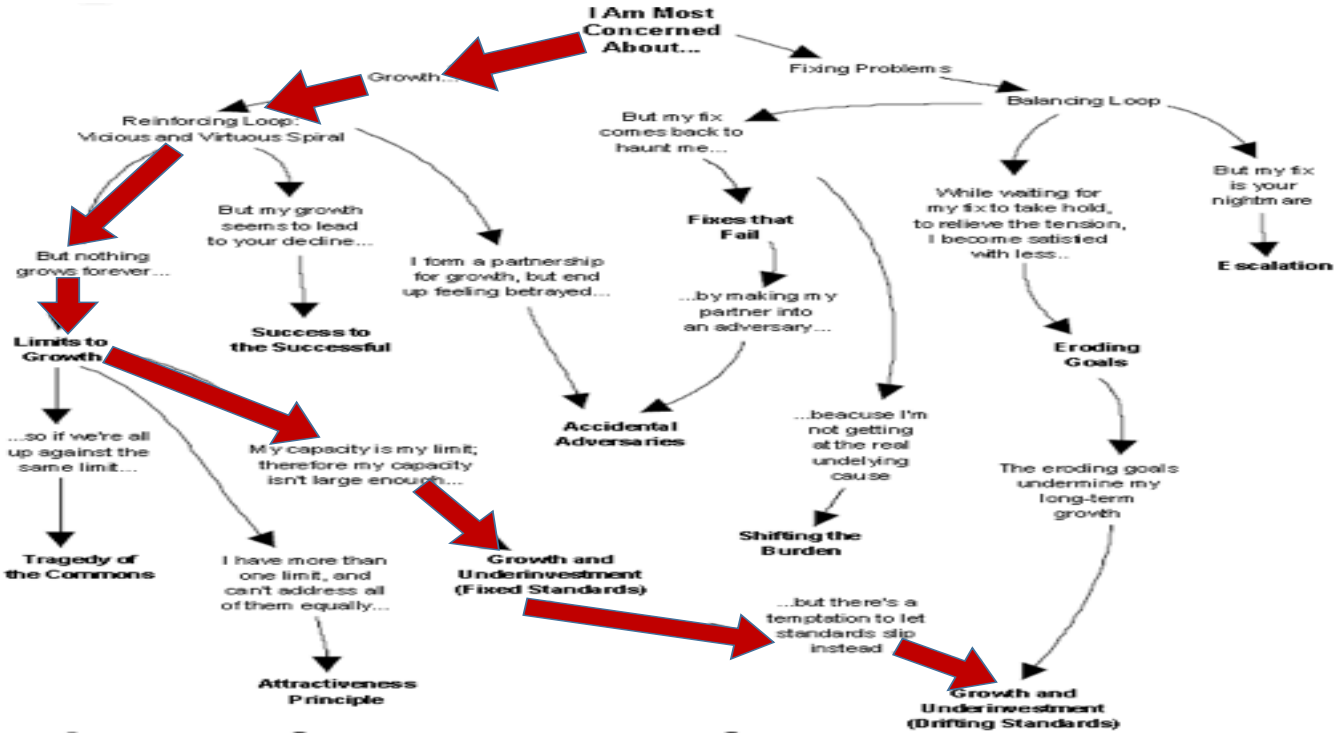


Figure 14: Braun's (2002) Flowchart for Selecting Systems Archetypes, Adapted

Using Wolstenholme's four generic archetypes, my concern variable falls under Underachievement- underachievement of mainstream investments into renewable energy along with Growth and Underinvestment.

5.4.4. Assessing Characteristics of the Identified Archetype

Using Wolsteholme's archetypes, the underachievement archetype was selected due to the concern of underachievement of investment into renewable energy assets.

The problem archetype consists of reinforcing loop which accelerates the given trend of a process . The reinforcing loop pushes the system in the same direction as its inputs. Ascending input will bring about an ascending growth. The balancing loop is also known as a stabilizing feedback. The balancing process intends to reduce the gap between the existing state and the target state. The balancing force adjusts the present state to a desirable state regardless if the input trend is ascending or descending.

In other words, the reinforcing loop may be the organization intending to achieve a successful outcome (A) from an initiative in one sector. The reaction from another sector (B), for example a resource constraint, causes a delayed underachievement of the intended outcome (A) over time(Eric F Wolstenholme & Corben, 1993).

According to Braun's flowchart Growth and Underinvestment was the system archetype identified.

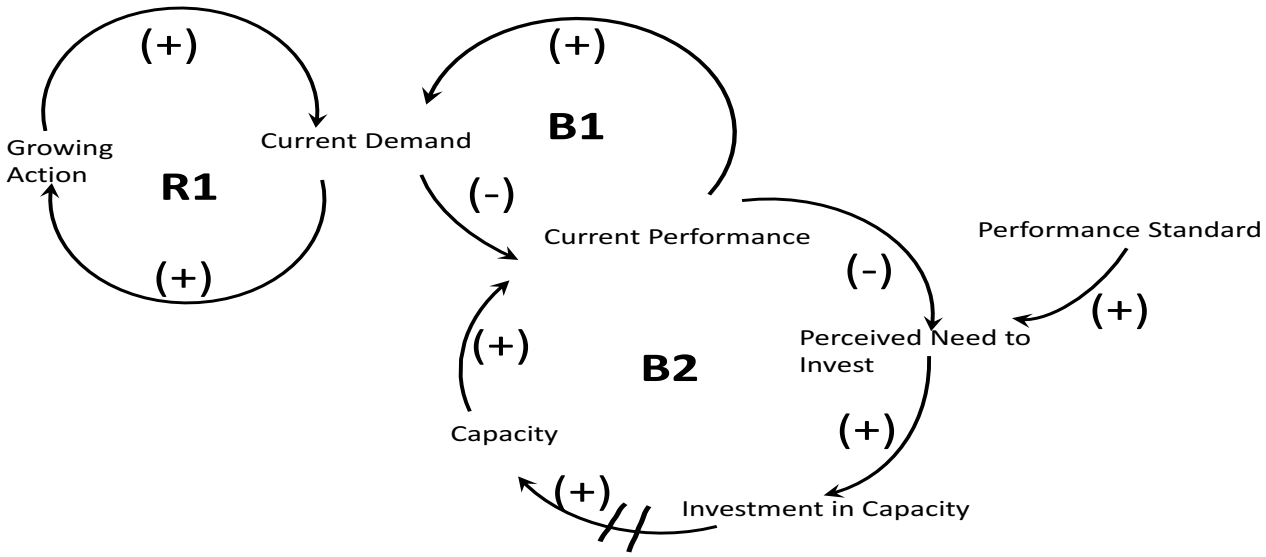


Figure 15: Growth and Underinvestment Archetype

This archetype is made up of one reinforcing loop, R1 with two interconnected balancing loops, B1 and B2. Initially there is a growing action which initiates growth and which in turn positively loops back to an increase in growth in this structure, this is the reinforcing loop. As nothing grows forever, sooner or later there is a limit to growth or growth inhibitor, this is the first balancing loop, B1. As growth moves in the desired direction, it also drives the growth inhibitor. This growth inhibitor interacts with a defined standard which results in a perceived need to decrease the growth inhibitor through an inhibitor avoidance action, loop B2. The actual effects of the inhibitor avoidance action on the growth inhibitor variable does take time and there is therefore a time delay factor. The two balancing loops move in different time delays, the growth inhibitor works in a shorter time frame and reduces growth. The reduced growth adds less to the growth inhibitor thus reducing perceived need for action.

The perceived need for action is reduced by the system's action. By the time the growth inhibitor avoidance action is identified and carried out, the need for the action has reduced. Therefore the best action in this system is foresight and planning. The implications of growth and therefore actions to decrease inhibitors to growth need to ultimately be identified before they are at play (Gene, 2004).

5.4.5. Inferring the Known Structural Archetype Aspects

Transferring elements from the growth and underinvestment model towards corresponding elements from interrelationship diagraph is shown and explained below. Figure 15 identifies the generic elements in the Underinvestment CLD.

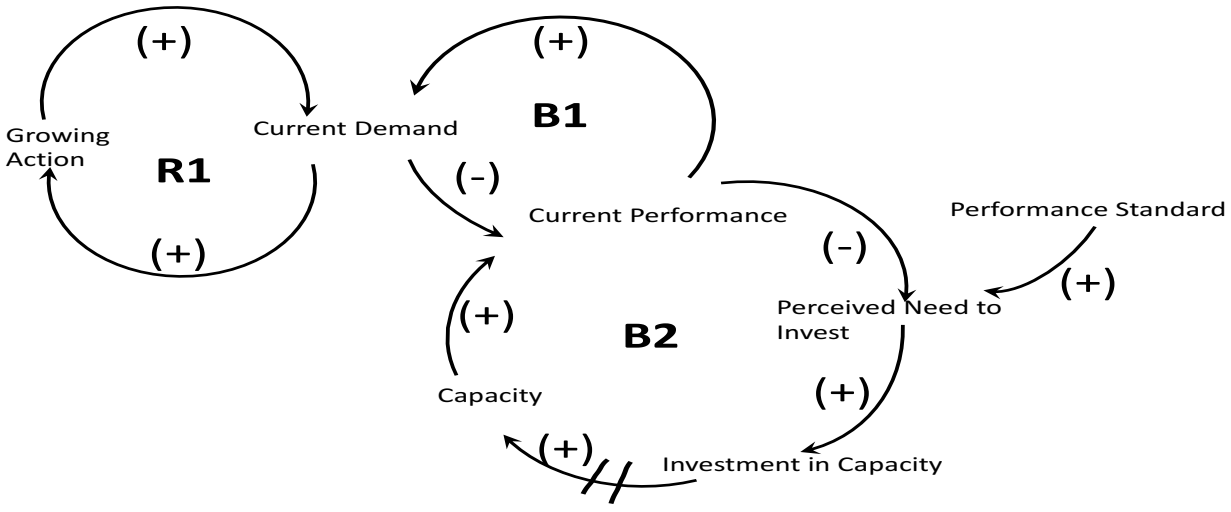


Figure 16: Generic Elements in Underinvestment CLD

Generic elements are depicted and tabled below. These elements were assessed and understood in context to their impact in and relationship to the other elements in the CLD. Similar relationships and loops were identified through the interrelationship diagraph of attributes framed as variables in Figure 12, this along with the background and deeper understanding gained through the literature review, variables were matched with elements of the CLD through similar

drivers and behaviours to the generic elements. Below are the generic elements matched with the corresponding variables. This is not a perfect match in causation and behaviour but the relational loops all remain.

Element from growth and underinvestment archetype	**Corresponding variable from the RE interrelationship diagraph**
Growing Action	Suitability of solar projects
Current Demand	Decrease in required returns
Current Performance	Current cumulative amount invested into RE assets
Perceived need to invest	Forecasted Risk
Performance Standard	Rate of change of policy or incentive
Investment in Capacity	Returns delivered
Capacity	Supply of RE assets
Time delay	Time delay in developing assets given changes in system

Table 10: Transforming Elements from the Growth and Underinvestment Archetype into Elements of Investment into Renewable Energy Assets

These corresponding variables have been inserted into the Underinvestment CLD to create a CLD relative to the concern variable of underinvestment in solar RE assets.

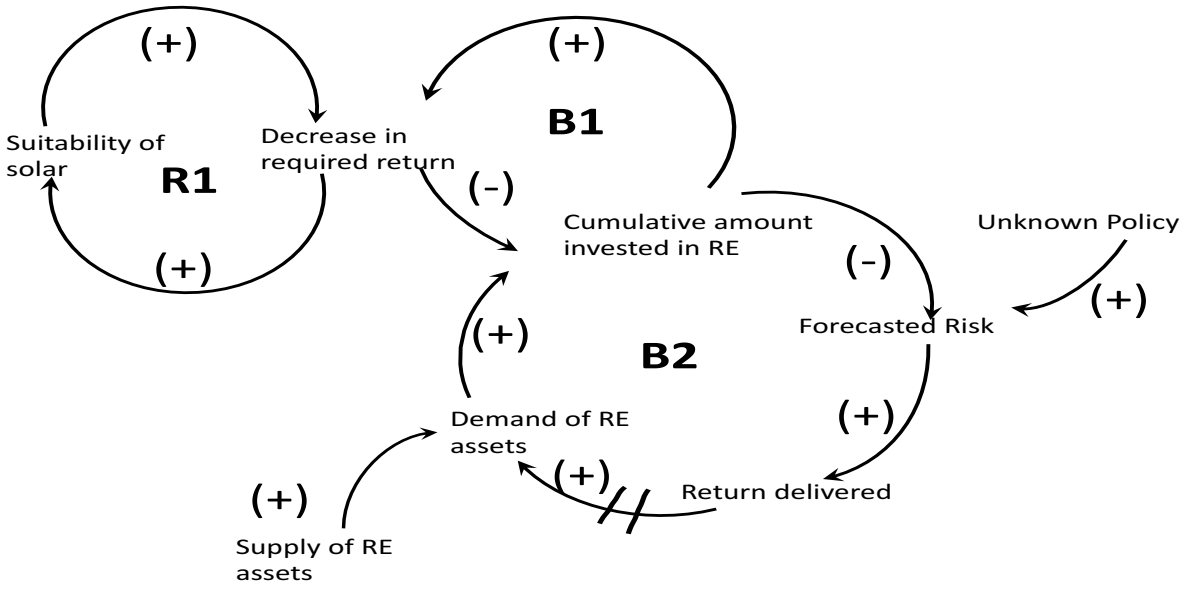


Figure 17: Causal Loop Diagram on Investment into RE Assets

5.5. Conclusion

In this chapter we discussed how analogies and metaphors can be used to build insight into a target domain of study. Variables from Chapter 4's literature review and insights into core categories' antecedents, attributes and consequences were used to form variables. These variables were used to build an interrelationship diagram and already relationships between the variables, drivers and outcomes formed.

Archetypes are used in this study to help explain the forces in an environment and Braun's generic archetype of Growth and Underinvestment was selected as the most pertinent archetype to the concern variable being studied; attracting more investment towards RE assets. The variables were then connected to generic terms of the growth and underinvestment archetype through similar behaviour traits, what resulted was a CLD specific to the concern variable and build through insights from the attributes of the core categories. The CLD is a theory that will help to explain the RE investment landscape. In Chapter 6 this CLD formed will be assessed, insights explained and a leveraging factor proposed as a solution to close the RE investment gap.

Chapter 6: Discussion of Model and Conclusion

6.1. Introduction

This Chapter will discuss and build on insights to the CLD formed in Chapter 5. A leveraging factor will be identified as a variable to be used to decrease the underinvestment gap. Finally, validity of the CLD and factor will be assessed to build credibility and discipline to the research.

6.2. Discussion of the Model

Reinforcing Loop -R1

As the level of required return decreases, in other words as there is a lower level of required return, more projects are suitable for investment as the required return has decreased and therefore more projects meet the requirements. As more projects are accepted and meet the suitability it decreases the risk and therefore further decreases the required return. This is a reinforcing loop.

First Balancing Loop- B1

As required returns decrease and therefore provided returns on projects decrease this decreases the amount of cumulative investments into RE as some investors will not see the returns provided as attractive enough. The decreasing effect on total cumulative investments will increase the required return therefore balancing out required return.

Second Balancing Loop-B2

An increase in the cumulative amount of investments into renewable energy assets leads to a decrease in perceived or forecasted risk as the more investors who have committed, the less inherent risk is perceived. Risk is affected largely but not exclusively by policy with regards to possible policy changes bringing about uncertainty in cash flows. Lower risk translates into steadier and less uncertain cash flows/ return profiles of assets. An increase in returns delivered and lower risk leads to an increase in the demand for solar PV assets and developers of these assets need to increase the supply of these assets to the market for accessible investment into RE assets. The transition for the market to take up/ buy into these assets and signal that a greater

supply is needed has a time delay lag. Development of these assets to increase supply to market also takes time and is subject to time delays. Renewable energy assets usually come in the form of large scale energy projects and are therefore lumpy and sensitive to time delays and long term development cycles. As supply of assets increase this leads to an increase in cumulative investment into RE assets.

6.3. Leveraging the Model

From the insight and understanding added from this model as well as the new knowledge gained from the literature review; these have been used to assess a leveraging factor that would have a positive change on the CLD. The leveraging factor that emerged to have the strongest impact in this model and positively affect closing the underinvestment gap is an increase in policy stability. Policy incentives would be an obvious beneficial factor to increase the suitability of solar power but in order to make government policy recommendations taking into account government's position would be necessary to avoid a one-sided recommendation which is beyond the scope of this research paper.

Stable governmental policies at a national or municipal level would have a material effect on reducing risk and future uncertainty. Both favourable policies and unfavourable policies (negative changes in policy, due to municipalities guarding their income streams from selling electricity) both create uncertainty with RE investing and perceived risk. Without supporting policies renewable energy is still on the rise and investments into RE will increase regardless of a lack of supportive policies. However stable policies- both with regards to supportive and negatively impactful is key to reduced uncertainty and therefore investors making large moves in the industry as discussed in 4.9.3 Policy Risks and 4.9.4 Stable Policies of the literature review. There is a distrust and unrest between Eskom, South African government and investors. An example cited in literature was the incident in Spain in 2012, where unfavourable policies were imposed, wiping out investor's project returns.

Policy risk is a big risk consideration and uncertainties regarding this un-mitigatable risk factor is one of the most discussed and feared in the industry. I have been to two conferences on Renewable Energy where the bulk of the discussion centred onmaking assumptions and predictions on future policy. Even for the off taker or person entering into a PPA the concern is

with changes in policy - for example, the potential of Eskom and municipality to a set higher percentage based on connection fee instead of electricity usage. This would render solar PV systems virtually useless in savings / earning revenue if the system was still grid tied. Nersa has indicated a change in future policies but slow implementation has increased speculation and perceived risk.

If Nersa works with municipalities to propose set policies that take into account different municipalities' needs and sets these out transparently for investors this would align parties and understanding between stakeholders. Nersa, along with municipalities and project developers, needs to work out a solution to different agendas. Perhaps municipalities need to be included into the financial benefits that arise from favourable policies which makes them pro-renewable energy and solar PV projects, as at the end of the day it also includes risks and rewards to municipalities. Investors could then weigh up net returns versus risk (that does not involve policies) and make an informed, confident decision.

Known policies along with the decreasing risk, increasing returns and therefore increasing demand, would also help project developers to forecast demand and develop projects (supply) before the market demand rises. This would decrease the time delay represented in B2. With a decrease in time delay, cumulative amount invested into RE would rise.

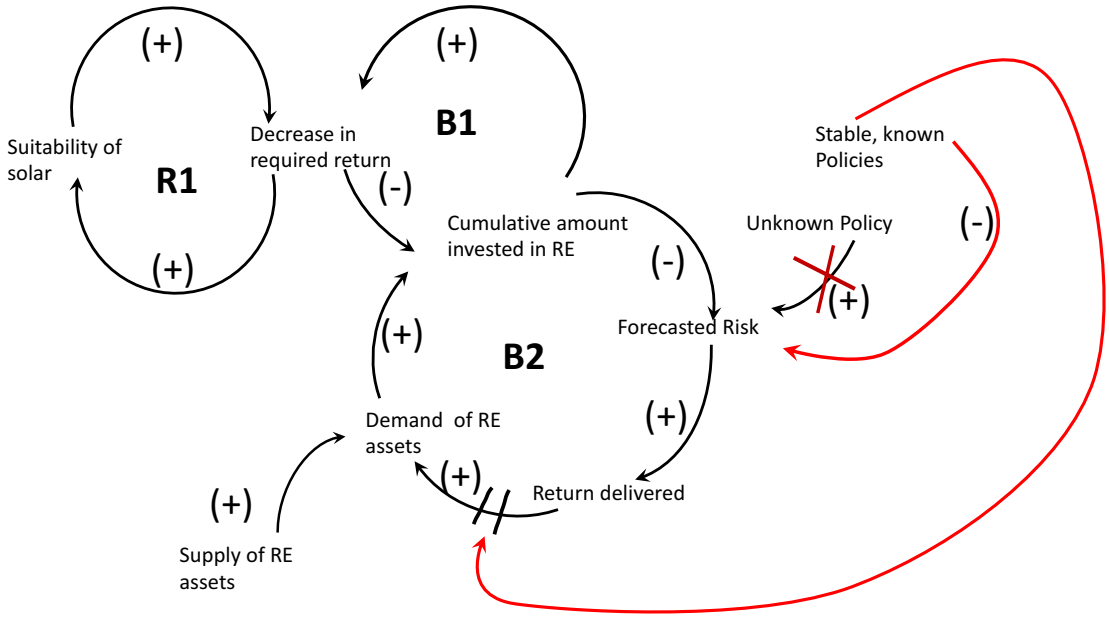


Figure 18: Causal Loop Diagram on Investment into RE Assets with Leveraging Factor

Nersa and solar PV project developers need to work with municipalities to create stable policies achieving this through possibly including municipalities in the financial benefits of policies supportive to solar energy production so that their revenue is not compromised and all parties agendas are aligned.

6.4. Grounded Theory Evaluation Criteria

In order to assess whether the CLD and proposed leverage is adequately representative of literature and is practically insightful, the model is compared to Maxwell's Grounded Theory criteria (Maxwell, 2009) and adoptions from Tom Ryan's supervision notes (Ryan, 2016).

6.4.1. Fit

With regard to Maxwell's GT criteria, the CLD developed adequately describes the RE investment landscape and therefore fits the facts of the context, situation.

While the model does not incorporate all the factors, it does highlight relevant and insightful attributes. Through research, general consensus in meetings and interviews as well as literature; people are concerned that municipalities will retaliate to the uptake of renewable energy and IPPs and force Nersa's regulations to impose additional tariffs on connection to the grid. With the uncertainty in South Africa regarding Eskom's next moves and potential policy changes there is increased perceived risk bringing on reluctance to invest. If government and policy makers would commit to transparent and stable policies, this would reduce risk and facilitate in a stable investment environment. This was seen partially through the REIPP Program -transparent, uncorrupted procedures and government commitment were reasons cited in literature for REIPPP being a success in increasing cumulative investments into RE projects.

6.4.2 Understandable

With regards to Maxwell's Understand-ability criteria, I do think the CLD model is understandable, and describes part of the problem the concern variable is trying to resolve. The CLD describes the behaviours of the concern variable and limitations as well as causes for underinvestment. The leverage factor if implemented will assist in directly affecting the concern variable of closing the underinvestment gap.

6.4.3. Generality

In assessing the generality of the theory and CLD developed, I believe a lot of risk, especially in developing countries is due to uncertainties regarding governmental policy changes, especially under different governments elected. If there could be a regulation body similar to Nersa that assess a country's needs, budget and specific factors and make recommendations that if accepted are set for a guaranteed period of time; would result in a decrease in perceived risk and increase in foreign investment into many developing countries which could extend to for example, infrastructure and water programs.

6.4.4. Control

Against Maxwell's GT criteria of control and workability, I believe the leveraging factor of stable policies is workable; it could be implemented in varying degrees of commitment i.e. within this range for 5 years- rolling. This would already have a huge positive impact and signal greater stability and commitment from government. How this will impact the CV in other ways outside of the market I have not studied. This I am aware is a downfall of this theory as if negative impacts arise, and policy is set, how this will influence the market a range of movement may need to be assessed.

6.5. Research Paper Conclusion

Renewable energy as an asset class has the ability and profile to attract mainstream investment capital, specifically suited to pension funds due to its high cash yield, long term and low risks. Much of the risk inherent in the renewable energy space is due to close reliability on governmental policies and different interest groups such as municipalities pushing their own agenda. The market is aware that government has and can change policies, possibly decreasing returns to long term invested projects. Through the CLD constructed in Chapter 5, a leveraging factor emerged that being the regulator's commitment to stable policies. Stable policies and a commitment with regards to favourable polices towards renewable energy production and re-selling will reduce actual and perceived risk of investments into renewable energy projects. The result being increased financing and investments in renewable energy, closing the underinvestment gap that exists between projects requiring funding and projects receiving funding or projects that meet the return expectations given the lower risk.

In order to achieve stable policies, they need to be beneficial to all interest groups especially municipalities who are also able to push or oppose beneficial tariff structures towards RE PV solar projects. A possible solution to achieve stable, favourable policies is to include all stakeholders in the risk-reward assessment.

6.6. Further Research

Further research is necessary to assess how to stabilise governmental policies and Nersa regulations on energy production and the sale thereof. An outcome needed is to build a solution and assess the leveraging factors between RE investor's project returns and providing incentives or including municipalities to be part of the solution towards favourable tariffs as opposed to being seen as the problem through apposing RE production.

6.7. Research Ethics

This research was conducted ethically as no group or individual was harmed or discriminated against. Research was done through the researcher's participation in the field of renewable energy analysis and meetings were with consenting adults.

Bibliography

Arfsten, M. (2013). *Venture selection and decision factors influencing risk and return for angel investing. Doctoral Dissertation*. Argosy University.

Badi, S., & Pryke, S. (2016). Assessing the impact of risk allocation on sustainable energy innovation (SEI) The case of private finance. *Managing Projects in Business*, *9*(2), 259–281. http://doi.org/10.1108/IJMPB-10-2015-0103

Beck, F., & Martinot, E. (2004). Renewable Energy Policies and Barriers. *Encyclopedia of Energy*. http://doi.org/10.1016/j.enpol.2004.08.032

Bent, N., Williams, K., & Gilbert, E. (2004). The syndication of private equity investments in South Africa. *South African Journal of Business Management*, *35*(4), 39–48.

Bergmann, A., Colombo, S., & Hanley, N. (2008). Rural versus urban preferences for renewable energy developments. *Ecological Economics*, *65*(3), 616–625. http://doi.org/10.1016/j.ecolecon.2007.08.011

Bloomberg New Energy Finance, & UNEP. (2015). Global Trends in Renewable Energy Investment 2015, 85.

Branker, K., Pathak, M. J. M., & Pearce, J. M. (2011). A review of solar photovoltaic levelized cost of electricity. *Renewable and Sustainable Energy Reviews*, *15*(9), 4470–4482. http://doi.org/10.1016/j.rser.2011.07.104

Brown, M. (2001). Market failures and barriers as a basis for clean energy policy. *Energy Policy*.

Cairns Patrick. (2015). Can you get in on the renewable energy boom? *Moneyweb*.

Charmaz, B. K., Belgrave, L. L., Gubrium, J. F., Holstein, J. A., Marvasti, A. B., & Mckinney, K. D. (2014). Qualitative Interviewing and Grounded Theory Analysis. *The SAGE Handbook of Interview Research*, 347–366.

Chase, J. (2012). *Breakthroughs in solar power - it's not just about technology any more*.

Cherry, T. (2014). *Toward a new climate agreement : conflict, resolution and governance*. *Routlege Advances in Climate Change Research*.

Christina Numez. (2015). *Solar Energy Sees Eye-Popping Price Drops*. *National geographic*. Retrieved from http://news.nationalgeographic.com/energy/2015/10/151002-solar-energy-sees-eye-popping-price-drops/

City of Cape Town. (2016). Utility Services - Electricity Services (Consumptive), (July), 47–49. Retrieved from https://www.capetown.gov.za/en/electricity/Elec tariffs 201415/Schedule of Consumptive Tariffs.pdf

Clyde, P., & Karnani, A. (2015). Improving Private Sector Impact on Poverty Alleviation:, *57*(2), 20–36.

Contents, T. O. (1960). International Finance Corporation. *International Organization*, *14*(4), 661. http://doi.org/10.1017/S0020818300010365

Daim, T., Harell, G., & Hogaboam, L. (2012). Forecasting renewable energy production in the US. *Internatonal Journa of Energy Sector Management*, *7*(1), 84–112. http://doi.org/10.1108/14636681211239764

Dg, S. R., Eltantawy, A. B., Member, S., & Salama, M. M. A. (2014). *Management Scheme for Increasing the Connectivity* (Vol. 5).

Dick, W. (2016). Renergen pens deal for offtake from SA's first helium reserve. Retrieved July 5, 2016, from http://www.mineweb.com/news/oil-gas/renergen-pens-deal-offtake-sas-

first-helium-reserve/)
Diner, F. (2011). The analysis on photovoltaic electricity generation status, potential and policies of the leading countries in solar energy. *Renewable and Sustainable Energy Reviews*, *15*(1), 713–720. http://doi.org/10.1016/j.rser.2010.09.026
Eberhard, A., Kolker, J., & Leigland, J. (2014). South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons. *PPIAF, Washington DC, USA*, (May), 1–56. Retrieved from http://www.ee.co.za/article/south-africas-reippp-programme-success-factors-lessons.html
Euston-Brown, M. (2014). Local Government Energy Full Strategy Efficiency and Document Renewable Energy. *Sustainable Energy Africa*, *11*(6), 1275–1287.
Fernandes, B., Cunha, J., & Ferreira, P. (2011). The use of real options approach in energy sector investments. *Renewable and Sustainable Energy Reviews*, *15*(9), 4491–4497. http://doi.org/10.1016/j.rser.2011.07.102
Gene, B. (2004). Growth and Underinvestment. Retrieved from isbn-13: 978-0415643795
Glaser, B. (1995). *Grounded Theory*.
Grant, L. (2015). How electricity powers the revenue of municipalities. *Mail &Gardian*.
Gregory F, Jenner. Edward, E. A. S. (2015). Understanding the Yieldco Structure for Renewable Energy Project Finance. *Renewable Energy World.com*, *11*(9), 1–67. Retrieved from http://www.renewableenergyworld.com/articles/print/volume-18/issue-3/features/finance/understanding-the-yieldco-structure-for-renewable-energy-project-finance.html
Hall, D. C. (2013). Geoeconomic time and global warming : renewable energy and conservation policy. *International Journal of Scial Economica*, *23*(4/5/6), 64–87. http://doi.org/10.1108/03068299610121723
Hartigh, W. den. (2011). South Africa becoming a renewable energy hub. *Media Club South Africa*. Retrieved from http://www.mediaclubsouthafrica.com/economy/2634-renewable-energy
Henderson, J. M., & Quandt, R. E. (1980). *Microeconomic Theory*.
Holton, G. A., & Knight, F. (2004). Defining Risk. *Financial Analytics Journal*, *60*(6), 218–219.
Hunt, T. (2014). 5 Different Ways to Invest in Renewable Energy. *Green Tech Media*.
Hyland, K. (2001). Humble servants of the discipline ? Self-mention in research articles, *20*, 207–226.
Hyland, K. (2002). Authority and invisibility : authorial identity in academic writing. *Journal of Pragmatics*, *34*, 1091–1112.
Intelligence, E. (2016). REIPPP: All you need to know. *Energy Intelligence*, *3*(1), 230–256.
Johnson,Brian; Christensen, L. (2008). *Educational Reseach: Quantitative, Qualitative and Mixed approaches*. *Sage Publications*.
Johnstone, I., & Popp, D. (2010). Renewable energy policies and technological innovation: Evidence based on patent counts. *Environmental and Resource Economics*, *45*(1), 133–155. http://doi.org/10.1007/s10640-009-9309-1
Ka, E. (2017). Modelling support policies and renewable energy sources deployment in the Hungarian district heating sector. *Energy& Enviroment*, *28*(1–2), 70–87. http://doi.org/10.1177/0958305X16685473
Karmali, A. (2015). Can the World Run on Renewable Energy? *University of Pensylvania*. Retrieved from http://knowledge.wharton.upenn.edu/article/can-the-world-run-on-renewable-energy/
Kaye, L. (2013). Samsung Continues Global Renewable Energy Investment with Solar in

Canada. Retrieved March 23, 2016, from http://www.triplepundit.com/2013/07/samsung-solar-canada/
Krupa, J., & Burch, S. (2011). A new energy future for South Africa: The political ecology of South African renewable energy. *Energy Policy*, *39*(10), 6254–6261. http://doi.org/10.1016/j.enpol.2011.07.024
Lehtovaara, M., & Tuunanen, J. (2012). *Commercializing Emerging Renewable Energy : A Case Study Regular Paper* (Vol. 4). http://doi.org/10.5772/54707
Lozanova, S. (2016). Largest Corporate Purchaser of Renewable Energy. Retrieved from http://www.triplepundit.com/2016/03/google-became-worlds-largest-corporate-purchaser-renewable-energy/
Malterud, K. (2001). Qualitative research: Standards, challenges, and guidelines. *Lancet*, *358*(9280), 483–488. http://doi.org/10.1016/S0140-6736(01)05627-6
Manoukian, A., & Odabashian, V. (2015). A proposed framework for renewable energy technology commercialization and partnership synergy A case study approach. *American Jornal of Business*, *30*(2), 147–174. http://doi.org/10.1108/AJB-08-2014-0052
Martinot, E. (2002). Renewable Energy Markets in Developing Countries. *Annual Review of Energy and the Environment*, *27*(1), 309–348. http://doi.org/10.1146/annurev.energy.27.122001.083444
Maxwell, J. A. (2008). Designing a Qualitative Study. *The SAGE Handbook of Applied Social Research Methods*, 214–253. http://doi.org/10.1111/1467-9299.00177
McClelland, C. (2016). Investing in renewable energy brightens returns in SA. *Fin24*. Retrieved from http://www.fin24.com/Economy/investing-in-renewable-energy-brightens-returns-in-sa-20160601
McCrone, A., Moslener, U., Usher, E., Grüning, C., & Sonntag-O'Brien, V. (2015). Global Trends in Renewable Energy Investment 2015. *Global Trends Reports*, 85.
McGilligan, C., de Wilde, P., & Goodhew, S. (2008). An assessment of the potential returns of energy certificates for the UK household sector. *Journal of Financial Management of Property Ad Construction*, *13*(3), 187–199. http://doi.org/10.1108/13664380810913421
McGregor, N. (2011). Providing Incentives for Investments in Renewable Energy. *Investment Climate*. Retrieved from https://www.wbginvestmentclimate.org/advisory-services/private-participation/infrastructure/upload/Policy-Note-Green-Incentives.pdf
Mezher, T., Tabbara, S., & Hosany, N. (2010). An overview of CSR in the renewable energy sector Examples from the Masdar Initiative in Abu Dhabi. *Management of Enviromental Quality; An International Journal*, *21*(6), 744–760. http://doi.org/10.1108/14777831011077619
Moodley, N. (2016). Renewable energy projects are the latest trend in the world of responsible investing. We put our nose to the ground to find out who is investing where.
Muller, Simon: Brown, Adam: Olz, S. (2011). Policy Conciderations.
Norges Bank. (2015). *Renewable Energy Investments; Discussion notes*. *Norges Bank Investment Managers*.
Oliva, L., & Sobra, C. M. (2014). Risks and strategies in a Brazilian innovation – flexfuel technology. *Maufactoring Technology Management*, *17*(1), 25–40. http://doi.org/10.1108/JMTM-11-2012-0105
Owen, A. (2006). Renewable energy: Ecternality costs as market barrier. *Energy Policy*.
Papazu, I. (2016). Management through hope : an ethnography of Denmark ' s Renewable Energy Island. *Journal of Organizational Ethnography*, *5*(5), 184–200. http://doi.org/10.1108/JOE-11-2015-0025

Pegels, A. (2010). Renewable energy in South Africa: Potentials, barriers and options for support. *Energy Policy*, *38*(9), 4945–4954. http://doi.org/10.1016/j.enpol.2010.03.077
Plessis, J. (2016). *Pension Funds Looking For New Energy and Infrastructure Investment Options*.
Popp, D. (2006). The effects of backstop technology R&D on climate policy models. *Energy Economics*.
Schensul, V. L. A. (1999). *Field Work Studies: Non-Impact Social Studies*.
Sebitosi, A. B., & Pillay, P. (2008). Renewable energy and the environment in South Africa: A way forward. *Energy Policy*, *36*(9), 3312–3316. http://doi.org/10.1016/j.enpol.2008.05.013
Silverstone, B. (1988). Macroeconomic Theory and Stabilisation Policy. *The Economic Journal*, *98*(393), 1209. http://doi.org/10.2307/2233732
The First Person in Academic Writing. (1918). *Duke Writing Studio*, (70).
Tier, J. (2016). U.S. Renewable Energy Growth Accelerates. *Worldwatch Institute*.
Timilsina, G. R., Kurdgelashvili, L., & Narbel, P. A. (2012). Solar energy: Markets, economics and policies. *Renewable and Sustainable Energy Reviews*, *16*(1), 449–465. http://doi.org/10.1016/j.rser.2011.08.009
UNEP & BNEF. (2016). Global Trends in Renewable Energy, 84.
UNEP News Centre. (2016). Renewable Energy Investments: Major Milestones Reached, New World Record Set. *UNEP*.
Van Parys, J. and S. (2009). Incentives and Investments—Evidence and Policy Implications. *World Bank Group, Investment Climate, Washington, D.C*.
Webb, C. (1992). The use of the first person in academic writing: objectivity, language and gatekeeping. *Journal of Advanced Nursing*, *17*(6), 1–3. http://doi.org/10.1111/j.1365
Winkler, H. (2005). Renewable energy policy in South Africa: Policy options for renewable electricity. *Energy Policy*, *33*(1), 27–38. http://doi.org/10.1016/S0301-4215(03)00195-2
Wolstenholme, E. F. (2003). Towards the definition and use of a core set of archetypal structures in system dynamics. *System Dynamics Review*, *19*(1), 7–26. http://doi.org/10.1002/sdr.259
Wolstenholme, E. F., & Corben, D. A. (1993). Towards a Core Set of Archetypal Structures in System Dynamics. *Proceedings of the 1993 International System Dynamics Conference*, (1988), 583.
Zindler, E., Wolstenholme, E. F., Corben, D. A., Winkler, H., Vishal Shah, Tsoukas, H., … Rodríguez-Pozo, F. (2015). Global Trends in Renewable Energy Investment 2015. *Renewable and Sustainable Energy Reviews*, *15*(1), 85. http://doi.org/10.1016/j.rser.2011.07.102

Annexure

Annexure: A
Proposition table

Data (observations, description passage)	Relevance (to concern variable)	Impact (on Concern Variable)	Proposition Subject-relevance Predicate- Impact
venture capital and private equity funds , pubic markets, asset finance, mergers and acquisition in renewable sectors.	There are many instruments to invest into RE.	Drive investments into sector up	I want to narrow down and focus specifically on VC/ PE
2015 produced a new record for global investment in renewable energy. The amount of money committed to renewables excluding large hydro-electric projects **rose 5% to $285.9 billion**, exceeding the previous record of $278.5 billion achieved in 2011.	There is increasing investments into sector, and information available into numbers and trends	Driver Up	Give a good background into the RE field and trends.
Venture capital and private equity investment in renewable energy increased by 34% to $3.4 billion in 2015, the second successive year of growth.	Investments into this sector is increasing and figures are available	Driver up	What are the returns, mostly discussing the increase in investments.
Funding for the **solar sector rose to its highest** level for seven years thanks to a number of substantial deals involving US residential PV firms.	Solar sector, rising up	driver	Can discuss not only investment instrument but type of renewable.
Investment in **early-stage venture capital jumped 60%,** albeit from a very low base. There was a more modest, 28% uptick in the amount of late-stage venture capital, while private equity made solid gains of 32%.	Increase into RE VC/PE	Driving up	Looking at instrument and increased investment.
RE is a different asset class which is often **not in an investment mandate** allocation	RE sector is not considered but could be part of 5% real asset allocation	Restrained	Need to look at allocation of funds toward "real assets" or alternative allocation
sharp **falls in oil, coal and gas prices that protected the competitive** position of fossil fuel generation.	General reasons for not investing into RE	Restrained	Looking at reasons in market for restrains to RE
Prices of PV solar panels has decreased drastically due to China manufacturing them	Cost to install PV solar panels decreased	driver	Input prices increase competitiveness
So far, the drivers of investment in renewable, including **climate change policies and improving cost-competitiveness**, have been more than sufficient to enable renewable to keep growing their share of world electricity generation at the expense of carbon-emitting sources.	General driers into market for RE	driver	Lists drivers in market for RE as sector
There is a lot of increasing **vestment into 'clean energy' by government or Organizations but not on an investment competitive scale**.	Looks more like asset financing investments into RE projects	Driver	However, restrained into VC/PE investment projects but is causing traction and knowledge into sector.
So far**, PBW (a $200 mil EFT tracking 57 green energy firms**) hasn't lived up to its promise and the fund	Narrowing down into return as opposed to just investment. Certain shares of EFT	restrained	Perhaps investments into projects have increased,

has managed to lose around 8% a year since its inception in 2005. That's versus a 7% gain for the S&P 500.	baskets of solar projects have not done well.		however market share prices on EFT have decreased
Commercial investment scale is in the trillions and RE is only a drop in the ocean however it does not need to compete in scale, only returns/ risk	There are many, many investors who would never consider RE sector	Driver down	However the right risk/ reward will bring the money- what is the capacity of the market
Basket portfolios of RE projects such as Power shares windmill (PBW 75% loss) TAN solar fun (70% loss) have not done well after initial IPO hype.	Returns on specific EFT have decreased	restrained	Perhaps financial market on a commercial level is not that ready. Why did price drop?
Broadreach Capital has structured XXXX as a Venture Capital Company in terms of section 12J of the Income Tax Act, with a view to specializing in commercial- and industrial-scale ("C&I") solar power generation	Narrowing down into specific case study and attempt to make returns	driver	Can look into a project and focus on inherent risk and return of fund not just industry in general.
We believe the Harbour Energy section 12J fund ("Harbour Energy S12J Solar Fund") can **address the material funding shortfall that currently exists in the C&I market, which results in viable commercial solar projects not being constructed due to high upfront capital** expenditure and lower than desired project and equity returns for roof top owners	The model of upfront capital into rooftop, solar in a commercial and industrial setting.	Driver	Case study into the inner workings of fund. As it is pioneering. Retainers and drivers on a fund specific level.
Returns to investors in the Harbour Energy **S12J Solar Fund are forecast to be between 18% and 25% per project on an ungeared basis.** Factors that affect these returns include the fundamentals of the projects acquired, the speed of the project rollout and the marginal tax rate of the investor concerned	First allure to actual returns of a fund. With generous returns forecasted	Driver up	If these returns can be achieved it will be in competition to commercial investments.
Given the **predictable cash flows and low risk profile of the underlying assets**, this is a highly attractive risk–reward proposition	Looking at risk/ return to commercial, SA investments. The risk of known technology may not be as high as other stat up VC/PE funds.	Driver up	Will need a competing risk/ return in SA context. Perhaps JALSH or other VC/PE funds.
The portfolio of projects being constructed carries **a forecast blended, after-tax project IRR of 15.39%.**	Level of tax is going to be a big factor. As by different tax sections play a key role into making this investment competitive.	Driver up	Tax sections are SA or country specific.
Power supply has become unreliable and power prices have increased rapidly in recent years – and will continue to increase ahead of inflation	Unreliability of Eskom and electricity prices increasing paints picture of increasing demand.	Driver up	SA specific electricity context
To date the focus in the renewable energy sector has been on the **large-scale REIPPP program – but the same factors that make South Africa ideal for utility-scale Solar PV make it ideal** for commercial and industrial rooftop projects	Sa REIPPP program to be off taker in renewable energy projects has increased knowledge and demand in RE	Drives up	REIPPP forms part of SA background into RE sector and government is putting money into RE

Eskom and the municipalities continue to investigate the **purchase of power from commercial independent power producers** and this has now been put in place in many municipalities	This increases money flow into promising RE projects as have off take agreements and back into the grid purchases.	Drives up	Power purchase "back into grid' potential CF flows
Carbon taxes are imminent with legislation expected in early 2017	Carbon taxes could shift commercialization and investments in RE may mean decreased taxes.	Driver up	Carbon taxes could create a pull from commercial industry.
Section **12J of the ITA allows a full deduction against taxable income of an investment into a renewable energy focused12J** Company as long as the 12J regulations are complied with	A lot of tax regulations to increase financial investment in RE	Drive Up	Tax free deductibles help returns compete with commercial
Section 12B of the ITA provides an accelerated capital allowance for solar generation plant brought into use by a taxpayer for the first time	New RE projects as tax brackets	Drive up	May need close look at all applicable tax breaks
RE is clearly a tiny part of total investments	I can find many sources into why RE has not succeeded so far	Drive down	But as focus is if RE has a chance not focusing on drivers down
The sector is dominated by Eskom, a state-owned enterprise. Eskom not only produces almost all of South African electricity (95 per cent), but also owns and operates the national transmission system. Only about 2 per cent of South African electricity is produced by private companies.	Renewable energy investment is still relatively low	Down	Low basis overall
SA electricity sector faces 3 problems- undersupply, underfunding, high emissions.	These three problems can be solved by RE	Driver up- not directly affecting investments	Green focus does not have big impact on investment amount
It will not therefore be due to a lack of coal that an energy shift takes place	Cheap coal is a “problem” towards uptake of RE	Driver down	RE is therefore relatively more expensive
The two main energy providers, Eskom (electricity) and Sasol (fuel),	Main power players and political pushers	down	Policy changes are slower
Having its roots in the apartheid period, when independence from external energy supplies was a political necessity, energy research has cantered on fossil fuel technologies.	Past effects future uptake of RE- path dependent	down	Our past RR and tech has been focused on FF
There are two main technologies for producing electricity from solar radiation: concentrating solar power (CSP), also known as solar thermal energy, and solar photovoltaics’’ (PV). CSP	Focus on solar PV	None	Focus on solar PV even though referring to RE sector
The total area of high radiation in South Africa amounts to approximately 194,000 km2, including the Northern Cape, one of the best solar resource areas in the world	South Africa is RE resource abundant	Driver up	S.A is therefore a ‘perfect’ nation for RE
A mere 1.25 % area of high radiation could thus meet projected South African electricity demand in 2025 (80 GW). This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres.	RE could well solve S.A problem of electricity shortage	Driver Up	Therefore this topic is relevant and important

GEEREF invests public and private sector risk capital in specialist renewable energy and energy efficiency private equity funds developing small and medium-sized projects in emerging markets	There are many firms and investments available to RE investors	Driver Up	Market uptake increases future market uptake
renewable energy investing in developing economies is driven by three principal factors: 1) population and economic growth; 2) energy demand growth; and 3) a growing share of clean power in the energy mix	There are macro-economic factors that drive investments into renewable energy	Driver up	Macro factors are NB
Hudson has a differentiated investment strategy, predicated on capturing and building franchise value while limiting downside exposure. Hudson's investment strategy is focused only on compelling – but risk-mitigated – growth opportunities	Risk mitigation is large focus	Driver down	Risk mitigation is NB
Policy changes are viewed as risk indicators and risk accelerators and are watched by RE investors. Changes to policies is not kept to a standard	Risk is in policy changes which affect returns	Driver down	Policies and policy stability is important to investors
"We are constantly warning investors about renewable energy. One is investing more in political decisions than in tangible assets," he said.	Political decisions affect investors in RE greatly	Driver down	Political decisions are key
87 per cent of renewables-focused private equity funds have generated returns below that of the median private equity fund to date	There are like any investments negative return examples	Driver down	Must be aware of negative stories and investments
Private equity funds have a big advantage in the renewables space, we can be much more creative with structuring and de-risking."	The structure and investment vehicle affects asset returns	Driver up	Not just sector but structure and asset class is important
Investment by PE funds in the industry fell 53 percent last year to $1.3 billion, the lowest in a decade, according to data compiled by Bloomberg.	Different fund and fund structures have different uptakes	Both	Different uptake profiles can de-risk a sector
Since 2007, Glenmont Partners has invested over EUR 1.5bn in 31 clean energy infrastructure projects generating ca. 600 MW in total.	There are examples of large investors	Driver up	Large anchor investors de-risk asset
The country has an average of more than 2,500 hours of sunshine per year and average direct solar radiation levels range between 4.5 and 6.5kWh/m2 per day, placing it in the top-3 in the world.	S.A is one of top 3 destinations for RE solar	Driver up	S.A has top RE potential
completed four bid windows, a total number of 92 IPPs have secured contracts with Government to produce RE with a combined nameplate capacity of 6,327MW. At least 48 of these IPPs are located in the Northern Cape province	REIPPP program brought RE awareness and expertise	Driver up	Expertise reduces risk
The REIPPPP has to date attracted R53.2 billion in foreign investment and financing across all bid windows. Foreign equity in the REIPPPP from the completed four bid windows amounts to R35 billion	REIPPP investments attract further foreign investments	Up	Compound effect of investments

The United Nations Environment Programme (UNEP)2 ranked the country among the top-10 renewable energy investing countries in 2014 and, by breaching the 500MW of utility scale solar power in the same year, South Africa became the 10th biggest solar market in the world for installations sized 5MW and above	South Africa is recognized as RE asset destination worldwide	Up	Again S.A is put on the investment map for RE

Data (observations, description passage)	**Relevance (to concern variable)**	**Impact (on Concern Variable)**	**Proposition Subject-relevance Predicate- Impact**
variance in returns may be a proxy for risk. Uncertainty is a state of not knowing whether a proposition or statement is true or false.	Understand the restrained-risk	Look at data in terms of risk	Review data in terms of relevant risk
Types of financial risks can be broken down into broad categories namely market, credit, operational and liquidity risk (Maverick, J.B 2015)	Understand the restrained-risk	Look at data in terms of risk	Review data in terms of relevant risk
solar PV assets the cash yield is produced from selling electricity	Returns come from selling electricity	Understand return drivers	Electricity is directly relevant to returns
cash payments in a fairly steady stream is known as a high cash yielding asset.	RE assets are high cash yielding assets	Up	Classify returns-drivers
It is a market failure that fossil fuel prices do not take into account, Green House Gas (GHG) emissions (negative externalities).	FF negative externalities need to transition into financial aspect	Up	GHG need to be taken into financial account
GHG costs to society are not accounted for, this results in fossil fuel energy being consumed above optimal level (Brown, 2001)	FF are produced above optimal level	Down- could be changed to driver	Need to change this around to make a restrained a driver
Another negative externality of fossil fuel energy is the supply vulnerability and its price associated with national security risks (Owen, 2006)	FF hold national security risks	Driver (removed)	Another benefit of RE over FF
knowledge and innovation that accrues from investments into new technologies such as spending on research and development, results in a benefit to society of better process and non-excludable information	Investing into RE is a driving reinforcing loop	Up	Exhibits positive momentum
policy needs to protect intellectual property research findings and provide incentives to generate knowledge or provide compensation for sharing (Popp, 2006)	IP needs to be protected for developers but shared to advance RE- this needs to be balanced	Balances out	Showup IP be protected
PV project focus these assets need to be funded by an investor and structured so that it pays a cash dividend, this is done through a Power Purchase Agreement (PPA)	The basis of turning a solar project into a solar asset	Driver	Needs to be recognized as an asset class
Tax deductions on up-front capital as such, is allowed in India but is not in practice is terribly beneficial as these deductions are only allowed in year one and cannot be used to offset future cash inflows from the project.	Tax deductions reduce costs	Driver	Tax incentives are NB and need to be assessed in detail
risks related to PV solar projects specifically into 6 groups; political risks, technical risks, economic risks, time delay risks, legal risks and social risks.	Risks of solar PV directly	Restrained	Understand and mitigate risks
harder and slower process to get RE projects off the ground, as business development and market education is needed as RE is not widely accepted	RE is a new sector this therefore involves a slow uptake	Restrained	Being an asset developer education is part of role

Tax holidays are when the project is exempt from tax for a stated number of years	Tax holidays are another incentive- reduce tax paid for period	Driver	Tax holiday can be used as incentive
The technology in the RE sector is fairly young, which translates into lower past cumulative funding of research & development, resulting in lower technical skills, which leads to lack of expertise,	Young sector needs time to build momentum	Restrained- may turn into driver in future	Need to understand and be patient
Independent Power Producers (IPP) are rising into renewable energy investments. Many originated as traditional fossil fuel IPPs that are slowly transitioning into renewables	IPP are becoming big market players even companies transitioning from FF	Driver	Big market players exist that are driving industry
Power purchase agreements are an example of securitisation of the solar power assets. When these are bundled into larger deal pools they attract funding.	PPA's can be used in securitization mechanisms	Driver	Adds flexibility and ability to sculpt risks and returns
Available capital and project experience feeds into lower risks which again feed into better risk to reward ratios, which again facilitates greater capital available	There is a positive mechanism at play	Driver	Experience reduces risk
Germany's experience, expertise, stronger economy and much higher level of acceptance toward renewable projects, their risk is the lowest, an average development project typically offers 8-9%	Germany is a good example of RE of the ground- wider acceptance, lower perceived risk and reduced required return	Driver	Developed countries to learn from
A countries specific technology risk depends on the domestic markets technology stage reached as well as its global market technology experience and stage	Technology level is country dependent	Restrained- can lead to driver	SA has relevant high tech risk which is decreasing due to uptake and REIPPP
To unlock mainstream capital, pension funds are an important target. Pension funds are the largest investment group. Mandates control the fund's investments and these typically fall into Section 28	Pension funds are attracted to RE assets as they are relevantly stable-cash yielding assets	Driver	If pension money is unlocked it will unlock mainstream capital
Portfolio managers try to access optimal portfolio balance, with regard to: location, construction entities, track records of technology used and the social and environmental contributions of each project.	Within the PPA asset model there are factors to diversify	Driver	Risks can be diversified to some extent
The upfront capital is provided by an investor or funder, who owns the PV panel system and sells the electricity to the user who pays off the solar panel with the savings in the electricity bill.	The benefit to the off-taker is reduced electricity cost	Driver	The mechanism needs to provide benefits to all parties to work
The relatively infant state of renewables in SA leads to higher risk in project success projections or perceived risk.	Infant stage again leads to increased risk	Restrained- can become driver	Projections are unknown and can lead to higher perceived risk
non-economic barriers are regulatory and policy uncertainty, which can be an outcome of bad policy design, discontinuity and insufficient policy transparency	Policy needs to be transparent and thought-out to remain stable and achieve objectives	Restrained-can become a driver	Policy needs to be thought-out stable and transparent
To manage this technology risk, diffusion is needed and information sharing helps to mitigate risk as global market technology has advanced especially among developed markets and lessons and skills learnt through this progression can be studied	The case for sharing IP	Driver	IP is thought to need to be shared as well as protected
SolarCity has been a pioneer in pooling of securitization, raising three pools of capital so far for this financing mechanism. The last pool was $200 000 000 in size	Examples of asset pools and securitization	Driver	Assets need to be repackaged to reach wider range of investors
Institutional and administrative barriers can be managed by decreasing bureaucracy supporting institutions, to help to apply the required permits and streamline the process	Permits and red tape can lead to slow uptake	Restrained	Red tape needs to be reduced and tools given to manage

Municipal Utilities, generally owned by municipalities or the city, are often politically motivated to invest into renewables	Municipalities often fight RE PPA's as revenue comes from electricity sold	Restrained and driver	Municipalities need to be pressured to working with solar PV
Vantage Capital GreenX Fund has been set up with the intention of investing in energy and renewable energy projects in South Africa.	There are specific fund emerging with the sole mandate of investing into RE	Driver	Accessible funds and current investors are NB
funding is necessary to increase cash flow, which needs to be available to continue developing, as these projects have such a long-term nature of usually 20+ years.	The turnover of projects is NB, developers need to be able to sell to replenish funds	Driver- can be restrained	Investors are important in driving supply
From 2009 to 2015 solar panel prices dropped by 70%, despite successful developments to become more efficient in energy harnessing (Christina Nunez, 2015).	Decreases in solar PV projects	Driver	Micro return driver
The extension of African Infrastructure support, particularly to energy infrastructure, also drives energy investments through reduced risk	Infrastructure level drives demand for RE	Driver	Macro return driver
Governmental policies which do help to drive and improve the financial numbers and economics may also change over the lifetime of the project and squash the project economics.	Government policies need to be watched	Restrained	Macro risk
GreenX also require that the majority of the funding for the projects originates from local S.A. banks and that these loans require increased liquidity in the foreseeable future	Other funders and investors play a part	Balance	Micro Project risk
Due to the small size per residential solar panel, The National Renewable Energy Laboratory (NREL) established a *'Solar Access to Public Capital Working Group*' to review solar securitisation and released standardised PPA contracts,	Resources available to streamline PPA process	Driver	Micro project risk reducer
Following the Kyoto Protocol was enacted in 1997, the number of countries taxing fossil fuels has tripled (McGregor, 2011).	Fossil fuel tax is key	Driver	Macro return driver
Spain, where there was a reduction in feed in tariffs (FIT) one year after projects commencement, or in 2012 where they cancelled FIT completely, which hit all current investors hard.	Example of FIT and policies affecting returns	Restrained	Macro risk driver
GreenX's opinion is that the future holds positive movement in favour of renewable energy. Some of these movements relating to increased expected returns	Movements and trends in macro environment that lead to returns	Driver- can balance	Macro return driver
proposed renewable electricity prices falling by 40% in the next three years, appears to be roughly on target reducing 20% in 2016 alone.	Reduction in RE project cost	Driver	Project return driver
To "de risk" investments in Greenfield investments, guarantees as well as innovative insurance products help to align investors	Insurance products to mitigate risk	Restrainer turned driver	Manage risk- project risks
Vantage assesses whether assets exhibit stable cash flows and strong defensive characteristics	Cash flow profile of RE is appealing	Driver	Project returns driver and risk decrease
China is competing to be the main supplier of PV panels which has competitively driven prices of panels down	Chinas competition is positive to RE costs	Driver	Micro project returns from macro trend
Increasing the price of electricity would unfortunately have a negative effect on South Africa's economy as well as poverty eradication.	Electricity is key basic good therefore issues around driving economy and job creation- negative is it can drive inefficient systems	Restrainer	Macro risk
Mergence Infrastructure and Development Funds is targeted at 60% renewable energy investments, targeting CPI+7% returns	An example of fund	Driver	Current investors and asset accessibility

A factor driving returns indirectly to RE through decreasing returns to fossil fuel investors is divestiture. This is when investors sell off their holdings in shares of companies that are not abiding by their personal preferences and moral beliefs	Divestiture could drive returns to RE asset holders	Driver	Indirect to RE
predictability of policies plays an important role in reducing risks to the investors. Government needs to commit to stable policies and predictable policies for investors to trust and enter into the market	Again stable policies are important	Restrainer could become driver	Stability in policies- Macro risk
Installation has also become cheaper as the number of trained technicians and installation efficiency has gone up, creating jobs on competitive tenders.	As industry gains traction and experience risk goes down	Driver	Macro Risk
There should be follow through with claims, to build reputation and trust between the public and private sectors	RE involves public and private sectors working together	Balancer	Macro Risk
In South Africa carbon taxes have been brought into parliamentary conversation recently. On 20th June 2016, the South African National treasury published draft Carbon Offset Regulations (ENS Africa, 2016).	S.A specific info on carbon tax	Driver	Macro return
Al Gore pointed out that the cost of solar power has been dropping by 10% a year.	Another citation of decreasing solar cost	Driver	Micro return
The REIPPP has reduced risks to RE investors as it displays commitment towards growing the sector, it has drawn foreign and domestic investments to RE investing, therefore increasing the size of the sector and reducing liquidity risk	REIPPP is strong signal of Gov commitment	Driver	Macro
Dubai 2015 a solar project went online offering electricity at a rate of $0.058 per kWh. This future planning by the Middle East, with the largest oil reserves in the world, was a global statement	Country example of RE	Driver	Current Investors
In 2011 the World Bank approved a R1.5 billion loan to South Africa's Eskom to develop a 100MW wind and solar plant in Upington (Hartigh, 2011).	Other examples of lenders –World Bank	Driver	Investor/ lender
Government policies that help RE tariffs compete with fossil fuel tariffs can be achieved through a multitude of solutions namely taxes and incentives.	Gov needs to step in to accelerate RE take up	Driver	Macro return
Yieldco's refers to the bundling of a portfolio of cash generating assets through renewables, in a separate holding, which is then floated on an exchange	Yieldco's as example of investment product	Driver	Accessibility
In less than three years, South Africa has signed up more investments from independent power producers than has been procured over the entire African continent in twenty years	REIPPP has shown positive acceleration	Driver	Macro
Morocco, who announced in February 2016, an offshore wind farm that produces electricity at $0.03 per kWh; estimated to be the cheapest clean energy available in the world	Countries example of uptake	Driver	Investors/ macro examples
The implementation of carbon credits has been anticipated and planned for by various stakeholders	Carbon taxes is key variable to returns	Driver	Macro return
the only investors able to get into this investment space are banks, pension funds and asset managers. With no opportunity for individuals to get "a piece of the action"	Big projects are sometimes the domain of large investors	Driver/ restrained	Current Investors
Chile reported free renewable electricity for 113 days and South Australia and Germany have gone over to negative rates for renewable electricity (Al Gore, 2016)	RE getting to cheap its free, this could flip to neg for investors	Driver becoming a restrained	Micro/Macro

The RE assets form part of a growth orientated, low risk, cash generating, publically traded fund	RE asset has good profile	Driver	Current Investors
Currency risk is also a risk involved, when the engineers do the analysis and provide the system specifications and costs it is in some cases months before the system is purchased and installed	Currency risk	Restrainer- can be balanced	Macro/ Micro risk
Taxes that takes into account, the negative externalities of fossil fuel production and upkeep of power stations helps to level the costs between RE and FF	FF power has been subsidized	Restrainer	Macro return (neg affect)
According to McClelland (McClelland, 2016) the R196 billion secured since 2011, will attract another R550 billion by 2020	Funding has snowball affect	Driver	Supply of funding reduces risk. Maco risk decreased
long debt is due to PPAs which usually run over a 20-year contract, with options for the off-taker to buy out at an acceptable IRR for the client. These long term liabilities suit pension funds and insurers, the biggest investment group.	RE asset has good profile for pension funds	Driver	Current Investors
Renewable energy is going to dwarf vanilla private equity options, because of its capital intensive nature"	Capital intensive RE can be seen as positive	Driver/ restrained	Current Investors/ Accessibility
Carbon taxes can be used to internalise the costs of emission damage.	Again Carbon tax's	Driver	Macro Return
"It's very hard to see investors getting stable returns like that (of renewable energy) in other asset classes where there's a lot of uncertainty and yields are relatively low,"	Again RE asset has good profile	Driver	Current Investors
It is evident that investors and financiers are willing to invest into renewable energy when the procurement process is well designed and transparent	The way the policies/ systems are designed is NB- needs to be feedback loop to Gov	Balanced- can be both	Macro return
Carbon taxes will drive the price of coal electricity well beyond renewables, and help to unlock the clients who do not qualify because of low tariffs that are hard to compete with	Again Carbon taxes needed to level playing field with FF	Driver tool	Macro return
reducing risk relating to RE investments can also be done through the private sector, third party insurers that reduce risks, make the project a lot more attractive.	Innovative insurance can be used to reduce/ mitigate risk	Driver tool	Micro risk
A Yieldco fund does have pressure to renew the project pipeline on an ongoing basis and usually partners with a developer to have first rights to projects and in so doing, provides a more reliable capital stream to the developers	Yieldco's create demand for developers	Driver	Micro return
In 2011, university students called for institutions to remove fossil fuels from their portfolios. There has been a focus on morality of investments but now the strength of the economic value and sway has become hard to ignore	Green focus can become financial focus	Driver	Macro return
Whether it is through taxes or subsidies or both government needs to step in to level the playing field, as energy is considered a public good that empowers communities and improves the standard of living (McGregor, 2011)	Electricity is a public good which complicates public sectors involvement	Restrainer and driver	Macro risk
A restrained of investable projects is the client's usage, as unused electricity causes inefficiencies and reduces returns	Project limits on solar PV	Restrainer	Micro return(reduced)
US Overseas Private Investment Corporation (OPIC) who provides US investors with financing, guarantees, political risk insurance and support for private equity investment fund, to help mobilise private capital	Outside support to help streamline process of getting renewable PV onto roofs	Driver	Micro return

Advisor Partners reported that "Between 2014 and 2015 New York City's biggest pension fund lost $135m because of fossil fuel holdings"	Negative returns to FF	Driver	Macro return
Incentives are needed when the marginal investments can be pushed over to bankable investment projects that provide sufficient required returns (Van Parys, 2009).	Again Public sector involvement	Driver/ restrained	Macro return
Risks vary along the life of the project and according to Norges Bank, can be divided into three distinct periods; project development, construction (Greenfield investments) and operation (Brownfield investments).	Risks inherent in developing Solar PV assets	Restrainer	Micro risk
In Australia an activist group, Market Forces reported that fossil fuel investments cost 15 of Australia's top funds an estimated $5.6 billion equating to a loss for each member of $1109	FF investments losing money	Driver	Current investors (change in landscape)
Net metering is when a producer can feed into the grid what they are not using and receive payment for this from the municipality	Project specific factors with municipality	Driver	Macro return
Bruce Watson explains that in the past corporate social responsibility was about avoiding embarrassing scandals, keeping a good public image and not being the target of activism. But many examples point to profitability and sustainability becoming increasingly intertwined	Green focus is becoming big risk/reward financial factor- higher level of public awareness	Driver	Macro return
SPAC's or Special Purpose Acquisition Companies buy up RE assets and projects	Helps to increase demand	Driver	Micro return
municipalities ultimately protect their revenue stream of selling electricity and therefore often do not support RE solar PV	Municipalities often not supporting solar PV	Restrainer	Macro return (decreased)
A UN Investor Summit on Climate Risk held in January 2016 was attended by 500 global investors representing an estimated $22tn in assets.	Climate change is recognized and supported	Driver	Current Investors
Yieldco experienced a strong boom in 2013 which drew back in 2015. The returns usually include inflation protection with initial yields at 6%.	Yieldco returns	Driver	Micro returns
Citigroup also reported that the decrease in oil prices is expected to bottom out in 2016 and would likely stay at $60 a barrel for ten years	Decrease in oil is hard to compete with	Restrainer	Macro risk
Municipalities offering net metering; include, for example, the Drakenstein Municipality (Paarl, Wellington area)	Net metering is key supporting policy	Driver	Micro return
investors cannot afford to ignore low carbon, sustainable assets because in doing so they will stand to lose a lot of money	RE is becoming hard to ignore	Driver	Current investors
EFTs have diversification benefits as they hold many different stocks and therefore risk is decreased. EFT's in RE are available.	RE assets can be repacked like any other assets	Driver	Accessibility of assets
Wheeling is when energy producers can utilise the Eskom installed infrastructure to sell on produced electricity directly to a counterparty (as opposed to back into the general grid)	Another mechanism that can be used as supportive policy	Driver tool	Micro returns
The renewable energy sector has displayed high volatility in the past. As politics change the potential returns and changing regulations play a very speculative role	Politics again add to RE assets risk	Restrainer	Macro risk
liquidity through listed shares. It also gives the opportunity of gaining RE exposure through shares which are more easily accessible than multi million rand projects.	RE asset exposure also through listed shares	Driver	Accessibility

The City of Cape Town Municipality is not as conducive, currently they are offering R0.59 kWh (City of Cape Town, 2016)	Municipality support varies	Restrainer-can become driver	Micro return
According to Renergen, their demand drivers for energy, specifically alternative energy are; SA's high level of resource extraction (which uses a lot of power), economic diversification and development in sub-Saharan Africa, growth and development of the middle class, growth in connectivity and telecommunications infrastructure and upgrading power stations	Different drivers for different investors	Driver	Current investors/ Macro returns
RE supportive policies in some cases, may result in unintended consequences or inefficiencies, such as examples discovered through rigorous research by the World Bank Group on the Investment Climate into Renewable Energy	Policies need to be well thought out in order to have intended consequence	Restrainer- can become driver	Macro risk
MAC Global Solar Index (Hunt, 2014). The fund invested in and financed 40 gigawatts in 2013 alone	Investments are directly attributable to funding new energy	Driver	Current investors
Flaws they found were; tax exemption for renewable energy investments is designed to facilitate inflows into renewable energy, however large pension funds are usually tax exempt, therefore project funders may seek out equity investors	Policies consequences not always positive	Restrainer/ driver	Macro risk
Renergen acquired Tera4 on the 25th of November 2015, as its first viable acquisition. The purchase price paid by Renergen for Tetra4 was reported at R124m. With the announcement of the acquisition of Tera4 the share price jumped 23% in 2 days	Examples of investments and reaction to news	Driver	Current investors
Financial incentives can be used to effectively bring down the cost of a system. These tax incentives differ across countries and include but are not limited to, investment tax credits, investment allowances, accelerated depreciation, tax holidays and deductions for R&D spending	Different incentives	Driver	Micro return
In the past, hype has been created as countries make declarations towards supporting renewables but in reality it takes a lot longer to implement	Following through with policy is also important, slow red tape	restrained	Macro risk
The IEA predicts that developing countries will have moderate to negative demand growth due to energy efficiency and therefore is a weaker link between economic growth and electricity consumption	Not all positive views, IEA predicts decrease in PV demand	Restrainer	Macro risk
In 2014, there was $9 billion worth of renewable energy bonds traded in the market.	RE bonds are traded relatively widely	Driver	Accessibility
Molopo company extracts biogenic gas (methane) and compresses it for sale to industrial customers. Deloitte has estimated Molopo's total proven reserves at R2.2 billion	Companies valued on RE assets	Driver	Micro returns
According to BNEF's predictions, 54% of power capacity in OECD countries will be renewable energy capacity by 2040	Predictions for increased demand	Driver	Macro return
Because of the growing number of listed SPAC's in South Africa, project managers and investors in the market look forward to these acquisitions led vehicles providing liquidity and future growth.	SPAC's provide demand	Driver	Current investors and drives return
In 2015 renewables, as a percentage of installed capacity were about one sixth or 16.2%, excluding large hydro and 18% including hydro (Tier, 2016) but this number is increasing every year.	Actual percentage of installed RE	Restrainer and driver	Return and Risk factors

It also shows that investors do want to get exposure to renewables and are actually "overpaying" for renewables based on the above analysis	There is a bit of a hype with investors wanting to get exposure and may even 'overpay'	Driver- can become restrained	Micro return
Warren Buffets MidAmerican Energy company offered $1 billion in bonds to finance a 550 megawatt solar farm in California. The bonds are paying 5.375% interest	Example of RE asset returns	Driver	Micro return/ accessibility
South Africa is a developing country, with growing infrastructure and growing electricity needs, securing future demand.	SA has growing Elec needs which creates demand	Driver	Macro risk (decreased)
Montauk is listed on JSE's main board under the "Integrated Oil and Gas" sector. Montauk operates in the United States of America and is a fully integrated renewable energy company, operating 13 landfill gas (LFG) sites	RE competing on exchange with FF companies	Driver	Micro return
Many fossil fuel and non-renewable energy companies are creating small divisions in order to invest and explore renewable energy projects	Even big corporations that are FF lead are investigating RE	Driver	Current Investors
RE projects do not have inherent volatility with regard to their cash flow returns, however market opinion is volatile and therefore more risk can come from market overreactions and not the assets themselves.	RE depending on asset can have financial risk if listed	Restrainer	Micro risk
France declared in 2015 that all commercially zoned buildings need to have either solar or gardens on their roof's. These legislations help to bring in building with a green, sustainable focus.	Legislations that help with RE uptake	Driver	Micro return
BNEF also predicts that the cost of solar projects will come down a further 48% by 2040, due to increased competiveness and improved technologies	Further decrease in solar costs predicted	Driver	Micro return
There are crowd sourcing platforms for investments into PPAs. A company doing this is Mosaic team, where they vet and run the projects and pay interest rates of 4.5% to 6%	Different examples of investing	Driver	Accessibility
Yieldco's show that listing assets on a stock exchange through a pooling structure reduces liquidity risk but at the same time brings in risk with direct exposure to the financial market	Yieldco's and being listed decrease liquidity risk but increase financial market related risk	Balancer	Accessibility
GreenZu is one of many Solar Micro Utilities who oversee installation, provide long term management and distribute the energy. There are three major parties involved; the funders, the off-taker and the third party facilitator	Different parties involved in development of RE assets. All need returns	Balance	Current investors
BNEF predicts in 2040 12.2 trillion dollars will be invested in a new power generating capacity worldwide over the next twenty five years, two thirds going towards renewable energy	Predictions are strong for RE investment uptake!	Driver	Current investors
Greater variety in the renewable energy mix is important and although PV solar systems were the focus of this study, wind and hydro play an important part in funding allocation towards solar as the three work together to help create a more stable energy supply, through interconnection	Different RE sources are needed for stable energy supply	Driver	Accessibility
Testla, has launched a Gigafactory, designed for improving and manufacturing lithium-ion batteries. Many universities and private parties are also working on this problem	Batteries will help to unlock solar PV	Driver	Macro returns
Fernandes and Ferreira argue that the use of real options should be used to value renewable energy projects. Real options are also used in project	How we value RE projects and assets as can usually add on	Driver	Accessibility

financing, as these real projects by nature are often flexible and complex			
Renewable Energy assets are also recognized for having stable (connected to the weather) cash flows that raise with inflation and are long term in nature	Profile of RE assets are good and stable- low risk	Driver	Micro Risk and affects investor type
Corporate social responsibility is important towards image especially with newer generations therefore relation to green energy positively affects companies brands and companies often wish to invest into green energy along their own business lines for image reasons.	Green focus again seen to transition into financial focus and factor for corporations	Driver	Current Investors
In 2015 developed and emerging nation's net investments reached a record $16 billion, up 19% compared to 2014 and investments into developed countries totalled $130 billion, down 8% from 2014	Developing nations overtaking developed	Driver	Macro risk (decrease)
RE debt has by nature offers lower returns and has less risk. The RE debt can also be backed by major corporations and inherently be a corporate bond.	RE can be viewed according to profile as a corporate bond, however may not be categorized according to mandates	Driver	Micro risk (reduced) also affects current investors.