

**UNIVERSITY OF KWAZULU-NATAL**

**RENEWABLE ENERGY PRODUCTION AS MEANS FOR LOCAL  
ECONOMIC DEVELOPMENT IN ETHEKWINI MUNICIPALITY**

**By**

**Thobeka Radebe**

**210503823**

**A dissertation submitted in fulfilment of the requirements for the degree of Masters in  
commerce**

**Graduate school of business and leadership**

**College of Law and Management Studies**

**Supervisor: Dr Jennifer Houghton**

**2015**

## Declaration

I, Nokukhanya Thobeka Radebe declare that

- i. The research reported in this dissertation/thesis, except where otherwise indicated, and is my original research.
- ii. This dissertation/thesis has not been submitted for any degree or examination at any other university.
- iii. This dissertation/thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
- iv. This dissertation/thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
  - A) Their words have been re-written but the general information attributed to them has been referenced:
  - B) Where their exact words have been used, their writing has been placed inside quotation marks, and referenced.
- v. This dissertation/thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the sources being detailed in the dissertation/thesis and in the references sections.

Signature:

.....

Name of Student

## Acknowledgments

Bayede ngonyama yezulu, Lord of Lord's, ufanelwe udumo lonke, all adoration belongs to you. Ngidlulisa ukubonga okukhulu kuwe'baba wami oyingwele owangipha ukuphila, wahamba nami impilo yami yonke wangipha ithuba lokuthi ngifunde kabanzi, uwena kuphela onamandla kwakho konke lokhu ngakhoke ngiyabonga smakade, mana njalo Nkosi yama khosi. (Mark 11: 24).

I would like to thank my supervisor Jennifer Houghton who has been in the absence of family throughout the year that motherly figure that encouraged me, this has thought me to do and desire excellence in all spheres of my life. Thanking you so much Jen for believing in me, for giving me a chance to part of the Young Researchers Programme, indeed this route has changed my life in ways you can never imagine, thank you so much.

I would like to kindly take this opportunity to thank my mother Simangele for everything that she has done for me in my life, through the rough times that life brings having to start over from scratch being a single parent with just two children, myself and my brother Lindokuhle . I have never for one moment felt the absence of a father in my life; I truly commend her for being a strong woman and a one who loves the Lord. I love you dearly mah.

Huge thanks goes to Sphamandla Khumalo and sis Celiwe of which I both love for always being there in times of need and showing me courage and strength and instilling in me a character of being ambitious and walking in the will of God in my life, thank you for being in my life. I would also love to thank my new found friends the 'young researchers' who have always brightened up my day; spending the year with these researchers was truly something I wouldn't forget. Especially Phindile Mkhize.

I would also like to thank the eThekweni Energy Office for allowing me to conduct my research and for helping me with everything I needed

I would also like to express my special gratitude to the Department of Economic Development, Tourism and Environmental affairs (DEDTEA), KZN for funding and supporting the Local Economic Development Master of Commerce programme.

## **Abstract**

Given South Africa's increasing demand for energy, insufficient generation capacity, dependence on imported oil, and sensitivity to global economic shocks, the need for renewable and sustainable energy systems is clear. The South African government recognizes that substantial opportunities exist for electricity and energy generation through the production and use of renewable energy resources. In recognizing that local authorities are primary agents for electricity service provision, the national treasury has committed to supporting local renewable energy programs. Renewable energy resources are widely seen as means to address the challenges of climate change and energy insecurity; and can be of key importance in the development of a sustainable society. Renewable energy resources can provide new economic opportunities, contribute to higher standards of living and reduce the impacts of society on ecosystems, among other things. South Africa is ranked as the country with the high potential for the use of renewables.

Great pressure is placed on the national government to initiate a way of achieving greater economic growth as well as alleviating poverty. A mandate has therefore been given to local government to play a role in achieving this, Local economic development, a relatively new approach to development, is currently seen as a prominent strategy to tackle the problem of unemployment in South Africa. A literature review is thus presented in the study that addresses the different type's renewable energy resources available and the links between local economic development and employment creation through renewable energy resources provision. The study used the Ecological Modernisation theory that can be used as a theoretical lens to examine the phenomenon of renewable energy adoption, it addresses the theoretical framework.

An investigation into the background of the eThekweni Energy Office is provided and serves as a departure point from which to critically examine the ways in which renewable energy initiatives of the eThekweni Municipality contribute to local economic development. The findings address the ways in which renewable energy adoption can play a part in the reduction of greenhouse gas emissions. Furthermore, an assessment of renewable energy production is provided based on the results of the qualitative data analysis. Key Words: Local economic development, green economy, renewable energy, ecological modernisation.

# Table of Contents

<b>Declaration</b> .....	i
<b>Acknowledgements</b> .....	ii
<b>Abstract</b> .....	iii
<b>List of Acronyms</b> .....	vii
<b>List of Tables and Boxes</b> .....	viii
<b>Chapter One: Introduction</b> .....	1
1.1 Introduction.....	1
1.2 Aim of the study.....	2
1.3 Objectives of the study.....	2
1.4 Rationale.....	2
1.5 Research Questions.....	4
1.6 Chapter Outline.....	4
1.7 Conclusion.....	5
<b>Chapter Two: Background</b> .....	6
2.1 Introduction.....	6
2.2 Energy Issues in South Africa.....	6
2.3 White Paper on Renewable Energy (2003).....	13
2.4 Case Context: eThekweni Energy Office.....	14
2.4.1 History of the eThekweni Energy Office.....	15
2.2.5 Conclusion.....	16
<b>Chapter Three: Conceptual Framework</b> .....	17
3.1 Introduction.....	17
3.2 The Green Economy.....	18

3.3	Renewable Energy.....	23
3.4	Aligning potential renewable benefits with local motivation and priority.....	27
3.5	Ecological Modernization Theory.....	35
3.6	Local Economic Development.....	43
3.7	Conclusion.....	49
<b>Chapter Four: Research Methodology.....</b>		<b>51</b>
4.1	Introduction.....	51
4.2	Research Design.....	51
4.3	Data Sources.....	52
4.3.1	Secondary Data Sources.....	53
4.3.2	Primary Data Sources.....	53
4.4	Primary Data Collection Tools.....	54
4.4.1	Sampling.....	55
4.5	Document and Textual Analysis .....	57
4.6	Data Analysis and Interpretation.....	58
4.7	Subjectivity issues/concerns/limitations.....	60
4.8	Ethical Considerations.....	61
4.9	Conclusion.....	61
<b>Chapter Five: Findings and Discussions.....</b>		<b>62</b>
5.1	Introduction.....	62
5.2	eThekwini Energy Office’s Purpose.....	63
5.3	Renewable Energy Production as Means for Local Economic Development.....	64
5.3.1	Understanding of Local Economic Development.....	65
5.3.2	Human Capital Development .....	67
5.4	Policy landscape for renewable energy.....	70

5.4.1	The Integrated Development Plan (2014/2015) .....	71
5.4.2	The Durban Climate Change Strategy (2015).....	72
5.4.3	Renewable Energy Policy in light of Ecological Modernization theory.....	74
5.5	Small Business Growth.....	75
5.6	Financing for Renewable Energy projects.....	78
5.7	Conclusion .....	82
<b>Chapter Six: Conclusions and Recommendations .....</b>		<b>85</b>
6.1	Summary.....	85
6.2	Contribution of the Research.....	89
6.3	Recommendations.....	90
6.4	Final Remarks.....	91
<b>References.....</b>		<b>93</b>
<b>List of Participants.....</b>		<b>105</b>
<b>Appendix A : Interview Schedule.....</b>		<b>106</b>
<b>Appendix B: Ethical Clearance .....</b>		<b>109</b>
<b>Appendix C: Informed Consent .....</b>		<b>110</b>
<b>Appendix D: Participant Consent.....</b>		<b>111</b>
<b>Appendix E: Turnitin Report.....</b>		<b>112</b>

## List of Acronyms

Co2	: Carbon dioxide
DCCS	: Durban Climate Change Strategy
DEAT	: Department of Environmental Affairs and Tourism
DoE	: Department of Energy
EE	: Energy Efficiency
EO	: eThekweni Energy Office
GDP	: Gross domestic product
GHGs	: Greenhouse gases
GWh	: Gigawatt hour
IDP	: Integrated Development Plan
NDP	: National development plan
PV	: Photovoltaic
RE	: Renewable Energy
REFSO	: Renewable Energy Finance and Subsidy Office
REIPPP	: Renewable Energy Independent Power Producer Procurement Programme
REN21	: Renewable Energy policy network for the 21 <sup>st</sup> century
SWH	: Solar Water Heater
UN	: United Nations
UNEP	: United Nation Environment Programme

## **List of Tables**

Table 2.1: Economic development criteria of the Renewable Energy Independent Power Producer Procurement Programme.....	10
Table 2.2: Potential renewable energy job creation compared to coal-fired power stations.....	12
Table 4.1: eThekweni Energy Office Projects.....	55
Table 4.2: Interviewees details.....	57
Table 4.3: Data Documents.....	58
Table 6.1: Central themes emerging from the results.....	88

## **List of Figures**

Fig 3.1 : Total primary energy supply by resource 2013.....	32
---	----

# Chapter One

## Introduction

### 1.1 Introduction

This study will be focusing on green economy initiatives looking at the production of renewable energy resources which supports local economies, the creation of green sustainable employment and moving towards a cleaner region with more reliable energy for the future. The consumption of non-renewable sources of energy has caused more environmental damage than any other human activity source (Abdeen, 2007). Electricity generated from fossil fuels such as coal and crude oil has led to high concentrations of harmful gases in the atmosphere this has in turn led to problems such as ozone depletion and global warming. Furthermore, energy availability is becoming a critical problem and very often the poorest communities are the most affected by these challenges as they spend their highest share of their income on energy and food. They are highly dependent on natural resources and ecosystems for food, fuel and income generating activities (Abdeen, 2007).

This study will be focusing on the green economy. The KwaZulu-Natal Department of Economic Development and Tourism (DEDT) identified the need to transform the provinces economy to a green economy, in line with national policy (Sutherland et al., 2011). South Africa's abundant renewable energy resources (wind, solar, water) and extensive biodiversity offer new opportunities for the transition to a green economy and green jobs (Sutherland et al., 2011). The study will also touch on ecological modernization theory strongly because; this study will be exploring renewable energy resources and its impact on development.

Ecological modernization theory argues that societies in advanced state of industrialization adopt ecologically benign production technologies and political policies, suggesting that modern societies could be on course to alleviate the ecological damage caused by capitalism (Schelly, 2015). Ecological modernization can be used as a theoretical lens to examine the phenomenon of renewable energy adoption (Schelly, 2015). The study will focus on local economic development the theoretical framework will draw on Nel and Rogerson's (2005) consideration of local

economic development as a process in which local government and community based groups manage their existing resources.

## **1.2 Aim of the Study**

Given South Africa's increasing demand for energy, insufficient generation capacity, dependence on imported oil, and sensitivity to global economic shocks, the need for renewable and sustainable energy systems and technologies is clear. The South African government recognizes that substantial opportunities exist for electricity and energy generation through the development and use of renewable energy systems. Therefore the main aim of the study is to critically examine the ways in which renewable energy initiatives of the eThekweni Municipality contribute to local economic development.

## **1.3 Objectives of the Study**

The following objectives were formulated by the researcher to provide a full understanding of the nature of eThekweni Energy Office and examine their role in LED. The objectives of the study are as follows:

1. To investigate the understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development.
2. To critically examine the inclusion of economic development goals within strategies and policies put in place by the eThekweni Energy Office to promote the uptake of renewable energy in the city.
3. To analyze the municipal financing for renewable energy projects.
4. To examine the relationship between renewable energy resource projects in the eThekweni Municipality and small business growth.

## **1.4 Rationale**

The reasons for the study is that South Africa is experiencing severe energy crisis with demand exceeding supply resulting in rolling electricity blackouts, this study seeks to create awareness about renewable energy production as a means to addressing this crisis and the uptake of

renewable energy resources. It will also shed light on the relationship between renewable energy projects and economic development. There is scope for further examination on the topic of renewable energy.

South Africa's economy is growing, and it's expected to grow strongly in the coming decades. The government is considering medium term infrastructure projects to the value of 3.2 trillion (Business Report, 2012), and considerably expanding access to housing, stabilising and decarbonising the electricity supply (Du Plessis, 2012). Under current modes of development, economic, industrial and infrastructural expansions on this scale are tightly bound to the increased consumption of energy resources, and the similar expansion of energy and electricity infrastructure. South Africa and much of the rest of the world faces major challenges in decoupling this economic growth from similar increases in the unsustainable consumption of finite ecosystem services and energy resources, while reducing the carbon intensity of local economic activity (Smeddle et al., 2012).

South Africa is well endowed with abundant renewable energy resources that can be converted to productive energy uses. Renewable energy technologies generally have lower operation and maintenance costs (UNEP, 2010). However, they also often have higher investment costs (UNEP, 2010). The result is that many technologies are not cost-competitive compared with South Africa's fossil-based energy technologies (Winkler, 2007). There are many reasons for this discrepancy in cost, including, the fact that the lower costs associated with fossil fuel use does not fully account for its adverse impact on the environment. There is therefore a need for government to create an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework, to allow renewable energy technologies to compete with fossil-based technologies (Winkler, 2007).

The South African government has recently embarked on a mission to cut greenhouse gas emissions by 42 % in the country before 2025 and to increase energy supply from renewable resources (Smeddle et al., 2012). In 2010 it first released its integrated resource plan which recognizes that South Africa is particularly well endowed with wind and solar resources. The

question now is how to manage, understand and fulfil the goals of well-intentioned strategies and policies (Smeddle et al., 2012).

## **1.5 Research Questions**

1. What are the perceived linkages between renewable energy projects and economic development in eThekweni municipality experience?
2. Is the implementation of these renewable energy projects creating employment at local scale?
3. How is implementation capacity ensured institutionally?
4. What are the challenges being experienced in renewable energy projects with regard to achieving local economic development?
5. Are the successes of the projects in any way influencing planning, development or environmental management in the city?

## **1.6 Chapter Outline**

This thesis consists of six chapters. The first chapter is an introductory chapter and provides the introduction and an overview of the main issues to be discussed in the thesis. The statement of problem, motivation for the research, objectives of the study, conceptualization, study area, research design and methodology, organization of thesis and lastly problems experienced in the research formed the basis of this chapter.

The second chapter consists of the background of the study. It outlines the relevance of this study and discussing the energy crisis that we are currently facing as a country and then further elaborating on how South Africa is tackling these energy issues.

Chapter three, the literature section, will highlight the main literature that will be reviewed, focusing on the green economy, ecological modernization and local economic development. Much emphasis is placed on the green economy of which is an approach that reflects the shift in thinking from a business as usual neoliberal economic approach, which considers the environment as an infinite resource from which to grow the economy. As well as look at policy of which energy policies focused on trying to achieve the targets and timetables that the

government set itself, these targets relate to job creation and economic security, as mentioned in this section and recognize that development paths have to proceed in a sustainable manner and protect both local and global environments (Davidson and Winkler, 2006).

Chapter four, the Methodology chapter, provides a concise overview of how this research will be conducted; employing a qualitative research design approach, using a case study design. This research will use primary data in the forms of semi structured interviews and proxy documents. The researcher has developed and used an interview protocol for asking questions and recording answers. Secondary data in the form of books and journals were used to compile the literature section. This chapter describes the various steps that the researcher used to transcribe and analyze the data as well as checking the validity of the study.

The key findings and analysis are addressed in chapter five, which discusses the themes that emerged from the analysis of the interviews. Themes reflect that renewable energy production has huge potential in the eThekweni region. In chapter six, the researcher reviews the discussion to provide final responses to the research objectives and the aim of the study. The researcher also makes recommendations regarding gaps that future research could fill.

## **1.8 Conclusion**

This chapter provided a broad insight about the nature of the study conducted. It discussed the relevant background information of the study and described the aims and objectives of the study. Thereafter the chapter provided a rationale that motivated the researcher to undertake a study of this nature. The following chapter presents the background of the study looking at energy issues in South Africa and how the emergence of renewable energy industry provides potential for empowerment and job creation.

## **Chapter Two**

### **Background**

#### **2.1 Introduction**

The purpose of this chapter is to contextualise and discuss the relevance of this study, this is necessary in order to meet the objectives of the study and to thereby assess renewable energy production as means for local economic development in South Africa. In this regard this chapter begins by discussing the energy crisis that we are currently facing as a country and then further elaborating on how South Africa is tackling energy issues, then focus on the renewable energy policy framework in South Africa. And lastly, the discussion will outline the case context of which is the eThekweni Energy Office, its history and detailed functions it is involved in. The following section is looking at the energy issues in South Africa.

#### **2.2 Energy Issues in South Africa**

The country is currently experiencing serious energy constraints which is an impediment to economic growth and is a major inconvenience to everyone in the country. The president stated that overcoming the challenge is uppermost in our programme (State of The Nation Address, 2015). In December 2014, after Eskom implemented Stage three load shedding; government intervened to relieve pressure on the national grid. The last time the country experienced such power cuts, was in 2008 when national rotational load shedding was implemented. In the second week of January 2015, Eskom was forced to introduce Stage one load shedding which meant it had to load shed up to 1000 megawatts. The national power system remains under pressure as Eskom is at times unable to produce the full amount of electricity the country needs. This is mostly due to maintenance and unexpected breakdowns at power stations (Department of Energy, 2015).

As a country, South Africa has a checked relationship with energy production and usage of energy. According to Rumsey and King (2009), although it is considered developing country,

South Africa is ranked 8th in the list of top 50 countries with the highest CO<sub>2</sub> emitting power sectors. According to Tyler (2009), over 80 percent of the power generated by Eskom is coal-based.

One of the main contributing factors to this energy situation is South Africa's unique history of aiming to be independent from the world due to the isolation of the country during the apartheid regime. Another contributing factor is the large amount of coal reserves that South Africa holds, thus making it the fourth largest exporter of coal in the world (Schmidt, 2008). Furthermore, the history of energy policy from 1948-1994 shows a focus on energy security (Winkler, 2006) and therefore little focus on energy conservation existed and the current practice of heavy reliance on fossil fuels for energy production was put in place. South Africa, similar to other developing countries, argues that it should not be denied coal to drive and develop its economy seeing that other countries had the benefit of such power to become industrialized themselves. However, in contemporary debates there is a strong view that economic development using coal and nuclear fuels amounts to regression rather than modernization, as these have social and economic impacts that negatively cost society, with its poorest members often bearing the brunt of these impacts (Gets 2013).

While fossil fuel usage continues to dominate the energy sector in South Africa, subsequent to 1994, energy policies focused on redressing the injustices of the previous regime. More recently, this has evolved to take environmental issues into consideration (Winkler, 2006). Renewable resources are widely seen as the means to address the challenges of climate change, peak oil<sup>1</sup> and energy insecurity, and can be of critical importance in the development of a sustainable society (REN21, 2009). Energy security is becoming an increasingly important issue in the energy domain. However, from an economic point of view, many questions related to energy security are still unclear: from its definition and the costs associated to insecurity, to the design of policies intended to reduce it (European Commission, 2008).

---

<sup>1</sup> Peak oil predicts that oil production will soon start a terminal decline. Most authors imply that no adequate alternate resource and technology will be available to replace oil as the backbone resource of industrial society (Friedrichs, 2010).

The most extended meaning of energy security refers to the availability of sufficient energy supplies at affordable prices, thus focusing on the supply-side of the energy domain. It is clear that this is an elusive concept because several parts of the definition are rather unclear: whether this availability should be continuous, if sufficiency takes into account the heterogeneity of energy sources and, above all, how affordability can be defined (European Commission, 2008). According to the most current energy policy, the government intends to strategically develop the renewable energy resources in the future in a systematic way (Smeddle et al, 2012).

South Africa is in a unique position in that it endeavours to internalise the external cost of its traditional energy generation processes, while taking due account of its fragile environment. Post-apartheid South Africa has seen a flurry of new environmental legislation being implemented, commencing with the National Environmental Management Act (Act 107 of 1998). The following extract is from the legislation and illustrates this point: ‘Everyone has the right to have the environment protected, for the benefit of present and future generations’. Through reasonable legislative and other measures that -

- I. Prevent pollution and ecological degradation;
- II. Promote conservation; and
- III. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. (Republic of South Africa, 1998b: 2)

Therefore South Africa has the opportunity to leapfrog fossil-fueled development by embarking on a world-leading ambitious renewable energy and energy efficiency programme where clean, sustainable, secure, stable, employment-supporting and accessible energy is achieved. It is envisaged that this would enable true long-term socio-economic development with reduced emissions but requires strong commitment from the government to move towards a clean energy future (Gets, 2013).

There is a need to undertake research in renewable energy development. Renewable resources are widely seen as the means to address the challenges of climate change, peak oil and energy insecurity, and can be key importance in the development of a sustainable society as mentioned

above (REN21, 2009). It is envisaged that this would enable true long-term socio-economic development with reduced emissions but requires strong commitment from government to move towards a clean energy future the first signs of any commitment are under the REIPPPP but it falls short of an Energy revolution (Gets, 2013).

The first signs of commitment are under the Renewable Energy Independent Power Producer Procurement Programme. But falls short of an energy revolution (Gets, 2013). The South African Department of Energy launched the Renewable Energy Independent Power Producer Procurement Programme (RE IPPPP) in August 2011. The programme aims to procure 3725 megawatts in five procurement windows. Project developers can choose to propose electricity generation using wind, solar, biomass or hydro technologies. ‘This IPP Procurement Programme has been designed so as to contribute towards this target of 3 725 megawatts and towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in South Africa’ (Pretorius, 2011).

The procurement programme does not only have the power to stimulate a whole new industry for South Africa and to reduce greenhouse gas emissions by greening grid electricity, it also sets out to tackle economic development on the local level. Bidding project proposals are assessed against a whole range of economic development elements (30%) and pricing (70%). The programme combines climate change objectives and development policies at least that are the objectives. To actually develop poverty-alleviating, largescale renewable energy projects is a challenging task. Two of the required economic development elements in the request for proposals documents ask project developers to submit a socio-economic development plan (Department of Energy, 2011).

The Department of Energy (DoE) states in the RE IPPPP documentation that it recognizes the programme’s great potential to realize positive socioeconomic outcomes. These outcomes give heaviest weighting to the criteria of job creation and local content, followed by local ownership and socioeconomic development, management control and enterprise development (Wlokas et al, 2012).

**Table 2.1: Economic development criteria of the RE IPPPP**

<b>Economic development elements</b>	<b>Weighting</b>
Job Creation	25 %
Local Content	25 %
Ownership	15 %
Management Control	5 %
Preferential Procurement	10 %
Enterprise Development	5 %
Socio-Economic Development	15 %
Total	100 %
Total Points	30 Points

**Source: Department of Energy (2011)**

The DoE saw an opportunity for the RE IPPPP to have a positive socio-economic impact in communities where it is located. Socio-economic development is defined in the procurement documents as “initiatives carried out by a measured entity towards the promotion of access to the economy by black people”. Four out of the mentioned seven economic development elements address specifically local communities in a radius of 50 km around the project site. These elements are job creation, local ownership, socio-economic development and enterprise development (Wlokas et al., 2012).

The National Development Plan identifies the need for South Africa to invest in a strong network of economic infrastructure designed to support the country’s medium- and long-term economic and social objectives. Energy infrastructure and services is a critical component that underpins economic activity and growth across the country. In order to properly plan for the electricity

needs of South Africa, an Integrated Resource Plan was developed to identify the preferred energy mix with which to meet electricity needs over the next 15 years. In line with the national commitment to transition to a low carbon economy, 17 800 MW of the mix is planned to be supplied from renewable energy sources (Department of Energy, 2015).

Dr Barnard in the department of Energy highlighted the following benefits at the Africa Energy Indaba, 2015 that are offered by the development of regional energy markets; improved security of supply; better economic efficiency; enhanced environmental quality; and wider deployment of renewable energy resources. He then explained that broadening our energy mix through tapping our vast renewable resources and fostering partnerships with the private sector is crucial in our quest to simultaneously address all dimensions of the energy trilemma, namely energy security, energy equity, and environmental sustainability.

The emergence of a Renewable Energy Industry provides potential for empowerment and job creation. Providing there is local manufacture of renewable technologies, the amount of jobs as a function of units of energy produced is much higher compared to conventional energy technologies. The manufacture of renewable technologies is more labour-intensive than conventional energy technologies and requires an appreciable labour force for manufacturing as can be seen from Table 2.2 below.

**Table 2.2 Potential renewable energy job creation compared to coal-fired power stations (DME, DANCED, 2001)**

<b>Resource</b>	<b>Danish Study (a)</b>	<b>New York State(b)</b>	<b>AWEA(c)</b>	<b>World Watch Institute (d)</b>
	man-years, same amount of energy	Jobs per mil. US\$. Invest	Jobs per mil. US\$. Invest	Jobs per TWh
Coal Fired Plant	6200	13.1	13	116
Photovoltaics		7.4		
Solar Thermal electricity				248
Wind generated electricity	14200	10.0	14	542
Biomass derived electricity		17.0-22.6		
Hydro-derived electricity		4.0	8	

a Source: I. Munksgaard, J. Rahbæk Pedersen, T. Jensen Societal benefits of wind turbines, part 3 Employment and balance of payment. (In Danish, AKF 1995)

b Source: 1994 New York State Energy Plan, Volume III: Supply Assessments, Table 57, p. 612.

c Source: American Wind Energy Association (AWEA) (1995)

d Source: Scheer (1993), p. 110.

The next section below will be discussing the white paper on renewable energy of which is important to understand the forecast on the future of energy in South Africa.

### **2.3 White paper on Renewable Energy (2003)**

In 1998, the White Paper on Energy was published in order to present a forecast on the future of energy in South Africa. It was a comprehensive document which included issues about using clean coal technologies and renewable energy. However, it did not set out specific targets to measure these objectives. In 2003, the Department of Minerals and Energy released a White Paper on Renewable Energy which set out the long-term goal of including 10 000 GWh of renewable energy into the grid by 2013 (Republic of South Africa, 2003b). The paper elaborates as follows:

‘The renewable energy is to be utilized for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 Megawatts) of the projected electricity demand for 2013 (41539 MW). This is equivalent to replacing two (2x 660 Megawatts) units of Eskom's combined coal fired power stations. This is in addition to the estimated existing (in 2000) renewable energy contribution of 115 278 GWh/annum (mainly from fuelwood and waste)’ (Republic of South Africa, 2003b: ix).

The White paper aims to encourage investment in the renewable energy sector in South Africa. It highlights the need to abide by sustainable development principles. An enabling environment needed to be created both financially and legally in terms of providing once-off finance for capital-intensive projects like wind and solar energy projects. As a result the Department of Energy has created a Renewable Energy Finance and Subsidy Office (REFSO) which has disseminated over R14, 5 million in subsidies since 2006 for renewable energy projects (Modise, 2011).

The REFSO is one of the initiatives that government undertook to aid renewable energy projects in becoming commercially viable. The project office has since closed due to the National Energy Regulator of South Africa's Renewable Energy Feed-in Tariff (NERSA's REFIT) programme being launched. The REFIT is “a mechanism to promote the deployment of renewable energy

that places an obligation on specific entities to purchase the output from qualifying renewable energy generators at pre-determined prices” (NERSA, 2009). The standard tariff electricity price in 2009 was averaging 25.24c per kilowatt-hour (kWh), and NERSA was proposing that Eskom purchase electricity from private producers of electricity.

The increase in price starts bringing the renewable energy prices on par with coal-based electricity prices in future years at the proposed tariff structure. The mass implementation of renewable energy technologies is still lacking to a large degree. It is now 2015, and there has been very little development in the renewable energy sector. The White Paper analyses the viability and application of the various renewable energy sources in South Africa, such as wind, solar, biomass, wood and hydro, but strangely does not discuss these options in terms of their savings in CO<sub>2</sub> emissions and the environmental impacts flowing from these renewable energy resources (Rumsey and King, 2009).

The CO<sub>2</sub> savings from renewable energy projects could aid South Africa in meeting its target of developing an environment that is protected for present and future generations, as indicated in the constitution of South Africa. An analysis of the renewable energy policy in South Africa indicates that there are numerous environmental decision-making processes that need to be examined. Environmental decision-making includes decisions that are made for both the physical and social environment. The term ‘environmental decision-making’ is used to ensure that issues around poverty, unemployment and health services are taken into consideration (Rumsey and King, 2009). The next section elaborates on the context of the eThekweni Energy Office and its role.

#### **2.4 Case Context: eThekweni Energy Office**

This section will give an overall outline of where the eThekweni Energy Office is located and the purpose of the eThekweni Energy. The eThekweni Energy Office is located in the eThekweni Municipality; this study will focus on the eThekweni municipality’s Energy Office. The eThekweni Energy Office is important in terms of being the main case study for this research and because of the role they play in renewable energy in the city of Durban. The eThekweni Energy

Office is a branch within the Treasury Cluster and under the Finance, Pensions and Major Projects Unit. eThekwini Municipality is located on the east coast of South Africa in the Province of KwaZulu-Natal (KZN). The eThekwini Energy Office is responsible for energy efficiency and renewable energy. It has a number of initiatives in the eThekwini area and all efforts in these areas are aligned to the city's Integrated Development Plan, and are focused on enabling eThekwini to become a sustainable energy hub for the Southern African region (eThekwini Energy Office, 2015).

The Energy Office is responsible for conceptualising and initiating projects in the following areas:

- Renewable Energy (generating energy from renewable sources, such as the sun);
- Energy Efficiency (helping use less energy); and
- Climate Change Mitigation (reducing our greenhouse gas (GHG) emissions).

The Energy Office's mission statement is to transform Durban's governance, social, development and economic systems in order to effectively mitigate climate change (eThekwini Energy Office, 2015).

#### **2.4.1 History of the Energy Office**

The eThekwini Municipal Energy Office was launched in early 2009 in response to the National Power Conservation Programme which set energy saving targets between 10% and 15% across all sectors in South Africa. Over the 2009/10 period the Energy Office initiated a number of pilot streetlight retrofit projects and various metering interventions as the city's first intervention in energy conservation (eThekwini Energy Office, 2015).

Parallel to the establishment of the EO, the eThekwini Municipality drafted a municipal Energy Strategy. The funding for this process was sourced through the UEMP. In January 2010, the eThekwini Municipality Council adopted the eThekwini Energy Strategy. This strategy significantly broadened the mandate and responsibility of the EO to promote sustainable energy interventions in the broader eThekwini Municipal area (eThekwini Energy Office, 2015).

Over the 2010-2014 periods, the responsibility of the EO grew to include renewable energy and climate change mitigation interventions. In 2014 the EO and Environmental Planning and Climate Protection Department jointly developed the Durban Climate Change Strategy (DCCS). The DCCS further expanded the mandate of the EO to respond directly to the challenge of Climate Change mitigation (eThekweni Energy Office, 2015).

The eThekweni Energy Office has 17 employed people working at the office. The people in management roles include an international energy transaction officer of which is the Co-acting senior manager whom focuses on strategic projects for the EO; a co-acting manager whom deals with procurement and infrastructure and special projects, climate change and mitigation manager who deals with implementation of Climate Change Mitigation interventions, there is a renewable energy manager being responsible to design and implement a strategic approach to renewable management in the eThekweni Municipality, there is also a climate change monitoring and reporting advisor, project officer: Energy Efficiency and lastly a project officer: Renewable Energy whom assists in renewable energy projects.

## **2.5 Conclusion**

This chapter provides the reader with a background and an idea of the context in which the energy issues are situated in South Africa and the policy context. It presented an analysis of the white paper on renewable energy (2003) of which is important when dealing with renewable energy research to understand its context and state in the country. This section provided an understanding of where the eThekweni Energy Office is located and what the eThekweni Energy Office is doing. It also shed light on the history of the eThekweni Energy Office, on how it was launched. The next chapter presents a review of literature and the theoretical framework of the study.

## **Chapter Three**

### **Conceptual Framework**

#### **3.1 Introduction**

This study will be reviewing literature, providing the reader with a picture of the state of knowledge in this topic being investigated and bringing together empirical evidence about this study. This chapter will have three sections; the first being the green economy, the second being ecological modernization and third and last section looking at local economic development. At the core of this discussion, much emphasis will be placed on the green economy of which is an approach that reflects the shift in thinking from a business as usual neoliberal economic approach, of which considers the environment as an infinite resource from which to grow the economy, to one that recognises that that the environmental system has thresholds or limits (UNEP, 2010).

Included in the first section in the literature review under the green economy section the focus will be on renewable energy and how the government intends to strategically develop renewable energy resources in the future in a systematic way. The challenge for the government will be to provide sufficient incentives for the renewable energy-based industries to develop, grow and to be sustainable in the long-term. South Africa's fiscal resources are however limited. The limited financial resources available for the renewable energy programme will be optimally used with a specific emphasis on ensuring that the global climate change resources and other financial resource are accessed to facilitate its implementation (Winkler, 2007). The second section of this study will consist of the Ecological Modernization theory strongly because this study will be exploring renewable energy resources and its impact on development and the ecological modernization theory will help the researcher investigate the problem. Ecological modernization can be used as a theoretical lens to examine the phenomenon of renewable energy adoption (Schelly, 2015).

The third section of this chapter will examine local economic development, the theoretical framework will draw on Nel and Rogerson's (2005) consideration of local economic

development as a process in which local government and community based groups manage their existing resources. Lastly synthesize and conclude from drawing upon the importance of these three sections and how each one links up with the other.

### **3.2 The Green Economy**

This section will firstly evaluate the concept of the green economy of which is vital because there are many definitions surrounding this concept. The Environmental Program of the United Nations (UNEP) defines green economy as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.” Thus green economies are not based on the demand, but on the idea of qualitative growth, where low-carbon and environmentally friendly technologies, as well as international cooperation play a key role (Barbier, 2010).

During the height of the global financial and economic crisis, the UNEP launched the Green Economy Initiative. The purpose of this initiative was to encourage governments to apportion a significant percentage of their stimulus packages to the following five critical areas; energy efficiency in old and new buildings; renewable energy technologies e.g. wind, solar, geothermal and biomass technologies; sustainable transport technologies e.g. hybrid vehicles, high speed rail and bus rapid transit systems; restoring ecological infrastructure e.g. freshwater ecosystem, forests, soils and coral reefs; and sustainable agriculture e.g. organic production (Barbier, 2010). UNEP referred to the use of these targeted investments to promote low-carbon economic growth and clean production as the ‘Global Green New Deal’.

Energy and climate traditionally have been ‘relatively discrete’ academic and policy domains and in many jurisdictions they remain so (Lovell et al., 2009b). Until recently, work in the social sciences on carbon has focused primarily on the downstream, post-utility end of economic activity, a terrain of emissions, sinks and wastelands lying beyond economy’s conceptual walls. Here the elemental moniker ‘carbon’ has stood in for carbon-dioxide equivalent, a fictitious molecular category through which several different greenhouse gases are made commensurable. These materiality’s of carbon have traditionally defined economy’s ‘outside’ but lately have become one of its leading edges: the brave new world of the ‘new carbon economy’ (Boykoff et

al., 2009; Brown and Corbera, 2003). However, limiting the label ‘carbon’ to this downstream portion is unnecessarily restrictive. There is an ‘actually existing’ carbon economy that extends backwards from the point of greenhouse gas emissions all the way upstream to the site of fossil fuel extraction. As Smil (2005) points out, a very large proportion of the world’s population is either already a ‘high energy society’ or aspires to be so and, for the most part, the sources of this energy are carbon-intensive fossil fuels. It is desirable, therefore, to extend the idiom ‘carbon’ beyond its conventional association with greenhouse gases to examine the installation and maintenance of contemporary fossil-fuel intensive forms of social life, and the cultural and political forms to which they give rise (e.g. Huber, 2009; Lohmann, 2005; Mitchell, 2009).

much of the geographical work on the new carbon economy focuses on the construction of climate policy and the governance of carbon markets, research has begun to focus on the enclosures and transformations necessary to produce sequestration landscapes as objects of speculation and instruments of profit – what Lohmann (2005: 204) terms the framing of ‘a carbon dump commodity’. As Bumpus and Liverman (2008) point out, there is a distinctive geography to this ‘spatial fix’ because: carbon reductions are like many other resources in that they can be expensive to obtain locally and are often easier and cheaper in the developing world, where industrial processes are generally less efficient, forest offsets are more effective, opportunities for implementing ‘cleaner’ energy systems may be less costly, and labor and land are generally less expensive. (Bumpus and Liverman, 2008: 131)

The concepts of “green economy” and “green jobs” have been gaining momentum. Two bills, the Green Jobs Act (passed as part of the Energy Independence and Security Act) and the American Recovery and Reinvestment Act of 2009 (ARRA, also known as the stimulus) have allocated tens of billions of dollars to jump-start the green economy in the USA, strengthened the concept of green, and lent it greater prominence. What green is, and what the green economy constitutes, however, is still a matter of contention. These green concepts, which broadly refer to an increasing environmental awareness among both consumers and producers, are both ambitious and ambiguous. There are many different stakeholders pushing for increased attention to and investment in green. Proponents argue that green jobs will revitalize the American economy and are well-paying jobs providing pathways out of poverty for a large number of

historically under-served, under- and un- employed workers. Others counter that the green economy is more hot air than reality, a politically useful but economically overhyped sales pitch (Georgetown Centres on Education and the Workforce, 2013).

The first obstacle to understanding and tracking the green economy is defining it. The task of defining and enumerating green jobs in the economy has been attempted by many disparate parties, from industry groups, labour unions and other worker's rights activists, academic and policy institutions, local, state and federal governments, to the workforce development and labour market information community. There are dozens of different definitions and approaches. Environmental and workforce advocates brought green to national prominence, but it has generally been the labour market economist and workforce development community at the forefront of measuring the green economy (Barbier, 2010).

Defining green is a difficult task. Questions that must be addressed in defining green include, but are not limited to: Is being green the same as being environmentally friendly? How is environmentally friendly defined? Does it include just products and services that are environmentally friendly? What about environmentally friendly production processes? Environmentally friendly can be a continuum, so how green does a product/process have to be to count? If a product is environmentally friendly but it is packaged, delivered, and marketed in an environmentally unfriendly way, is it still green? (Krugman, 2010).

These questions, and the reports that have attempted to tackle these issues, have led to two types of green definitions:

1. The social justice/worker-centred definition, which makes green contingent on the job quality and its potential to address poverty and related social problems;
2. The renewable energy and energy efficiency definition, which defines green as activities in the sectors related to creating renewable energy and increasing energy efficiency, also known as clean energy.

The broad environmental definition is expansive and the most widely-used by labour market analysts and economists. This definition, which encompasses all environmental activities,

includes environmental protection and remediation, and generally any activity that enhances, preserves, or restores the quality of the environment. Washington State defines green economy as, “rooted in the development and use of products and services that promote environmental protection and energy security. It is composed of industries and businesses engaged in: Energy efficiency; Preventing and reducing pollution; Renewable energy; Mitigating or cleaning up pollution. Green jobs promote environmental protection and energy security” (2009: 4). Furthermore, green economic activity is defined as products and services whose predominant function serves to conserve energy and other natural resources, and/or reduce pollution.

Transition to greener economies implies the formulation of an overarching integrated approach that links social, economic and environmental policies and actions designed to ensure sustainable development and poverty eradication (Stoevska and Hunter, 2012). Green growth strategies in developing countries need to be undertaken within this context and should ultimately address major priorities such as: providing basic education, housing and employment; ensuring food security and health coverage; and delivering essential services such as access to modern energy, water, sanitation, waste treatment and transport (Stoevska and Hunter, 2012).

“Green jobs” refers to the direct employment which reduces environmental impact ultimately to the levels that are sustainable. This includes jobs that help to reduce the consumption of energy and raw materials, decarbonize the economy, protect and restore ecosystems and biodiversity, and minimize the production of waste and pollution. Core environment-related employment refers to jobs which are sustained by activities that are more environmentally sustainable (as defined by compliance with relevant standards and other performance indicators in the study process) but which have not been ‘filtered’ for decency of work (Stoevska and Hunter, 2012). Due to this emerging status, it is difficult, at this point in time, to project employment demand and know exactly where green jobs are going to be, what they will look like, what industries and occupations they will be in, and what types of skills and training will be needed to fill them. Further, it is impossible to predict how the green economy will change the current workforce in the long-term, because many potential jobs, skills, and possibly even industries have yet to be invented and developed. Unforeseen technologies could play a decisive role in the development of the green economy (Smeddle et al., 2014).

According to this framework, green jobs are either jobs in businesses that produce goods and provide services that benefit the environment or conserve natural resources. These goods and services are sold to customers, and include research and development, installation, and maintenance services. This definition was used in the BLS survey of establishments in industries that produce green goods and services. Green goods and services fall into one or more of five groups; firstly energy from renewable sources. Electricity, heat, or fuel generated from renewable sources. These energy sources include wind, biomass, geothermal, solar, ocean, hydropower, landfill gas, and municipal solid waste. Secondly energy efficiency, products and services that improve energy efficiency: Included in this group are energy-efficient equipment, appliances, buildings, and vehicles, as well as products and services that improve the energy efficiency of buildings and the efficiency of energy storage and distribution, such as Smart Grid technologies (Stoevska and Hunter, 2012).

Thirdly pollution removal, greenhouse gas reduction, recycling and reuse can be constituted as part of the green economy. These are products and services that, reduce or eliminate the creation or release of pollutants or toxic compounds, or remove pollutants or hazardous waste from the environment. Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources. These workers research, develop, maintain, or use technologies and practices to lessen the environmental impact of their establishment, or train the establishment's workers or contractors in these technologies and practices. This definition was used in the BLS survey of establishments across all industries to identify jobs related to green technologies and practices used within the establishment. These technologies and practices fall into one or more of four groups from renewable energy sources (Stoevska and Hunter, 2012).

Generating electricity, heat, or fuel from renewable sources primarily for use within the establishment is further considered to be part of the green economy. These energy sources include wind, biomass, geothermal, solar, ocean, hydropower, landfill gas, and municipal solid waste. Using technologies and practices to improve energy efficiency within the establishment: Included in this group is cogeneration (combined heat and power) (Stoevska and Hunter, 2012).

The above section has discussed the green economy in terms of focusing on the definition and jobs in this sector and how difficult it is at this time to project employment demand and where these green jobs will be. This section also discussed green goods and services which fall into energy from renewable sources of which is electricity, heat, or fuel generated from renewable sources. Emphasis is placed on these energy sources wind, biomass, geothermal, solar, ocean, hydropower, landfill gas, and municipal solid waste. The next section will discuss in detail these sources.

### **3.3 Renewable Energy**

The term renewable energy is typically applied to sources of energy that are readily available and cannot be depleted. Essentially, all of our energy is derived from the sun, or from planetary motion and radioactivity decay that occur on a geological timescale. This statement holds true for both fossil fuel energy from coal, oil and gas as well as energy derived from wind, rivers and dams, the earth's heat, plant matter, waves and sea currents, and of course sunlight. South Africa has some of the best, if not the best conditions in the world for the use of solar energy (Smeddle et al., 2012).

#### **Types of Renewable Energy Technologies**

##### **a) Solar**

The solar conditions in South Africa present staggering financial and technical advantages. The following outlines the solar technologies that are commercially available in the current market. Photovoltaics (PV), convert sunlight into electricity, concentrating solar power mirrors to capture, reflect and concentrate sunlight into receivers that convert the sunlight into heat, using heat fluids, solar water heaters (SWHs), use sunlight to heat geysers for domestic use. They are comprised of a solar collector, which is mounted on a wall or roof with good sunlight exposure, a water storage tank and a backup electrical heating element (EERE, 2011a). Linear collectors use flat or parabolic mirrors to reflect sunlight into linear receiver tubes. These tubes are positioned along the focal line of the mirror, and contain a heat transfer fluid that once heated is used to create a steam to drive a steam turbine (EERE, 2011b)

## b) **Wind**

The quality of South Africa wind resource and its potential for the generation of wind power has been estimated by a variety of sources as being either quite poor or world –class. The quality of SA wind resources is highly dependent on specific local conditions, obstructions and variations in the land surface. Based on the meso-scale wind model of south Africa which was developed in 2008, it appears that potential wind market could be competitive with the top five wind markets worldwide (including the China, the USA, Germany, Spain and India) (Hagemann, 2011). This model estimates a realistic capacity of 26 GW. More detailed assessments are currently being carried out, most notably via the wind Atlas for South Africa (WASA) project (WASA, 2012).

Simple turbines such as water-pumping windmills achieve this with a flat tail, located downwind of the turbine blades, while large, power generating turbines actively adjust their orientation with automated orientation or yaw system. Large, grid –connected wind turbines are typically used to generate grid –connected power. Small off grid wind turbines, are available for localized electricity generation and battery charging, or for water pumping applications. Onshore wind turbines are applied to land turbines that are typically built in land areas noted for strength and predictability of their wind conditions. Alternatively, offshore wind turbines, are installed at sea, where lack of physical obstruction creates stronger, more predictable wind conditions. Off shore wind developments require significant additional investment in the apparatus used either to secure the base of the turbines to the ocean floor or to securely and stably float the turbine on the water’s surface (Hagemann, 2011).

## c) **Hydropower**

Hydropower systems make use of inland water resources for the generation of electricity. A body of water raised above sea level has inherent potential energy. This potential energy is converted into kinetic energy is converted into sound, vibrations and heat, which result from the friction between the flowing water and adjacent objects such as rocks in the riverbed. As a relatively dry country, with few large rivers, South Africa has somewhat limited potential for conventional, large hydropower plant. Small-scale hydropower are typically defined as

either impulse or reaction systems. Impulse systems use a water –wheel concept, whereby the turbine is placed outside of the water and is driven by the impact of a jet or stream of water. Large scale hydropower stations store water in a large dam and discharge it via turbines in the dam wall (Bossard, 2011). The water pressure at the turbine level forces water through the turbine structure. This rotates the turbine shaft, which in turn drives an electrical generator. Water that passes through the turbines is discharged into the river, downstream of the dam. Conventional hydropower plants can produce large amounts of electricity (Bossard, 2011).

#### d) **Sea**

Sea energy commonly referred to as ocean or marine energy, encompasses all technologies designed to extract energy from waves and tidal and ocean currents. Sea energy technologies convert the kinetic energy from waves and currents into useful mechanical motion, which in turn used to pump, or generate electricity. Sea energy systems are relatively young in terms of development, and are largely in a pre-commercial phase. Wave energy systems convert energy of ocean waves into usable energy forms. A wide array of wave energy devices are currently under development around the world. In general, these devices fall into the following categories drawn from Crses (2011): Point absorbers are devices comprised of a floating buoy or structure, which is secured to the ocean floor via a cable or moveable arm. Linear absorbers consist of elongated, snake-like, segmented structures that float on the surface. As wave passes under the absorber, the segments shift in relation to one another, driving interconnected hydraulic pistons that, in that, drive an electrical generator unit. Wave terminators aim to absorb fully the energy of incoming waves by catching and terminating the wave itself. They typically utilize wide arms that channel and concentrate incoming waves into a central absorber unit, which converts the wave energy into useful mechanical motion. Oscillating water columns use wave action to compress air in a column. As waves rise under the device they increase the air pressure in the column, driving an air turbine at the top of the device. Similarly as the waves drop away, they create negative pressure, drawing air in from the top of the column, and driving the air turbine in the opposite direction (Smeddle et al., 2012).

e) **Geothermal energy**

Geothermal energy system converts heat from the earth's crust into usable forms, typically through the application of heat exchange technologies. Depending on the location, geothermal resources can be found in shallow ground or in hot water or rock that is several kilometers below surface (EERE,2011g)

f) **Bioenergy**

Bioenergy is renewable energy derived from biological sources such as wood, leaves, seeds, alge, waste products, and many others. Bioenergy is used to generate electricity such as fuel for transport and heating applications. Bioenergy is used in solid, gaseous, or liquid forms, as discussed below. For example, biomass harvested in the form of wood must come from a sustainably managed forest, where the rate of harvest or deforestation is equaled or exceeded by the rate of growth or reforestation (Smeddle, 2012). South Africa makes significant use of bioenergy resources, most commonly in the form of biomass, although not all of these cases are truly sustainable or renewable.

g) **Biomass**

Many South Africans who lack access to modern energy services use traditional biomass, in the form of wood burning for cooking and heating. In some cases, the wood is derived in a sustainable manner, while in others it is gathered unsustainably. The South African sugar industry also uses biomass to generate process heat and electricity. Sugar is extracted from sugar cane by squeezing and compressing the cane. A portion of the dry, fibrous by-product or bagasse is burned as a fuel in cogeneration processes, producing process heat and electricity (Smeddle et al., 2012).

h) **Biofuels**

From about 1920 until the 1960s South Africa blended bio-ethanol derived from sugarcane into petrol. This practice fell away with increasing use and declining costs of crude oil in the 20<sup>th</sup> century (DME, 2007). Rising oil prices and concerns over carbon emissions associated with the use of transportation fuels derived from crude oil has

revived the biofuels discussion in South Africa, with the department of minerals and energy releasing a national biofuels strategy in 2007 (DME,2007)

i) **Hybrid systems**

Many renewable energy systems, particularly wind, solar and wave energy systems rely on weather patterns that may be unpredictable, or might not correspond with existing energy use patterns. Hybrid renewable energy systems make of multiple renewable energy technologies, or combine renewable energy technologies with fossil-fuels based systems, with the aim of improving reliability while increasing sustainability (Smeddle et al., 2012). The benefits of coupling different renewable energy technologies can be enhanced by spreading the installed systems over a wide geographic range. This reduces the effect of localized lulls in wind or sunlight (Smeddle et al., 2012).

This study has looked at the different types of renewable energy technologies such as; solar, wind, hydro power, sea, geothermal energy, bio-energy, biomass, biofuels and hybrid systems.

### **3.4. Aligning potential renewable benefits with local motivation and priorities**

According to Smeddle, though renewable energy technologies can provide new economic opportunities, can contribute to high standards of living, and reduce the impacts of society on ecosystems, these technologies are all at unique stages of development, and offer varying potential benefits in specific regions (Smeddle et al., 2012). Growing concern has led many to question the conventional energy development approach and to propose mechanisms for enabling local communities to become better informed about, and more closely involved in, energy development in their locality. For example, it has been suggested that ‘local energy end-users could and should participate in energy planning and their grasp of energy issues as end-users—coupled with their knowledge of local conditions—needs to be fully integrated into the decision making process (Devine, 2005). More local or community-embedded examples of these could involve local use of energy generated by local plant, as might exist in a local district heating scheme, a ‘private wire’ mini-grid electricity network or generation technologies such as solar photovoltaic panels on community buildings. Economic benefits can be locally embedded through local distribution of profit generated by sales of energy or financial benefits from energy

saved by efficiency activities (in common with the ‘negawatt’ concept of Von Weizsäcker et al., 1998), local training and employment opportunities and local shareholding. Shareholding can also involve individuals resident outside of the local community, forming part of a more spatially dispersed ‘community of interest’ involved in, and supportive of, the development (Devine, 2005).

While wind and solar PV technologies are commercially mature and increasingly readily available, other technologies such as wind and solar technologies such as wave energy and tidal energy converts are still largely pre-commercial. Thus, the potential benefits of such technology type are very different. Wind and solar technologies might offer significant potential for the cleaner expansion of local electricity generating capacity. The potential advantages and disadvantages of renewable energy technologies should therefore be closely assessed before initiatives to promote their development is included in a local sustainable energy strategy. In order to do this, through assessment of a variety of local conditions, and their potential to help or hinder renewable energy integration, should be conducted (Smeddle et al., 2012).

Renewable resources are widely seen as the means to address the challenges of climate change, peak oil and energy insecurity, and can be of key importance in the development of sustainable society (REN21, 2009). Renewable resources can provide new economic opportunities, contribute to higher standards of living and reduce the impacts of society on ecosystems, among other things. The use of renewable based technologies, as an extension of the concept of “environmentally sound technologies” introduced through the agenda 21 (UN, 2009), is often believed to contribute to sustainability in general (Smeddle et al., 2012).

Energy production has been, and still is, one of the main contributing factors to the social and economic development of South Africa. It has lent prosperity and security to the country by providing heat and power for industry, transportation, and household use. The sector has been largely driven by economic and political forces, which have had a profound impact on energy policies (Davidson & Winkler, 2006). Worldwide, efficient, cheap and reliable energy resources are now increasingly being demanded. Certainly, this is the reason why oil and natural gas have dominated the energy market many years and will continue for some time, despite the change in oil price.

Furthermore, most of current infrastructure depends on these fuels, meaning that they will be increasingly be disputed by various countries. However, the current debate is about the physical and economical oscillations of these resources, together with a strong political instability in regions with oil reserves, without considering awareness of the use of fossil fuels as contribution to global climate change. There are several worries in the areas of Energy and Environment. Firstly, global warming, caused by emission of greenhouse gases (GHGs) as a result of the burning of fossil fuels. These forecasts about climate changes affect, especially, agriculture and many species of animals and plants. Secondly, the population growth in many countries of the world, particularly in China and India. Thirdly, the continued growth trend of supply and demand of energy in the world. Fourthly, the global dependence on oil and its derivatives, in particular from the countries of the Middle East. (Teles et al, 2015).

Decision-makers, societal groups and scientists have at various moments in time expressed their interest in renewable energy sources such as power from wind, sun and biomass-derived fuels. Recently, this interest has been on the rise. Several reasons are mentioned for this: the risk of energy supply insecurity and the corresponding need for resource diversification, the prospect of depletion and hence cost increases of conventional oil and gas occurrences and the adverse impacts of climate change and local air pollution as a result of fossil-fuel burning related emissions (van Vuuren et al, 2009).

The concerns show up in questions asked by policy makers, citizen groups and industrial firms: How fast can renewable energy sources expand? When will they be competitive with conventional energy options? Which role can they play in reducing greenhouse gas emissions and which are the best policy instruments to stimulate their introduction? To answer such questions adequately, it is necessary to have proper insight in the potential availability of renewable energy sources at different costs levels, and also in the evolution of the energy system in which these resources have to be implemented (van Vuuren et al, 2009).

The potential availability of wind, solar and biomass energy varies over time and between locations. This variation is not only caused by the resource characteristics (wind/solar regime, soil) but also by geographical (land use and land cover), techno-economic (scale, labour cost)

and institutional (policy regime, legislation) factors. Some of these factors cannot or can only approximately be quantified. As a consequence, an assessment of the long-term role of renewable energy sources has to rely on a combination of data from observations, mathematical models and narratives that is, on scenarios (De Vries, 2006).

Renewable energy technologies are increasingly being utilized in the South African context. Due to its climate, South Africa is ranked as a country with the highest potential for the use of renewables. Renewable technologies are becoming incrementally more affordable, and individuals, developers and local authorities are more often including the use of renewable technologies in their development planning (Smeddle et al, 2012). Municipality originated that renewable energy programmes face a number of general challenges and barriers that limit significant widespread deployment in South Africa. The challenges can be classified as natural factors, economic and financial factors, institutional and regulatory barriers, research and development barriers (Painuly, 2001). Thus in order to ensure the sustainable utilization of renewable energy, political leadership, proper planning and innovative funding efforts, that address these challenges are required (Smeddle et al, 2012).

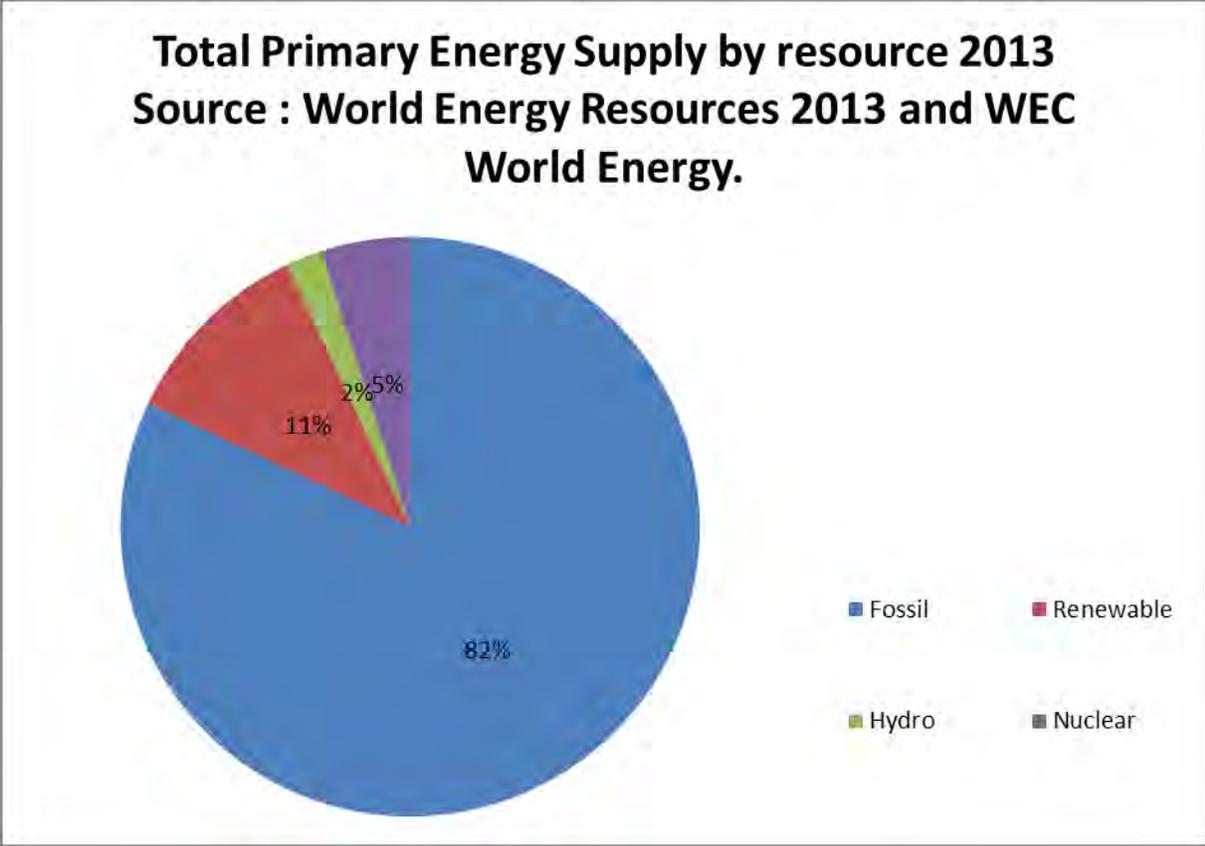
Large-scale renewable energy implementation plans must include strategies for integrating renewable sources in coherent energy systems influenced by energy savings and efficiency measures (Li, 2005); (Muneer and Munawwar, 2005); and (Hvelplund, 2006). First, the major challenge is to expand the amount of renewable energy in the supply system. Renewable energy is considered an important resource in many countries around the world (Alnatheer, 2005); (Gnansounou, Dauriat, and Wyman, 2005). The supply and use of energy have powerful economic, social and environmental impacts.

Not all energy is supplied on a commercial basis. Fuels, such as fuelwood or traditional biomass are largely non-commercial. Fuelwood is playing a leading role in the developing countries, where it is widely used for heating and cooking. Universal access to commercial energy still remains a target for the future. In many countries, especially in Africa and Asia, the pace of electrification lags far behind the growing demand. It is imperative to address this major challenge without further delays, in particular taking into account the impact access to electricity

has on peoples' lives and well-being, economic growth and social development, including the provision of basic social services, such as health and education (Lior, 2010).

A change for a renewable energy system will demand large investments and good planning and strategy in the medium and long-term. In addition, there is a socio-political appeal on the development of renewable energies, especially among those who are worried about excessive industrial growth and the domination of basic energy by some groups (Lior, 2010). It is proposed that, in order to accelerate the transition to renewable energy system, the breaking of all energy systems is necessary (Verbruggen et al., 2010). The intervention is necessary to encourage the development of renewable energy sources that are widely available (Verbruggen et al., 2010). However, the intense transformation is not an answer to get to a sustainable energy system, at the risk of causing a serious impact on the energy market, economy, environment and society. According to Omer (2008) the solutions to these energy questions require the achievements of feasible actions over long-term, to ensure that development can be truly sustainable it was further emphasized by Markevicius et al., (2010).

In this light, effective policies promote the development of sustainable energy taking into consideration the limits of renewable energy in terms of technical and commercial feasibility. The adoption and abandonment of economic and market policies that provide little incentive for technological innovation and energy development does not help the energy transition in a view of sustainability (Omer, 2008).



**Fig 3.1: Total Primary Energy Supply by Resource 2013**

The above figure shows that renewable energy is only eleven percent of the total primary energy supply in the world. This shows that fossil fuels is the dominant energy supply in the world still, but also gives us an indication that renewable energy can grow or has the potential to be used. Problems with energy supply and use are related not only to global warming that is taking place, due to effluent gas emission mainly CO<sub>2</sub>, but also to such environmental concerns as air pollution, acid precipitation, ozone depletion, forest destruction and emission of radioactive substances (Omer, 2008).

These issues must be taken into consideration simultaneously if humanity is to achieve a bright energy future with minimal environmental impacts. Much evidence exists, which suggests that the future will be negatively impacted if humans keep degrading the environment (Omer, 2008). The World Summit on Sustainable Development in Johannesburg in 2002 committed itself to

“encourage and promote the development of renewable energy sources to accelerate the shift towards sustainable consumption and production”. Accordingly, it aimed at breaking the link between resource use and productivity. This can be achieved by the following; Trying to ensure economic growth does not cause environmental pollution, improving resource efficiency. Examining how taxes, voluntary agreements, subsidies, regulation and information campaigns, can best stimulate innovation and investment to provide cleaner technology (Omer, 2008).

The development of a renewable energy in a country depends on many factors. Those important to success are; Motivation of the population towards awareness of high environmental issues, rational use of energy in order to reduce cost. Subsidy programme should be implemented as incentives to install renewable energy plants. In addition, image campaigns to raise awareness of renewable technology. Technical product development which is to achieve technical development of renewable energy technologies the following should be addressed, increasing the longevity and reliability of renewable technology, adapting renewable technology to household technology for example hot water supply, integration of renewable technology in heating technology, integration of renewable technology in architecture, e.g., in the roof or façade, development of new applications, e.g., solar cooling and cost reduction (Omer, 2008).

The government intends to strategically develop the renewable energy resources in the future in a systematic way, the challenge for the government will be provide sufficient incentives for the renewable energy based industries to develop, grow and to be sustainable in the long-term. South Africa’s fiscal resources are however limited. The limited financial resources available for the renewable energy programme will be optimally used with a specific emphasis on ensuring that global climate change resources and other financial resource are accessed to facilitate its implementation (Winkler, 2007). In South Africa, the development of the renewable energy industry is held back by lack of ambitious policy that would encourage investment. Further administrative bottlenecks slow the uptake of renewable energy (Koplow and Kretzmann, 2010). Renewable energy industry would promote job creation. In a 2003 South African study, Austin (2003) concluded that large scale deployment of renewable energy technologies substantially increases the number of jobs in the energy sector. These are borne from the manufacturing of Renewable energy components as well as the installation and operation of renewable energy

plants. South Africa's abundant renewable energy resources (wind, solar, water) and extensive biodiversity offer new opportunities for the transition to a green economy and green jobs (Sutherland et al., 2011).

Renewable energy requires a balanced mix of technical, financial and legal professional service providers, innovative funding, interdepartmental leadership and project championship to be successful. Decision making with regard to renewable energy projects is facilitated if the decision makers, be they councillors or officials acting under delegated authority, and are assured that the decision to embark on the project in question justified from a governance and mandate perspective. It is therefore fundamental to the planning of renewable energy projects that their proponents must understand the legal framework within which local government may embark on these projects. The white paper on renewable energy (2003) is a foundational document aimed at promoting renewable energy development in South Africa (Smeddle et al, 2012). A fundamental aspect of the national development plan, which was released by the national planning commission with a vision for 2030, is the need for South Africa to move away from unsustainable use of natural resources and transition to a low carbon economy (Smeddle et al., 2012).

Project planning is important, Successful application of renewable technologies also require: acceptance by decision makers in the building sector (architects, house technology planners, etc.), integration of renewable technology in training, demonstration projects/architecture competitions, renewable energy project developers should prepare to participate in the carbon market by: ensuring that renewable energy projects comply with Kyoto Protocol requirements, quantifying the expected avoided emissions, registering the project with the required offices, contractually allocating the right to this revenue stream (Omer, 2008).

Energy Saving measures are also important because they speak to the following, the following energy saving measures should also be considered: building integrated solar PV system, day-lighting, ecological insulation materials, natural/hybrid ventilation, passive cooling, passive solar heating, solar heating of domestic hot water, utilization of rainwater for flushing. Energy efficiency and renewable energy programmes could be more sustainable and pilot studies more effective and pulse releasing if the entire policy and implementation process was considered and

redesigned from the outset. New financing and implementation processes are needed which allow reallocating financial resources and thus enabling countries themselves to achieve a sustainable energy infrastructure. The links between the energy policy framework, financing and implementation of renewable energy and energy efficiency projects have to be strengthened and capacity building efforts are required (Omer, 2008).

There is strong scientific evidence that the average temperature of the earth's surface is rising. This is a result of the increased concentration of carbon dioxide and other GHGs in the atmosphere as released by burning fossil fuels. This global warming will eventually lead to substantial changes in the world's climate, which will, in turn, have a major impact on human life and the built environment. Therefore, effort has to be made to reduce fossil energy use and to promote green energies, particularly in the building sector (Omer, 2008).

Energy use reductions can be achieved by minimizing the energy demand, by rational energy use, by recovering heat and the use of more green energies. This study was a step towards achieving that goal. The adoption of green or sustainable approaches to the way in which society is run is seen as an important strategy in finding a solution to the energy problem. The key factors to reducing and controlling CO<sub>2</sub>, which is the major contributor to global warming, are the use of alternative approaches to energy generation and the exploration of how these alternatives are used today and may be used in the future as green energy sources (Omer, 2008). Focusing policy on the most important environmental impacts associated with the use of particular resources, rather than on the total level of all resource use which leads to the next section this study will be elaborating on.

### **3.5 Ecological Modernisation Theory**

Ecological modernisation in the energy sector is defined as the promotion of energy efficiency and renewable energy. Ecological modernisation can be used as a theoretical lens to examine the phenomenon of renewable energy adoption (Schelly, 2015). Ecological modernisation theory argues that societies in advanced state of industrialization take on ecologically benign production technologies and political policies, suggesting that modern societies could be on course to alleviate the ecological damage caused by capitalism (Schelly, 2015). This theory has the

assumption about modern economies and technologies; it can be used as a theoretical lens to examine the phenomenon of solar energy adoption. This theory sheds light on the increasing adoption of solar energy adoption in both developing and developed regions and the potential social conditions for promoting renewable energy technology adoption (Schelly, 2015).

Ecological modernization is a concept introduced by the EU's Fourth Environmental Action Programme (Baker, 1997). Essentially, it describes a set of processes and perspectives whereby capitalism is currently trying to achieve its version of sustainable development. EM is currently replacing the earlier phase of crude, environmentally damaging, industrial capitalism. For capitalism, crucially, sustainability includes the premise that the system of capitalism itself must be sustained. Christoff (1996) has reviewed the concept of EM. He describes it as a set of processes by which the content and style of environmental policy in the West have changed in the 1980s, involving, for instance, the precautionary principle, a push for integrated regulatory approaches, voluntarism and market-based incentives. All these are seen as alternatives to regulation and force, and they have ostensibly led to greater integration of economic and environmental policy in countries such as Germany and Japan, The Netherlands and Scandinavia, whereby such countries seem to have achieved decreased energy and materials use per unit of GNP produced.

These processes include:

- EM as a set of technological adjustments and innovations which would anyway have been undertaken to improve market competitiveness, and where environmental gain is incidental (fuel efficient cars);
- EM as a 'policy discourse' (Christoff, 1996), where new goals are assumed in public policy, which are supposed to inform all economic policy and activity. An example is the Fifth EU Action Programme for the Environment, incorporating such principles as the polluter pays, the precautionary principle, burden of proof on actors rather than the damaged party and that environmental protection can be profitable to firms. The Programme advocates that these principles should underlie all EU social and economic policy. This discourse, says Christoff (1996, 482), is 'utilitarian', holding that economic

growth can be reconciled with resolving environmental problems, and ‘allowing governments to back away from regulation’. However, there are some obvious reservations about EM.

First, some of the environmental improvement which has been achieved has come at a cost of displacing environmentally harmful activities to newly industrialized and less developed countries. We have been receiving in the mid-1990s a rising amount of publicity about the steady flow of toxic wastes from Western countries to India, for instance. EM as currently conceived is only ‘weakly ecological’, according to Christoff, for it is economically reductionist, attempting to monetize the environment. This therefore makes it subject to the objections to monetization often voiced by environmental groups (see Jacobs, 1991, for instance). It is ‘a version of ecological sustainability in the wasteland of a vastly depleted biological world’ (Christoff, 1996, 486).

Furthermore this makes it dependent on technocratic elites (scientific and economic experts) and state control. Secondly, it is not truly international and holistic. It does not take into its accounting the kinds of displacement cost mentioned above, nor the environmental/social costs of so-called ‘efficiency gains’ through globalization of the economy and so-called ‘comparative advantage’ in trade. Lastly, says Christoff, EM is conceived as the only, exclusive, way to ‘development’ and ‘sustainability’, ignoring the diversity of possibilities raised by different cultures and approaches to economics. In other words, it is part of, not a counter to, the mainstream modernization model.

The theory of ecological modernisation has become a focus for academic debate in recent years. As part of an essentially sociological discussion on the nature of modernity, ecological modernisation has been identified as one of the ways in which late modern society is responding to its increased awareness of, and anxiety about the ecological risks associated with industrialism (Murphy and Gouldson, 2009). In each case ecological modernisation is centrally concerned with the relationship between industrial development and the environment. Consequently, it is concerned with the capacity of modern industrial societies to recognize and respond to existing and emergent environmental problems (Murphy and Gouldson, 2009).

EMT offers theoretical conceptualisation of the relationship between industrialization and environmental protection. EMT allows for an analysis of “the necessary development of central institutions in modern societies to solve the fundamental problems of the ecological crisis” (Schelly, 2015). According to EMT, achieving certain levels of advanced industrialization influences institutional capacity for considering ecological consequences and addressing ecological concerns. EMT contends that at a certain level of modernisation, industrial growth and success will require an ecological rationality. Industry will thus consider ecological impact as a major component of any cost-benefit analysis, will minimize environmental externalities, and will increase the efficiency of production to the maximum possible level, all because it will be rational to do so (Schelly, 2015).

Furthermore, ecological modernisation sheds light on the increasing adoption of solar energy technologies in both “developing” and “developed” regions and the potential social conditions for promoting renewable energy technology adoption (Schelly, 2015). Ecological modernisation theorists contend by extension that the use of solar energy technology is yet another step in the process of modernisation in capitalist production processes, geared towards ecological sustainability for the sake of both profit and industrial longevity. Ecological modernisation offers theoretical conceptualization of the relationship between industrialization and environmental protection. Ecological modernisation therefore allows for an analysis of “the necessary development of central institutions in modern societies to solve the fundamental problems of the ecological crisis (Schelly, 2015).

Ecological modernisation envisages a process of the progressive modernisation of the institutions of modern society, the basic argument is that the central institutions of modern society can be transformed in order to avoid ecological crisis. In this view ‘the current capitalist system is seen as having the capacity to develop sustainable solutions to environmental problems, that capitalism’s drive for innovation can be harnessed to realize environmental improvements’ (Beveridge and Guy 2005: 666). An ecological modernisation approach would involve both structural changes at the macro-economic level, through broad sectoral shifts in the economy, and at the micro-economic level: for example, through the use of new and clean technologies by individual firms. For its proponents, ecological modernisation indicates the possibility of

overcoming environmental crises without leaving the path of modernisation. Rather, the assumption is made that it is possible to restructure processes of production and consumption on ecological terms through the institutionalization and internalization of ecological aims (Gibbs, 2009).

Ecological modernisation has also gained purchase as a pragmatic political programme to combine environmental policy-making with economic development (Huber, 1985). Proponents of ecological modernisation argue that we have already seen this process at work in countries such as Japan, the Netherlands, Germany, Sweden and Denmark (Mol, 2002). In these countries, material flows have become delinked from economic flows, with a consequent decline in the use of natural resources and emissions. As a pragmatic political programme, ecological modernisation approaches suggest that this will engender support from private-sector businesses, given that it can have beneficial outcomes (Hajer 1995; Harvey 1996). It is claimed business can gain advantages in a number of ways (Drysek 1997). Through greater business efficiency due to reduced pollution and waste production, avoiding future financial liabilities, such as the potential cost of contaminated land clean-up, through improved recruitment and retention of the workforce due to the creation of a better work environment, from the potential for increased sales of more 'environmentally friendly' products and services. Through the sale of pollution prevention and abatement technologies as a political programme a shift towards ecological modernisation would involve a number of interrelated measures (Gouldson and Murphy 1997).

The restructuring of production and consumption towards ecological goals includes the development and diffusion of clean production technologies, decoupling economic development from the relevant resource inputs, resource use and emissions, exploring alternative and innovative approaches to environmental policy, such as 'economising ecology' by placing an economic value on nature and introducing structural tax reform, integrating environmental policy goals into other policy areas; and the invention, adoption and diffusion of new technologies and production processes. It could thus be argued that ecological modernisation has a well-developed perspective on how to conceptualise economy–environment relationships and a set of policy prescriptions that, if taken as a whole, would engender the development of a new economic trajectory (Gibbs, 2009).

One of the central arguments of the *Manifesto* is that human-induced environmental impacts could one day become “decoupled” from economic growth. As noted, this has long been the fantasy of neoclassical economists, who want to have their cake and eat it too. But rather than addressing the fundamental flaws of a growth-obsessed economy, the ecomodernists assume that economic growth is both necessary and possible in the long term and that, therefore, technology will have to do the work of decoupling. “Decoupling of human welfare from environmental impacts will require a sustained commitment to technological progress and the continuing evolution of social, economic, and political institutions alongside those changes” (Borowy et al, 2014). The authors thus argue that the *relative* environmental impact of humans has decreased in some domains, even though there has not been an absolute decoupling of these aggregated impacts. They cite as evidence the fact that many countries have reduced their carbon intensity over the past few decades, meaning that they get more economic bang for their energy buck, partly because of increases in energy efficiency (Borowy et al, 2014). However, to hold aggregate ecological impact over time constant with growth, eco-efficiency would need to improve at the same rate as the economy grows, which places a heavy burden on engineers and inventors. More troublingly, the ecomodernists fail to address the deeper problem that absolute, aggregated impacts have continued to climb the concentration of GHGs in the atmosphere is increasing (Borowy et al, 2014). .

Renewable energy production has, so far, overcompensated for the decline in production in nuclear energy, and there is every indication that it could continue to do so. It is true that Germany, along with many other countries, is still powered in part by coal. But Germany, unlike national governments in Canada or the United States, has a long-term energy plan to wean itself from fossil fuels (Borowy et al, 2014). Why abandon those gains in favor of nuclear power (a proven liability) and carbon capture and storage (which reinforce the fossil-fueled status quo)? Rather than ramping up on dangerous forms of energy production to meet increased economic activity, the world needs less (and also different) economic activity and a sustainable population, which could then create the possibility of powering the world via renewable resources. That is, degrowthists and ecomodernists agree that economic growth creates energy problems, but the two camps differ starkly in their response to this dilemma (Borowy et al, 2014). For the

ecomodernists, population and economic growth are taken as givens, and thus governments are forced into making difficult decisions about energy, including support for conventional, hard energies, from coal and gas to nuclear power. For degrowthists, population growth and continued economic expansion are seen as undesirable and essentially impossible in the medium term, and thus the solution is to live within biophysical limits, and reduce global energy demands to a level that could be safely met by renewables (Borowy et al, 2014).

According to Borowy et al. (2014), the authors of *An Ecomodernist Manifesto* are seen to have their collective hearts in the right place. There is no argument that the human economy needs to “decarbonize” or that growth will create new energy challenges (Borowy et al, 2014). There is no argument that “humans are completely dependent on the living biosphere” and that ecosystems need to be protected and strengthened. We agree that climate change, ozone depletion, and the acidification of the ocean constitute real threats to the prospects of a sustainable future. Further, there is no argument that a sustainable society is one that would promote human wellbeing, public health, and life satisfaction” (Borowy et al, 2014). But unfortunately, the authors also argue that the vision put forth by the ecomodernists, with its technophilia and support for endless economic growth, falls well short of crafting a set of objectives that can or should be adopted globally. There is thus the argument that there is nothing really “eco” about ecomodernism, since its base assumptions violate everything we know about ecosystems, energy, population, and natural resources. Fatally, the ecomodernists are seen as neglecting to identify the ultimate ill that plagues us as a planet and global society, this is the addiction to growth-based economics, rooted in finite and polluting fossil fuels, and the sprawling industrial society that these energy sources and policies have facilitated over the past two hundred and fifty years; deeper still, they subscribe to the pig-headed belief that all of this necessarily equates to a desirable mode of development (Borowy et al, 2014).

Beyond the above debates, ecological modernisation is essentially a realist perspective on the ‘green economy’, with Barry and Doran (2006) arguing that there is little to be gained from ‘a complete rejection of consumption and materialism’ even though there is a need for the reassessment of materialistic lifestyles, the delinking of quality of life from material goods and the introduction of new economic signals (Barry and Doran, 2006: 252). Barry and Doran (2006)

further argue that ecological modernisation should be seen as a ‘jumping off’ point for more radical shifts towards a green economy and politics, rather than as an end in itself. Concepts derived from work on ecological modernisation have become incorporated into the policy agenda, even if their actual implementation is limited and they have so far largely been drawn from ‘weak’ conceptions of ecological modernisation (Barry and Paterson, 2003). In total, then, ecological modernisation envisages a process of the progressive modernisation of the institutions of modern society in order to mitigate ecological crisis.

Moreover, this can supposedly be achieved without leaving the path of modernization (Mol and Spaargaren, 1993). The assumption is that processes of production and consumption can be restructured on ecological terms through the institutionalisation of ecological aims. From this perspective the capitalist system, supported by regulation, has the capacity to develop sustainable solutions and the greening of the economy through the market. As Roberts and Colwell (2001: 424) observe “ecological modernisation suggests that it is possible to integrate the goals of economic development, social welfare and environmental protection, and that through this reconciliation synergies will be generated which can be harnessed and put to good use”. The key importance for the argument developed in this paper, however, is that these moves towards ecological modernisation have “created a space and an increased need for a form of business which looks to work across two logics that have often been seen as incompatible: the commercial and the environmental green” (Beveridge and Guy, 2005: 667).

Initially, the concept of ecological modernisation was developed by Martin Jänicke in the early 1980s to describe the common field of ecology and economy. A policy for ecological modernisation is defined as the sum of government actions aimed to stimulate environmental innovations and their diffusion (Reiche, 2010). According to ecological modernisation nations that reach a state of modern industrialization can and will develop industrial policies that promote environmental responsibility. Ecological modernization has been profusely challenged for its failure to actually predict current policy structures (York and Rosa, 2003).

Yet the theory does offer insight into how to promote renewable energy technology adoption. According to this theoretical framework, nations must be able to advance to a modern level of

industrialization before it will be in their best interest to adopt environmental responsibility as a key pillar of industrial policy (Schelly, 2015). Ecological modernisation has framed environmental discourse and the tools used for environmental management for the past thirty years in developed and developing countries. This mainstream approach relies on science and technology and addresses problems of efficiency rather than need (Oelofse et al., 2006). From this perspective the capitalist system, supported by regulation, has the capacity to develop sustainable solutions and the greening of the economy through the market. As Roberts and Colwell (2001: 424) observe that ecological modernisation suggests that it is possible to integrate the goals of economic development, social welfare and environmental protection, and that through this reconciliation synergies will be generated which can be harnessed and put to good use (Gibbs, 2009).

Ecological modernization theory provides a technical fix for environmental problems but without addressing the structural logic of the capitalist system which promotes inequality. In this regard, environmental justice advocates argue that the profit driven logic of capitalism means that the very technologies that can mitigate the adverse consequences of climate change comes at a price which most developing countries cannot afford. In fact, the resolutions and commitments of the past UN global climate changes conference, including the most recent one held in Paris in 2015, have floundered primarily because the promised funds to purchase the technologies to promote climate change adaptation strategies in developing countries failed to materialise. Furthermore, some critics argue that EMT from its origins and application in Western Europe does not really speak to the reality developing countries. Key proponents of EMT, Spaargaren and Mol have argued that the only possible way out of the ecological crisis is by going further into industrialization, however, many developing have not reached the stage of industrialization while others like South Africa are de-industrialising (Spaargaren and Mol, 1995)

### **3.6 Local Economic Development**

Local Economic Development first appeared on the development scene in South Africa in the early 1990s with the demise of apartheid in 1994, and within a remarkably short space of time it

experienced a radical transformation in its acceptance and credibility, from being regarded as a rural curiosity to becoming mainstream development policy (Nel et al., 2009).

Local economic development can be viewed as an attempt to address increasing socio economic problems including low economic growth, high levels of unemployment and high levels of poverty. Local economic development is now included firmly on the agenda of many national governments and international agencies acknowledging its prominent role in urban development and business promotion (Nel & Rogerson, 2005). The concept of local economic development has gained widespread acceptance internationally as being a locality based response to the challenges posed by globalization, devolution and local level opportunities and crisis (Rogerson, 2003; Nel & Rogerson, 2005).the theoretical framework rely draw on Nel and Rgerson's (2005) consideration of local economic development as “.. process in which local government and community based groups manage their existing resources and enter into partnership arrangement with the private sector, or with each other to create new jobs and stimulate economic activity in economic area” (Zaaijer & Sara, 1993 in Nel & Rogerson, 2005).

Broadly speaking LED, around the world and in South Africa, is associated with concepts such as partnership-based development, and local responses to local crises and opportunities using local inputs and resources as far as is practicable (Nel & Rogerson, 2005; World Bank, 2006). Within this context, Local Economic Development (LED) is now widely practiced around the world, and is closely associated with decentralization and devolution policies, localized responses to changing global geo-economies and what are often locally-specific factors, such as economic crises, job loss or new wealth-generating opportunities (Glasmeier, 2000; Egziabher & Helmsing, 2005; Pike et al, 2006). While LED in the countries of the North is predictably more sophisticated and better funded than that in South Africa, in the context of the South, the country, sobbingly, is regarded as something of a front-runner (Nel and Rogerson, 2005; Rodriguez-Pose and Tijnstra, 2005). LED is still very much in its infancy in most developing countries, and South Africa, along with Brazil, has been investigated by international organizations to establish the degree to which they might serve as examples for other countries in the South (Nel and Goldman, 2006).

More generally, there is certainly no agreement on how to define LED, or even on how local is the 'local' in LED. In some contexts, such as isolated peripheral towns, the latter may seem self-evident, but elsewhere there are various possibilities. The South African government's LED policies of the late 1990s have been institutionalizing a particular neo-liberal conceptualisation and vision, but this is generally insufficiently modified to local conditions (which are very different from those in the global North where it evolved) or flexible enough to accommodate the very different circumstances facing the diversity of localities from metropolitan, aspirant world cities to small, rural settlements in the country. Indeed, I would argue in favor of a different, more locally appropriate and grounded 'developmental' approach (Simon, 2003).

Interestingly, like any other field of development, defining LED remains a challenge and most definitions have been increasingly recognized as insufficient (Blakely and Leigh, 2010). The concept of LED is still imprecise, ill-defined and open to multiple interpretations (Akudugu and laube, 2013). However simply put, LED is an alternative to traditional development strategies that applied top-down techniques subsequently sidelining and marginalizing certain parts of regions (Rodriguez-pose and Tijmstra, 2009). In this interconnected and borderless world, localities have had to make themselves competitive and fit enough to identify economic opportunities offered by the global market (Raco, 1999).

Globalization has made localities more important for propriety and economic growth, whilst localities who fail to meet the demands of globalization run the risk of being marginalized (Rodriguez-Pose and Tijmstra, 2009). A critical part of developmental local government is economic development. According to Todaro and Smith (2011:14–18), economic development means the sustained growth of income per capita to enable a community to export its output at a faster rate than population growth. Blakely and Bradshaw (2002:56) state that local and regional economic development potential equals a local area's capacity in terms of the economic, social and technology sectors and its resources, which include the physical environment, location, labour, capital investment, entrepreneurial climate, transport, export market and government spending (Meyer, 2014).

LED and the basic needs approach is closely linked with development economics and provides communities with an enabling environment that is required by local communities to improve

quality of life, reduce poverty levels and levels of inequality (Todaro and Smith 2011:19). According to Todaro and Smith (2011:21), the core values of development are the ability to meet the basic needs of people such as shelter, food, health and protection, good individual self-esteem with a sense of worth and self-respect and to be able to have choices or human freedom in terms of the economy and social choices.

The integrated linkage between development economics, developmental governance and strategic spatial planning initiatives, allows for optimal implementation of the concepts. For this reason, the use of LED initiatives in collaboration with spatial planning concepts, are critical. LED initiatives are planned within a specific spatial environment. Such initiatives will have a high level of failure if the spatial planning concepts such as nodal and corridor development are not incorporated. A positive spatial planning system is required at the local level because it provides direction for what type of development is desirable within a specific locality. Resources must be used in a sustainable manner and this assists in achieving a higher quality of service delivery, with development priorities being set and the avoidance of duplication of efforts by various levels of government (DPC 1999:20 and Meyer 2013:285). The overall aim is to create a spatial environment that promotes integration and economic activities (Madell 2008:52; Donaldson 2001:2).

In the early stages, it centred mostly on the marketing of localities to potential external investors, offering incentives and developed infrastructure. This stage was followed by a period during which attention was shifted to internal, economic potentials of regions or localities, which saw support offered for competitiveness of existing firms and the promotion of entrepreneurship development and training programmes, business support and business linkages mechanisms, providing access to finance, skills development, rural development and sectoral development approaches. However limited budget allocation and resource constraints clearly represent a barrier to direct implementation. Indeed, the survey revealed low levels of LED expenditure by municipalities, nearly a quarter of municipalities (22 per cent) were not spending any money on LED, 16 per cent spent less than R100,000 per annum and 60 per cent spent more (Nel et al.,2009). The success of LED is therefore not measured solely in terms of economic activity and the employment opportunity created but also lies in the generation and nurturing of strong

stakeholder partnerships in which government and its agencies, businesses and civil society actors, negotiate best ways to promote development (Akudugu and Laube, 2013).

Because the definition of LED remains a challenge in theory, its implementation has also been problematic and, as a result, it incorporates numerous dimensions of socio-economic development and upliftment. These include:

- Human capital and skills development, small business development and entrepreneurship (Blakely and Leigh, 2010)
- Tourism (Rogerson, 2010)
- Employment creation (Nel, 2001), poverty reduction (Rogerson, 1999)
- Community development (Binns and Nel, 2002)
- Informal sector support, public works programmes, sectoral targeting (Nel and Rogerson, 2005), and corporate social responsibility and investment.

For the purpose of this study literature on two of these dimensions will be looked at: small business development, employment creation and Human Capital development.

The small business sector plays an important role in reducing the concentration in South Africa's oligopolistic industrial structure and in creating employment (Luiz, 2002). Small businesses are the multitudinous suppliers of employment and creators of work opportunities, innovators and initiators, subcontractors for large organizations, responsible for the manifestation of the free market system, in many instances the entry point into the business world, playing an important socio-economic role (Herbst, 2001). Importantly for the small business sector to meaningfully contribute to the economy; it needs to be integrated into the mainstream which requires effort from government and the formal private sector (Luiz, 2002).

Business linkages have been identified as development needs (SBP, 2009) as they benefit both big and smaller business enterprises. Bigger enterprises reduce input costs while simultaneously increasing specialization and flexibility, and the small business sectors growth and development spurs, bringing about positive social and economic impacts into the wider community (Jenkins, Akhalkatsi and Roberts and Gardiner, 2007). Big businesses can either acquire goods and services from small businesses or sell and distribute through them (SBP, 2009). Big businesses

can act as a powerful stimulus for the small business sector by providing a real and steadily source of demand and also providing skills transfer to small businesses (Luiz, 2002). With South African small businesses facing so many challenges, such as access to finance. Lack of influence of communities, isolated operations, competition and nature of the economy (Brand, Schutte and du Preez, 2006), big businesses can play a significant role in assisting in this regard.

In recent years, LED, and more specifically its associated local government job creation and service delivery endeavors, has become a contested terrain (Desai, 2003). LED is one of the employment generating strategies that have been investigated and experimented with by the state and private organizations in South Africa (Nel, 2001). According to Patterson (2008) LED in South Africa has evolved over the years.

Unemployment levels have been high in South Africa for many decades, despite periods of relatively high economic growth in the mid-1980s, mid-1990s and mid-2000s. Since the country's first democratic elections in 1994 there has been debate about the failure of national policy frameworks to increase employment substantially and reduce unemployment. Attention is being focused on municipal government's role in tackling persistent high levels of unemployment beyond the economic growth-oriented local economic development strategies favored by most of the larger city administrations (Robins, 2012).

In South Africa the body of literature on the experiences of local economic development LED in the country's towns and cities has been growing (Bond, 2003; Nel and Binns, 2003; Nel and Rogerson, 2005; Xuza, 2007). In the tradition of the Reconstruction and Development Programme (Republic of South Africa [RSA], 1994), Bond (2003) argues that ongoing attention to the delivery of affordable services to the poor will have both direct and indirect employment benefits, but warns that poor quality services with prohibitive user charges will severely curtail prospects for self-employment. Nel and Binns (2003) say their research makes it apparent that a major motivation for local government to initiate LED programmes has been the high levels of unemployment. Although this research relies on unverified self-reporting by municipal officials, it is nonetheless interesting to note that in 31 per cent of the LED initiatives it reports, employment creation had been noted (Nel and Binns, 2003:176).

### 3.7 Conclusion

This chapter has served to establish a foundation for understanding South Africa's transformation. It looked at the green economy which is an approach that reflects the shift in thinking from a business as usual neoliberal economic approach, which considers the environment as an infinite resource from which to grow the economy, to one that recognises that the environmental system has thresholds or limits.

A shift to the green economy thus involves the restructuring of business, infrastructure and institutions towards more sustainable (green) production, consumption and distribution process, creating new economic opportunities and green jobs furthermore, it includes a discussion on the need for sustainable solutions such as renewable resources as means to address the challenges of climate change and being seen as key importance in the development of a sustainable society. How renewable resources can provide new economic opportunities that can contribute to higher standards of living and reduce the impacts of society on ecosystems, among other things.

This paper expanded by discussing the transfer and adoption of such technologies especially in the African context, have been shown to be problematic. Thus, renewable energy resources are not always necessarily synonymous with sustainable solutions. However, renewable technologies are increasingly being utilized in the South African context, due to its climate conditions and that South Africa is ranked as a country with the highest potential for the use of renewables. This paper also discussed developers and local authorities are more often including the use of renewable technologies in their development planning and an overview of renewable resources and technologies.

This study looked at the theory of ecological modernisation and in each case ecological modernisation is centrally concerned with the relationship between industrial development and the environment. Consequently, it is concerned with the capacity of modern industrial societies to recognize and respond to existing and emergent environmental problems. Ecological modernisation theory describes a way of addressing some of the environmental problems associated with industrialism whilst at the same time improving economic

competitiveness. The discussion of innovation above has shown that clean technologies and in the longer term the development and wider adoption of innovations is the only way in practice to realize the goal of ecological modernisation.

For the purpose of this study it looked at the emergence of LED in the country, it is clear that the country is facing the challenge of unemployment and inequality amongst other challenges and looked at the dimensions of LED and only two are discussed in depth because particularly relevant to this study. These include small business development and employment creation served to depict the country's efforts in development. It provides a context within which transition towards improved quality of life and greater socio- economic equality in South Africa. And how the application of LED clearly faces numerous challenges, some of which are of an applied nature such as limited access to funding and skilled personnel and while other challenges are conceptual in terms of how LED is understood and applied. The next section presents the research methodology.

## **Chapter Four**

### **Research Methodology**

#### **4.1 Introduction**

Research methodology is one of the significant sections of any research study as it assists a researcher to understand which method is best suitable for the study in order to answer questions posed to meet the study's objectives. The purpose of this chapter is to introduce the empirical techniques applied in the study and describe the qualitative research approach that was followed to address the research objectives already presented. An ultimate plan for collecting and utilizing data is significant in any study in order that the desired and relevant information is obtained with sufficient precision, methods utilized in order to provide a precisely completed research paper (Bell, 2010). In this chapter the research design is discussed, sources of data and participants are outlined; the data collection methods and analysis process are discussed. Lastly, the ethical issues pertinent to the study are considered.

#### **4.2 Research Design**

The purpose of research is to discover answers to questions by applying scientific methods or certain procedures. Each research has its own methodology and procedures in order to complete the objectives and answer the questions set at the beginning. There are two common types of research designs, quantitative and qualitative (Creswell, 2013). Quantitative research is based on the quantitative measurements of some characteristics. It is applicable to phenomena that can be expressed in terms of quantities (Creswell, 2013). On the other hand, qualitative research refers to the “meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things” (Gray, 2014). There is also a mixed method research design which resides in the middle of this continuum because it incorporates elements of both qualitative and quantitative approaches (Creswell, 2013).

This study has used a qualitative research design. Qualitative research means to explore and understand the meaning of social or human problems, and this process of research involves

emerging of questions and procedures of which data is typically collected in the respondent's settings. This study has taken on the constructivism perspective of which views knowledge as socially constructed and may change depending on the circumstances. Crotty (1998) defined constructivism from the social perspectives as the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context. In any qualitative research, the aim is to engage in research that probes for deeper understanding rather than examining surface features (Johnson, 1995).

The constructivist notion is that reality is changing whether the observer wishes it or not (Hippis, 1993), is an indication of multiple or possibly diverse constructions of reality. Constructivism values multiple realities that people have in their minds. Therefore, to acquire valid and reliable multiple and diverse realities, multiple methods of searching or gathering data are in order. This study used a case study as a strategy of enquiry, one of the features of a case study research is its flexibility. The term case study is strongly associated with qualitative research, partly because case allow for the generation of multiple perspectives either through multiple data collection methods, or through the creation of multiple accounts from a single method (Lewis, 2003). The integration and contrasting of different perspectives can build up rich and detailed understanding of a context.

As Punch (2005) asserts, a case is not easy to define since almost anything can serve as a case. Hence, adjustments can be made during the data collection method process by deciding to make use of additional data sources (Gray, 2014). A case study approach is also commonly useful for understudied concepts (Yin, 2009). The unit of analysis for this study will be eThekweni Energy Office dealing with renewable energy resources.

### **4.3 Data Sources**

The following paragraphs discuss two types of data sources, primary data sources and secondary data sources. The significance of the use of secondary data sources is to firstly justify the need for the study. The purpose of secondary data is to also draw on the relevant literature to provide an understanding of the nature of the study and the primary data which forms the core of the

study (Saunders et al., 2009). In order for the study to be comprehensive and cohesive, secondary data sources and primary data sources must be interlinked. These two types of data sources are further discussed below. The main data collection techniques used in this study are the literature review, interviews and documentary evidence. Using various data sources facilitates the reliability of the study findings (Creswell, 2009). All the data collected were informed by the aim and objectives outlined in chapter one.

#### **4.3.1 Secondary Data Sources**

Secondary data used for this study includes books, journal articles that produced the study's conceptual and theoretical framework. Secondary data is the data that has already been collected by researchers and is readily available from other sources (Saunders et al., 2009). Substantial work has been done in developing theoretical framework of which has drawn from literature relating to ecological modernization, local economic development and the green economy. Secondary data is not only used in order to address the specific issues that the study strives to address, but it can also be used to highlight general issues in that particular field of study by discussing a broad theoretical framework attached to the study (Bless et al., 2000). This study used secondary data to construct the introduction and the background of the study. These data sources assisted in providing an understanding of what renewable energy resources are and how they can play a role in economic development. The following paragraph discusses the primary data sources used in the study.

#### **4.3.2 Primary Data Sources**

There are many different types of primary data such as observations, interviews, documents and audio-visual material; This study will use interviews; face to face semi structured interviews of which is useful when participants cannot be observed directly and that participants can provide historical information as well as means of providing sufficiently detailed and rich textual material and lastly allows researcher control over the line of questioning (Creswell, 2013).

Semi-structured interviews were conducted and they are commonly defined by their conversational nature. Such a conversational approach means that each interview varies according to the interests, experiences and views of interviewees (Creswell, 2013). Respondents

are able to discuss issues from their perspective in their own words, and are able to explain and elaborate further when necessary (Gray, 2014).

To increase the reliability of reliability of research results, further data was extracted from policy documents. An important source of data used in this study was found in documents such as the integrated development plan (eThekweni Municipality, 2014/2015), the Durban Climate Change Strategy (2014), and the white paper on renewable energy (2003). Documents can be accessed at a time convenient to the researcher. Documents represents data that is rich, in those participants have given attention to compiling and as written evidence; it saves a researcher the time and expense of transcribing (Creswell, 2013).

#### **4.4 Primary Data Collection Tools**

The researcher has developed and used an interview protocol for asking questions and recording answers during a qualitative interview. The interview protocol has included the following components; a heading, instructions that the interviewer will follow so that standard procedures are used from one interview to another. It has also included spaces between the questions to record responses and lastly a final thank-you statement to acknowledge the time the interviewee spent during the interview (Creswell, 2013). The researcher has recorded the information from interviews by making handwritten notes; a log has been developed to keep a record of documents collected for analysis in qualitative study. The log contains information that represents primary material (i.e., information directly from the people).

The researcher in this study used a semi structured interviewing technique in order to obtain primary data. King and Horrocks (2010) stated that interviews are effective when a researcher wants to collect in depth information about the subject at hand. In this study seven semi structured interviews were conducted in the form of face-to face interviews. According to Sekaran and Bougie (2010) face-to-face interviews are important in qualitative research as they allow the researcher to capture feelings and facial expressions of the participants. The open ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail than structured

interviews, if the interview schedule is too tightly structured this may not enable the phenomena under investigation to be explored in terms of either breadth or depth. All interviews were recorded in order to allow the researcher to pay full attention to the respondents by not having to take notes during the interviews. A further advantage of recording the interviews was to ensure that all information was captured in detail, and also to simplify the process of transcribing the interviews. Steward and Shamdasani (1990) argue that voice recorders are valuable as data collection tools; however they tend to obtain background sounds. A voice recorder was set up before the interview began and it was visible to the participant.

The interview schedule compiled for the semi-structured interviews included 30 questions (see appendix A). All interviews were recorded, completing an interview took approximately 60 minutes at the eThekweni Energy Office during the 19<sup>th</sup> and the 26<sup>th</sup> of August 2015. The interviewees were informed that the interview may take up to an hour. The researcher initially planned to conduct only ten interviews, however during the interview process the interviewer identified only seven potential interviewees. See appendix A for interview questions and structure.

#### **4.4.1 Sampling**

A population can be defined as including all people or items with the characteristic that the researcher wishes to understand (Richards, 2009), and a sample is a subset of a population (Creswell, 2009). A population in other words be an entire set of elements that have certain common attributes well-defined by the sampling criteria and well selected by the researcher (Sekaran and Bougie, 2010). The population in this study consisted of the eThekweni Energy Office staff. The population included the eThekweni Energy Office staff because they play an important role in renewable energy projects. The table below shows the projects that the eThekweni Energy Office is involved in.

**Table 4.1: eThekweni Energy Office Projects**

<b>Project Name</b>
1. Durban Solar City (DSC)
2. EOS
3. Natural Gas
4. Geo-Sun Reunion Partnership
5. Green Corridor
6. Solar Traffic Lights
7. Water and Sanitation Renewable Energy Program (EWSRE)
8. Wind Repowering Program

**Source: eThekweni Energy Office**

Qualitative research usually works with purposive non-probability samples because it seeks to obtain insights into particular practices that exist in a specific location, context and time (Gary, 2014). The study has used a non-probability sampling of which is purposive because sometimes it's appropriate to select your own knowledge of the population, its elements, and the nature of the research aims (Babbie & Mouton, 2001). Purposive sampling was used to select the sample because it enables the researcher to use her own judgment to select cases that best enabled her to answer the research question and meet the objectives (Richards, 2009). According to Saunders et al, (2009), purposive sampling is often used when working with small sample and when a researcher wants to use cases that particularly informative. Sample used for this study is shown in table 4.2 below.

**Table 4.2: Interviewees' Details**

<b>Interviewee Number</b>	<b>Date</b>	<b>Position</b>	<b>Entity</b>
Interviewee One	19 August 2015	Project Officer: Energy Efficiency (Acting Manager: Energy Efficiency)	eThekwini Energy Office
Interviewee Two	19 August 2015	Project Manager (Co-acting Senior Manager).	eThekwini Energy Office
Interviewee Three	19 August 2015	Manager: Renewable Energy.	eThekwini Energy Office
Interviewee Four	31 August 2015	International Energy Transaction Officer (Co-acting Senior Manager).	eThekwini Energy Office
Interviewee Five	31 August 2015	Manager: Climate Change.	eThekwini Energy Office
Interviewee Six	31 August 2015	Climate Change Monitoring and Reporting Advisor	eThekwini Energy Office
Interviewee Seven	31 August 2015	Advisor: Climate Change	eThekwini Energy Office

**Source: Authors own**

#### **4.5 Documents and textual analysis**

Studies conducted by researchers and academics have been reviewed as part of the study. Furthermore, published documents were used to support interview data. According to Berg (2009), documentary evidence comes in the form of recorded document such as written documents, recordings, or other form of media. Documents used in this study are shown in the data table 4.2 below.

**Table 4.3: Data Documents**

Name	Author	Year	Content
eThekwini Municipality Integrated Development Plan (IDP)	eThekwini Municipality	2014/2015	Climate Change and Key Development Challenges
Durban Climate Change Strategy	eThekwini Energy Office	September 2014	Energy and Economic Development
White paper on Renewable Energy	Department of Minerals and Energy	November 2003	The setting and context

**Source: Author's own**

#### **4.6 Data Analysis and Interpretation**

In the data analysis and interpretation, in general the intent is to make sense out of text data. It involves segmenting and taking apart the data as well as putting it back together in the light of the research questions (Creswell, 2013). The data analysis in qualitative research preceded hand in hand with, the data collection and the write up of findings. While interviews are going on, for example researchers may be analyzing an interview collected earlier. This process is unlike quantitative research in which the investigator collects the data, then analyses the information, and finally writes the report (Creswell, 2013).

The process of qualitative data analysis generally involves the development of data categories, allocating units of the original data to appropriate categories, and recognizing relationships within and between categories of data to produce well-grounded conclusions (Berg, 2009). This section presents the data analysis process undertaken in this study. The analysis relied on a combination of literature, interviews and documentary evidence and was conducted with the aim

of producing results from the study and to show that the research results can be relied on and are valid.

The data analysis method adopted by this study was a qualitative content analysis, which is a method to analyze raw data. The thematic content analysis is a descriptive presentation of qualitative data (Anderson, 2007). According to Anderson, this method works effectively with Microsoft word, which is used as a substitute for the traditional style of cutting out transcription paper and pasting according to categories of analysis furthermore transcribing into text and converting to Microsoft word makes developing themes and analysis much easier (Leedy and Ormrod, 2014). This enabled the researcher to develop codes which were utilized in order to develop themes to discuss in the analysis section.

In the data analysis stage the researcher has transcribed the data, field notes from observation and reflective diaries were written up into a format that can be easily read. The recorded interviews have been transcribed. While typing up the transcript it may be time consuming and laborious, it does develop familiarization with the data at an early stage (Gray, 2014). Because the text data is so dense and rich, not all the information can be used in qualitative study. Thus, in the analysis of the data, the researcher has to “winnow” the data (Guest, MacQueen, and Namey, 2012) a process of focusing in on some of the data and disregarding other parts of it. This process, to, is different from quantitative research in which researchers go to great lengths to preserve all of the data and reconstruct or replace missing data (Creswell, 2013).

A helpful conceptualization to advance in the methods section is that qualitative data analysis has proceeded in two levels, the first is the more general procedure in analyzing the data and the second is the analysis steps embedded within specific qualitative designs. This study is using a case study which involves a detailed description of the setting or individuals, followed by analysis of the data for themes or issues (Stake, 1995 and Wolcott, 1994). The researcher has coded the data organizing the data and writing a word representing a category in the margins (Rossman and Rallis, 2012).

Coding comprises of seeking codes on topics that readers would expect to find, based on the past literature and common sense, codes that are surprising and that were not anticipated at the

beginning of the study, codes that are unusual. It will then use the coding process to generate a description of the setting or people as well as categories or themes for analysis. This analysis is useful in designing detailed descriptions for case studies. After this stage the researcher will advance how the description and themes will be represented in the qualitative narrative. The most popular approach is to use a narrative passage to convey the findings of the analysis. Using Microsoft search function, keyword frequencies and codes were created. These codes were then used to create subtopics/themes to discuss in the analysis chapter. The discussions were supported by documents the researcher used. Through these discussions, key findings were identified and summarized of which is the final step in data analysis involves making an interpretation in qualitative research of the findings or results (Creswell, 2013).

When checking for validity and reliability, the researcher has used validity strategies such as using a peer debriefing to enhance the accuracy of the account. This process involves locating a person who reviews and asks questions about the qualitative study so that the account will resonate with people other than the researcher. This strategy involving an interpretation beyond the researcher and invested in another person adds validity to an account and to also present negative or discrepant information that runs counter to the themes. Most evidence will build a case for the theme; researchers can also present information that contradicts the general perspective of the theme. By presenting this contradictory evidence, the account becomes more realistic and more valid (Creswell, 2013).

#### **4.7 Subjectivity Issues and limitations**

The limitations of this study when using interviews it provided indirect information filtered through the views of interviewees. And with the documents it required the researcher to set out the information in hard-to-find places and materials may be incomplete or the documents may not be authentic or accurate. The limitations of this study was not being able to interview other stakeholders and project developers because the unit of analysis is the Energy Office and restricted to this organization. The following paragraphs present a consideration of the ethics procedure that was followed when undertaking this study. Appendices for informed consent etc must be referred to.

#### **4.8 Ethical Considerations**

Ethical clearance has been sought from the ethical clearance committee of the College of Law and Management Studies, University of KwaZulu-Natal, to ensure that research complies with the University's code of conduct and ethical expectations by its research community. Before the interviews had been done. A request for and consent to interviews have been presented to all participants, both in written and verbal form (See Appendix C). During the interview, the researcher has introduced the study by explaining the aims and objectives of the study.

#### **4.9 Conclusion**

This chapter presented and discussed the methods and techniques that were utilized in conducting this qualitative study. It provided a concise overview of how this research has been conducted by employing a qualitative research approach, using a case study design which enabled the researcher to obtain relevant information from the purposively sampled participants. This research has used primary data in forms of conducting semi-structured interviews and the use of proxy documents and secondary data in the form of books and journals to compile the literature chapter. This chapter has presented the various steps that the researcher has used to analyze the data; a discussion of the thematic analysis method which allows for rigorous interpretation of the collected data was also put forth. This chapter discussed checking the validity of the study and despite the limitations mentioned above this study has checked the validity and reliability of the data collected. The following chapter presents the results of the data collected.

## **Chapter Five**

### **Findings and Discussions**

#### **5.1 Introduction**

The importance of renewable energy resources and local economic development have been explored in the previous chapters. This chapter continues from the previous chapters by providing an analysis of the primary data that was collected in order to address the objectives of this study. It has been established from the literature review that renewable energy production can provide new economic opportunities, can contribute to high standards of living and reduce the impacts of society on ecosystems. Renewable resources as the means to address the challenges of climate change, peak oil and energy insecurity, and that it can be of key importance in the development of a more sustainable society. This study focuses particularly on the importance of renewable energy resources and local economic development in the eThekweni region.

This chapter provides an analysis of the responses gathered from the participants regarding the relationship between renewable energy projects and economic development in eThekweni Municipality. The data was collected from participants involved with the promotion and uptake of renewable energy in eThekweni Municipality through the eThekweni Energy Office. The data was analysed by considering the themes that emerged from the interviews. The main themes that emerged from the data, namely local economic development and renewable energy projects, human development, policy landscape, small business growth and financing for renewable energy projects. Some of the themes mentioned are aspects of local economic development and are supporting environment for local economic development. LED is intended to maximise the economic potential of all municipal localities throughout the country and, to enhance the resilience of the macro-economic growth through increased local economic growth, employment creation and development initiatives within the context of sustainable development (Cogta, 2015).

The data is therefore presented according to these themes and sub themes. The first section of this chapter focuses on an analysis of the nature of eThekwini Energy Office and the work that it does. In this study there are key themes from the primary data collected that appeared throughout the discussions, these terms include local economic development, human development and renewable energy resources. As such, these key concerns will be highlighted in the presentation of the findings. The chapter begins with an overview of the purpose of eThekwini Energy Office below.

## **5.2 eThekwini Energy Office's Purpose**

The eThekwini Energy Office was launched in 2009 in response to the National Power Conservation Program which set energy saving targets between 10% and 15% across all sectors in South Africa. It was mentioned in the background chapter that the eThekwini Energy Office is responsible for conceptualising and initiating projects in renewable energy generating energy from renewable sources, such as the sun and wind. They are also responsible for energy efficiency which involves helping the municipality to use less energy and the planning and implementation of climate change mitigation measures (reducing our greenhouse gas emissions).

In January 2010, the eThekwini Municipality Council adopted the eThekwini Energy Strategy. This strategy significantly broadened the mandate and responsibility of the EO to promote sustainable energy interventions in the broader eThekwini Municipal area. And then over the 2010-2014 periods, the responsibility of the EO grew to include renewable energy and climate change mitigation interventions. In 2014 the EO and Environmental Planning and Climate Protection Department jointly developed the Durban Climate Change Strategy (DCCS). The eThekwini Energy Office is responsible for energy efficiency and renewable energy in the region. It has a number of initiatives in the eThekwini area and all efforts in these areas are aligned to the city's integrated development plan, and are focused on enabling eThekwini to become a sustainable energy hub for the Southern African region.

The acting senior manager of the eThekwini Energy Office (19 August 2015) expanded on the purpose of the Energy Office being initiated:

*“...I have been in the Municipality for 8 years and joined the eThekweni Energy Office in 2012. I deal with procurement and Infrastructure; I’m in charge of all renewable energy projects. Basically, the main purpose or why the Energy Office got initiated is to conceptualise and initiate renewable energy projects in the eThekweni region, and to transform Durban’s governance, social, development and economic systems in order to effectively mitigate climate change...”*

The main purpose of eThekweni Energy Office is thus based on conceptualizing and initiating renewable energy projects and promoting the uptake of these technologies in the region. The importance of renewable energy is discussed in detail below.

The above discussion aimed to provide an overview about the purpose of the eThekweni Energy Office and to gain an understanding of what role they play in addressing the issues that deal with energy. It is evident, as will be shown in the rest of the chapter, that the eThekweni Energy Office plays a role in promoting the uptake of renewable energy in the city and its economic gains in the eThekweni municipality. Given the purpose of the eThekweni Energy Office, they do not have an LED mandate. The engagement of the eThekweni Energy Office with the green economy initiatives and local economic development can be the key leverage point to not only address the Climate Change phenomenon but also tackle other priority areas such as job creation.

### **5.3 Renewable energy production as means for local economic development**

This section aims to provide a precise discussion about the impact that renewable energy projects has on economic development. In order to provide a clear understanding this section begins by discussing the definition of local economic development of which is an important aspect to this study, and to further explore the significance of renewable energy projects in economic development. This section will draw on some of the dimensions of LED as mentioned and discussed in the literature chapter and these dimensions are discussed in relation to the primary data collected from participants at the eThekweni Energy Office.

### 5.3.1 Understanding of Local Economic Development

The definition of the term local economic development , the German international development agency (GIZ) considers LED is ‘an ongoing process by which key stakeholders and institutions from all spheres of society, the public and private sector as well as civil society, work jointly to create a unique advantage for the locality and its firms, tackle market failures, remove bureaucratic obstacles for local businesses and strengthen the competitiveness of local firms’ (Ruecker and Trah, 2007: 15). The success of LED is therefore not measured solely in terms of economic activity and the employment opportunity created but also lies in the generation and nurturing of strong stakeholder partnerships in which government and its agencies, businesses and civil society actors, negotiate best ways to promote development (Akudungu and Laube, 2013). According to the acting manager of the eThekwini Energy Office (19 August 2015), this stakeholder engagement aspect of LED is very much understood by the eThekwini Energy Office , when conceptualizing and implementing the renewable energy projects, they work jointly with different stakeholders to achieve development.

According to the acting manager of the eThekwini Energy Office (19 August 2015):

*“..The renewable energy projects that we conceptualize and implement are dependent and driven by the local municipality, private sector, architecture department and also community based members which include councilors. All of these are important stakeholders that are needed in this process so it’s important that all members are able to work together and form some kind of partnership...”*

This definition of LED as involving people working together is aligned to what eThekwini Energy Office is doing. The eThekwini Energy Office is involved with community members of a particular area that the renewable energy project is being implemented and that is why they are engaging in local economic development.

According to the senior manager of the eThekwini Energy Office (31 August 2015) renewable resources are widely seen as the means to address the challenges of climate change and energy insecurity and (REN21, 2009) states that renewable energy resources can be of key importance in the development of a sustainable society. Renewable resources can provide new economic

opportunities, contribute to higher standards of living and reduce the impacts of society on ecosystems, states the acting manager of the eThekweni Energy Office (19 August 2015). The renewable energy industry would promote job creation and in a 2003 South African study, Austin (2003) concluded that large scale deployment of renewable energy technologies substantially increased the number of jobs in the energy sector. These are borne from the manufacturing of Renewable energy components as well as the installation and operation of renewable energy plants. South Africa's abundant renewable energy resources (wind, solar, water) and extensive biodiversity offer new opportunities for the transition to a green economy and green jobs. Local economic development is a practical process where different stakeholders manage their essential resources to serve their means in stimulating the economy; this leads to job creation and local economic stability. Stakeholders include the government, the community, the civil society and partnership with the private sector (Van der Waladt, 2014). The acting manager of the eThekweni Energy Office (19 August 2015) stated:

*“..We raise awareness and educate about renewable energy technologies to the community members in a particular area where we are initiating the project, and these renewable energy projects definitely create employment and job opportunities especially in the installation of the PV'S of which creates a conducive environment but one must mention that it is difficult to know the number of jobs created and there is a limited number of unskilled job opportunities mainly semi-skilled and skilled are the people most likely to gain an opportunity....”*

The above statement made by the eThekweni acting manager (19 August 2015) justifies that renewable energy projects create job opportunities but at the same time accommodates what was stated in the literature chapter that according to Stoevska and Hunter (2012) it is difficult, at this point in time, to project employment demand and know exactly where green jobs are going to be and what types of skills and training will be needed to fill them. However the acting senior manager of the eThekweni Energy Office (19 August 2015) stated that the importance of renewable energy production is mainly, *“... Reduction of Greenhouse Gas emissions and the potential to reduce the impact of load shedding. It also has economic benefits which including job creation, localisation of the manufacturing and not importing energy into eThekweni*

*municipality region...*”, renewable energy resources can provide new economic opportunities, contribute to higher standards of living and reduce the impacts of society on ecosystems. From the above discussion one can gather that the study found that the eThekweni Energy Office contributes to local economic development firstly through job creation, secondly localization of the manufacturing and lastly not importing energy into the country.

This study also found through documentary analysis in the IDP, 2014/15 that one of the key benefits of implementing renewable energy (solar, wind, etc.) and energy efficiency (solar water heaters, etc.) interventions is that the jobs it creates tend to have higher local content than traditional fossil-fuel-based economic activities. Energy-efficient investments such as retrofitting buildings tend to be location specific and require local labour. Most clean energy industries are also more labour intensive than carbon-intensive ones. However, it should be noted that capturing these benefits locally, specifically in the renewable energy industry, may require strong engagement from eThekweni Municipality to ensure that a thriving local industry is promoted and incentivized, rather than importing good made elsewhere. It is important that a more detailed analysis is undertaken to understand how to maximise local jobs.

The purpose of the above discussion in this section is to justify the role of the eThekweni energy office and how it plays a role in contributing to local economic development. It is illustrated from the above discussions how renewable energy projects and the adoption of renewable energy resources can play a role in economic development through job creation which leads to the following discussion which focuses on human capital development as an important aspect of this chapter. Human capital development forms an additional part of the dimensions of LED and will therefore be addressed in the following section.

### **5.3.2 Human Capital Development**

Human capital development is one of the dimensions of local economic development. The discussion of this dimension of LED in relation to the data generated through the interviews aims to substantiate how renewable energy productions contribute to local economic development. Overall, the projects that the eThekweni Energy Office are involved in create long term outcomes in the community. The projects are based on creating long term outcomes in the community by

training and raising awareness to the host community receiving the installation of these renewable energy technologies.

Human capital is conceptualised as existing within one of the four factors of production which include natural resources, capital, labour and entrepreneurship. According to Marthur (1999) human capital as the stock of skills, talent, and knowledge. Therefore indicates that human capital contains social and personal attributes that includes creativity and innovation. He also ascertains that human capital is a central to economic development growth. The eThekwini Energy Offices project manager (19 August 2015) stated that:

*“...we bring new technologies and innovative solutions such as alternative energy, that consumes less of which is import and energy that lasts longer and less maintenance, the city strives to create jobs and service providers get that job opportunity, a platform to make money, training is provided to understand renewable energy, private companies sell to the market of renewable energy. There are local manufactures, there are solar PV companies promoting the market of the local goods...”*

The above discussion supported by the view of the project manager shows the contribution of the eThekwini Energy Office in human capital development in terms of providing a platform for service providers and training is provided to understand renewable energy technologies. Job creation is very important and it shows it links with training. There is a need to attain knowledge and creating awareness of these renewable energy technologies because they are the key to addressing the challenges of climate change and energy insecurity. The eThekwini energy office is providing service to the city, providing opportunities for the local communities to learn about these new technologies and how they work and how they can raise awareness. In the South African context, Prasad (2007, 3) explains how “general environmental awareness is limited when compared to European countries.” This knowledge deficit is another contributing factor towards why solar technologies are not widely disseminated, despite these technologies being particularly suitable in the country due to the high solar resources available.

In developing countries human development has been used as a mechanism to enhance local economic development (Rogerson, 2010) and according to Son (2010) in developing countries

there is a low level of human capital that explicitly contributes to economic growth. The eThekweni Energy Office has a project called the EOS aimed at promoting the use of embedded rooftop solar PV generation in eThekweni and the primary aim of this project is to provide opportunities for learning about photovoltaic installations for the municipal officials and the public members. The manager in climate change division (19 August 2015) in the eThekweni Energy Office stated that:

*“...the solar PV project through research we noted that the local people benefit because the projects include the community whereby they are given a platform to raise their issues that they may have and also a chance to give training to the installers.”*

According to Prasad (2007) outreach programmes to educate consumers are important in not only informing communities and businesses, but also changing perceptions. If these negative externalities of fossil fuel based electricity were factored in, then the playing field would be far more even between conventional and renewable energy costs. The eThekweni Energy Office has skills of staff and are broad and varied, extending from marketing to various disciplines of engineering, they have had a chance of running an energy efficiency training course on the fundamentals of energy management for selected municipal officials. The purpose of the training was to equip trainees with skills to identify energy saving opportunities and propose energy interventions. The study found that these interventions can lead to business ideas. The eThekweni Energy Office is also involved in capacity building through recruiting graduates through the in-service programme run by the municipality acting manager of the Energy Office (19 August 2015).

Interviewee six (31 August 2015) stated that an analysis of renewable energy potential in the Durban area indicates that Durban does not have strong competitive advantages in wind or solar relative to other areas in South Africa, but solar does still offer significant local opportunity (PV and solar thermal). Biofuel may represent an important opportunity and waste (from paper and wood industries, landfill, sewage and wastewater) also has potential.

A national study conducted by Agama Energy in 2003 found that a total of 1204.692 direct and indirect jobs could be created by 2020 in the renewable energy field.

**Table 5.1 Summary of gross direct and indirect from renewable sources in 2030**

Technology	Direct Jobs	Indirect Jobs	Total Jobs
Solar thermal	8,288	24,864	33,152
Solar PV	2,475	7,425	9,900
Wind	22,400	67,200	89,600
Biomass	1,308	3,924	5,232
Landfill	1,902	5,706	7,608
<b>RET* Subtotal</b>	<b>36,373</b>	<b>109,119</b>	<b>145,492</b>
Biogas	1,150	2,850	4,000
SWH	118,400	236,800	355,200
Biofuels	350,000	350,000	700,000
<b>Other RE Subtotal</b>	<b>469,550</b>	<b>589,650</b>	<b>1,059,200</b>
<b>TOTAL</b>	<b>505,923</b>	<b>698,769</b>	<b>1,204,692</b>

(Agama Energy, 2003: x)

This above discussion shows that the eThekweni Energy Office has projects that actually plays a part in human development and have even a greater potential to have even a greater impact on human development through the various projects that they initiating. The eThekweni Energy Office manager (19 August 2015) indicated that various projects have different opportunities and benefits; it will not always be the same for every project that they initiate. She also mentioned and emphasized that the eThekweni Municipality strives to create jobs and give a platform for any business to make money. The training is provided to understand renewable energy of which is important in the reduction of Greenhouse Gas emissions and the potential to reduce the impact of load shedding of which is a problem the country is facing at this particular moment and time. One of the study's objective is to investigate the understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development. The data collected has shown how renewable energy projects of the eThekweni Energy Office contribute to local economic development.

#### **5.4 Policy Landscape for Renewable Energy**

This section will provide an overview of existing policies relating to legislation, regulatory and institutional arrangements, strategies, and bylaws that are associated with energy and future planning. One of the objectives of the study is to critically examine the inclusion of economic development goals within strategies and policies put in place by the eThekweni Energy Office to

promote the uptake of renewable energy in the city. The main energy policy that has been formulated in the country are the Renewable Energy White Paper of 2003. The white paper on renewable energy is a foundational document aimed at promoting renewable energy development in South Africa. However, the following discussion will address policies such as, the National development plan, the Integrated Development Plan and the Durban Climate Change Strategy. This study has found that most participants of the study view that South Africa's policy framework has improved over the past years.

#### **5.4.1 The Integrated Development Plan (2014/2015)**

This section will discuss the IDP (2014/2015) in relation to the plans put in place regarding renewable energy initiatives. The data collected showed that the eThekweni Energy Office strategies are aligned to the municipal strategies such as the integrated development plan (IDP). Through documentary analysis, the eThekweni Municipality's Energy strategy (2008) has outlined four themes for energy efficiency interventions; however there are two important themes to mention for this study.

The first theme is for the industrial, commercial and agribusiness sector; to support the application of renewable energy technologies in the industrial, commercial and agricultural sectors to work towards the elimination of net GHG emissions and all other energy related atmospheric pollutants. The second theme is for the transport sector to work towards the elimination of all atmospheric pollutants arising from transport energy use by maximizing the application of sustainable, renewable energy technology in both the public and private sector. To promote non-motorized transport and disincentives private motorized transport. Ultimately the objective of the above themes is to reduce the consumption of energy throughout the municipality, and in so doing, reduce operating costs for the municipality and make energy resources available for further economic development activities. Furthermore to decrease the municipalities dependence on national energy supply and facilitate market transformation in the energy sector by promoting renewable energy initiatives.

The elements of promoting renewable energy initiatives is to include development of an enabling policy that addressed the key barriers and creates an enabling environment for decentralised

renewable energy, and promoting large scale and decentralized grid-tied renewable energy transition, this is evident in the data collected when the senior manager of the eThekweni Energy Office (31 August 2015) stated that :

*“...in the economic sector the projects are centered on decentralization, the projects that the eThekweni Energy Office is involved in are mainly centered on decentralization and that the policy is centralized. The projects that we deal with have to fall into the grid of Eskom...”*

At a national level there are a number of policies and strategies that exist to support renewable energy and more continue to be developed, however it's important to note that new policy does not by itself create an enabling environment for renewable energy programme development and implementation. There are many national and provincial laws and local bylaws, which can impact renewable energy delivery in municipalities. The integrated development plan (2014/2015) states that the energy planning, which of necessity must include consideration of renewable energy projects, is an essential component of longer-term municipal planning.

#### **5.4.2 The Durban Climate Change Strategy (2015)**

The development of this strategy acknowledged that we live in a world with finite and diminishing natural resources, such that Durban needs to convert to a low carbon, green economy that prioritizes the sustainable use of ecosystem services whilst still overcoming the development challenges faced by the majority of Durban residents. The energy sector is substantial and lies at the heart of the economy and of society. Energy consumption within the eThekweni Municipal Area contributes some 4.5% to total energy consumption in the country (SEA, 2011).

Interviewee five (31 August 2015) highlighted that the eThekweni Energy Office has the Durban Climate Change strategy in place to promote the uptake of renewable energy in the city but there are challenges such as creating an enabling environment that supports local development and production. This brings us back to an important note mentioned in this chapter that new policy does not by itself create an enabling environment for renewable energy project developments and implementation.

The senior manager of the eThekweni Energy Office stated that:

*“... The procurement process is such a problem and the council takes such a long time to address our issues and the biggest problem is corruption in the whole process. The timeframes are problematic. The policy framework of the ownership of the electricity of which feeds into the grid is Eskom of which has control over everything...”*

It is evident in the above discussion that the eThekweni Energy Office has noted the challenges that they are faced with in order to promote the uptake of renewable energy. The Durban Climate Change Strategy shows that in even when there is sound policy or strategy in place, energy transition is difficult and requires a combination of factors: substantial political will, new skills and capacity, funding streams and institutional pathways. And some of these issues they need to reduce risk and transaction costs, reduce lengthy procurement processes within government-led initiatives, and support access to finance. In relation to embedded power generation, the investment framework needs to be established.

Margolis and Zuboy (2006), writing on behalf of the National Renewable Energy Laboratory (NREL), a component of the U.S Department of Energy, clarify that the main issue with the electricity market is that it is designed with conventional, centralized power plants in mind. As long as this is the case, monopolized electricity sales will remain cheaper. This is also the case within South Africa, where Eskom has been the sole supplier of electricity until the recent introduction of the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme by the Department of Energy (DoE).

Renewable energy technologies typically enter markets that have been managed and regulated to serve the needs of fossil fuel systems and inefficient energy use practices. The reformation of existing regulations to allow the introduction of new energy systems is often complex, slow and difficult process. This is evident in the numerous delays that have accompanied the development framework for large scale renewable energy procurement by the South African government. While the first official intentions to pursue renewable energy development were outlined in 1998 (White Paper on Energy) (DOE, 1998), it was only at the end of 2011 after many delays and

adjustments, that the procurement process for renewable generating capacity began, under a competitive bidding system (DOE, 2011a).

This strategy that they have developed states that Durban has a thriving sustainable energy sector where renewable energy supplies a significant portion of Durban's energy and energy is used efficiently by all sectors and that all residents have access to safe energy sources and there are multiple economic opportunities in the sustainable energy sector. And forty percent of Durban's electricity demand is generated from renewable energy. The following section will discuss ecological modernisation and policy.

#### **5.4.3 Renewable Energy policy in the light of Ecological Modernisation Theory.**

In analyzing the renewable energy policy processes; this study finds that policy processes in South Africa exhibit a 'weak' form of ecological modernisation. In terms of the public participation processes that have been undertaken, it has found that government did strive for an inclusive and communicative process; however, the general public is still skeptical about the resultant White Paper on Renewable Energy of November 2003 (senior manager of the eThekweni Energy Office, 2015). According to Oelofse *et al.*, (2006) environmental management in South Africa is generally framed within a weak ecological modernisation approach, and the notion of strong ecological modernisation is used more in theory in the South African context, and has only begun to be applied.

Ecological modernisation has also gained purchase as a pragmatic political programme to combine environmental policy-making with economic development (Huber, 1985). Proponents of ecological modernisation argue that we have already seen this process at work in countries such as Japan, the Netherlands, Germany, Sweden and Denmark (Mol, 2002). In these countries, material flows have become delinked from economic flows, with a consequent decline in the use of natural resources and emissions. Hajer's (1995: 30) notion that ecological modernisation is "the most credible way of 'talking green' in spheres of environmental policy-making" is important here. The state in South Africa has tried to be participatory and create more deliberative processes in its renewable energy policy-making procedures, but this has not been done successfully. This reveals that the Renewable Energy Policy White Paper of November

2003 reflects that government has theoretically tried to move towards strong ecological modernisation processes.

As a pragmatic political programme, ecological modernisation approaches suggest that this will engender support from private-sector businesses, given that it can have beneficial outcomes (Hajer 1995; Harvey 1996). It is claimed that business can gain advantages in a number of ways (Drysek 1997). Through greater business efficiency due to reduced pollution and waste production, avoiding future financial liabilities, such as the potential cost of contaminated land clean-up, through improved recruitment and retention of the workforce due to the creation of a better work environment, from the potential for increased sales of more ‘environmentally friendly’ products and services. Which leads us to the next section of this chapter; the following LED dimension that will be discussed is small business development.

## **5.5 Small Business Growth**

In this section, the discussion of the promotion of small business development aims to support the argument that renewable energy can play a role in local economic development. Other dimensions of LED were focused on economic development, but the overview of small business development in this study aims to emphasize economic growth as potentially fostered.

The senior manager of the eThekweni Energy Office explained that eThekweni Energy Office engages in creating small business enterprise. The senior manager (31 August 2015) explained:

*“... The eThekweni Municipality has developed a business plan in order to establish a Sustainable Energy SME Incubator in the eThekweni Municipal area with the majority financial support of the DTI Incubator Support Programme or alternatively, the SEDA Technology Programme. The eThekweni Energy Office has a policy to promote small and medium artisanal companies...”*

The above discussion shows that the eThekweni Energy Office is involved in economic growth. In the NDP, it is indicated that small business development is a very important LED intervention as it fosters local economies and it capacitates job creation (Malefane, 2013). The eThekweni Energy Office is focused at outlining the need, intended outcomes and funding modalities

required for the establishment of these SME incubators dealing with the investigation into the market for renewable energy and energy efficiency. This involves the eThekweni Energy Office assisting small businesses that are dealing with renewable energy and energy efficiency.

According to Van der Waldt (2014) In relation to fostering the important category of high growth SMMEs the importance of existing and new programs for development of technology stations and business incubators must be highlighted as a positive catalyst for innovation and for endogenous growth. Interviewee seven (32 August 2015) highlighted that with their new business plan being developed by the energy office. There is a need of supporting innovation in the SMME sector in order to ensure the greater possibility of survival with employment being a positive consequence. And that employment growth in localities can be the outcome of innovation support for improved business survival for start-up enterprises, natural consequence of larger and innovative SMMEs expanding and graduating to larger-sized businesses.

The study found through documentary analysis in the Durban climate change strategy that the business plan formulated by the eThekweni Energy Office attempts to outline the need and intended outcomes that are targeted beneficiaries. And funding modalities required for the establishment of a Sustainable Energy and related sectors. Business Incubators for up to fifty emerging and especially black-empowered SMEs and combined with technical training and skills development facilitation role. There is a vision for incubates and other sector-specific enterprises evolving, ultimately, into an Artisan/Internship programme of which leads to job creation. It also attempts to outline the need for a visitors Centre incorporating a public education, demonstration and conference facility aimed at raising awareness of sustainable energy and the technology available for its deployment. And the primary beneficiaries and target market of the incubator are black-owned and managed SMEs active in and investigating the market for renewable energy and energy efficiency.

One of the common focus areas of the National Development Plan (NDP) is that of supporting the growth of small businesses as well as cooperatives as a vehicle for drawing more South Africans into entrepreneurial activities and boosting job creation. And essentially this commitment in support of small enterprise development represents a continuation and re-

statement of policy support that goes back to the early years of democratic change (Rogerson, 2004). According to Malefane (2013) the centrality of small business development for achieving the objectives of competitive local economies and inclusive growth is emphasized.

According to the International Renewable Energy Agency (2015) scaling up modern renewables in Africa is an affordable means to help meet fast-growing energy demands while increasing energy access, improving health and achieving sustainability goals. The agency has estimated that a substantial shift to renewable energy would reduce the use of traditional wood cooking stoves by more than 60 percent, by 2030 through the reduction of health complications from poor indoor air quality. “Tapping into renewable energy sources is the only way African nations can fuel economic growth, maximise socio-economic development and enhance energy security with limited environmental impact,” said Irena director-general Adnan Amin.

Localisation gives isolated communities a chance to participate in the process. They can serve as workers, and local businesses can play a role in supply and procurement in the engineering and construction of mini-grid and off-grid projects. “*Access to modern energy through off-grid solutions presents tremendous opportunities in health, education, agriculture, water and telecommunications sectors. Stable access to such services provides a basis for income-generating activities,*” said interview four (31 August 2015).

From the discussion above this study learned that therefore there might be potential for start-ups, sector growth and entrepreneurship. There is a need to set up a support system in the development of the renewable industry in the province and that the industry would have a chance to be able to facilitate skills development for those who would need to operate and maintain the resources to be used, and those who are interested in the field. During project development, local businesses could be included in procurement and local workforce and enterprises utilized.

The main hurdles to implementation for renewable energy penetration, was then analyzed. The issue of Eskom holding a monopoly in the renewable energy market has surfaced. Until an ‘enabling environment’ is created where REFIT tariffs are acceptable to project developers, renewable energy will not be commercially viable in South Africa. The lack of capital and political will to get projects started also surfaced as key issues. This study’s objective is to

examine the relationship between renewable energy resource projects in the eThekweni Municipality and small business growth. The data collected for this study shows that the initiatives that the Energy Office is involved in play a part in small business growth and learning from the data collected it also leads to job creation. The following section will be discussing the last and final theme of this study is the financing for renewable energy projects.

## **5.6 Financing for Renewable Energy Projects**

In this section will discuss financing for renewable energy. Financing is one of the largest barriers to the development of sustainable energy in Africa and this is true for both renewable energy and energy efficiency. While various barriers exist as shown above, the primary barrier for most renewable energy technologies in South Africa is high capital costs, which is why this section will discuss financial barriers associated with renewable energy technology.

The deployment of renewable energy projects often require substantial amounts of money in order to plan the project, purchase and install the equipment, as well as to train staff for the operation and maintenance of the system installed. The renewable energy manager of the eThekweni Energy Office (19 August 2015) stated that, *funding is such an issue in renewable energy projects; it's highly capital intensive, there is a need to develop appropriate financing schemes and most of our funding comes from the municipal budget of which is a three year plan... ”*.

The main barrier, identified in the majority of the literature on renewable energy, is the cost or perceived cost of the technology (Margolis & Zuboy, 2006; Miller et al, 2012; IRENA, 2013). Cost related barriers can be further considered in relation to perceptions around the economic viability of the projects and the inability to access the finance to cover the initial investment (UNEP Risø, undated). Aligned with the literature, funding for renewable energy projects is an issue because it came up in almost all the interviews the researcher had with the participants of this study (19 August 2015). The literature chapter discussed the specific challenges to renewable energy technologies that include high upfront capital costs which states that while the cost of some renewable energy technologies has been reduced in recent times, however some renewable technologies still have high capital costs (Smeddle et al, 2012).

In the literature chapter it mentioned that South Africa's abundance of cheap coal also poses as a major challenge to the successful implementation of renewable energy technologies. For the successful uptake of renewable energy as an alternative energy option, affordability is a prime consideration. Affordability depends on the type of technology, policy direction and investment considerations (Kaggwa et al., 2011). All of these aspects have a direct bearing on the price that will ultimately be paid by the consumer. This is also evident when interviewee five (31 August 2015) stated that, "...the country has cheap coal and the consumer will want to take the most affordable option..."

This study found that renewable energy projects have so far had a rather poor reputation with the financing community as they are still viewed as a higher risk investment, resulting in stiffer requirements for investors and developers alike. The reasons behind the relatively limited financing for renewable energy in Africa as a whole thus far are multiple, this evident in the discussion with the renewable energy manager of the eThekweni Energy Office (19 August 2015):

*"...Market related issues, renewable energy potential is often only roughly estimated and a limited number of feasibility studies are available. There are few renewable energy project developers active in the market and market information is still largely unavailable. Another limit for financing renewable energy is political and policy related issues because there are underdeveloped regulatory and operational frameworks..."*

Market barriers can be both technical and non-technical. The majority of market barriers fall under the non-technical category. This is evidenced by the non-technical nature of the key barriers highlighted above. In the literature chapter it discussed that in this context is best explained by Sovacool (2009: 372) who summarizes the challenges facing renewable technologies today as "more about culture and institutions than engineering and science."

The above discussion shows that there is a huge potential for renewable energy to work well in the country if the challenges are addressed, of which are centered around market related issues and political and policy related issues. Municipal councilors may be tempted to give priority to "quick fix" service delivery projects which have more immediate, tangible and visible benefits

than renewable energy projects, in order to be seen to be attending promptly to urgent service delivery needs (Smeddle et al., 2012). The acting manager of the eThekweni Energy office (19 August 2015) stated that:

*“...also councilors term of office is limited duration, which may result in renewable energy initiatives not being followed through if their proponents are not re-elected to office the following year ...”*

This above discussion shows the lack of political will to prioritize renewable energy in the region. The timeframes are a huge barrier and that when it comes to policy alignment it becomes an added on issue in the successful uptake of renewable energy in the region. The country is faced with many developmental issues and for some people in the leadership position they are very much tempted to give priority to service delivery projects.

Municipalities in South Africa have a constitutionally mandated role to play in providing sustainable services that enable social and economic development whilst ensuring environmental compliance and sustainability. As mentioned in this chapter under the policy landscape for renewable energy, the eThekweni municipality has been developing renewable energy plans in light of the global and national energy challenges and changing regulations and in response to these challenges the municipality has been implementing and conceptualizing renewable energy projects.

One method for reducing costs and improving investment returns from renewables is to develop large scale projects that take full advantage of economies of scale, when planning renewable energy measures municipalities should consider this method and give priority to measures that deploy renewable technologies on a large scale in order to reduce the pay-back period on, and improve the financial viability of investments. This is evident in the following discussion that the eThekweni Energy Office is engaging in such interventions.

Interviewee Five (31 August 2015) stated that:

*“...The solar irradiation at a particular location determines the amount of energy that an installation is able to potentially generate for a defined area. This in turn lowers the*

*payback period for the installed systems. EThekweni Municipality has some of the lowest annual solar irradiation figures in the country. This will have implications regarding the financial benefit to the customer base installing the technology, specifically in terms of the potential financial saving achieved from investing in the solar technology...*

As discussed above, solar energy installations have a high initial capital cost. The high costs may require that the installations be debt funded. The market for renewable energy technologies is relatively new. This lack of maturity leads to higher volatility and thus to greater risk for lenders. As most renewable energy technologies are still in their infancy, they entail an additional technology risk. The challenges that the technologies would face in South Africa are still unknown. The financial institutions will factor all these risks into their credit conditions, which will raise the cost of lending. In addition, a lack of competition among South African financial institutions may have led to reluctance to explore new fields of lending activity in the past. As there is generally a lack of experience with renewable energy projects, it is difficult to obtain funding on the private capital market (Pegels, 2010). Interview four indicated that, “...governments have traditionally been the main investors in energy and have tended to focus on centralized power projects, whereas the greatest potential for renewable and energy efficiency is in decentralized projects...”

The above discussion aimed to provide an understanding of the reasons behind the relatively limited financing for renewable energy in the country and that these factors usually result in the risk of a proposed renewable energy project being overrated and the required viability hurdle rate becoming untenable. The study’s objective is to analyze the municipal financing for renewable energy projects and therefore affordable financing is therefore one of the critical factors inhibiting the wider realization of renewable energy projects. This study also found through documentary analysis in the Durban Climate change strategy a number of energy efficiency interventions were analyzed to determine their financial and energy impact, and in particular to assess their financial feasibility. Interventions that form part of the “low-hanging fruits” (i.e. least cost and easy to implement) are included as short-term options in the scenario modelling, whilst interventions that have higher capital costs and/or require long-term planning interventions have a longer lead-in time. In the latter case, the assumption is that over the life of

the programme the targets can be predominantly met by replacement of current technologies as they fail coupled with the growth in the various sectors, therefore there will be relatively few retrofits necessary.

Financial barriers were identified as the greatest barrier to investment. This was found to be specifically true for contexts where the consumer tariff for conventional electricity is considered to be relatively low. This outcome is further exacerbated in contexts where solar irradiation is low, thereby extending the payback period and making the return on investment less attractive. Added to this are high initial investment costs and difficulties obtaining the finances required for such an investments. However, as the price of the technology decreases and the cost of conventional electricity continue to increase, the attractiveness of such an investment increases proportionately. There are potential outcomes for the green economy and local economic development in the municipality.

This section of the results intended to critically examine the ways in which renewable energy projects of the eThekweni Municipality contribute to local economic development. The study proposes that if the local government can realize the potential of the uptake of renewable energy in the region in fostering local economic development.

## **5.7 conclusion**

This study aimed to critically examine the ways in which renewable energy initiatives of the eThekweni municipality contribute to local economic development. The study critically examines the role of the eThekweni Energy Office by investigating the understanding of the EO in regard to the relationship between renewable energy projects and economic development. The chapter further explored the inclusion of economic development goals within strategies and policies put in place by the eThekweni Energy Office to promote the uptake the uptake of renewable energy in the city.

The study also analysed municipal financing for renewable energy projects. The study examined the relationship between renewable energy projects in the eThekweni municipality and small business growth. These issues were examined through primary data collection during semi structured interviews with participants from the eThekweni Energy Office. Renewable energy

resources can be of key importance in the development of sustainable society (REN21, 2009). Each section in the results presented above addressed the aim and objectives of the study.

The first section of the chapter examined the eThekweni Energy Office purpose in playing a role in economic development. This section aimed to offer an understanding of the role that eThekweni Energy Office is playing. The intention was to determine their understanding and alignment with the promotion of renewable energy. The discussion presented in this section indicated that the eThekweni Energy Office is mandated to promote sustainable energy interventions in the broader eThekweni Municipal area.

The second section of this chapter examined the importance of renewable energy projects and local economic development. In this section LED was defined and the one of the dimensions of LED was explained and discussed and this is human capital development. The outline of this dimension aimed to clarify the role in which the eThekweni Energy Office is partaking in and how they can operate and focus in this LED dimension to foster local economic development. This was more apparent in the discussion of human development, as the researcher explored the value and impact that the eThekweni Energy Office has created.

The third section of this chapter critically examined the policy landscape of renewable energy in South Africa. This section focused more on the economic development goals, strategies and policies put in place by the eThekweni Energy Office to promote the uptake of renewable energy in the city. It focused on the National Development Plan (2011), which placed emphasis on how South Africa has to move away from unsustainable use of natural resources and transition to a low carbon, resilient economy. The study found that the eThekweni Energy Office's regulatory framework is fairly new to Local Government. Efforts has been made to put the necessary processes and with authorization from other Governmental institutions in place to allow local producers of 'green electricity' to feed into the eThekweni Municipal Electricity Grid. This section also highlighted the importance of the alignment of projects of the eThekweni Energy Office and the Integrated Development Plan. The EThekweni Energy Office developed the Durban Climate change strategy to promote the uptake of renewable energy in the city. This section also covered ecological modernisation theory and policy.

The fourth section of this chapter examined the relationship between renewable energy projects in the eThekweni municipality and small business growth. The study found that the eThekweni Municipality has developed a business plan in order to establish a Sustainable Energy SME Incubator in the eThekweni Municipal area with the majority financial support of the DTI Incubator Support Programme or alternatively, the SEDA Technology Programme. The eThekweni Energy Office has a policy to promote SMMEs.

The last section of this chapter analysed financing for renewable energy projects. This section focused more on the financing issues of renewable energy technologies. It is indicated from the discussions in this section that renewable energy technologies are highly capital intensive and that financing them is a critical issue. The deployment of renewable energy projects often require substantial amounts of money in order to plan the project, purchase and install the equipment, as well as to train staff for the operation and maintenance of the system installed.

This study found that renewable energy projects have so far had a rather poor reputation with the financing community as they are still viewed as a higher risk investment, resulting in stiffer requirements for investors and developers alike. The reasons behind the relatively limited financing for renewable energy in Africa as a whole thus far are multiple, this evident in the discussion with the renewable energy manager of the eThekweni Energy Office (19 August 2015).

The discussion in this section shows the lack of political will to prioritize renewable energy in the region. The timeframes are a huge barrier and that when it comes to policy alignment it becomes an added on issue in the successful uptake of renewable energy in the region. Conclusions can be established that renewable energy projects play a role in contributing to local economic development. The following chapter provides the overall conclusions to the study and suggests recommendations based on the discussions from this chapter.

## **Chapter Six**

### **Conclusions and Recommendations**

This study was conducted to critically examine the ways in which renewable energy initiatives of the eThekweni Municipality contribute to local economic development using the case study of the eThekweni Energy Office. This chapter aims to merge different sections of the study in order to show how the aim and objects of the study were realized. This chapter also aims to provide conclusions and recommendations based on the different aspects that were examined in the study. These sections include the summary, contribution of the research, recommendations and final remarks on the study.

#### **6.1 Summary**

This section provides an overview of the study, extracting from the aim of the study to the findings. The first chapter of the study provided a background regarding the purpose of the study, in order to satisfy the aim of this study, the following objectives were identified:

1. To investigate the understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development.
2. To critically examine the inclusion of economic development goals within strategies and policies put in place by the eThekweni Energy Office to promote the uptake of renewable energy in the city.
3. To analyse the municipal financing for renewable energy projects.
4. To examine the relationship between renewable energy resource projects in the eThekweni Municipality and small business growth.

This chapter also outlined the research design and methodology of the study. After this key concepts were defined and an outline of the chapters was given.

Chapter two presents a background into the policy framework that exists in South Africa with regards to renewable energy and climate change. Chapter Three constitutes the literature review, which outlines green economy as an approach that reflects the shift in thinking from a business as usual neoliberal economic approach, of which considers the environment as an infinite resource from which to grow the economy, to one that recognises that the environmental system has thresholds or limits (UNEP, 2010). It discussed how the green economy is defined. This chapter also discussed the types of renewable energy resources and how the government intends to strategically develop the renewable energy resources in the future in a systematic way.

This section of the study also focused on theoretical literature in order to understand the concept of ecological modernisation, Ecological modernization is a theoretical framework which is being used to conceptualise the changes that are taking place in environmental policies (Spaargaren and Mol, 1992 in Mol *et al.*, 2009). This theory aims to provide an understanding of the relationship between society and the environment. The theory of ecological modernisation is used to analyse the current policies being established to manage the environment in the face of climate change. The literature review presented early views on ecological modernisation and then provided a critique of the theory. The last section of this chapter looked into Local economic development, the theoretical framework will draw on Nel and Rogerson's (2005) consideration of local economic development as a process in which local government and community based groups manage their existing resources.

Chapter Four presented the research methodology of this study. This research has been conducted by employing a qualitative research design approach, using a case study design. Semi structured face-to-face interviews were then conducted with each participant and recorded with a voice-recording device. A thematic analysis was then conducted and key themes were identified from the data collected, which fed into the results of the study. Documentary data were also collected relating to South African legislation. This data provided a basis on which participants views were tested.

Chapter Five presents a detailed analysis of the data findings. This chapter has been divided into five sections first being on examining the role that the eThekweni Energy Office plays in

fostering development. The discussion presented in this section indicated that the eThekwini Energy Office is mandated to promote sustainability. The second section of this chapter examined the importance of renewable energy projects and local economic development. The third section of this chapter also explored the inclusion of economic development goals within strategies looking at the policy landscape of renewable energy in South Africa. Through documentary analysis it focused on the NDP (2011) which placed emphasis on how South Africa has to move away from unsustainable use of natural resources and transition to low carbon, resilient economy. This section also focused on the Durban Climate Change Strategy and the Integrated Development Plan in terms of renewable energy initiatives and the data collected showed that the eThekwini Energy Office strategies are aligned to the integrated development plan. The Fourth section of this chapter focused on the relationship between small business growth and renewable energy projects and the last section of this chapter analysed financing for renewable energy projects and it was indicated in the discussions that renewable energy is highly capital intensive and that financing them is a critical issues.

There were key terms that appeared throughout the discussion, these key terms fall under the above mentioned themes. Table 6.1 below outlines central themes that appeared throughout discussions.

**Table 6.1.: Central themes emerging from the results**

<b>Central Themes</b>	<b>Explanation</b>	<b>Source of Data</b>
Creating market access	eThekwini Energy Office stresses the need to create an enabling environment for businesses to tap into the market of renewable energy.	All Participants
Skills development	Skills development can play a critical role in facilitating or fostering economic activities for example installation and maintenance of renewable energy technology.	All Participants

Job creation	The adoption of renewable energy in the city can create jobs through installation and maintenance and acquiring skills.	All Participants
Climate Change	EThekweni Energy Office sees renewable energy resources as the means to address the challenges of climate change and energy insecurity.	All Participants
Partnerships	The stakeholders that participate in renewable energy projects are needed in the process and it's important for a partnership to be built for the success of these projects.	All Participants

Moreover, it's well affirmed by the participants that renewable energy adoption is important mainly because it plays a role in the reduction of Greenhouse Gas emissions and the potential to reduce the impact of load shedding. It also has economic benefits which including job creation, localisation of the manufacturing and decreasing the importation of energy into eThekweni municipality region. And from a technical perspective, when you generate energy closer to the point of consumption technical losses are reduced which increases the efficiency of the entire system.

It's evident in the discussions with participants that renewable energy industry would promote job creation. In a 2003 South African study, Austin (2003) concluded that large scale deployment of renewable energy technologies substantially increases the number of jobs in the energy sector. These are born from the manufacturing of renewable energy components as well as the installation and operation of renewable energy plants. South Africa's abundant renewable energy resources (wind, solar, water) and extensive biodiversity offer new opportunities for the transition to a green economy and green jobs (Sutherland et al., 2011). Knowing these aspects would improve our ability to predict and understand the extent of impact of the green economy in the city, but these are details which are not clearly known.

## **6.2 Contribution of the Research**

This study aims to critically examine the ways in which renewable energy initiatives of the eThekweni Municipality contribute to local economic development. This thesis has focused on highlighting that the adoption of renewable energy can be means for local economic development.

According to the German international development agency (GIZ) LED is an ongoing process by which key stakeholders and institutions from all spheres of society , the public and private sector as well as civil society, work jointly to create a unique advantage for the locality (Ruecker, Trah, 2007). Using the case study of the eThekweni Energy Office, the discussions showed that eThekweni Energy Office has the potential to foster local economic development in eThekweni municipality because already they work with different stakeholders to conceptualize and drive renewable energy projects. The success of local economic development is also measured by the generation and nurturing of strong stakeholder partnerships to negotiate best ways to promote development.

This study should also prove valuable for the development of future mechanisms to reduce GHG emissions within localities. Fossil fuels are responsible for nearly 60% of global greenhouse gas emissions generated each year by human activity. More than half of that amount or around one-third of total greenhouse gas emissions stems from oil and gas; the remainder comes from coal. The consensus in the scientific community, especially the Intergovernmental Panel on Climate Change (IPCC), is that greenhouse gas emissions have an impact on climate and that an international effort is necessary to keep the resultant temperature increase to 2°C to 2100.

The following section presents the recommendations to future researchers who wish to conduct research in this field.

## **6.3 Recommendations**

This section aims to provide recommendations for future researchers who may wish to conduct research in the same field of study. This section also includes recommendations for improved practice. Recommendations based on the evidence are provided here. Firstly, an enabling

environment should be created for Independent Power Producers (IPP) to produce electricity in order to catalyse the large scale implementation of renewable energy. Furthermore, the nature of the decentralized geographical locations of renewable energy projects provides an opportunity to provide a more dispersed distribution of revenue from renewable energy projects.

One obstacle to the development of renewables is the lack of information available to the consumer about renewable energy options. There is a need to provide comprehensive, independent and comparative information on renewable energy products and services to customers to support informed decision-making. The main constraint on implementing a national solar water heating programme relates to cost, which is a function of the current small market and lack of economies of scale. A lack of demand in itself is due to low public awareness of the technology or its economic benefits. The successful penetration and uptake of renewable energy technologies into South Africa depends crucially on growing a market demand in the various energy sectors. However, at present public awareness of the existence of renewable energy or its economic, environmental and social benefits, is limited.

The job creation potential of the renewable energy industry lay not so much in the operation and maintenance of such facilities, but rather in the manufacture of such technologies. The manufacture of renewable technologies is more labour-intensive than conventional energy technologies and requires an appreciable labour force for manufacturing. However, in order to make local manufacture viable, economies of scale, that is significant demand, will be required. Since significant levels of demand will be partly a function of Government support, and since in the short-term at least, South Africa will face many pressing demands. There is a need to have secondary municipal data which will provide statistics and having this information is useful for future research.

It is recommended that future research be investigated, mainly because there is a need to undertake research to find out how renewable energy can be incorporated in South Africa in terms of local economic development. Research can be conducted in the following areas mentioned below:

- The impact of carbon taxes on the future of South African business.

- South African industry response to financing renewable energy projects
- Research into ecological modernisation principles, which may be adopted by policy makers in order to provide a more democratic, open process in terms of environmental decision-making.

#### **6.4 Final Remarks**

It was well established from the literature chapter that Local economic development is now included firmly on the agenda of many national governments and international agencies acknowledging its prominent role in urban development and business promotion. LED incorporates numerous dimensions of socio-economic development and upliftment. These include human capital and skills development, small business development and Employment creation. It was also established from the literature that according to the green economy framework, green jobs are either jobs in businesses that produce goods and provide services that benefit the environment or conserve natural resources.

The above argument integrates the commonalities between local economic development and the green economy by outlining the linkages between them. And how important it is to focus on green economy initiatives such as renewable energy resources which supports local economies, the creation of green sustainable employment, and moving towards a cleaner region with more reliable energy for the future. And the South African government recognizes that substantial opportunities exist for electricity and energy generation through the development and use of renewable energy systems.

It was also established in previous discussions that the deployment of renewable energy sources, it must be noted or realized that they often requires substantial amounts of money, in order to plan the projects, purchase and install the equipment. Renewable energy resources are seen as higher risk investments resulting in stiffer requirements for investors and developers alike. The reasons behind the relatively limited financing for renewable energy are multiple from market related issues to political and policy related issues and these factors usually result in the risk of a proposed project being overrated and required viability hurdle rate untenable. Therefore

affordable financing is one of the critical factors inhibiting the wider realization of renewable energy projects.

And in overcoming these barriers to renewable energy generation, this obligation rests on everyone; the government, public and private entities, individuals and communities forming partnerships is important to achieve the main goal.

## References

- Abdeen O.M. (2007), Energy, environment and sustainable development, *Renewable and sustainable energy reviews*, (12), 2265-2300
- Akudugu, J. A. and Laube, W. (2013), Implementing Local Economic Development in Ghana: Multiple Actors and Rationalities. Bonn: ZEF Working Paper Series, No. 113.
- Alnatheer, O. (2006), Environmental benefits of energy efficiency and renewable energy in Saudi Arabia's electric sector. *Energy Policy*, 34(1), 2-10.
- Austin, G. (2003), Employment Potential of Renewable Energy in South Africa. *Agama Energy*, p.63
- Barbier, E. B. (2010), *A global green new deal: rethinking the economic recovery*. Cambridge University Press.
- Barry, J., & Doran, P. (2006), Refining green political economy: from ecological modernisation to economic security and sufficiency. *Analyse und Kritik-Zeitschrift für Sozialwissenschaften*, 28(2), 250.
- Bell, L. (2010), *Doing Your Research Project: A Guide for First-Time Researchers in Education, Health and Social Sciences*. McGraw Hill International: England.
- Berger, G., Flynn, A., Hines, F., and Johns, R. (2001), Ecological modernization as a basis for environmental policy: Current environmental discourse and policy and the implications on environmental supply chain management. *Innovation: The European Journal of Social Science Research*, 14(1), 55-72.
- Bethke, S., Allison, J., Ambrus, K., Barlow, R. J., Bartel, W., Bowdery, C. K., & Duerdoth, I. P. (1988), Experimental investigation of the energy dependence of the strong coupling strength. *Physics Letters B*, 213(2), 235-241.

- Beveridge, R., & Guy, S. (2005), The rise of the eco-preneur and the messy world of environmental innovation. *Local Environment*, 10(6), 665-676.
- Blakely, E. J., & Bradshaw, T. K. (2002), Concepts and Theories of Local Economic Development. *Blakely and Bradshaw Planning Local Economic Development*. Sage, 53-73.
- Bless C., Higson-Smith, C., and Kagee, A. (2006), *Fundamentals of Social Research Methods: An African Perspective*. Juta and Company Ltd: Zambia.
- Bond, P. (2003, April), Debates in local economic development policy and practice. In *Urban Forum*, 14 (2), pp. 147-164). Springer Netherlands.
- Borowy, I. (2014). *Defining sustainable development: The world commission on environment and development (Brundtland Commission)*. Milton Park: Routledge.
- Bossard, G., & Nicolai, H. (2011), Counterterms vs. dualities. *Journal of High Energy Physics*, 2011(8), 1-18.
- Boykoff M, Bumpus A, and Liverman D (2009) Guest editorial: Theorizing the carbon economy. *Environment and Planning A* 41(10): 2299–2304.
- Blowers, A. (1997), Environmental Policy: Ecological Modernisation or the Risk Society? *Urban Studies*, 34 (5-6), pp. 845-871.
- Bumpus A and Liverman D (2008) Accumulation by decarbonisation and the governance of carbon offsets. *Economic Geography* 84: 127–155.
- Buttel, F.H. (2000), Ecological modernization as social theory, *Geoforum*, 31(1), 57-65
- Cock, J. (2004), Connecting the red, brown and green: the environmental justice movement in South Africa.[.na](http://www.southafrica.net)
- Christoff, P. (1996), Ecological Modernization, Ecological Modernities: Environmental Politics, 5 (3), pp. 476-500.

Creswell, J. W. (2013), *Research design: Qualitative, quantitative, and mixed methods approach*. Sage.

Department of Energy (2011), *Integrated Resource Plan for Electricity 2010-2030, Revision 2* Final report, issued on 25 March 2011.

Department of Environmental Affairs and Tourism (DEAT). (2009), *Greenhouse Gas Inventory South Africa: 1990-2000*. Pretoria.

<http://www.pmg.org.za/files/docs/090812greenhouseinventory.pdf> (Last accessed 12/04/2015).

De Vries, J. (2006), *European Urbanization, 1500-1800 (Vol. 4)*. Routledge.

Du Plessis, C. (2012), Towards a regenerative paradigm for the built environment. *Building Research & Information*, 40(1), 7-22.

Eskom. (2012), *Distribution charges (DUoS) electricity pricing definitions (standard) use of system policy* <http://www.eskom.co.za/content/ElectrPricDefbroch07v1.pdf?Src=Item+2255> (Last accessed 13/03/2015).

Foster-Pedley, J & Hertzog, H. (2006), *Financing strategies for growth in the renewable energy industry in South Africa: UCT Graduate School of Business and Atlantic Solar*. *Journal of Energy in Southern Africa*, Vol 17 No 4, November 2006. p.61.

Freedsmen, J. J., Kennedy, L. J., Kumar, R. T., Sekaran, G., & Vijaya, J. J. (2010), *Studies on the structural and optical properties of zinc oxide nanobushes and Co-doped ZnO self-aggregated nanorods synthesized by simple thermal decomposition route*. *Materials Research Bulletin*, 45(10), 1481-1486.

Gets, A. (2013), *Powering the Future: Renewable Energy Roll-out in South Africa*. Prepared for Greenpeace Africa by AGAMA Energy (Pty) Ltd Cape Town, South Africa.

Gibbs, D (1997) *Urban sustainability and economic development in the United Kingdom: exploring the contradictions*, *Cities*, 14(4), 203-208.

Gnansounou, E., Dauriat, A., & Wyman, C. E. (2005), Refining sweet sorghum to ethanol and sugar: economic trade-offs in the context of North China. *Bioresource Technology*, 96(9), 985-1002.

Gray, D. E. (2013), *Doing research in the real world*. Sage.

Greenpeace East Africa, (2012), *China wind power outlook 2012*.

<http://www.greenpeace.org/eastasia/publications/reports/climate-energy/2012/wind-energy-report-2012/> Accessed 18 December 2012.

Habib, A., and Maharaj, B. (2008), *Giving and Solidarity: Research Flows for Poverty Alleviation and Development in South Africa*. HSRC Press: Cape Town.

Hajer, M.A. (1995), *The Politics of Environmental discourse Ecological Modernization and the Policy Process*, Oxford University Press, Oxford.

Hajer, M.A. (1996), *Ecological modernisation as cultural politics*.

Hajer, M.A. and Wagenaar, H. (2003), *Deliberative Policy Analysis: Understanding Governance in the Network Society*, Cambridge University Press, Cambridge.

Hajer, M.A. (2004), *Three dimensions of deliberate policy analysis: the case of rebuilding ground zero*. Paper presented at the Annual Meeting of the American Political Science Association, Chicago, 2-4 September 2004.

Harper, M. E., Green, K., & Brand, M. D. (2008), The efficiency of cellular energy transduction and its implications for obesity. *Annu. Rev. Nutr.*, 28, 13-33.

Helmsing, A. H. J. (2005), *Governance of local economic development in Sub-Saharan Africa: who are the dancers and do they act'in concert'?*. Institute of Social Studies.

Henderson, H. (2007), *Growing the green economy globally: International Journal of Green Economics*, 1(3), 276-298.

Herbst, D. (2001), *Internet-PR*. Berlin: Cornelsen.

Huber, J. (2000), Towards Industrial Ecology: Sustainable Development as a Concept of Ecological Modernisation, *Journal of Environmental Policy and Planning*, 2, pp. 269-285.

HuberM(2009a) Energizing historical materialism: Fossil fuels, space and the capitalist mode of production. *Geoforum* 40(1): 105–115.

Hvelplund, F. (2006), Renewable energy and the need for local energy markets. *Energy*, 31(13), 2293-2302.

King, N, & Horrocks, C. (2010), *Interviews in qualitative research*. Sage.

Koplow, D & Kretzmann, S. (2010), *G20 Fossil-fuel Subsidy Phase Out: A review of current Gaps and Needed Changes to Achieve Success*. November 2010. p.9.

Kruyt, B, van Vuuren, D. P., De Vries, H. J. M., & Groenenberg, H. (2009), Indicators for energy security. *Energy Policy*, 37(6), 2166-2181.

Leedy, P. D., and Ormrod J. E. (2014), *Practical Research Planning and Design*: Pearson Education Limited, Upper Saddle River.

Leigh, N. G., & Blakely, E. J. (2013), *Planning local economic development: Theory and practice*. SAGE Publications, Incorporated.

Letete, T; Guma, M; Marquard, A. (Date not given), How do South African emissions compare with those of other countries? Energy Research Centre, University of Cape Town p.4.

Little, G., Maxwell, T. and Sutherland, M. (2006), *Accelerating the Implementation of the Clean Development Mechanism in South Africa*, Gordon Institute of Business Science, University of Pretoria. SAJEMS NS 10 Volume 4.

Lohmann L (2005) Marketing and making carbon dumps: Commodification, calculation and counterfactuals in climate change mitigation. *Capitalism Nature Socialism* 14(3): 203–235.

Lovell H, Bulkeley H, and Owens S (2009) Converging agendas? Energy and climate change policies in the UK. *Environment and Planning C: Government and Policy* 27: 90–109.

- Malefane, S. R. (2013), Small, Medium and Micro Enterprise and Local Economic Base Restructuring A South African Local Government Perspective, *Journal of Public Administration*. (48) 4, 672–691.
- Mandell, S., & Wilhelmsson, M. (2011), Willingness to pay for sustainable housing. *Journal of Housing Research*, 20(1), 35-51.
- Markevičius, A., Katinas, V., Perednis, E., & Tamašauskienė, M. (2010), Trends and sustainability criteria of the production and use of liquid biofuels. *Renewable and Sustainable Energy Reviews*, 14(9), 3226-3231.
- Marthur, V. (1999), Human Capital-Based Strategy for Regional Economic Development: *Economic Development Quarterly*. 13(3), 203-216.
- Mol, A. (1995), *The refinement of production: Ecological Modernisation Theory and the Chemical Industry*, Van Arkel, Utrecht.
- Mol, A. (2000), The environmental movement in an era of ecological modernization. *Geoforum*, 31, pp. 45-56.
- Mol, A., Sonnenfeld, D. and Spaargaren, G. (2009), *The Ecological Modernisation Reader*. Routledge, London and New York.
- Munday, M., Bristow, G. and Cowell, R. (2011), Wind farms in rural areas: How far do community benefits from wind farms represent a local economic development opportunity? *Journal of Rural Studies* 27 1e12.
- Muneer, T., Asif, M., & Munawwar, S. (2005), Sustainable production of solar electricity with particular reference to the Indian economy. *Renewable and Sustainable Energy Reviews*, 9(5), 444-473.
- Murphy, J. (2000), Editorial-Ecological Modernization, *Geoforum*, 31(1), 1-8.

Nel, E. (2001), Local Economic Development: A Review Assessment of its Current Status in South Africa. *Urban Studies*. Sage Online. Available online at: <http://usj.sagepub.com/content/38/7/1003>. [Accessed 20th April].

Nel, E. L., and Rogerson, C. M. (2005), Pro-Poor Local Economic Development in South Africa Cities: Policy and Practice. *Africa Insight*.

Nel, E. L., & Humphrys, G. (1999), Local economic development: Policy and practice in South Africa, *Development Southern Africa*, 16(2), 277-289.

Nel, E., & Rogerson, C. (2005), Setting the scene: Local economic development in Southern Africa.

Nel, Etienney Rogerson, Christian. (2005), *The Experience of Southern Africa: Local Economic Development in the Developing World*. New Jersey: Transaction Publishers, 1-16.

NERSA. (2009), Renewable Energy Feed-in tariff Phase 2 consultation document.

<http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/REFIT%20Phase%20II%20150709.pdf>; (Last accessed 23/01/2015).

Oelofse, C., Scott, D., Houghton, J. and Oelofse, G. (2006), Shifts within Ecological Modernisation in South Africa: Deliberation, Innovation and Institutional Opportunities, *Local Environments* 11(1), pp. 61-78.

Omer, A. M. (2008), Energy, environment and sustainable development. *Renewable and sustainable energy reviews*, 12(9), 2265-2300.

Painuly, J. P. (2001), Barriers to renewable energy penetration; a framework for analysis. *Renewable energy*, 24(1), 73-89.

Pretorius, L. (2011), A cause for concern, in *Financial Mail* 24 August 2011, available online at [www.fm.co.za/Article.aspx?id=15154](http://www.fm.co.za/Article.aspx?id=15154).

REN21. (2009), *Renewables Global Status Report: 2009 Update*. REN21 Secretariat. Paris.

- Republic of South Africa (2004), Act No. 53 of 2003: Broad-Based Black Economic Empowerment Act. Government Gazette 463. (25899), Cape Town 9 January 2004.
- Republic of South Africa. (1995), Constitution of the Republic of South Africa, Act 108 of 1995. Government Printer, Pretoria.
- Republic of South Africa. (1998a), White Paper on Energy Policy. Government Printer, Pretoria. <http://www.info.gov.za/whitepapers/1998/energywp98.htm>. (Last accessed 25/03/2015).
- Republic of South Africa. (1998b), National Environmental Management Act, Act 100 of 1998. Government Printer, Pretoria.
- Republic of South Africa. (2003), White Paper on Renewable Energy of November 2003. Government Printer, Pretoria.
- Republic of South Africa. (2011a), National Climate Change Response White Paper [http://www.environment.gov.za/PolLeg/WhitePapers/national\\_climatechange\\_response\\_whitepaper.pdf](http://www.environment.gov.za/PolLeg/WhitePapers/national_climatechange_response_whitepaper.pdf) (Last accessed 25/05/2015).
- Republic of South Africa. (2011b), Integrated Resource Plan for Electricity 2012 – 2030 [http://www.energy.gov.za/IRP/irp%20files/IRP2010\\_2030\\_Final\\_Report\\_20110325.pdf](http://www.energy.gov.za/IRP/irp%20files/IRP2010_2030_Final_Report_20110325.pdf) (Last accessed 05/03/2013).
- Richards, A., & Waterbury, J. (2009), *A political economy of the Middle East*. Westview Press.
- Robinson, J. B., Shaw, M., Silburn, D. M., Roberts, A., Viagak, O., Thornton, C., & McClymont, D. (2011), An improved model for linking Phosphorus loads in runoff to climate, soil and agricultural management. MODSIM.
- Rodríguez-Pose, A., & Tijmstra, S. (2009), On the emergence and significance of local economic development strategies.
- Rogerson, C. M. (2003), Towards pro-poor local economic development: the case for sectoral targeting in South Africa. In *Urban Forum* (Vol. 14, No. 1, pp. 53-79). Springer Netherlands.

Rogerson, C. M. (2004), Pro-poor Local Economic Development in Post-apartheid South Africa: The Johannesburg Fashion District. *International Development Planning Review*. (26) 4, 401–429.

Rogerson, C. M. (2008), Integrating SMMEs in Value Chains: The Role of South Africa's Tourism Enterprise Programme. *Africa Insight*. Vol. 38, No. 1, 1–19.

Rogerson, C. M. (2010), *In Search of Public Sector-Private Sector Partnerships for Local Economic Development in South Africa*. Springer Science & Business Media LLC: USA.

Rumsey, A.B. and King, N.D. (2009), 'Climate Change: Adaptation, and Mitigation; Threats and Oppourtunities' pp.1063-1072.

Rutovitz, J & Roth, K. (2011), More jobs and progress for South Africa: The Advanced Energy [R]evolution scenario and its impact. Institute for Sustainable Futures, University of Technology Sydney prepared for Greenpeace. p. 5.

Santos, F. M. (2012), A positive theory of social entrepreneurship. *Journal of Business Ethics*. (111) 3, 335-351.

Saunders M., Lewis, P., and Thornhill A. (2003), *Research Methods for business students*. Pearson Education: Upper Saddle River.

Schelly, C. (2015), Frameworks for Understanding and Promoting Solar Energy Technology Development. *Resources*, 4(1), 55-69.

Schmidt, S. (2008), Coal deposits of South Africa - the future of coalmining in South Africa. [http://www.geo.tufreiberg.de/oberseminar/os07\\_08/stephan\\_Schmidt.pdf](http://www.geo.tufreiberg.de/oberseminar/os07_08/stephan_Schmidt.pdf).

Scott, D. and Oelofse, C. (1999), The Location of Regional Landfills on the Lower North Coast, KwaZulu-Natal: A Social Probe of the Mandeni and Kwadakuza Landfill Windows, Department of Geographical and Environmental Science, University of Natal, Durban, unpublished report.

Seippel, O. (2000), Ecological Modernisation as a Theoretical Device: Strengths and Weaknesses, *Journal of Environmental Policy and Planning*, 2, pp. 287-302.

Sekaran, U., and Bougie, R. (2010), *Research Methods for Business: A Skill Building Approach*. Willey: UK.

Simon, D. (2003), *Contextualizing South African Local Economic Development within Current Development Debates: The International Setting*. Urban Forum.

Simon, K. W. (2005), *Reform of China's Laws for NPOs: A Discussion of Issues Related to Shiye Danwei Reform*. *Journal of Chinese Law*. Vol. 30, No. 2, 77-82.

Smeddle, L. (2012), *A South African Renewable Energy Guide for Local Government*. Juta and Company Ltd: Cape Town.

Son, H. H. (2010), *Human Capital Development: Asian Development Review*. Vol. 27, No. 2, 29-56.

SmilV(2005) *Energy at the Crossroads: Global Perspectives and Uncertainties*. Cambridge, MA: MIT Press.

Stake, R. E. (1995), *The art of case study research*. Sage.

Stoevska, V., & Hunter, D. (2012). *Proposals for the statistical definition and measurement of green jobs*. International Labour Office: Geneva. <http://www.gogle.ca/url>.

Sutherland, C., et al (2012), *developing a strategy for a green economy in KwaZulu-Natal: Green economy strategy for KwaZulu-Natal*, vol (4)1-39.

Tait, L. (2011), *The potential for local community benefits from wind farms in South Africa*. Masters Dissertation, Energy Research Centre, University of Cape Town, February 2011.

Teles, F. F. F., WHITING, F. M., Price, R. L., & Borges, V. E. (2015), *indica (L.)Ceres*, 44(252).

Todaro, M. S. (2011). *SC: Economic Development*. Harlow.

Tyler, E. (2009), *Aligning South African energy and climate change mitigation policy*. University of Cape Town. Energy research centre.

[http://www.erc.uct.ac.za/Research/publications/09Tyler\\_Policy\\_alignment.pdf](http://www.erc.uct.ac.za/Research/publications/09Tyler_Policy_alignment.pdf). (Last accessed 13/11/2011).

UNEP, (2010), *Green Economy: Developing Countries Success Stories*. United Nations Environment Programme, Geneva.

UNEP, (2011), *Towards a green economy: Pathways to sustainable development and poverty eradication*. Geneva.

UNFCCC, (2012), <http://www.unfccc.int>. Home page. (Last accessed 21/06/2012).

United Nations Environmental Programme, (2006). <http://www.cdmpipeline.org/overview.htm>. (Last accessed 19/06/2012).

United Nations Environmental Programme, (2011). <http://www.cdmpipeline.org/overview.htm>. (Last accessed 19/06/2012).

Van der Waldt, G. (2014), *Municipal Management: Serving the People*. Juta and Company Ltd: Cape Town.

Verbruggen, A., Fishedick, M., Moomaw, W., Weir, T., Nadaï, A., Nilsson, L. J & Sathaye, J. (2010), Renewable energy costs, potentials, barriers: Conceptual issues. *Energy Policy*, 38(2), 850-861.

Wolcott, H. F. (1994), *Transforming qualitative data: Description, analysis, and interpretation*. Sage.

World Bank (2007), *World Development Report 2008: Agriculture for Development*. World Bank: Washington, D.C.

World Bank (2010), *World Development Indicators*. Available online at: <http://data.worldbank.org/data-catalog/world-development-indicators/wdi> [Accessed June 2014].

Wlokas, H.L. and Tait, L. (2012), *Memo: Challenges and opportunities to maximise the sustainable development potential for local communities in South Africa's Renewable Energy Procurement Programme*. Online available

[http://www.erc.uct.ac.za/Tempdocs/ERC%20and%20CDRA\\_Memo\\_RE%20IPPPP\\_Aug%202013.pdf](http://www.erc.uct.ac.za/Tempdocs/ERC%20and%20CDRA_Memo_RE%20IPPPP_Aug%202013.pdf), Energy Research Centre, University of Cape Town, August 2012.

Winkler, H. (2007), Energy policies for sustainable development in South Africa. *Energy for sustainable Development*, 11(1), 26-34.

Winkler, H. (2006), Energy policies for sustainable development in South Africa. Options for the Future. University of Cape Town. Energy research centre.

[http://www.iaea.org/OurWork/ST/NE/Pess/assets/South\\_Africa\\_Report\\_May06.pdf](http://www.iaea.org/OurWork/ST/NE/Pess/assets/South_Africa_Report_May06.pdf). (Last accessed 13/11/2011).

Wynne, B. (eds.), *Risk, Environment and Modernity: Towards a New Ecology*, Sage Publications, London. pp. 246-268.

Yin, R. K. (2009), *Case Study Research: Design and Methods*. SAGE Publications: London.

York, R.; Rosa, E.A (2003), Key challenges to ecological modernization theory. *Org. Environ*, 16, 273–288.

### **List of Participants**

Interviewee One (19/08/2015), Project Officer, eThekwini Energy Office, KwaZulu-Natal

Interviewee Two (19/08/2015), Project Manager, eThekwini Energy Office, KwaZulu-Natal

Interviewee Three (19/08/2015), Manger: Renewable Energy, eThekwini Energy Office,  
KwaZulu-Natal

Interviewee Four (31/08/2015), International Energy Transaction Officer, eThekwini Energy  
Office, KwaZulu-Natal

Interviewee Five (31/08/2015), Manager: Climate Change, eThekwini Energy Office, KwaZulu-  
Natal

Interviewee Six (31/08/2015), Climate Change Monitoring and Reporting, eThekwini Energy  
Office, KwaZulu-Natal

## **Appendix A: Interview Schedule**

### **Interview Schedule Guideline**

1. Introduce myself- I am currently undertaking master degree in commerce at the university of natal interested in renewable energy and local economic development.
2. Introduce Thesis topic- in broad terms my thesis looks at renewable energy initiatives as means for local economic development in the eThekweni municipality. As a case study I am reviewing the understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development. I would like to get a sense of how the eThekweni energy office perceives linkages between renewable energy projects and economic development.
3. The interview is intended to be an informal discussion; the following outline gives you a sense of the issues I would like to discuss with you.
  - A brief description of your department and responsibilities and functions, as well as your area of responsibility
  - Your involvement in renewable energy projects
  - The inclusion of economic development goals within strategies and policies put in place by the eThekweni Energy Office to promote the uptake of renewable energy in the city
  - How is implementation capacity ensured?

#### **A. Introduction to the interview**

Explain to project manager/consultant being interviewed what I want to gain from the interview:

- An understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development.

- An understanding of the different perspectives of the various role-players in the projects, and how this did or did not influence the project process and end product.
- The potential (or not) of the project to influence planning, development and environmental management in the city.

### **General Questions**

1. Please could you give me an overview of your professional experience, the type of work you are involved in, and your interest and expertise?
2. Provide background on the project process. How the project got initiated and how the team got involved?
3. Who were the most dominant role players in the projects?
4. What ideas did they bring to the project, how did their ideas influence the development of the project and final result?
5. Where there any conflictual issues, disagreements negotiations, compromise as part of the project? How did these get resolved?
6. Has the projects achieved its aim?

### **Objectives and questions**

- **To investigate the understanding of the eThekweni Energy Office in regard to the relationship between energy projects and economic development.**
  - The projects that the energy office is involved in, are they in anyway contributing to economic development?
  - Is implementation of these projects creating employment?
  - Who gets involved in physically implementing the technical part?
  - Do you think jobs can be created through physically implementing the technical component?
  - Does the locality benefit in anyway once the renewable energy project is up and running (in what ways)?

- Has there been any feedback given about how the project has been running? What kind of feedback?
  - Are there any issues relating to the project process and outcomes that you would like to discuss?
  - What are your overall perspectives on the projects, its concepts and ideas?
  - What are the challenges being experienced when trying to implement these renewable energy projects?
- **To examine the inclusion of economic development goals within strategies and policies put in place by the Energy Office to promote the uptake of renewable energy in the city.**
- Do you have policies or strategies that have been implemented to promote renewable energy?
  - Is it aligned with the IDP?
  - What interventions has the Energy Office put in place to meet or address the uptake of renewable energy technology?
- **To analyse the municipal financing for renewable energy projects.**
- Documentary analysis
  - Where does the funding come from?
  - Is it in the municipal budget (renewable energy projects)?
- **To examine the relationship between renewable energy resource projects in the eThekweni Municipality and small business growth**
- Is there a service provider providing assistance with the implementation of the renewable technology?
  - Economic growth is often a result of small businesses pushing the adoption of technological advancement coupled with the drive for efficient operations, have you seen such in the city?
  - In your view will renewable energy adoption for businesses improve the economy while lowering their carbon footprint?

## Appendix B: Ethical Clearance Certificate

08 July 2015

Ms Nokukhanya Thobeka Radebe (210503823)  
Graduate School of Business & Leadership  
Westville Campus

Dear Ms Radebe,

**Protocol reference number: HSS/0758/015M**

**Project title:** Renewable Energy Production as means for Local Economic Development: A case study of eThekweni Municipality

Full Approval – Expedited

Application In response to your application received on 18 June 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted FULL APPROVAL.

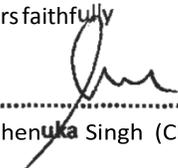
**Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above referencenumber.**

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

**The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.**

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully



.....  
Dr Shenuka Singh (Chair)

Cc Supervisor: Dr Jennifer Houghton  
Cc Academic Leader Research: Dr  
Muhammod Hoque Cc School Administrator:  
Ms Zarina Bullyraj

---

Humanities & Social Science Research Ethics Committee

Dr Shenuka Singh (Chair)

Westville Campus, Govan Mbeki

building

Postal Address: Private Ba0X54001, Durban 4000

Telephone: +27(0)212603587/8350/4557 Facsimile: +27(0)312604609 Email: [ximbap@ukzn.ac.za](mailto:ximbap@ukzn.ac.za) / [snymanm@ukzn.ac.za](mailto:snymanm@ukzn.ac.za)

1910 • 2010  
100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

## Appendix C: Informed Consent Letter

### UNIVERSITY OF KWAZULU-NATAL GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

#### MCOM Research Project

**Researcher:** Thobeka Radebe (031 260 8898)

**Supervisor:** Dr Jennifer Houghton (031 260 7429)

**Research Office:** Ms P Ximba (031260 3587)

Dear Participant,

I, Thobeka Radebe, a master of commerce student, at the Graduate School of Business and Leadership, of the University of KwaZulu-Natal. You are invited to participate in a research project entitled **Renewable Energy Production as means to Local Economic Development: A Case study of eThekweni Municipality**. The aim of the study is to critically examine the ways in which renewable energy initiatives of the eThekweni Municipality contribute to local economic development.

Through your participation I hope to find out the understanding of the eThekweni Energy Office in regard to the relationship between renewable energy projects and economic development.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey/focus group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about participating in this study, you may contact me or my supervisor at the numbers listed above.

The interview should take you about 30-45 minutes to complete. I hope you will take the time to help in making this study feasible and add to the knowledge of eThekweni Municipality.

Yours Sincerely

Investigator's signature \_\_\_\_\_ Date \_\_\_\_\_

**This page is to be retained by participant**

**Appendix D: Participant Consent**  
**UNIVERSITY OF KWAZULU-NATAL**  
**GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP**

**MCOM Research Project**  
**Researcher:** Thobeka Radebe (031 260 8898)  
**Supervisor:** Dr Jennifer Houghton (031 260 7429)  
**Research Office:** Ms P Ximba (031260 3587)

**CONSENT**

I.....(Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I hereby consent/do not consent to record the interview.

SIGNATURE OF PARTICIPANT

DATE

.....

.....

**This page is to be retained by researcher**

## Appendix E: Turnitin Report

### Turnitin Originality Report

Processed on: 14-Dec-2015 9:46 AM CAT  
ID: 614319404  
Word Count: 28337  
Submitted: 2

Thesis by Thobeka Radebe

Similarity Index

5%

#### Similarity by Source

Internet Sources:

5%

Publications:

1%

Student Papers:

3%

1% match (Internet from 24-Oct-2013)

<http://webdav.uct.ac.za>

<1% match (Internet from 03-Oct-2008)

<http://lnw.creamermedia.co.za>

<1% match (Internet from 11-Oct-2009)

<http://www.rmef.co.za>

<1% match (Internet from 08-Sep-2015)

<http://www.ipp-projects.co.za>

<1% match (student papers from 06-Jun-2014)

[Submitted to University of Stellenbosch, South Africa on 2014-06-06](#)

<1% match (Internet from 10-Apr-2015)

<http://www.greenpeace.org>

<1% match (Internet from 11-Nov-2013)

<http://uir.unisa.ac.za>

<1% match (Internet from 15-Jun-2009)

<http://en.oboulo.com>

<1% match (student papers from 26-Jun-2007)

[Submitted to University of Stellenbosch, South Africa on 2007-06-26](#)

<1% match (Internet from 30-Apr-2014)

<http://led.co.za>

<1% match (publications)

[Schelly, Chelsea. "Frameworks for Understanding and Promoting Solar Energy Technology Development", Resources, 2015.](#)

<1% match (student papers from 09-Nov-2013)

[Submitted to University of KwaZulu-Natal on 2013-11-09](#)

<1% match (student papers from 23-Apr-2012)

[Submitted to University of Stellenbosch, South Africa on 2012-04-23](#)

<1% match (Internet from 06-Mar-2015)

<http://www.sustainlabour.org>

<1% match (student papers from 04-Nov-2014)

[Submitted to North West University on 2014-11-04](#)

<1% match (Internet from 23-Mar-2015)

<http://m.capetimes.co.za>