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The Factors that Influence the Implementation of Clean Energy Interventions in Low-income Urban Communities in South Africa

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ABSTRACT

During the fifties it was not unusual to measure economic growth of a country through the presentation of statistics around its energy consumption. The higher the consumption, the higher the economic growth. However, the unprecedented economic growth experienced in the global village during the 21st Century, is steering the ship in the direction of a disaster, measured from a sustainable energy supply point of view, the massive damage to the environment as a result of the high use of dominating fossil fuels and a lack of the implementation of clean energy strategies.

Apartheid, to a large extent, contributed to unacceptable socio-economic conditions in low-income urban communities. The Reconstruction and Development Programme of government from 1994 attempted, inter alia, to mitigate the housing demand for the disadvantaged citizens. However, over the years, poor quality in construction of these houses and other factors impacted negatively on the living conditions of the homeowners. Government realised that it had to change this situation and policy programmes with action plans focussed, inter alia, on the roll-out of solar water heaters (SWH), insulation of ceilings and repairs to the dilapidated houses.

This study aims to identify the key factors that influence the successful implementation of clean energy interventions in low-income urban communities in South Africa. The research showed that it is indeed possible to implement such projects successfully, if the key factors are acknowledged, as demonstrated in this study.

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Alida Elizabeth Streeter

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"Overcoming poverty is not a task of charity, it is an act of justice…"
Nelson Mandela

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1. CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

1.1 Introduction

This chapter serves to introduce and outline the research problem. It will also present the background to the research, the purpose of the research, the significance of the study and will describe the scope of the study.

1.2 Research Title

The Factors That Influence The Implementation Of Sustainable Energy Interventions In Low-Income Communities in South Africa.

1.3 Background to the Research Problem

The world's significant economic growth experienced over the last 200 years is attributable to man's ability to generate and store energy (Covary, 2006). However, in the 21st century the massive growth in energy demand the world over has become a major challenge for governments in order to serve its growing industries and populations, Asimov and White (1991) state that the ability to control energy is a prerequisite for civilization, whether it is by making fires or building power plants. Sachs (2005) concludes that it is also the key reason for the divide between rich and poor countries.

According to the 2011 Energy Report of the World Wide Fund for Nature (WWF) released internationally on 3 February 2011, it will take trillions of dollars and a significant shift in the mindsets of consumers, corporate and political decision makers to understand that the world can meet all its energy needs from renewable

energy sources such as wind, water, solar and geothermal sources by mid-century" (World Wide Fund for Nature, 2011).

In order to make this shift to renewable sources and energy saving measures required to serve the needs of industry and the population, the report also stresses the fact that the changeover cost must be understood in real terms and budgeted for by governments, this will also assist in avoiding an environmental and climate change catastrophe (WWF, 2011).

Furthermore, the International Energy Agency's World Energy Outlook Report 2010 states that despite the rising energy use in the world, 1,4 billion poor households in developing countries have no access to modern energy services. "Prioritising access to modern energy services can help accelerate social and economic development" (IEA, 2010. p.14).

Post-apartheid South Africa witnessed a substantial revision of its energy policy with a strong focus on energy for development. In accordance with the Constitution of South Africa (Act 108 of 1996) an inclusive Energy White Paper was developed (Prasad & Visagie, 2005).

The key objectives of government's Energy White Paper (Department of Minerals and Energy, 1998) included:

- Increasing access to affordable energy services;
- Stimulating economic development and encouragement of competition within energy markets;

- Managing energy related environmental and health effects;
- Securing supply through diversity – increased opportunities for energy trade and diversity in both supply sources and primary energy carriers.

Considering these objectives, Prasad and Visagie (2005) highlighted that South Africa's peak energy generation capacity was dwindling and would run out by 2007, thus recommended that Government should focus more on renewable energy options to diversify energy supply from a coal dominated system, while managing energy-related environmental impacts and the alleviation of poverty.

This statement of Prasad and Visage (2005) takes further momentum if juxtaposed with the study undertaken by the Department of Energy (DOE), under the tile South African Energy Synopsis 2010, which reflected the reality of South Africa's energy supply in 2006 as a benchmark to work from for the future, namely: 65,7 percent comes from coal; 21,6 percent from crude oil; 7,6 percent from renewable sources; 2,8 percent from gas; and 0,4 percent from hydro (Department of Energy, 2010).

Adding to the supply challenge South Africa in 2008 experienced periods of energy shortages and load-shedding initiated by Eskom, South Africa's national power utility provider in an attempt to manage peak demand and at the same time facing challenges in providing energy to its poorer citizens (Goldman, 2010).

As a result, the South African Government recognised the need to intensify its sustainable energy strategy, the diversification of its energy supply and the promotion of the use of renewable energy technologies (Burger, 2010, p.172). This led to The National Energy Act, 2008 to be signed into law on 17 November 2008.

The legislation focuses on ensuring that sustainable quantities of diverse energy resources are available at affordable prices to support economic growth and to alleviate poverty, while also taking into account environmental management requirements. The act, inter alia, accommodates further provision for energy planning, increased generation and consumption of renewable energies and contingency energy supply (Burger, 2010).

The South African Energy Synopsis 2010 study (DOE, 2010) recognises that South Africa is indeed well endowed with renewable energy resources with the potential to produce energy from biomass, wind, solar, small-scale hydro and waste; these resources remain largely untapped. The main use for the renewable energy would be power generation and non-electric technologies such as solar water heating and bio fuels.

Thus to understand Government's process of dealing with its energy concerns one has to go back to 2003 when The White Paper on Renewable Energy was published by the then Department of Minerals and Energy (DME). The White Paper targets the provision of 10 000 GWh of electricity from renewable energy sources by 2013. (Department of Minerals and Energy, 2003).

Besides its commitment to broadening the national energy mix and to include renewable sources in the generation and consumption of power, currently dominated by fossil fuels, Government also aimed to reduce energy demand through improved energy efficiency drives across the country and has set a target of 15 percent energy efficiency for industry and 12 percent nationally, to be achieved by 2015. This

initiative is supported by a large scale energy efficient compact florescent lighting (CFL) programme and a national solar water heating drive (Burger, 2010, p.174).

It can be inferred that Local Governments have recognised the significant role that clean energy interventions can play in service delivery to provide access to energy and to alleviate poverty as part of sustainable livelihood and climate change mitigation strategies in low-income communities, to create a “better life for all” as stated by President Zuma in his State of the Nation Address (June 2009).

Proof of this recognition is found in the various pilot project initiatives in low-income communities over the past few years such as the Kuyasa CDM and the Nelson Mandela Bay Solar Water Heating projects, amongst others. More recently the Mail and Guardian Online reported on 4 March 2011 that Municipalities across the country were contracting companies to install solar water heaters as part of the mass solar water heating roll-out programme, which commenced in April 2010. In 2009 The Minister of Energy set a target of one million solar water heaters to be implemented by 2014 (DOE, 2011). The initiative also aims to address electricity shortages, mitigate harmful Carbon Dioxide (CO2) emission from fossil fuels, to create employment and to alleviate poverty. (Macleod, 2011).

In 2008 the Kuyasa CDM project commenced installations of sustainable energy interventions such as solar water heaters, thermal insulated ceilings, energy efficient lighting and improved wiring in the low-income community of Kuyasa in Cape Town. The community comprises of 2 300 low-income RDP homes. The aim of the project was to improve the quality of life of Kuyasa residents and to reduce the monthly

expenditure on energy sources through addressing the inefficient design of the RDP houses (Walsh, Wesselink & Janisch, 2011). Advantages of the project include emissions reductions of approximately 2.85 tonnes of Carbon Dioxide (CO2) per household, per year; household energy cost savings of up to US$100 per year; health benefits to residents from not having to use paraffin to boil water, employment creation through installation and maintenance of interventions and the building of human capacity to understand the importance and role of renewable energy (Fig, 2010).

The Nelson Mandela Bay Municipality (NMBM) launched its “Low Pressure Solar Water Heating System Pilot Project” in the low-income community of Zanemvula situated 20 kilometres outside Port Elizabeth. The installation of 1 263 low pressure solar water heaters aimed to improve the quality of life of residents, reduce the municipality’s electrical load on the grid, while providing energy access to low-income households, create environmentally sensitive and sustainable communities and reducing CO2 emissions (Smit, 2009; Wlokas, 2009).

“The project also intends to address the use of alternative energy, specifically renewable energy and its impact on the lower income and indigent socio-economic group. A reduction in the current use of electricity for water heating, the use of safe fuels compared to hazardous fuels, social upliftment, carbon trading, feed-in tariffs are some of the issues to be considered.” (Wlokas, 2009, p.11).

To provide further context to these significant projects and their benefits, this qualitative, explorative study aims to identify and explore the factors that influence the implementation of sustainable energy intervention projects in low-income urban

communities. This will be done through the investigation of the experiences and lessons learnt by selected municipal and private sector project implementation teams. The research aims to capture the rich experiences and perceptions of the implementation team members of six projects in low-income communities, where clean energy interventions have been implemented.

The outcome and results of this study could also provide valuable insights to aid future project implementation stakeholders throughout the development and implementation of these important initiatives in South Africa.

The concepts of sustainable energy and low-income communities in South Africa will be explored further in the literature review in Chapter two of this study.

1.4 Purpose of the Study

The purpose of study is to identify and explore the key factors that influence the implementation of sustainable energy interventions in low-income urban communities in South Africa. It can be argued that the effective implementation of sustainable energy intervention programs could lead to the ultimate benefit of sustainable socio-economic development of the poor and at the same time it will address carbon reductions and environmental sustainability issues. Therefore, it is important to understand the factors which influence the implementation of these projects as experienced by the project implementation teams of the recent projects, to aid the successful development and roll-out of large scale projects currently underway and planned for the future and to promote knowledge sharing.

1.5 Significance of the Study

It is reasoned that, understanding the factors associated with the implementation of these projects in a South African context, will contribute to national and international dialogue between Academics, Government Stakeholders, Investors and Entrepreneurs. This understanding is focused on key issues relating to energy for sustainable development and the potential solutions and benefits offered by sustainable energy interventions for development in low-income communities from an emerging market perspective.

Social Entrepreneurs could benefit from the insights this study will provide on the key factors associated with the implementation of sustainable energy intervention projects, for example, information on potential opportunities; the possibility to offer intervention solutions and the creation of jobs, linked to socio-economic development for low-income communities and South Africa's economy as a whole.

Corporate Social Investors will gain value from the insights provided in this study relating to critical success factors to the development and implementation of effective projects, to determine the decision making criteria for investing in potentially successful and sustainable clean energy intervention projects.

In order to ensure the effectiveness of the implementation and roll-out of these projects, service providers and implantation agents need to be informed of the key factors which constitute the implementation of these projects to ensure that intervention technologies and services have the capabilities and capacity to effectively meet the project requirements.

1.6 Research Project Scope

There are various technical studies and case study reports that address the benefits and impacts of clean energy interventions such as solar water heaters, compact florescent lighting (CFL) and insulated ceilings amongst others in low-income households. Yet, there is very limited academic literature available that identified and examined the factors which influence the implementation of clean energy interventions in low-income urban communities, particularly in a South African context. Therefore this research aims to fill this gap by identifying and understanding these factors by exploring and analysing the experiences, perceptions and lessons learnt from project implementation teams from six projects which have piloted or rolled-out various sustainable energy interventions across South Africa.

2. CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter will provide the theoretical background of the research. It will focus on policy and reports from government, academic institutions and Multilateral Fora, amongst others, to provide a basis for the research. It will commence with a discussion on the literature on climate change and emerging markets. This will be followed by sustainable development in South Africa and the implications on low-income rural households, emphasising the issue of energy poverty, which forces low-income communities to make use of various forms of "dirty" energy to satisfy their basic needs (Haw & Hughes, 2007, p.1). Dirty energy is an industry wide term referring to the use of fossil fuels, namely, coal, oil and natural gas, which are harmful to the environment. The MIT Sloane School of Management (2011) in the United States provides the most inclusive description of clean energy:

"Clean Energy is broadly defined so as to deal with both the reduced environmental foot print balanced with increased global demand for energy and the imperative for energy independence."

The literature engages the phenomenon of migration and its impact on urbanisation and the supply of energy services. Furthermore, the Reconstruction and Development Programme of the South African Government, is a socio-economic policy framework programme launched in 1994 (Government Information Communication Service, 1994) seeking to mobilise all South Africans and the resources of South Africa towards the final eradication of apartheid in the building of a democratic, non-racial and non-sexist future where a better living for all can be achieved. The RDP also focussed on the provision of housing for poor communities and between 1994 and 2001 alone, 1,1 million inexpensive RDP houses were

constructed. These accommodated 5 million of the 12,5 million South Africans without proper housing (Lodge & Philip, 2003).

2.2 Climate Change Mitigation and Emerging Markets

In recent years new terminology emerged to describe developing countries or emerging markets, thus those nations with business activities that are in a rapid growth and industrialisation phase, for example BRIC (Brazil, Russia, India, and China) (Goldman Sachs, 2001) and since 13 April 2011, BRICS when South Africa was admitted as a member at the Summit in China (Sanya Declaration, 2011).

South Africa's membership of BRICS results in the overarching objective and strong shared desire for peace, security, development and cooperation which brought together BRICS countries with a total population of nearly 3 billion from different continents. BRICS aims at contributing significantly to the development of humanity and establishing a more equitable and fair world (Sanya Declaration, 2011) .

The Sanya Declaration (2011), a joint Declaration signed by the BRICS leaders on 13 April, continues to recognise that global change is one of the threats challenging the livelihood of communities and countries. The Declaration states the commitment of the BRICS countries to work towards a comprehensive, balanced and binding outcome, to strengthen the implementation of the United Nations Framework Convention on Climate Change and its Kyoto Protocol. The BRICS countries declared their will to intensify cooperation at the of UNFCCC COP17/CMP7 Durban conference on 28 November 2011 and enhance practical cooperation in adapting economy and society to climate change. A further declaration supports the development and use of renewable energy resources in recognition of the important role of renewable energy as a means to address climate change.

Haw and Huges, (2007) pertinently state that energy and economic development are inseparable and that without access to affordable energy, long-term development cannot take place. “Historically the most used energy sources have been those nearest and easiest to consume. This has resulted in a global reliance on fossil fuels – initially coal but with increasing amounts of oil” (Haw & Huges, 2007, p1).

According to the Long Term Mitigation Scenarios Technical Summary Report of the Department of Environmental Affairs and Tourism (DEAT) the role of the energy sector in South Africa in response to climate change mitigation is key, with emissions up to 2050 anticipated to continue to be dominated by energy sources which are increasing at a far more rapid rate than emissions from non-energy sectors (Department of Environmental Affairs and Tourism, 2007).

Winkler (2005) points out that an expanding global economy and growing populations, demand a more efficient use of energy, a switch to cleaner sources of energy and fundamental changes in various economic sectors.

Tyler (2009) notes that the South African Government is moving towards a more diverse, energy efficient and less carbon intensive energy sector, as a number of policy instruments have been developed and are being expanded.

Furthermore, an extensive climate change resolution was adopted at the ruling party’s (African National Congress – ANC) December 2007, 52nd National Conference in Polokwane, Limpopo Province, which formulated a strong policy commitment based on “The ANC’s position on environmental issues has been consistent and is reflected in the RDP document. It is this vision that has informed the various policies, programmes and actions of government since 1994”. The

Polokwane resolution places emphasis on the mitigation of greenhouse gas emissions and to adopt a low carbon growth path, the impact of climate change on the poor and the Government's commitment to a sustainable future.

Government's determination to develop and implement emissions mitigation policies is underlined by South Africa's greenhouse gas emissions per capita, which are similar to that of industrialised countries because of the country's strong reliance on coal (Winkler, 2006, p.8; Tyler, 2009). For example, South Africa in 2009 was at 7,27 CO2 emission tons person per year, compared to its BRICS partners, namely, Brazil at 1,81; Russia at 11,21; India at 1,18; and China at 4,57. South Africa compared to other industrialised nations in the following way: Germany at 9,71; France at 5,81; Italy at 7,38; Austria at 8,38 and Chile at 4,28. (Carbon Planet, 2011).

Furthermore, the National Climate Change Response Strategy developed by the Department of Environmental Affairs and Tourism (DEAT) in 2004 focuses strongly on the achievement of national sustainable development objectives, while simultaneously responding to climate change (DEAT, 2004).The strategy claims that there is major compatibility between national government objectives, sustainable development and climate change, however, the associations need to be established to maximise the overall benefits (Dixon & Pretorius, 2001; DEAT, 2004).

The Third Industrial Pollution Prevention and Control (IPPC) Report indicates that these benefits are achievable and will contribute to the mitigation of climate change, even if climate change was not a primary reason for taking such actions (IPPC, 2001; Winkler, 2005).

In conclusion, it is evident from the literature that South Africa as an emerging economy views a green economy as a sustainable development path based on addressing the interdependence between economic growth, social protection and the natural ecosystem (DEAT, 2010).

2.3 Sustainable Development in South Africa

The understanding of sustainable development in a South African context for this study is based on the definition provided by the National Environmental Management Act (1998) and the White Paper on Renewable Energy (2003) Department of Minerals and Energy (DME, p.26.), which states that "sustainable development is defined as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations"

South Africa's National Framework for Sustainable Development (DEAT 2008, p.1) explains that the term sustainable development, as expounded by the World Summit for Sustainable Development of 2002 in Johannesburg, consists of three pillars: Care and respect for People; Planet and Prosperity. Parry-Davies (2007) states that these three pillars are of equal importance – if any one aspect is ignored or given a higher priority than others, the effect will be to unbalance and destabilise all three aspects, because they are inter-connected and interdependent. It is also recognised that these three aspects need to be addressed simultaneously – we cannot address them on a one-at- a-time basis as this would also create an imbalance.

Viewed from the understanding of sustainable development as defined and described above, and the RDP of government of 1994, one understands why the

government placed its main focus on sustainable development and the correction of disparities inherited from the apartheid era and building a better future for the people of South Africa, with social services, education, health and welfare taking up the largest part of the national budget (Dixon & Pretorius, 2001).

The South African National Climate Change Response Strategy (DEAT, 2004) of the Department of Environmental Affairs and Tourism (DEAT) underlined Government's recognition of the importance and significance of committing to climate change mitigation strategies and to protect poor communities. According to the report, poor communities are the most vulnerable to the effects of climate change (DEAT, 2004). This is due to their comparatively high sensitivity to climate disruptions and limited capacity to adapt, and have less financial and human resources with which to mitigate impacts (Berdai, 2010).

Berdai (2001) emphasises that energy is one of the structuring factors for social and economic development and that energy and sustainable development are inseparable from one another. He continues by stating that access to energy is fundamental for improving people's quality of life, a key indicator for any society's development. Basic services such as health care, education, water, housing and transportation cannot be effective without appropriate and sustained energy services (Berdai, 2001, p.75; Constitution of the Republic of South Africa, 1996; African National Congress, 2007; Department of Minerals and Energy, p.26),

2.4 Poverty Reduction as a National Priority

"Poverty reduction is seen by many policy-makers as the most important goal of Development Policy" (Klasen, 2000, p.33). It is the "single greatest burden" resulting from the apartheid system and the industrial development which supported it (Prasad & Visagie, 2005). In 2004, political leaders recognised that the livelihoods of the poor had not improved (Wlokas, 2010). since the new administration came into power in 1994. This led the new government in 2004 to put poverty reduction at the top of the agenda as stated in former President Mbeki's State of the Nation address on 21 May 2004**.** President Mbeki declared that "At the core of our response to all these challenges is the struggle against poverty and underdevelopment" (Presidency, 2004).

A developing consensus among policy analysts has characterised poverty as the inability of individuals, households or entire communities to command sufficient resources to satisfy a socially acceptable minimum standard of living (Clark & Drimie, 2002; Radoki, 2002). This rationale follows one of two schools of thought as highlighted by Klasen (2000). He points out that there are predominantly two views on the measurement of poverty. One view has defined poverty in financial terms such as insufficient incomes or consumption, while a second view expresses a more broad-based definition of poverty which is not exclusively based on financial resource, and states that poverty should be seen relative to the lack of important "basic goods" or "basic capabilities".

The 1996/1997 South African Participatory Poverty Assessment (SAPPA) expressed the following factors associated with poverty, which include (Clark & Drimie, 2002):

- Alienation from the community and institutions of kinship;

- Food insecurity;
- Overcrowded conditions and inadequate dwellings;
- Use of basic forms of energy, particularly as the poor lack access to safe and efficient sources;
- Lack of an adequately paid, secure job; and
- Fragmentation of the family

Though many of the factors associated with poverty are relevant to this research, the particular dimension of poverty which is focused upon is associated with energy and income. Wlokas (2010, p.9) points out that the World Summit on Sustainable Development which took place in Johannesburg in 2002 confirmed the link between energy and poverty. The Johannesburg Plan on Implementation was the outcome of the Summit and also stressed the main links between energy and the Millennium Development Goals (MDG) (United Nations Development Programme, 2005).

The correlation of poverty to geographical dimensions is important to note, since this research focuses on low-income, urban communities. According to limited statistics available, two sources from 2002 confirm that 58 percent of South Africa was urbanised and 28 percent of the population was classified as poor in urban areas while 70.9 percent was classified as poor in rural areas (Aliber, 2002; Clark & Drimie 2002).

In conclusion, this section clarified the South African Government's policy development on sustainable development, climate change mitigation and the improvement of the quality of life of all South Africans against the backdrop of the Constitution, the Reconstruction and Development Programme of 1994, the White

Papers, the outcomes of the WSSD of Johannesburg, and the resolutions of the 52nd Polokwane ANC National Conference.

The following section presents literature on the concept of urban migration and its impact on urban communities and municipal capacity to deliver basic services to poor urban communities.

2.5 Urbanisation

In a statement by Deputy Minister of Human Settlements, Ms Zou Kota-Fredericks, on land in the context of sustainable urbanisation, delivered on the occasion of the Third African Minister's Conference on Housing and Urban Development (AMCHUD III) in Bamako, Mali on 24 November 2010, p.1, "Growing urbanisation is a reality in South Africa as it is in many cities in Africa and beyond. Rapid urbanisation and the accompanying competition for diminishing land resources as well as the rapid increase in slums are the most pressing challenges for cities. According to United Nations projections, the urban population of sub-Saharan Africa will increase from 387-million in 2010 to 705-million in 2025. The pressure on our African cities to provide for these growing populations in a sustained way is immense".

Cornwell and Inder (2004) explained that urban migration results when the individual's expected urban wage exceeds that of the rural sector's wage. Sub-Saharan Africa is witnessing elevated levels of urban migration with urban populations set to more than triple by 2050 in comparison to a 9 percent growth expected in Europe (United Nations, 2009).

According to Walsh, *et. Al.,* (2010) migrant workers, as in the case of South Africa, are seeking the economic opportunities that cities can provide and are mostly forced to live in informal settlements, therefore, adverse implications for both migrants and local governments have developed. This includes a surplus in local labour, insufficient job opportunities, increasing levels of unemployment, poverty, crime, major problems in terms of infrastructure and the challenge local government face to meet the basic needs of the poor.

For the period 2006–2011 it is estimated that approximately 211 600 people will migrate from the Eastern Cape, while Limpopo is estimated to experience a net out-migration of just over 140 000 people. During the same period, Gauteng and Western Cape are estimated to experience a net inflow of migrants of approximately 364 400 and 94 600 respectively (Statistics South Africa, 2006).

Local authorities in South Africa supply electricity to urban and peri-urban areas, while Eskom supplies electricity directly to rural areas. Although a large section of poor households in South Africa have access to grid electricity, which is provided by government through the National Electrification Programme of the 1990's and the Integrated National Electrification programme of 2000, affordability remains a major problem (Visagie, 2008). Many households meet most of their energy needs though bio-mass sources, paraffin and small amounts of commercial energy when accessible and affordable (Balmer & Hancok, 2009; Roberts & Wentzel, 2006).

In conclusion, the literature in this section presented a backdrop to the dimensions of poverty and the reality of increased urban migration. These variables are associated characteristics affecting low-income urban communities in South Africa. The

following section presents the complexity of defining the term "low-income communities" since it is used broadly in the industry and in the literature. The literature investigated did not present a clear definition of the term, but instead used the term broadly as a concept to describe a community group.

2.6 Understanding Low-Income Urban Communities

The nature of the integrated community mix of settlements in South Africa is complex and constitutes vibrant metropolitan areas and towns with high levels of crime, and ranges in size from 5 000 to 900 000 people. It also includes a diversity of development levels or income groups within the high population densities of these communities. (Statistics SA, 2006).

Statistics South Africa, in its Census Report, published in 2003, defined a number of these settlements in order to conduct its 2001 census. The settlements have been classified according to (A) formal urban areas;

(B) informal urban areas, (C) commercial farms, (D) tribal areas and rural informal settlements. Definitions are also provided for municipalities and townships (Statistics SA, 2003):

- Settlement Types: Classification according to the characteristics of a residential population in terms of urban and rural, to the degree of planned and unplanned (in the case of urban) and jurisdiction (in the case of rural).
- Urban Area: A classification based on dominant settlement type and land use as planed (formal) or unplanned (informal), in cities, towns, townships or suburbs.
- Rural Area: Any area that is not classified *urban*. Rural areas are subdivided into tribal areas and commercial farms.
- Township: Usually a town or part of a town. Historically, 'township' in South Africa referred to an urban residential area created for black migrant labour, usually beyond the town or city limits. Generally, every town/city has one or several townships associated with it.

- Informal Settlement: An unplanned settlement on land which has not been surveyed or proclaimed as residential, consisting mainly of informal dwellings (shacks).

- Municipality: The area of jurisdiction of the third sphere of government, after national and provincial. There are now four types of municipality encompassing the whole country including rural areas and tribal areas: metropolitan areas (Category A); local councils (Category B); district councils (Category C); and district management areas (DMAs). Metropolitan areas (Cat A) stand alone. District councils (Cat C) are subdivided into local councils (Cat B) and DMAs.

Of relevance to this study are urban, formal, non-metropolitan areas which fall under urban municipalities and include townships. Every city or town has one or several townships linked to it, as in the case of Khayelitsha which consists of a low-income community located south-east of Cape Town's city centre (Walsh, et al., 2011).

To qualify income levels, the Department of Energy used the All Media Products Survey (AMPS) to define Poor, Low-income, Middle Income and High Income households for their Draft South African National Solar Water Heating Framework and Implementation Plan in 2009. These bands are presented in Table 1. The Table also indicates each band's access to modern energy such as electricity and those with geysers for the provision of hot water.

Table 1: Income Bands in South Africa According to AMPS (DOE, 2009)

Average Income Bands Rand per month	**Total households**
Poor <R1200	2, 301, 709
Low-Income <R6000	4, 812, 083
Middle Income <16000	2, 811, 402
Upper Income > R16 000	1, 213, 212
TOTAL	**11, 138, 407**

The table indicates that at least 7.1 million households fall into to the low-income and poor bands of below R6 000 per month, which represents 64 percent of the 11 million households. Though this study investigates the factors which influence the implementation of clean energy interventions in "low-income" communities, the 7.1 million households is representative of the income levels of the communities which formed part of this research.

Table 2 represents important characteristics on the graphical spread according to rural and urban classifications and highlights access to modern facilities.

Table 2: Household Characteristics (DOE, 2009)

Characteristic	Percentage	Percentage
Geographic spread	36.9% rural	63.1% urban
Electrified	88 % are electrified	12% are not electrified
Running water in homes	52% have running water	48% do not have water
Geyser penetration	46% have a geyser	54% do not have a geyser

In conclusion, the definition of "low-income urban communities" in South Africa is a complex concept to define. The literature was not helpful and therefore industry experts were consulted from the university of Cape Town, from Eskom and from an NGO which led to the presentation of low-income urban communities in this study, in the context of Statistics South Africa's 2001 Census classifications and the Department of Energy's segmentation of income bands presented in its Draft National Solar Water Heating Plan of 2009. Therefore, "low-income communities" refer to households based in formal, urban, township settlements which include the

combined poor and low-income range bands. The next section will provide insight into South Africa's Reconstruction and Development Low-Cost Housing Programme as these houses offer context to low-income community dwellings.

2.6.1 The Reconstruction and Development Programme's Low-Cost Housing in South Africa

In order to further understand the context to the "formal" dwelling structures in low-income communities in South Africa, it is valuable to provide a brief insight into government's Reconstruction and Development Programme (RDP, 1994) implemented by the Mandela Administration, which stated that:

> "The Reconstruction and Development Programme (RDP) is an integrated coherent socio-economic policy framework. It seeks to mobilise all our people and our country's resources toward the final eradication of the results of apartheid and the building of a democratic, non-racial and non-sexist future. It represents a vision for the fundamental transformation of South Africa."

Therefore, by the end of March 2009, government had provided 2,8 million subsidised houses, to more than 13,5 million people, while over 570 housing projects had been approved and a housing grant of R12,4 billion was allocated for the 2009/10 financial year for expenditure on the construction of 226 000 new housing units across all nine provinces" (Government Communication and Information Service, 2011).

In order to qualify for the housing subsidy the Department of Housing (now Human Settlements) determined that beneficiary criteria require that a person has an income of up to R3 500 per month; is a permanent resident of South Africa; is married or has

financial dependents; has not yet benefited from government funding; and is a first time home owner (Department of Housing, 2002).

2.6.2 Conditions of Low-Cost Housing in South Africa

Despite the impressive Government figures presented for the provision of housing for the poor as presented in section 2.7.1, many challenges have been associated with the RDP project to date, which has also lead to criticisms of poor quality of construction; insufficient participation of banks; insufficient structure and plot size; empty vacated units due to remote locations and lack of transport; and undocumented resale of units by poorer households to wealthier households (Aliber, 2002).

RDP houses have generally been built on vacant government land on the periphery of urban areas and a number of households have opted to vacate these houses to stay in informal settlements (Visagie, 2008 & Walsh, et al., 2011; Muyeba & Seekings, 2010) for financial reasons.

According to Visagie (2008) low-cost housing in South Africa has been characterised by poor design parameters; poor craftsmanship; lack of densification; creating an urban sprawl with no regard for energy efficiency; and little concern for residents' quality of life. This has resulted in a pool of over 2 million poorly built housing units (Muyeba & Seekings, 2010; Mathews & van Wyk, 1995; Makaka, et al., 2008; Walsh, et al., 2011).

Mathews and van Wyk (1995, p.117) claim that as a result of the poor insulation of RDP houses, occupants spend up to 20 percent of their disposable income during

winter on heating and this poor thermal performance leads to high energy consumption at a time of energy conservation (Makaka, Meyer & Mc Pherson, 2007).

Walsh et al. (2002, p. 11) continues to point out that the state of the housing units "subjected their occupants to a disproportional health, energy and poverty burden exacerbating an already fragile social structure."

In conclusion, the highlighted consequences, presented in the literature, of these poorly built RDP homes lead to an understanding of the concept of "energy poverty" as an element of the characteristics associated with the challenges faced by low-income communities, which will be discussed in the following section of this study.

2.6.3. Energy Poverty

It is a given fact that energy is a basic need for humans. Energy assists people in achieving at the least, a minimum level of economic and social development (Clark & Drimie, 2002). Balmer and Hancok (2009) argue that energy poverty remains a large challenge for developing countries as it impacts on the well-being and health security of approximately 3 billion people globally and on the environment. This means that poor households do not have access to sufficient and appropriate energy sources to serve their basic energy needs. This could be due to a lack of infrastructure to provide energy, or the limited means of a household or community to purchase the required energy and these aspects are closely linked to the overall poverty of that community (Balmer & Hancock, 2009; Walsh et al., 2011).

The United Nations Development Programme, (2000) also defines energy poverty as the "absence of sufficient choice in accessing adequate, affordable, reliable, high

quality, safe and environmentally benign energy services to support economic and human development" (p.40). Therefore households rely on income generating activities and the provision of basic needs through the availability, accessibility and choices of energy. Biomass energy sources and small amounts of commercial energy is used when it is accessible and affordable. According to Balmer and Hancock (2009) low-income households in developing countries display distinct energy use patterns where thermal energy requirements such as cooking, space heating and water heating are usually met with biomass sources while small quantities of electricity is used to supply energy for lighting, cell phone charging, radio and television.

One of the challenges for governments of developing countries is the implementation of measures that meaningfully increase poor people's access to modern energy forms such as electricity, paraffin, diesel and liquid petroleum (LPG) (Davison & Sokona, 2002).

According to Clark and Drimie (2002) improving access to energy services implies finding ways and means by which energy services can be delivered in a reliable, affordable, environmentally sound and socially acceptable manner in urban and rural areas. Furthermore, Visagie (2008, p.21) points out that "a lack of communication and co-ordination is an aspect of the challenges the different tiers of government (national, provincial and municipal) continue to have in terms of delivering adequate services to the poor and low-income communities". He goes further to recommend that the White Paper on Energy should be more explicit in prescribing which government departments should co-ordinate their activities in terms of policy development and implementation related to energy.

The following section unpacks energy poverty in low-income communities in more detail to create a theoretical context in support of the research.

2.6.4 Access to Energy in Low-Income Households

Access to energy is commonly accepted as a critical step in socio-economic development, which is why many developing countries, including South Africa are aiming for universal access to electricity for all its citizens (Haw & Hughes; Cowan & Dieden, 2007; Winkler & Janssen, 2005) Prior to the 1994 democratic elections, people of colour were largely excluded from access to services, including electricity (Prasad, 2006). As pointed out, access to modern energy services is not just a challenge in South Africa but a global challenge, which affects 40 percent of the world's population (Balmer & Hancock, 2009). Throughout Sub-Saharan Africa access to electricity services is still quite limited, particularly in rural areas. Only 24 percent of this region has access to electricity in comparison to 40 percent in other low-income countries (International Monetary Fund, 2008)

The number of household in South Africa connected to the electricity grid was 82,6 percent in 2008, thus 17,4 percent of households had not electricity at all. The effect is that 26,1 percent of households prepared food with wood or paraffin (Statistics SA, 2008).

The National Electrification Programme of 2000 focused on the provision of universal access to electricity for all by 2012. The follow-up programme in 2003 enabled municipalities to supply 150kWh per month, which predominantly benefited low-income households. Due to the criticism of the free basic electricity grant, the Free

Basic Alternative Energy (FBAE) policy was developed for the poor. The FBAE is an attempt to provide alternative fuels and technologies such as paraffin, liquefied petroleum gas (LPG) and renewable energy to promote a more equitable share in energy services across the income bands. (Visagie 2008, Winkler, et al., 2006, Wlokas, 2010). Though significant advances have been made, the overtly developmental commitments of government have not yet had the desired impact in creating sustained growth or redistribution (Pranell, 2004).

In conclusion, the link between access to energy and socio-economic development, leads to the following section which provides a brief overview of the energy use patterns in low-income communities.

2.6.5 Energy Use in Low-Income Communities

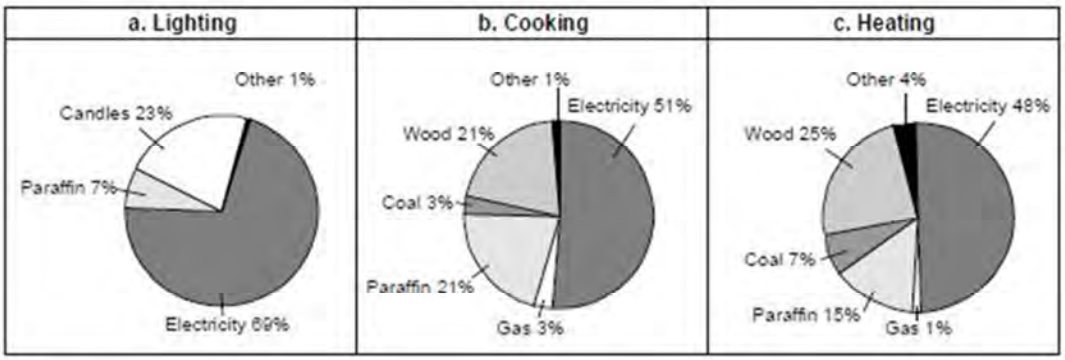
Balmer and Hancock (2009) have related the use of energy by low-income households in developing countries to a pattern of “multiple fuel use”. This implies that thermal energy requirements such as cooking, space heating and water heating are traditionally met with multiple fuels which include biomass sources, wood or kerosene and limited electricity. However, it is important to note that those who have access to electricity services, cannot afford electrical appliances or pay their electricity bills (Balmer & Hancock, 2009; Prasad, 2006).

In 2006, 69 percent of low-income households in South Africa had access to electricity which was predominantly used for lighting, while 23 percent used candles for lighting and 7 percent use paraffin. Wood, coal and paraffin is used for heating

instead of electricity and 18 percent of households, although connected to electricity are unable to afford it for cooking (Prasad, 2006).

Figure 1 presents the distribution of energy sources used for lighting, cooking and space heating.

Figure1: Distribution of South African households by main energy source used for lighting, cooking and heating (Prasad, 2006)



Not only does the use of these fuels have a negative impact on household health and safety, they are also expensive (Balmer & Hanckock, 2009). Prasad (2006) points out that these fuels appeal to low-income households since they are perceived as being more economical. However, a study by Roberts and Wentzel (2006) indicates that some low-income households spend up to 20 percent of their monthly income on paraffin and up to 23 percent on coal alone, particularly in the winter months for space heating.

The table below indicates the seasonal fuel mix and household expenditure of four communities studied by Roberts and Wentzel (2006).

Table 3: Highest household expenditure on fuel per season (Roberts & Wenzel, 2006)

Area	Summer Predominant fuel use	% of Household expenditure	Winter Predominant fuel use	% of Household expenditure
Benoni	Paraffin	9.4	Coal	23
Galeshewe	Paraffin	14.2	Paraffin	20.4
Gugulethu	Electricity	11	Paraffin	18.9
Lady Grey	Paraffin	10.4	Paraffin	17.5

2.7 Energy for Development

The literature throughout this study has emphasised that in an emerging economy like South Africa, development and poverty alleviation are still the primary objectives on government's agenda, further concerns relate to issues such as security of energy supply. Haw and Hughes (2006) continue to emphasise the pressing social needs relating to energy use and energy access which must be addressed. Many people still rely on costly "dirty" fuels, which are to meet their daily energy needs while transport to and from the workplace is costly due to the urban sprawl created under apartheid (Haw & Hughes, 2006). The lack of access to modern energy affects health and development of poorer communities. Government is determined on addressing unemployment while increasing GDP growth in the coming years, while at the same time economic growth is accompanied by an increased demand for energy (Haw & Hughes, 2006; Spalding-Fecher, Winkler & Mwakasonda, 2005).

According to the World Bank (2008) "The need for massive emission reductions comes at a time when energy use, the primary source of Green House Gas emissions, is expanding globally at unprecedented rates and is vital to the continued

economic growth of client countries" (p.1). As populations and economies continue to grow in developing countries, the primary energy demand is projected to increase by 74 percent between 2005 and 2030, this accounts for 85 percent of the overall increase in global demand. Fossil fuels are expected to remain the dominant source of primary energy. This is a serious dilemma that can only be reconciled with new and improved clean energy technologies that balance climate change mitigation with the increased energy needs (World Bank, 2008).

Spalding-Fecher, et al. (2005) continue to emphasise these points as the production, distribution and use of energy, particularly fossil fuels (coal, natural gas, and petroleum) and traditional biomass, have significant environmental impacts, which can affect human health and cause ecological damage.

The need for clean energy is emphasised further by Spalding-Fecher, et al. (2005) as in developing countries exposure to indoor air pollution, derived from wood and coal smoke, carbon monoxide and other un-burnt hydrocarbons can lead to headaches, fevers and acute chronic respiratory problems that claim the lives of many people, especially children.

South Africa has large coal and small oil and gas reserves and as a result, coal is used for electricity generation and synthetic fuel production, which is used by households in the commercial sector, the industrial sector and in the transport sector (Haw & Hughes, 2007, p.1). In addition to the reliance on coal to meet energy needs, South Africa has an energy intensive economy which has developed from, and still relies heavily on, extraction and raw materials processing (Davidson, 2006; Haw & Hughes, 2007).

Eskom, South Africa's state owned national power generating utility, supplies and distributes electricity to 95 percent of South Africa's demand. Approximatley 42 percent of this energy is sold to local authorities. Municipalities supply electricity directly to predominantly urban and peri-urban customers, while Eskom supplies electricity directly to rural customers (Davidson, 2006; Visagie, 2008).

In conclusion, South Africa's energy profile characterised by excess capacity has ended as Eksom's ability to cater for peak demand stagnated in recent years (Prasad & Visagie; Winkler et al., 2006). This has resulted in serious constraints and rolling power-shedding in 2007/08, thus Government and Eskom have recognised the need for rapid energy efficiency and the building of capacity to meet growing demand (IMF, 2008; Walsh et al., 2008; Prasad & Visagie, 2005; Winkler, 2006).

2.7.1 Defining Clean Energy

After extensive review of literature and consultation with industry experts on the terminology of clean energy, no direct academic or scientific definition was presented, but rather the proposition that "Clean Energy" is a self-explanatory term which generally refers in literature to alternative energy technologies and energy sources to traditional fossil fuel energy sources, which is considered to have negative impacts on society and the environment. The term "clean Energy" is also used interchangeable with the term "renewable energy". For the purpose of this study, the MIT Sloane School of Management in the United States has provided the most inclusive description of "clean energy" to date:

"Clean Energy is broadly defined so as to deal with both the reduced environmental foot print balanced with increased global demand for energy and the imperative for energy independence." (MIT Sloane School of Management, USA, 2011).

Clean Energy solutions involve products or services which promote, enhance or advance: (MIT Sloane Management School, 2011).

- Diversity of supply sources/transmission;
- Efficiency in use; and
- Reduce negative environmental effects such as greenhouse gas emissions.

This can include but is not limited to: (MIT Sloane Management School, 2011).

- Renewable sources of energy (solar, wind, fuel cells, bio-fuels, geothermal, hydro-technologies, etc.);
- Conservation and demand response (building use, grid management, delivery & transportation, resource mining, extraction and refining);
- Enabling technologies (power electronics, storage systems and batteries, cables & wires, sensors & instrumentation, control systems, materials & manufacturing technology);
- More efficient & effective use of hydrocarbons (hybrid cars, cleaner use of coal, more environmentally friendly oil recovery methods, CO2 sequestration); and
- Integrated Systems (sustainable design & integrated clean energy applications)

2.7.2 Renewable Energy Technologies for Poverty Alleviation

Renewable energy is one of the areas that the South African Government is pursuing in managing energy related environmental impacts and diversifying energy supplies from a coal dominated system (Clark & Drimie, 2005). "Government considers the use of renewable energy as a contribution to sustainable development"

(Davidson, 2006). Due to the fact that the renewable energy sources are predominantly indigenous and naturally available (such as solar power, wind energy, biomass and geothermal energy), the use of renewables, in theory, strengthens energy security as it is independent of international determinants and crisis (Davidson, 2006; Clark & Drimie, 2005; Goldemberg, 2004).

The definition for renewable energy provided by the leading world information repository on renewable Energy, the Energy Information Administration (EIA) describes renewable energy as energy that can be “harnessed” from an infinite number of naturally occurring energy sources, which is exhaustive and abundant, such as the sun (solar), hydro, wind, geothermal and biomass (International Energy Outlook, 2009).

Goldemberg (2004) reasons that “While the development and deployment of new state-of-the art renewable technologies require a highly skilled, knowledge intensive workforces in industrialised countries”, developing nations such as South Africa are exploring ways to benefit from this new industry.

Fossil fuels such as oil, wood, coal and gas will not last forever and the production of coal based energy in particular has proven to be one of the key sources of negative environmental impacts (Goldemberg, 2004). The World Wide Fund for Nature’s (WWF) Energy Report, published in 2011, motivates for a 100 percent adoption and production of energy through renewable sources by 2050. This illustrates that “finite and increasingly expensive fossil fuels are not the answer for developing countries”. Renewable energy sources offer the opportunity to transform quality and economic prospects of billions of people living in underserviced communities (WWF, 2011).

2.7.3 Job Creation Potential of Renewable Energy

The most current unemployment statistics reported by Statistics South Africa's Quaterly Labour Force Survey Report (2011), indicate that the unemployment rate in Quarter One of 2011 in South Africa reached 25 percent. The report also indicates that the contributing factor to job losses is attributed to the international financial crises. Between Quarter four in 2011 and Quarter one, many industries lost informal sector jobs while some gained a few. Additionally it is reported that the construction industry lost most jobs (26 000) followed by trade (21 000) and finance (16 000), while some jobs were created in community and social services (18 000) and mining (6 000). This resulted in a net loss of 46 000 jobs across all industries over a quarter (Statistics SA, 2011).

The creation of decent permanent jobs in South Africa is a key focus of Government in all its tiers. According to an AGAMA Energy research report, (2009) studies have indicated that the renewable energy sector can create more employment per unit of energy installed and generated than conventional sources of energy (UNEP, 2008; AGAMA Energy, 2003; Prasad, 2006).In the scenario which projected an electricity demand for 2020 as 267TWh, increased by 62TWh from the projection made in the year 2000, it is anticipated that 52 000 jobs will be created if this capacity is generated inclusively from renewable energy technologies and coal capacity. However, an estimated 57 000 jobs would be created if only renewable energy technologies were used to meet this demand (AGAMA Energy, 2003; Prasad, 2006).

In conclusion, all indicators pointing to the future generation of energy, states that renewable energy is the only clean way for countries to go and that this contributes

greatly to an improved socio-economic environment where jobs are needed. The next section will focus on clean energy and low-income urban communities.

2.8. Clean Energy Interventions in Low-Income Urban Communities

The expectations linked to the implementation of renewable and energy efficiency interventions in low-income urban communities in South Africa are great (Wlokas, 2010). According to Walsh et al. (2011) a number of these projects in low-income communities have been implemented across South Africa, with the objective to understand and address the challenges facing these communities, while providing basic services, facilitating energy efficiency measures, and assisting socio-economic development. The projects are also aimed at determining the impacts and benefits that different interventions may have on the communities in which they are implemented. It is anticipated that these initiatives will also inform policy formulation and implementation approaches into the future in support of developing sustainable low-income urban communities across South Africa (Walsh, et al., 2011).

2.8.1 The Kuyasa Case Study

Limited literature is available on the phenomenon of clean energy intervention projects in low-come urban communities in South Africa. In order to provide context to this study, this section will focus on the facts as reported from the Kuyasa Clean Development Mechanism (CDM) project by Walsh, et al., Goldemberg, 2010 and Wlokas, 2009.

According to Walsh, et al. (2011), the project made valuable contributions in reducing some of the burdens faced by low-income urban communities. The project

has also received interest locally and internationally and has won several awards, serving as an example of the potential that renewable energy and energy efficiency intervention projects can be attained within low-income communities.

The Kuyasa CDM project was registered in 2005 as the first Gold Standard United Nations Clean Development Mechanism (CDM) project in South Africa. It is owned by the City of Cape Town and involved the retrofitting of 2 300 RDP homes in the low-income community of Kuyasa, in the urban township of Khayelitsha. This involved the installation of insulated ceilings, low-pressure solar water heaters and compact florescent lighting (Goldburg, 2010). It's aim was to address the inefficient design of the RDP houses in order to improve the quality of life of residents, especially health, to reduce monthly expenditure on energy sources, and the creation of jobs accompanied by skills development. (Walsh, et al., 2011).

A baseline survey conducted in 2008 in Kuyasa provided the following insights to the community's demographics:

- Almost all of the community houses are served with electricity (by pre-paid meters and receive 50kWhs of free electricity through the Free Basic Electricity Programme) and water from the City of Cape Town;
- Sixty three percent of the households heated their homes in winter and 53 percent used paraffin (paraffin flame stove or paraffin heater), seven percent use electricity and one percent use gas or multiple fuels; and
- The electric kettle was the most common appliance used for the heating of water in 92 percent of households, while multiple fuels for water heating was used by five percent and one percent was in a possession of an electric geyser.

A post installation survey indicated that 81 percent of the households reported a decrease in the frequency of illness and 48 percent of the households attributed their improvement in health to insulated ceilings. A reduction in monthly electricity and fuel expenses from R200 was reduced to less than R100 a month. This had a significant impact on the stability of household income. Respondents indicated that the solar water heaters also saved them money, since they did not have to boil numerous amounts of kettles as often. Of the surveyed respondents 82 percent of the households listed employment and skills development as a benefit of the project in addition to energy efficiency and health benefits.

Of particular relevance to this study is the lessons learnt by the project management team. These included (Walsh, et al., 2011):

Stakeholder Engagement

- The critical need for extensive consultation with key stakeholders such as government, the beneficiary community and the extended community, extended the project lead times; and
- The most suitable beneficiary community must be identified for retro-fitting based on clear and sound methodologies to ensure community buy-in and the mitigation of potential resistance from neighbouring communities.

Project Model and Finance

- This CDM was complicated and the process of accessing finance through the CDM has been described as long and difficult;
- The subsidised financial mechanisms the Standard Offer provided by Eskom through their Integrated Demand Management Programme (IDM) have “roles to play” in financing further projects; and
- The role of Government is critical. These projects require inter-departmental co-ordination and effective public private interaction and co-operation. The

project concept also needs to fit within the relevant regulatory framework to facilitate progress.

In conclusion, the replicability of the project also offers an opportunity for other project developers to learn and gain from the Kuyasa experience in the implementation of other projects across South Africa. Similarly, this study aims to investigate the lessons learnt and experiences of the project implementation managers from various clean energy intervention projects in low-income urban communities across South Africa. It also aims to identify the factors which influence the implementation of these projects in relation to the potential contributions of clean energy intervention projects to sustainable development and the socio-economic improvement of low-income urban communities.

2.9 Conclusion to Chapter Two

This chapter unpacked the literature around government's climate change mitigation policies, the reduction of poverty as a national priority and how urbanisation impacts on the socio-economic situation of low-income communities. In order to improve the lives for all in South Africa as a result of the legacy of Apartheid, government developed the Reconstruction and Development Programme in 1994, of which housing formed part and poor construction resulted in mitigation challenges. The reality of energy poverty impacted negatively on the socio-economic situation in low-income urban communities. As a result of climate change challenges for South Africa, being a high emitter of greenhouse gases, the government developed strategies to harness clean sustainable energy sources to meet the demand side in the economy and for the improvement of the quality of life in low-income urban communities. Therefore, clean energy interventions in these communities have

become a priority for government, now and in the future. The review revealed a lack of academic research on clean energy intervention projects in low-income urban communities, mainly as a result of the newness and uniqueness of these interventions. The Kuyasa Case Study, a gold standard award winning CDM project, also assisted in providing context to answering the main research question of what are the factors that influence the implementation of clean energy interventions in low-income urban communities in South Africa?; and the sub-questions of (a) How do these factors influence the implementation of clean energy interventions in low-income communities in South Africa?; and (b) How do these factors contribute to socio-economic development?, which will form the basis of this research as explained in chapter three.

3. CHAPTER 3: RESEARCH QUESTIONS

3.1 Introduction

This study aims to identify and understand the factors which influence the implementation of Clean Energy Interventions in low-income urban communities in South Africa, through the exploration of the experiences and lessons learnt by the project implementation teams of these projects throughout South Africa. Against a backdrop of limited literature and research on the factors which influence the implementation of these projects in South Africa, this research aims to use to present new knowledge and empirical insights by answering the following research questions:

3.2 Research Question 1: What are the factors that influence the implementation of Clean Energy Intervention projects in low-income, urban communities in South Africa?

> **Research Question 1.1:** How do these factors influence the implementation of Clean Energy Intervention projects in low-income, urban communities in South Africa?
>
> **Research Question 1.2:** How do these factors contribute to socio-economic development of low-income communities.

4. CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

Chapter three outlined the research questions which have been explored and investigated in this study.

The research aimed to identify and investigate the factors which influence the implementation of clean energy interventions in low-income urban communities in South Africa. Only limited literature addressing the factors could be found, this might be attributed to the fact that clean energy intervention projects in low-income communities in South Africa is a relatively new phenomenon. Since this is an emerging field of interest, a qualitative, exploratory investigation of the experiences and key lessons learnt by project implementation managers from a few clean energy intervention projects have been undertaken. These projects have been implemented in low-income urban communities in South Africa and have been identified as the best approach to achieve the research objectives and to efficiently answer the research question.

Chapter Four outlines the methodology that has been used to explore the unit of analysis to provide rich insights to address the research questions. Justification of the research approach, design, data gathering instrument and data analysis will also be provided in this section.

4.2 Research Strategy

To effectively address the research question and objectives, a qualitative exploratory and descriptive research design presented the most viable approach.

Therefore, the richness of a qualitative explorative investigation of the experiences and key lessons learnt from the target sample respondents aimed to provide comprehensive insights to identify and extract the key factors which constitute the effective implementation of clean energy intervention projects in low-income urban communities in SA. The primary data gathered was analysed to identify and describe these factors.

Leedy and Ormond (2001) advise that qualitative research is effective when the researcher is trying to understand a new phenomenon in a particular situation as opposed to establishing a relationship between two or more variables. According to Henning (2004) qualitative research is distinct for its quest for understanding an in-depth enquiry. In a qualitative study the variables are usually not controlled as the aim is the freedom to capture the natural development of action and representation. Therefore, in this research undertaking the freedom of control variables to explore the experiences and key learnings of the respondents are key to address the research question and achieve the research objectives with a smaller sample.

4.2.1 Explorative Qualitative Research

To identify and understand the factors as a phenomenon, involved in the clean energy intervention projects in South Africa, this research intends to seek new insights into this phenomenon, to ask questions and to assess these in a new light through an exploratory research design (Saunders, Lewis & Thornhill, 2009, p.592) where the phenomenon is expected to “unfold naturally” in the context of a qualitative approach (Golafshani, 2003).

Since these project initiatives are still young and more lesson are still to be learnt from the complexities of implementation, it is important for this study to explore the experiences and lessons leant by the respondents naturally, and was conducted in a semi-structured manner in order to answer the research question concisely.

4.2.2 Descriptive Design

The descriptive aspect, supplemented by the explorative part of the study aimed to describe and define the subject by creating a profile of challenges, people or events (Blumberg, Cooper & Schindler, 2008) from the data.

The descriptive part of the study also formed part of the data analysis component, which examined the number of times a single event or characteristic was presented in the data (Blumberg, et al., 2008) and endeavoured to profile and describe the key factors revealed. These lead to the presentation in chapter five of the factors that influence the effective implementation of these projects.

Semi-structured interviews were conducted with the respective sample respondents as part of the primary data gathering component. The evaluation of secondary documentation made available by the respondents complemented the primary data findings to provide comprehensive insights in answering the research questions.

4.2.3 Inductive-Deductive Hybrid Approach

Certain researchers advocate a purely inductive approach to qualitative research allowing the emergence of new meanings and gestalts without the inference of prior theory and propositions (Saunders, et al., 2009) However, researchers such as Yin (2003) necessitate tightly structured hypotheses to guide the data collection and

analysis processes. This study adopted a mixed inductive-deductive approach. This study sought an inductive approach which allowed for the emergence of new meanings, without the interference of prior theory and propositions. (Saunders, et al., 2009). Perry (2001) states that "pure induction without prior theory might prevent the researcher form benefiting from existing theory; just as pure deduction might prevent the development of new and useful theory". These arguments are important to consider in academic research, which includes theoretical constructs examined from the literature review in conjunction with the empirical study. In the case of this study, limited theory was available, thus a qualitative, explorative, descriptive design was followed with both inductive and deductive elements.

4.3 Research Process

In order to meet the research objectives the research process was approached in three phases.

Phase One: Involved an explorative, primary data gathering process through semi-structured interviews. Secondary data was made available by respondents in the form of official project reports.

Phase Two: Involved the data analysis of the primary qualitative, explorative, semi-structured interview data and the consented documentary secondary data.

Phase Three: Involved the identification and description of the key factors, which influence the implementation of clean energy interventions in low income-urban communities. Phase three will be presented in Chapter 5 of this study, as part of the findings.

4.4 Population of Relevance

A population of relevance can be described as a segment of a large group within a society who share common characteristics (Zikmund, 2003, p. 369; Saunders, et al., 2003)

The proposed population of relevance for this study are private and government stakeholders involved in the implementation of clean energy intervention projects in low-income urban communities across South Africa. These include entities that are affected or are interested in these types of clean energy intervention projects in South Africa.

4.5 Sample Method

According to Zikmund (2003, p.369) a sample is a subset of the population of relevance. As this study investigates the factors that influence the implementation of clean energy interventions in low-income communities in South Africa, the research is focused on the project managers involved in the implementation of these projects.

In order to address the research question from a qualitative perspective, non-probability sampling methods present the most practical means to apply to the sampling design of this research. According to Saunders, et al. (2009) the probability of each case being selected from the total population is not known and it is not possible to answer the research questions or to address objectives that require statistical inferences as in quantitative research studies.

The sampling method applied comprised of a purposive-judgement sampling approach.

According to Blumberg, et al. (2008) judgement sampling occurs when a researcher selects sample members to conform to some criterion (Blumberg, et al., 2008), the research interest of this study is from the perspective of project implementation stakeholders. Therefore, to gather the richest and most authentic data, the criterion for this study requires that the sample respondents have been involved in and experienced the process of the implementation of clean energy intervention projects, particularly focused in low-income urban communities in South Africa in the last ten years. The respondents of preference have more information and a richer experience of the phenomenon due to their position held (Welman & Kruger, 2001).

Blumberg et al. (2003) also states that judgment sampling is important and relevant at the early stages of exploratory research.

As there is no sampling frame for this study other than the criterion as per the purposive-judgement sampling method, respondents were initially identified by non-probability, convenience sampling through the use of the researcher's own network and contact base.

4.6 Sample Size

With regards to non-probability sampling techniques, the matter of sample size is ambiguous and unlike probability sampling, there are no stringent rules (Saunders, et al., 2009). Accordingly, the logical relationship between the sample selection technique and the purpose of the research is more important.

According to Saunders, et al. (2009) the non-probability sample size is dependent on the research questions and objectives, particularly in light of studies where qualitative data will be collected through interviews.

The sample size for this study was small due to the limited number of existing fully completed clean energy intervention projects implemented in low-income urban communities in South Africa. Therefore a rich in-depth qualitative study with a smaller sample size is the objective of this research design.

Six clean energy intervention projects in low-income communities were identified through convenience, purposive-judgement sampling as per the criterion outlined earlier. The number of respondents interviewed from the six projects totalled fifteen project implementation managers. Furthermore, a sixteenth project manager from a non-profit organisation was interviewed, which consults to municipalities on the implementation of clean energy intervention projects in low-income communities.

The table below provides a brief summary of the projects which participated in this research:

Table 4.1 Summary Of Projects Which Participated In The Research

Project	Project Owner	Location	Beneficiaries	Interventions	Type
Project A	Municipality	Cape Town	Low-income Community	Low pressure solar water heaters; insulated ceilings; rewiring of houses; CFL lights	Pilot CDM; Climate Change Project
Project B	Municipality	Port Elizabeth	Low-income Community	Low pressure solar water heaters	Pilot Project to showcase technology
Project C	Private Company	Port Elizabeth	Low-income Community	Low pressure solar water heaters	Private roll-out driven by Eskom Subsidies
Project D	Municipality	Darling	Low-income Community	Insulated Ceilings	Climate Change and Energy Efficiency Project
Project E	Municipality	Johannesburg	Low-income Community	Solar Water Heaters, CFL Lamps, Insulated Ceilings	Climate Proofing Project
Project F	Municipality	Johannesburg	Low-income Community	Solar Water Heaters	Energy Efficiency and

					Policy
Non-Profit Organisation	Not applicable	Cape Town	Not Applicable	Across all projects and interventions	All interventions

In order to ensure valid and reliable information and to gather comprehensive data, respondents across the six projects were placed into three categories pertaining to their project management roles. These included: (i) High Level Project Manager; (ii) Project Implementation Manager; and (iv) Project Manager and Community Liaison. Of the sixteen respondents, twelve were interviewed and 3 completed the semi-structured interview guide.

4.7 Unit of Analysis

The unit of analysis of this research is the investigation of the experiences and the key lessons learnt of project implementation managers involved in the implementation of clean energy intervention projects in low-income urban communities in South Africa, in order to identify the factors which influence the implementation of these projects.

4.8 Phase 1: Data Collection

Semi-structured interviews were used for the primary data collection phase of this study.

As semi-structured interviews are non-standardised qualitative interviews Saunders et al. (2009) the research instrument was a semi-structured interview guide which comprised of themes and questions that were covered in the interview as advised by Saunders et al. (2009) to answer the research questions. Paraphrasing, summarising and clarifying techniques were used to allow the researcher to test her own understanding and to expand on vague comments.

4.8.1 Primary Data Gathering Procedure

An introduction and background information with regard to the research was forwarded to the respective respondents prior to the face-to-face interview discussion along with a consent form. The questionnaire framework was not forwarded to the respondents prior to the interview to prevent any potential response bias.

The following practice was undertaken in the data gathering process (Saunders, et al., 2009; Patton, 2002; Welman &Kruger, 2001; Miles & Huberman, 1994):

1. The interviews were conducted by the researcher and were audio recorded with the permission of the respondent.
2. A hard copy of the semi-structured interview framework was used to capture key notes and observations during the interviews.
3. The interview was then transcribed from the audio recording and notes, these actions created the platform for the explorative research process.
4. The content data was summarised into a spread sheet format for further analysis to identify key themes and trends across the projects and respective respondent responses.

4.9 Phase 2: Data Analysis

The purpose of phase two encompasses the analysis and interpretation of the primary data gathered in phase one from the primary semi-structured interviews. The outcome of this phase is to be able to identify and describe the factors, which influence the effective implementation of clean energy interventions in low-income

urban communities in Chapter Five of this research document which represents the research findings.

Lal (2001) states that data analysis is the process in which the aim is to bring order, structure and meaning to large amounts of data collected. According to (Zikmund, 2003) the interpretation and application of reasoning in qualitative research is highly subjective and intuitive, therefore making it difficult to identify the source of an insight. As qualitative research analysis methodology is not a perfect science a combination of qualitative methodologies best served the purpose of this study.

A combination of content, narrative and comparative analysis were used to mine and analyse the data content to extract predominant themes, insights, common and differentiating variables with which to describe and profile the factors that constitute the effective implementation of clean energy intervention projects in low-income urban communities in South Africa.

The data obtained from interviews on each project was analysed using a combination of content, comparative and narrative analysis techniques. According to Welman and Kruger, (2001) Content analysis is a way of systematically analysing unstructured interviews and identifying the incidence of themes. Narrative final comparative analysis has been conducted to compare results across the various project respondents. The predominant themes and constructs that emerged from the semi-structured interviews were used to derive the key factors that influence the implementation of clean energy intervention projects in low-income urban communities. The narrative analysis retains the richness of the data and allows

patters to develop (Saunders et al., 2009). It was not appropriate to conduct a rigorous frequency analysis, since the interviews were semi-structured with broad themes, however it was useful to quantify which themes were noted by the most number of respondents.

4.10 Research Limitations

Due to the socio-economic tones of the study, which involved speaking to respondents from the public sector, the private sectors and low-income communities in South Africa, where service delivery issues have flared into public demonstrations, non-response and response bias were two factors that had to be considered.

Non response bias is caused by respondents electing not to respond to some questions for personal, sensitivity or other reasons, particularly pertaining to political issues.

The interviewee may be willing to participate in principle, however will be sensitive to unstructured exploration of certain themes (Saunders et al., 2009) especially pertaining to this study. It may be that the interviewee has provided partial information of the situation that casts themselves or the organisation in a socially desirable light or to avoid potential negative inferences.

Interviewer bias can also be considered, this is where the comments or tone, or non-verbal behaviour of the interviewer creates bias in the interviewee's response to the questions being asked (Saunders et al., 2009).

4.11 Reliability and Validity

4.11.1 Reliability

The lack of standardisation in qualitative interviews at times leads to concerns about reliability. With regards to qualitative research, reliability is concerned with the replication potential of the study and whether alternative researchers would discover similar findings (Easterby-Smith, et al., 2008).

However, the value of non-standardised research is derived from its flexibility to explore the complexity of the topic. Therefore, it is not feasible or realistic to ensure that the qualitative research can be replicated by alternative researchers since this would undermine the strength of this type of research (Saunders, et al., 2009).

4.11.2 Validity

Validity also refers to the extent to which the researcher gains access to the participant's knowledge and experience and is able to infer a meaning that the participant intended from the language that was used by this person (Saunders et al., 2009). In order to achieve the desired level of validity to present a credible non-standardised study, interview questions were clarified, meanings of responses were probed and topics discussed from a variety of angles during the interview within the given time frame. The interview framework of this study also guided the interviewer to achieve this objective.

The sample for this study consisted of three respondents in four projects, two respondents in one project, one respondent from a private project and one respondent from a high-level consulting project management NGO. Of the sixteen

respondents twelve were interviewed and four completed the semi-structured interview guide, as a result of non-availability for the interview.

The stability of the sample has, firstly, been confirmed by the number of the respondents; and secondly, by the positions of the respondents being consistent throughout the sample size.

4.12 Ethical Considerations

The Gordon Institute of Business Science of the University of Pretoria requires that all research undertakings pass through an ethical clearance process. This process examines methodology and research questionnaires used in the study. This is also to ensure the confidentiality and ethical component of the research. The ethical clearance process also warrants that the participant's name, details and responses will be kept confidential. Respondents have been informed of the confidentiality of the research at the onset of their engagement and have been provided with a consent form, which contains the name and contact details of the researcher. Documentary secondary data pertaining to the various projects also formed part of the data gathering portion of this study. The researcher relied on the sample respondents from the various projects to provide the documentation through their consent. A consent clause for the documentary data was included on the research participation consent form.

4.13 Conclusion of Chapter 4

The research methodology strategy and design selected for this study were qualitative exploratory and descriptive research, which makes use of semi-structured interviews and documentary secondary data. This research identified and described

the key factors which constituted the effective implementation of clean energy intervention projects in low-income urban communities. The research also brought an understanding of how the key factors affected effective implementation of these projects, with a specific focus on low-income urban communities. The rich data which resulted from this methodology provided the basis for the insights required to efficiently meet the research objectives and answering the research question efficiently.

5. CHAPTER 5: RESULTS

5.1 Introduction

The previous chapter explained the methodology used to answer the questions presented in chapter three. The aim of the research is to identify and explore the key factors that influence the implementation of clean energy interventions in low-income urban communities in South Africa. This chapter will present the findings from the semi-structured interviews conducted with project implementation managers based on their experiences and lessons learnt.

5.2 Sample Description

The research design requires a sample of 15 respondents from the project implementation teams of six clean energy intervention projects implemented across South Africa. Over and above the 15 respondents one respondent was a clean energy intervention project manager from a Non-Profit Organisation, which provided consulting and project management assistance to public sector project implementation teams across the country. Thus, the total respondents who participated in this research were 16.

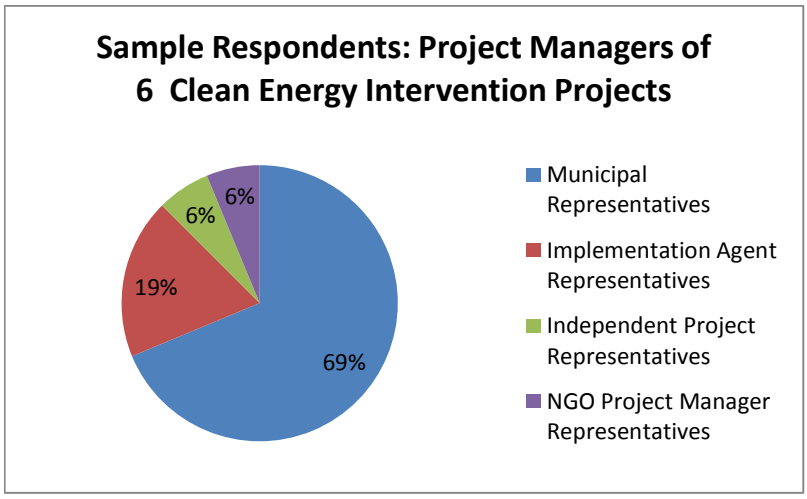
Of the six projects, five are owned by the respective municipalities, while one is a private sector initiative. Therefore 11 of the 16 respondents who participated in this study were municipal representatives, three were independent private implementation agents contracted by municipalities, one respondent represented the implementation team from the private sector project, and one respondent represented the project advisory team from the Non-Profit Organisation.

Clean energy intervention initiatives across the six projects comprised of two categories of project approaches, namely either a hybrid of clean energy interventions or a singular intervention as summarised in Table 5.1. The category is depended on budget availability and /or the objectives of the project. Figure 5.1 presents a breakdown of the Project Managers who participated in this study.

Table 5.1: Sample Description Summary

Project	Project Owner	No of participating respondents	Respondent type	Interventions
Project A	Municipality	3	1 Municipal Project Manager 2 Private Implementation Agent Managers	Low pressure solar water heaters (SWH); insulated ceilings; rewiring of households; compact florescent lighting (CFL)
Project B	Municipality	3	3 Municipal Project Managers	Low pressure SWH
Project C	Private Company	1	1 Private Company Project Manger	Low pressure SWH
Project D	Municipality	3	3 Municipal Project Managers	Insulated Ceilings
Project E	Municipality	3	3 Municipal Managers	SWH; CFL; Insulated Ceilings
Project F	Municipality	2	1 Municipal Representative 1 Private Project Implementation Agent	SWH
Non-Profit Organisation	Independent	1	1 Consulting NGO-Representative	Across all projects and interventions

Figure 5.1: Summary of Sample Representatives



The roles of the project managers can be categorised into three groups, namely, Overall Project Manager; Implementation Manager; Community Project Manager and Community Liaison Officer. The Implementation Managers' roles can be further segmented into two categories consisting of Municipal Implementation Managers on the one hand and Private Implementation Agents on the other hand.

A summary of the roles and activities of the respective project managers are tabulated in Table 5.2.

Table 5.2: Summary of the Roles and Activities of the Project Manager Respondents

Role	Activity	Respondents
High Level Project Manager **(HLPM)**	• Obtaining political buy-in for the project. • Oversight and project management to completion on behalf of the municipality as the project owner. • Developing the tender documents, liaising with the Department of Housing, liaising with Ward Counsellors and Officials. • Identifying all role players, managing finances, administration and the appointing of contractors. • Quality control and inspection. • Allocate geographical areas of operation: avoid conflict of interest between service providers.	4

Role	Activity	
Project Implementation Manager **(PIM)**	**Municipal Implementation Manager:** • Project design, planning and implementation. • Project management and technical assistance. • Development of the project specifications. • Adjudication, awarding of tenders, supervising, payments and general project management. • Contractor management. • Quality assurance and administration • Monitoring and evaluation of implementation.	4
Project Implementation Manager **(PIM)**	**Private Implementation Agent and Company Managers:** • Initialising the project and developing the relationships between stakeholders eg. Eskom, municipality, private individuals and suppliers. • Communication and facilitation between all. • Conceive and develop the modelling of the project. • Implementation and management of daily operations at a micro level; learn from a practical point of view what the maintenance issues are. • Employ local labour to create a community based project and community ownership. • Marketing. • Administration.	3
Project Manager and Community Liaison Officer **(PMCLO)**	• On site project management with focus on installation and working with contractors. • Quality control and inspection. • Recruitment and management of community labour on-site. • Identify beneficiary houses and engage with residents in terms of the work programme embarked upon by the intervention contractor. • Community liaison, education, communication relationship facilitation between community and implementation project teams. • Liaise with community after installation to determine whether residents are satisfied with interventions. • Marketing and Administration.	4
High Level Project Manager: Consulting NGO **(HLPM)**	• Role varies from situation to situation as sustainability advisor, facilitator and sharing information between cities. • advisor of best practices and implementation.	1

Against the above it is important to provide a brief perspective on the background and objectives of the six projects that participated in this research, viewed from the

side of the sample respondents. Table 5.3 presents the background to the reasons for the initiation of the projects and what the objectives were.

Table 5.3: Project Background and Objectives

Background	Project Objectives
Project A: Municipal Project	
• The project was initiated as a climate mitigation project for the Municipality. • It also served as a pilot project to test how the Clean Development Mechanism (CDM) could be applied to low-income housing and to prove that the process can improve the living conditions of the poorer communities of the city, while reducing carbon emissions. • The selected RDP community was on the fringe of the city and very low-income.	• To obtain validation for the CDM project. • To provide low-income communities with clean energy and an improved life quality. • To determine the carbon benefits. • To replace electricity and biomass as a medium for water heating through solar water heaters. • To improve the thermodynamic performance of the RDP homes through the installation of insulated ceilings. • To improve the standard of electrical wiring in the RDP homes. • To replace incandescent bulbs with CFL.
Project B: Municipal Project	
• In 2008 the Electricity Energy Directorate approached housing in terms of the overall green goals of the City Council. • The pilot project output was used to decide on strategy for the municipality and the way forward. • Looked at the advantages for human settlement linked to energy savings and to create a carbon offset. • To find a solution to mitigate the long term needs for electricity in new developments. • For socio-economic development by providing people with hot water through solar water heaters, instead of electricity. • To uplift the community. •	• To test the feasibility of installing low pressure SWH in a low-income housing community in relation to the municipality's overall green goals. • To reduce the load on the national energy grid by installing SWH. • To encourage sustainable business opportunities within low-income communities. • To evaluate the overall cost of the project, installation and future maintenance. • To evaluate the social impact on communities; to determine if they need SWH or if the money should be spent on another project. • To determine the technical performance of the SWH systems. To gage the socio-economic, technical and financial impacts of such a project.

Project C: Private Project	
• The private project was initiated as a result of the subsidies Eskom provided for such projects and it was an excellent business opportunity.	• The core objective was to install as many solar water heaters as possible. • Job creation and upliftment formed part of the process.
Project D: Municipal Project	
• The municipality compiled a climate change action plan with a number of objectives. One way to achieve the objectives was to improve energy efficiency by installing insulated ceilings in RDP houses, and so improve the living conditions of previously disadvantaged communities. • The municipality received funding for the initiative through an international donor agency. • The project was initiated under the municipality's urban environmental programme.	• To alleviate poverty; improve living conditions of the disadvantaged and impoverished people. • Improve the energy efficiency of low-cost homes as well as the thermal performance and insulation capacity of these homes. • Project also expected to minimise respiratory problems like asthma and bronchitis and improved space heating. • To involve the affected beneficiaries in the project in terms of testing the results of the installed insulated ceilings on their lives. • To provide employment opportunities to locally based already skilled people.
Project E: Municipal Project	
• The Municipality received funding from an international donor agency to implement a climate change mitigation project targeting low-income communities as part of an Urban Environmental Management Programme. • The Municipality's Housing Development Unit was selected since it is the City's flagship for clean or green urban development and had done a previous roll-out of 170 SWHs in their area of jurisdiction in 2006/7 • It was decided to implement Phase 2 of the SWH project which would include a further 700 homes in Ext 2. This phase involved more interventions - the installation of water heaters, insulated ceilings and the distribution of CFLs.	• To prove that it can change the lives of poor people through climate change interventions and to promote a mass roll-out of these types of projects. • To help residents save on electricity costs and to free up income for other basic necessities. • To demonstrate the potential for raising carbon income from housing projects, as well as to fund further clean energy improvements. • To demonstrate that SWH is a viable option for water heating in low-income communities. • To demonstrate the importance of insulating ceilings in low-cost homes for energy saving, health benefits and a better quality of life. • To promote the low use, if not elimination, of burning paraffin and two-plate stoves to keep warm.

Project F: Municipal Project	
• The project was initiated as a result of the electricity load-shedding programme in 2008 of the national energy utility Eskom due to a shortage in energy supply • To action a means of service delivery to indigent communities by providing hot water through SWH and not electricity.	• To form part of meeting Government's policy on the roll-out of one million SWHs by 2014 as well as managing power capacity. • Initial objective was to cover 120 000 houses, however, the target has been expanded to any house that qualifies, eg (house facing north and structure is sturdy, no shacks). • Job creation, transferring of skills to the community, creation of business opportunities associated with water heating for the community.

The most common reasons why these projects were initiated and what their objectives were, are mainly associated with socio-economic development, the reduction of energy poverty, job creation, the improvement of the standard of living and quality of life in low-income communities. Energy efficiency and demand side management strategies, along with climate change strategies were also cited as a key.

The private project acknowledged that though these issues are important, its key objective was to generate profit.

Project C, Respondent: PIM *"I was aware of the socio-economic benefits of this project, which were clearly always there. But, those factors on their own would have driven the project. The project was driven due to the fact that there were subsidies … without these it was a no go."* The core objective was to *"install as many of these low pressure geysers as we possibly could."*

The interviews provided insights into the fact that the Municipalities' objectives were predominantly aligned with the initiation of pilot projects to test and build cases for clean energy interventions in their respective low-income jurisdictions, as part of a

socio-economic development, energy management and a climate change agenda.

This observation was confirmed by various respondents:

Project D, Respondent: PIM *"The City has put together a climate action plan. One of its objectives was to improve energy efficiency. We looked at ways of achieving that. One of those ways was through the installation of insulated ceilings in houses, built by the City as part of its RDP Housing Programmes, to improve the energy efficiency and thermal performance of those homes … The funding for the project came from a donor agency programme with the intention to increase the resilience of 'at risk communities', in other words to make communities that are already at risk, increase their resilience to the effects of climate change, so installing insulated ceilings met both objectives".*

Project E, Respondent: PIM *"The main objective was to change the lives of people through climate change mitigation interventions and to eliminate energy poverty through energy efficiency and renewable energy interventions. Because people had no solar water heaters, they were using stoves and sometimes very poor methods of heating water, so the other objective was to reduce the problems associated with fire and things like that by giving them a modern source of energy to be able to use to change their lives."*

Project E, Respondent: PMCLO *"We wanted to, as a Climate Change Sub-Directorate, come up with projects that reduce greenhouse gas emissions. One of the technologies identified was the solar water heater system and ceiling insulation and the planting of trees. After receiving funds from the donor agency we decided to implement those technologies in order to reduce greenhouse gases in low-income communities … We should see people reducing the usage of electricity, people use a lot of electricity for boiling water for bathing, making tea and cooking. Therefore, if you provide a solar water heater, you are reducing the amount of energy that they are using. Also, if you provide insulated ceilings, in winter the ambient temperature is able to capture the temperature within the house and in summer the level of heat that comes from the sun. So insulation and also solar water heaters reduce the level of electricity that they use."*

Project B, Respondent: HLPM *"We looked at insulation, ceilings, north facing buildings and solar water heating. Specifically to group it together and create a means of carbon offset … We've always said that while we are designing for the future, we're also aware that what we are designing is limited in the event of electric water heaters. So we put out a tender to do a thousand solar water heaters. The arrangement was that we would do a good due diligence - we'd use USAID and the local university, and we'd do a proper professional community participation program. We'd also have a look at what the communities want and what the benefits of solar water heating were."*

5.3 Research Results

The research findings are presented according to the sequence of questioning during the interviews, which follow in Table 5.4.

Table 5.4: Findings According to the Sequence of Questioning

5.3.1 Project Implementation Process
5.3.2 Barriers to Implementation
5.3.4 Overcoming Barriers
5.3.5 Lessons Learnt
5.3.6 Success Factors

5.3.1 Project Implementation Process

Key themes were presented in the discussion about the Project Implementation Process. Project Managers were asked to reflect on the steps taken during implementation. The findings will be presented according to the themes categorised in Table 5.5.

Table 5.5: Findings According to Key Themes Presented in the Implementation Process.

5.3.1.1 Project Development and Planning
5.3.1.2 Community Participation
5.3.1.3 Information Gathering
5.3.1.4 Installation and Maintenance

5.3.1.1 Project Development and Planning:

The six projects presented unique variables pertaining to the high-level development and planning aspects of the implementation process. The findings for this section describe each project individually.

Project A: This project is a municipal owned project which was funded through Departmental Programmes of National Government. It was a pilot Clean Development Mechanism (CDM) project tested in a low-income urban community. The interventions included SWH, CFL, insulated ceilings and electrical rewiring.

Three respondents were interviewed from this project as per the roles described in the sample description, namely, the High-Level Project Manager (HLPM) from the respective Municipality; the Project Implementation Manager (PIM) who was an independent implementation agent and the Project Manager and Community Liaison Officer (PMCLO) who was a resident from the low-income urban community.

The CDM project was developed by a Non-Governmental Organisation. After its acceptance by the specific municipality, documentation was compiled in partnership to commence the CDM registration process with the respective authorities. Business plan proposals were written in accordance with the criteria of the public funders and they were accepted. High-level planning commenced, with detailed planning taking place around the homes, products and applications, which also entailed:

- Searching for right product and application method, ideally looked for a local manufacturer;
- Meet with suppliers;
- Piloting of products;
- Checking safety standards;
- Ease of maintenance and repair; and
- Cost effectiveness.

Project B: The project is also municipal owned, funded through its Energy and Electricity Department's operational budget.

The aim was to showcase the solar water heating technology as an intervention to include into the regulatory standards for newly built Reconstruction and Development Programme (RDP) homes.

All three respondents interviewed were Project Implementation Managers from the Municipality, with the following roles: High-Level Project Implementation Manager (HLPM); Project Implementation Manager (PIM); and Project Manager and Community Liaison Officer (PMCLO).

Project B, Respondent: HLPM *"We made certain that we understood the political environment. That was the first thing, before you can do anything. Secondly to make sure that the product was technically sound … To ensure that the political regime had accepted the project and that the principles of how one intended to roll the project out were accepted politically and understood in the target areas – the low-income and indigent areas with all homes having electricity and water."*

Specifications for a tender process were developed and approved to source suppliers. Memoranda of Understandings (MoUs) were set up with contractors to provide a clear understanding of what was required from both parties. Suppliers were selected on criteria established by the South African Bureau of Standards (SABS).

Project C: Is a private project as a result of a business opportunity created by subsidies from South Africa's power utility, Eskom. These subsidies formed part of its SWH roll-out programme. Though the project is private, it was supported by the specific Municipality. The project was financed by the Eskom subsidy and carbon finance, which will be administered for the post SWH installation programme.

The Project Implementation Manager of the project was interviewed and he summarised the process steps as follows:

"The first step was to clear up the relationship between parties and make sure that it's correct in legal terms, which will in this case be the municipality, Eskom, the service provider, even the ANC – the ruling party … The second one was putting contracts in place between the various parties where needed … The third one would have been to plan the project out. The high level planning – put the pieces and blocks together … And the fourth step – a very important step – was to get some understanding from the communities as to the acceptance of the project. That's quite important … And I would say the last step would be to get the right people on board to work with. That's quite crucial".

The respondent also highlighted the importance of flexibility and readjusting structures and strategies to manage the complexity or dynamics in certain elements of the project,

"… that's actually something that you need to take with you throughout the project. But the key issues are that you have to allow yourself enough flexibility in your strategy to be able to move forward."

Project D: This project is also a municipal project, based on a climate change and developmental agenda, which received donor funds. The focus was on the implementation of insulated ceilings in the RDP homes of the low-income community. All three respondents who participated in the study were Project Managers from the municipality and included the High-Level Project Manager (HLPM), the Project Implementation Manager (PIM) and the Project Manager and Community Liaison Officer (PMCLO). The PMCLO respondent was also a member of the low-income community.

The project commenced with the identification of a suitable low-income community in consultation with the Municipality's Housing Department, who played a key role, Ward Councillors and other City role players.

The High-Level Project Implementation Manager stated: *"I was really guided on that because the Housing Department was more skilled in identifying where a suitable community would be."*

The next step was the developing of the tender documents, which scoped the project. Following this, the project was advertised. Contractors had to have the skills, correct credentials, accreditations, a reputable track record and references, and a liquid balance sheet. Engaging the community followed a process, which called for a meeting to inform them about the intended project, the benefits to them, to introduce the role players in terms of their functions, roles and responsibilities, to obtain community buy-in and to field questions with clear factual and understandable answers.

Project Implementation Manager: *"Social engagement and public participation first to explain everything that has got to do with the project. It's very important because it's about dissemination of information; it's about consultation, about active community participation and involvement."*

A separate briefing session with the contractors was also conducted to discuss the project and the plan details.

Project E: This project is also a municipal owned project which received development funding through an international donor agency. The project was part of a Climate Change Proofing initiative. Interventions in the low-income community included the implementation of SWH, insulated ceilings, and CFL.

Three Project Managers from the Municipality participated in the study namely, the Project Implementation Manager (PIM), A Supporting Project Manager (SPM) and a Project Manager and Community Liaison Officer (PMCLO).

Once the low-income community has been identified, preparation for the groundwork started, which included the mapping of the low-income community. Next was the awareness campaign and consultation work, which involved:

- Aligning City Council and administrative stakeholders;
- Mapping the local political landscape;
- Liaising with gatekeepers, including the Ward Councillors, Community Liaison Officer, local leaders, the housing developer, all the contractors and relevant Municipal Departments and entities working in the area;
- Surveying the communications systems in order to understand how communication took place in the community (e.g. via leaders, local organisations, churches, and meetings).

One of the Project Managers interviewed, highlighted the important fact that after the identification of a viable project, which met the climate change related objectives, discussions and planning centred on:

"What exactly are the technologies we can use? Are they implementable? Do we have local skills? If not, can we train people on the ground to do that?"

The Project Implementation Manager described the project design process, which also included the researching of technologies on the market, visiting similar projects in the country, auditing of the structural aspects of the RDP homes and identifying energy behaviour of the residents. The answers to these questions informed the Terms of Reference Documents and the technology selection process.

After formulation of the Terms of Reference Document for the tender process, it was advertised. Proposals were received from potential contractors and service providers for the supply and installation of products and the appointment process then commenced.

Project F: This is a Municipal driven SWH project in a low-income community in its area of jurisdiction. The project is financed through the Eskom rebate as part of Government's SWH roll-out programme of a million SWHs by 2014.

Two project managers were interviewed, namely the High-Level Project Manager (HLPM) representing the Municipality and the Project Implementation Manager (PIM) representing a Private Service Provider as the Implementation Agent.

Though this project is owned and facilitated by the municipality, it has taken a "free for all" market approach to the implementation criteria as described by the HLPM:

"Eskom administers this rebate fund. Now, we assume that for them [service providers] to qualify they need to meet Eskom's criteria, it's not just anybody. So we assume that they have certain things in place, that when it comes to us it's not an issue. The only thing that we say is that anybody who can access that fund, anybody who meets Eskom's criteria is welcome to do the job. Our main role here is just to facilitate that these systems are installed."

A service level agreement is established with the service provider to regulate the operation, obligations of both parties, responsibilities of parties and technical specifications. Geographical areas are agreed on between the service provider and the Municipality. Further obligations include employing labour from the communities. Thus, service providers are not allowed to employ labour from outside the respective low-income communities. The municipality facilitates the community engagement process, which involves working with the community political leaders, Ward Councillors and community members.

"Before these guys can even set foot in the area they will not be accepted before we communicate it to the ward councillor, then they know what is going to happen." HLPM Project F.

The private Project Implementation Manager (PIM) stated that apart from the service provider employing labour from the community, providing a quality product and meeting the Eskom criteria, high on the Municipality's agenda is an after sales maintenance service.

Conclusion

The overall project planning and development process in relation to the projects presented in this study, shows that the planning and project development aspects differed in sequence. However, similar principles of development, planning and contracting suppliers as well as community participation formed part of every process. Furthermore, five out of the six projects were driven or administrated by the municipalities of which one (Project F) was administered on a "free for all" principle, based on Eskom criteria for service providers to install quality solar water heaters in the identified low-income communities and was governed by a service level agreement. The municipality merely played a facilitating role.

On the funding side, two projects were funded through international donor funds; one project was funded through public funds from Departmental Programmes of National Government; one Municipal project was funded through the operational budget of the Municipality's Electricity and Energy Department, while two projects, a private and a public project for funding relied on Eskom subsidies, through Government's SWH roll-our programme of 1 million units by 2014.

5.3.1.2 Community Participation

Community engagement and participation were presented as the most critical aspect to the implementation of clean energy interventions in low-income communities in

South Africa. Various aspects of engagement and participation were cited by all 16 respondents from the six projects.

The PIM Respondent from Project D pertinently pointed this aspect out:

"You cannot just go into a community and do things, you need to consult, you need to inform people and importantly, obtain their blessing and cooperation, which is what we got and that manifests itself when you do a periodical site visits and you ask people or you enquire, 'how are your living conditions now compared to before implementation'? If you get a positive response it means you have consulted adequately"

This point is further illustrated by the experience from Respondent HLPM of Project F:

"We just went in, we thought we had done it the right way, we went in and then just as we started installing we were stopped and we were told that, ' no you did not tell us about these things, what is that stuff on the roof there, we don't know what it is' … So there is a lot that should be happening within the communication, people need to know upfront and people need to know exactly how the system works. If you are asked a question: What happens when there is no sun? You should be able to explain in detail".

The PIM Respondent from Project C empathised with community buy-in:

"It was important to get an understanding from the community in terms of their acceptance of the project, this is a very important step".

Factors regarding the implementation steps on community engagement and participation were presented in the interviews to respondents. These were categorised as follows: Political Buy-in and Support; Community Engagement and Communication; Local Labour and Employment; Beneficiary Criteria; and Community Liaison Officers.

- **Political Buy-In and Support**

Five respondents from five projects cited the importance of obtaining political buy-in and support within the community. Ward Councillors played an important role in

facilitating communication and buy-in of the project by the community. Table 5.6 presents the key political elements discussed by the respondents.

Table 5.6: Political Buy-In and Support

Key Points
Critical to manage the political aspects in and communication with the community
Political support from the community is important for communication, “you need a political champion who can stand up for you".
To get political buy-in Ward Councillors had to be involved
Once buy-in from local politicians have been received the project is discussed with the community through a number of meetings where the benefits of the project and the process of rolling out were explained.
Ward Councillors assisted with issues around employment.

- **Communication and Engagement**

Community engagement and communication was extensive, particularly in projects A, B, C, D and E since the Municipalities were directly involved in the process.

Nine respondents highlighted important points presented in Table 5.7, which include the dissemination of information on the projects, the technology and the installation process, community buy-in, education and training through a process of engagement which involved extensive community meetings with the involvement of community stakeholders such as the Ward Councillors.

Table 5.7: Communication and Engagement

Important Points	Project
Marketing and communication campaigns, formed part of the municipal communication agenda and also used Ward Committees to create understanding; requested political parties to communicate and support buy-in; CLO visited Wards to communicate the process through community meetings, "So it's quite a process"; we worked predominantly with Ward Councillors.	A;C
Marketing, communication and environmental awareness; informed community about the project and system; community must be aware of processes from the beginning, this helps to accept the project.	E
Worked with the Ward Councillor and municipality to inform the community of the project and to provide information.	F
Called public meetings to inform the residents about the project; to facilitate	D

Q&A's; to explain process; to get community buy-in; and to introduce role-players.	
Community participated extensively in meetings; this created buy-in; we informed them of the scope of the project; and had to sign happy letters to confirm installation satisfaction.	D
Stakeholder engagement and awareness campaign; understand local context/culture; gain access through gatekeepers; empower local champions to be voice of project; have direct community meetings; maintain continuity in communication leadership; feedback to community; launch project in wider community to increase legitimacy; follow up communications and monitoring.	E
Consulted with residents in terms of the working programme regarding installation, which involved the removal of furniture and household goods from the houses.	D
Needed to train the community on the SWH systems to be used and get them on board with the project.	B
Three-day workshop on how the system works, what the contractors will do; community members to give permission if they want the product.	E
Organise educational campaigns on how to use the system	F

- **Local Labour and Employment**

Local labour and employment was a predominant factor elaborated on by nine respondents from all six projects. The resident Community Liaison Officer from Project A cited the following:

"The most important benefit of this project that they [community members] liked was the employment. Yes, that also came up a lot in the survey, local employment … The fact that it [the project] has created a lot of jobs to previously unemployed people was important to us. We believed in previously unemployed people and the skills that we gave them, so that they can do similar work elsewhere."

The High-Level Project Manager from Project D highlighted that the contracting of local labour was a prerequisite for service providers who were appointed for the implementation of the interventions.

"We included in the specifications that the appointed contractor, besides the relevant grading that he needed to be on, he also needed to use local labour, that was a requirement that we included in the tender specification. So they needed to actually quote for local labour, they had to use a component of local labour."

The key points regarding local labour and community employment that emerged from the discussion around the project implementation process are presented in Table 5.8.

Table 5.8: Local Labour and Employment

Key Points	Project
Labour employed from the community: plumbers, electricians and carpenters; It was key to set employment criteria.	A
Labour needs were assessed, equipment and tools were sourced, hiring of staff took place; worked closely with Ward Development For a; and employed the disabled.	A
Training co-ordinator hired: managed admin and communications; formal and informal training on ceiling installations and SWH; employees given time off for extra studies outside of the project.	A
Used local labour and local training.	B
Employ community members to work with contractors and for research surveys.	B
Temporary employment: three community members per Ward employed by plumbers for installation; Very Important: communities in Wards do not accept workers from other Wards in their Wards; this was clearly communicated to all.	C
Contract local labour: circulated a notice in the community explaining the project; a skills inventory had to be developed; posted a request for persons with skills; interviewed candidates; candidates must be from the community; some were already trained as a result of previous projects.	D
Employment criteria was set up; some service providers had previous experience of working with communities; to be employed had to be a resident in the area; submit CV's; installers must be technically experienced.	E
Labour was hired from the community to assist with administration (bar-coding of geysers) and installation; intensive on the job training and training in the factory were provided.	F

- **Beneficiary Criteria**

Insights to the beneficiary criteria were presented by six respondents from five projects. Table 5.9 presents the elements relating to the criteria used by the respective projects to determine the beneficiaries within the community who qualified for interventions such as SWH.

Table 5.9: Elements of Beneficiary Selection Criteria

Elements	Project
RDP houses facing north and Eskom regulations applied, which included water and electrification; looked at the technical aspects and the social aspects; also used members of community to assist.	B
Communities of low-income, with houses of a sound structure on a formal site with access to water and electricity; many houses also vacant as home owners returned to their original communities.	C
Not everyone gets a ceiling; beneficiary criteria involved the poorest of the poor: impoverished; aged; with health problems; low employment levels; on a merit system; if they had received a geyser before, they don't get a ceiling;	D
Beneficiary criteria was based on Eskom regulations, which stated that houses needed to be electrified and have access to water mains; houses also needed to be structurally sound – no shacks.	F

- **Community Liaison Officer**

Three respondents from three projects highlighted the benefits and significance of working with Community Liaison Officers (CLOs) from the community, who were responsible for facilitating communication between the project implementation team and the community. The Project Implementation Manager of Project D stated the following:

"Now this person comes from the community and was selected by the community. Obviously the person is known to the community, that person now links up to the contractor. Remember that this person knows where everybody stays and whatever else. This person will have to do the preparation work before the contractor sets his foot in the house,"

The benefits of the Community Liaison Officer are presented in Table 5.10 hereunder.

Table 5.10: Community Liaison Officer

Benefits	Project
The CLO comes from the community and is known to the community; links with contractor; does preparation and communication prior to contractor entering; captures complaints of community.	D
A CLO appointed and served as an officer to interface with community: dealt with project information and issues arising from the installation.	E
Projects must have a CLO from the community involved, it smoothes the process; sets up and attends meetings to hear issues and problems.	F

The key themes covered in this section of the study, namely, Political Buy-in and Support; Community Engagement and Communication; Local Labour and Employment; Beneficiary Criteria and Community Liaison Officers offered important insights into the factors which influence and guarantee the success of any clean energy, CDM project in South Africa.

5.3.1.3 Information Gathering

The gathering of all relevant project information is critical for success. Projects A and B as presented in Table 5.11, highlighted the information gathering processes, which formed part of their implementation. Pre- and post installation surveys were conducted to evaluate and understand the social landscape and to evaluate the technical performance of the interventions. Both projects collaborated with Universities to gage social aspects, project impacts and technical performance.

Table 5.11: Information Gathering and Research

Information Gathering and Research	Project
Pre-installation community survey: ask community residents if they want SWH, insulated ceilings and if they had to pay how much they would pay. Also gave sense of community needs and thinking.	A
Post-installation community survey: also did a post survey to assess how people rated their new benefits resulting from the project.	A
Collaborate with research institutions: social assessments, technical performance and evaluations.	B
Social survey: baseline demographics and engaged if community was happy about the project.	B
Inspection: understand the target area; do an audit of the houses with original home owners; check structure; water and electricity supply	B
Monitoring and verification: use of technical committee; supplier; project manager; installer; water and sanitation drainage inspectorate.	B

5.3.1.4 Installation and Maintenance

The theme pertaining to the installation and maintenance processes highlighted the importance and understanding of the scope of the project, the co-ordination and

control along with efficient administrative systems to manage a project of this nature. Furthermore, sustainable maintenance through carbon finance posed to be a solution. However, Project A still fell short of funding even with the carbon finance. The model which proposed a monthly household contribution of R30 failed due to an insufficient collection mechanism. Table 5.12 presents the most important insights pertaining to installation and maintenance issues as pointed out by six respondents.

Table: 5.12 Installation and Maintenance

Installation and Maintenance Insights	Project
Co-ordinate; quality control and inspection	A
Understand scope of the project and commence with installations; do maintenance, set up office where problems were reported and followed up.	B
Make sure the product is technically sound .	
Manage the contractors, first time for such a project.	
Building Capacity and Monitoring: building capacity in numbers and quality overall; monitor everything, e.g.: no street names and no house numbers create logistical problems; where there are numbers, numbers could be wrong; used a computerised developed system to monitor project and manage logistics in order to check everything.	C
Manage logistics: set up a monitoring database; computer spread sheets; capture all data and extract info required; sequential planning processes; project management.	A
Maintenance: this is part of the process; it will be administered through carbon finance; project has been registered and the project will receive a recurring income to facilitate maintenance; use subcontractors who in turn subcontract members of the community.	C
Maintenance: The community payment model failed as part of on-going sustainability, rollout and of generation of money. No mechanism to collect funds from the households. If the project received R30.00 a month per geyser maintenance would be sustainable with another R130.00 per year for carbon.	A

5.3.2 Barriers to Implementation

Respondents were requested to highlight the most pertinent barriers they had to deal with during the implementation process.

The following categories of barriers hindering implementation have been identified in relation to the predominant themes which emerged from the interviews of

respondents, namely: Community Related Barriers; Barriers Pertaining to Project Management; and Logistical and Technical Barriers;

- **Community Related Barriers**

Three respondents from three projects highlighted political barriers as an important factor signalling the importance of obtaining political buy-in from political members of the community; to mitigate the risk of projects becoming political vehicles for party agendas; particularly if projects are implemented close to an election period.

Elements pertaining to community buy-in, education and training were cited by six respondents from three projects and the NGO explaining challenges relating to mistrust from community members in the project, linked to an understanding of the beneficiary selection criteria and the value of the project to the community. Table 5.13 describes these elements in more detail.

Table 5.13: Community Related Barriers

Political Barriers	Project
Biggest challenge is timing: implemented close to the elections in 2009; became a political vehicle; risks of boycotts; creates an unstable community.	B
Highly political environment: many actors trying to access resources from projects; political actors trying to increase legitimacy by being associated with project; conflict within the community.	E;A
Overcoming mistrust and dealing with community mind-sets: initial mistrust due to historical poor delivery by Government; more community concern with getting a job than greening the city; had to manage community expectations.	E;B
Emotive communities; irrational behaviour.	NGO E
Dealing with complaints: who gets and who doesn't get an intervention; not everyone was happy regarding selected beneficiaries; other residents also wanted interventions.	D
Beneficiary selection: only 700 beneficiaries could be selected out of 5000 low-cost houses; selection criteria changed to prioritising those in the area on a first-come-first serve bases; homes were left out because they were not north facing.	E
Households did not know how the system worked; communication and training within the community; battled to understand SWH, what it is all about.	B

- **Barriers Pertaining to Project Management**

Three respondents from three projects pointed out barriers relating to project finance which included relying on external donor funds and relying on Eskom subsidies, which were slow and influenced cash flow. After sales maintenance of the project is also impacted on by the financial models. Two respondents from two projects highlighted elements pertaining to the interventions which related to trust of suppliers, understanding the technology and the capacity of supply. Four respondents highlighted general project challenges which included long and involved procurement processes, bureaucracy and poor communication between government departments. Project D however highlighted in its project development phase the importance of departmental co-ordination, this was one of the first steps in the implementation process.

Table 5.12: Barriers Pertaining to Project Management

Financial Barriers	Project
Reliance on external funding: Uncertainty as to how long Eskom rebates will continue; carbon income only useful for large scale projects.	E
Cash flow issues: 3 month delay in payments from the public funder.	A
Payment model unsuccessful: Community agreed to contribute a small amount towards the maintenance of the interventions however, a collection mechanism proved to be challenging.	A
Maintenance: sustainable maintenance models needed for after warranty period, and funds required to do this.	
Financial strategy - project needs to sustain itself, not rely on donor funding.	E
Slow payments from Eskom, administration not in order, communication with fund rebate facilitator is slow, create cash flow problems.	F
Uncertain about which supplier to trust, took time to learn about the market and systems, changed from installing high pressure geyser to low pressure solar water heaters.	E
Equipment supply: country can only produce 20 000 units per year, not enough stock.	F
Procurement process: long and involved, a lot of time set aside for contracting	E
Bureaucracy, departments don't co-ordinate with each other, policy and legislation uncertainties;	F;E

- **Logistical and Technical Barriers**

Eight respondents commented on the logistical and technical barriers. These are predominantly related to gaining access to homes and homes not meeting the technical criteria for installation due to structural conditions. This also impacted on budgets and project schedules. Houses which weren't clearly marked also contributed to financial loss since some installations were conducted in the wrong homes.

Table 5.13: Logistical and Technical Barriers

Logistical and Technical Barriers	Project
Houses that were vacant; houses without a water connection.	B
Not all the new RDP houses in the community were complete so it added delays to the project.	B
Gaining access to homes; people were not there; wanted home owner present when removing furniture which caused delays; had to meet deadline.	D
Inclement weather: re-programming installation due to rain.	D
Structural conditions of the houses presented challenges leaking roofs; brittle roofs; poor plumbing; poor ventilation; poor wiring; had to fix, which escalated cost.	E;F
No street names and numbers: plumbers confused, incorrect installations, loss of funds.	F
Couldn't install systems in houses that were disconnected from electricity, Eskom standards required a live connection.	F
Houses facing the wrong direction; houses don't have water; Eskom regulations to use copper piping as part of installation in low-income areas are not feasible.	F

This section of the study categorised the barriers hindering implementation, which emerged from the interviews of respondents, namely: Community Related Barriers; Barriers Pertaining to Project Management; and Logistical and Technical Barriers;

5.3.3 Overcoming Barriers

The following section of the study deals with the positions of respondents on overcoming barriers during the project implementation process. Key factors focused

on the inter-related aspects of Community Participation; Communication and Education. These factors are presented in more detail in Table 5.14.

Tactics to overcome barriers from a Project Management perspective are presented in table 5.15. The significance of Monitoring and Verification are highlighted in Table 5.16.

- **Community Participation, Communication and Education**

Remaining politically neutral and understanding the political landscape emerged as an important factor to manage when engaging communities as indicated by four respondents from three projects.

Involving communities' right from the initial stages of the project, constant communication and engagement, education and training, adjusting communication messages and leadership are some of the points presented in Table 5.14.

Table 5.14: Community Participation, Communication and Education Factors

Factors	Project
Maintain political neutrality; understand the community; stay connected to local politicians on the ground; community participation is key.	A;B;E
Involved community from the get go; meetings during evenings; training on impacts of climate change; manage communities well through communication and constant engagement.	D
Established trust and legitimacy in communicated messages; involve community at all stages; use established protocols to build trust; access community through the right gatekeepers; and have accountable leadership.	E
Adapted communication messages to mental mind-sets and current knowledge; make explicit links to electricity crisis.	E
Established a network of local champions to become living carriers of knowledge.	E
Gave training on the systems; use local labour for installations; build trust.	C;A;E

- **Project Management**

Project managers commented on different tactics used to overcome specific obstacles. Table 5.15 presents insights from eleven respondents across the six projects.

Table 5.15: Insights Regarding Project Management

Insights	Project
Used applicable by-laws; engaged Eskom regarding standards (copper pipes not feasible); used technical committee.	B
Looked at what was done in other areas, took own initiative; own funding used; not reliant on others.	B; B
Had an external managing agent that kept project running.	E
Stakeholders needed to work together.	D
Worked with the Department of Housing to integrate technology for new RDP houses.	E
Linked communities, businesses, and municipality to develop a sustainable model for these projects.	E
Dealt with more than one supplier; look at imports to meet the capacity.	F
Effective management on every level.	NGO
Effective systems and procedures: meet regularly with contractor; CLO needed to be out in community.	E
Ensured things were done properly; no payment to contractors if they were not done properly.	
Paid people on time; ensured community happy with the product.	E
Got uniforms for employees to identify them; community resident had to be present to open the home for and during the installation.	A
Sent circular to homeowners about what is required from them during the installation process and they had to sign consent form.	D

- **Monitoring and Verification**

Six respondents emphasised consistent Monitoring and Verification as an important aspect of the project implementation process and life-cycle. This is presented in Table 5.16.

Table 5.16: Monitoring and Verification

Monitoring and Verification	Project
Installed water meters for monitoring and verification.	B
Received assistance from USAID to do social impact assessment.	B
Questionnaire: used during survey to monitor what is happening in health and livelihood.	D
Collect data on a monthly basis; monitoring and verification.	E

Runners in the community appointed; handing out pamphlets and checking which houses had been installed.	F

This section of the study dealt with the positions of respondents on overcoming barriers during the project implementation process and lifted the key factors out such as Community Participation; Communication and Education.

5.3.4 Lessons Learnt

The results pertaining to the Lessons Learnt from the experiences of the various Project Managers who participated in this research, have been categorised according to the following themes presented during the data analysis: Community Engagement and Participation; Project Management; Monitoring, Research and Information; Sustainable Models and Maintenance.

- **Community Participation**

Community participation has been a consistent theme throughout the research process. In exploring the lessons learnt by project managers regarding the importance of involving the community as early as possible in project development and implementation, this factor came up as key. Employment and transparency have also been highlighted. Tabe 5.17 highlights the inputs from eight respondents from five projects.

Table 5.17: Community Participation

Community Participation	Project
Need strong leadership; acts as role model.	A
Understand the political dynamics and structures; remain politically neutral.	B
Community dynamics cannot be controlled and it varies from community to community.	D
Involved the community as much and as early as possible; participation is important to obtain community buy-in; make	B;D;F;G

communities the owners and spokespeople of the project through educators and community leaders.	
Engage households as soon as possible in the project design and before writing the Terms of Reference; engage households outside of the implementation area; explain why they are not part of this implementation phase.	E
Utilisation of local labour in the project; important to have hiring criteria and hiring processes.	D;B
Prioritise fair and transparent labour hiring: project offers create hope where unemployment is high; conduct hiring openly via meetings and introduce workers.	E

- **Project Management**

The lessons learnt, which form part of the project management spectrum key points experienced by eight project manager's from all six projects were highlighted. The Project Implementation Managers from Project A in particular pointed to the dynamic nature of these initiatives and stated that in a volatile environment with little certainty the "just do it" approach, while being adaptable and flexible, is necessary. The respondent from project C emphasised not to underestimate anything that seems simple and that a hands-on system of administration and monitoring is critical.

Table 5.18: Project Management Lessons

Project Management Lessons	Project
"Just do it" – if there is very little certainty, environment is volatile, while business model is adaptable and flexible.	A
Don't underestimate anything that seems simple; hands-on system administration and monitoring is critical.	C
Need a team that will work with you; trust each other	C
Timing of projects is important viewed from a political perspective.	B
Good Financial Management; work with what you've got.	D
Specifications must be accurate and very good so contractors can be held accountable.	B
Manage suppliers tightly at all stages of the project, including independent sign off of all installations; qualified plumber to be in charge of installations; provide independent quality assurance installation checklist; workers must be supervised.	E
Everything must be standardised, don't give leeway regarding pricing, roll-out, products, installation.	F
Streamline administrative procedures: tendering and payment processes.	D
Public/private partnerships between communities, government and	D

private sector must be encouraged.	

- **Monitoring, Research and Information**

Five respondents from three projects presented in this study, advised to do through research prior to commencing projects and to understand the landscape from a technical and social perspective. A respondent from Project F recommended that implementers should be very well informed prior to commencing with agreements between parties, while a respondent from Project E advised to do research prior to developing the Terms of Reference for contract suppliers. He also highlighted the auditing of the technical issues, such as house structures. Table 5.19 presents further insights to Monitoring, Research and Information aspects.

Table 5.19: Monitoring, Research and Information

Monitoring, Research and Information	Project
Advisable to study the area; have full information and what is happening with community; educate residents about the intervention.	B
Do research thoroughly upfront; determine what are the community needs.	
Establish what is the status of technical issues, like wiring and water.	E
Have general data available on the houses, which have water, which don't, before implementing.	F
Be very informed before you start, get everything in writing, so agreements are clear; regulations are clear.	F
Research what to do before developing the Terms of Reference, consult neutral bodies, associations, universities.	E
Continuous monitoring and evaluation of project	D

- **Sustainable Models and Maintenance**

The future of CDM projects in South Africa need to be further developed in order to make it sustainable. Maintenance plans are being formulated however finance to manage the longevity of the socio-economic benefits of these projects is still evolving. Although the recommendation is to develop sustainable models, many of these are still being tested. A respondent from Project B noted that carbon finance

could present a potential solution, while a respondent from Project E calls for the participation of business to assist in the development of the future of the interventions. Table 5.20 presents highlights from respondents on sustainable models and maintenance.

Table 5.20: Sustainable Models and Maintenance.

Sustainable Models and Maintenance	Project
Project must be sustainable; people must have the means to sustain the systems.	B
Co-ordination and communication between all relevant government departments is important.	B
Financing model that will replicate itself over time is needed.	E
Sustainable roll-out practices need to be developed.	G
Involve business; banks should lend money; carbon credits too small.	E
Good carbon market for solar water heaters which can be used to offset the cost/or start a maintenance fund.	B
Maintenance issues: mechanisms to be in place for residents to assist with problems solving, access to long term assistance required.	G
Maintenance strategy is highly important, maintenance plan for 5 yrs but need permanent strategy; Need a sustainable model for the future; involve business to develop sustainable models.	E
Long term planning required; lack of structures and processes, only short term opportunistic approaches	G

The experiences of the various Project Managers who participated in this research contributed to valuable lessons learnt as reflected above, in the categories of Community Engagement and Participation; Project Management; Monitoring, Research and Information; Sustainable Models and Maintenance.

5.3.5 Critical Success Factors

The critical success factors which emerged from the discussions with respondents based on their experiences have been categorised accordingly: Community Participation, Project Management and Information Monitoring, and Verification. Sub-factors of each theme were identified and presented in the tables below.

- **Community Participation**

Understanding the political landscape within communities was cited as a critical success factor by six respondents from across the six projects. While building trust and buy-in is required, remaining politically neutral is crucial. Respondents continued to emphasise the importance of community participation, employment, communication and education. Table 5.21 presents the factors shared by respondents in relation to Community Participation.

Table 5.21: Community Participation

Community Participation	**Project**
A. Political Factors	
Political commitment: high-level political blessing (mayor, council, mayoral level) and, community commitment.	B
Understand the culture and political structure.	E
Get political buy-in; but remain politically neutral, have commitment, be transparent.	A;C;E
Remain politically neutral: transparent in service delivery, councillors of all parties involved, let the voice be heard, importance of timing of the project, involve all political figures in community, chair meetings well.	D

Table B of 5.21 stresses the need for community ownership and buy-in of the project by seven respondents from five projects.

B. Community Buy-In	**Project**
Community must accept the project; the project won't succeed without it; community members were also involved in research survey.	B
Community participation, ownership, buy-in.	A; E; D
Community as the owners of the project: community educators taking charge of project, communication means community owns and understands, educators become project champions.	D

Consistent engagement, communication and education about the project are critical factors, while managing community expectations was emphasised by seven respondents from four projects. Table C of 5.21 presents these insights.

C. Communication and Education	Project
• Community consultation early on in the project to inform the project, don't make assumptions.	E
• Constant, regular communication and community participation with target groups and affected beneficiaries; follow-up letters.	D
• Effective engagement with the community, prioritise and deal with expectations.	A
• Continuous communication, awareness about the project, education and training.	B; NGO E
• Community engagement and communication, education - people need to know upfront and exactly how the system works. Need to be able to answer questions.	E
• Education and training: every weekend for 6 months, and on Wednesdays, about SWH, used videos for education as well.	A

Table D of 5.21 describes another critical success factor relating to the community employment to ensure the successful implementation of the projects as presented by four respondents from three projects. The concurrent point is that without community employment, projects will be stopped by the community. A respondent from Project E notes that projects have been stopped for not using local labour; another project manager stressed the importance of transparent hiring processes.

D. Community Employment	Project
Create as many jobs as possible, employ local people; communities won't accept project otherwise.	B
Local employment is key: use local skills, projects have been stopped for not using local labour.	E
Fair and transparent hiring process of local labour – labour can become a big issue and even in cases stop the project if the process is seen as unfair.	E
Staff must be well trained and monitored.	B

- **Project Management**

The Factors presented in the category of Project Management include the Financial Aspects; Stakeholders and General Project Management issues; Technology and Interventions; and Maintenance. Table 5.22 presents the findings in these categories according to the respondents' experiences.

Table 5.22: Critical Success Factors Pertaining to Project Management

Table A of 5.22 presents the pertinent issues from project managers' relation to the project's financial dynamics, from cash flow to the need for sustainable financial models. A respondent from Project E emphasised the need for flexible funding models that do not solely rely on subsidies for but should be flexible and not affected by external factors.

Project Management	**Project**
A . Financial Aspects	
Proper cash flow, keep promises; carbon will form part of this, must have funds available, state entities to honour their commitments.	B
Good funding model; combination between private funds and subsidies to mitigate risk when subsidies run out – sustainable, should be flexible, should not be affected by external factors	E
Matching funding source with the requirements of the project, mismatch can delay project by two years.	B
Funding model is very important; you must have the funds to make payments when required.	D M
Cash flow and funding are top priorities.	E
Sustainable funding model, need to graduate from the pilot.	E

Table B of 5.22 presents the factors associated with stakeholders which emphasise the need for cohesiveness amongst the group of major stakeholders with clear goals, co-operation between beneficiaries and contractors. Local government involvement is important to manage contractors as a respondent stated that private contractors are only profit driven, three respondents provided insights into this factor.

B. Stakeholders	Project
Project champions within government to work through procurement and implementation systems.	E
Local government involvement to regulate/manage the project - contractors just want to make money.	B
Commitment from municipality.	E
Political support on a national level.	B
Links and communication with all stakeholders.	D
Cohesiveness amongst the group or major stake holders; clear roles; clear goals; co-operation between beneficiary and contractor, team work.	D
Cohesive partnership: each stakeholder must know and execute its responsibilities.	D

Table C of 5.22 highlights that strong leadership and good project management, a level project model structure, clear responsibilities, capacity in terms of people and the physical, constant communication, monitoring and inspection and quality installations. The project manager from the NGO pointed out the need for some national criteria to roll-out these projects supported by planning, effective budgeting and the understanding of the socio-economic benefits presented by these projects to communities.

C. General Project Management	Project
Strong leadership, good project management.	NGO;E
Good project management, creative modelling, take responsibility, networking.	A
Good Leadership and Project Management	E
Need to have a project model structure: fairly level structure, clear roles and responsibilities.	E
Some national criteria, planning for roll-out, budget correctly, understand the social benefit.	NGO
Capacity in terms of people and physical capacity.	A
Communication, monitoring, inspection	E
Quality installations	E

Table D of 5.22 describes specific points from five respondents from two municipal projects around technology and products. Project E in particular expressed the need

to understand the technology, quality, knowing what is conducive for the South African climate particularly relating to Solar Water Heaters. This needs to be accompanied by competent suppliers that are hands-on and can stay afloat from a cash-flow perspective.

D. Technology and Suppliers	Project
Products must be conducive to the South African climatical conditions	E
Know what technologies are conducive for the area.	E
Quality and reliable technology required.	E
SWH technology: understand it and make sure it is suitable for the community.	E
Quality of the product is very important; better to work with a quality system; less problems.	B
Technical reliability of the equipment.	B
Competent suppliers and warranties.	B
Maintenance team that will stay for at least six months.	E
Contractors to have own cash flow and be hands-on.	E

Furthermore, maintenance was a theme presented in previous findings which are pointed out again by two respondents and links with the issue pertaining to sustainability. The project manager from Project E stated the need for a maintenance plan that involved the local community and business organisations with a sustainable financial plan.

- **Information, Monitoring and Verification**

Table 5.23 presents the findings pertaining to factors described in relation to Information, Monitoring and Verification by four respondents. The project implementation manager from project E noted that research and analysis prior to embarking on the project are important factors to develop a high standard Terms of Reference for tenders, while two project managers from different projects mentioned the need to monitor and evaluate and to develop contingency plans.

Table 5.23 Information Monitoring and Verification

Information Monitoring and Verification	Projects
Do proper analysis and research prior to embarking on the project, help to develop better Terms of Reference for Tenders.	E
Monitor and measure what you do, so you can benchmark.	E;C
Monitoring and evaluation to develop contingency plans, need to be well informed plans.	F
Monitoring and verification, technical aspects to see if everything is working.	NGO

5.3.6 Project Rankings by Project Managers from Six Clean Energy Intervention Projects

Respondents were requested to rank their respective projects on a scale from one to ten with regard to project implementation effectiveness. Many respondents interpreted effectiveness in terms of their perception of the success of the project. A ranking of one represents an unsuccessful project, while a ranking of ten reflects a very successful benchmark project.

In total, the six projects ranked at an average of eight. Though projects were predominantly pilot projects and new experiences for most of the respondents. In terms of success, the projects ranked highly measured against overall effectiveness and achieving project objectives. Figure 5.2 presents the project rankings from the perspective of 15 project managers.

Figure 5.2 Project Rankings

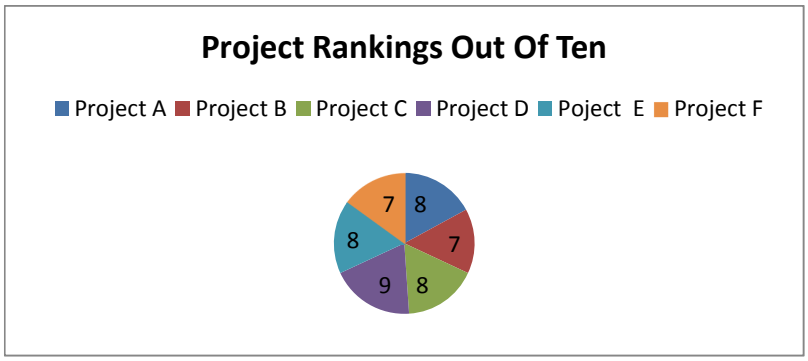


Table 5.23 presents the individual rankings with justifications from respondents in terms of their decisions. Comments were dominated by the success of the projects to be used as examples of creating awareness around the value and massive socio-economic impacts offered to communities. However, areas of improvement and further consideration were raised, for example, budget limitations and its impact on maintenance sustainability of the projects.

Table: 5.23: Project Rankings by Fifteen Respondents from Six Clean Energy intervention projects.

Rating	Comment	Project
8	If we had a reliable source of income, on-going income, it would be 10.	A
8	Brought a lot of positive change and hope to the residents, beneficiaries do not travel to the chemist that often. Job creation, skills development, new work opportunities.	A
8	Short of ten because limitations of the budget meant that imported evacuated tube solar water heater rather than locally manufactured panel heaters had to be used. For the rest the project met its objectives.	A
7	Sustainability aspect: post implementation we don't know what is going on. If there was a plan, no follow ups.	B
7	You can always do better.	B
6	Installations were done well and the community is happy, social impact was done, no plan for maintenance sustainability of project afterwards.	B
8	Things can be done differently, but socio-economic impact is huge; it is a noteworthy case of alternative energy.	C
9	Nothing is perfect, but it was an incredibly successful project; can be replicated	D
10	Award winning, community very satisfied, knowledge sharing,	D

9	Project was successful from start to finish, each stakeholder contributed fully. Community was receptive. Local authority endorsed and supported project from the start. Administrative procedures refined, expedited implementation as there was a funding deadline by the donor.	D
8	Positive impact on the community and households. Rating would improve if more longer term employment was created, and if training was accredited.	E
8	A few problems: ceilings detaching, feeder tanks of solar water heating system faulty.	E
8	Pilot project, learning curve and yet we exceeded some of our targets and expectations.	E
7	We could have done better (10) if we didn't have to skip houses, thus, if all the houses had water and met the criteria.	F
8	It was great but had its downfalls	F

The individual rankings of the projects by respondents were dominated by the success of the projects to be used as examples of creating awareness around the value and massive socio-economic impacts offered to low-income communities.

5.3.7 Socio-Economic Impacts

A brief overview which presents the socio-economic benefits achieved by two projects follows. This overview is based on project official reports based on community research conducted through surveys post installation.

Project A: (Walsh, Wesselink & Janisch, 2011) Project A conducted two surveys in its low-income community, before and after the installation of the interventions. The post installation survey indicated that 81 percent of the households reported a decrease in the frequency of illness and 48 percent of the households attributed their improvement in health to insulated ceilings. A reduction in monthly electricity and fuel expenses from R200 was reduced to less than R100 a month. This has a significant impact on the stability of household income. Respondents indicated that the solar water heaters also saved them money, since they did not have to boil numerous

amounts of kettles as often. Of the surveyd respondents 82 percent of the households listed employment and skills development as a benefit of the project in addition to energy efficiency and health benefits.

Project B: (Wlokas, 2010) Project B reported a decline in energy poverty through the increased number of electrified houses and the installation of solar water heaters. A reduction of wood and paraffin usage have been reported, which might also contribute towards a reduction in greenhouse gasses. The Project B report stated that human capital was fostered through the employment of 24 people from the community. As mentioned in the project above, respondents indicated less frequency of respiratory illnesses. Hygiene improvement was reported amongst men, since hot water enabled bathing. It was also suggested that households might use the money saved through the reduced expenditure on electricity and fuel, to purchase new appliances.

5.4 Conclusion to Chapter 5

The overall project planning and development process in relation to the projects presented in this study, shows that the planning and project development aspects of the projects differed in sequence. However, similar principles of development, planning and contracting suppliers as well as community participation formed part of every process

Five out of the six projects were driven or administrated by the Municipalities of which one, (Project F) , was administered on a “free for all” principle, based on Eskom criteria for service providers to install quality solar water heaters in the

identified low-income communities and was governed by a service level agreement. The Municipality merely played a facilitating role.

Two projects were funded through international donor funds; one project was funded through public funds from National Government Departmental Programmes; one Municipal project was funded through the operational budget of the Municipality's Electricity and Energy Department, while two projects, a private and a public project relied on Eskom subsidies, through the National Solar Water Heating Programme, to finance the projects.

The key themes identified in this study, namely, Political Buy-in and Support; Community Engagement and Communication; Local Labour and employment; Beneficiary Criteria and Community Liaison Officers provided important insights into the factors which influence and guarantee the success of any clean energy, CDM project in South Africa.

Barriers hindering implementation, which emerged from the interviews with respondents, were Community Related Barriers; Barriers Pertaining to Project Management; and Logistical and Technical Barriers. Respondents provided useful insights on overcoming barriers during the project implementation process and lifted the key factors out such as Community Participation; Communication and Education.

The experiences of the various Project Managers who participated in this research contributed to valuable lessons learnt reflected in the categories of Community Engagement and Participation; Project Management; Monitoring, Research and Information; Sustainable Models and Maintenance.

In conclusion, the individual rankings of the projects by respondents were dominated by the success of the projects to be used as examples of creating awareness around the value and massive socio-economic impacts offered to low-income communities.

6. CHAPTER 6: DISCUSSION OF RESULTS

6.1 Introduction

This chapter discusses the data gathered and presented in chapter 5. The arguments presented in chapter six follows a consolidated structure of chapter five to present the key factors which influence the implementation of clean energy interventions in low-income communities in South Africa. Chapter 6 will commence with a brief discussion on the sample used and observations made with regard to clean energy interventions in low-come communities in South Africa.

A variety of factors came to the fore, which were supported by the data collected to provide context to the research problem and the interviews conducted with the 16 key respondents. Of the respondents, 69 percent were from municipalities, 19 percent were implementing agents, six percent were independent private sector project representatives and the last six percent were NGO project manager representatives. It is for these reasons that the findings are brand new and unique in their own right. The key factors will be highlighted and discussed in a consolidated fashion below. These are the key factors which should be borne in mind whenever a new clean energy intervention project in a low-income community in South Africa is considered.

6.2 Sample Description

The sample generation was an extensive process since only specific persons could be targeted as respondents for interviews. This was in relation to their level of involvement and roles in clean energy intervention projects which had to be gauged for the purposes of this study and were geographically spread across South Africa. Six projects were identified, which formed the core base of this research. The

geographical spread provided validity to the data collection on the basis that the research confirmed that low-income urban communities across South Africa faced exactly the same challenges with regard to energy poverty, unemployment and poor living conditions to name a few. It also confirmed that project managers of implementing authorities faced similar challenges in the implementation of these projects, though projects are unique in their own right, the overarching principles for those implementing rectifying measures through clean energy interventions were similar. A difficulty experienced was the availability of the respondents, who in a number of cases, was a senior employee of a municipality or company. As a result, three respondents completed the semi-structured interview questionnaire without being interviewed. This in no way impacted negatively on the data collection and findings.

Five of the clean energy intervention projects were municipal owned, which impacted on the process of engagement between the municipality and the community. The private project was municipal supported and communication with the community was facilitated.

Funding for the intervention projects were received from public funds, own funds and donor contributions, with the latter having specific criteria for such funding, namely, to increase the resilience of poor communities to the effects of Climate Change.

The respondents indicated that maintenance after completion of the project, delivered concerns of how households identify a system problem, who to approach for the solution and who to pay for the solution. A unanimous concern for the development of sustainable funding models was raised for this purpose.

6.3 Discussion of Key Factors

The frameworks and factors generated in this research are descriptive. They describe the realities of what happened during implementation process, based on the experiences and opinions of the respondents of each project. This research did not seek to test constructs against outcomes or to provide a blue print for how implementation should happen. Rather, it presents a description of how the implementation process happened and identified the key factors that influenced the implementation which are critical for stakeholders.

6.3.1 Project Objectives

On 27 April 1994 all South Africans voted for the first time to eliminate a governmental system of Apartheid and the bringing into office of a democratic government, representative of all the citizens of the country. As is commonly known, apartheid created a massive socio-economic imbalance with regard to the majority non-white citizens, which the new Government had to eliminate as fast as it possibly could. As presented in the literature the main objective of the Reconstruction and Development Policy Framework, 1994 of the new government was exactly to close the gap between the advantaged and disadvantaged citizens in South Africa. One such programme to achieve this was the construction of millions of RDP houses and only recently the roll-out of SWH in the low-income urban communities took place. An additional objective of government was the provision of clean energy to old and new low-income urban communities to avoid further pressure on the national electricity grid (as a result of Eskom's programme of load-shedding in 2007/8 since it could not keep up with peak demand) combined with climate change mitigation

objectives and socio-economic development to improve the lives of the poor as presented in the policies mentioned in the literature.

As a result of the of the political and socio-economic developments mentioned above, it is clear why government, facilitated by Eskom through the national solar water heating rebate programme, focussed on a roll-out of 1 million SWH by 2014. It is against this background that most of the clean energy intervention projects in South Africa developed in order to improve the quality of lives of these residents, while managing electricity demand and mitigating climate change. Though the private project was driven from the business opportunity presented, it was supported by the respective municipality as it contributed towards meeting the overall objective of improving the quality of the lives of the low-income communities in its jurisdiction.

These developments formed the basis of this study to highlight the key factors to be considered in the implementation of clean energy interventions in the future in South Africa.

6.3.2 Project Implementation Process

There are nine key factors that form part of the implementation process, which emerged as predominant themes in the findings, the rich data provided a series of sub-factors and the most pertinent of these have been consolidated under the key themes in the discussion that follows.

The nine key factors are: Project Planning and Development; Community Participation; Employment; Political Buy-In; Communication and Engagement; Beneficiary Criteria; Installation and maintenance; Project Management; and Technology and Suppliers.

6.3.2.1 Project Planning and Development

This study indicated that the phenomenon of clean energy intervention projects in South Africa is still brand new for the owners of the project, the low-income urban communities and for the funders thereof. It was a dynamic experience which presented many lessons to the respective stakeholders. Though similar factors influenced implementation in all the projects, important an element such as project models are still unique. Knowledge and experience sharing was done predominantly through discussions and site visits amongst some of the projects to aid with planning development and risk mitigation, this was evident between projects A, B and E. No published peer reviewed literature is available which could be used as terms of reference, only very recent research has been done and is still being done in collaboration with universities on the socio-economic impacts these interventions have on low-income urban communities.

The implementation process was very much a progression of learn-as-you-go. This resulted in the fact that no project was mistake-free, for example, the late involvement of a community resulted in a project being stopped, the owners were not able to meet their completion deadline and additional unbudgeted costs had to be borne. Great challenges were presented from a logistical point of view in terms of the conditions of the RDP home structures which formed part of the criticisms in the literature review pointed out by Aliber (2002) and Visagie (2008). Poor quality RDP homes not only impact on the wellbeing of residents but greatly hampers any initiatives to elevate living standards through the provision of basic services. Examples provided by respondents pointed out that houses had no street names or numbers, or the numbers did not correspond with the city plan, houses were cut-off

from electricity supply and poor basic infrastructure. This situation resulted in the installation of interventions in the wrong houses, the re-plumbing of houses and structural re-enforcements which delayed projects with additional costs and created political animosity amongst residents when the installation had to be removed. A lesson learnt was to thoroughly evaluate and document the community landscape and structural components prior to implementation and to administrate the process by making use of administrative software. One project invested in the customisation of administrative software to account for the logistical aspects of the project to ensure efficient administration and to save costs and avoid errors. Another key point raised which Visagie (2008) highlights in the literature is the importance of inter-departmental co-ordination within government. It is critical for the Department of Human Settlements to participate in these projects to provide the necessary support in terms of resident information, structural issues and facilitation in some instances. Co-ordination between departments will ultimately aid in less costly project implementation processes.

6.3.2.2 Community Participation

One of the basic principles underpinning the findings of this study was the critical element of community participation from the onset of any project, prior to any form of implementation. All six projects stressed that without community buy-in and trust, projects would not be able to commence.

"So social engagement and public participation first to explain everything that has got to do with the project." PIM, Project D

"We make it a community based project where we inculcate the community ownership and participation" PIM, Project A.

"We tried to really address those issues because of the community participation issue … Ownership, you need to make sure they are seeing you creating jobs and you are with them in terms of the problems they are experiencing, you know." PIM Project E.

The study showed that support from the community for the project is enforced when unemployed members of that community are trained and employed, with the benefit that the skills gained could be used in another project somewhere else. Employment was a criteria set by municipalities as key in tender documentation. Contractors had to employ community members as part of the installation teams.

"Make sure that job creation is high on your agenda. If its not, you are doomed." PMCLO, Project E.

Many community members, in fact, were more concerned about employment than the social benefits of the project. This aspect emphasises the employment crisis in South Africa with a 25 percent unemployment rate, in quarter one of 2011 and 46 000 jobs losses across all industries in South Africa (Statistics South Africa, 2011).

Though these projects do not offer long-term employment at this stage they do offer skills, knowledge transfer and training, in some instances projects also provided reference letters for administrative staff and on-site labour to support employment credibility.

The study also brought to the fore a socio-economic, but crucial principle that all implementing authorities must keep in mind, namely, that community members trained from one Ward will only be allowed to work in that Ward and because community members of another Ward will not except them. This point impacts on the

implementation and time costs of the project as new labour constantly have to be trained.

6.3.2.3 Political Buy-In and Support

Political buy-in is quite different from community buy-in and has very negative implications if not handled correctly by implementers. This study found that it was critical to map the local political landscape and obtain both high-level and community political support for the projects. The Ward Councillors played an important role in this regard. Political neutrality will ensure that the implementer stays free from possible fraud charges or favouritism, which may take a negative turn.

The PIM of Project A, pointed out the complexity of the political environment within communities.

"So those communities are highly politicised, they have got political gatekeepers, they have got wannabe councillors, they have got councillors and then they have got Youth League and SANCOs and the divisions that are at national level are reflected there in that community." PIM, Project A.

"Political support as well is key; you need to manage different political parties in whatever you do… You have to be neutral at all times because the moment you show you political affiliations; then you don't succeed at all. You can rather just close shop. You just don't succeed." PIM Project, E.

In terms of high-level political buy-in, the literature presented statements from numerous policies and white papers, clearly stating National Government's objectives to mitigate climate change, to diversify the national energy mix to incorporate renewable energy and the importance of sustainable development. All of these objectives incorporated the socio-economic well-being of the poor, to bridge the energy poverty gap and the alleviate poverty. It is evident, however, from quotes presented in section 5.3.1.1 of the findings, that despite Government's visions,

lobbying to obtain political buy-in and support of these projects through-out the various tears of Government is critical to ensure the success of these projects, as they are facilitated by local government.

6.3.2.4 Communication and Engagement

Communication with the identified low-income urban community again is critical. Without this tool community and political support for the project will not happen and challenges from the community for one or another reason will not be satisfactorily addressed resulting in major problems – see for example "beneficiary criteria" hereunder. The question to be answered is how to communicate. Communication was consistent, through public meetings and every aspect and concern with regards to the project, the technology, social benefits and employment was managed in this manner. Project managers constantly emphasised the provision of information, education on the functioning of the systems and marketing of the project. Ward Councillors and community leaders are highly influential in communities, thus consistent messaging and transparency were important to maintain stability and ensure constant support, preventing potential boy-cots.

Findings presented in chapter five also showed that the Community Liaison Officer is a must for any project. This person must come from the community, must be elected by the community to this role, must be well-known by the community, must be trusted by the community and must know what the opinions of the community are. The study revealed that no sexism existed when the CLO was elected.

The CLO formed the ultimate link between the implementer and the community. He/she fulfilled multiple roles benefitting both the community and the implementer

and it must be understood that the community elected the CLO, therefore he/she is the only CLO implementers will work with, whether the implementer like him/her or not.

Thus, communication and engagement is an on-going process, from the onset of the project, during implementation and after project implementation to ensure long term adoption and to mitigate risks as much as possible.

"How did we overcome the barriers? By continuous communication to ensure that things are done in the proper manner" PIM, Project D.

Communication between all stakeholders was presented as a prerequisite for successful implementation as the following quote illustrates:

"I think the critical success factors to make sure that these projects are implemented in low income communities, is communication. Communication is very, very important, not only communication with the local communities but communication with all role players." PIM, Project E

6.3.2.5 Beneficiary Criteria

Apart from an urban community being "low-income" as the number one criteria for clean energy interventions, it was of high importance that implementers developed beneficiary criteria to derive eligible beneficiaries. The study showed that these criteria can be categorised according to (i) social criteria which included household status in terms of poverty levels, the elderly, employment and child headed households to name a few and (ii) technical criteria which constituted structural conditions, of the houses, access to water mains and electricity. These criteria were interrelated. Without clear criteria project costs would escalate beyond retention as structural issues proved to be the most costly. The implications of the criteria were

that not every community member was eligible to receive a solar water heater or ceiling.

As to be expected this caused some dismay amongst community members and the implication is that though the intention is to uplift communities as a whole, the reality is that budget limitations and the structural conditions of the low-cost housing units does not permit this. Walsh, et al. (2010) reported that recent housing policy seeks to improve the basic building standards of subsidised housing. According to a project manager from Project E, of 5 000 low-cost houses, only 700 were eligible for selection to be part of the project.

The study pointed to the critical role that effective communication played in managing the expectations of the community. Well formulated, detailed and understandable communication via meetings; the CLO; Ward Councillors and Community Leaders and educational pamphlets are examples of tools used by the implementation authority to mitigate discontent in the community.

6.3.2.6 Information Gathering

Information formed a key part of the implementation of these projects. Due to the lack of accurate data available on house plots, house numbers and resident owners, much of the information had to be surveyed prior to project commencement. Four projects collaborated with universities to conduct social studies and to monitor the technical performance of the solar water heaters. From a project management perspective constant monitoring, inspection and evaluation of logistics and the project processes took place. Project managers reiterated the importance of staying informed.

The complexity of the implementation of these projects became increasingly prevalent throughout the research. Constant communication and information gathering was a means by which project managers could mitigate as much risk as possible and to plan. Important to note is that community members formed part of the research, site audits and general information systems again highlighting the inclusive nature of these projects.

A project manager from project D summarises the point:

"I would say make sure and please ensure that you have all the factual information and fund resources, sort it out upfront, you know where your money is going to come from, you know your payment procedures, you know your tender documents, that is the factual information you know your beneficiary community, you have done all your preparation work, you shouldn't move an inch unless you have covered your basis, see your line of authority is also important. You have got to know who is going to sign what and who is going to report on what."

6.3.2.7 Installation and Maintenance

The importance of planning, managing of logistics and building capacity to administer the installation process was key. Most projects improved their processes as lessons were learnt. A project plan drawn up by implementing authority after consultation of all stakeholders needs to be compiled well before the installation phase takes place. This plan must cover the budget for the project; key role players; the communication methodologies to be used before, during and after the project has been finalised; what the criteria are to ensure quality products and other criteria for implementation, for example those from Eskom; prepare Terms of Reference and advertise for tenders; select and approve supplier; implement; and maintenance plan. Thought these processes are standard from a project management

perspective, the context of the dynamics between the stake holders are unique. Project managers have to manage a multitude of elements at the same time of which community involvement is the most prevalent factor.

A major aspect which was raised and presented as a concern by the municipal project managers in particular, was the point of sustainability. Though tenders insist on post installation maintenance from contractors, the practicality of this requirement is questionable, especially if the implementing authority did not budget for post installation maintenance costs.

The challenge is to find a sustainable model to maintain the interventions to ensure long term success. The question is who is responsible for this and where is the funding going to come from? Two projects indicated that Carbon Finance will form part of their maintenance model. However, registering these projects are a long and laborious process, not all future projects will be able to replicate this model per say. Project E in particular noted the importance of public, private partnerships and called for the private sector to work with municipalities to find a long term solution. Project F presented another view from a market perspective. The project manager pointed out that a market has been created for community members to take responsibility to sustain the project themselves after the maintenance contract of the suppliers expire. He argues that community members have been trained to install these interventions and should use those skills to start small businesses within the community to service residents.

"We made sure as part of our terms of reference, we indicate clearly that we need a 5 years maintenance plan and they must give us methodology in terms of how will they respond to those problems the people are facing. If the roofs are leaking, how will they be able to respond to those issues? If the walls are cracking because of the

interventions that they have put, how will they solve those issues?" Project Implementation Manager, Project E.

6.3.2.8 Project Management

The findings revealed that implementation of projects close to election periods comes with its own political interferences and therefore project managers should maintain a neutral position without question.

During the interviews it became clear that every community has its own dynamics and that implementing authorities should under no circumstances attempt to control them, should understand the landscape and ensure communication and community engagement is constant, that information systems are efficient and that there is sufficient capacity to implement. It is for this reason that project managers should not underestimate matters that appear to be simple.

Strong leadership and a hands-on approach to administration, implementation, monitoring and verification are required in order to deliver a project within budget and without political or community challenges that have the potential to stall things if not shipwreck it totally.

6.3.2.9 Technology and Suppliers

The findings also indicated that products must be conducive to South African climatical conditions. This fact was supported by a very important element, namely, that research must be undertaken during the project planning stage in order to have full information on the types of products available, meet SABS standards; meet the technical specifications for specific applications and are supplied with sufficient warrantees (most are 5 year warrantees). Without this research, projects will become costly lessons learnt, while several projects also tested the products prior to

installation to ascertain suitability and durability. Product warrantees for the SWH also formed part of the maintenance aspect of the project. However, technology is still new, technical challenges were presented as several product failures occurred, these were rectified at the suppliers' costs.

6.4 Social Impact

The research data clearly pointed out that clean energy intervention projects in low-income urban communities in South Africa are successful, verified by two official project reports. The other four communities have not as yet officially published their post intervention results, however, interviews with Project Managers indicated the susses of their projects.

The official surveys indicated that 81 percent of the households reported a decrease in the frequency of illnesses and 48 percent attributed their improvement in health to insulated ceilings. Furthermore, a reduction in monthly electricity expenses was reduced from R200 per month to R100, which impacted positively on the financial stability of the household.

An additional social factor of high importance, as mentioned above, was employment from the community. Eighty two percent of respondents surveyed listed employment and skills development at the top of their list.

6.5 Conclusion to Chapter 6

This chapter pointed to the fact that no academic study on this topic has as yet been undertaken. Therefore, this study is unique in bringing the key factors, as discussed in this chapter, to the forefront that influence the implementation of clean energy interventions in low-income urban communities in South Africa. These factors will

assist in the future clean energy interventions in low-income urban communities, where the objectives of the improvement of the living conditions of the poor are met and energy efficiency contributes to a lowering of demand on the national electricity grid, currently and in the future.

The objectives of this study have been met, namely, to bring insights to the key factors that influence the implementation of clean energy interventions in low-income urban communities in South Africa and the research question as contained in chapter 3, has been answered.

7. CHAPTER: 7 CONCLUSIONS

7.1 Introduction

The world's significant economic growth experienced over the last 200 years is attributable to man's ability to generate and store energy (Covary, 2006). However, in the 21st century the massive growth in energy demand the world over has become a major challenge for governments in order to serve its growing industries and populations, Asimov and White (1991) state that the ability to control energy is a prerequisite for civilization, whether it is by making fires or building power plants. Sachs (2005) concludes that it is also the key reason for the divide between rich and poor countries.

Local Governments have recognised the significant role that clean energy interventions can play in service delivery to provide access to energy and to alleviate poverty as part of sustainable livelihood and climate change mitigation strategies in low-income communities and to create a "better life for all" as stated by President Zuma in his State of the Nation Address in June 2009.

Proof of this recognition is found in the various pilot project initiatives in low-income urban communities over the past few years such as the Kuyasa CDM and the Nelson Mandela Bay Solar Water Heating projects, amongst others. On 4 March 2011 the Mail and Guardian Online reported that Municipalities across the country were contracting companies to install solar water heaters as part of the mass solar water heating roll-out programme of government, which commenced in April 2010. In 2009 the Minister of Energy set a target of one million solar water heaters to be implemented by 2014 (DOE, 2011). The initiative also aims to address electricity

shortages, mitigate harmful Carbon Dioxide (CO2) emission from fossil fuels, to create employment and to alleviate poverty (Macleod, 2011).

This study investigated the factors that influence the implementation of clean energy interventions in low-income urban communities in South Africa. The factors generated in this research are descriptive. This research did not seek to test constructs against outcomes or to provide a blue print for how implementation should happen. Rather, it presented a description of how project implementation has happened and identified key factors that have influenced the process. The research was gaged from the perspectives and experiences of 16 project managers involved in the project implementation process in projects across South Africa and explored the respondent's experiences and lessons learnt, to develop knowledge pertaining to this new phenomenon.

7.2 Key Findings

The results indicated that although many important factors were identified throughout this research, the ultimate success of the implementation of clean energy interventions in these communities, are not the clean energy interventions themselves, but in fact hinges on nine key factors.

The key factors are: (i) Project Planning and Development; (ii) Community Participation; (iii) Community Employment; (iv) Political Buy-In; (v) Communication and Engagement; (vi) Beneficiary Criteria; (vii) Installation and Maintenance; (viii) Project Management; and (ix) Technology and Suppliers.

The successful outcomes and ultimately the socio-economic benefits of these interventions indicated that these projects offer a solution to basic service delivery, bridge the energy poverty gap and improve the general quality of beneficiaries' lives. These projects can be implemented successfully by recognising the implications of the mentioned nine key factors.

In summary:

(i) **Project Planning and Development:** This is an extensive process, unique to each project. Factual information and fund resources are required upfront, along with systems and procedures, tender documents, and an understanding of the beneficiary community – do not move unless all bases are covered.

(ii) **Community Participation:** This is the ultimate factor pertaining to the success of these projects> Without community participation from the onset of the project, implementation is at risk of being stopped and or rejected.

(iii) **Community Employment:** With the high unemployment rate in South Africa, job creation is a top priority of government. This forces a prerequisite in tendering processes for contractors to sub-contract members of the community to form part of the implementation teams. This resulted in skills transfer, extensive on-the-job-training and a temporary income.

(iv) **Political Buy-In:** Communities are highly politically sensitive and therefore political leaders play a key role in influencing the temperament and dynamics of communities. Political support on a community level is vital. High-level political buy-in within the tiers of Government is also critical to

ensure backing at the highest levels to ultimately achieve the goals of creating sustainable quality of life communities.

(v) **Communication and Engagement:** Communication with and engagement of the beneficiary community needs to be, transparent, consistent and comprehensive. The study indicated that most challenges can be managed and solved through effective, clear communication by means of multiple community meetings, community liaison officers, Ward Councillors and marketing material.

(vi) **Beneficiary Criteria:** Once the low-income urban community has been identified, it is necessary to develop clear beneficiary criteria to identify eligible houses, which are viable for interventions. The poor quality of some of the houses, houses not facing north to take maximum advantage of the rays of the sun, and houses do not have water and electricity connections do not make it possible implement interventions. Criteria are interrelated between social and technical factors. Community expectations relating to who the beneficiaries will be, are managed through clear communication.

(vii) **Installation and Maintenance:** Effective administration and capacity is required to ensure that as much risk as possible is mitigated during implementation. Budgets of implementers are also challenged as a result of structural deficiencies of the low-cost houses, discovered during implementation. Critical for implementing authorities is the issue of the long term sustainability of the projects through post installation maintenance, which the implementers must budget for. In addition warranties and maintenance plans should be obtained from contractors.

Models are still being developed to ensure long term sustainability of these projects.

(viii) **Project Management:** Strong leadership and effective co-ordination are very important to manage the complex multi-dimensional aspects of these projects. Communication between all stakeholders forms a life-line for success. It is vital to remain informed for effective planning and risk mitigation, extensive information gathering pertaining to the social demographics of communities and technical aspects of the installation sites are key.

(ix) **Technology and Suppliers:** Many projects tested product prior to installation to investigate the quality, durability and performance of products in the South African climatological environment. Products and suppliers had to meet SABS standards and had to be accredited by relevant bodies to ensure quality control.

7.3 Recommendations for Future Implementation

The findings from this study provide useful insights to all stakeholders involved in the development and implementation of clean energy interventions in low-income urban communities. The key factors presented, provide a framework within which development and implementation of these projects should be considered. The findings in chapter 5 presented rich data in order to gain an in-depth understanding of the dynamics and elements which form part of the implementation process and chapter 6 presented a discussion around the findings.

These projects offer a fundamental solution to service delivery, to facilitate the reduction of energy poverty and to improve the quality of life of the poor, while mitigating environmental challenges.

Sustainable financial support for the implementation of clean energy intervention projects in low-income urban communities is viable through public private partnerships.

7.4 Recommendation for Further Research

This research investigated and described the key factors which influence the implementation of clean energy interventions in low-income urban communities in South Africa. Rich data provided insights into the dynamic nature of these projects and the complexity of implementation. These projects have illustrated that clean energy interventions are a viable solution for service delivery, sustainable development, the improvement of the quality of life of the poor, particularly in terms of energy cost savings and improved health benefits.

Recommendations for further research include:

- Investigation of each factor as a proposition to test and expand on, particularly the aspect of community participation;
- The investigation and development of sustainable financial models for these projects;
- Investigation into the additional benefits of private/ public/ partnerships;
- An explanatory study to develop a blueprint of best practices for implementation; and

- A comparative study of the factors that influence these projects in other emerging markets such as South Africa's BRICS partners.

APPENDICES

Appendix One: List of Interviewees

(Real names of individuals and projects kept by researcher)

Project A: KK_Municipal	**Type of Project Manager**
1. PIM	Private Implementation Agent
2. PMCLO	Community Resident
3. HLPM	Municipal
Project B: NMB_Municipal	
4. PMCLO	Municipal
5. HLPM	Municipal
6. PIM	Municipal
Project C:NMB_Private	
7. PIM	Private
Project D: MRE_Private	
8. PIM	Municipal
9. HLPM	Municipal
10. PMCLO	Municipal & Community Resident
Project E: CC_Municipal	
11. PIM 1	Municipal
12. PMCLO	Municipal
13. PIM 2	Municipal
Project F: EKHR_Municipal	
14. HLPM	Municipal
15. PIM	Private Contractor
G: NGO	
16. HLPM	NGO

Appendix Two: Consent form and Interview Guide

GORDON INSTITUTE OF BUSINESS SCIENCE
University of Pretoria

FULL TIME MBA RESESRCH PROJECT 2011
Gordon Institute of Business Science

The Factors which influence the effective implementation of clean energy interventions in low-income communities.

Good Day,

My name is Leandi Streeter. As a Full Time MBA student at the Gordon Institute of Business Science (GIBS), partial fulfilment of the requirements for the degree of Master of Business Administration is the submission of an academic research project.

This research aims to study the key factors which constitute and influence the effective implementation of clean energy intervention projects in low-income urban communities in South Africa.

The objectives of this study serve to:

- Investigate and profile of the main factors which constitute the effective implementation of these projects.
- To understand how these factors influence the effective implementation of these projects.

The outcome of this research aims to provide stakeholders with rich insights to effectively achieve the objectives of these initiatives and to achieve a positive, sustainable, socio-economic impact on low-income urban communities in the long run.

Interview discussions of your experience as part of the project implementation team in the roll-out of these projects will form part of the data capturing process. In order to understand the effective implementation of these projects this study explores the lessons learnt and key factors which influence the successful implementation of these projects for the benefit of industry stakeholders and future implementations.

Interview participation:

- The interview should take about 90 minutes at the most.
- The interview will be recorded with your permission to ensure that important comments are not missed.
- Notes will also be taken during the interview.
- Your participation is voluntary and you are welcome to withdraw at any time.
- All responses will be kept confidential. This means that your interview responses will only be shared with the research team. Any information included in the research report does not identify the respondents.
- Please note: By confirming an interview appointment, you indicate that you voluntarily participate in this research.

Written documentation and reports:

- Should you be willing to provide reports and previous research conducted on your project, this for also serves as a consent document.
- Documentation and reports will only be shared with the researcher and respective research team. No document will be made public or shared with other entities other than the academic research team.
- Forwarding documents in emails indicate that you voluntarily agree to provide the information.
- Consent can also be provided through the signing of this document.

Should you have any concerns, please feel free to contact me or my supervisor.

Details are provided below:

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Name	Date	Signature

Interview Guide

Project: **Date:** **Code:** (Researcher Use)

Respondent position:

Section 1: General

1. **Why was this project initiated?** ***(Background)***

2. What were the key project objectives?

3. What was your role in the implementation of this project?

Section 2: The implementation of the project

1. **What were the key steps you took in the implementation of this project?**

2. **What were some of the barriers that you encountered? And how did you overcome those barriers**

Barriers

3. How did you overcome these barriers?

4. What were the greatest lessons learnt from this experience?

5. Looking back on your experience, if you could do it again, what would you do differently?
   Prompts:
   - What factors would you recommend should be sustained or scaled up?
   - What strategies would you discontinue and why?

6. What in your opinion are the critical success factors to ensure the successful implementation of these projects?

Section 3: Socio-economic Impacts

1. What effect in your opinion has the project had on the community as beneficiaries to date? Please explain.

2. Do these effects include the following?

Item	Yes	Maybe	No
Energy efficiency			
Cost savings			
Access to income			
Job Creation			
Improvement in health			
Living conditions			
Environmental			
Please insert others			

3. Ranking scale**:** How impactful has the project been on the following socio-economic aspects of the beneficiaries on a scale of 1 to 5? (0 no impact; 5 great impact).
   Mark with an "X".

Item	0	1	2	3	4	5
Energy efficiency						
Cost savings						
Access to income						
Job Creation						
Improvement in health						
Living conditions						

Environmental						
Other:						

4. Have there been any measureable impacts to date?

Section 4: Effective Implementation

1. How has the effectiveness of this project been measured or determined? Please describe.

2. If you had to rate the effective implementation of the project on a scale of 0 – 10, where 0 is not effective or successful and 10 is a bench mark project. What would you rate it?

3. Why did you give the project this rating?

Section 5: The Future

1. What recommendations do you have for the future implementation of these projects to ensure their success and sustainability?

• *Project implementation agents* • *Municipality* • *National government* • *Suppliers*

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