

An investigation of the barriers and drivers to CDM renewable energy investment at
the Metro, Kouga and Jeffreys Bay windfarms

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Executive Summary

This research is presented in three sections. Section 1 presents the research report in an academic journal article format. Section 2 provides a comprehensive literature review and Section 3 describes the research methodology and methods employed during the research.

Climate change is the most urgent challenge facing planet earth today. The Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5) clearly states, “Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems” (IPCC, 2014:2).

The Renewable Energy Policy Network for the 21st Century (REN21) published the 10th annual edition of the Renewables 2015 Global Status Report, which illustrates the importance of a zero emissions energy sector (REN21, 2015). Despite the world’s average annual 1,5% increase in energy consumption in recent years, and average 3% growth in Gross Domestic Product, carbon dioxide (CO₂) emissions in 2014 were unchanged from 2013 levels (REN21, 2015). The report findings state, “For the first time in four decades, the world economy grew without a parallel rise in CO₂ emissions” (REN21, 2015:17). Renewable energy and improved energy efficiency is key to limiting global warming and avoiding dangerous impacts from climate change (REN21, 2015). With a view to the successful outcome of the 21st Conference of the Parties (COP21) in December 2015, renewable energy could contribute significantly in mitigating climate change and supporting the Sustainable Development Goals (SDGs), specifically SDG 7, on Sustainable Energy for All (SAIREC, 2015).

South Africa has been rated the 15th most attractive destination for investment in the renewable energy sector and could become a renewable energy leader in the African continent, according to the *Renewable Energy Country Attractiveness Index* of EY (Ernest and Young) (EY, 2015).

South Africa's Integrated Resource Plan (IRP) aims to diversify the energy mix away from fossil fuels (DoE, 2014). The IRP covers the electricity generation requirements from 2010 to 2030, and plans to increase national capacity from 41 000 MW to 89 532 MW by 2030 (DoE, 2014). The IRP includes 20% of installed capacity (17,8 GW) from renewable energy sources by 2030 to deliver 10% of the energy supply (DoE, 2014). These measures are in line with South Africa's Integrated Resource Plan (IRP) for 2030, which plans for a 34% reduction in carbon dioxide (CO₂) emissions and a 64% reduction in water usage (Eskom, 2014).

The South African energy sector has developed into one of the leading destinations for foreign investment in the renewable energy sector, which is largely attributed to the Renewable Energy Independent Power Producers Procurement Programme (RE-IPPPP (DoE, 2014). A privately developed renewable energy sector, launched in August 2011 through the RE-IPPPP, is being integrated into an electricity network previously dominated by Eskom (DoE, 2014).

The Kyoto Protocol sets out the framework of the Clean Development Mechanism (CDM), which allows developed countries to initiate projects to reduce emissions in developing countries and receive carbon credits in the form of certified emission reductions (CERs) (Sterling and Waterford, 2004). The CDM is the first global, environmental investment and credit mechanism of its kind whereby emission-reduction projects in developing countries can earn a CER for each ton of CO₂ reduced (UNFCCC, 2014).

Current global demand for CERs is low, impacting the CER revenues and profitability of Renewable Energy (RE)-CDM projects. Registrations have declined in South Africa and abroad, significantly in 2013 to 2014 and potentially beyond 2015. The CDM methodology has not been successfully adopted by South Africa, representing only 0,73% of registrations globally for developing countries, compared to China (49,16%) and India (20,61%) as at 31 July 2015 (UNFCCC, 2015).

The limited research conducted in the South African context, relevant to CDM barriers and drivers for South African developers of greenfield renewable energy

projects, offered an opportunity to investigate the first commissioned projects in South Africa at the Eastern Cape windfarms in order to make recommendations in promoting CDM renewable energy projects in the Eastern Cape and South Africa. The objectives of this research are to analyze the current literature to derive a comprehensive framework of barriers and drivers, including mechanisms to mitigate the barriers and enhance the drivers; to investigate the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay Windfarms and, finally, to identify mechanisms and approaches to mitigate the barriers and enhance the drivers to provide a framework for improved CDM renewable energy project investment implementation in the Eastern Cape Province.

By using information gathered in literature with regard to CDM and RE-CDM barriers and drivers and the attributes perceived by the respondent's experience, this research establishes the mechanisms and approaches to mitigating barriers and enhancing drivers to promote RE-CDM investment. Based on the research results and findings, the following recommendations in summary (per the *framework* in section 1.7 on page 55) have been made, to provide a potential framework for improved CDM renewable energy project investment implementation in the Eastern Cape and potentially South Africa: develop a CDM Designated National Authority (DNA) strategy to drive and promote RE-CDM in South Africa; integrate the DNAs CDM Sustainable Development (SD) criteria with the RE-IPPPP; support the United Nations Framework Convention on Climate Change (UNFCCC) secretariat's CDM Business Plan strategy to nurture demand for CERs and participation in CDMs.

By supporting these recommendations, the CDM could be "continually enhanced as an innovative, effective, credible and successful mechanism for mitigating climate change" (UNFCCC, 2015:3), while simultaneously driving sustainability in the renewable energy sector of the Eastern Cape and potentially of South Africa.

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List of Abbreviations

AR5 – IPCC 5 th Assessment Report
BEE – Black Economic Empowerment
CAPEX – Capital Expenditure
CDM – Clean Development Mechanism
CDM EB – Clean Development Mechanism Executive Board
CDR – Carbon Dioxide Removal
CERs – Certified Emission Reduction(s)
CFCs – Chlorofluorocarbon(s)
CH ₄ – Methane
CO ₂ – Carbon Dioxide
CO ₂ e – Carbon Dioxide Equivalent
COP – Conference of the Parties
COP21 – 21 st meeting of COP
CP – Commitment Period
CSP – Concentrated Solar Power
DEA – Department of Environmental Affairs
DNA – Designated National Authority
DoE – Department of Energy
DOE – Designated Operational Entity
EB – Executive Board of the CDM
ED – Economic Development
EIA – Environmental Impact Assessment
ERU – Emission Reducing Units
EU – European Union
EU-ETS – European Union Emission Trading Scheme

FDI – Foreign Direct Investment
GHG – Greenhouse Gas
HFC – Hydro Fluorocarbons
IDC – Industrial Development Corporation
IGO – Inter-governmental Organizations
IPCC – Inter-governmental Panel on Climate Change
IPP – Independent Power Producers
IRP – Integrated Resource Plan
IRR – Internal Rate of Return
KP – Kyoto Protocol
NERSA – National Energy Regulator of South Africa
N2O – Nitrous Oxide
PDD – Project Design Document
PIN – Project Idea Note
PoA – Programme of Activities
PPA – Power Purchase Agreement
PFC – Per Fluorocarbons
REBID – Renewable Energy Bidding
RE-CDM – Renewable Energy CDM
RE-IPPPP – Renewable Energy Independent Power Producer Procurement Programme
ROI – Return on Investment
SAIREC2015 – South African International Renewable Energy Conference 2015
SD – Sustainable Development
SDG – Sustainable Development Goals
SED – Socio-economic Development
SF6 – Sulphur Hexafluoride
UNEP – United Nations Environment Programme
UNFCCC – United Nations Framework Convention on Climate Change

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Section 1: Academic Journal Article

1.1 Abstract

The research was conducted with the aim of investigating the barriers and drivers to Clean Development Mechanism (CDM) renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms in the Eastern Cape Province, South Africa.

In order to address the goals of the research, interviews were used to conduct this research at three windfarms. The research respondents were identified as individuals representing the project developers of each of the windfarms. The Project Manager, Project Engineer, and CDM Project Design Document (PDD) contact person for each windfarm were interviewed.

The limited research conducted in the South African context, relevant to CDM barriers and drivers for South African developers of greenfield renewable energy projects, offered an opportunity to investigate the first commissioned projects at the Eastern Cape windfarms in order to make recommendations in promoting CDM renewable energy projects in the Eastern Cape and South Africa.

By using information gathered in literature with regard to CDM and RE-CDM barriers and drivers, and the attributes perceived by the respondents' experience, this research establishes the mechanisms and approaches to mitigating barriers and enhancing drivers to promote RE-CDM investment. The following recommendations are made, based on the research findings, to provide a framework for improved CDM renewable energy project investment implementation in the Eastern Cape and South Africa; develop a CDM DNA strategy to drive and promote RE-CDM in South Africa; integrate the DNAs CDM SD criteria with the RE-IPPPP; support the UNFCCC's CDM business plan strategy to nurture demand for CERs and participation in CDMs.

1.2 Introduction

Global climate change is one of the biggest challenges the world currently faces (IPCC, 2014). The devastating consequences of natural disasters are not confined within a nation's boundaries but threaten all inhabited areas of the planet alike (Turner and Varughese, 2013). South Africa is being impacted and the full impacts of climate change will unleash in the coming decades (ERC, 2010). In 2005, South Africa was responsible for 1,1% of total global emissions and approximately 40% of sub-Saharan Africa's emissions (WRI, 2009). South Africa's Greenhouse Gases (GHGs) are on a sharp upward trajectory with fossil-fuel burning from coal-fired power stations accounting for the highest portion of South Africa's GHG emissions (ERC, 2010).

With the renewable energy resource potential in South Africa, the country could develop into a renewable energy leader on the African continent (EY, 2015). South Africa's Integrated Resource Plan (IRP) aims to diversify the energy mix away from fossil fuels (DoE, 2014). The IRP is South Africa's key master plan, covering the energy needs from 2010 to 2030, and plans to increase the capacity from 41 000 MW to 89 532 MW (DoE, 2014). The Integrated Resource Plan (IRP) includes 20% of installed capacity (17,8 GW) sourced from renewable energy by 2030 to deliver 10% of the supply (DoE, 2014). These measures are in line with South Africa's Integrated Resource Plan (IRP) for 2030, which plans for a 34% reduction in carbon dioxide (CO₂) emissions and a 64% reduction in water usage (Eskom, 2014).

The National Energy Regulator of South Africa (NERSA) introduced the competitive bidding process for Independent Power Producers (IPPs) to award long-term Power Purchase Agreements (PPAs) (CSIR, 2015). This process requires IPPs seeking a PPA, to bid a tariff price for energy generated for the national grid (CSIR, 2015). Eskom guarantees the purchase of the power generated from IPPs and distributes it on to the national grid (DoE, 2014).

The Clean Development Mechanism (CDM) is an innovative market mechanism, which provides investors of carbon-reducing projects in developing countries the opportunity to earn financial resources and carbon emission reductions (CERs) from an open carbon market (UN, 1998). For developing countries, the CDM is a channel for financial

assistance and investments to promote sustainable development by means of technology transfer and the promotion of equity – according to the goals of the United Nations Framework Convention on Climate Change (UNFCCC) (Goldemberg, 1998). Renewable energy projects in South Africa qualify for CDM financing where relevant CDM sustainability criteria (per Table 1,2 on page 28) are met. Renewable energy projects account for the majority (75,1%) of the 7655 projects registered in the CDM pipeline globally as at 31 July 2015 (UNFCCC, 2015). Despite Africa's potential for CDM projects, the CDM process has not been successfully adopted by Africa, which represents only 2,6% globally for developing countries (UNFCCC, 2015). CDM has not been successfully adopted by South Africa, representing only 0,73% globally for developing countries, compared to China (49,16%) and India (20,61%) as at 31 July 2015 (UNFCCC, 2015). Despite the findings by Greene (2005), Jung (2006) and Greene (2006) that South Africa is an ideal candidate to host CDM projects, it continues to lag behind China, India, and Brazil.

The limited research conducted in the South African context, relevant to barriers and drivers for developers of greenfield renewable energy projects in South Africa, offered an opportunity to investigate three greenfield projects at the Eastern Cape windfarms (Metro, Kouga and Jeffreys Bay) in order to make recommendations to promote CDM renewable energy projects in the region and potentially in South Africa.

The three windfarms are all greenfield CDM projects located in the Eastern Cape Province within a 100 km radius from Port Elizabeth. From background information gathered, all three windfarms had been commissioned (Aug 2013, July 2014 and March 2015) to generate power to the national grid. All three windfarms have registered CDM Project Idea Notes (PINs) together with Project Design Documents (PDDs) with the Designated National Authority (DNA). Only one windfarm has been registered with the UNFCCC's CDM Executive Board (EB) after validation by the CDM's Designated Operational Entity (DOE). The DNA office in South Africa, under the DoE, confirmed the aforementioned CDM status for the three windfarms (DoE, 2015).

1.3 Literature review

1.3.1 Theoretical grounding

1.3.1.1 The Clean Development Mechanism (CDM)

The Kyoto Protocol sets out the framework of the CDM for developed countries to initiate emission reduction projects in developing countries and receive certified emission reductions (CER) (Sterling *et al*, 2004).

As illustrated in Figure 1,1 below, the CERs may be used by developed countries to offset national emission reduction targets and, once the CERs have been registered, they can be traded. This mechanism affords developed countries greater flexibility to meet their emission targets and simultaneously transfer cleaner technology to developing countries (UNFCCC, 2014).

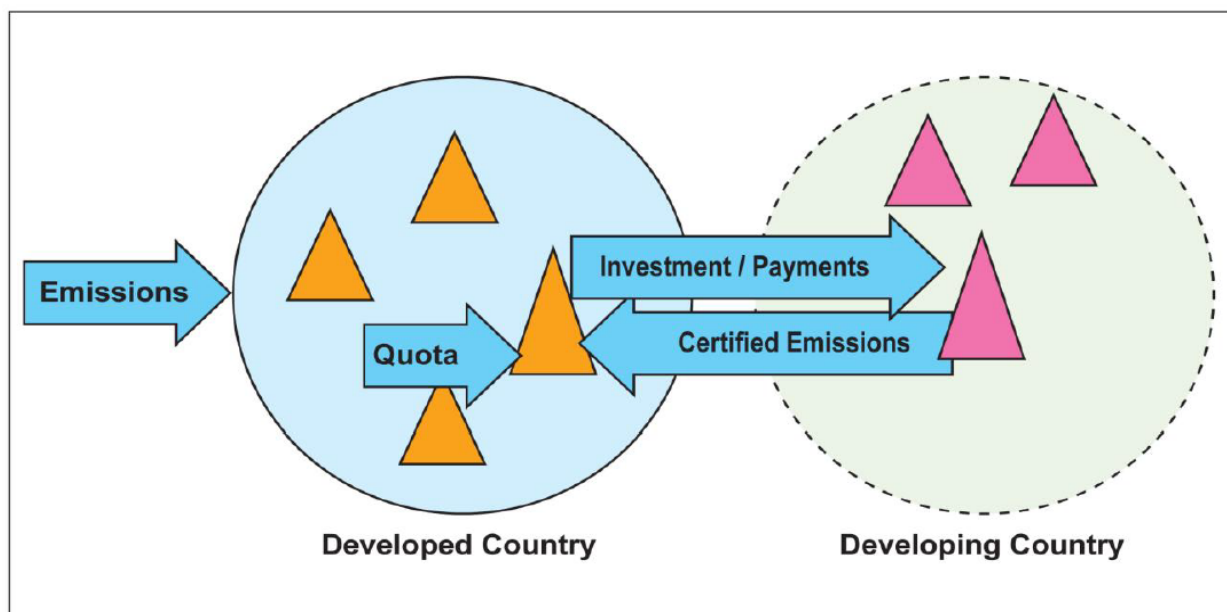


Figure 1,1: Schematic operation of CDM (DoE, 2015:5).

Through the CDM, a win-win situation is achieved by the host developing country receiving investments and clean technology assistance, while the developed country receives the CERs to offset their own emission targets (UNFCCC, 2014). Hence, the

CDM contributes to the objective of the Kyoto Protocol and sustainability in developing countries (UNFCCC, 2014).

The UNFCCCs published data for the status of CDM projects as at 31 July 2015 is noted to support current literature findings on the barriers and drivers in a South African context.

Renewable energy project activities account for 75,1% of the 7655 projects registered in the CDM global registry, as at 31 July 2015 per Figure 1,2 below (UNFCCC, 2015).

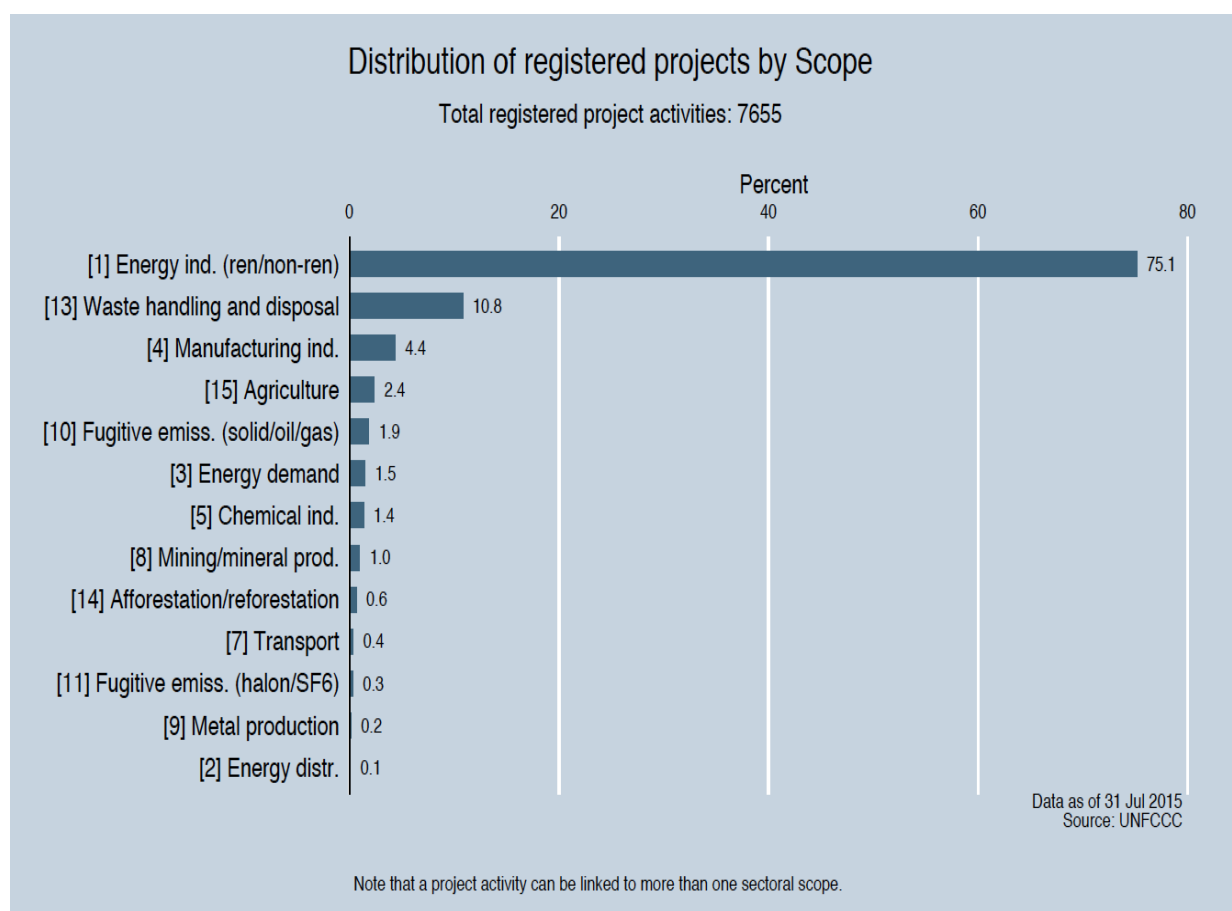


Figure 1,2: Distribution of registered CDM projects by scope (UNFCCC, 2015).

CDM has not been successfully adopted by Africa, which represents only 2,6% globally for developing countries as at 31 July 2015 per Figure 1,3 below (UNFCCC, 2015).

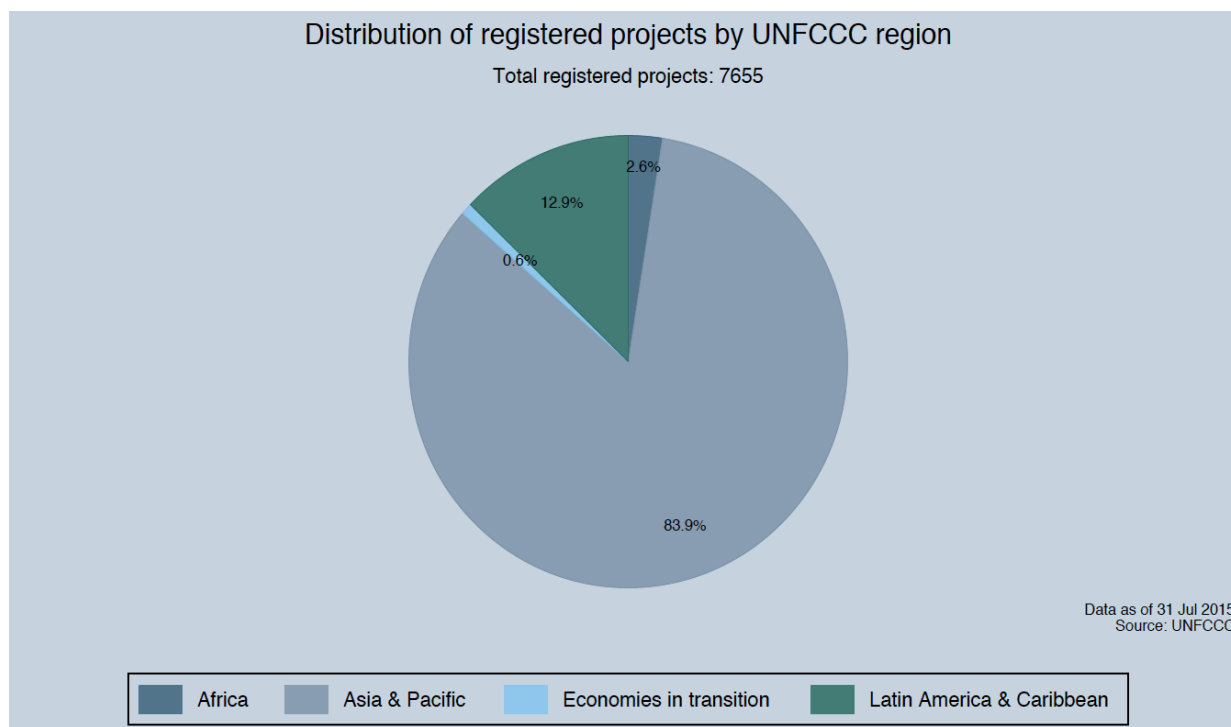


Figure 1,3: Distribution of registered CDM projects by region (UNFCCC, 2015).

CDM has not been successfully adopted by South Africa, which represents only 0,73% globally for developing countries, compared to China (49,16%) and India (20,61%), as at 31 July 2015 per Figure 1,4 on page 17 (UNFCCC, 2015). Despite the findings by Greene (2005), Jung (2006) and Greene (2006) that South Africa is an ideal candidate to host CDM projects, it continues to lag behind China, India, and Brazil.

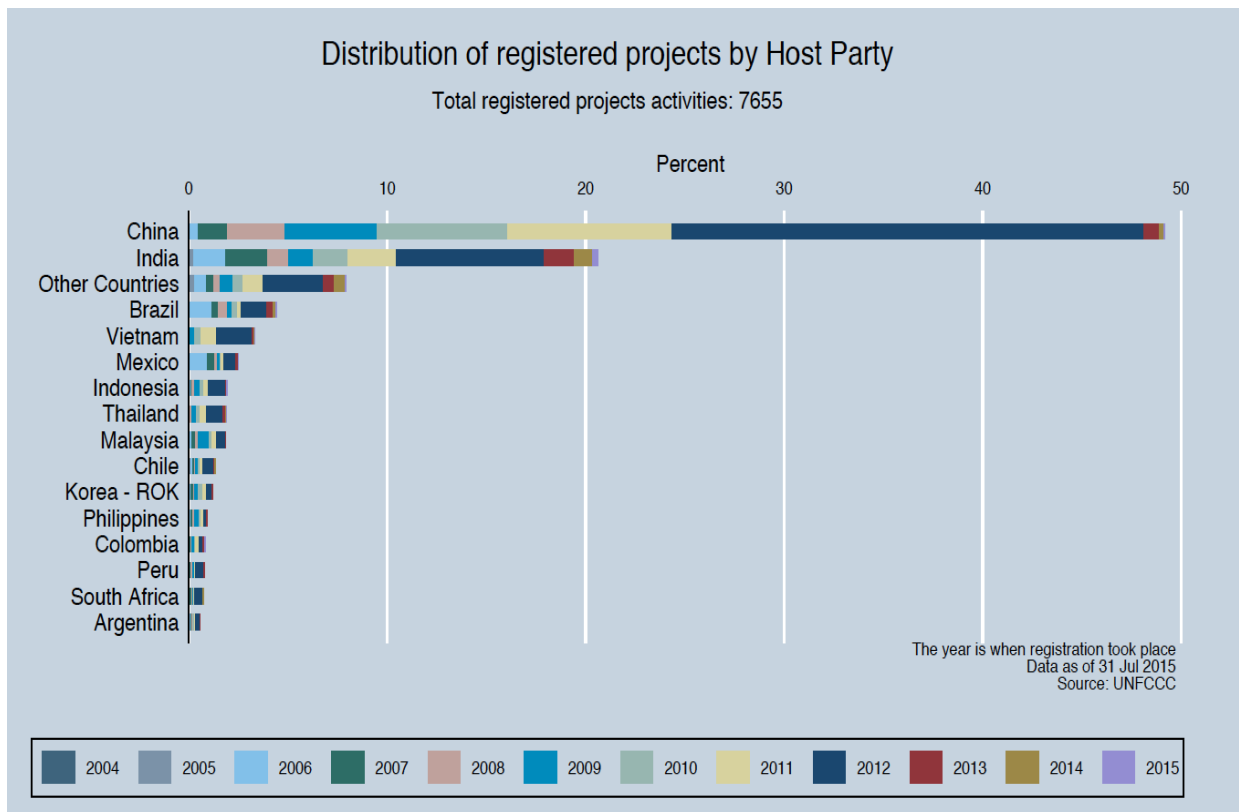


Figure 1,4: Distribution of registered CDM projects by host party (UNFCCC, 2015).

1.3.1.2 The South African Context

South Africa has been rated the 15th most attractive destination for investment in the renewable energy sector and could become a renewable energy leader in the African continent, according to the *Renewable Energy Country Attractiveness Index* of EY (Ernest and Young) (EY, 2015). South Africa has also qualified as an ideal candidate to host CDM projects (Greene, 2005; Jung, 2006; Greene, 2006).

South Africa's Integrated Resource Plan (IRP) aims to diversify the energy supply mix away from fossil fuels through a master plan to double national capacity from 41 000 MW to 89 532 MW by 2030 (DoE, 2014). Guided by the Constitution, South Africa ratified the UNFCCC on 21 August 1997 and subsequently acceded to the Kyoto Protocol on 31 July 2002 by incorporating climate change considerations, promoting sustainability and the transfer of clean technology (DoE, 2014 and Eskom, 2014).

Against this theoretical grounding, the following sections focus specifically on the barriers and drivers to the implementation of CDM and RE-CDM projects.

In this research, the terms *barrier* and *driver* are informed by the themes from Beck and Martinot (2004:3) who define a barrier as a “condition that prevents investment from occurring” and drivers as “conditions that promote and support investments”.

CDM and RE-CDM are subject to numerous barriers and drivers, as described in the literature. The factors identified formed the theoretical basis of this study, upon which the experiences and perceptions of the RE-CDM developers for this study are informed. These factors, which enlist the experience of the three Eastern Cape windfarm developers, sought to explore the mechanisms and approaches to mitigating barriers and enhancing drivers to provide a framework for implementing improved CDM renewable energy investment in the Eastern Cape, and potentially, South Africa.

Table 1,1: CDM barriers, RE-CDM barriers and RE-CDM drivers, on page 20, is a condensed view of the main themes of the barriers and drivers identified from the literature, with corresponding meaning and contributing factors illustrating the main ideas.

Table 1,1: CDM barriers, RE-CDM barriers and RE-CDM drivers

CDM Barriers	Meaning	Contributing Factors
Additionality Requirements	Projects, which would not have been undertaken in the absence of CERs, are eligible to be registered as a CDM (Stiles, 2006).	Project developers' perception of business-as-usual factors and the possible disqualification from CERs registration.
Transaction Costs	Transaction costs as a profitability barrier to implementing CDM projects (Del Rio, 2007). High fixed cost perceptions discourage the implementation of smaller CDM projects by potential developers (Del Rio, 2007).	CDM methodology costs relating to search, negotiation, baseline determination, approval, validation, registration, monitoring, verification, enforcement, transfer and registry (Del Rio, 2007).
Lack of Awareness	A lack of information on and knowledge of CDM projects (Ellis and Kamel, 2007).	Factors relating to ignorance of policy, technology, financial and legal aspects to clean energy development.
Complex CDM Project Cycle	Factors due to the complexity and uncertainty of the CDM approval methodology (Stiles, 2006).	CER registration and approval requirements.
RE-CDM Barriers	Meaning	Contributing Factors
Competitiveness of Renewable Energy	The comparative disadvantages of RE-CDM projects due to small numbers of CERs (Wang and Chen, 2010).	RE-CDM CERs revenue vs other CDM CERs revenue; Return on Investment perceptions.
Economic and Financial	Factors influencing the investment decision making process by potential developers (Beck <i>et al</i> , 2004).	CER market price risks; High transaction, technology, finance and cost of capital; Project life cycle; Risk vs Return; Multiple role players.
Implementation	Factors relating to the execution of projects (Pegels, 2010).	Lack of infrastructure; Project management problems; Operational technology problems.
RE-CDM Drivers	Meaning	Contributing Factors
Technology Transfer	Factors promoting sound clean energy technologies from developed to developing countries (UNFCCC, 2011).	Sustainable energy solutions; Advanced technology and skills development.
Financial Benefits	Foreign Direct Investment and revenue from CERs encourages support for CDM investment projects (Del Rio, 2007).	Profitability benefits; Financial risks reduced; Access to financing.
Promotion of RE-CDM Projects	Factors promoting renewable energy to support sustainable development and strategic opportunities coupled with abundant renewable energy resources in SA (Pegels, 2010).	South Africa's support for renewable energy through the IRP, PPAs and IPPs.

1.3.2 CDM barriers

The following CDM barriers are identified from the literature as applicable to the overall CDM methodology.

1.3.2.1 Additionality requirements

The CDM project additionality requirement stipulates that only GHG-reduction projects, which would not have been undertaken in the absence of CERs, are eligible to be registered as CDMs (Stiles, 2006). According to Greene (2006), should a project be classified a business-as-usual project, or if it is required in terms of the host country law, then such projects are disqualified from CER registration because they are not additional in nature. This concept creates a rather perverse incentive for developing host countries not to introduce policies and measures to mitigate climate change (Worthington, 2005). In terms of South Africa's Integrated Resource Plan, more renewable energy projects are envisaged and hence present the possibility of disqualification from CER registration due to the CDM additionality requirement applied as business-as-usual.

1.3.2.2 Transaction costs

The transaction costs associated with CDM projects discourage the implementation of smaller renewable energy projects (Del Rio, 2007). The profitability of smaller CDM projects is reduced by the high fixed costs associated with the CDM methodology process (Del Rio, 2007). A significant amount of funding is tied up in the initial phases of developing a CDM project and any delay in issuing CERs causes risk and hence the upfront transaction costs are a major hampering factor to the development of CDM projects (Turner *et al*, 2013).

1.3.2.3 Lack of awareness

Ellis *et al* (2007) identified a lack of information and knowledge of the CDM as barriers preventing stakeholders from adopting the CDM. Greene (2005) confirms this lack of

awareness through the ignorance of policy, technology, financial and legal aspects of the CDM.

1.3.2.4 Complex CDM project cycle

The complexity and uncertainty of the process causes the most straightforward projects to flounder along the way (Stiles, 2006). This is attributable to the CDM methodology, which must be followed in order to register the PDDs with the CDM Executive Board for approval and CER issuance (UNFCCC, 2015).

All CDM projects have to pass through a project cycle as illustrated in Figure 1,6 below (DoE, 2015).

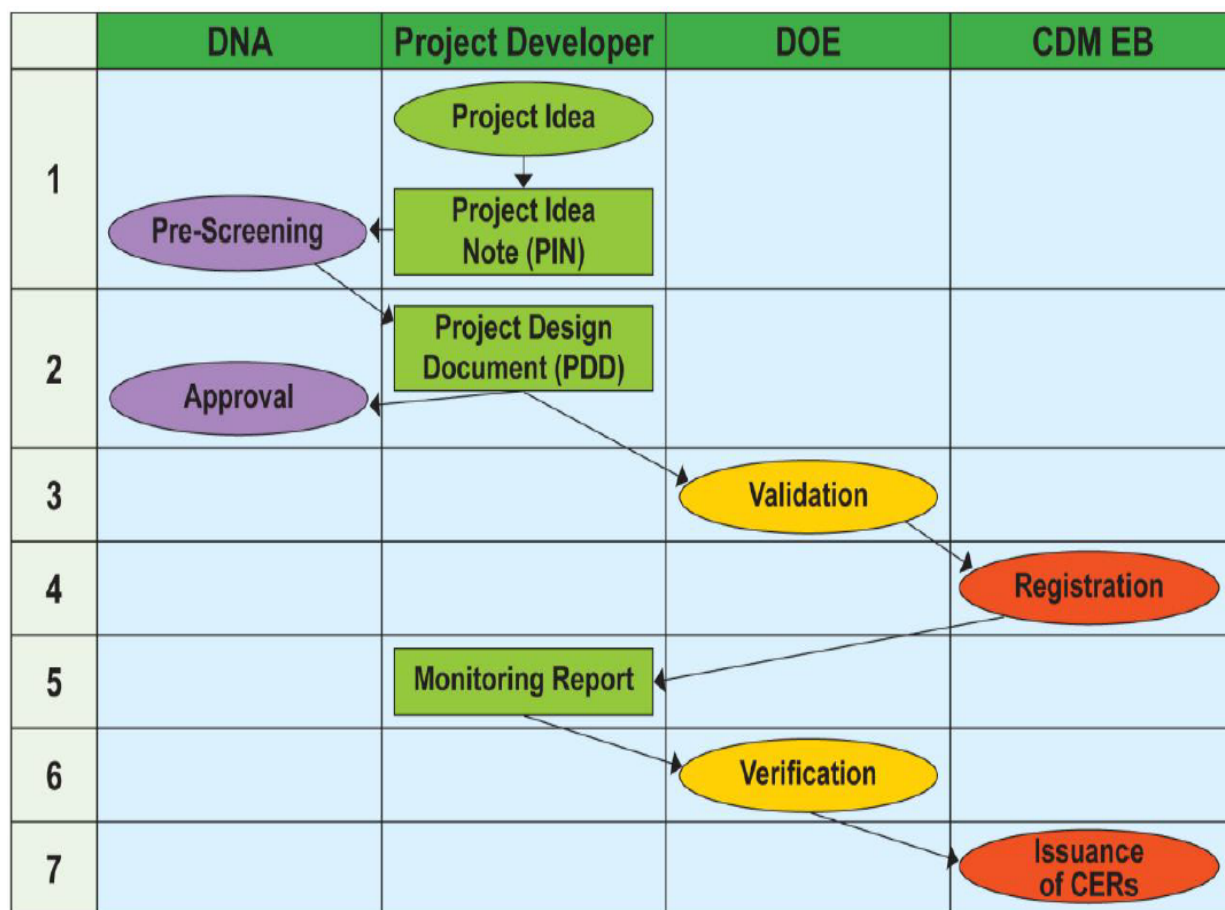


Figure 1,6: CDM project cycle (DoE, 2015:6).

1.3.3 RE-CDM barriers

The following additional barriers are identified from the literature as specific to the experience of the renewable energy sector's CDM developers.

1.3.3.1 Competitiveness of renewable energy

The comparative disadvantages of RE-CDM projects generating small amounts of CERs as compared to other CDM projects present barriers to RE-CDM developers' Return on Investment (ROI) perceptions (Wang and Chen, 2010). The ratio of high revenues from a smaller number of HFC projects and low revenues from a larger number of renewable energy projects signifies a major shortcoming for the deployment of renewable energy CDMs (Schroeder, 2009). While it makes sense to phase out high climate-destructive gases like HFC-23, the potential for RE-CDM as a driver for the transition to a lower carbon emission economy is not fully tapped (UNEP, 2014).

According to Pearson (2007), RE-CDM projects have an unfavourable financial profile in that they are capital intensive, provide low rates of return and generate small volumes of carbon credits. Ellis *et al* (2007) observed in a CDM stocktake paper, that if a renewable energy project's viability depends on carbon credits, it may actually be adjudged even more risky. Therefore literature suggests that high emission CDM projects, rather than renewable energy CDM projects, are more attractive in the CER trade market.

1.3.3.2 Economic and financial factors

The economic and financial factors play a significant role in the investment decision-making process of renewable energy projects (Beck *et al*, 2004). According to Del Rio (2007), the market trade price of the CERs could vary and affect the forecasted revenue stream of the RE-CDM project. Additional risk factors associated with high interest rates, scarcity of investment capital, debt finance and project life cycles present further barriers to RE-CDM project developers in South Africa (Pegels, 2010). Since the CERs are only tradable once the CDM project has received final approval

from the CDM EB, the high volatility of the carbon market adds risk to any CDM project (Turner *et al*, 2013).

1.3.3.3 Implementation

Despite the CDM renewable energy projects potential in South Africa, the designated national authority (DNA) for CDMs in South Africa reports good intentions through the registration of PINs, but very poor registration of the PDDs (DoE, 2015). According to the DNAs statistics for CDM projects portfolio at 19 March 2015, there have been 360 CDM projects submitted to the DNA, made up of 222 Project Idea Notes (PINs) and 138 Project Design Documents (PDDs) (see Figure 1,7 below). Of the 138 PDDs, 90 have been approved and registered by the CDM Executive Board as CDM projects, of which only 12 have been verified for CER issuance. Only 48 of the 78 awaiting CER issuance are at the final stages of the project cycle – CDM EB approval, validation stage for CERs (DoE, 2015).

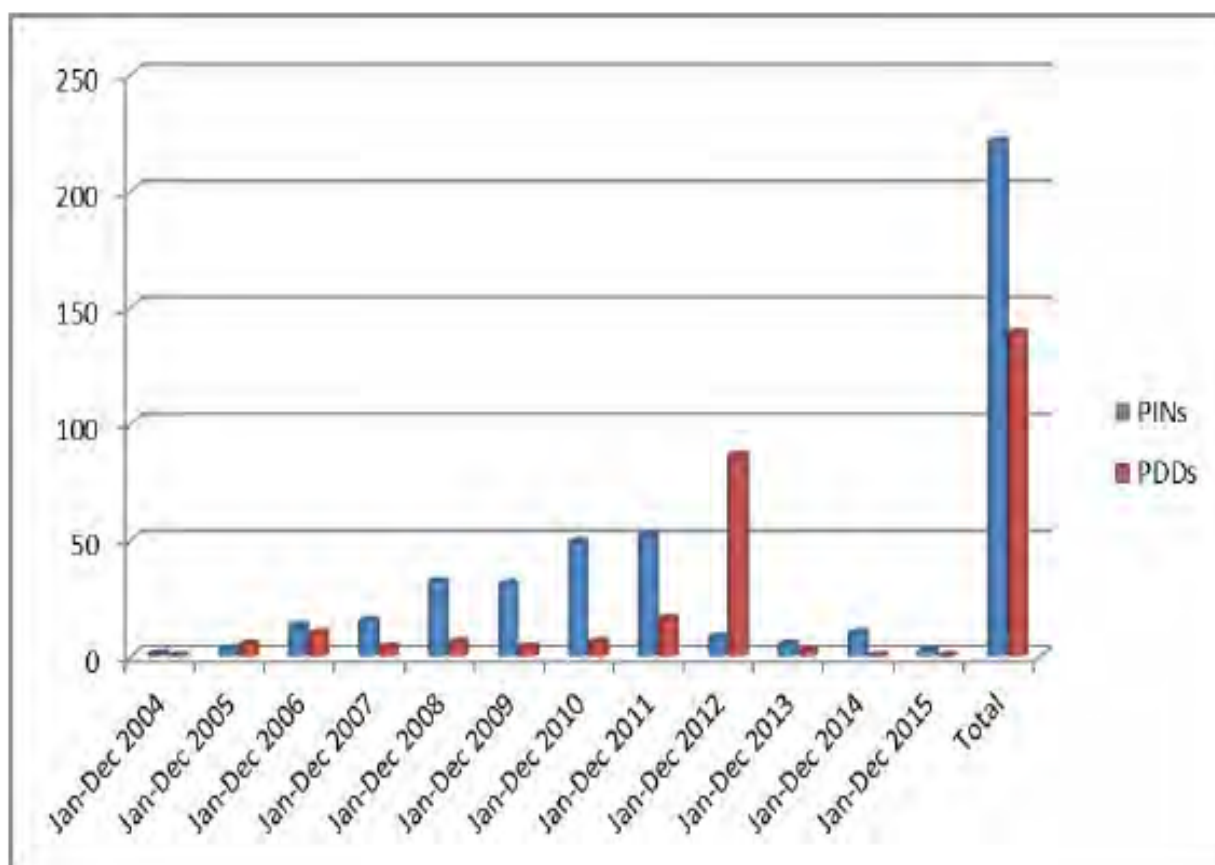


Figure 1,7: DNA CDM project portfolio of PINs and PDDs at 19 March 2015 (DoE, 2015).

According to Greene (2006) and Jung (2006), effective CDM implementation at the DNA level is an absolute prerequisite for CDM projects. The implementation of RE-CDM projects through the DNA in South Africa is further hampered by project management problems in dealing with third-party international CDM PDD consultants (Pegels, 2010). The lack of infrastructure in undeveloped parts of South Africa presents challenges in terms of the renewable energy project's connectivity to the grid and subsequent dependence on Eskom (Pegels, 2010).

1.3.4 RE-CDM drivers

The following RE-CDM drivers from the literature identify the opportunities to promote and support RE-CDM developments.

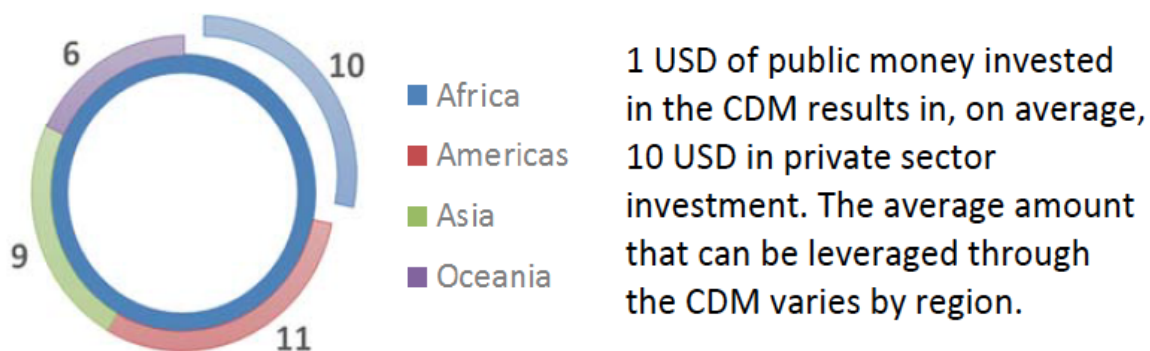
1.3.4.1 Technology transfer

The transfer of clean technologies from developed countries to developing countries, as stated by Article 10 of the Kyoto Protocol, will allow RE-CDM developers in South Africa access to sustainable energy solutions and skills development (UNFCCC, 2011). The CDM fosters the transfer of technology into undeveloped countries, which speeds up their path to economic growth (Dechezlepre, Glachant and Meniere, 2009). A study by Schneider, Holzer and Hoffmann (2008) confirms that the CDM process under the UNFCCC, supports technology transfer. The CDM is aimed at changing the high emission energy sector of developing countries through a market-based mechanism (Frankel, 2007).

1.3.4.2 Financial benefits

The financial benefits from Foreign Direct Investment (FDI) and the revenue generated from the CERs, attract potential RE-CDM developers (Greene, 2005) and the increased profitability and reduced financial risks encourage support from RE-CDM developers (Del Rio, 2007).

The CDM projects are primarily financed by resources outside the CDM and Figure 1,8 illustrates that the CDM has leveraged private investment 10 times the public funds allocated for CDMs in Africa (UNFCCC, 2014).



1 USD of public money invested in the CDM results in, on average, 10 USD in private sector investment. The average amount that can be leveraged through the CDM varies by region.

Number of dollars leveraged per public dollar spent on the CDM

The analysis was done on CDM activities that have issued certified emission reductions (CERs). It assumed an average CER price of 5USD used in project planning.

Figure 1,8: CDM Leverage factor (UNFCCC, 2014).

Analyzing CDM CERs by sector indicates that the multiplier effect is significantly greater in sectors more closely associated with having more significant sustainable development co-benefits (UNFCCC, 2014). Figure 1,9 illustrates that CDM investment in renewable energy projects leverages investment 18 times the price of CERs purchased.

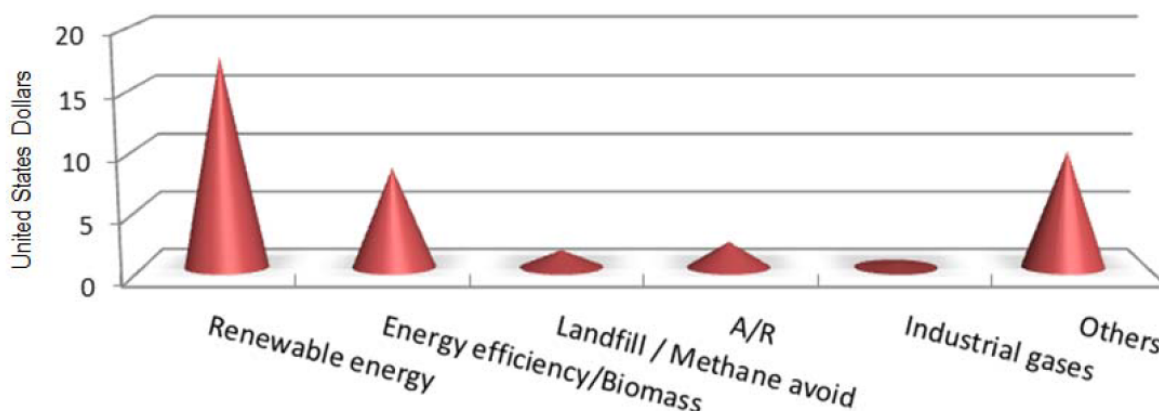


Figure 1,9: CDM Leverage relative to CERs purchased (UNFCCC, 2014).

1.3.4.3 Promotion of RE-CDM projects

Developing host countries need a cleaner renewable energy path which supports the sustainability development goals of the CDM, and Nelson (2004) identified RE-CDM projects as eligible CDM projects with set procedures to expedite approval and implementation by the CDM Executive Board (EB).

In South Africa, the renewable energy sector supports sustainable development through the strategic opportunities presented by South Africa's Integrated Resource Plan (IRP), Power Purchase Agreements (PPAs) and Independent Power Producers (IPPs) (DoE, 2015). According to Pegels (2010), this promotes a favorable RE-CDM project development and investment climate to capitalize on the clean renewable energy resources.

The DNA in South Africa evaluates CDM projects according to specific sustainability criteria illustrated in Table 1,2 on page 28 (DoE, 2014).

Table 1,2: CDM Sustainability criteria applied by the DNA (DoE, 2014:3).

	Criteria	Indicator
Environmental	Impact on local environmental quality	<ul style="list-style-type: none"> • Impact of the project on air quality • Impact of the project on water pollution • Impact of the project on the generation or disposal of solid waste • Any other positive or negative environmental impacts of the project (such as impacts on noise, safety, visual impacts, or traffic)
	Change in usage of natural resources	<ul style="list-style-type: none"> • Impact of the project on community access to natural resources • Impact of the project on the sustainability of use of water, minerals or other non renewable natural resources • Impact of the project on the efficiency of resource utilisation
	Impacts on biodiversity and ecosystems	<ul style="list-style-type: none"> • Changes in local or regional biodiversity arising from the project
Economic	Economic impacts	<ul style="list-style-type: none"> • Impact of the project on foreign exchange requirements • Impact of the project on existing economic activity in the area • Impact of the project on the cost of energy • Impact of the project on foreign direct investment
	Appropriate technology transfer	<ul style="list-style-type: none"> • Positive or negative implications for the transfer of technology to South Africa arising from the project • Impacts of the project on local skills development • Demonstration and replication potential of the project
Social	Alignment with national provincial and local development priorities	<ul style="list-style-type: none"> • How the project is aligned with provincial and national government objectives • How the project is aligned with local developmental objectives • Impact of the project on the provision of, or access to, basic services to the area • Impact of the project on the relocation of communities if applicable • Contribution of the project to a any specific sectoral objectives (for example, renewable energy targets)
	Social equity and poverty alleviation	<ul style="list-style-type: none"> • Impact of the project on employment levels? (specify the number of jobs created/lost; the duration of time employed, distribution of employment opportunities, types of employment, categories of employment changes in terms of skill levels and gender and racial equity) • Impact of the project on community social structures • Impact of the project on social heritage • Impact of the project on the provision of social amenities to the community in which the project is situated • Contribution of the project to the development of previously underdeveloped areas or specially designated development nodes
General	General project acceptability	<ul style="list-style-type: none"> • Are the distribution of project benefits reasonable and fair?

1.4 Methodology

1.4.1 Introduction

This section details the research methodology and research method that was used in investigating the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms. The section outlines the aim of the research, the research paradigm, population and sample description, data collection and analysis and interpretation. This section then discusses validity, reliability, the ethical considerations and limitations of the research conducted.

1.4.2 The Aim of the Research

The aim of the research was an investigation of the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms. The objectives of the research follow:

- Objective 1: To analyze the current literature to derive a comprehensive framework of barriers and drivers inclusive of mechanisms to mitigate the barriers and enhance the drivers.
- Objective 2: To investigate the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms.
- Objective 3: To identify mechanisms and approaches to mitigating the barriers and enhancing the drivers to provide a framework for improving the implementation of CDM renewable energy project investment in the Eastern Cape Province.

1.4.3 Methods, Procedures and Techniques

The objective of the research is to critically examine and build onto the known assumed reality (Guba and Lincoln, 1994). The paradigm adopted is that of post-positivism, with the ontological view of critical realism. The epistemology is the

modified/objectivist inductive approach to determine if the research fits with pre-existing knowledge (Guba and Lincoln, 1994). A qualitative methodology has been adopted. The barriers and drivers as perceived by the developers versus those of the literature are compared in order to present argument and contrast.

Structured interview transcripts (per Appendix 2) were used to collect data for this research from three windfarms in the Eastern Cape. The literature-identified barriers and drivers to CDM renewable energy investment informed the basis of these interviews to identify mechanisms and approaches to mitigating the barriers and enhancing the drivers. The research respondents were identified as individuals representing the project developers of each of the windfarms – Kouga, Metro and Jeffreys Bay. The Project Manager, Project Engineer, and CDM PDD contact person for each windfarm were interviewed. Nine interviews were conducted, each of one to two hours duration. The data collection was conducted during October to November 2014 and July to August 2015.

1.4.4 Population and Sample Size

The project developers key personnel involved with the CDM development of the three windfarms were the focus point of the research. Permission from each windfarm's Project Manager was given prior to conducting the research. Interview questions were provided and authorized prior to commencing the interviews.

Nine interviews were conducted on a voluntary basis.

1.4.5 Data Collection

The research data was collected by means of structured, face-to-face interviews. Interviews were conducted during October to November 2014 and July to August 2015.

Respondents were identified through the CDM Project Design Documents (PDDs) and were approached through formal emails and confirmed telephonically for interview times. The researcher introduced himself politely and asked respondents "Would you mind participating in the research?" This was to allow all possible

respondents to have the opportunity to decline or volunteer for the research. Interview survey questions were designed to ensure that the interview process took approximately one to two hours.

In addition, the CDM Project Design Documents (PDDs) were made available by the project developers for each project. These were studied to obtain information and insight into the project's methodology of implementation, specific to each windfarm. This is necessary to identify and discuss approaches to dealing with barriers and drivers for further recommendations as the PDDs provide key insight into the factors that contributed to the project's success.

1.4.6 Data Analysis

The design and content of the research questions were informed and guided by the contributing factors of the barriers and drivers identified in the literature (as outlined in section 1.3 above). The interview transcripts from copious notes and audio recordings were used to analyze the data. Thematic analysis of the qualitative data was presented in a narrative format to aid in providing recommendations.

1.4.7 Validity and Reliability

In order to ensure that the research reflects what is taking place (valid) and is credible (reliable), hand-written notes were taken during interviews as well as audio recordings of the interviews.

1.4.8 Ethical Considerations

The researcher is aware of concerns relating to subjectivity and confidentiality. To avoid unethical practices, Bassey's (1999) three principles of ethical practice ensured effective governance and ethical behavior throughout the research, i.e. respect for persons, democracy, and the truth. Assurances were given to the respondents that the findings of the research were for research purposes only and that confidentiality would be maintained.

All the respondents who offered to participate in this research were contacted beforehand and the purpose and scope of the research was detailed prior to permission being granted by the project developers for the research to be conducted.

1.5 Results

The following data were collected in relation to objectives two and three of the research, namely the investigation of respondents' experience with CDM barriers and drivers at the windfarms. The experiences of the respondents will assist in identifying mechanisms and approaches to mitigating the barriers and enhancing the drivers to provide a framework for improving CDM renewable energy project investment implementation in the Eastern Cape and, potentially, South Africa.

Three respondents from each windfarm were interviewed and the results were combined for each question. The results from the three windfarms surveyed are compared and presented for discussion later (section 1.6 below).

1.5.2.1 Question 1: What do you believe are the barriers to implementing CDM projects?

This question was to determine the main CDM barriers from the respondents' experience and perceptions, prior to identifying barriers through the literature, for further questioning.

Windfarm 1 – CERs price and low demand for CERs.

Windfarm 2 – CDM support in South Africa and the lack of interest from stakeholders on the project due to negative profitability from low CER revenue.

Windfarm 3 – The low market for carbon credits generated by the project has caused a lack of interest from project investors.

It is clear from most respondents that the CER market prices are a major barrier to CDM projects, while only one respondent experienced a lack of interest and poor support by project stakeholders.

1.5.2.2 Question 2: Do you believe the CDM Additionality requirements present the possibility of disqualification from CER registration? If so, please elaborate / If not, why not?

The following Questions, 2 to 5, identify specific CDM barriers from the literature, to determine the experiences by the respondents.

Windfarm 1 – No disqualification through additionality as it is a “greenfield project”.

Windfarm 2 – No, although our project runs the risk of disqualification as it stands alone as profitable through the RE-IPPPP without the need for CER revenue. Our CDM PDD, however, recognises the need for clean power in South Africa and therefore grants an exemption for “additionality”.

Windfarm 3 – No, the PDD additionality requirement makes provision for “greenfield” renewable energy projects in South Africa to avoid disqualification. It would be interesting to see further down the road as the bidding process through the RE-IPPPP gets more competitive and the projects start taking on the business-as-usual characteristics.

All of the respondents agree that the “additionality” requirement is not a barrier for their CDM projects as the CDM EB has made specific provisions to exclude this requirement for renewable energy projects in South Africa. Concerns by two of the respondents over the impact of the bidding process through South Africa’s RE-IPPPP highlighted the possibility of future disqualification as the projects are implemented without the need for CERs.

1.5.2.3 Question 3: Do the CDM transaction costs discourage the implementation of smaller renewable energy projects? If so, please elaborate / If not, why not?

Windfarm 1 – Yes, as the costs to get a PDD to final approval by the CDM EB are high in terms of overseas consultant fees and the lag in earning CER revenues.

Windfarm 2 – Currently yes, as the low CER revenues compared to the transaction costs are not profitable. The high costs of third-party consultants add to the problem when you have to get the PDD validated for CDM EB approval.

Windfarm 3 – No, as the CER earning potential over 10 years is greater, despite the low prices. Our PDD fees to date after registration with the CDM EB are higher than our CER potential revenue for our annual CO₂ offsets per annum, but looking at the costs over a 10-year period and the probable increase in the price of CERs, we believe the transaction costs are negligible.

Two of the respondents agreed that transaction costs are a barrier; however the third respondent took a longer-term view over 10 years and found the costs negligible compared to potential CER revenue over the longer 10-year crediting period. It is interesting to note that the third respondent is the only windfarm registered with the CDM EB after validation. The other windfarms are in the process of validation and possibly frustrated with the costs of dealing with third-party validation agencies and consultants, considering the poor current CER prices.

1.5.2.4 Question 4: Do you believe the lack of awareness amongst potential CDM stakeholders prevents potential investment in renewable energy opportunities in South Africa? Please elaborate.

Windfarm 1 – No, all of our project investors were aware of the CDM at the time of negotiations in 2010.

Windfarm 2 – No, both our international and national partners had experience with CDM projects.

Windfarm 3 – No, especially concerning this CDM project as the stakeholders were engaged and committed when CERs earned €20 per CO₂e, prior to the collapse of the CER market. A lot of interest and high levels of engagement helped us get the

PDD through to CDM EB approval. As we are currently involved in another windfarm development, we have found that stakeholders have displayed a lack of awareness or possibly interest in the CDM registration due to uncertainty for the future CER market.

All of the respondents agreed that a “lack of awareness” was not an inhibiting factor for potential CDM stakeholders, based on the current project negotiations prior to the collapse of the CER market in 2012.

1.5.2.5 Question 5: What factors relating to the CDM project cycle inhibited the final CDM approval?

Windfarm 1 – The CDM project cycle to the point of obtaining the DNA approval, after submitting the PIN and PDD, was straightforward. The problems and delays occurred dealing with international third-party consultants in obtaining the validation of the PDD prior to submitting to the CDM EB for registration.

Windfarm 2 – The whole process is straightforward with clear timelines from the DNA office in South Africa. We are waiting for the validation of our PDD through an international consulting firm accredited by the CDM. We had hoped to have the CDM project approved by the CDM EB prior to commissioning in July 2014 to claim the CERs.

Windfarm 3 – The DNA helped with clear guidelines to get our PDD approved. The only delays were from the DOEs who are the only accredited firms to validate our PDD, prior to submission with the CDM EB. The negotiations around the consulting fees and legal costs are time-consuming, especially since these entities are international firms. The PDD was eventually approved by the CDM EB prior to commissioning and at this stage we are in the monitoring stage to verify our emission reductions for submission to the CDM EB for CER issuance.

All the respondents experienced problems and delays in the validation stage of the CDM project cycle, which inhibited the final CDM approval. The delays occurred in

dealing with the accredited DOEs during the validation stage of the CDM project cycle.

1.5.2.6 Question 6: What do you believe are the barriers specific to implementing RE-CDM projects?

This question was to determine the main RE-CDM barriers from the respondents' experience and perception, prior to identifying barriers through the literature for further questioning.

Windfarm 1 – The low CER revenues for renewable energy CDMs compounded by the poor CER price.

Windfarm 2 – The lower profitability of RE-CDM projects relative to HFC-CDM projects higher CO₂e emission factors.

Windfarm 3 – The low market for carbon credits generated by the renewable energy project has caused a lack of interest from project investors.

It is clear from all the respondents that lower profitability of RE-CDM due to lower CER revenues and the current poor market prices act as a major barrier to RE-CDM projects.

1.5.2.7 Question 7: Do you believe the comparative disadvantages of RE-CDM projects generating smaller CERs present barriers to project developers ROI perceptions? If so, please elaborate.

The following questions, 7 to 12, identify specific RE-CDM barriers from the literature, to determine the experiences by the respondents.

Windfarm 1 – Yes, the low CER revenues for renewable energy CDMs compounded by the poor CER price is definitely a disadvantage for our sector compared to the other gases with a greater global warming potential earning more CERs.

Windfarm 2 – Yes, the lower profitability of RE-CDM projects relative to HFC-CDM projects higher CO₂e emission factors add to the lower investment returns for RE-CDM projects. At the current poor CER price, investors don't even factor the CER revenue into calculations.

Windfarm 3 – The lower market for carbon credits generated by the renewable energy projects has caused a lack of interest from project investors in our sector. We understand the higher CO₂e emission factors applied to dangerous gases with high global warming potential, but we need to ensure a fair playing field for renewable energy projects, which are driving a zero emissions target to save the planet.

It is clear from all the respondents that the comparative disadvantage of RE-CDMs generating smaller CERs and lower revenues are impacting on project investors' perceptions of ROI contributions. It is interesting that one respondent calls for a "fair playing field" compared to the higher HFC-CDMs ROI compared to RE-CDMs ROI.

1.5.2.8 Question 8: Do you believe economic and financial factors play a significant role in the RE-CDM investment decision making process? If so, please elaborate.

Windfarm 1 – Yes, the need for clean energy in South Africa has created an emerging market for renewable energy technology from markets with an over-supply of technology. The financial crisis in Europe has caused prices for wind and solar components to fall, which has enabled project developers to source surplus hardware at competitive prices. We managed to source our turbines from China and take advantage of the lower competitive pricing in an established renewable energy manufacturing industry. This timely situation has contributed to project developers in South Africa managing to bid lower prices for each round of the RE-IPPPP.

Windfarm 2 – Yes, and we have taken advantage of the surplus of wind technology hardware in Europe to develop wind and solar projects in South Africa at very competitive prices per the RE-IPPPP bid rounds 1–3. We hold the highest approved capacity for wind as a lead developer in South Africa and hope to make a substantial contribution to the development of the renewable energy sector.

Windfarm 3 – Most definitely. South Africa's developing renewable energy market has created demand for clean technology at a perfect time in terms of the worldwide supply of components reaching the lowest prices yet. This has timed perfectly with the launch of the RE-IPPPP programme and other national development finance initiatives. We are 100% owned by South Africans with a 26% black ownership shareholding.

All the respondents agreed that the economic and financial factors both abroad and locally, have contributed to the RE-CDM investment decision-making process.

1.5.2.9 Question 9: Do you believe the carbon market and the market price of CERs significantly affect the revenue of RE-CDM projects? If so, please elaborate / If not, why not?

Windfarm 1 – At this stage the CER prices are so low they hardly cover the costs to get our CDM PDD registered. The CER revenue is significantly compromised under these poor market conditions, but we believe that the CDM mechanism makes a substantial contribution to the reduction of emissions worldwide. We believe that the COP21 meeting later this year will firm up carbon prices through an increasing demand for carbon offsets and hence CERs.

Windfarm 2 – The oversupply of CERs on the market has caused the drop in CER prices. At this stage, we are not concerned, as we have not depended on the RE-CDM revenue but rather the 20-year RE-IPPPP bid price revenue secured with Eskom. We believe the market for CERs will improve and subsequently create a stable CER price to factor into future RE-CDM revenues.

Windfarm 3 – Since the collapse of the CER market in 2012, we have not factored the CER revenue into our project's profitability. The 2015 to 2020 period is critical in creating a demand for CERs on the carbon trading platforms. We hope the CDM EB's initiative allowing the voluntary cancellation of CERs, will create demand for CERs on the secondary market from organizations wishing to reduce their carbon footprint.

All the respondents agreed that the carbon market and poor CER market price has had a significant impact on the RE-CDM revenues. Since all three windfarms are not dependent on the CER revenue, but rather on the RE-IPPPP bid income stream over 20 years, the effect of the low CER prices has no impact on the windfarms' financial feasibility at this stage.

1.5.2.10 Question 10: What risk factors relating to high interest rates, scarcity of capital and project life cycles did you experience in developing the RE-CDM projects?

Windfarm 1 – The debt equity ratio for our windfarm is 75:25 as the interest on debt is lower than equity returns expected by shareholders. This ratio allows us to bid the lowest price on the RE-IPPPP by minimizing finance costs. The interest on loans from debt capital is around 12%, which is lower than the equity shareholders' rate of return of between 18% to 25%. The project is financed by Old Mutual and IDC as a lender and equity shareholder financing our BEE shareholding. The higher the debt ratio, the lower the cost of finance and the lower the RE-IPPPP bid price to secure a 20-year revenue stream to reduce financial and business risks of the project. The CER revenue forecast over the initial 10-year period helped in the initial stages to leverage the development capital for our project.

Windfarm 2 – Our majority shareholder is an international company supplying the debt and equity capital. As a lender with access to international debt capital, we are able to lend at a 7,5% interest rate and this, coupled with the high return on equity of 20% plus, is an attractive investment for our foreign shareholder. The balance is covered by loans from commercial banks and equity shareholdings by local development banks.

Windfarm 3 – Our shareholding is 100% South African and supported by the IDC with a 26% black ownership shareholding. The commercial banks in South Africa structured favorable lending rates based on the low risks of revenue from the RE-IPPPP bid price revenue guaranteed over 20 years. This secured revenue has contributed substantially to reducing the risk of our project over a 20-year period.

All the respondents experienced low financial and business risks primarily attributed to the guaranteed revenue from the 20-year RE-IPPPP. The lower international debt costs have contributed to major shareholdings by international companies, coupled with higher returns in the South African market. In comparison, the local shareholders are equally competitive with access to development capital in the form of loans and equity.

1.5.2.11 Question 11: What operational and project management problems hampered the implementation of the RE-CDM project?

Windfarm 1 – The DNA office was extremely helpful in dealing with our PIN and PDD documentation. The delay in our registration by the CDM EB is as a result of delays in project managing third-party overseas consulting firms tasked to complete the validation.

Windfarm 2 – The DNA office in South Africa offered clear guidelines to get our PDD approved. We are waiting for the validation of our PDD through an international consulting firm accredited by the CDM before registration by the CDM EB.

Windfarm 3 – The whole approval by the DNA was exceptional. The only delays were from the DOEs who are the only accredited firms to validate our PDD prior to submission with the CDM EB. The PDD was eventually approved by the CDM EB prior to commissioning and, at this stage, we are in the monitoring stage to verify our emission reductions for submission to the CDM EB for CER issuance.

All the respondents experienced problems and delays in the validation stage by accredited DOEs. All PDDs have been approved by the local DNA office but only one has been registered with the CDM EB due to the delays in validation by third-party firms.

1.5.2.12 Question 12: What factors relating to South Africa's infrastructure presented challenges for the RE-CDM project?

Windfarm 1 – Since the windfarm is situated in a rural area, road networks had to be developed and upgraded for access by heavy equipment machinery. The socio-economic needs of the local community were greatly improved through upgrades to the local infrastructure as part of the sustainable development obligations of the CDM project.

Windfarm 2 – No significant challenges as the windfarm is located close to a national road and in close proximity to a sub-station feeding the national grid.

Windfarm 3 – We experienced problems in connecting with the national grid as Eskom delayed the construction and commissioning of a power line connecting the

windfarm to the grid. Eskom caused a three-month delay in commissioning the windfarm.

Two of the windfarms experienced challenges with the infrastructure, related to poor road networks and grid connectivity.

1.5.2.13 Question 13: What mechanisms should be addressed and introduced to mitigate RE-CDM barriers?

This question was to determine specific RE-CDM mechanisms to mitigate the RE-CDM barriers from the experiences of the respondents.

Windfarm 1 – Investigate the accreditation of DOEs from South Africa to reduce the delays in the validation stage by accredited international DOEs.

Windfarm 2 – Investigate a trading platform for the carbon market in South Africa and set a floor CER price to reduce risks in forecasting RE-CDM revenues from CERs.

Windfarm 3 – DNA motivation to the CDM-EB to address the comparative disadvantage of RE-CDMs generating smaller CERs and lower revenues which are impacting on project investors' perceptions of ROI contributions. A "fair playing field" compared to the higher HFC-CDMs ROI compared to RE-CDMs ROI is needed. The CDM-EB could address the problem, or alternatively, the DNA could motivate for tax exemptions for RE-CDM projects CER revenues to level the profitability.

1.5.2.14 Question 14: What factors do you believe promoted and supported RE-CDM project investment?

This question was to determine the main RE-CDM drivers from the respondents' experience and perceptions, prior to identifying drivers through the literature for further questioning.

Windfarm 1 – Clean technology, sustainability drive and the CER revenue to offset costs.

Windfarm 2 – The CER revenue from the carbon emission reductions and support for sustainability in South Africa while addressing the climate change challenges facing the planet.

Windfarm 3 – The CDM sustainability drive and the opportunity to support a market mechanism to reduce carbon emissions globally.

All the respondents identified sustainable development at the windfarms as the main factor supporting RE-CDM project investment. The potential CER revenue and clean technology transfer are also identified by the respondents as important factors promoting RE-CDM projects.

1.5.2.15 Question 15: Do you believe the transfer of environmentally sound technologies contributed to sustainable energy solutions and skills development at the windfarm? If so, please elaborate / If not, why not?

The following questions, 15 to 22, identify specific RE-CDM drivers from the literature, to determine the experiences by the respondents.

Windfarm 1 – Yes, nine turbines were installed, each with an installed capacity of 27 MW and the total capacity to generate 80 000 MW each year. The Sinovel Wind Group in China manufactures turbines with low voltage capability, which allows for perfect integration into the South African electricity grid. Direct jobs generated during the construction phase numbered 120, with 80 of these set aside for locals. During the production phase, nine full-time jobs were created, with four set aside for locals, while local small businesses were engaged for various maintenance activities and skills training. In addition, members of the local community have been trained as conservation officers and employed to protect the biodiversity of the area.

Windfarm 2 – Yes, we installed 60 wind turbines, the Siemens SWT 2.3 MW, with an installed capacity of 138 MW. These turbines were selected based on the technology's quality and compatibility with the local wind regime and its proven track record of over 5170 units installed worldwide. During construction, the number of jobs varied according to the stage of construction, but in August 2013, at the peak of

construction, there were 602 people working on site, 45% of whom were from the local community. This is a reflection of our commitment to employ and empower as many people from the local community as possible. Now in operation, we employ eleven people to operate and maintain the wind farm.

Windfarm 3 – Yes, 32 Nordex turbines manufactured in Germany have been installed. Each turbine has a 2,5 MW capacity, which gives a combined installed capacity of 80 MW. The generation capacity is extremely efficient and suitable for the wind in the coastal area of St Francis and Oyster Bay. During construction, 250 jobs were created with 17 unskilled positions filled from the local community. We are working on a skills development programme within the community to improve the lives of the people in the Kouga region, severely impacted by high unemployment.

All the respondents installed wind technology with advanced generating capacities to create clean sustainable energy for the grid. The jobs created during construction contributed to skills development in the region with possibilities of re-employment in the construction phases of more windfarms in the region and nationally.

1.5.2.16 Question 16: What Foreign Direct Investment was made within the windfarm? Please list and elaborate.

Windfarm 1 – None, 100% South African owned.

Windfarm 2 – We are owned by a consortium of international and local partners. With Mainstream SA leading the consortium. We have access to foreign funding through the Dublin head office, Mainstream Renewable Power.

Windfarm 3 – None, 100% South African owned.

Only one windfarm used FDI for financing the project, while the other two are wholly owned by South African lenders and equity companies.

1.5.2.17 Question 17: Do you believe the CERs revenue generated attracts potential RE-CDM developers? If so, please elaborate / If not, why not?

Windfarm 1 – During the feasibility stage of our project, our stakeholders' interest in the CDM mechanism was primarily focused on the CER revenue as a means to reduce risk and leverage finance from investors and lenders.

Windfarm 2 – The potential of the CERs to leverage investment from stakeholders cannot be under-estimated. We managed to leverage a small share of our capital needs based on the potential CER revenue earned for the CO₂e over the 10-year term of the project's initial crediting period. We have no doubt that, given a stable CER price of around US\$5, the potential to leverage private sector investments is enormous in RE-CDM projects.

Windfarm 3 – The CDM is an excellent market mechanism to address climate change. The fact that the poor CER prices have caused potential developers to overlook the other sustainability and technology benefits of a CDM is shortsighted. It is not just about the CERs, although the potential to leverage finance is important, it is all about contributing to a global initiative for the benefit of our planet.

All the respondents experienced an interest by stakeholders in the CER revenue. One respondent capitalized on the leverage factor, while one respondent recognized the importance of the CDM as a whole to support sustainable development and transfer clean technology.

1.5.2.18 Question 18: Do you believe the increased profitability and reduced financial risks resulting from CERs encourages support for RE-CDM developments? If so, please elaborate / If not, why not?

Windfarm 1 – Most definitely, given a stable CER price, the contribution from CER revenues will reduce debt and equity finance risk as the project's profitability will improve. This will attract more debt and equity investors interested in an additional revenue source.

Windfarm 2 – Yes, greater profitability and low risk attracts investors. We believe the market for CERs will improve and subsequently create a stable CER price to factor into future RE-CDM revenues.

Windfarm 3 – Since the collapse of the CER market in 2012, we have not factored the CER revenue into our project's profitability. Given stable CER prices, RE-CDM developments will increase through increased profitability and lower risks from CER revenues over the long-term.

All the respondents agree that increased profitability and lower risks resulting from stable market conditions for CER revenues would promote support for RE-CDMs by project developers.

1.5.2.19 Question 19: What aspects of sustainable development did the RE-CDM project address in terms of South Africa's Integrated Resource Plan?

Windfarm 1 – Economically, the improvement of roads and services in the local rural community. Job creation has stimulated the local economy and alleviated poverty. Environmental preservation of the natural bio-diversity of the windfarm area, through a training programme for local conservation officers. Socially, through the engagement with the local community trust, social amenities and training of young people and women are a priority for the empowerment of previously disadvantaged people in the region.

Windfarm 2 – Environmental impacts include water saving (590 M litres of water per year), CO₂e avoided (8,4 M CO₂e tons over 20 years). Socio-economic benefits include initiatives to support emerging black farmers in the area and to assist with sustainability of local enterprises; health programmes and youth upliftment / sport programmes; a scholarship programme for tertiary engineering studies in Port Elizabeth. During construction, 45% of the people working on site were from the local community. A community trust owns 6% of the windfarm and shares in the dividends and revenues.

Windfarm 3 – Based on both the CDM SD criteria and the RE-IPPPP SED and ED criteria, we have engaged with sustainability criteria to meet our 30% rating contribution per the RE-IPPPP scorecard. The Kouga Windfarm Community Trust own 26% of the windfarm. This is a broad-based ownership scheme participating in

the revenue stream from the sale of electricity. These revenues are channeled back into the communities through the socio-economic and enterprise development projects. Economically, the local economy is stimulated through job creation and skills development. Environmental benefits to the region include preservation of natural habitat and vegetation in the rural area, water-saving, and reduced carbon emissions. Social impacts include the provision of social amenities and support of education at the pre-primary and primary school level.

All the respondents have made significant contributions to the environmental, socio-economic and economic development of the regions. One respondent noted the additional requirements according to the RE-IPPPP scorecard on SED and SD criteria.

1.5.2.20 Question 20: How are the Power Purchase Agreement (PPAs) and Independent Power Producers (IPPs) linked to the favorable development of RE-CDM projects? Please elaborate.

Windfarm 1 – Through the RE-IPPPP bidding rounds, renewable energy projects are required to bid for contracts below a certain cap. Our project was involved in Round 1 with a R1.15 per kWh cap awarded. This guaranteed revenue stream from Eskom, complements the RE-CDM development as external funding is secured for a 20-year period and any future CER revenues are a bonus.

Windfarm 2 – As an IPP we bid through the RE-IPPPP to secure our projects. This programme promotes renewable energy development to diversify South Africa's energy supply. The bid is scored with 70% based on the bid price and 30% on socio-economic development criteria. A bid is awarded by meeting the lowest price and meeting the SED requirements. RE-CDM projects focus on sustainability criteria, CO₂e offsets and CER revenues. The project's revenues are secured through the RE-IPPPP bid price paid for electricity generated, which reduces a RE-CDM's dependence on CER revenues. Synergies could be met through the RE-IPPPP SED criteria and CDMs SD criteria set by the local DNA, which will contribute to RE-CDMs development in South Africa.

Windfarm 3 – The PPAs are a fundamental part to the development of RE-CDM projects. The RE-IPPPP programme makes a huge contribution to the success of the

renewable energy sector in South Africa. It is competitive and based on solid financial and sustainability criteria. The RE-CDM projects, through the verification and validation cycles by the CDM EB, add value in terms of credibility in meeting SD criteria and carbon emissions.

All the respondents linked the favorable development of RE-CDM projects to South Africa's PPAs and IPPs programme. One respondent noted the possible synergies with the RE-IPPPP SED criteria and the CDMs SD criteria, while another respondent suggested the CDM process adds credibility to projects.

1.5.2.21 Question 21: Do you believe South Africa's abundant renewable energy resources will promote RE-CDM investment? If so, please elaborate / If not, why not?

Windfarm 1 – Most definitely. Solar PV, CSP and wind have huge potential in South Africa. The main development areas are also situated in undeveloped parts of South Africa, which complements the RE-CDM SD initiatives.

Windfarm 2 - Huge potential exists in South Africa over the next five years. We have successfully bid on another two solar plants, so yes, RE-CDM projects could contribute to significant growth in the energy sector for South Africa.

Windfarm 3 – South Africa is regarded as an attractive destination for renewable energy investment. The CDM goes hand-in-hand with the current projects approved through the RE-IPPPP. As the bid rounds progress, lower bid caps are set, which puts pressure on developers to structure financially feasible projects. The CER revenues from CDMs could make a substantial contribution to the feasibility of projects in later bidding rounds.

All the respondents agreed on South Africa's renewable energy potential in promoting RE-CDM investment. One respondent raised a valid point concerning the potential for lower price caps in the RE-IPPPPs later bidding rounds, and the RE-CDM CERs contribution to a projects success.

1.5.2.22 Question 22: What additional support is required to facilitate and improve your RE-CDM project implementation?

Windfarm 1 – DNA assistance in dealing with validation of PDDs through third parties.

Windfarm 2 – DNA request to the CDM EB for local accredited DOEs for validation purposes.

Windfarm 3 – Improved validation processes to reduce delays in the PDD registration.

All the respondents identified the need for the DNA to request improved validation processes through DOEs, to expedite the PDD registration by the CDM EB.

1.5.2.23 Question 23: What mechanisms should be introduced to enhance RE-CDM drivers and promote RE-CDM project investment? Please list and elaborate.

This question was to determine specific RE-CDM mechanisms to enhance the RE-CDM drivers, from the experiences by the respondents.

Windfarm 1 – The CDM EB should investigate a way to increase the demand for CERs from buyers to establish a stable CER market. With a reasonable market price for a CER, the RE-CDM projects in South Africa will generate substantial investments through increased profitability.

Windfarm 2 – The DNA in South Africa should integrate the CDM SD criteria with the RE-IPPPP SED and ED criteria to add value to the CDMs PDD and promote the development of a market-based climate change mechanism. The synergies from the process would help project developers establish a clear development programme focused on national and international sustainability standards. The DNA could develop procedures to facilitate the combined registration of PDDs through a Programme of Activities (PoA), which would increase efficiency for developers of multiple RE-CDM projects.

Windfarm 3 – Firstly, a stable CER market needs to be established to improve demand for CERs to justify the time and costs of implementing the CDM in renewable energy developing countries. Secondly, the sustainability criteria of the CDM process, which is approved by the DNA in South Africa, should be integrated into the RE-IPPPP sustainability criteria to add credibility to a registered RE-CDM

project developer's bid. This will promote the development of RE-CDM projects in South Africa and help to earn CERs, which may contribute substantially to the feasibility of a project constrained by lower bid prices in later rounds of the RE-IPPPP.

These results are discussed further in the discussion section below.

1.6 Discussion

The findings of the research presented in section 1.5 described the current experiences of the respondents towards the barriers and drivers of CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms. These findings were compared against the literature through cross-case and cross-comparative analysis below, to ascertain whether the experiences of the respondents at the windfarms supported the following CDM barriers and drivers.

1.6.1 CDM Barriers

Additionality requirements:

All the respondents agreed that the "additionality" requirement was not a barrier for their current CDM projects as the CDM EB has made specific provisions in the PDDs' methodologies to exclude this requirement for large-scale renewable energy projects in South Africa (see question 2 and its findings). As mandatory national renewable energy standards are legislated, the projects initiated by project developers become business-as-usual and are hence potentially disqualified as CDM projects. The literature states that if a project is required in terms of a law of a host country, then such projects are disqualified from CER registration because they are business-as-usual projects (Greene, 2006). Concerns by two of the respondents are indeed valid over the long-term, whereby the impact of the later bidding rounds through South Africa's RE-IPPPP could present the possibility of future disqualification. The projects would be feasible and could be implemented without the need for CERs, which presents a strong case for business-as-usual and disqualification.

Transaction costs:

Two of the respondents agreed that transaction costs are a barrier, however the third respondent took a longer term view over 10 years and found the costs negligible compared to potential CER revenue over the longer 10-year crediting period. It is interesting to note that the third respondent is the only windfarm registered with the CDM EB after validation (see question 3 and its findings).

A significant amount of funding is tied up in the initial stages of developing a CDM project and any delay in the issuance of CERs causes risk and hence the upfront transaction costs are a major hampering factor to the development of CDM projects (Turner *et al*, 2013). The other windfarms are in the process of validation and possibly frustrated with the already sunk costs and additional costs of dealing with third-party validation agencies, especially considering the poor CER market prices.

Lack of awareness:

All the respondents agreed that a “lack of awareness” was not an inhibiting factor for potential CDM stakeholders based on the current project negotiations prior to the collapse of the CER market in 2012 (see question 4 and its findings). Greene (2006) confirms this lack of awareness through the project developers’ ignorance of CDM aspects relating to policy, technology, financial and legal aspects. The project developers and stakeholders are well informed by the DNA and clearly support the CDMs as a climate change market mechanism to compliment the current projects. One of the respondents observations concerning a future renewable energy project is noted, where they found that “stakeholders have displayed a lack of awareness or possibly interest in the CDM registration due to uncertainty for the future CER market”. This concern could be as a result of the poor conditions of the CER market and lack of profitability for more competitive later RE-IPPPP bid rounds.

Complex CDM project cycle:

None of the respondents experienced any problems with the CDM Project’s approval by the DNA (see question 5 and its findings). The delays in the validation stage by accredited DOEs, prior to submission to the CDM EB for registration approval, were the main points of concern in the cycle. This delay is attributable to the methodology

around the CDM approval process to register the PDD with the CDM Executive Board for the CER issuance (UNFCCC, 2015).

The DNA helped with clear guidelines to get the PDDs approved. The only delays were from the DOEs who are the only accredited firms to validate the PDDs prior to submission with the CDM EB. The negotiations around the consulting fees and legal costs are time-consuming, especially since these entities are international firms.

1.6.2 RE-CDM Barriers

Competitiveness of renewable energy:

It is clear from all the respondents that the comparative disadvantage of RE-CDMs generating smaller CERs and lower revenues are impacting on project investors' perception of ROI contributions (see question 7 and its findings). A respondent made a statement calling for a "fair playing field" compared to the higher HFC-CDMs ROI compared to lower RE-CDMs ROI. The current low prices for CERs could be partially attributed to the different comparative CER earning potential. Point Carbon noted an oversupply of CERs to the period 2020, which is largely attributed to the increased supply of the higher global warming potential GHG gases CERs (Point Carbon, 2012). The respondents understand the higher CO₂e emission factors applied to dangerous gases with high global warming potential, but highlighted the need to ensure a fair playing field for renewable energy projects which are critical to driving a zero emissions target to reduce emissions in the energy sector.

Economic and financial factors:

All the respondents agreed that the economic and financial factors both abroad and locally, have contributed to the RE-CDM investment decision process (see questions 8, 9, and their findings). The financial crisis in Europe has resulted in surplus clean technology and caused prices for wind and solar components to fall, which has enabled project developers to source surplus hardware at competitive prices. South Africa's emerging renewable energy market has created demand for clean technology at a perfect time in terms of the worldwide surplus supply of components reaching the

lowest prices yet. This has timed perfectly with the launch of the local RE-IPPPP programme and other national development finance initiatives.

The carbon market and poor CER market price has had a significant impact on the RE-CDM revenues with all the respondents. Since the CERs are only tradable once the CDM project has received final approval from the CDM EB, the high volatility of the carbon market adds risk to any CDM project (Thurner *et al*, 2013).

Since none of the three windfarms depend on the CER revenue, but rather on the secured RE-IPPPP bid income stream over 20 years, the effect of the low CER prices has had no direct impact on the windfarms' financial feasibility at this stage.

All the respondents experienced low financial and business risks primarily attributed to the guaranteed revenue from the 20-year RE-IPPPP (see question 10 and its findings). Additional risk factors associated with high interest rates, scarcity of capital for investment, debt finance and project life cycles present further barriers to RE-CDM project developers in South Africa (Pegels, 2010). The respondents experienced lower international debt costs, which have contributed to major shareholdings by international companies, coupled with higher comparative returns in the South African market. In comparison, the local shareholders are equally competitive with access to development capital in the form of loans and equity.

Implementation:

All the respondents experienced problems and delays in the validation stage by accredited DOEs (see question 11 and its findings). The only delays were from the DOEs who are the only accredited firms to validate the PDDs prior to submission with the CDM EB. All the respondents' PDDs have been approved by the local DNA office, but only one had been registered with the CDM EB due to the delays in validation by third-party firms. According to Greene (2006) and Jung (2006), effective CDM implementation at the DNA level is an absolute prerequisite for CDM projects. The whole implementation process to the approval by the DNA was exceptional. The other PDD was eventually approved by the CDM EB prior to commissioning and, at this stage, the PDD is in the monitoring stage to verify the emission reductions for submission to the CDM EB for CER issuance. All the respondents identified the need

for the DNA to request improved validation processes through DOEs, to expedite the PDD registration by the CDM EB.

1.6.3 RE-CDM Drivers

Technology transfer:

All the respondents confirmed installing wind technology with advanced generating capacities to create clean sustainable energy for the grid (see question 15 and its findings). The jobs created during construction contributed to skills development in the region with possibilities of re-employment in the construction phases of future windfarm projects in South Africa. The transfer of clean technologies from developed countries to developing countries, as stated by Article 10 of the Kyoto Protocol, will allow RE-CDM developers in South Africa access to sustainable energy solutions and skills development (UNFCCC, 2011).

Financial benefits:

All the respondents experienced an interest by stakeholders in the CER revenue (see questions 16, 17 and their findings). One respondent capitalized on the leverage factor to attract foreign direct investment from an international equity partner. The potential of the CERs to leverage investment from stakeholders cannot be underestimated. The respondent managed to leverage a share of the project's capital needs based on the potential CER revenue earned for the CO₂e over the 10-year term of the project's initial crediting period.

Analyzing CDM CERs by sector indicates that the multiplier effect is significantly greater in sectors more closely associated with having more significant sustainable development co-benefits (UNFCCC, 2014). Figure 13 illustrates that CDM investment in renewable energy projects leverages investment 18 times the price of CERs purchased. Given a stable CER price of around US\$5, the potential to leverage private sector investments could be enormous in RE-CDM projects.

All the respondents agreed that increased profitability and lower risks resulting from stable market conditions for CER revenues would promote support for RE-CDMs (see question 18 and its findings).

Promotion of RE-CDM projects:

All the respondents identified the importance of supporting sustainable development through the CDM and made significant contributions to environmental, socio-economic and economic development of the regions (see question 19 and its findings). The South African DNA will evaluate CDM projects through consideration of the following stated sustainability criteria (DoE, 2014:2): “Economic (*Does the project contribute to national economic development?*); Social (*Does the project contribute to social development in South Africa?*) and Environmental (*Does the project conform to the National Environmental Management Act principles of sustainable development?*)”

In South Africa, renewable energy supports sustainable development through the strategic opportunities presented by South Africa’s Integrated Resource Plan (IRP), Power Purchase Agreements (PPAs) and Independent Power Producers (IPPs) (DoE, 2014). All the respondents linked the favorable development of RE-CDM projects to South Africa’s PPAs and IPPs programme (see question 20 and its findings). One respondent noted the possible synergies with the RE-IPPPP SED criteria and the CDMs SD criteria, while another respondent suggested the CDM process adds credibility to projects.

All the respondents agreed on South Africa’s abundant renewable energy resources potential in promoting RE-CDM investment (see question 21 and its findings). South Africa is regarded as an attractive destination for renewable energy investment. The CDM goes hand-in-hand with the current projects approved through the RE-IPPPP. The findings suggest that, as the bid rounds progress and lower bid caps are set, this could put pressure on developers to structure financially feasible projects. The CER revenues from CDMs could make a substantial contribution to the feasibility of projects in later bidding rounds.

1.7 Recommendations

From this research and by using information gathered in literature with regard to CDM and RE-CDM barriers and drivers and the attributes perceived by the respondents' experience, the mechanisms and approaches to mitigating barriers and enhancing drivers to promote RE-CDM investment are established. The following recommendations have been made, based on the research findings above to provide a *framework* for improved CDM renewable energy project investment implementation in the Eastern Cape and potentially in South Africa.

Because of the limited size and scope of this research, the framework should be interpreted with caution and not utilized to implement policy but rather to provide a basis for suggestions to guide strategic policy for South Africa's renewable energy sector.

1.7.1 South Africa's DNA and RE-CDM Strategy

The findings suggest that the Designated National Authority (DNA) in South Africa should continue to capitalize and improve on the support from the CDM Executive Board by adopting the following strategy aligned with the core strengths of the established UNFCCC's CDM Board:

- Operate efficient project and assessment processes by fully implementing the CDM project cycle and validation procedures for registration by the CDM EB according to prescribed timelines (see questions 5, 11, 13, 22 and their findings).
- Operate an efficient framework resulting in reduced transaction costs for project developers by consolidating on current practices and facilitating national accreditation for Designated Operational Entities (DOEs) (see questions 3, 13, 22 and their findings).
- Develop simplified standards and procedures that increase efficiency by facilitating the combined registration of Project Design Documents (PDDs) through a Programme of Activities (PoA) (see question 23 and its findings).

- Develop a sub-committee to approach developers who have submitted PINs and assist in the submission of the PDDs for approval by the CDM EB to register for CERs (Winkler, 2009). The delays experienced in the validation process would be addressed in the process to ensure all the PDDs are registered by the CDM EB (see questions 5, 22 and their findings).
- Develop the CDM as a “tool for monitoring, reporting and verifying the outcomes of mitigation finance” (UNFCCC, 2015:7). The potential links between the CDM and national climate change mitigation could be facilitated to firmly establish the CDM as a sustainable development tool in South Africa (DoE, 2015).
- Engage with potential emissions trading systems in South Africa on the use of CERs (see questions 9, 13 and their findings) to facilitate the “acceptance of CERs for compliance purposes” (UNFCCC, 2015:7). This will support CDM Board global initiatives “to close the pre-2020 mitigation gap and possibly facilitate meeting the post-2020 international mitigation targets” (UNFCCC, 2015:7).
- Facilitate a DNA office motivation to the CDM-EB to address the comparative disadvantage of RE-CDMs generating smaller CERs and lower revenues which are impacting on project investors’ perceptions of return on investment (ROI) contributions (see question 13 and its findings). A “fair playing field”, according to a respondent (see question 13 and its findings), is required compared to the high HFC-CDMs ROI compared to the low RE-CDMs ROI. The CDM-EB could address the problem, or alternatively, the DNA could motivate for tax exemptions for RE-CDM projects’ CER revenues to level the profitability (Pegels, 2010).
- Facilitate the use of the CERs earned in South Africa within a carbon taxation system to support national mitigation projects in South Africa (see question 13 and its findings).
- Facilitate the development of a national emissions trading system by converting CERs into South African Carbon Units through the CDM voluntary cancellation procedure (UNFCCC, 2015). This development will achieve greater offsetting by public and private entities in South Africa (see question 9, 13, 23 and their findings).

1.7.2 Integration of the CDMs DNA SD criteria with the RE-IPPPP

The Designated National Authority (DNA) of South Africa, assesses the sustainable development benefits of the CDM project (DoE, 2014). Host countries have the responsibility to approve RE-CDM implementation in their country subject to specific sustainable development criteria (Yang, 2004). All the respondents identified sustainable development at the windfarms as the main factor supporting RE-CDM project investment (see questions 14, 15, 19, 21, 23 and their findings). The DNA in South Africa, as the assessor, could exploit the potential synergies between the CDMs sustainable development (SD) criteria and the national RE-IPPPP socio-economic development (SED) criteria for the emerging renewable energy sector (see question 23 and its findings).

The findings suggest that the DNA in South Africa could integrate the CDM Sustainable Development (SD) criteria with the RE-IPPPP Socio-Economic Development (SED) and Economic Development (ED) criteria to add value to the CDMs Project Design Document (PDD) and promote the development of a market-based climate change mechanism (see question 23 and its findings). The synergies from the process could help project developers establish a clear development programme focused on national and international sustainability standards. The sustainability criteria of the CDM process, which is approved by the DNA in South Africa, could be integrated into the RE-IPPPP sustainability criteria to add credibility to a registered RE-CDM project developer's bid (see questions 20, 23 and their findings). This could promote the RE-CDM projects development in South Africa and help to earn CERs, which may contribute substantially to the feasibility of a project potentially constrained by lower bid prices in later rounds of the RE-IPPPP (see questions 21, 23 and their findings).

1.7.3 Supporting the UNFCCC secretariat's CDM Business Plan Strategy

Current demand for CERs is low, impacting the CER revenues and profitability of RE-CDM projects (see questions 1, 6, 7, 9, 17, 18, 23 and their findings). Demand for CERs at this stage is not sufficient to meet the supply capabilities of the CDM

(UNFCCC, 2015). Registrations have declined in South Africa and abroad, significantly in 2013 to 2014 and potentially beyond 2015 (UNFCCC, 2015).

The CDMs potential to contribute to the mitigation of the impacts of climate change and sustainable development in the host countries, is critical to support collaborative measures by all parties; in response the CDMs Executive Board (EB) developed a two-year 2014–2015 business plan (UNFCCC, 2015).

Key trends have developed, whereby governments and the private sector are interested in using market-based mechanisms to attain carbon neutrality and sustainability (UNFCCC, 2015). Interest in this offsetting and carbon neutrality could be increasing (see questions 9, 17, 18, 23 and their findings).

The findings suggest that, according to the UNFCCC's secretariat, the following activities to nurture demand for the CDM and CERs could be critical in supporting the CDM business plan strategy (UNFCCC, 2015):

- Engaging with inter-governmental organisations (IGOs) to serve multiple purposes, including to build understanding and support for the use of the CDM and its CERs beyond its use as an offset mechanism.
- Supporting the implementation of the United Nations Climate Neutral Strategy, which is supported by the United Nations Environment Programme (UNEP). UNEP and the UNFCCC secretariat agreed in 2014 to cooperate to further encourage other United Nations organisations to become climate neutral.
- Developing and promoting the voluntary cancellation tool which allows project participants who hold certified emission reductions (CERs) in the CDM registry to cancel CERs earned. This gives them access to a broader source of demand for CERs in the voluntary market. Interested buyers can filter available CERs by country and/or project type to ensure that their purchases are in line with organizational goals or personal preferences to reduce carbon footprints. The secretariat is encouraging the use of the voluntary cancellation of CERs as a means to reduce one's climate footprint and move towards climate neutrality. The expected impact is a significant

increase in voluntary cancellations of CERs by the end of 2015, as well as increased recognition of the potential of the CDMs CER market.

By supporting the UNFCCC secretariat's CDM business plan strategy, the CDM could be "continually enhanced as an innovative, effective, credible and successful mechanism for mitigating climate change" (UNFCCC, 2015:3), while simultaneously driving sustainability in the renewable energy sector of the Eastern Cape and potentially in South Africa.

1.7.4 Further research recommendations

The main focus of this research was to investigate the information gathered from the RE-CDM project developers' experience at the Metro, Kouga and Jeffreys Bay windfarms with the CDM and RE-CDM barriers and drivers. The mechanisms and approaches to mitigating barriers and enhancing drivers to promote RE-CDM investment could be established to make recommendations that pertained to the three windfarms in the Eastern Cape. Because of the limited size and scope of this research, the results should be interpreted with caution and not utilized to guide policy but rather to provide a basis for further research in the following areas:

- The research presented in this thesis should be replicated at all the RE-IPPPP rounds 1–4 commissioned renewable energy projects, including all sectors (solar, concentrated solar power, hydro and wind) and provincial regions, to increase the size and scope of the research.
- Further research into the development of a national emissions trading system by converting CERs into South African Carbon Trading Units and a carbon taxation system to support national mitigation projects in South Africa.

1.8 Conclusion

Current global demand and prices for CERs are low (UNFCCC, 2015), impacting the CER revenues and profitability of Renewable Energy (RE)-CDM projects as determined from the findings (section 1.5 and 1.6). Demand for CERs at this stage is not sufficient to meet the supply capabilities of the CDM (UNFCCC, 2015). Registrations have declined in South Africa and abroad, significantly in 2013–2014 and potentially beyond 2015 (UNFCCC, 2015). According to the UNFCCC's CDM statistics (Figure 1,4 on page 17), South Africa, as a host country, represents 0,73% of the globally registered CDM projects for developing countries, compared to China (49,16%) and India (20,61%) as at 31 July 2015 (UNFCCC, 2015).

From this research, and by using information gathered in literature with regard to CDM and RE-CDM barriers and drivers and the attributes perceived by the respondent's experience, the mechanisms and approaches to mitigating barriers and enhancing drivers to promote RE-CDM investment are established.

The majority of the respondents agree that the "additionality" requirement is not a barrier for their CDM projects as the CDM EB has made specific provisions to exclude this requirement for renewable energy projects in South Africa. Concerns by two of the respondents over the impact of the bidding process through South Africa's RE-IPPPP highlighted the possibility of future disqualification as the projects are implemented without the need for CERs.

The findings suggest that transaction costs are a barrier; however, one respondent took a longer term view over 10 years and found the costs negligible compared to potential CER revenue over the longer 10-year crediting period.

A "lack of awareness" was also not a barrier for potential CDM stakeholders, based on the current projects' negotiations prior to the collapse of the CER market in 2012.

It is clear from all the respondents that the lower profitability of RE-CDM due to lower CER revenues and the current poor market prices are a major barrier to RE-CDM projects. The comparative disadvantage of RE-CDMs generating smaller CERs and

lower revenues is impacting on project investors' perception of return on investment (ROI) contributions. It is interesting that one respondent calls for a "fair playing field" for the high HFC-CDMs ROI compared to low RE-CDMs ROI. All the respondents agree that the carbon market and poor CER market price have had a significant impact on the RE-CDM revenues. Since none of the three windfarms are dependent on the CER revenue, but rather on the RE-IPPPP bid income stream over 20 years, the effect of the low CER prices has had no impact on the windfarms' financial feasibility at this stage.

The low financial and business risks experienced by the respondents is primarily attributed to the guaranteed revenue from the 20-year RE-IPPPP. The lower international debt costs have contributed to major shareholdings by international companies coupled with higher returns in the South African market. In comparison, the local shareholders are equally competitive, with access to development capital in the form of loans and equity.

The findings from all the respondents' experience indicated problems and delays by accredited DOEs in the validation stage of the CDM project cycle. All PDDs had been approved by the local DNA office but only one had been registered with the CDM EB due to the delays in validation by third-party DOE firms.

All the respondents identified sustainable development at the windfarms as the main factor supporting RE-CDM project investment. The respondents installed wind technology with advanced generating capacities to create clean sustainable energy for the grid. The jobs created during construction contributed to skills development in the region with possibilities of re-employment in the construction phases of more windfarms in the region and nationally.

The findings suggest that all the respondents experienced an interest by stakeholders in the CER revenue. One respondent capitalized on the leverage factor, while one respondent recognized the importance of the CDM as a whole to support sustainable development and the transfer of clean technology. All the respondents agree that increased profitability and lower risks resulting from stable market conditions for CER revenues would promote support for RE-CDMs by project developers.

All the respondents made significant contributions to environmental, socio-economic and economic development of the regions. One respondent noted the additional requirements according to the RE-IPPPP scorecard on SED and SD criteria and linked the favorable development of RE-CDM projects to South Africa's PPAs and IPPs programme. One respondent noted the possible synergies with the RE-IPPPP SED criteria and the CDMs SD criteria, while another respondent suggested the CDM process adds credibility to projects.

South Africa's renewable energy potential in promoting RE-CDM investment is evident from the findings. One respondent raised a valid point concerning the potential for lower price caps in the RE-IPPPPs' later bidding rounds, and the RE-CDM CERs' contribution to a project's financial success. South Africa is regarded as an attractive destination for renewable energy investment and the CDM goes hand in hand with the current projects approved through the RE-IPPPP. As the bid rounds progress, lower bid caps are set, which puts pressure on developers to structure financially feasible projects. The CER revenues from CDMs could make a substantial contribution to the feasibility of projects in later bidding rounds.

The following recommendations in summary (per the framework in section 1.7), have been made, based on the research findings to provide a potential *framework* for improved CDM renewable energy project investment implementation in the Eastern Cape and potentially South Africa:

- Develop a CDM Designated National Authority (DNA) strategy to drive and promote RE-CDM in South Africa.
- Integrate the DNAs CDM Sustainable Development (SD) criteria with the RE-IPPPP.
- Support the United Nations Framework Convention on Climate Change (UNFCCC) secretariat's CDM business plan strategy to nurture demand for CERs and participation in CDMs.

By supporting these recommendations, the CDM could be “continually enhanced as an innovative, effective, credible and successful mechanism for mitigating climate change” (UNFCCC, 2015:3), while simultaneously driving sustainability in the renewable energy sector of the Eastern Cape and potentially in South Africa. With a view to the successful outcome of the 21st Conference of the Parties (COP21) in December 2015, renewable energy and the CDM could play a central role in mitigating climate change and supporting the Sustainable Development Goals (SDGs) (SAIREC, 2015).

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Section 2: Literature Review

2.1 Introduction

Climate change is one of the biggest challenges the planet currently faces (IPCC, 2014). The devastating consequences of natural disasters are not confined within a nation's boundaries but threaten all inhabited areas of the planet alike (Turner and Varughese, 2013). South Africa is being impacted and the impacts will intensify in the coming decades (ERC, 2010). In 2005, South Africa was responsible for 1,1% of total global emissions and approximately 40% of sub-Saharan African emissions (WRI, 2009). South Africa's Greenhouse Gases (GHGs) are on the increase with fossil-fuel burning from coal-fired power stations accounting for the highest portion of South Africa's GHG emissions (ERC, 2010).

With the renewable energy resource potential in South Africa, the country could develop into a renewable energy leader on the African continent (EY, 2015). South Africa's Integrated Resource Plan (IRP) aims to diversify the energy mix away from fossil fuels (DoE, 2014). The IRP is South Africa's master energy plan, covering the energy requirements from 2010 to 2030, and plans to increase the capacity from 41 000 MW to 89 532 MW (DoE, 2014). The Integrated Resource Plan (IRP) includes 20% of installed capacity (17,8 GW) sourced from renewable energy by 2030 to deliver 10% of the supply (DoE, 2014). These measures are in line with South Africa's Integrated Resource Plan (IRP) for 2030, which plans for a 34% reduction in carbon dioxide (CO₂) emissions and a 64% reduction in water usage (Eskom, 2014).

The National Energy Regulator of South Africa (NERSA) introduced a competitive bidding process for Independent Power Producers (IPPs) to award long-term Power Purchase Agreements (PPAs) (CSIR, 2015). This process requires IPPs seeking a PPA, to bid a tariff price for energy generated for the national grid (CSIR, 2015). Eskom guarantees the purchase of the power generated from IPPs and distributes it on to the national grid (DoE, 2014).

The Clean Development Mechanism (CDM) is an innovative market mechanism, which provides investors of carbon-reducing projects in developing countries the opportunity to generate financial resources and carbon emission reductions (CERs) from an open carbon market (UN, 1998). For developing countries, the CDM is a channel for financial assistance and investments to promote sustainable development by means of technology transfer and the promotion of equity – the objectives of the United Nations Framework Convention on Climate Change (UNFCCC) (Goldemberg, 1998). Renewable energy projects in South Africa qualify for CDM financing where relevant CDM sustainability criteria (per Table 2,3 on page 96) are met. Renewable energy projects account for the majority (75,1%) of the 7655 projects registered in the CDM pipeline globally as at 31 July 2015 (UNFCCC, 2015). Despite Africa's potential for CDM projects, the CDM process has not been successfully adopted by Africa, which represents only 2,6% globally for developing countries (UNFCCC, 2015). CDM has not been successfully adopted by South Africa, which represents only 0,73% globally for developing countries, compared to China (49,16%) and India (20,61%) as at 31 July 2015 (UNFCCC, 2015). Despite the findings by Greene (2005), Jung (2006) and Greene (2006) that South Africa is an ideal candidate to host CDM projects, it continues to lag behind China, India, and Brazil.

The limited research conducted in the South African context, relevant to barriers and drivers for developers of greenfield renewable energy projects in South Africa, offered an opportunity to investigate three greenfield projects at the Eastern Cape windfarms (Metro, Kouga and Jeffreys Bay) in order to make recommendations in promoting CDM renewable energy projects in the region and potentially in South Africa.

The three windfarms are all greenfield CDM projects located in the Eastern Cape Province within a 100 km radius from Port Elizabeth. At the time of the interviews, all three windfarms had been commissioned (August 2013, July 2014 and March 2015) to generate power to the national grid. The installed capacity of each windfarm ranges from 138 MW (60 turbines), 80 MW (32 turbines) to 27 MW (9 turbines). The annual carbon emission reductions range from 420 000 tons, 30 220 tons to 80 000 tons (combined over the 20-year project lifetime, a total of 16 104 400 tons CO₂ emissions are avoided and approximately 18 billion litres of water saved). The projects represent investments ranging from R550 million, R2 billion to R3.4 billion. All three windfarms

have registered CDM Project Idea Notes (PINs) together with Project Design Documents (PDDs) with the Designated National Authority (DNA). Only one windfarm has been registered with the UNFCCC's CDM Executive Board (EB) after validation by the CDM's Designated Operational Entity (DOE).

2.2 Theoretical grounding

2.2.1 Climate change

Climate change is the most urgent challenge facing the planet today. The Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5) clearly states, "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems" (IPCC, 2014:2).

Anthropogenic greenhouse gas emissions have increased, driven largely by economic and population growth (IPCC, 2014). Their effects have been observed in the climate system and evidence suggests that GHGs have been the dominant cause of the observed global warming since the mid-20th century (IPCC, 2014).

The IPCC AR5 report highlights the challenge to contain global warming to below 2°C (IPCC, 2014). Strategies and actions should be implemented, which will create climate-resilient pathways for sustainable development (IPCC, 2014). Integrated responses relevant to energy planning and implementation could provide opportunities for building resilience, through reduced emissions and sustainable development (IPCC, 2014).

2.2.2 Towards Zero CO₂ emissions

The Renewable Energy Policy Network for the 21st Century (REN21), published the 10th annual edition of the Renewables 2015 Global Status Report, which illustrates the importance of a zero emissions energy sector (REN21, 2015). Despite the world's average annual 1,5% increase in energy consumption in recent years and average 3%

growth in Gross Domestic Product, carbon dioxide (CO₂) emissions in 2014 were unchanged from 2013 levels (REN21, 2015). The report findings state, “For the first time in four decades, the world economy grew without a parallel rise in CO₂ emissions” (REN21, 2015:17). Renewable energy and improved energy efficiency is key to limiting global warming and avoiding dangerous impacts from climate change (REN21, 2015).

The landmark “decoupling” of economic and CO₂ growth is due in large measure to China's increased use of renewable resources, and efforts by countries in the OECD to promote more sustainable growth – including increased use of energy efficiency and renewable energy (REN21, 2015). With a view to the successful outcome of the 21st Conference of the Parties (COP21) under the UNFCCC in December 2015, renewable energy could play a central role to mitigate the impacts of climate change and support the Sustainable Development Goals (SDGs), specifically SDG 7, on Sustainable Energy for All (SAIREC, 2015).

2.2.3 The Clean Development Mechanism (CDM)

The Kyoto Protocol sets out the framework of the CDM for developed countries to initiate carbon emission reduction projects in developing countries and receive certified emission reductions (CER) (Sterling and Waterford, 2004).

As illustrated in Figure 2,1 on page 75, the CERs may be used by developed countries to offset national emission reduction targets and, once the CERs have been registered, they can be traded. This mechanism affords developed countries greater flexibility to meet their emission targets and simultaneously transfer cleaner technology to developing countries (UNFCCC, 2014).

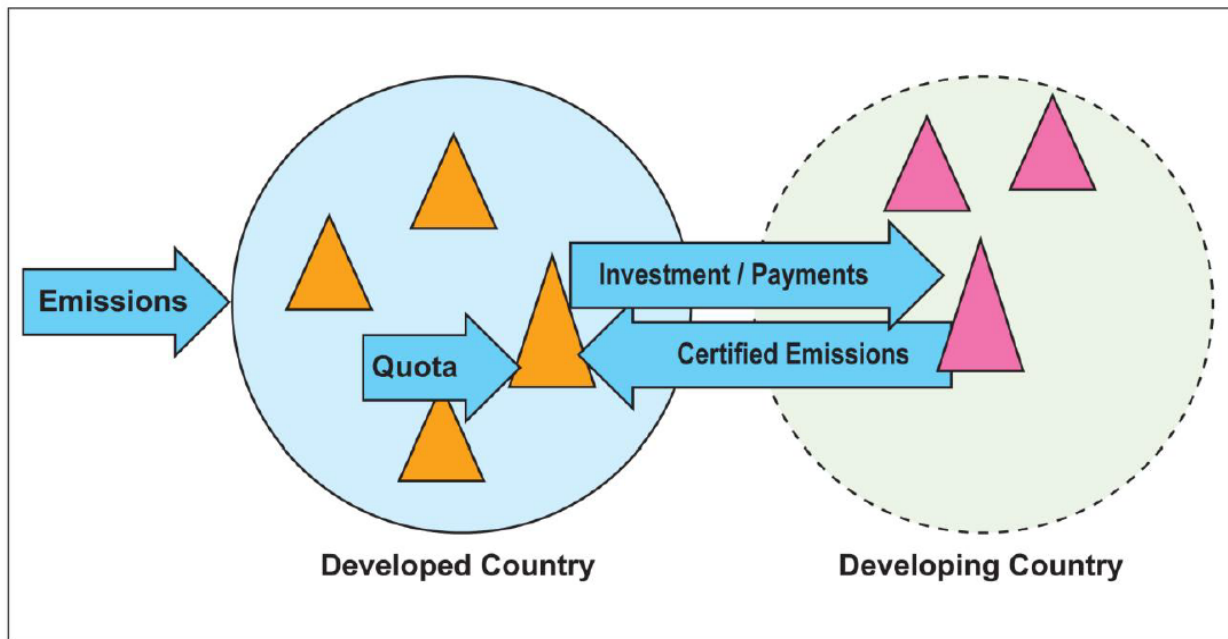


Figure 2,1: Schematic operation of CDM (DoE, 2015:5).

Through the CDM, a win-win situation is achieved by the host developing country receiving investments and clean technology assistance, while the developed country receives the CERs to offset their own emission targets (UNFCCC, 2014). Hence, the CDM contributes to the objective of the Kyoto Protocol and sustainability in the developing countries (UNFCCC, 2014).

The CDM was designed to meet a dual objective (UNFCCC, 2014):

- To help developed countries fulfill their commitments to reduce emissions.
- To contribute to developing countries progress in promoting sustainable development.

The CDM facilitates the compliance of developed countries with emission reduction commitments, while simultaneously facilitating sustainable development in host countries (Jung, 2006).

Renewable energy CDM projects have the potential to significantly contribute to the following sustainability criteria in developing countries (Del Rio, 2007):

- Economic sustainability with the transfer of financial, technological and intellectual capital.
- Social sustainability through intellectual capital creation, job creation and local community capacity building.
- Environmental sustainability through reducing environmental impacts.

The UNFCCC published data for the status of CDM projects as at 31 July 2015 is noted to support current literature findings on the barriers and drivers from a South African context.

Renewable energy project activities account for 75,1% of the 7655 projects registered in the CDM global registry, as at 31 July 2015 per Figure 2,2 below (UNFCCC, 2015).

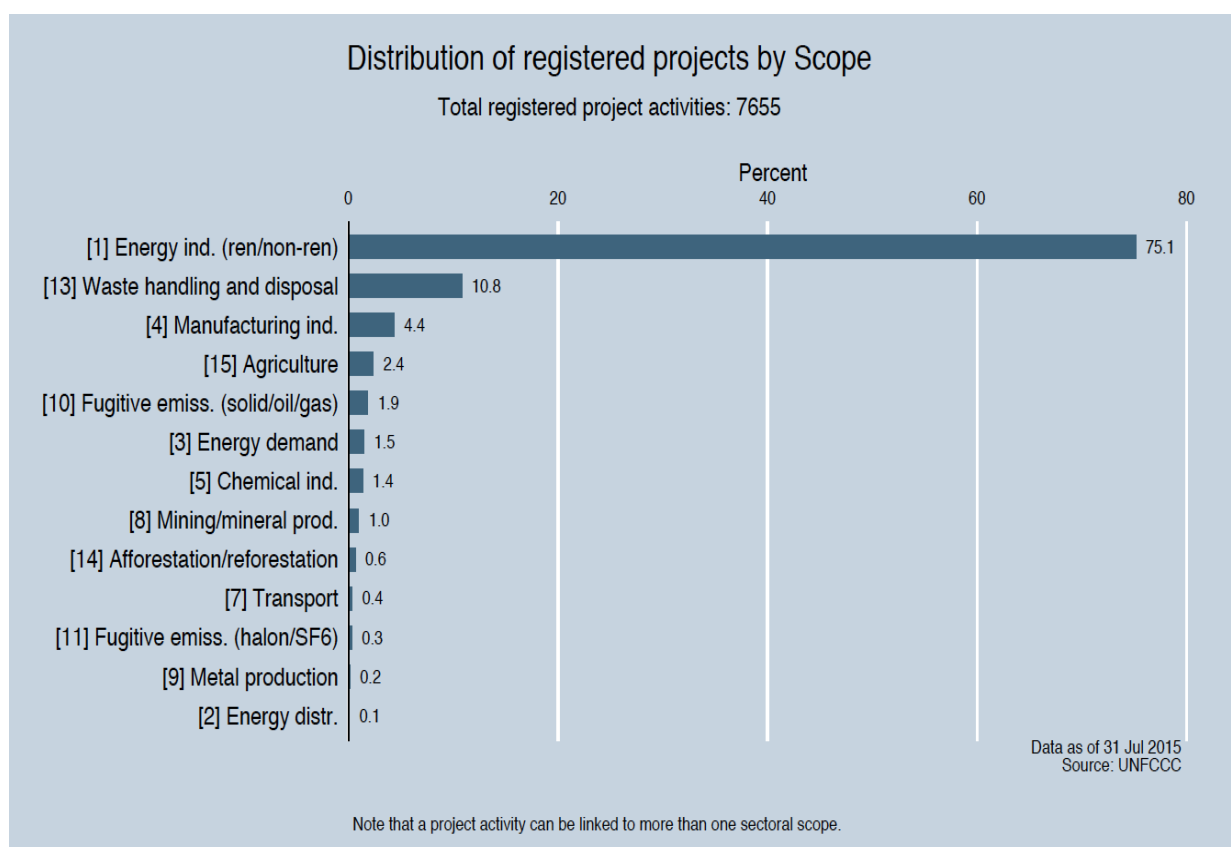


Figure 2,2: Distribution of registered CDM projects by scope (UNFCCC, 2015).

CDM has not been successfully adopted by Africa, which represents only 2,6% globally for developing countries as at 31 July 2015 per Figure 2,3 below (UNFCCC, 2015).

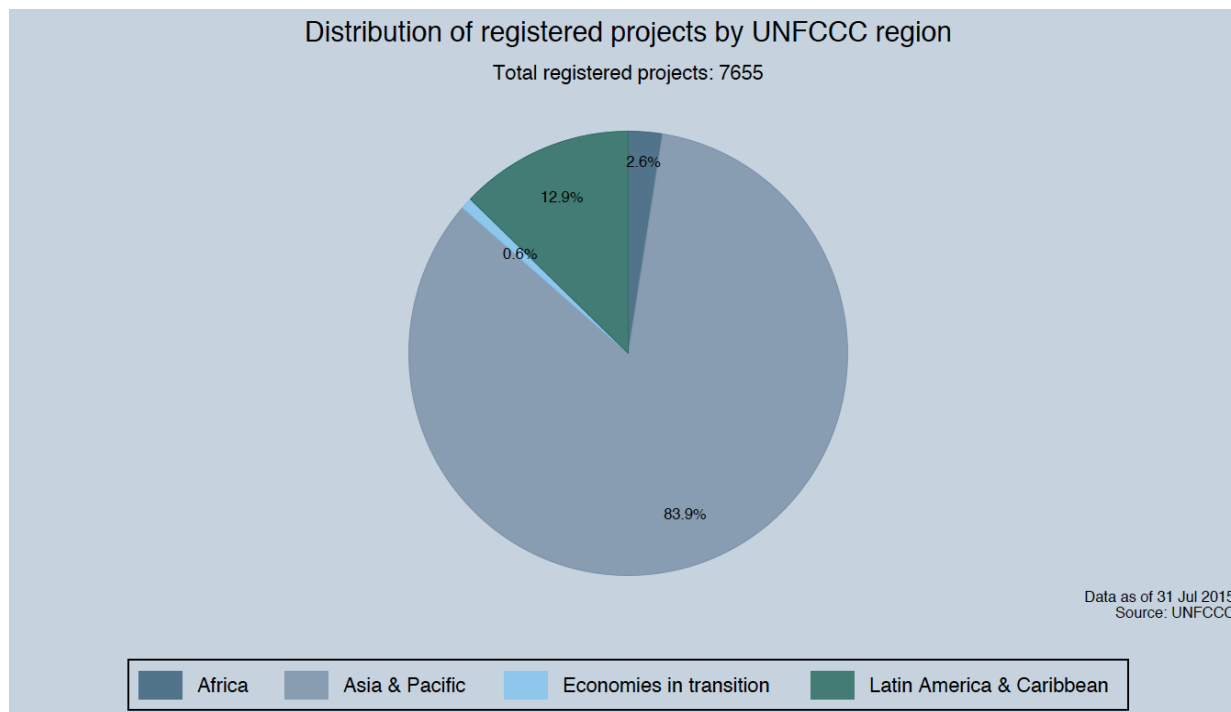


Figure 2,3: Distribution of registered CDM projects by region (UNFCCC, 2015).

CDM has not been successfully adopted by South Africa, which represents only 0,73% globally for developing countries, compared to China (49,16%) and India (20,61%) as at 31 July 2015 per Figure 2,4 on page 78 (UNFCCC, 2015). Despite the findings by Greene (2005), Jung (2006) and Greene (2006) that South Africa is an ideal candidate to host CDM projects, it continues to lag behind China, India, and Brazil.

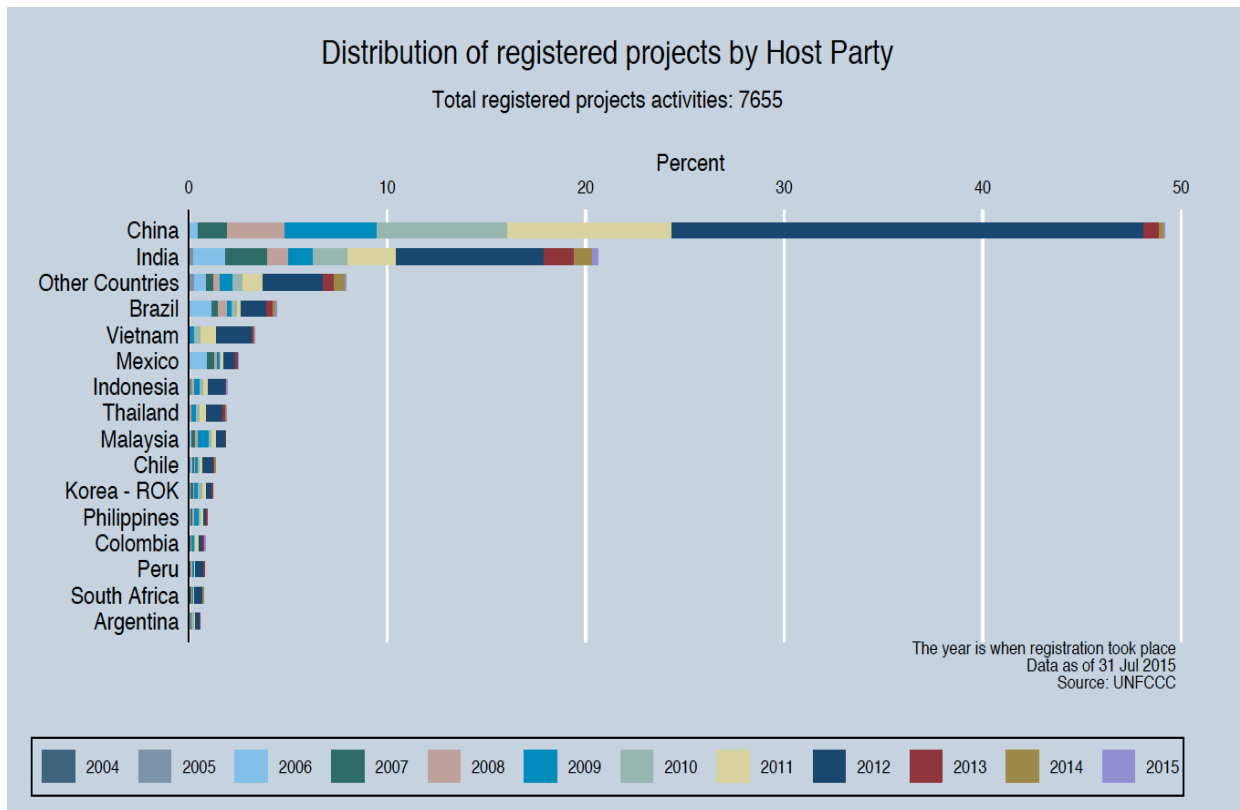


Figure 2,4: Distribution of registered CDM projects by host party (UNFCCC, 2015).

CDM distribution of expected CERs for South Africa, which represents only 1% globally for developing countries, compared to China (60,1%) and India (11,4%) as at 31 July 2015 per Figure 2,5 on page 79 (UNFCCC, 2015).

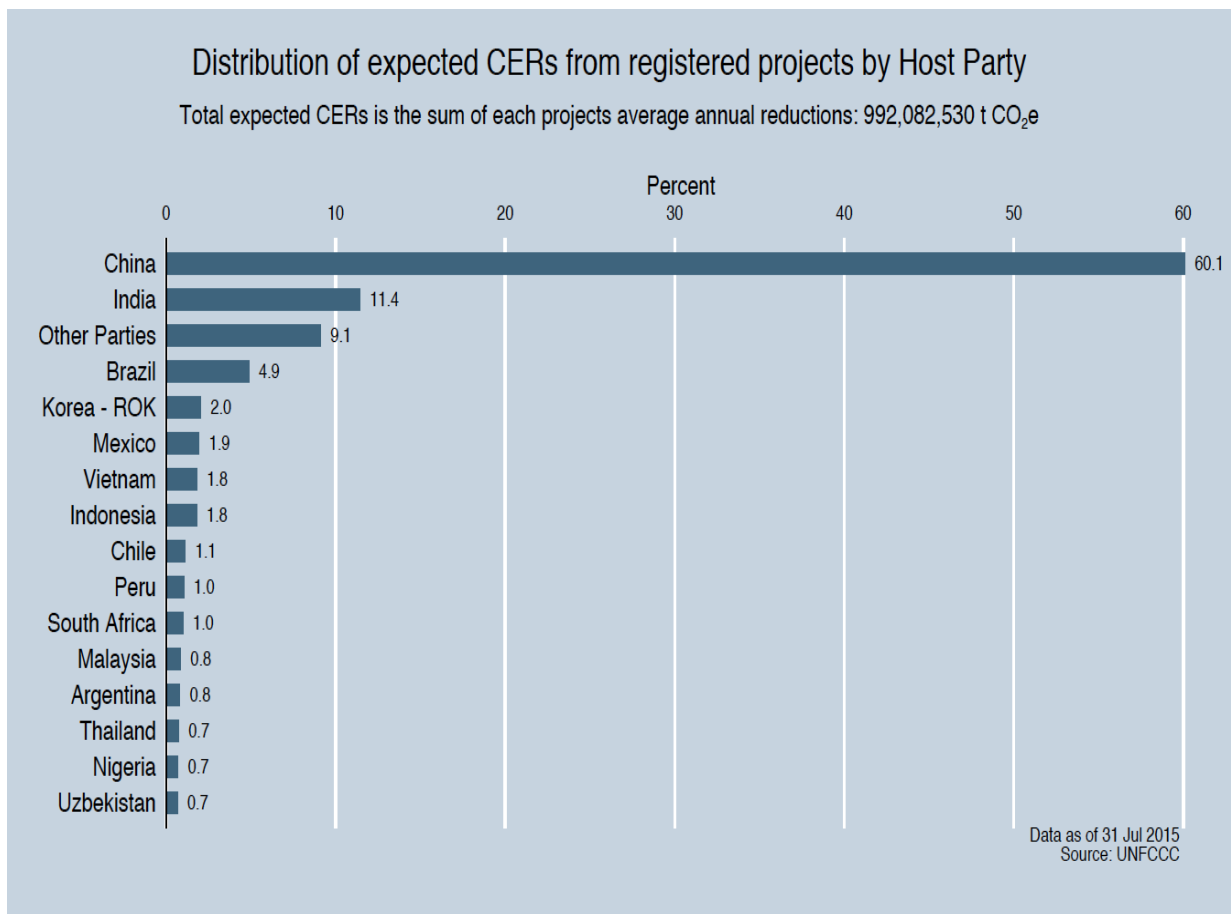


Figure 2,5: Distribution of expected CERs by host party (UNFCCC, 2015).

CDM projects registered and in the process of registering, show a sharp decline from 2013 onwards as at 31 July 2015 per Figure 2,6 below (UNFCCC, 2015).

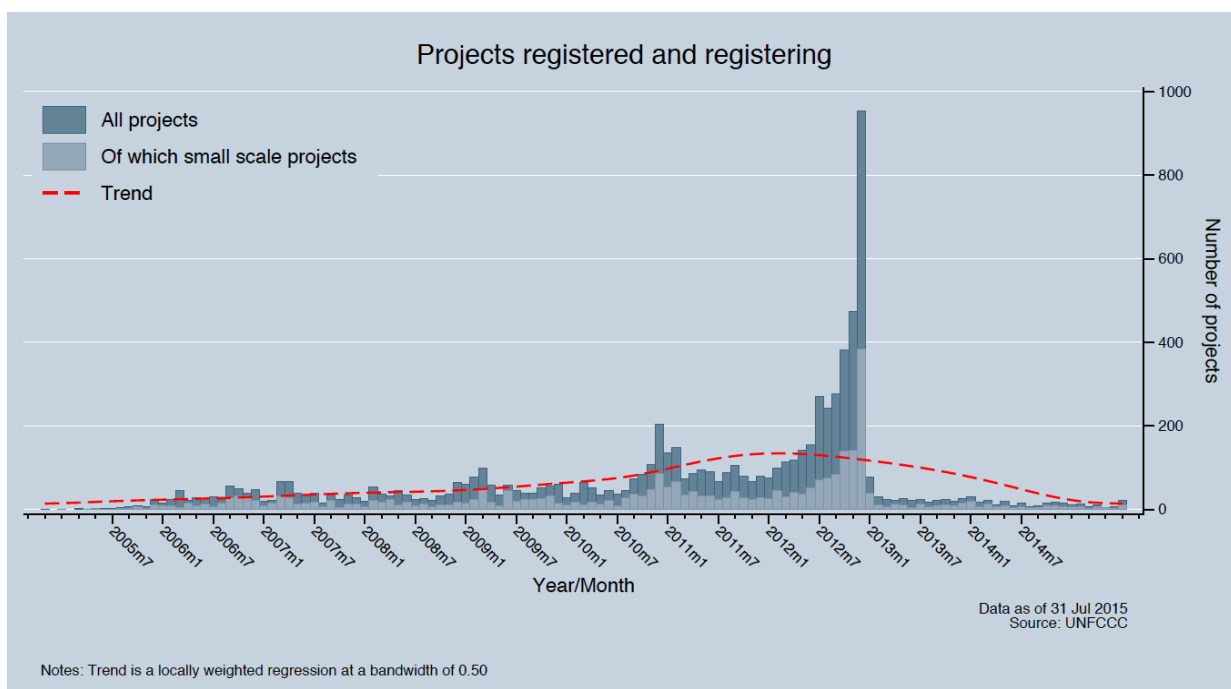


Figure 2,6: CDM projects timeline registered and registering (UNFCCC, 2015).

CDM projects registered and in the process of registering by host party, show a sharp decline inclusive of China and India from 2013 onwards as at 31 July 2015 per Figure 2,7 below (UNFCCC, 2015).

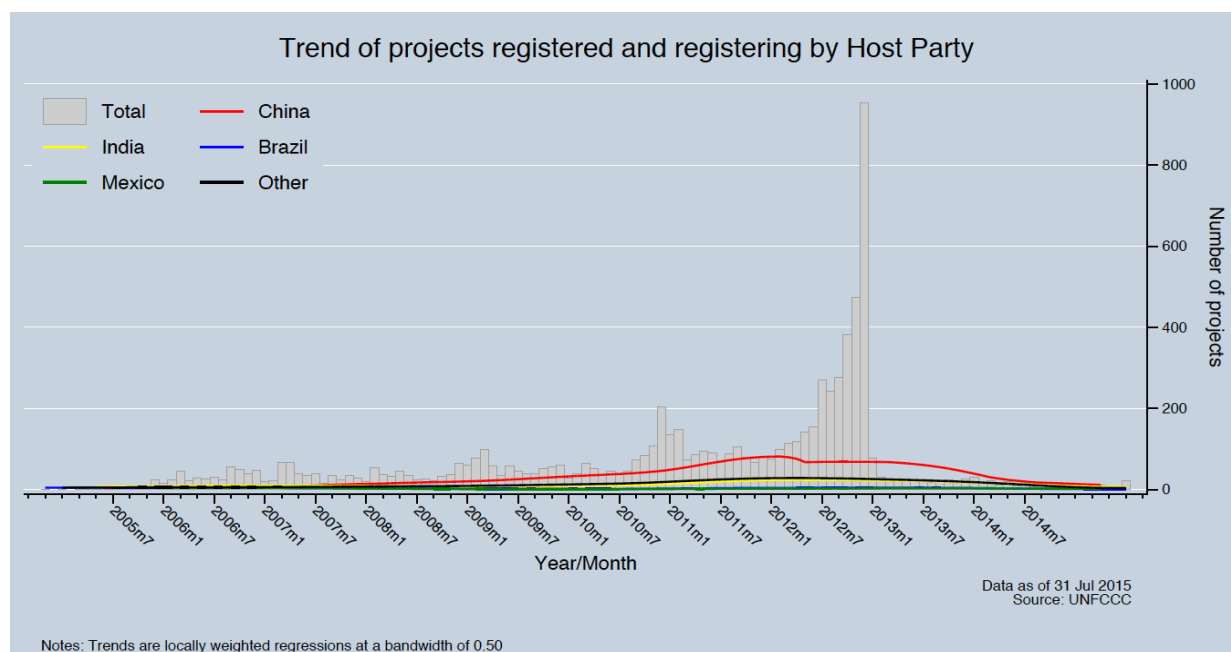


Figure 2,7: CDM projects timeline registered and registering by host party (UNFCCC, 2015).

2.2.4 The South African context

South Africa has been rated the 15th most attractive destination for investment in the renewable energy sector and could become a renewable energy leader in the African continent, according to the *Renewable Energy Country Attractiveness Index* of EY (Ernest and Young) (EY, 2015). South Africa has also qualified as an ideal candidate to host CDM projects (Greene, 2005; Jung, 2006; Greene, 2006).

South Africa's Integrated Resource Plan (IRP) aims to diversify the country's energy mix away from fossil fuels through a master plan to double national capacity from 41 000 MW to 89 532 MW by 2030 (DoE, 2014). Guided by the Constitution, South Africa ratified the UNFCCC on 21 August 1997 and subsequently acceded to the Kyoto Protocol on 31 July 2002 by incorporating climate change considerations, promoting sustainability and the transfer of clean technology (DoE, 2014 and Eskom, 2014).

In the last three years, the South African energy sector has developed as a leading destination for foreign investment in renewable energy, which is due to the successful introduction of the country’s pioneering Renewable Energy Independent Power Producers Procurement Programme (RE-IPPPP) (DoE, 2014).

After three bidding rounds, see below (Figure 2,8), 66 projects have reached the approval stage and 47 power purchase agreements (PPAs) totaling 2450 MW have been signed off and guaranteed (DoE, 2014).

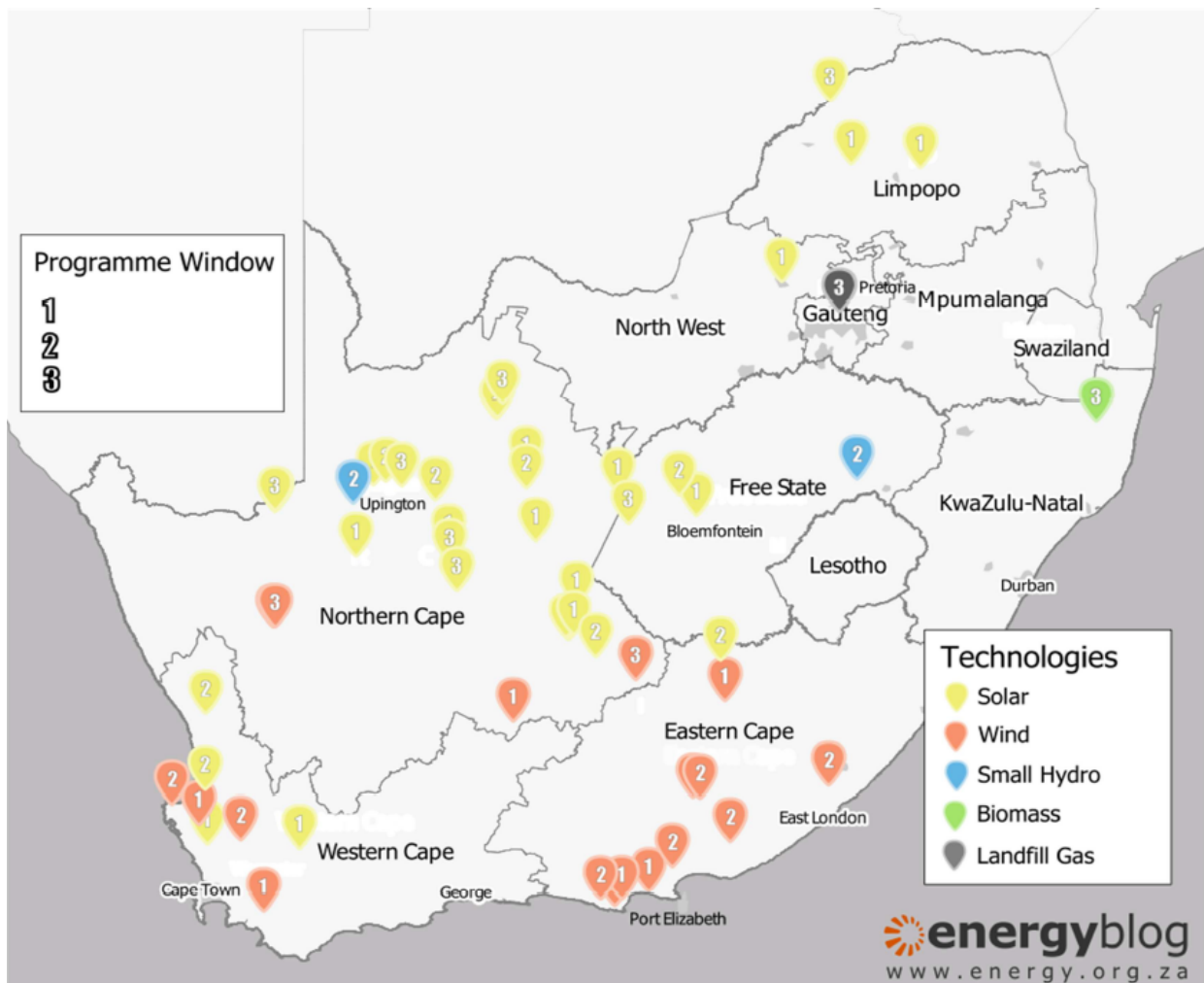


Figure 2,8: Map of approved RE IPPPP projects in SA after three bid windows (Energy Blog, 2015).

The RE-IPPPP has been applauded for the successful implementation of a regulatory framework, with strict qualification criteria focused on economic development and community ownership (Baker *et al*, 2015). All of these characteristics provided the

necessary positive investment signals to renewable energy developers (Eberhard, 2013).

Renewable energy investment shifted focus on developing countries (Lema *et al*, 2012), with South Africa as a primary beneficiary (UNEP/BNEF, 2014). As reflected on Table 2,1 below, the levelised cost of solar PV decreased by 68% while wind experienced a 42% decrease in cost between rounds 1 and 3 (Baker and Wlokas, 2015).

Table 2,1: Price caps and average REIPPPP rounds 1–3 (Baker and Wlokas, 2015:4).

<i>Tariffs</i>	<i>Round 1 bid cap (Aug 2011)</i>	<i>Round 1 average bid (per kWh)</i>	<i>Round 2 average bid (per kWh)</i>	<i>Round 3 average bid (per kWh)</i>	<i>Percentage drop Rounds 1-3</i>
Wind	R1.15	R 1.14	R 0.90	R 0.66	42%
Solar PV	R2.85	R 2.76	R 1.65	R 0.88	68%
CSP	R2.85	R 2.69	R 2.51	R 1.46 ³	

Under the RE-IPPPP, the commissioned projects sell the energy generated to Eskom’s national grid under a 20-year, government guaranteed Power Purchase Agreement (PPA) (DoE, 2014). The RE-IPPPP is critical to the South African government’s commitment to achieve a green economy, through supporting key national documents in the form of the Green Economy Accord, the National Development Plan and the New Growth Path (Tait, Wlokas and Garside, 2013).

Against this theoretical grounding, the following sections focus specifically on the barriers and drivers to the implementation of CDM and RE-CDM projects.

In this research, the terms *barrier* and *driver* are informed by the themes from Beck and Martinot (2004:3) who define a barrier as a “condition that prevents investment from occurring” and a driver as “conditions that promote and support investments”.

CDM and RE-CDM are subject to numerous barriers and drivers, as described in the literature. These identified factors formed the theoretical basis of this study, upon which

the experiences and perceptions of the RE-CDM developers for this study are based.

These factors, which enlist the experience of the three Eastern Cape windfarm developers, sought to explore the mechanisms and approaches to mitigating barriers and enhancing drivers to provide a framework for improved CDM renewable energy investment implementation in the Eastern Cape and South Africa

Table 2,2: CDM barriers, RE-CDM barriers and RE-CDM drivers, on page 84, is a condensed view of the main themes of the barriers and drivers identified from the literature, with corresponding meaning and contributing factors illustrating the main ideas.

Table 2,2: CDM barriers, RE-CDM barriers and RE-CDM drivers

CDM Barriers	Meaning	Contributing Factors
Additionality Requirements	Projects, which would not have been undertaken in the absence of CERs, are eligible to be registered as a CDM (Stiles, 2006).	Project developers' perception of business-as-usual factors and the possible disqualification from CERs registration.
Transaction Costs	Transaction costs as a profitability barrier to implementing CDM projects (Del Rio, 2007). High fixed cost perceptions discourage the implementation of smaller CDM projects by potential developers (Del Rio, 2007).	CDM methodology costs relating to search, negotiation, baseline determination, approval, validation, registration, monitoring, verification, enforcement, transfer and registry (Del Rio, 2007).
Lack of Awareness	A lack of information and knowledge on CDM projects (Ellis and Kamel, 2007).	Factors relating to ignorance of policy, technology, financial and legal aspects to clean energy development.
Complex CDM Project Cycle	Factors due to the complexity and uncertainty of the CDM approval methodology (Stiles, 2006).	CER registration and approval requirements.
RE-CDM Barriers	Meaning	Contributing Factors
Competitiveness of Renewable Energy	The comparative disadvantages of RE-CDM projects due to small amounts of CERs (Wang and Chen, 2010).	RE-CDM CERs revenue vs other CDM CERs revenue; Return on Investment perceptions.
Economic and Financial	Factors influencing the investment decision making process by potential developers (Beck and Martinot, 2004).	CER market price risks; High transaction, technology, finance and cost of capital; Project life cycle; Risk vs Return; Multiple role players.
Implementation	Factors relating to the execution of projects (Pegels, 2010).	Lack of infrastructure; Project management problems; Operational technology problems.
RE-CDM Drivers	Meaning	Contributing Factors
Technology Transfer	Factors promoting sound clean energy technologies from developed to developing countries (UNFCCC, 2011).	Sustainable energy solutions; Advanced technology and skills development.
Financial Benefits	Foreign Direct Investment and Revenue from CERs encourages support for CDM investment projects (Del Rio, 2007).	Profitability benefits; Financial risks reduced; Access to financing.
Promotion of RE-CDM Projects	Factors promoting renewable energy to support sustainable development and strategic opportunities coupled with abundant renewable energy resources in SA (Pegels, 2010).	South Africa's support for renewable energy through the IRP, PPAs and IPPs.

2.3 CDM barriers

The following CDM barriers are identified from the literature as applicable to the overall CDM methodology. The CDM project additionality requirement stipulates that only GHG-reduction projects, which would not have been undertaken in the absence of CERs, are eligible to be registered as CDMs (Stiles, 2006). In terms of South Africa's Integrated Resource Plan, more renewable energy projects are envisaged as business-as-usual and hence present the possibility of future disqualification from CER registration due to the CDM additionality requirement (Greene, 2006). The transaction costs incurred with CDM projects often discourage the implementation of smaller renewable energy projects (Del Rio, 2007). According to Del Rio (2007), the profitability of smaller CDM projects is reduced by the high fixed costs associated with the CDM methodology. The lack of awareness amongst potential CDM stakeholders (Ellis and Kamel, 2007) and the complex CDM project cycle (Stiles, 2006), present further barriers for potential investors looking for renewable energy opportunities.

2.3.1 Additionality requirements

The CDM project additionality requirement stipulates that only GHG-reduction projects, which would not have been undertaken in the absence of CERs, are eligible to be registered as CDMs (Stiles, 2006). According to Greene (2006), should a project be classified a business-as-usual project, or if it is required in terms of the host country law, then such projects are disqualified from CER registration because they are not additional in nature. This concept creates a rather perverse incentive for developing host countries not to introduce policies and measures to mitigate climate change (Worthington, 2005). In terms of South Africa's Integrated Resource Plan, more renewable energy projects are envisaged and hence present the possibility of disqualification from CER registration due to the CDM additionality requirement applied as business-as-usual.

2.3.2 Transaction costs

The transaction costs associated with CDM projects, discourage the implementation of smaller renewable energy projects (Del Rio, 2007). The profitability of smaller CDM projects is reduced by the high fixed costs associated with the CDM methodology process (Del Rio, 2007). A significant amount of funding is tied up in the initial phases of developing a CDM project and any delay in issuing CERs causes risk and hence the upfront transaction costs are a major hampering factor to the development of CDM projects (Turner and Varughese, 2013).

2.3.3 Lack of awareness

Ellis *et al* (2007) identified a lack of information and knowledge of the CDM as barriers preventing stakeholders from adopting the CDM. Greene (2005) confirms this lack of awareness through the ignorance of policy, technology, financial and legal aspects of the CDM.

2.3.4 Complex CDM project cycle

The complexity and uncertainty of the process causes the most straightforward projects to flounder along the way (Stiles, 2006). This is attributable to the CDM methodology, which must be followed in order to register the PDDs with the CDM Executive Board for approval and CER issuance (UNFCCC, 2015).

CDM projects have to pass through a project cycle as illustrated in Figure 2,9 below (DoE, 2015).

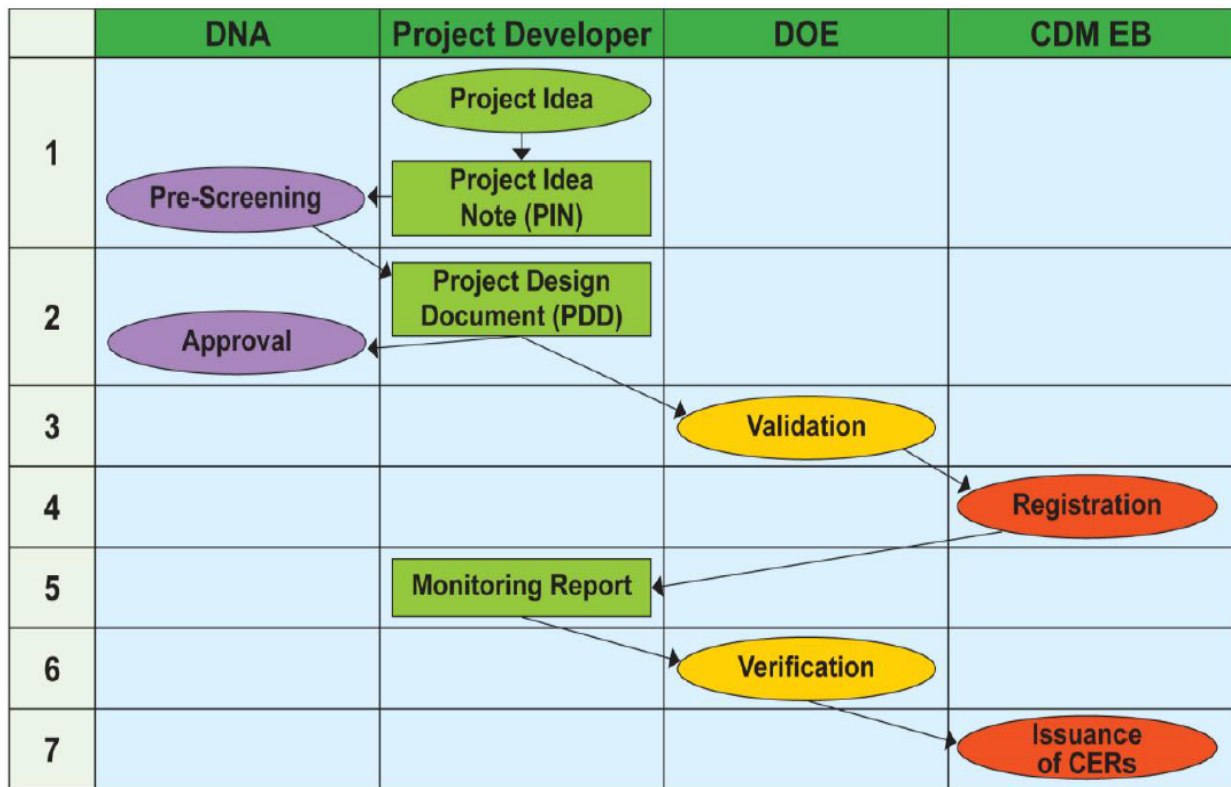


Figure 2,9: CDM project cycle (DoE, 2015:6).

A CDM project starts with the submission of a Project Idea Note (PIN) by the project developer. This document provides a brief overview of the project with information on emission reduction forecasts, the additionality, the project contributions to sustainable development and an overview of the financials of the project (DoE, 2015).

The next step is the development of the Project Design Document (PDD), which contains a detailed description of the project. The details include: the approved baseline and monitoring methodology; the term of the project and the crediting period; information on potential environmental impacts and stakeholder comments (DoE, 2015). The PDD is the final document prepared for the validation by the DOEs, host country approval, registration and verification of the CDM project by the CDM EB for the final issuance of CERs (DoE, 2015).

2.4 RE-CDM barriers

The following additional barriers are identified from the literature as specific to the experience of the renewable energy sector's CDM developers. The comparative disadvantages of RE-CDM projects generating small amounts of CERs presents barriers to RE-CDM developers' Return on Investment (ROI) perceptions (Wang and Chen, 2010). The economic and financial factors play a significant role in the investment decision process (Beck and Martinot, 2004). The market trade price of the CERs earned by projects may fluctuate and affect the revenue stream generated for the RE-CDM project (Del Rio, 2007). Additional risk factors associated with high interest rates, scarcity of investment capital and project life cycles present further barriers to RE-CDM developers in South Africa (Pegels, 2010). The implementation of RE-CDM projects is further hampered by operational and project management problems (Stigler, 2009). The lack of infrastructure in parts of South Africa presents challenges in terms of the connectivity to the grid and communications by project developers (Pegels, 2010).

2.4.1 Competitiveness of renewable energy

The comparative disadvantages of RE-CDM projects generating small amounts of CERs (one prevented ton of CO₂ receives one CER) as compared to other CDM projects (one prevented ton of HFC-23 receives 11 700 CERs) present barriers to RE-CDM developers Return on Investment (ROI) perceptions (Wang and Chen, 2010). The ratio of high revenues from a smaller number of HFC projects and low revenues from a larger number of renewable energy projects signifies a major shortcoming for the deployment of renewable energy CDMs (Schroeder, 2009). While it makes sense to phase out high climate destructive gases like HFC-23, the potential for RE-CDM as drivers for a transition to a low carbon emission economy is not fully tapped (UNEP, 2014).

According to Pearson (2007), RE-CDM projects have an unfavourable financial profile in that they are capital intensive, providing low rates of return and generating small volumes of carbon credits. Ellis *et al* (2007) observed in a CDM stocktake paper that, if a renewable energy projects viability is dependent on carbon credits, it may actually be

adjudged even more risky. Therefore literature suggests that high emission CDM projects, rather than renewable energy CDM projects, are more attractive in the CER trade market.

2.4.2 Economic and financial factors

The economic and financial factors play a significant role in the investment decision-making process of renewable energy projects (Beck and Martinot, 2004). According to Del Rio (2007), the market trade price of the CERs may fluctuate and affect the forecasted revenue stream of the RE-CDM project. Additional risk factors associated with high interest rates, scarcity of investment capital, debt finance and project life cycles present further barriers to RE-CDM project developers in South Africa (Pegels, 2010). Since the CERs are only tradable once the CDM project has received final approval from the CDM EB, the high volatility of the carbon market adds risk to any CDM project (Turner *et al*, 2013).

Point Carbon predicted that CER prices would drop from €2 to 50 cents. On 12 December 2012 CER prices reached another record low of 31 cents (Point Carbon, 2012). Figure 2,10 on page 90, indicates the potential supply of CERs from the end of the Kyoto Protocols 1st commitment period 2012 to 2020 (UNFCCC, 2015).

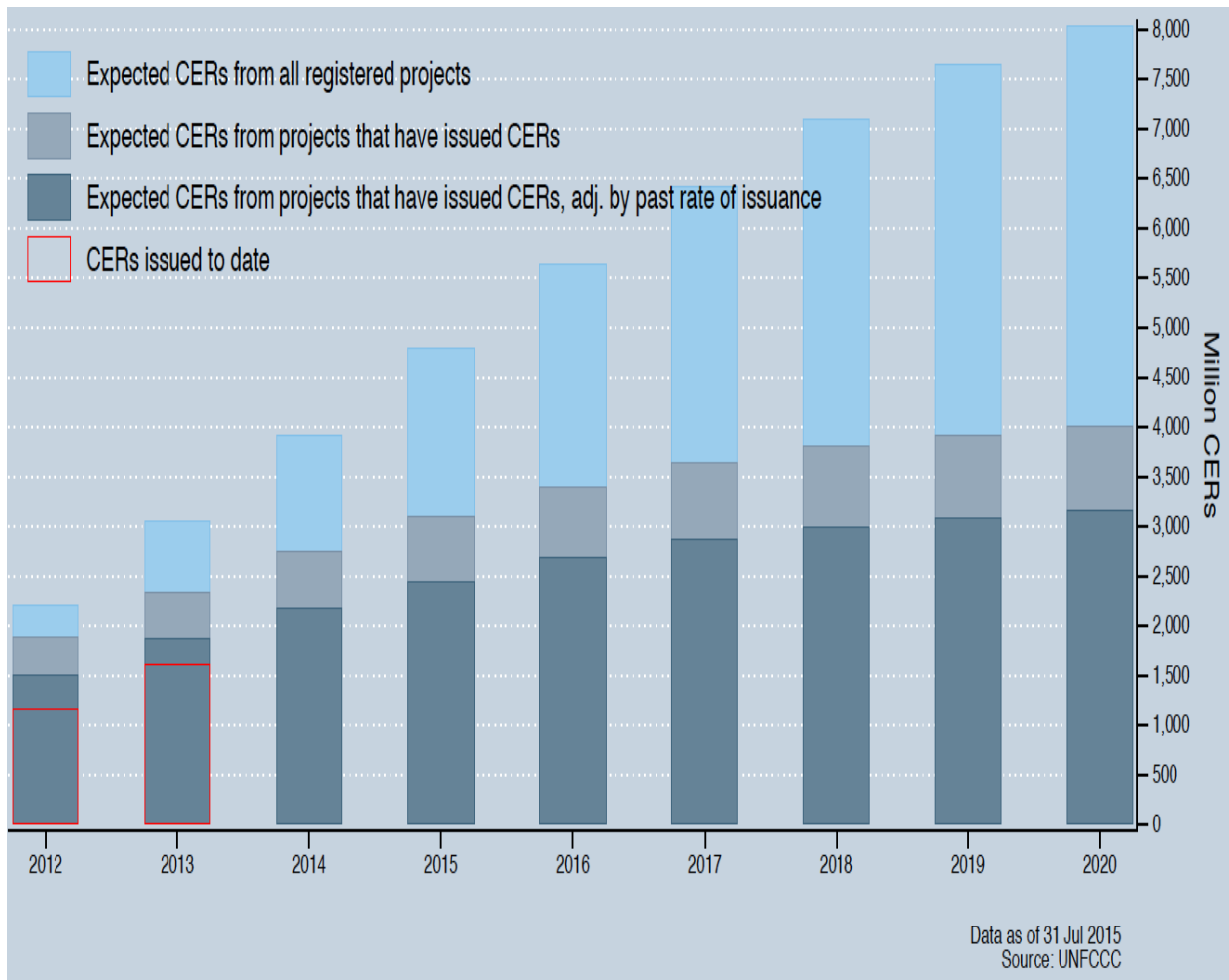


Figure 2,10: Potential supply of CERs from end of KP 1st CP to 2020 (UNFCCC, 2015).

2.4.3 Implementation

Despite the CDM renewable energy projects potential in South Africa, the designated national authority (DNA) for CDM in South Africa reports good intentions through the registration of PINs, but very poor registration of the PDDs (DoE, 2015). According to the DNAs statistics for CDM projects portfolio at 19 March 2015 per Figure 2,11 on page 91, there have been 360 CDM projects submitted to the DNA, made up of 222 Project Idea Notes (PINs) and 138 Project Design Documents (PDDs). Of the 138 PDDs, the CDM Executive Board registered 90 as CDM projects, of which only 12 have been verified for CER issuance. Only 48 of the 78 awaiting CER issuance are at the final stages of the project cycle – CDM EB approval, validation stage for CERs (DoE, 2015).

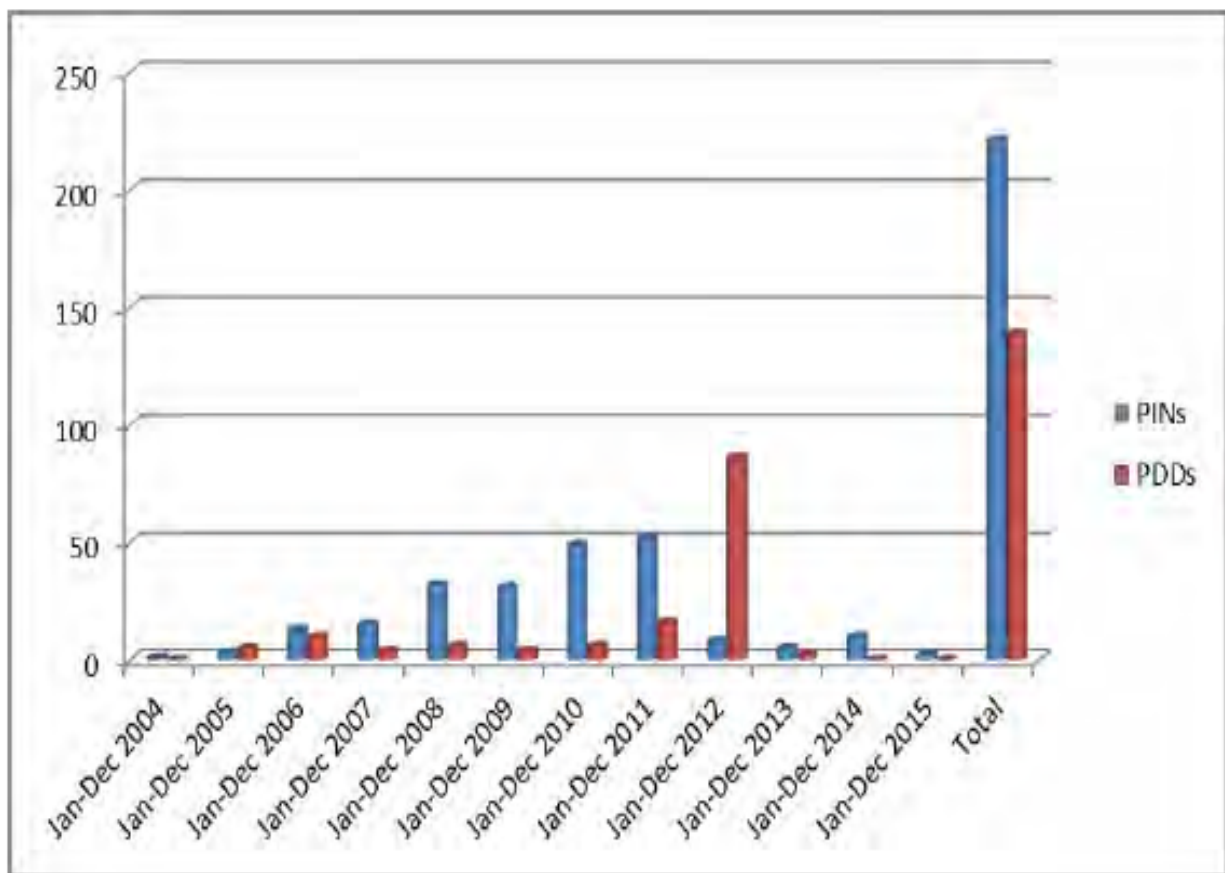


Figure 2,11: DNA CDM project portfolio of PINs and PDDs at 19 March 2015 (DoE, 2015).

According to Greene (2006) and Jung (2006), effective CDM implementation at the DNA level are an absolute prerequisite for CDM projects. The implementation of RE-CDM projects through the DNA in South Africa is further hampered by project management problems in dealing with third-party international CDM PDD consultants (Pegels, 2010). The lack of infrastructure in undeveloped parts of South Africa presents challenges in terms of the renewable energy projects connectivity to the grid and subsequent dependence on Eskom (Pegels, 2010).

2.5 RE-CDM drivers

The following RE-CDM drivers from the literature identify the opportunities in promoting and supporting RE-CDM developments. The transfer of environmentally sound technologies from developed to developing countries, as stated by Article 10 of the

Kyoto Protocol, may apply to South Africa and allow RE-CDM developers in South Africa access to sustainable energy solutions and skills development (UNFCCC, 2011). The financial benefits from Foreign Direct Investment (FDI) and the revenue generated from the CERs attract potential RE-CDM developers (Del Rio, 2007). The increased profitability and reduced financial risks encourage support from RE-CDM developers (Del Rio, 2007). In South Africa, renewable energy supports sustainable development through the strategic opportunities presented by South Africa's Integrated Resource Plan (IRP), Power Purchase Agreements (PPAs) and Independent Power Producers (IPPs) (DoE, 2013). A favorable RE-CDM project development and investment climate is promoted, coupled with the abundant renewable energy resources (Pegels, 2010).

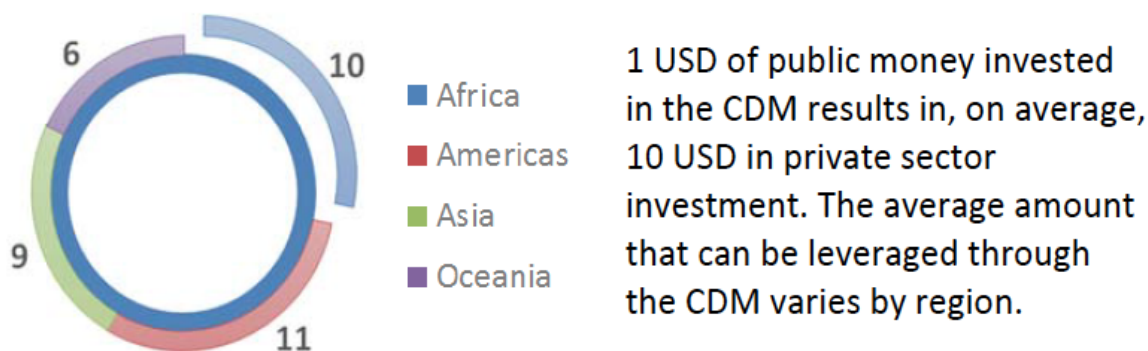
2.5.1 Technology transfer

The transfer of clean energy technologies from developed to developing countries, as stated by Article 10 of the Kyoto Protocol, will allow RE-CDM developers in South Africa access to sustainable energy solutions and skills development (UNFCCC, 2011). The CDM fosters the transfer of technology into undeveloped countries, which speeds up their path to economic growth (Dechezlepre, Glachant and Meniere, 2009). A study by Schneider, Holzer and Hoffmann (2008) confirms that the CDM process under the UNFCCC, supports technology transfer. The CDM is aimed at changing the high emission energy sector of the developing countries through a market-based mechanism (Frankel, 2007).

2.5.2 Financial benefits

The financial benefits from Foreign Direct Investment (FDI) and the revenue generated from the CERs attract potential RE-CDM developers (Greene, 2005). The increased profitability and reduced financial risks encourage support from RE-CDM developers (Del Rio, 2007). The profitability of CDM can be viewed as potentially positive or negative when trading carbon credits (Ellis *et al*, 2007).

The projects are primarily financed by resources outside the CDM and Figure 2,12 illustrates that the CDM has leveraged private investment 10 times the public funds allocated for CDMs in Africa (UNFCCC, 2014).



1 USD of public money invested in the CDM results in, on average, 10 USD in private sector investment. The average amount that can be leveraged through the CDM varies by region.

Number of dollars leveraged per public dollar spent on the CDM

The analysis was done on CDM activities that have issued certified emission reductions (CERs). It assumed an average CER price of 5USD used in project planning.

Figure 2,12: CDM Leverage factor (UNFCCC, 2014).

Analyzing CDM CERs by sector indicates that the multiplier effect is significantly greater in sectors more closely associated with having more significant sustainable development co-benefits (UNFCCC, 2014). Figure 2,13 illustrates that CDM investment in renewable energy projects leverages investment 18 times the price of CERs purchased.

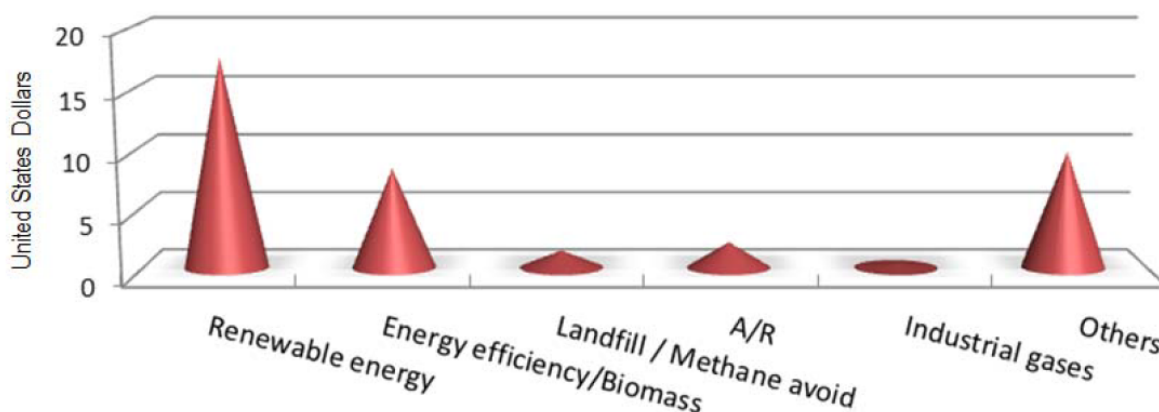


Figure 2,13: CDM Leverage relative to CERs purchased (UNFCCC, 2014).

Figure 2,14 indicates that the CDM has a significant pipeline of projects ready for deployment, given a meaningful CER price signal. The CDM CERs currently available and the potential reductions from registered CDM projects could close up to 30% of the current cumulative emissions gap to 2020 (UNFCCC, 2014).

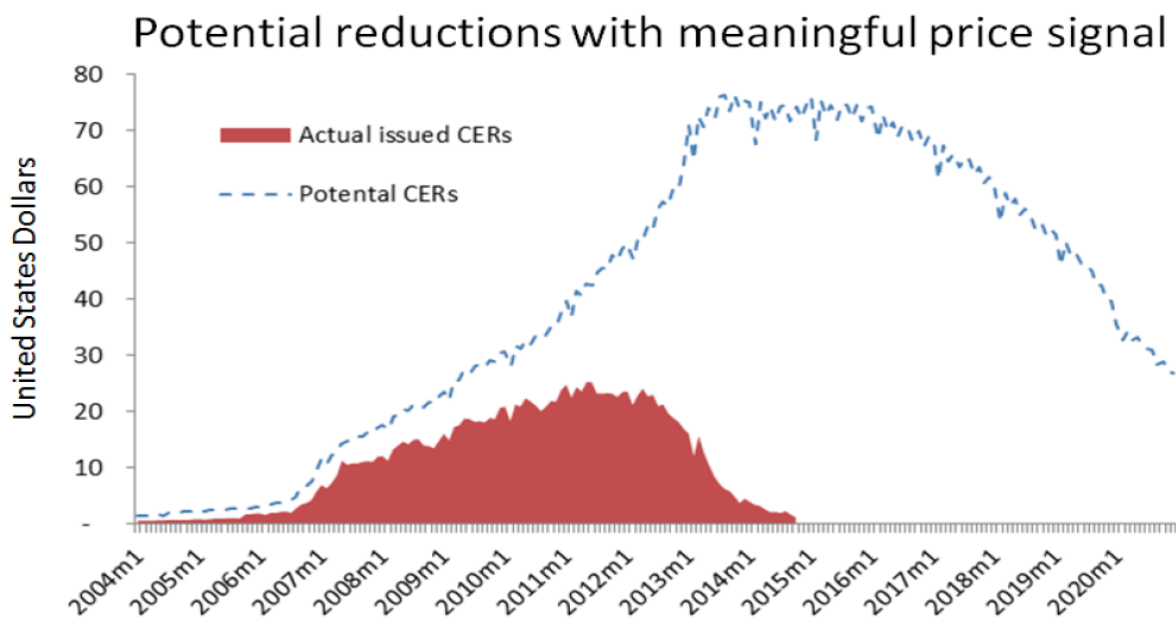


Figure 2,14: CDM potential emission reductions (UNFCCC, 2014).

The UNFCCC secretariat shows that with a US\$5 floor price in the period 2015–2020, CDM could leverage more than US\$120 billion in additional green investment and contribute to the elimination or prevention of 1.8 billion tons of CO₂ equivalent of GHGs. This represents a significant contribution to closing the emissions gap and financing transformation to renewable energy CDM projects. If the same level of investment were focused on the renewable energy sector, the leveraged rate of finance could be over US\$210 billion (UNFCCC, 2014). The initial capitalization of the Green Climate Fund is a significant step toward that goal and the CDM Executive Board encourages deploying resources through the CDM to scale up climate action (UNFCCC, 2015).

2.5.3 Promotion of RE-CDM projects

Developing host countries need a cleaner renewable energy path which supports the sustainability development goals of CDM, and Nelson (2004) identified RE-CDM projects as eligible CDM projects with procedures set to expedite approval and implementation by the CDM Executive Board (EB).

In South Africa, the renewable energy sector supports sustainable development through the strategic opportunities presented by South Africa's Integrated Resource Plan (IRP), Power Purchase Agreements (PPAs) and Independent Power Producers (IPPs) (DoE, 2015). According to Pegels (2010), this promotes a favorable RE-CDM project development and investment climate to compliment the abundant clean renewable energy resources.

The DNA in South Africa evaluates CDM projects according to the following stated sustainability criteria (DoE, 2014:2):

1. Economic – “Does the project contribute to national economic development?”
2. Social – “Does the project contribute to social development?”
3. Environmental – “Does the project conform to the National Environmental Management Act principles of sustainable development?”

In determining the answers to questions 1–3 the DNA is informed by consideration of the project indicators provided in Table 2,3 on page 96 (DoE, 2014).

Table 2,3: CDM Sustainability criteria applied by the DNA (DoE, 2014:3).

	Criteria	Indicator
Environmental	Impact on local environmental quality	<ul style="list-style-type: none"> • Impact of the project on air quality • Impact of the project on water pollution • Impact of the project on the generation or disposal of solid waste • Any other positive or negative environmental impacts of the project (such as impacts on noise, safety, visual impacts, or traffic)
	Change in usage of natural resources	<ul style="list-style-type: none"> • Impact of the project on community access to natural resources • Impact of the project on the sustainability of use of water, minerals or other non renewable natural resources • Impact of the project on the efficiency of resource utilisation
	Impacts on biodiversity and ecosystems	<ul style="list-style-type: none"> • Changes in local or regional biodiversity arising from the project
Economic	Economic impacts	<ul style="list-style-type: none"> • Impact of the project on foreign exchange requirements • Impact of the project on existing economic activity in the area • Impact of the project on the cost of energy • Impact of the project on foreign direct investment
	Appropriate technology transfer	<ul style="list-style-type: none"> • Positive or negative implications for the transfer of technology to South Africa arising from the project • Impacts of the project on local skills development • Demonstration and replication potential of the project
Social	Alignment with national provincial and local development priorities	<ul style="list-style-type: none"> • How the project is aligned with provincial and national government objectives • How the project is aligned with local developmental objectives • Impact of the project on the provision of, or access to, basic services to the area • Impact of the project on the relocation of communities if applicable • Contribution of the project to a any specific sectoral objectives (for example, renewable energy targets)
	Social equity and poverty alleviation	<ul style="list-style-type: none"> • Impact of the project on employment levels? (specify the number of jobs created/lost; the duration of time employed, distribution of employment opportunities, types of employment, categories of employment changes in terms of skill levels and gender and racial equity) • Impact of the project on community social structures • Impact of the project on social heritage • Impact of the project on the provision of social amenities to the community in which the project is situated • Contribution of the project to the development of previously underdeveloped areas or specially designated development nodes
General	General project acceptability	<ul style="list-style-type: none"> • Are the distribution of project benefits reasonable and fair?

2.6 Potential CDM strategy to mitigate barriers and enhance drivers

In support of the research goals, the following mechanisms to mitigate barriers and enhance drivers are sought from the literature to provide a framework for improved CDM renewable energy project investment in the Eastern Cape and potentially for South Africa.

2.6.1 South African Tax measures and CER Futures Markets

2.6.1.1 Tax Exemption for CER revenue

The South African Government, through the South African Revenue Service (SARS), has introduced a tax exemption for CER revenues earned to promote RE-CDM projects (Pegels, 2010).

2.6.1.2 Risk mitigation strategy for CER volatility

A risk mitigation strategy to absorb the fluctuations of the CER prices through negotiating an option with a trader to enter into forward sales or futures contracts (Turner *et al*, 2013).

2.6.2 UNFCCC secretariat's CDM Business Plan 2014–2015

2.6.2.1 Ensuring the success of the CDM

The current demand for CERs under the CDM is low and a reasonable number of developed countries are not currently participating in the Kyoto Protocol post-2012 (UNFCCC, 2015). Demand at this stage is not sufficient to meet the supply capabilities of the CDM and registrations declined significantly in 2013 to 2014 and potentially beyond (UNFCCC, 2015). A trend has developed whereby governments and the private sector are interested in using market-based mechanisms to attain carbon neutrality and sustainability. The potential of the CDM to support the mitigation of climate change and sustainability is critical to support collaborative measures by all parties (UNFCCC, 2014).

The CDM EB has established and stated the following goals to enhance the CDM within this potential growth context (UNFCCC, 2015:6):

- Goal 1: “Enable the implementation of mitigation activities to ensure the trusted and transparent certification of their outcomes”.
- Goal 2: “Nurture policies to broaden demand and participation for CERs in the CDM”.

2.6.2.2 Activities to nurture demand for the CDM and CERs

The UNFCCC's secretariat will engage in the following activities to nurture demand for the CDM and CERs (UNFCCC, 2015):

- Engaging with inter-governmental organisations (IGOs) which serves multiple purposes, including building understanding and support for the use of the CDM and its CERs beyond its use as an offset mechanism.
- Supporting the implementation of the United Nations Climate Neutral Strategy, which is supported by the United Nations Environment Programme (UNEP). This initiative has met with a positive response and the number of United Nations organisations that have declared that they will become climate neutral has more than doubled since a year ago, with an estimated 18 to 20 United Nations organisations expected to be using CERs to become climate neutral by COP21.
- Responding to requests for information on the potential of using the CDM within a carbon taxation system to support domestic mitigation projects.
- Supporting the new South Korean emissions trading system by converting CDM project CERs into Korean carbon trading units on the South Korean emissions trading system, through the CDM voluntary cancellation procedure.
- Developing and promoting the voluntary cancellation tool. The expected impact is a significant increase in voluntary cancellations of CERs by the end of 2015, as well as increased recognition of the potential of the CDM (UNFCCC, 2015).

The secretariat is encouraging the use of the voluntary cancellation of CERs as a means to reduce carbon footprints and move towards climate neutrality. The expected impact is a significant increase in voluntary cancellations of CERs by the end of 2015, as well as increased recognition of the potential of the CDM (UNFCCC, 2015).

2.6.3 The South African DNAs SD and RE-IPPPP Strategy

The DNA in South Africa could make a more concerted effort in promoting RE-CDM projects by setting up a CDM investment promotion sub-committee to approach developers who have submitted PINs and to assist in the submission of the PDDs for approval by the CDM EB for project CERs (Winkler, 2006). The provision of support and resources from the DNA will help project developers prepare PINs and PDDs (Alves, 2005).

The governance bodies of the CDM, including the CDM Executive Board, have a mandate to ensure emission reductions in developing countries are real, long-term and measurable (Ellis et al, 2007). The current structure for CDM values the CER component of a CDM project and leaves the assessment of sustainability benefits of a CDM project to the DNA represented in the host country (DoE, 2014). Host countries to the CDM, like China, have the responsibility to approve CDM implementation in their country subject to specific sustainable development criteria complementing the renewable energy sector (Yang, 2004). The DNA in South Africa, as the assessor, could exploit the potential synergies between CDM SD criteria and the national RE-IPPPP socio-economic development (SED) criteria for the emerging renewable energy sector.

Table 2,4 on page 100 illustrates the RE-IPPPP criteria, with SED and ED criteria accounting for 20% of the bid rating submitted by IPPs.

Table 2,4: RE-IPPPP elements and weighting as outlined in the procurement document for the first bid round (Baker and Wlokas, 2015:20).

	<i>Economic development elements</i>	<i>Description</i>	<i>Measurement</i>	<i>Threshold</i>	<i>Target</i>	<i>Weighting</i>
1.	Job creation	RSA-based employees who are citizens	Number of citizens employed / number of RSA based employees	50.0%	80.0%	25%
		RSA-based employees who are black citizens	Number of black citizens employed/ number of RSA-based employees	30.0%	50.0%	
		Skilled employees who are skilled black citizens	Number of skilled black citizens employed/ skilled employees	12.0%	20.0%	
		RSA-based employees that are citizens from local communities	Number of citizens from local communities employed / number of RSA-based employees	15.0%	25.0%	
2.	Local content	Value of local content spend	Value of local content spend / total project value	Technology specific		25%
3.	Ownership	Shareholding by black people in the project company	Shareholding by black people/ total shareholding	12.0%	30.0%	15%
		Shareholding by black people in the contractor responsible for construction		8.0%	20.0%	
		Shareholding by black people in the operations contractor		8.0%	30.0%	
		Shareholding by local communities in the project company	Shareholding by local communities/ total shareholding	2.5%	5.0%	
4.	Management control	Black top management	Number of black people in top management using the adjusted recognition of gender/ number of people in top management		40.0%	5%
5.	Preferential procurement	BBBEE procurement spend	Amount of procurement spend on BBBEE Contributors recognised in terms of BBBEE Recognition levels / total amount of procurement spend		60.0%	10%
		QSEs and EMEs procurement	Amount of procurement spend on QSEs and EMEs/ total amount of procurement spend		10.0%	
		Women owned vendors procurement	Amount of procurement spend on women owned vendors/ total amount of procurement spend		5.0%	
6.	Enterprise development	Enterprise development contributions	Enterprise development contributions/ revenue		0.6%	5%
		Adjusted enterprise development contributions	Adjusted enterprise development contributions/ revenue		0.6%	
7.	Socio-economic development	Socio-economic development contributions	Socio-economic development contributions/ revenue	1.0%	1.5%	15%
		Socio-economic development contributions	Socio-economic development contributions/ revenue	1.0%	1.5%	
	Total					100% / 30 points

The DNA in South Africa could integrate the CDM Sustainable Development (SD) criteria with the RE-IPPPP Socio-Economic Development (SED) and Economic Development (ED) criteria to add value to the CDMs Project Design Document (PDD) and promote the development of a market-based climate change mechanism. The synergies from the process could help project developers establish a clear development programme focused on national and international sustainability standards. The sustainability criteria of the CDM process, which is approved by the DNA in South Africa, could be integrated into the RE-IPPPP sustainability criteria to add credibility to a registered RE-CDM project developer's bid under the RE-IPPPP.

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Section 3: Description of Research Methodology

3.1 Introduction

This section details the research methodology and research method that was used in investigating the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms. The section outlines the goals of the research, the research paradigm, population and sample description, data collection and analysis and interpretation. This section then discusses validity, reliability, the ethical considerations and limitations of the research being conducted.

3.2 The aim of the research

The aim of the research is an investigation of the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms. The objectives of the research are:

- Objective 1: To analyze the current literature to derive a comprehensive framework of barriers and drivers inclusive of mechanisms to mitigate the barriers and enhance the drivers.
- Objective 2: To investigate the barriers and drivers to CDM renewable energy investment at the Metro, Kouga and Jeffreys Bay windfarms.
- Objective 3: To identify mechanisms and approaches to mitigating the barriers and enhancing the drivers to provide a framework for improved CDM renewable energy project investment implementation in the Eastern Cape Province.

3.3 Methods, procedures and techniques

The objective of the research is to build onto and critically examine the known assumed reality (Guba and Lincoln, 1994). The paradigm adopted is that of post-positivism, with the ontological view of critical realism. The epistemology will be the

modified/objectivist inductive approach to determine if the research fits with pre-existing knowledge (Guba and Lincoln, 1994). A qualitative methodology has been adopted. The barriers and drivers as perceived by the developers versus those of the literature are compared to present argument and contrast.

Structured interview transcripts (per Appendix 2) were used to collect data for this research from three windfarms in the Eastern Cape. The literature-identified barriers and drivers to CDM renewable energy investment informed the basis of these interviews to identify mechanisms and approaches to mitigating the barriers and enhancing the drivers. The research respondents were identified as individuals representing the project developers of each of the windfarms – Kouga, Metro and Jeffreys Bay. The Project Manager, Project Engineer, and CDM PDD contact person for each windfarm were interviewed. Each of these nine interviews lasted one to two hours. The data collection was conducted during October to November 2014 and July to August 2015.

3.4 Population and sample size

The project developers' key personnel involved with the CDM development of the three windfarms were the focus point of the research. Permission from each windfarm's Project Manager was given prior to conducting the research. Interview questions were provided and authorized prior to commencing the interviews.

Nine interviews were conducted on a voluntary basis.

3.5 Data collection

The research data was collected by means of structured, face-to-face interviews. According to De Vos (2005), performing interviews are the predominant mode of information or data collection. By making use of structured questions, the researcher was able to guide the interview process. Interviews were conducted during October to November 2014 and July to August 2015.

Respondents were identified through the CDM Project Design Documents (PDDs), were approached through formal emails and confirmed telephonically for interview times. The researcher introduced himself politely and asked respondents, “Would you mind participating in the research?” This was to allow all possible respondents to have the opportunity to decline or volunteer for the research. Interview survey questions were designed to ensure that the interview process took approximately one to two hours in length.

In addition, the CDM Project Design Documents (PDDs) were made available by the project developers for each project. These were studied to obtain information and insight into the project’s methodology of implementation specific to each windfarm. This was necessary to identify and discuss approaches to dealing with barriers and drivers for further recommendations as the PDDs provide key insight into the factors that contributed to the project’s success.

3.6 Data analysis

The design and content of the research questions were informed and guided by the contributing factors of the barriers and drivers identified in the literature (as detailed in section 2 above). The interview transcripts from copious notes and audio recordings were used to analyze the data. As per Silverman (2011), recording equipment allows for a more complete record of the interview to aid note-taking. Thematic analysis of the qualitative data was presented in a narrative format to aid in providing recommendations. The qualitative data was presented in narrative format, where cross-case analysis was conducted, deducing patterns appearing across the respondents from each windfarm. Cross-comparative analysis was conducted between the three windfarms to determine differences in data.

3.7 Limitations

The availability of respondents to conduct the face-to-face interviews, considering the duration (one to two hours) of the interviews. The time constraints presented challenges for both the respondents and researcher.

Because of the theoretical insights gained by the researcher on the topic, the potential of creating a researcher bias in the form of preconceived ideas of respondent's responses. The questionnaire made use of some non-leading questions to reduce the potential researcher bias.

The CDM knowledge and level of awareness of respondents was taken into account when considering responses that could consequently have limited the research results.

3.8 Validity and reliability

In order to ensure that the research reflected what took place (valid) and was credible (reliable), hand-written notes were taken during interviews as well as audio recordings of the interviews. Validity involves the question of whether you are measuring what you say you are measuring (Babbie, 2008). Some qualitative researchers prefer to use the term 'credibility' in the place of 'validity', referring to whether the same data would be observed from the same thing several times (Babbie, 2011). Guba and Lincoln (1981) assert that there can be no validity without reliability and a demonstration of the former (validity) is sufficient to establish the latter (reliability). Results of studies can only be used for decision-making purposes if there is a high degree of validity and reliability (Miles and Huberman, 1994). The designs of the research questions were clear and connected to the purpose of the research to ensure validity and reliability.

3.9 Ethical considerations

The researcher was aware of concerns relating to subjectivity and confidentiality. To avoid unethical practices, Bassey's (1999) three principles of ethical practice ensured effective governance and ethical behavior throughout the research.

Respect for persons – Ensured respondents understood questions and explanations of key terms of the questionnaire.

Respect for democracy – Explained the role of the respondent and the possibility of withdrawing from the research as well as assuring confidentiality at all times.

Respect for truth – Ensured that the research was conducted, examined and reported with rigor to ensure validity of findings.

Assurances were given to the respondents that the findings of the research were for research purposes only and that confidentiality would be maintained. All the respondents who offered to participate in this research were contacted beforehand and the purpose and scope of the research was detailed prior to permission being granted by the project developers for the research to be conducted.

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Appendix 1: Questionnaire

Questionnaire used in structured face-to-face interviews held with the Chief Executive Officers and CDM Operational Managers representing the developers of the windfarms – Kouga, Metro and Jeffreys Bay.



Rhodes Business School
Leadership for Sustainability

As an MBA student, it is required that a dissertation be submitted in partial fulfillment of the qualification. The purpose of the research dissertation is to provide the researcher with an insight of the barriers and drivers to CDM renewable energy investment at the Kouga, Metro and Jeffreys Bay windfarms. The goals of the interview are to investigate the barriers and drivers to CDM renewable energy investment at the three windfarms and to identify mechanisms and approaches to mitigating the barriers and enhancing the drivers.

The researcher is aware of concerns relating to subjectivity and confidentiality. To avoid unethical practices, the following three principles of ethical practice will apply: Respect for persons – the researcher will ensure the respondents understand the questions and key terms of the questionnaire; Respect for democracy – the researcher will explain the role of the respondent and the ability to withdraw from the research as well as assuring confidentiality at all times; Respect for truth – the researcher will ensure that the research is conducted, examined and reported professionally to ensure the validity of findings.

Your co-operation with regard to the completion of the interview will be appreciated.

All information will be treated confidentially.

Section A – Biographical details of respondent

- 1 Name of respondent
- 2 Position in the windfarm
- 3 Number of months/years' experience in current capacity
- 4 Total number of years of business experience
- 5 Total number of years of renewable energy industry experience
- 6 Academic and/or professional qualification

Section B – CDM conceptual awareness and perceptions

- 1 What do you understand about the concepts of Global Warming and Climate Change?
- 2 Do you believe that fossil fuel burning is a major contributor to South Africa's GHGs?
- 3 What do you understand of the Kyoto Protocol?
- 4 What do you understand of the UNFCCC?
- 5 What do you understand of the CDM?
- 6 What do you understand of the CDMs contribution to sustainable development?

Brief on CDM and RE-CDM Barriers and Drivers before continuing the interview questionnaire

Section C – CDM Barriers

- 1 What do you believe are the barriers to implementing CDM projects?
- 2 Do you believe the CDM Additionality requirements present the possibility of disqualification from CER registration? If so, please elaborate / If not, why not?
- 3 Do the CDM transaction costs discourage the implementation of smaller renewable energy projects? If so, please elaborate / If not, why not?
- 4 Do you believe the lack of awareness amongst potential CDM stakeholders, prevents potential investment in renewable energy opportunities in South Africa? Please elaborate.

- 5 What factors relating to the CDM project cycle inhibited the final CDM approval?

Section D – RE-CDM Barriers

- 1 What do you believe are the barriers specific to implementing RE-CDM projects?
- 2 Do you believe the comparative disadvantages of RE-CDM projects generating smaller CERs, present barriers to project developers ROI perceptions? If so, please elaborate.
- 3 Do you believe economic and financial factors play a significant role in the RE-CDM investment decision making process? If so, please elaborate.
- 4 Do you believe the carbon market and the market price of CERs, significantly affect the revenue of RE-CDM projects? If so, please elaborate / If not, why not?
- 5 What risk factors relating to high interest rates, scarcity of capital and project life cycles did you experience in developing the RE-CDM projects?
- 6 What operational and project management problems hampered the implementation of the RE-CDM project?
- 7 What factors relating to South Africa's infrastructure presented challenges for the RE-CDM project?
- 8 What mechanisms should be addressed and introduced to mitigate RE-CDM barriers?

Section E – RE-CDM Drivers

- 1 What factors do you believe promoted and supported RE-CDM project investment?
- 2 Do you believe the transfer of environmentally sound technologies contributed to sustainable energy solutions and skills development at the windfarm? If so, please elaborate / If not, why not?
- 3 What Foreign Direct Investment was made within the windfarm? Please list and elaborate.
- 4 Do you believe the CERs revenue generated attracts potential RE-CDM developers? If so, please elaborate / If not, why not?

- 5 Do you believe the increased profitability and reduced financial risks resulting from CERs, encourages support for RE-CDM developments? If so, please elaborate / If not, why not?
- 6 What aspects of sustainable development did the RE-CDM project address in terms of South Africa's Integrated Resource Plan?
- 7 How are the Power Purchase Agreement (PPAs) and Independent Power Producers (IPPs) linked to the favourable development of RE-CDM projects? Please elaborate.
- 8 Do you believe South Africa's abundant renewable energy resources will promote RE-CDM investment? If so, please elaborate / If not, why not?
- 9 What additional support is required to facilitate and improve your RE-CDM project implementation?
- 10 What mechanisms should be introduced to enhance RE-CDM drivers and promote RE-CDM project investment? Please list and elaborate.

Thank you for your co-operation and contribution!

Appendix 2: Interview Transcripts

Windfarm 1

Interview Question Results

- 1 What do you believe are the barriers to implementing CDM projects?

Respondent 1: CER prices
Respondent 2: CER prices
Respondent 3: Low demand for CERs

- 2 Do you believe the CDM Additionality requirements present the possibility of disqualification from CER registration? If so, please elaborate / If not, why not?

Respondent 1: No, as the project is exempted from the additionality requirement.
Respondent 2: No, as it is a “greenfield project”.
Respondent 3: No, as the CDM additionality methodology makes provision for renewable energy projects in South Africa to be excluded from the additionality requirement.

- 3 Do the CDM transaction costs discourage the implementation of smaller renewable energy projects? If so, please elaborate / If not, why not?

Respondent 1: Yes, the consulting fees are high.
Respondent 2: Yes, the fees are high and the CER revenue is delayed.
Respondent 3: Yes, the transaction costs are high to get the PDD approved by the CDM EB, especially the DOEs overseas fees.

- 4 Do you believe the lack of awareness amongst potential CDM stakeholders, prevents potential investment in renewable energy opportunities in South Africa? Please elaborate.

Respondent 1: No, all stakeholders were aware of the CDM
Respondent 2: No, all parties were aware during negotiations.

Respondent 3: No, all our project investors were aware of the CDM process at the time of negotiations in 2010.

5 What factors relating to the CDM project cycle inhibited the final CDM approval?

Respondent 1: The validation part of the PDD

Respondent 2: Delays in dealing with consultants to obtain the validation for the CDMs registration.

Respondent 3: The DNA approval after submitting the PIN and PDD was straightforward. Delays occurred with the international 3rd party consultants to get the validation approved by the CDM EB.

6 What do you believe are the barriers specific to implementing RE-CDM projects?

Respondent 1: Low CER revenue.

Respondent 2: Poor CER prices.

Respondent 3: Low CER revenues from RE-CDM projects.

7 Do you believe the comparative disadvantages of RE-CDM projects generating smaller CERs, present barriers to project developers ROI perceptions? If so, please elaborate.

Respondent 1: Yes, lower CER revenues for renewable energy projects.

Respondent 2: Yes, the poor CER price compounded by lower CER revenues for renewable energy CDMs.

Respondent 3: Yes, the low CER revenues from our renewable energy projects are a disadvantage, compared to other gases with a greater global warming potential earning more CERs.

8 Do you believe economic and financial factors play a significant role in the RE-CDM investment decision making process? If so, please elaborate.

Respondent 1: Yes, the need for clean energy in South Africa has created an emerging market for renewable energy technology from markets with an over-supply of technology.

Respondent 2: Yes, the financial crisis in Europe has caused prices for wind and solar components to fall, which has enabled project developers to source surplus hardware at competitive prices.

Respondent 3: Yes, we managed to source our turbines from China and take advantage of the lower competitive pricing in an established renewable energy manufacturing industry. This timely situation has contributed to project developers in South Africa managing to bid lower prices for each round of the RE-IPPPP.

- 9 Do you believe the carbon market and the market price of CERs, significantly effect the revenue of RE-CDM projects? If so, please elaborate / If not, why not?

Respondent 1: Yes, at this stage the CER prices are so low, it hardly covers the costs to get our CDM PDD registered.

Respondent 2: Yes, the CER revenue is significantly compromised under these poor market conditions but we believe that the CDM mechanism makes a substantial contribution to the reduction of emissions worldwide.

Respondent 3: Yes, at this stage the CER prices are so low but we believe that the COP21 meeting later this year will firm up carbon prices through an increasing demand for carbon offset's and hence CERs.

- 10 What risk factors relating to high interest rates, scarcity of capital and project life cycles did you experience in developing the RE-CDM projects?

Respondent 1: The debt equity ratio for our windfarm is 75:25 as the interest on debt is lower than equity returns expected by shareholders. This ratio allows us to bid the lowest price on the RE-IPPPP by minimizing finance costs.

Respondent 2: The interest on loans from debt capital is around 12%, which is lower than the equity shareholders rate of return of between 18% to 25%.

Respondent 3: The project is financed by Old Mutual and the IDC as a lender and equity shareholder, financing our BEE shareholding. The higher the debt ratio, the lower the cost of finance and the lower the RE-IPPPP bid price to secure a 20 year revenue stream to reduce financial and business risks of the project. The CER revenue forecast over the initial 10 year period helped in the initial stages to leverage the development capital for our project.

11 What operational and project management problems hampered the implementation of the RE-CDM project?

Respondent 1: The DNA office was extremely helpful in dealing with our PIN and PDD documentation.

Respondent 2: The delays with validation caused problems in registering the CDM.

Respondent 3: The delay in our registration by the CDM EB is as a result of delays in project managing third-party overseas consulting firms tasked to complete the validation.

12 What factors relating to South Africa's infrastructure presented challenges for the RE-CDM project?

Respondent 1: Since the windfarm is situated in a rural area, road networks had to be developed and upgraded for access by heavy equipment machinery.

Respondent 2: Poor road conditions needed development.

Respondent 3: The socio-economic needs of the local community were greatly improved through upgrades to the local infrastructure as part of the sustainable development obligations of the CDM project.

13 What mechanisms should be addressed and introduced to mitigate RE-CDM barriers?

Respondent 1: The improvement of the validation of PDDs.

Respondent 2: Investigate the accreditation of local DOEs.

Respondent 3: The accreditation of DOEs from South Africa to reduce delays in the validation stage by accredited international DOEs

14 What factors do you believe promoted and supported RE-CDM project investment?

Respondent 1: The clean technology installed.

Respondent 2: The drive for support of sustainability by the project.

Respondent 3: The CER revenue to offset costs.

15 Do you believe the transfer of environmentally sound technologies contributed to sustainable energy solutions and skills development at the windfarm? If so, please elaborate / If not, why not?

Respondent 1: Yes, nine turbines were installed with a 27MW installed capacity and approximately 80,000 MW hours of clean electricity per annum. 120 direct jobs were generated during the construction phase, with 80 of these set aside for locals.

Respondent 2: Yes, the turbines are Sinovel SL3000/113-HH90 wind turbines, manufactured by Sinovel Wind Group Company Limited in China. The wind turbines are easier to integrate into the grid, with their low voltage capability.

Respondent 3: Yes, during the production phase, nine full time jobs were created, with four set aside for locals, while local small businesses were engaged for various maintenance activities and skills training. In addition, members of the local community were trained as conservation officers and employed to protect the biodiversity of the area.

16 What Foreign Direct Investment was made within the windfarm? Please list and elaborate.

Respondent 1: No equity investment in the project.

Respondent 2: None.

Respondent 3: No, we are 100% South African owned.

17 Do you believe the CERs revenue generated attracts potential RE-CDM developers? If so, please elaborate / If not, why not?

Respondent 1: Yes, our stakeholders were attracted to the CER revenue potential.

Respondent 2: Yes, during the project feasibility stage, our stakeholders focused on the CER revenue as a means to reduce risk.

Respondent 3: Yes, the CER revenue helps to leverage finance from lenders.

18 Do you believe the increased profitability and reduced financial risks resulting from CERs, encourages support for RE-CDM developments? If so, please elaborate / If not, why not?

Respondent 1: Most definitely, given a stable CER price, the contribution from CER revenues will reduce debt and equity finance risk as the project's profitability will improve.

Respondent 2: Yes, as the project's profitability will improve.

Respondent 3: Yes, the CER revenues will attract more debt and equity investors interested in an additional revenue source to reduce financial risks.

19 What aspects of sustainable development did the RE-CDM project address in terms of South Africa's Integrated Resource Plan?

Respondent 1: Economically, the improvement of roads and services in the local rural community. Environmental protection of the natural bio-diversity in windfarm area. Socially, social amenities and training of young people and women are a priority for the empowerment of previously disadvantaged people in the region.

Respondent 2: Economically, job creation has stimulated the local economy and alleviated poverty. Environmental preservation of the bio-diversity through a training programme for local conservation officers. Socially, through the engagement with the local community trust, social amenities upgraded.

Respondent 3: Economically, roads and services in the local rural community were upgraded. Environmental preservation of the natural bio-diversity. Socially, the local community trust has benefitted through upgrades to social amenities and training of young people and women.

20 How are the Power Purchase Agreement (PPAs) and Independent Power Producers (IPPs) linked to the favourable development of RE-CDM projects? Please elaborate.

Respondent 1: Our project was involved in round 1 with a R1.15 kWh cap awarded. The 20-year guarantee from Eskom helps secure funding for RE-CDM projects.

Respondent 2: The RE-IPPPP bidding round 1 required us to bid below a certain cap. We secured the bid with a R1.15 kWh cap.

Respondent 3: The RE-IPPPP bidding rounds help secure a guaranteed revenue stream from Eskom, which compliments the RE-CDM development, and any additional CER revenues are a bonus.

21 Do you believe South Africa's abundant renewable energy resources will promote RE-CDM investment? If so, please elaborate / If not, why not?

Respondent 1: Yes, South Africa has huge potential for solar PV and wind.

Respondent 2: Yes, the solar PV, CSP and wind projects promote RE-CDM investments.

Respondent 3: Yes most definitely, renewable energy projects have huge potential in South Africa. These projects are also situated in undeveloped parts of SA, which compliments the RE-CDM SD initiatives.

22 What additional support is required to facilitate and improve your RE-CDM project implementation?

Respondent 1: DNA support in the validation stage.

Respondent 2: Improved validation procedures for the CDM process.

Respondent 3: DNA assistance with dealing through third parties for validation.

23 What mechanisms should be introduced to enhance RE-CDM drivers and promote RE-CDM project investment? Please list and elaborate.

Respondent 1: The CDM EB should stimulate the demand for CERs to achieve a stable CER price.

Respondent 2: The price of CERs need to be stable and reasonable to promote RE-CDM investments with better profitability.

Respondent 3: The CDM EB should investigate a way to establish a stable CER market. With a reasonable market price for a CER, the RE-CDM projects in South Africa will generate substantial investments through increased profitability.

Windfarm 2

Interview Question Results

- 1 What do you believe are the barriers to implementing CDM projects?

Respondent 1: Lack of interest from stakeholders due to low CER revenues.

Respondent 2: CDM support in South Africa is poor due to negative profitability.

Respondent 3: The low CER revenues have a negative impact on the profitability of projects

- 2 Do you believe the CDM Additionality requirements present the possibility of disqualification from CER registration? If so, please elaborate / If not, why not?

Respondent 1: No, although our project runs the risk of disqualification as it stands alone as profitable through the RE-IPPPP without the need for CER revenue.

Respondent 2: No, our CDM PDD recognises the need for clean power in South Africa and therefore grants an exemption for “additionality.”

Respondent 3: No, the CDM methodology for the project recognizes the need for renewable energy in SA.

- 3 Do the CDM transaction costs discourage the implementation of smaller renewable energy projects? If so, please elaborate / If not, why not?

Respondent 1: Currently yes, as the low CER revenues compared to the transaction costs are not profitable.

Respondent 2: Yes, the transaction costs are high to implement CDMs.

Respondent 3: Yes, the high costs of third-party consultants add to the problem when you have to get the PDD validated for CDM EB approval.

- 4 Do you believe the lack of awareness amongst potential CDM stakeholders, prevents potential investment in renewable energy opportunities in South Africa? Please elaborate.

Respondent 1: No, all our partners experienced the CDM.

Respondent 2: No, we all had some degree of experience with the CDM process.

Respondent 3: No, both international and local partners had CDM experiences.

5 What factors relating to the CDM project cycle inhibited the final CDM approval?

Respondent 1: We are waiting for the validation of our PDD through an international consulting firm accredited by the CDM. We had hoped to have the CDM project approved by the CDM EB prior to commissioning in July 2014 to claim the CERs.

Respondent 2: The approval from the CDM EB after validation is delayed.

Respondent 3: The whole process is straightforward with clear timelines from the DNA office in South Africa, although we are still awaiting approval from the CDM EB.

6 What do you believe are the barriers specific to implementing RE-CDM projects?

Respondent 1: The lower profitability of RE-CDM projects.

Respondent 2: Lower profitability from lower CO₂e emission factors for RE-CDM projects.

Respondent 3: RE-CDM projects have lower profitability relative to HFC-CDM projects higher CO₂e emission factors and higher CER revenues.

7 Do you believe the comparative disadvantages of RE-CDM projects generating smaller CERs, present barriers to project developers ROI perceptions? If so, please elaborate.

Respondent 1: Yes, the lower profitability of RE-CDM projects relative to HFC-CDM projects higher CO₂e emission factors, add to the lower investment returns for RE-CDM projects.

Respondent 2: Yes, at the current poor CER price, investors don't even factor the CER revenue into calculations.

Respondent 3: Yes, the low profitability from low CERs earned for RE-CDM projects relative to HFC-CDM projects, presents a disadvantage for RE-CDM projects.

- 8 Do you believe economic and financial factors play a significant role in the RE-CDM investment decision making process? If so, please elaborate.

Respondent 1: Yes, we have taken advantage of the surplus of wind technology hardware in Europe to develop wind and solar projects in South Africa at very competitive prices per the RE-IPPPP bid rounds 1-3.

Respondent 2: Yes, the low prices for technology in Europe and China have allowed us to compete successfully in the RE-IPPPP bid rounds.

Respondent 3: We have bid successfully by offering competitive rates based on clean technology sourced in surplus international markets. We hold the highest approved capacity for wind as a lead developer in South Africa and hope to make a substantial contribution to the development of South Africa's renewable energy sector.

- 9 Do you believe the carbon market and the market price of CERs, significantly affect the revenue of RE-CDM projects? If so, please elaborate / If not, why not?

Respondent 1: The oversupply of CERs on the market has caused the drop in CER prices and revenues of RE-CDM projects. At this stage, we are not concerned, as we have not depended on the RE-CDM revenue but rather the 20-year RE-IPPPP bid price revenue secured with Eskom.

Respondent 2: Yes, the carbon market has a direct impact on the CER revenues. We believe the market for CERs will improve and subsequently create a stable CER price to factor into future RE-CDM revenues.

Respondent 3: Yes, the CER prices are impacting revenues for RE-CDM projects. At this stage, we are not concerned, as we have not depended on the RE-CDM revenue but rather the 20-year RE-IPPPP bid price revenue secured with Eskom.

- 10 What risk factors relating to high interest rates, scarcity of capital and project life cycles did you experience in developing the RE-CDM projects?

Respondent 1: As an international company supplying the debt and equity capital, we are able to lend at a 7,5% interest rate. The balance is covered by loans from commercial banks and equity shareholdings by local development banks.

Respondent 2: The debt and equity capital is sourced from our parent company. The interest costs are low and the returns on equity are very competitive in South Africa.

Respondent 3: Our majority shareholder is an international company supplying the debt and equity capital. As a lender with access to international debt capital, we are able to lend at a 7,5% interest rate and this coupled with the high return on equity of 20% plus, is an attractive investment for our foreign shareholder.

11 What operational and project management problems hampered the implementation of the RE-CDM project?

Respondent 1: The DNA office in South Africa offered clear guidelines to get our PDD approved. Our PDD is awaiting final approval by the CDM EB.

Respondent 2: The DNA office in South Africa approved our PDD. The validation prior to CDM EB approval through the consulting firms is delaying the process.

Respondent 3: We are still waiting for the validation of our PDD through an international consulting firm accredited by the CDM before registration by the CDM EB.

12 What factors relating to South Africa's infrastructure presented challenges for the RE-CDM project?

Respondent 1: No infrastructure challenges.

Respondent 2: Fortunately the windfarm is located close to a national road and hence no infrastructure problems presented for the project.

Respondent 3: We had good access through the national road in close proximity and good access to a sub-station feeding into the national grid.

13 What mechanisms should be addressed and introduced to mitigate RE-CDM barriers?

Respondent 1: A stable floor price for CERs would help reduce risks in forecasting RE-CDM revenues.

Respondent 2: A stable CER price to help forecast CER revenues for projects.

Respondent 3: Investigate a trading platform for the carbon market in South Africa.

14 What factors do you believe promoted and supported RE-CDM project investment?

Respondent 1: The CER revenue from the carbon emission reductions promoted investment.

Respondent 2: The CER revenue attracted investment and support for RE-CDM projects.

Respondent 3: The support for sustainability in South Africa while addressing the climate change challenges facing the planet.

15 Do you believe the transfer of environmentally sound technologies contributed to sustainable energy solutions and skills development at the windfarm? If so, please elaborate / If not, why not?

Respondent 1: Yes, we installed 60 wind turbines, with an installed capacity of 138 MW. During construction, the number of jobs varied according to the stage of construction but in August 2013, at the peak of construction, there were 602 people working on site, of which 45% were from the local community.

Respondent 2: Yes, we installed 60 Siemens SWT 2.3 MW turbines, with an installed capacity of 138 MW. These turbines were selected based on the technology's quality and compatibility with the local wind regime and its proven track record of over 5170 units installed worldwide. We employed unskilled workers from the local community during construction.

Respondent 3: Yes, we installed 60 turbines based on the technology's proven track record worldwide. The number of jobs varied according to the stage of construction. As a reflection of our commitment to employ and empower as many people from the local community as possible, we now employ eleven

people to operate and maintain the wind farm.

16 What Foreign Direct Investment was made within the windfarm? Please list and elaborate.

Respondent 1: We are owned by a consortium of international and local partners. Mainstream SA lead the consortium and have access to foreign funding through the Dublin head office, Mainstream Renewable Power.

Respondent 2: International and local partners represented by Mainstream SA leading the consortium.

Respondent 3: Mainstream SA lead the consortium and have access to foreign funding through the Dublin head office, Mainstream Renewable Power.

17 Do you believe the CERs revenue generated attracts potential RE-CDM developers? If so, please elaborate / If not, why not?

Respondent 1: The potential of the CERs to leverage investment from stakeholders cannot be under-estimated. We have no doubt, that given a stable CER price of around \$5, the potential to leverage private sector investments is enormous in RE-CDM projects.

Respondent 2: The CER revenue attracts capital investment from RE-CDM developers.

Respondent 3: The potential of the CERs to leverage investment from stakeholders helped to leverage a small share of our capital needs based on the potential CER revenue earned for the CO₂e over the 10 year term of the projects initial crediting period.

18 Do you believe the increased profitability and reduced financial risks resulting from CERs, encourages support for RE-CDM developments? If so, please elaborate / If not, why not?

Respondent 1: Yes, greater profitability and lower risk, attracts investors.

Respondent 2: Yes, greater profitability and low risk, attracts RE-CDM developers.

Respondent 3: Yes, greater profitability and low risk, encourages support for RE-CDM projects. We believe the market for CERs will improve and subsequently create a stable CER price to factor into future RE-CDM revenues.

19 What aspects of sustainable development did the RE-CDM project address in terms of South Africa's Integrated Resource Plan?

Respondent 1: Environmental impacts include, water saving (590 M litres of water per year), CO₂e avoided (8,4 M CO₂e tons over 20 years). During construction, 45% of the people working on site were from the local community.

Respondent 2: Health programmes and youth upliftment / sport programmes. A scholarship programme for tertiary engineering studies in Port Elizabeth.

Respondent 3: Socio-economic benefits include initiatives to support emerging black farmers in the area and to assist with sustainability of local enterprises. During construction, the local community enjoyed preferential selection for unskilled workers. A community trust owns 6% of the windfarm and shares in the dividends and revenues.

20 How are the Power Purchase Agreement (PPAs) and Independent Power Producers (IPPs) linked to the favourable development of RE-CDM projects? Please elaborate.

Respondent 1: As an IPP we bid through the RE-IPPPP to secure our projects. This programme promotes renewable energy development, to diversify South Africa's energy supply. The bid is scored with 70% based on price and 30% on socio-economic development criteria. A bid is awarded by meeting the lowest price and meeting the SED requirements.

Respondent 2: RE-CDM projects focus on sustainability criteria, CO₂e offsets and CER revenues. The projects revenues are secured through the RE-IPPPP bid price paid for electricity generated, which reduces a RE-CDM's dependence on CER revenues.

Respondent 3: Synergies could be met through the RE-IPPPP SED criteria and CDMs SD criteria set by the local DNA, which will contribute to the development of RE-CDMs in South Africa.

21 Do you believe South Africa's abundant renewable energy resources will promote RE-CDM investment? If so, please elaborate / If not, why not?

Respondent 1: Huge potential exists in South Africa over the next 5 years. We have successfully bid on another two solar plants.

Respondent 2: South Africa offers abundant renewable energy opportunities in solar and wind RE-CDM investment.

Respondent 3: Yes, RE-CDM projects could contribute to significant growth in the renewable energy sector in South Africa.

22 What additional support is required to facilitate and improve your RE-CDM project implementation?

Respondent 1: Support for validation process improvements.

Respondent 2: The DNA office could motivate for local accredited DOEs.

Respondent 3: Request the DNA office to motivate for local accredited DOEs through the CDM EB.

23 What mechanisms should be introduced to enhance RE-CDM drivers and promote RE-CDM project investment? Please list and elaborate.

Respondent 1: The DNA in South Africa should integrate the CDM SD criteria with the RE-IPPPP SED and ED criteria to add value to the CDMs PDD and promote the development of a market based climate change mechanism. The synergies from the process would help project developers establish a clear development programme focused on national and international sustainability standards.

Respondent 2: Integrate the CDM SD criteria with the RE-IPPPP SED and ED criteria to add value to the CDMs PDD.

Respondent 3: The DNA could develop procedures to facilitate the combined registration of PDDs through a Programme of Activities (PoA), which would increase efficiency for developers of multiple RE-CDM projects.

Windfarm 3

Interview Question Results

- 1 What do you believe are the barriers to implementing CDM projects?

Respondent 1: The low market for carbon credits generated by the project.

Respondent 2: Poor market conditions for carbon credits.

Respondent 3: The low CER market conditions currently have caused a lack of interest from project investors.

- 2 Do you believe the CDM Additionality requirements present the possibility of disqualification from CER registration? If so, please elaborate / If not, why not?

Respondent 1: No, the PDD additionality requirement makes provision for “greenfield” renewable energy projects in South Africa to avoid disqualification.

Respondent 2: No, the PDD excludes the additionality requirement for our project.

Respondent 3: No, the additionality requirement is not applied. It would be interesting to see further down the road as the bidding process through the RE-IPPPP gets more competitive and the projects start taking on the business-as-usual characteristics.

- 3 Do the CDM transaction costs discourage the implementation of smaller renewable energy projects? If so, please elaborate / If not, why not?

Respondent 1: No, as the CER earning potential over 10 years is greater despite the low prices.

Respondent 2: The transaction costs are high but the CER revenues would offset the costs over the crediting period of the project.

Respondent 3: Our PDD fees to date after registration with the CDM EB are higher than our CER potential revenue for our annual CO₂ offsets per annum, but looking at the costs over a 10 year period and the probable increase in the price of CERs, we believe the transaction costs are negligible.

- 4 Do you believe the lack of awareness amongst potential CDM stakeholders, prevents potential investment in renewable energy opportunities in South Africa? Please elaborate.

Respondent 1: No, especially concerning this CDM project as the stakeholders were engaged and committed when CERs earned €20 per CO₂e, prior to the collapse of the CER market.

Respondent 2: No, as a lot of interest and high levels of engagement helped us get the PDD through to CDM EB approval.

Respondent 3: No, high levels of awareness helped us get CDM EB approval. As we are currently involved in another windfarm development, we have found that stakeholders have displayed a lack of awareness or possibly interest in the CDM registration due to uncertainty for the future CER market.

- 5 What factors relating to the CDM project cycle inhibited the final CDM approval?

Respondent 1: The DNA helped with clear guidelines to get our PDD approved. The only delays were from the DOEs who are the only accredited firms to validate our PDD prior to submission with the CDM EB.

Respondent 2: Delays by the DOEs for validation. The negotiations around the consulting fees and legal costs are time consuming, especially since these entities are international firms.

Respondent 3: The validation stage caused delays. The PDD was eventually approved by the CDM EB prior to commissioning and at this stage we are in the monitoring stage to verify our emission reductions for submission to the CDM EB for CER issuance.

- 6 What do you believe are the barriers specific to implementing RE-CDM projects?

Respondent 1: The low market for carbon credits generated by the renewable energy project.

Respondent 2: The low market for CERs has caused a lack of interest from project investors.

Respondent 3: The low market conditions for carbon credits.

- 7 Do you believe the comparative disadvantages of RE-CDM projects generating smaller CERs, present barriers to project developers ROI perceptions? If so, please elaborate.

Respondent 1: Yes, the lower market for carbon credits generated by the renewable energy projects has caused a lack of interest from project investors in our sector.

Respondent 2: Yes, the lower CERs generated by renewable energy projects compared to other higher CO₂e emission projects is a disadvantage in terms of investors ROI perceptions.

Respondent 3: Yes, the smaller CERs generated by RE-CDM projects is a disadvantage. We understand the higher CO₂e emission factors applied to dangerous gases with high global warming potential, but we need to ensure a fair playing field for renewable energy projects, which are driving a zero emissions target to save the planet.

- 8 Do you believe economic and financial factors play a significant role in the RE-CDM investment decision making process? If so, please elaborate.

Respondent 1: Most definitely, South Africa's emerging renewable energy market has created demand for clean technology at a perfect time in terms of the worldwide supply of components reaching the lowest prices yet.

Respondent 2: The demand for renewable energy technology in South Africa has capitalized on the low prices of clean technology globally.

Respondent 3: Yes, and this has timed perfectly with the launch of the RE-IPPPP programme and other national development finance initiatives. We are 100% owned by South Africans with a 26% black ownership shareholding.

- 9 Do you believe the carbon market and the market price of CERs, significantly affect the revenue of RE-CDM projects? If so, please elaborate / If not, why not?

Respondent 1: Since the collapse of the CER market in 2012, we have not factored the CER revenue into our projects profitability.

Respondent 2: Yes, the market for CERs has a direct impact on the revenue of RE-CDM projects.

Respondent 3: Yes, the price of CERs today, is hardly a factor in contributing to the profitability of RE-CDM projects. The 2015 to 2020 period is critical in creating a demand for CERs on the carbon trading platforms. We hope the CDM EB's initiative allowing the voluntary cancellation of CERs will create demand for CERs on the secondary market from organizations wishing to reduce their carbon footprint.

10 What risk factors relating to high interest rates, scarcity of capital and project life cycles did you experience in developing the RE-CDM projects?

Respondent 1: Our shareholding is 100% South African and supported by the IDC with a 26% black ownership shareholding. The low financial risk is due to the guaranteed income from the sale of electricity to Eskom.

Respondent 2: The security and guarantees of revenues from the RE-IPPPP provides for low financial risks for our project.

Respondent 3: The commercial banks in South Africa structured favorable lending rates based on the low risks of revenue from the RE-IPPPP bid price revenue guaranteed over 20 years. This secured revenue has contributed substantially to reducing the risk of our project over a 20-year period.

11 What operational and project management problems hampered the implementation of the RE-CDM project?

Respondent 1: The whole approval by the DNA was exceptional. The only delays were from the DOEs who are the only accredited firms to validate our PDD prior to submission with the CDM EB.

Respondent 2: The validation stage by the DOEs caused delays in the approval.

Respondent 3: The DNA office was exceptional. The delays occurred in the validation stage. The PDD was eventually approved by the CDM EB prior to

commissioning and at this stage we are in the monitoring stage to verify our emission reductions for submission to the CDM EB for CER issuance.

12 What factors relating to South Africa's infrastructure presented challenges for the RE-CDM project?

Respondent 1: We experienced problems in connecting with the national grid resulting in a 3-month delay in commissioning the windfarm.

Respondent 2: The Eskom power line construction connecting to the grid was delayed.

Respondent 3: Eskom delayed the construction and commissioning of a power line connecting the windfarm to the grid.

13 What mechanisms should be addressed and introduced to mitigate RE-CDM barriers?

Respondent 1: DNA motivation to the CDM-EB to address the comparative disadvantage of RE-CDMs generating smaller CERs and lower revenues which are impacting on project investors' perception of ROI contributions.

Respondent 2: The disadvantage of RE-CDMs generating smaller CERs and lower revenues compared to other higher emission CDM projects should be investigated by the CDM EB.

Respondent 3: A "fair playing field" compared to the higher HFC-CDMs ROI compared to RE-CDMs ROI is needed. The CDM-EB could address the problem or alternatively the DNA could motivate for tax exemptions for RE-CDM projects CER revenues to level the profitability.

14 What factors do you believe promoted and supported RE-CDM project investment?

Respondent 1: The CDM sustainability combined with carbon emission reductions.

Respondent 2: The support of sustainability criteria of the project.

Respondent 3: The CDM sustainability drive and the opportunity to support a market mechanism to reduce carbon emissions globally.

15 Do you believe the transfer of environmentally sound technologies contributed to sustainable energy solutions and skills development at the windfarm? If so, please elaborate / If not, why not?

Respondent 1: Yes, 32 turbines were installed with a capacity of 80MW. The generation capacity is extremely efficient and suitable for the wind in the coastal area of St Francis and Oyster Bay. The transfer of skills to the local community through employment in the construction phase, contributed to socio-economic development in the Kouga region.

Respondent 2: Yes, 32 Nordex turbines manufactured in Germany have been installed. Each turbine has a 2,5MW capacity, which gives a combined installed capacity of 80MW. During construction, 250 jobs were created with 17 unskilled positions filled from the local community.

Respondent 3: Yes, the Nordex turbines contribute to clean sustainable energy development in the area. We are working on a skills development programme within the community to improve the lives of the people in the Kouga region, severely impacted by high unemployment.

16 What Foreign Direct Investment was made within the windfarm? Please list and elaborate.

Respondent 1: None, 100% South African owned.

Respondent 2: No FDI.

Respondent 3: No, all South African equity and debt shareholders.

17 Do you believe the CERs revenue generated attracts potential RE-CDM developers? If so, please elaborate / If not, why not?

Respondent 1: The CDM is an excellent market mechanism to address climate change. The fact that the poor CER prices have caused potential developers to overlook the other sustainability and technology benefits of a CDM is shortsighted

Respondent 2: The CER prices are low and hence developers are not attracted to the CDM. The sustainability benefits are a counter measure for low CER revenues at this stage.

Respondent 3: The poor CER prices have caused potential developers to overlook the other sustainability and technology benefits of a CDM. It's not just about the CERs, although the potential to leverage finance is important, it is all about contributing to a global initiative for the benefit of our planet.

18 Do you believe the increased profitability and reduced financial risks resulting from CERs, encourages support for RE-CDM developments? If so, please elaborate / If not, why not?

Respondent 1: Since the collapse of the CER market in 2012, we have not factored the CER revenue into our projects profitability.

Respondent 2: The increased profitability from stable CER prices would definitely attract RE-CDM developers.

Respondent 3: Given stable CER prices, RE-CDM developments will increase through increased profitability and lower risks from CER revenues over a long term.

19 What aspects of sustainable development did the RE-CDM project address in terms of South Africa's Integrated Resource Plan?

Respondent 1: Based on both the CDM SD criteria and the RE-IPPPP SED and ED criteria, we have engaged with sustainability criteria to meet our 30% rating contribution per the RE-IPPPP scorecard.

Respondent 2: The local economy is stimulated through job creation and skills development. Environmental benefits to the region include, preservation of natural habitat and vegetation in the rural area, saving water and reducing carbon emissions. Social impacts include the provision of social amenities and support of education at the pre-primary and primary school level.

Respondent 3: The Kouga windfarm community trust own 26% of the windfarm. This is a broad based ownership scheme participating in the revenue stream from the sale of electricity. These revenues are channeled back into the communities through the socio-economic and enterprise development projects.

20 How are the Power Purchase Agreement (PPAs) and Independent Power Producers (IPPs) linked to the favourable development of RE-CDM projects? Please elaborate.

Respondent 1: The PPAs are fundamental to the development of RE-CDM projects. The RE-IPPPP programme makes a huge contribution to the success of the renewable energy sector in South Africa. It is competitive and based on solid financial and sustainability criteria.

Respondent 2: The RE-IPPPP process in South Africa has contributed to the success of RE-CDM projects without a doubt.

Respondent 3: The RE-CDM projects, through the verification and validation cycles by the CDM EB, add value in terms of credibility in meeting SD criteria of RE-IPPPPs and carbon emissions.

21 Do you believe South Africa's abundant renewable energy resources will promote RE-CDM investment? If so, please elaborate / If not, why not?

Respondent 1: South Africa is regarded as an attractive destination for renewable energy investment. The CDM goes hand in hand with the current projects approved through the RE-IPPPP.

Respondent 2: South Africa's renewable energy resources present an attractive opportunity for RE-CDM projects.

Respondent 3: South Africa has huge potential for RE-CDM projects. As the bid rounds progress, lower bid caps are set, which puts pressure on developers to structure financially feasible projects. The CER revenues from CDMs could make a substantial contribution to the feasibility of projects in later bidding rounds.

22 What additional support is required to facilitate and improve your RE-CDM project implementation?

Respondent 1: DNA office support for improved validation processes.

Respondent 2: Support from the DNA to improve timeframes for PDD validations.

Respondent 3: Improved validation processes to reduce delays in the PDD registration.

23 What mechanisms should be introduced to enhance RE-CDM drivers and promote RE-CDM project investment? Please list and elaborate.

Respondent 1: A stable CER market needs to be established to improve demand for CERs to justify the time and costs to implement the CDM in renewable energy developing countries.

Respondent 2: A stable market for CER prices to better forecast revenues to promote RE-CDM project investments.

Respondent 3: The sustainability criteria of the CDM process, which is approved by the DNA in South Africa, should be integrated into the RE-IPPPP sustainability criteria to add credibility to a registered RE-CDM project developer's bid. This will promote the development of RE-CDM projects in South Africa and help to earn CERs, which may contribute substantially to the feasibility of a project constrained by lower bid prices in later rounds of the RE-IPPPP.