The Clean Development Mechanism's Contribution towards Sustainable Development in South Africa: The Bisasar Landfill Case Study

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Abstract

The Clean Development Mechanism (CDM) was established under Article 12 of the Kyoto Protocol to assist developed countries (countries listed in Annex I of the Protocol) to reduce their greenhouse gas (GHG) emissions by investing in carbon-offset projects within developing countries. Therefore, the dual-objectives of the CDM are firstly, to provide an economically viable platform for developed countries to reduce their GHG emissions whilst, secondly, to promote sustainable development within developing countries (UNFCCC, 1998:11).

The aim of this mini-dissertation is to critically analyze the CDM's contribution to sustainable development in South Africa. In order to do so, an extensive literature review was conducted to ascertain the general sentiment behind the CDM's contributions to sustainable development in South Africa and abroad. Furthermore, a case study was undertaken whereby the Bisasar Landfill project was analyzed to provide tangible evidence on the extent to which CDM projects can, and do, contribute to South Africa's interpretation of sustainable development.

The case study was conducted in accordance with the methodology first devised by Christoph Sutter (2003) during his PhD, whereby he assessed the extent to which CDM projects contribute to sustainable development in the host country. However, whereas Sutter mainly relied on the Project Design Documents (PDDs) to assess these projects, this mini-dissertation will aggregate the opinions of experts with personal and relevant experience of the Bisasar Landfill project, in order to assess its sustainable development contributions.

Using a structured questionnaire, the respondents scored the Bisasar Landfill project according to its social, environmental and economic impacts. The results from these questionnaires were then aggregated and represented graphically. These findings were then evaluated against the literature review to form a more holistic and evidence-based assessment of how the CDM has, and might still, contribute to sustainable development in South Africa. The evidence from this mini-dissertation suggests that the CDM has had a net-positive impact on sustainable development within South Africa.

However, there remains room for improvement on how carbon-offset projects are vetted and monitored, as some negative impacts were revealed. With the carbon tax and preceding carbon offset regulations imminent, it thus remains important that the relevant authorities formulate effective ways in which to promote and regulate the development of carbon-offset projects in South Africa. This could then further facilitate the transition towards a low-carbon economy whilst simultaneously promoting sustainable development.

Declaration

I, the undersigned, hereby declare that the work contained in this thesis/dissertation/mini-dissertation is my own original work and that I have not submitted it previously, in its entirety or in part, to any other university.

Signature:

JW Johnson

Date:

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ACRONYMS

Acronym	Description
BPEO	Best Practicable Environmental Option
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
DEAT	Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DNA	Designated National Authority
DNT	Department of National Treasury
DOE	Designated Operational Entity
DoE	Department of Energy
EC	European Commission
EAP	Environmental Assessment Practitioner
EDRC	Energy & Development Research Centre (University of Cape Town)
EIA	Environmental Impact Assessment
ESR	Environmental Scoping Report
EU	European Union
GCCC	Government Committee on Climate Change
GHG	Greenhouse Gas
IAIA	International Association for Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPCC	Intergovernmental Panel on Climate Change
INDC	Intended Nationally Determined Contribution
LFG	Landfill Gas
MAUT	Multi-Attributive Utility Theory

MATA-CDM	Multi-Attributive Assessment of CDM
MCDA	Multi-Criteria Decision Analysis
MFMA	Municipal Finance Management Act (Act No. 56 of 2003)
NDP	National Development Plan
NEMA	National Environmental Management Act (Act No. 107 of 1998)
PDD	Project Design Document
PJ	Petajoule
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCED	World Commission on Environment and Development
WSSD	World Summit on Sustainable Development

CHAPTER 1. INTRODUCTION

"Climate change is probably the biggest global environmental challenge facing humanity, transcending the purely environmental problems"

-***Professor Tumai Murombo (2015:340)***

1.1 Introduction

It is nowadays widely accepted by the scientific community that climate change has come about as a consequence of human interactions with the environment (IPCC, 2013; Sadler, 1996:12). According to the Fifth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC), "human activity is the dominant cause of observed [global] warming since the mid-20th century" (2013:v). Therefore, tension exists between the desire to maximise human welfare within a finite plant, whilst at the same time maintaining a healthy environment (Patel, 2010).

Many countries recognise the role they have played, as well as the need to act towards mitigating this trend. This is evidenced by the fact that, to date, and according to the United Nations Framework Convention on Climate Change's (UNFCCC) website, the UNFCCC has 197 members with 192 parties to the Kyoto Protocol and 175 signatories to the Paris Climate Agreement. Both these instruments of the UNFCCC make provision for signatories and parties to align with the ultimate goal of stabilizing greenhouse gas (GHG) "concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC, 1992:9).

Market instruments are becoming a relatively common mechanism for government attempts to curb climate change and promote sustainable development. As a market instrument, the clean development mechanism (CDM) has initiated much debate since its inception around the effectiveness and appropriateness of utilizing such tools in the fight against climate change (Lohman *et al*., 2006). The CDM was established under Article 12 of the Kyoto Protocol, to allow developed countries to reduce their greenhouse gas emissions by investing in carbon-offset projects within developing countries.

The Western ideology of free market economics remains the dominant paradigm regulating global economic trends (Centeno & Cohen, 2012). Despite being an efficient model for regulating economic activity, this system has been known to perpetuate inequality and exacerbate negative externalities (IPCC, 2007). With climate change being potentially the gravest threat ever known to humanity, and the neoliberal economic paradigm still the most powerful force regulating global economic transactions, Bond *et al.* (2006:4) express the concern that efforts will be focused on preserving the economic system at the expense of people and the planet preserving the economic system at the

expense of people and the planet. Therefore, the need exists to ensure that the concept of sustainable development remains of paramount importance for countries seeking to capitalize on market-based instruments.

Despite most world leaders agreeing that climate change is primarily a product of anthropogenic GHG emissions, the contentious issue at hand revolves around who, if anyone, should be ultimately responsible for not only reducing these emissions, but installing the infrastructural capacity to reverse this trend (Barret, 2009; Campiglio, 2012). As an instrument designed to curb GHG emissions, the CDM is the result of a compromise between the competing interests of developed and developing nations.

By using this mechanism (CDM), developed countries can reduce their GHG emissions in a manner that does not excessively hamper their economic aspirations, whilst developing countries can enjoy the benefits of foreign investment aimed at bolstering their sustainable development agendas. To ensure such projects contribute towards sustainable development, they undergo mandatory screening by the host country. The host country then has the discretionary power to either accept or reject a proposed project, based upon whether it believes the project will make a positive contribution towards its understanding of sustainable development.

According to the National Environmental Management Act (NEMA) (Act 107 of 1998), South Africa defines sustainable development as the "integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations". This definition is very similar to the definition coined by the World Commission on Environment and Development (WCED) in the Brundtland Report of 1987 whereby sustainable development was defined as "development which meets the needs of the present, without compromising the ability of future generations to meet their own needs" (1987:43). Despite some disagreement over the appropriateness of this definition, it was soon widely accepted after being adopted in the Rio Earth Summit of 1992.

One of the major criticisms of the CDM centres on the implications of each country being able to define sustainable development as they see fit (Fenhann & Olsen, 2008). Without a universally accepted definition, such an approach could allow for potential green washing whereby CDM projects make no tangible contributions to sustainable development as defined in the Brundtland Report. This could pose a problem for developing countries such as South Africa which, as signatories of the Kyoto Protocol, are allowed to host CDM projects. However, with a comprehensive and robust environmental legal system, South Africa is relatively less exposed than other developing countries to unsustainable and environmentally harmful projects being allowed to proceed uncontested (Morrison-Saunders & Retief, 2012).

In South Africa, aside from needing approval from the Designated National Authority (DNA) to proceed with the project, most projects would also need to undergo a costly and rigorous environmental impact assessment (EIA). Although having a rigorous legal system can safeguard the environmental rights of its citizens, it also places South Africa in the predicament of potentially losing out on foreign investment opportunities, since costly time delays can act as a deterrent for potential investors (Little, 2006; Ntuli 2012). Therefore, cognisance must also be taken of the potential for bureaucratic inefficiencies to hamper sustainable development initiatives within South Africa.

The Kyoto Protocol is comprised of two commitment periods: the first was from 2008 to 2012 and the second, known as the Doha Amendment, runs from 2013 to 2020. With the new Paris Agreement coming into force in 2020, the Kyoto Protocol will be phased out, along with the CDM. However, given South Africa's commitment to transition to a low-carbon economy, as evidenced by the recently proposed carbon tax and associated carbon offset regulations, it is important to learn from the lessons provided by the CDM experience in order to better understand how best to vet and monitor the next generation of carbon-offset projects likely to be developed within South Africa.

According to a report by the National Treasury, the potential demand for carbon offsets as a consequence of the impending carbon tax "could be between 25 and 30 million tonnes of CO_2e per annum" (DNT, 2014:23). As such, South African authorities will have the difficult task of allowing market participants the flexibility to operate in this market space unencumbered whilst at the same time ensuring that this new market and its players promote the concept of sustainable development as envisaged within NEMA.

For this reason, it is increasingly important to critically analyze the lessons learnt from the recent CDM experience, so as to provide insight on how South African authorities might improve the system of vetting and monitoring these projects, whilst simultaneously promoting the concept of sustainable development. Therefore, this mini-dissertation seeks to contribute to this dialogue by investigating the negative and positive attributes of the CDM experience in South Africa so as to highlight areas of improvement on how carbon-offset projects might better contribute towards sustainable development.

1.2 Problem Statement

Debate around the issue of climate change mitigation and its relationship to sustainable development initiatives began to emerge within research and policy around the late 1980s (Olsen, 2007:2). CDM projects are obligated to, as articulated within article 12 of the Kyoto Protocol, "assist Parties not included in Annex I in achieving sustainable development" (UNFCCC, 1998:11). Annex I of the Kyoto Protocol includes countries that have signed the protocol and thereby agreed to cap their emissions. The EU signed the protocol as a collective, giving them the right to allocate national responsibilities

between themselves (Labatt & White, 2007:141). Huq *et al*. (2003) note how researchers from developing countries raised concerns around the omission of sustainable development requirements within the climate regime - which, given the obligation of Annex I parties to assist non-Annex I countries with their sustainable development objectives as per the Kyoto Protocol, remains a concern.

Therefore, although the Brundtland Report proved instrumental in coining the concept of sustainable development and bringing it to the attention of policymakers, the difficulty remained in how to integrate this concept with the objectives of the CDM. As the host country's authority is mandated to either accept or reject CDM proposals, there are at least three dimensions that the designated national authority (DNA) should consider when assessing the potential impact that a CDM project may have on sustainable development within the host country. These three dimensions include impacts on the social, economic and/or environmental status of the host country.

A non-Annex I country refers to any country not listed in Annex I of the Kyoto Protocol (e.g. South Africa, India and China). The reason for this is that these countries were classified as still developing and were therefore excluded from the obligations outlined in the protocol that forced countries listed in Annex I to reduce their GHG emissions. As already indicated, one of the primary objectives of the CDM is to contribute to the sustainable development of the non-Annex I host country in which the carbon-offset project takes place. Host countries are given the discretion to accept or reject a project proposal, based upon its assessment of the contribution *that* project would make towards the host country's sustainable-development goals.

Two issues immediately arise as a consequence of this arrangement. Firstly, there is the issue of how the host country, as a developing or non-Annex I country, should formulate its understanding of sustainable development. Fortunately for South Africa, it has already managed to provide a relatively robust definition of sustainable development via the National Environmental Management Act (NEMA), (Act No. 107 of 1998). The second issue relates to how the host country should then assess and monitor project proposals against this relatively new concept of sustainable development. It is this second problem that will be the focus of this mini-dissertation.

There exists a concern that developing countries often lack the necessary skills and resources to properly formulate a holistic and coherent understanding of what sustainable development entails. Although South Africa may have been successful in providing a holistic and progressive definition of sustainable development, it may lack the institutional capacity to ensure this definition materializes at the project level. There is no point in developing a world-class definition of sustainable development if it is does not guide economic activity in the manner intended.

Furthermore, given South Africa's substandard economic circumstances as a developing country, a perverse incentive could exist whereby sustainable development criteria are not afforded the necessary due diligence as a result of the desire to expedite investment in CDM projects. Given that there is usually no monitoring or verification on whether sustainable-development objectives are achieved, "and no reward for project developers in the compliance framework", the entire sustainable-development objective of the CDM becomes somewhat undermined (Frankhauser & Watson, 2009:4).

According to a report compiled by Achanta *et al*. (2012:5); "the majority of studies on the impact of the CDM agree that the CDM has a positive impact on the various facets of sustainable development in the host countries". However, Frankhauser and Watson (2009:3-4) point out that it would not be prudent to make such a general assumption, as there has been widespread criticism of the CDM's contribution towards sustainable development (Boyd *et al*., 2007; Bond *et al*., 2007; Bond *et al*, 2012; Olsen, 2007; Schneider, 2007; Sutter & Parreño, 2007; UNDP, 2006).

The Durban landfill gas-capture project was the first CDM project to be proposed on the African continent. During the World Summit on Sustainable Development held in Johannesburg in 2002, the World Bank's Prototype Carbon Fund offered US$15 million in start-up capital (Erion, 2007:31). As such, the Durban Solid Waste (DSW) project seemed primed to be a shining example of how developing countries might utilize carbon finance in a manner that reduces GHG emissions whilst promoting sustainable development. Three waste sites were chosen - namely Bisasar Road, La Mercy and Marianhill - to be drilled and to have the gas extracted in order to produce energy.

However, the Bisasar Landfill site began to experience immediate setbacks and resistance from the local community. This strong opposition from the surrounding community during the environmental impact assessment (EIA) process intimidated the World Bank to the extent that they decided to renege on their initial proposal to broker a deal for the purchase of certified emission reductions (CERs) from the Bisasar Landfill project. However, the EIA dispute was later resolved and, after securing investments from the French Development Agency and South Africa's Department of Trade and Industry, the project was completed in April 2008.

Given the potential for the CDM to facilitate investment in a manner that could undermine one of its primary objectives, namely the promotion of sustainable development within non-Annex I countries, it is necessary to investigate whether CDM projects are in fact upholding this objective as initially intended. This is important because, if it transpires that CDM projects are not adequately contributing towards the host country's understanding of what sustainable development means, there would need to be a re-evaluation of such projects.

Furthermore, given South Africa's aspirations to transition towards a low-carbon economy, combined with the impending carbon tax legislation, it is inevitable that there will be increased investor interest in developing carbon-offset projects. Therefore, South African authorities will need to be able to facilitate this transition by affording market players the platform to invest in carbon-offset projects with confidence whilst simultaneously ensuring these projects align with South Africa's concept of sustainable development.

1.3 Research Aim and Objective

The primary objective of this mini-dissertation is to critically analyse the CDM's contribution to sustainable development in South Africa.

In order to address the above-mentioned research question, the following sub-research questions will need to be explored and answered:

1.1) To what extent has the Bisasar Landfill project contributed towards sustainable development in South Africa?

1.2) Has the CDM been successful towards contributing to sustainable development in South Africa, and what lessons learnt can be applied to future carbon-offset projects?

1.4 Significance of Study

With 362 CDM projects having been submitted to the DNA as of the 19th of January 2016, evidence suggests that "there is a growing demand for carbon offsets being traded in the voluntary carbon offset markets domain" (DNT, 2013:57). Adding to this is the impending carbon tax legislation in South Africa which will most likely facilitate renewed urgency towards developing carbon-offset projects within the country. As such, this renewed urgency will result in increased investment into the development of carbon-offset projects.

South Africa cannot afford to develop in an unsustainable manner, but it also cannot afford to have no development at all. Therefore, it becomes imperative to understand the lessons learnt from the CDM experience, so as to ensure that the regulatory process around vetting and monitoring carbon-offset projects is improved. Detailed analysis into the strengths and weaknesses of the Bisasar Landfill project's contributions towards sustainable development can thereby facilitate an investigation into possible improvements around vetting and monitoring the next set of carbon-offset projects being developed in South Africa.

CHAPTER 2. RESEARCH METHODOLOGY

"By the early 1990s, the idea of mixing moved from seeking convergence to actually integrating or connecting the quantitative and qualitative data. For example, the results from one method can help identify participants to study or questions to ask for the other method"

- Creswell (2009:14)

2.1 Introduction to Research Strategy and Approach

The research strategy and approach utilised a mixed-method approach, as it includes both quantitative and qualitative research methods. This includes an extensive literature review, questionnaires and a case study. Johnson *et al*. (2007:115-117) identify positive reasons for combining quantitative and qualitative research. This study makes use of a "*qualitative dominant* mixed-methods research" approach, given that it utilises some quantitative data within an otherwise mainly qualitative research agenda (Johnson *et al*., 2007:124). As explained by Creswell, a "qualitative approach seeks to establish meaning of a phenomenon from the views of participants" and the main source of data utilised for this research is collected via questionnaires (2009:16).

The advantages of using a mixed-method approach are also motivated by Creswell (2003) whereby he advocates the use of quantitative and qualitative research in a manner that allows these two methods to speak to one another. The Bisasar Landfill project has been chosen as the representative case study because, as advocated by Collins (2012:8), the utilisation of multiple source types that both converge and contradict the subject matter at hand can generate "more meaning and, in turn, [enhance] the quality of syntheses". The Bisasar Landfill project has an abundance of literature espousing contradictory perspectives which can enhance the legitimacy of the study by allowing a more in-depth investigation into the subject matter.

This makes the Bisasar Landfill project valuable because, as described by Zorn (2006), literature reviews are a way to avoid "reinventing the wheel" by building upon the insights and discoveries of others. Furthermore, literature reviews assist researchers by enabling them to develop an argument by extending the knowledge already available in order to expand upon the subject in a particular direction (Zorn, 2006). As already mentioned, the Bisasar Landfill project has a plethora of accessible and reputable literature in this regard.

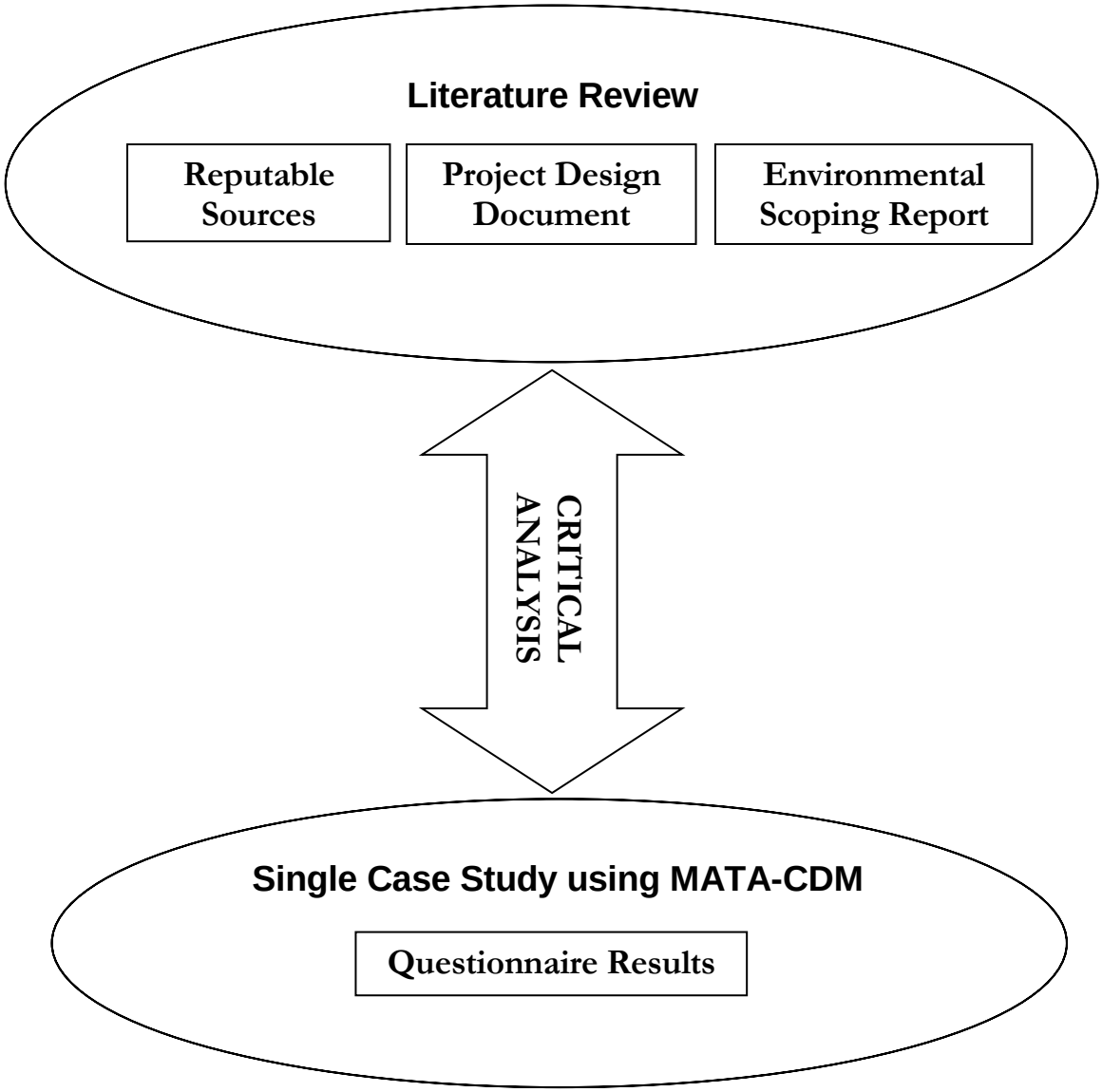

Figure 1: Methodology Flowchart

Source: Researcher's interpretation

2.2 Methods for Reviewing Literature

To achieve the primary objective of this study, a "qualitative systematic review" of the literature was utilised for integrating and comparing the findings from various qualitative studies (Grant & Booth, 2009:99). As such, literature was sourced according to a particular theme so as to broaden the understanding of a particular phenomenon (2009:99). The themes for this particular study were 'Clean Development Mechanism', 'sustainable development', 'South Africa' and 'Bisasar Landfill'. These key words were used to facilitate an internet search using Google and Google Scholar for the most current literature on these topics. The literature was then chosen according to how current it was, as well as

the quality and reputation of the publishing agent. To this extent, and as far as was practicably possible, outdated and/or grey literature was excluded from the study.

The literature review also made use of multiple source types to increase the legitimacy of findings by using "between-source triangulation" and "between-source initiation" (Collins *et al*., 2012:8). The former allows the researcher to assess the level of convergence between different sources whilst the latter makes use of material that highlights contradictions. In this way, the research is legitimised by the extent and variability of the sources utilised.

Aside from the most relevant and reputable literature covering the subjects of 'CDM', 'sustainable development' and 'Bisasar Landfill', the following two key documents were used;

1) Project Design Document (PDD): as a key document for validation, host country approval, registration and verification of a CDM project, the PDD contains a detailed description of the proposed project. Furthermore, these documents are made available to the public on the UNFCCC website.

2) Environmental Scoping Report (ESR): the Environmental Impact Assessment (EIA) process in South Africa is a relatively rigorous exercise investigating the potential impacts a project may have on the surrounding environment (PDD, 2015:57). As such, and given its status as a publicly available source of information, the ESR document provides detailed information on the potential environmental and social impacts posed by the Bisasar Landfill project.

These two documents are important sources of information, given their high level of detail and relative objectivity. Thus, the main purpose of the literature review was to provide current, reliable and divergent perspectives and information on how the CDM in general, and the Bisasar Landfill project specifically, have contributed to sustainable development in South Africa. The information gathered from this exercise was then assessed against the quantitative data collated from the case study.

2.3 Single-Case Study Approach

As mentioned previously (see Introductory section of the Methodology) there are various strengths and weaknesses attributed to conducting either single-case or multiple-case studies. The following section outlines the rationale behind the decision to adopt a single-case study, followed by the strengths and weaknesses of this particular approach.

The Bisasar Landfill project was chosen as a single-case study primarily because it forms an appropriate design approach in accordance with the three justifications provided by Yin (2009).

Furthermore, this single case represents what Yin (2009:47) refers to as a *critical case* in that it meets "all of the conditions for testing the theory [and can thus] confirm, challenge, or extend the theory" being explored. The reasons for it being a *critical case* are based on the fact that the Bisasar Landfill project has received extensive exposure around the efficacy of its contributions to sustainable development in South Africa. As such, a "single case can then be used to determine whether a theory's propositions are correct or whether some alternative set of explanations might be more relevant" (Yin, 2009:47).

These include the fact that this project was "awarded the 'Honorary Energy Globe Award' Project at the Prague Energy Globe Awards for the project's contribution and performance towards helping to sustain the environment" (DoE, 2009:76). However, despite this accolade, there have been numerous public complaints regarding to the project's negative impacts on the welfare of the neighbouring community. These complaints mostly relate to the project's negative impact upon the air quality and the associated health implications (Bond *et al.*, 2009). Therefore, and in keeping with Collins' (2012) ideas on using multiple source types to increase the legitimacy of findings, arguments for and against the Bisasar Landfill project and the CDM in general were sourced in order to maintain a balanced dialogue.

Furthermore, the Bisasar Landfill project also represents a broad range of CDM project types. When compiling their annual carbon-offset project statistics, the Department of Energy (DoE) categorizes the various project types into eleven categories. Due to the nature and activities associated with the Bisasar Landfill project, it could fall within any of the following three categories: renewable energy, waste management and/or methane recovery and flaring (DoE, 2016:77). When combined, these three categories account for over 60% of the total number of projects within South Africa. In this sense, the Bisasar Landfill project represents over half of the carbon-offset project types within South Africa, making it a relatively well-balanced and representative case study.

2.4 Methods for Empirical Investigation and Data Collection

Creswell (2009) provides for six major mixed-method models, namely: (i) sequential explanatory model; (ii) sequential exploratory model; (iii) sequential transformative strategy, (iv) concurrent triangulation strategy, (v) concurrent embedded strategy and (vi) concurrent transformative strategy. For the purposes of this mini-dissertation, the concurrent transformative strategy is employed, as it uses "the concurrent collection of both quantitative and qualitative data" (2009:215). Data is thus collected via the following two main methods:

1) Literature review: The research analyses various literature sources including, but not limited to, the PDD and ESR documents, as described in section 2.2.

2) Questionnaire: A structured questionnaire was provided to four key stakeholders involved in the Bisasar Landfill project via an interview process (see appendix A for full questionnaire).

The data gathered via these questionnaires formed the main source of data for critically evaluating the Bisasar Landfill project's contribution towards sustainable development. To ensure the quality of data obtained, only professionals with first-hand experience of the Bisasar Landfill project were chosen to complete the questionnaires. Creswell (2009:12) explains how this approach "provides a quantitative description of trends, attitudes or opinions of a population by studying a sample of that population using questionnaires or structured interviews for data collection".

The Multi-Attributive Assessment of CDM (MATA-CDM) methodology used to evaluate the Bisasar Landfill project's contribution to sustainable development is based upon the Multi-Attributive Utility Theory (MAUT) approach developed by Sutter (2003) during his PhD research at the Swiss Federal Institute of Technology in Zurich. This approach formed the core methodology for structuring the questionnaire as well as for evaluating and presenting the data obtained. The criteria for the questionnaire were based upon Sutter's MATA-CDM.

In accordance with the technique advocated by Gordon (cited by Barriball & While, 1994:330), the wording and sequence of questions were standardized for each respondent so that any difference in answers was as a consequence of differences amongst the respondents rather than in the questions asked. As such, the primary objective was to therefore focus on standardizing the stimulus and experience for each respondent. Furthermore, another invaluable component of this form of data collection rests on its ability to allow for probing (Barriball & While, 1994:331). Where possible, interviews were face-to-face; however, where logistics did not allow face-to-face interviews, telephone interviews were conducted.

Although the questionnaire was structured, the interviews were conducted in conversational form. This allowed the interviewee the flexibility to discuss information without having the feeling of being interrogated. Furthermore, it allowed the interviewer to probe the respondent's rationale behind selecting certain answers. Probing provides an invaluable means for eliciting valuable information whilst maintaining reliability (Barriball & While, 1994:331). Where logistics did not allow, probing was administered via a phone call and/or email correspondence. All forms of communication were recorded for quality purposes.

The sample size was relatively small, due to the availability of persons with direct experience of the Bisasar Landfill project. This type of non-probability sampling is referred to as 'deliberate sampling', as selection is based on their suitability (Robson, 2007; McNeill & Chapman, 2005). In other words, the

researcher “purposively chooses the particular units of the universe for constituting a sample on the basis that the small mass that they so select out of a huge one will be typical or representative of the whole” (Kothari, 2004:59).

The selection of the four people to be interviewed for the questionnaire was based on their particular role and experience on the Bisasar Landfill project. They included the then Bisasar Landfill project manager, the head engineer, the appointed environmental legal advisor and a professor from the University of the Witwatersrand. Each interviewee was selected to maintain, as far as practically possible, a representative sample. Maintaining a representative sample is important towards mitigating the possibility for systematic bias (Kothari, 2004:57). To accommodate this, only one respondent was actively involved in the project at the time of being interviewed, and Professor Patrick Bond was purposely chosen as a critic and long-time opponent of the Bisasar Landfill project.

Kothari explains (cited by Ntuli, 2012:39) how the data obtained from any questionnaire is usually categorical. In this way, questions can either be dichotomous (yes or no), multiple choice (alternative answers listed) or open-ended. Furthermore, when the choice of category is merely two, it is referred to as binary data while, when more than two choices are on offer (e.g. marital status categories can be expressed via married/single/divorced/widowed) it is nominal data. Finally, when the categories can be ordered or rated, (e.g. strongly agree, agree, disagree, strongly disagree), this form of data is known as ordinal data (Ntuli, 2012:39).

In practice, it is unusual to come across a case in which a questionnaire merely relies on a single form of questioning (2012:39). Instead, it is often prudent to allow various forms of questioning methods to complement one another. For instance, and according to Kothari (cited by Ntuli, 2012:39), when “multiple-choice questions constitute the basis of a structured questionnaire, open-ended questions are generally inserted (to gain a more complete picture of the respondent’s feelings and attitudes)”. As such, the questionnaire utilized for the purposes of this mini-dissertation made use of dichotomous, multiple-choice and open-ended questions.

The first set of questions was structured to gather background information on the respondent and makes use of dichotomous or binary data. These questions reveal the respondent’s level of involvement with the CDM in general, as well as the Bisasar Landfill project specifically. However, the focus of these questions, namely section A, was to gather information around the level and type of experience the respondent had with the Bisasar Landfill project, in order to provide evidence of their eligibility (and thus an added level of quality assurance).

The second part of the questionnaire, section B, involved a slightly modified version of Sutter’s (2003) MATA-CDM. In order to ensure that respondents were able to answer all of the questions posed,

three technically detailed questions were modified by making them less technical and therefore more open to elicit a response from all respondents. There were three subsections to this section, namely social, environmental and economic (see figure 2). Each subsection was comprised of four questions, resulting in a total of twelve questions for section B. Respondents had to choose from a selection of five answers (A-E) per question.

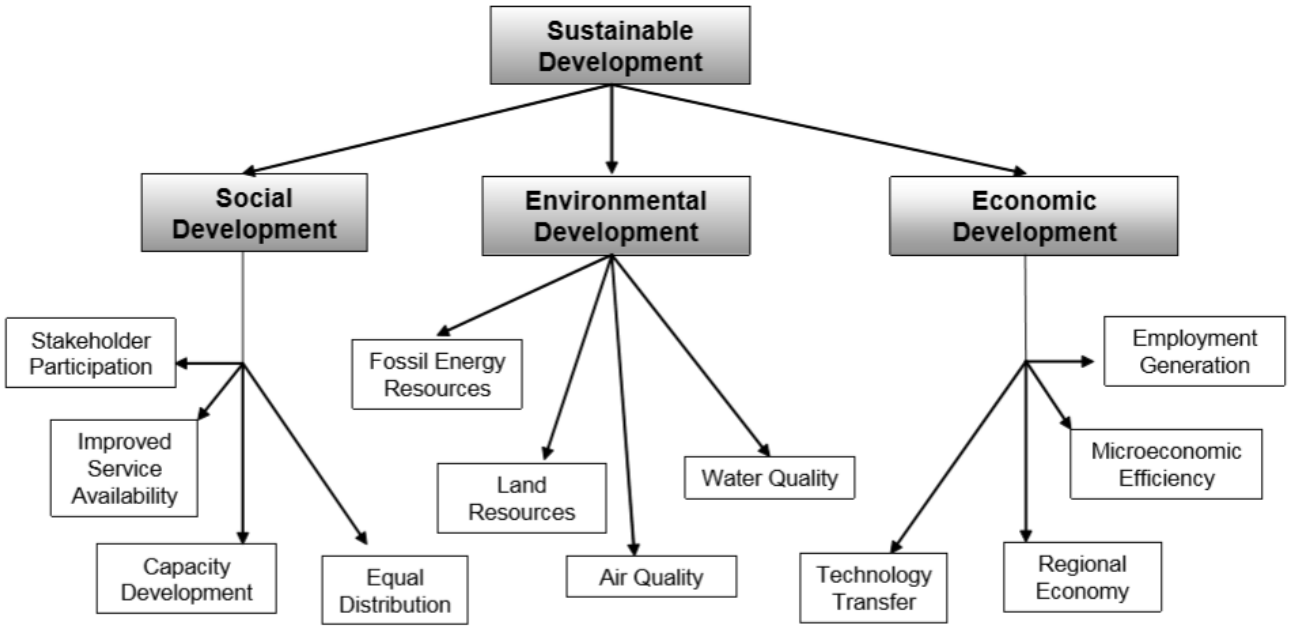

Figure 2: Hierarchical tree of sustainability criteria whereby the 12 criteria are grouped into social, environment, and economic sub-categories

Source: PhD thesis by Sutter, 2003:81

Section C made up the final part of this questionnaire and obtained further insight into the respondent's personal views around the topic of the CDM's contribution to sustainable development. This section made use of multiple-choice questions in the form of Likert scales, as well as open-ended questions. The multiple-choice questions obtained ordinal data through asking the respondents to rank their answers by choosing whether they strongly agree, agree, disagree or strongly disagree with the statement presented.

The final two questions are open-ended, with the purpose of not only further probing the respondent on their views and experience, but also providing the respondent with room to elaborate more freely around the subject matter and justify the rationale behind the choice of answer/s. This freedom not only allowed for better identifying the context in which the response was given, but also helped to enrich the data collected. This flexibility allowed for a more in-depth, detailed and vivid examination of the Bisasar Landfill case study (Rubin & Rubin, 2005).

2.5 Sustainability Assessment Using MATA-CDM

In order to assess the sustainable development contributions made by CDM projects, Sutter (2003) utilized Multi-Attributive Utility Theory (MAUT) as the theoretical framework for developing the methodology referred to as Multi-Attributive Assessment of CDM (MATA-CDM). Scholz and Tietje explain (cited by Sutter, 2003:76) that as a utility theory, the primary objective of MAUT "is to attain a conjoint measure of the attractiveness (utility) of each outcome of a set of alternatives". In other words, a set of alternatives or criteria are weighted according to their importance using scaling factors which, when combined, provide an overall utility score for the phenomenon under investigation based on absolutely defined value functions (Sutter, 2003:76-77).

According to Sutter (2003), the Multi-Attributive Assessment approach is exceptionally appropriate for collecting and analysing data for CDM projects. Furthermore, the MATA-CDM methodology has been developed and tested at the Swiss Federal Institute of Technology in collaboration with several partners since February 2002. Furthermore, the sustainability criteria were developed in collaboration with the World Business Council for Sustainable Development (WBCSD) in conjunction with the International Emission Trading Association (IETA), and the initial testing of the methodology was conducted in close co-operation with the University of Pretoria in South Africa.

For MATA-CDM, the criteria focused on the sustainability contributions of CDM projects and were developed by Sutter at the Swiss Federal Institute of Technology in collaboration with the World Business Council for Sustainable Development (WBCSD) and the International Emission Trading Association (IETA), and tested in close co-operation with the University of Pretoria in South Africa (2003:78). As such, given that 123 experts collaborated on developing these criteria (see figure 4) with South African experts playing a key role in the process, a relatively high level of quality assurance can be attributed to the formulation of these criteria as being best practice indicators of sustainable development for South African CDM projects (2003:80).

Each criterion can be converted to a single utility value (u) between -1 and 1 (see figure 3). As such, MATA-CDM provides the platform on which to aggregate "the results of the various criteria by an additive model that computes an overall utility (U) of the CDM project between -1 and 1" (2003:79). Once these results are collated, a final value is derived with which to determine whether the project had a positive or negative impact on the sustainable development of the host country. In essence, a "positive value indicates that the project has a net positive effect on the sustainable development of the country" whilst a negative value indicates a negative impact (2003:79).

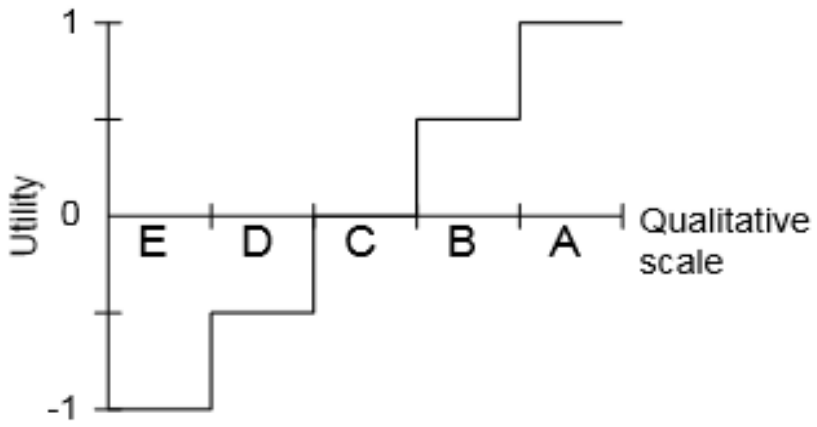

Figure 3: Utility Function for Quantifying Qualitative Data

Source: Sutter, 2003:225

Each criterion is assessed, and provided a value from -1 to 1. Sutter assessed each criterion using either quantitative, semi-quantitative or qualitative methods, based upon the data collected from the PDDs and stakeholders involved in the project (2003:82). Due to various capacity, time and information constraints, the qualitative method was employed to assess all criteria for the purposes of this mini-dissertation. This technique was similarly employed by Sutter whereby, in instances where a criterion was not directly measurable, it was "estimated by the study team or measured by a stakeholder inquiry" (2003:91).

Therefore, rather than using quantitative techniques to assess some criterion, this mini-dissertation relied on qualitative data gathered from professionals with experience of the Bisasar Landfill project in order to assess the criteria. Each and every criterion that employed a purely quantitative utility function, of which there were three, was reformatted and expressed using the qualitative utility function used by the other eight criteria. This utility function (see figure 3) provides a means of ascribing a value, or utility score, based upon a choice of five options (A to E).

The results obtained from the four respondents were then aggregated and represented as an average. In this way, the expert opinions of the respondents are quantified and aggregated to provide a final assessment on the Bisasar Landfill project's contribution to sustainable development. As such, this technique further removes individual bias by offering a representative value based upon the combined experience and intuition of all four respondents. This simple statistical method can be expressed using the following formula:

$$U = \frac{\Sigma x}{n}$$

where U = overall utility for a single criterion
$\sum x$ = sum of utility values gathered from respondents
n = number of utility values counted

The data collected from the questionnaires was then entered into an Excel® spread-sheet database. This spread-sheet then used the above formula to collate this data and provided a final average score for each criterion and is displayed via a graph. Data was also gathered from three South African CDM projects analysed by Sutter in order to provide a comparative assessment. The utility score of each criterion was then calculated for every project so as to directly compare the sustainable development impacts of all four projects.

This sequential mixed-method approach results in a quantitative method following from a qualitative research method. In other words, chapter 3 forms the literature review which is an entirely qualitative exercise while chapter 4, although also mainly a qualitative exercise, makes use of quantitative techniques to provide numerical data. In the words of Creswell (2009:220); "the qualitative data collection and analysis comes first, followed by the quantitative data collection and analysis". In this sense, the findings made from the quantitative research component helped to elaborate and extend upon the findings made during the qualitative literature review component.

Furthermore, although quantitative and qualitative data collected are presented in separate sections, "the analysis and interpretation combines the two forms of data to seek convergence or similarities among the results" (Creswell, 2009:220). Chapter 5 forms this final assessment whereby the results gathered from the purely qualitative literature review were assessed against the more quantitative case study results. This final chapter (refer to chapter 5) also offers possible solutions and potential areas for further investigation.

2.6 Quality Assurance of Data and Limitations

McNeill and Chapman (2005) point out the importance of maintaining validity in a research project. In this sense, validity refers to whether the data collected represents a true picture of what is being studied. Despite various measures employed to reduce author bias and increase the quality and transparency of the data, the inherent complexity associated with the relatively new endeavour of sustainability assessment (e.g. MATA-CDM) results in a level of subjectivity and nescience that cannot be altogether avoided. However, given that uncertainties are carefully and transparently declared, any limitations arising from limited experience and personal bias should not impact upon the integrity of the sustainability assessment in any material way.

Given that validity and reliability of mixed research is such a pertinent issue, the researcher needs to address the manner in which data is obtained, controlled and interpreted, so as to ensure the reliability of its outputs. For the purposes of a social science investigation, such as this one, the researcher needs to focus on validity from an internal and external perspective (Berg, 2007). As such, and according to Berg (2007), *internal validity* refers to the extent to which the research is actually

measuring what it initially sought out to measure whilst *external validity* looks at whether it answers the question being asked. Validity is relatively assured for the purposes of this mini-dissertation, given that it employs a methodology that has already proven to be successful in its endeavor, earning Sutter the ETH medal for best PhD thesis in 2003.

However, sustainability is a notoriously complex concept, making difficult its implementation at a practical level (Morrison-Saunders & Retief, 2012:38). One of the difficulties surrounding an assessment of a particular project at a particular point in time concerns the temporality as well as the spatial system boundaries of the assessment. For the purposes of this mini-dissertation, and given that the project is already in operation, the time-frame shall be limited according to the date of project commencement to the date of evaluation (i.e. interview process). Furthermore, the spatial scope will be delineated by the ESR and PDD.

It is almost impossible to retain complete objectivity during the assessment of a particular project against a pre-defined set of sustainability indicators. In order to reduce the potential for subjectivity to influence the results, the following quality controls were employed:

1) The application of a reliable, published methodology (MATA-CDM) which has already been tested on CDM projects within South Africa. A well-established mixed-method methodology aids in ensuring external validity (Robson, 2012).

2) To remove author bias and lack of experience in the field, key informants were selected for their first-hand knowledge and insight of the Bisasar Landfill project, and their responses were aggregated to remove individual bias.

Despite the high level of detail contained within both the PDD and ESR documents, information gaps are still evident, resulting in the need for key informants to provide further clarity by means of being interviewed. Unfortunately, as discussed by Barriball & While (1994:331), “individual respondents and the circumstances surrounding each research project also have an impact upon validity and reliability”. Therefore, at least half of the respondents included in the sample had no vested interests in the operational success of the Bisasar Landfill project - a method which balanced the potential for respondent bias.

Morse (1989) explores the issues around the varied reasons people have for agreeing to participate in research projects. It is usually found that, when the topic of research is not important to the respondent, there is less motivation to provide accurate and full answers (Gordon, 1975; Moser & Kalton, 1971. In this particular case study, given the relatively large-scale publicity the project had already received, respondents still involved in the project might have been inclined to elaborate more on the positive aspects of the Bisasar Landfill project (as opposed to its negative aspects)..

In order to counterbalance this biasness, a long-time opponent and researcher of the Bisasar Landfill project was also included in the questionnaire process. Professor Patrick Bond from the University of the Witwatersrand has published various articles on environmental justice, and has extensive academic insight into the negative impacts of the Bisasar Landfill project. Aside from ensuring that the sample of stakeholders included a cross-section of perspectives on the subject, cognizance was taken of the need to remain objective by following the structured questionnaire and only when necessary probing for further information on a particular subject.

In order to assist with the difficulty of assuring the quality of data for elaborate and lengthy answers, a digital voice recorder was used to record each interview. This allowed the interviewer to review the conversation in the event that certain points were not written down properly, or to review answers in more detail after the interview process was completed. As such, answers were reviewed to ensure accuracy and detail, and a digital record of the interviews retained on file.

Due to logistical difficulties, three of the respondents opted to fill in the questionnaires themselves. In these cases, the interviews to gather information around the reasoning behind certain answers were conducted telephonically. Furthermore, and also due to logistical reasons, two of the respondents opted to elaborate upon their answers within the questionnaire itself rather than via a face-to-face interview or phone call. The limitation of this option is that it can remove the interviewer's ability to assess visual clues and/or probe certain rationalizations more deeply. Despite this limitation, the questionnaires were administered and conducted in a similar informal manner and all interviews recorded for quality purposes.

In order to address the ethical component of the research, the researcher firstly obtained ethical clearance from the relevant university department and, secondly, outlined the purpose of the research to all respondents in the form of a letter (see annexure A). This letter was then emailed to each respondent, along with the questionnaire, so as to explain the role of the respondent in the study. Respondents were allowed to remain anonymous if they so wished, as well as not forced to divulge the names of organizations to which they belonged. However, all respondents were comfortable enough with the process, and none objected to revealing their personal details and affiliation with the project being studied.

CHAPTER 3. CONTEXTUAL OVERVIEW

"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs"

- World Commission on Environment and Development (1987)

3.1 Sustainable Development

There exists widespread consensus across the majority of scientific communities that GHG emissions have 1) increased at unprecedented levels since pre-industrial times, and 2) that human activities, both direct and indirect, are the main cause of the current global-warming trend (Sadler, 1996:12. The Industrial Revolution, which commenced around the middle of the 18th century, was celebrated as an era in which mechanisation unburdened humanity from various menial tasks, resulting in increased economic activity and higher standards of living. However, and unbeknown to the general populace of the time, this era of economic expedience was changing the composition of the atmosphere (Labatt & White, 2007:3-4).

French mathematician and physicist Joseph Fourier (1768-1830) began exploring ideas around the concept that Earth's atmosphere has certain characteristics which, under the right circumstances, allow it to trap heat. Later, Swedish scientist Svante Arrhenius (1859-1927) expanded on this notion by recognising the role that CO_2 played in warming the Earth's surface. As such, Arrhenius has been credited with uncovering the role played by the fossil-fuel industry during the Industrial Revolution in changing the global composition of the atmosphere.

The idea that the burning of fossil fuels can influence the composition of the Earth's atmosphere in such a way as to amplify the natural 'greenhouse effect', has since gained momentum as a credible scientific theory. Phenomena such as ozone depletion, climate change, acid rain, water pollution and land degradation are only some of the negative environmental consequences that can be attributed to unregulated economic activity. These negative environmental spinoffs are now well documented and are normally referred to, especially in economic circles, as 'negative externalities' (Roach *et al.,* 2015:10).

Evidence suggests that humanity has the capacity to overcome almost any challenge, should it decide to collaborate effectively towards resolving the dilemma at hand. Recent developments have seen various global initiatives taking form to combat ozone depletion, biodiversity loss and climate change. The advent of the concept 'sustainable development' provided a pivotal moment for global leaders to re-evaluate their understanding of economic growth, or 'business-as-usual'. The concept

of sustainable development has since its inception slowly gained traction, to the point where most countries strive to pursue a developmental path that is sustainable. The following chapter unpacks the etymology of the concept now referred to as “sustainable development”, as well as how it has developed within South Africa.

3.1.1 Historical Overview

According to Lawrence (2003), the concept of sustainability or sustainable development can be traced all the way back to the 19th century and beyond. However, the term ‘sustainable’ was most notably introduced into political language through the report titled ‘*Limits to Growth’*, published in 1972, where the authors describe a situation in which they “are searching for a model output that represents a world system that is 1. Sustainable without sudden and uncontrollable collapse” (Attah, 2010:8).

Etymologically speaking, the World Commission on Environment and Development (WCED) first introduced the notion of ‘sustainable development’ via the Brundtland Report (1987) through the definition; “sustainable development is development which meets the needs of the present, without compromising the ability of future generations to meet their own needs” (1987:43). Thereafter, the Rio Earth Summit convened in 1992, where a decision was made to adopt and promote the concept of ‘sustainable development’ as envisioned by this report. There remains debate over whether this definition encompasses all necessary nuances, or if perhaps it should be adapted or broadened.

Asheim (1994) points out how the most common definition of sustainability takes an anthropocentric stance, to the extent that ‘quality of life’ refers to the quality experienced from a human perspective. Human welfare features as the overriding goal to be maintained for future generations of human beings. Anthropocentrism is the approach that emphasises human interests as the most important, and often the only factor, that needs to be taken into account within ethical dilemmas. As such, this approach has been criticized for its inability to provide an extensive or holistic evaluation on the value of natural-resource preservation because of its limited focus on human interests.

However, Lawrence (2003:175) highlights that, despite such varied and extensive debates over the topic, “common to most definitions is a desire to maintain, over an indefinite future, necessary and desired attributes of the socio-political system and of the natural environment”. The concept of sustainability is a complex one whereby the definition becomes continuously refined through the interplay between sustainability forms and ethical perspectives. According to Sadler, (cited by Lawrence, 2003:175) this dynamic relationship, as represented below (see figure 4), can be further broken down by its “overlapping and interdependent value systems (e.g. ecological, social, economic)”.

The result of this dynamic process - whereby individuals, groups and societies formulate a particular understanding of sustainability - results in a multitude of various understandings and perceptions around the concept (Robinson *et al.*, 1990). However, the ultimate task is to find a common theme, develop principles that underpin the common theme, and finally to utilise the most appropriate tools available towards achieving specific goals based on the principles that uphold this common theme.

Since the Rio Summit in 1992 formally introduced the concept of sustainable development, there has been rapid growth towards integrating the concept of sustainability within various policy instruments and development activities. A notable example of this is Principle 4 of The Rio Declaration which states that “in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it”. However, environmental protection makes up only one element of sustainable development.

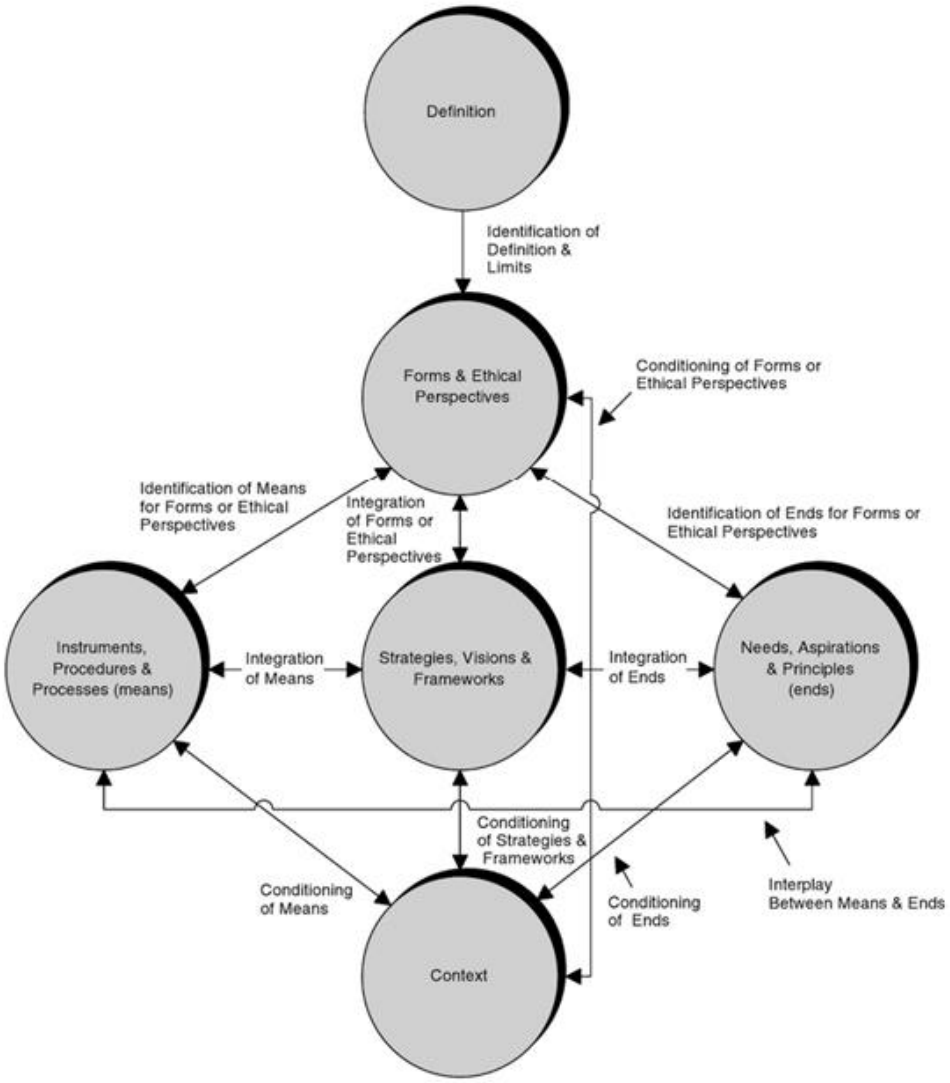

Figure 4: The interplay between sustainability forms and ethical perspectives

Source: Lawrence, 2003:178

The three fundamental principles that underpin the concept of sustainable development have since been established as a result of extensive and rigorous academic investigation and discourse around the subject. These three fundamental principles are, using Sadler's words (1996:184):

1) Ecological integrity -- the "self-organizing" capability of natural systems to maintain their structure and functions in the face of natural fluctuations, imposed stress, and irregular events;
2) Economic output or "'growth" -- to improve standards of living (real income per capita) and the quality of life, e.g., health and education services and;
3) Social equity -- the fairer distribution of income and opportunities among existing (intra-generational equity) and future (inter-generational equity) populations.

Lochner *et al*. (2008:92) agree with the inherent complexities associated with the concept of sustainability through the statement that "sustainability, or sustainable development, is a notoriously 'fuzzy' concept that arguably has different meanings at different levels of application and in different contexts". However, despite these complexities, Lochner *et al*. conceptualise sustainability similarly to Sadler (1996), in that they break it down into three simple overlapping circles (see figure 5).

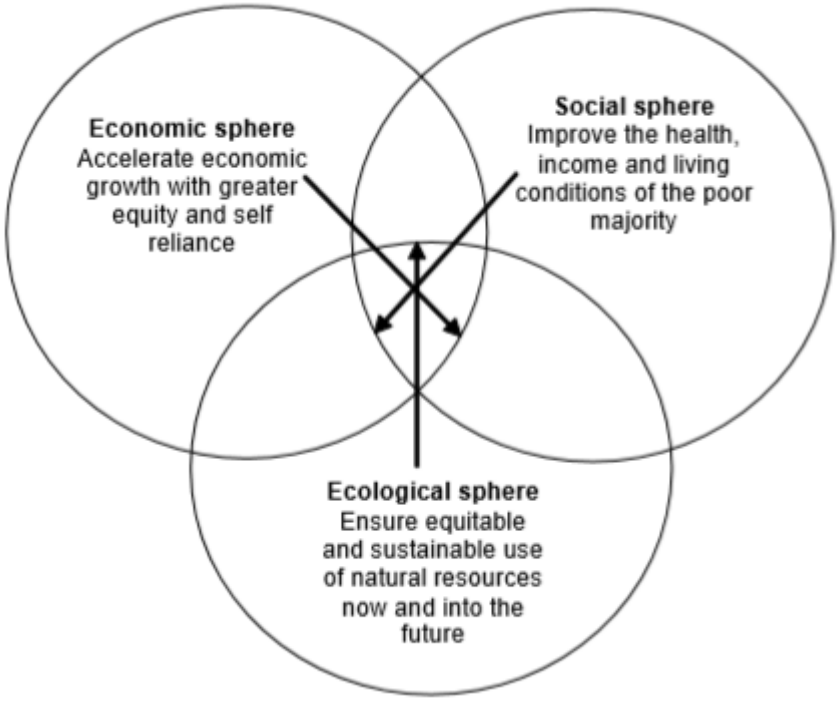

Figure 5: Fundamental principles underlying the concept of sustainability

Source: Lochner et al. 2008:92 and adapted from SADC, 1996

Despite these concerns, the author concurs with Nieslony (2004:14) in that "the concept of sustainable development has the potential to become a paradigm, on the basis of ecological, economic and social considerations, which can influence society's behaviour towards the human and natural environment". In other words, there remains the potential for this inherent complexity to be overcome to such an extent that a holistic and universally appropriate definition can be embraced on a global scale. Or, at the very least, that such a definition is adopted by global stakeholders, based upon the common goal of self-preservation.

This phenomenon is already underway, with 193 Member States of the United Nations unanimously adopting the United Nations Sustainable Development Agenda which includes 17 sustainable development goals at its core. These 17 sustainable development goals are comprehensive and make specific provision for Climate Action through goal 13. This global commitment from 193 different nation states showcases the extent to which a universally agreed-upon definition of sustainable development is possible.

3.1.2 Development in South Africa

> *"In our country, we have come to realise that the process of democratization and establishing good governance can only be guaranteed if it is based on a sound economic and socio-economic framework that is environmentally sustainable"*
>
> ***- White Paper on Environmental Management Policy (DEAT, 1997:2)***

Environmental awareness and conservation in South Africa can be traced as far back as 1926, when "the first national legislature on nature conservation called the National Parks Act (Act 57 of 1976) was promulgated" (Aregbeshola, 2009:29). However, these early efforts were relatively limited and mainly focused around the protection of fauna and flora. Since then, the Environmental Conservation Act (Act 100 of 1982) came into effect, with the then President requesting the "President's Council to investigate and propose appropriate principles for environmental management in South Africa" (2009:30).

Gerber (2009) explains how the transition to a democratic government, in conjunction with the first World Summit on Sustainable Development, resulted in criticism of the apartheid-era planning regime. The apartheid era can be characterized as having been primarily focused on serving the privileged (white) population, with limited focus on integrating environmental, social and economic concerns into residential planning for non-white areas. This system utilized a top-down process, allowing for little to no public and/or stakeholder participation (Gerber, 2009:76-77). However, 1994 ushered in the establishment of a constitutional democracy with the first democratic elections in South Africa.

The Constitution of the Republic of South Africa, 1996 (hereinafter referred to as the Constitution), expressly recognises that a correlation exists between the need to regulate environmental protection on the one hand whilst promoting sustainable development on the other. Section 24 of the Constitution affords the unilateral right to each and every South African to enjoy (a) an environment that is not harmful to their health or wellbeing; and (b) to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures.

Therefore, the State is constitutionally mandated to establish and implement reasonable legislative measures to promote sustainable development whilst protecting the environment for the benefit of present and future generations. In order to comply with these obligations, the Department of Environmental Affairs (DEA) has developed a regulatory framework consisting of various environmental laws (Acts of parliament), regulations, policies, norms and standards as well as other regulatory tools aimed at protecting the environment for the benefit of present and future generations. In 2008, the then Department of Environmental Affairs and Tourism published the National Framework for Sustainable Development in South Africa with the heading '*People – Planet – Prosperity'*.

There is little doubt that South Africa has made significant strides towards aligning its developmental goals with that of a sustainability agenda. A proliferation of tools has been formulated in the wake of the World Summit on Sustainable Development, held in Johannesburg in 2002. These tools and initiatives include, but are not limited to, spatial development frameworks (SDFs), strategic environmental assessments (SEAs), the Environmental Impact Assessment and Management Strategy (EIAMS), integrated development plans (IPDs) and various environmentally-friendly tax incentives - all framed within the overarching National Framework for Sustainable Development (NFSD), National Development Plan (NDP) and other legislative mandates.

However, one of the most important strides made by South Africa in establishing an overarching definition of the concept of sustainable development can be found in the National Environmental Management Act (NEMA), (Act No. 107 of 1998) which explicitly states that:

> *Sustainable development means the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.*

As such, South Africa's definition of sustainable development is strongly influenced by the internationally recognized definition provided by the Brundtland Commission, which is also then entrenched in South Africa's Constitution. South Africa therefore underpins its definition of sustainable development on two major premises;1) equity within generations and between generations, and 2) maintaining the integrity of natural, financial and human capital so as to ensure that economic and

social development is reconciled with environmental protection (2008:14). It is this definition and understanding of sustainable development with which this mini-dissertation concerns itself.

NEMA (Act No. 107 of 1998) also provides the bedrock for environmental governance in South Africa. However, despite its focus on protecting the environment, it can be argued that South Africa's environmental legislation retains an anthropocentric tenet. Leopold (1981) points out the inherent weakness of attempts to base conservation efforts on the precepts of an anthropocentrically-based legal system supported by a neoliberal economic paradigm. Therefore, in most incidents where conflicts arise, human welfare usually outweighs concerns of a purely environmental nature.

The National Environmental Management Act (107 of 1988) defines the environment as:

> *the surroundings within which humans exist and that are made up of —*
> *(i) the land, water and atmosphere of the earth:*
> *(ii) micro-organisms, plant and animal life:*
> *(iii) any part or combination of (i) and (ii) and the interrelationships among and between them: and*
> *(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being*

Not only is this definition restrictive, it also does not articulate the prominence of social versus economic versus environmental considerations. As such, and in the "absence of any clear definition of the concept – one can apply a very broad interpretation to include the natural environment, anthropogenic environment, cultural processes and socio-economic influences and considerations". (King & Strydom, 2009:05). Whilst embracing a holistic approach is commendable for various reasons, such a definition does however create difficulties for various practitioners seeking to define the environmental impact of various phenomena.

Similarly, the term 'sustainability' is also malleable to the extent that it can be utilised in a variety of academic fields. As such, it is also this semantic quality of the term that renders it prone to obfuscation in instances where the user does not apply the term in the manner specific to the field of inquiry at hand. This phenomenon is evidenced through the manner in which this concept is loosely interchanged between different policies and academic fields. Such idle exchanges thus provide the potential to see its semantic qualities eroded through excess and often arbitrary uses of the term.

For example, the White Paper on National Climate Change Response mentions both economic sustainability and ecological sustainability (2011:12,45). The National Framework for Sustainable Development in South Africa refers to environmental sustainability and ecological sustainability, (2008:25,31), whilst the White Paper on Environmental Management Policy (1997:59) refers to

"environmental, economic and social sustainability". As a consequence of this complexity, the concept of sustainable development becomes susceptible to attempts to subvert its definition in bids to maintain 'business-as-usual'.

It is generally accepted that, given its inherently complex nature, solutions towards aligning an entire nation towards the goal of pursuing a single, universally agreed-upon understanding of sustainable development is itself an extremely difficult endeavor. However, given that South Africa, as a developing nation, remains highly susceptible to the effects of an unsustainable development path and vulnerable to the impacts of climate change, the "urgency and importance of the sustainable development challenge for South Africa calls for bold decisions and the search for sustainable alternatives that will deliver urgent and fundamental change for all South Africans" (Gerber, 2009:ii).

Relative to other countries, South Africa has made steady ground in this regard, with the establishment of the DNA under Section 25 of NEMA gazetted on the 24th of December 2004. Following this, the DNA published the *"Guidance for Applicants of Clean Development Mechanism in South Africa"* which provides clearly laid out sustainable development criteria for project proponents (see table 1).These criteria have been developed in accordance with NEMA's definitions of 'sustainable development' and 'environment'.

No CDM project may commence without approval from the host country's DNA. The primary purpose of the DNA is thus to assess potential CDM projects to determine whether they will assist the host country towards achieving its sustainable development goals. Hence, a DNA was set up in South Africa with the mandate to develop a set of sustainable development criteria, screen the likely sustainable development impacts of proposed CDM projects against these criteria and, lastly, to decide whether or not to approve the project based upon its proposed sustainable development impacts.

As of the 19th of January 2016, 362 CDM projects were submitted to the South African DNA – and, of those, 90 have been registered by the CDM executive board. It can be argued that, given its relatively comprehensive set of sustainable development criteria, South Africa's DNA is effective in ensuring that CDM projects make a positive contribution to sustainable development in South Africa. However, given that there is often relatively little to no follow-up monitoring on whether project developers uphold their sustainable development commitments, there remain allegations that this might not always be the case (Fenhann & Olsen, 2006).

	Criteria	Indicator
Environment	Impact on local environment quality	• Impacts of the project on air quality • Impact of the project on water quality • Impact of the project on the generation or disposal of solid waste
	Change in usage of natural resources	• Impact of the project on community access to natural resources • Impacts of the project on the sustainable use of water, minerals or other non-renewable natural resources • Impact of the project on the efficiency of resources
	Impact on biodiversity and ecosystems	• Changes in local or regional biodiversity
Economic	Economic impacts	• Impacts of the project on foreign exchange requirements • Impacts 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	• Positive or negative implication 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 priorities	• How the project is aligned with national, provincial and local government objectives (access to basic services) • Impact of the project on the relocation of communities if applicable • Contribution of the project to any specific sectorial objectives
	Social equity and poverty alleviation	• Impact of the project on employment levels (jobs created/lost, duration of employment, type of employment) • Impact of the project on community social structure and heritage • Contribution of the project to the development of previously underdeveloped areas
General	General project acceptability	• Are the distributions of project benefits reasonable and fair?

Table 1: South Africa's Sustainable Development Criteria

Source: *Author's compilation based on the Department of Energy's CDM criteria, 2011*

3.2 Clean Development Mechanism

> *"The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3."*
>
> ***-Article 12.2 of the Kyoto Protocol (2005)***

The Clean Development Mechanism (CDM) was established under Article 12 of the Kyoto Protocol as a means of assisting member states with reducing their carbon emissions[1]. As a "project-based mechanism" devised under the Kyoto Protocol, it is regulated by the Marrakesh Accords. Through this instrument, Annex I countries can reduce their carbon emissions in efforts to achieve their reduction commitments whilst simultaneously contributing towards sustainable development within non-Annex I countries. Developing countries are then able to enjoy the benefits of capital inflows, skills development, technological transfers and ultimately, a more sustainable growth trajectory.

The CDM operates according to the following basic mechanics: A project offsets carbon emissions through a particular activity (e.g. flaring methane from landfills, carbon sequestration through afforestation or renewable energy production), and then quantifies the amount of carbon dioxide (tonnes of CO_2) it has prevented from escaping into the atmosphere. Once a project has successfully undergone the stringent approval process, proving it has indeed offset the amount of CO_2 claimed, it is then issued with certified emissions reductions (CERs). These CERs can then be bought by Annex I countries wanting to reduce their GHG footprint and comply with their commitments under Article 3 of the Kyoto Protocol.

Apart from carbon dioxide, CDM projects can reduce or avoid five other variations of GHGs as listed within Annex A of the Kyoto Protocol. In order to maintain consistency, there are various methodologies available for converting these GHGs back to their carbon dioxide equivalent (CO_2e) value. It is important to standardize a commodity for ease of trading across international markets. For every equivalent tonne of carbon dioxide offset through either destruction or sequestration, a single carbon credit is issued in the form of a CER.

CERs can then be sold to heavy GHG emitters wishing to offset their GHG emissions. Projects wishing to register under the auspices of the CDM have to be developed within non-Annex I countries

[1] Two other mitigation measures or Kyoto mechanisms include the establishment of an emissions trading scheme as well as the inclusion of a Joint Implementation mechanism which allows Annex I members to invest in an emission reduction project in another Annex I country (Kyoto Protocol Article 6 and 17).

that have signed the Kyoto Protocol. However, in order to develop and register a CDM project with the UNFCCC, there are additional criteria to comply with besides merely developing the project within a non-Annex I member country. One of the most important is 'additionality'. Additionality requires the project proponent to be able to motivate that his/her project would not be feasible without the added assistance of generating revenue via the sale of CERs.

3.2.1 Historical Overview

As a global phenomenon, climate change has consequently stretched the conceptual boundaries of traditional jurisprudence, as nations grapple with the bourgeoning complexity inherent within the trans-boundary nature of climate change. The era of environmental law rapidly began to expand in the wake of the 1972 Stockholm Declaration which provided a global platform encouraging nations to accept their legal responsibility towards maintaining a healthy environment. The relatively new field of international climate law relies on the application of both 'hard law' and 'soft law' instruments. In essence, the former is legally binding whilst the latter is not.

Hard law instruments can take shape in the form of, but are not limited to, 'agreements', 'conventions' or 'protocols'. An important example is the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the preceding Kyoto Protocol. This convention made specific reference for all member nations to respond by coordinating an effective and appropriate response to the challenge of climate change. To date, the UNFCCC has 197 members.

The Kyoto Protocol seeks to mitigate GHG emissions by imposing binding emission limits on developed countries listed in Annex I of the protocol, in line with the common but differentiated responsibilities (CBDR) principle. Essentially, the CBDR principle bestows more responsibility upon developed nations given that "the largest share of historical and current global emissions of greenhouse gases has originated in developed countries" (UNFCCC, 1992:2).

As might have been predicted, despite being responsible for the major share of GHG emissions to date, developed countries were not eager to compromise their local economic growth trajectories for the sake of addressing the global issue of climate change. The United States showcased this reluctance by announcing that they would not support the Kyoto Protocol. According to Bhandari (2003) (cited by Sutter, 2003:17), the consequence of this move resulted in a drop of about 70% in the level of emissions initially proposed to be reduced by Annex 1 countries - from 620 to 424 Mt carbon.

Despite the decision of both the U.S. and Australia to opt out of the agreement, Russia's decision to ratify the Kyoto Protocol resulted in it coming into force in February 2005. In response to the potential to trade CERs, the European Union (EU) decided to launch a platform to facilitate the trade in carbon credits and, in January 2005, the EU Emissions Trading Scheme (ETS), the biggest of its kind in the

world, was established. With the Kyoto Protocol entering into force a month later, a veritable 'gold rush' ensued as project proponents sought to register projects and sell CERs (Counsell *et al.*, 2009).

During 2005, as prices reached a high of €30 per CER, the value of this market was estimated to be around €6.5 billion. Furthermore, the World Bank estimated the overall carbon market to have been worth around $22 billion during the first nine months of 2006 (Labatt& White, 2007:iv). According to a report released by the World Bank (2015:10); "about 40 national jurisdictions and over 20 cities, states, and regions — representing almost a quarter of global greenhouse gas (GHG) emissions — are putting a price on carbon". Furthermore, Counsell *et al.* (2009) explain how, by the end of 2008, over 1,000 projects were registered by the CDM, with a projected saving of around 1.4 billion tons of CO_2e over the Kyoto Protocol's first commitment period (2008-2012).

Despite progress being made through the implementation of various ETSs and carbon tax legislation, there are still numerous concerns surrounding the efficacy of developing carbon markets and the carbon-offset projects that follow. By relating them to their respective academic fields, Erion (2007, 25-26) breaks down three important criticisms of the CDM whereby "legal minds take issue with the property regime it creates in the air, biologists note the dubious science around carbon sinks, and economists debunk myths of greater innovation and costs savings".

Furthermore, the CDM has been hampered by significant declines in demand for CERs post-2012. Despite the emergence of renewed interest in national and sub-national carbon pricing instruments (e.g. carbon tax), the demand for CERs between the 2015 and 2020 period is expected to be minimal. Notable events leading to the demise of CER prices include China and India's dominant role, whereby excessive supply began to reduce prices. According to the Carbon Market Report (2015) of international CERs exchanged until 30 April 2015, China and India dominate this market as the top two sellers of CERs. Added to this was the 2008-2009 financial crisis, resulting in a period of rapid economic decline.

Aside from a tempered economic climate while recovering from the financial crisis, the CDM market suffered further ills such as complex bureaucratic processes, high capital outlays and general teething difficulties which resulted in cases of poor project performance and even defaults. The result of which was that it forced potential buyers to structure 'payment on delivery' into most Emissions Reduction Purchase Agreements (ERPA). This development meant ERPAs were just about worthless as a form of collateral, making financiers and bankers reluctant to invest in CDM projects. As such, realistic expectations suggest that, because of this lack of demand, the maximum potential for CER issuance until 2020 is around 750 $MtCO_2e$.

Despite various obstacles hindering the development of a vibrant and effective carbon market, development has continued. There has been steady progress towards the ultimate goal of putting a price on carbon to account for its negative externalities. According to reports by the World Bank (2015:10; 2016:12); "[s]ince 2012, the number of carbon pricing instruments already implemented or scheduled for implementation has almost doubled [with] about 40 national jurisdictions and over 20 cities, states, and regions putting a price on carbon" (see figure 9).

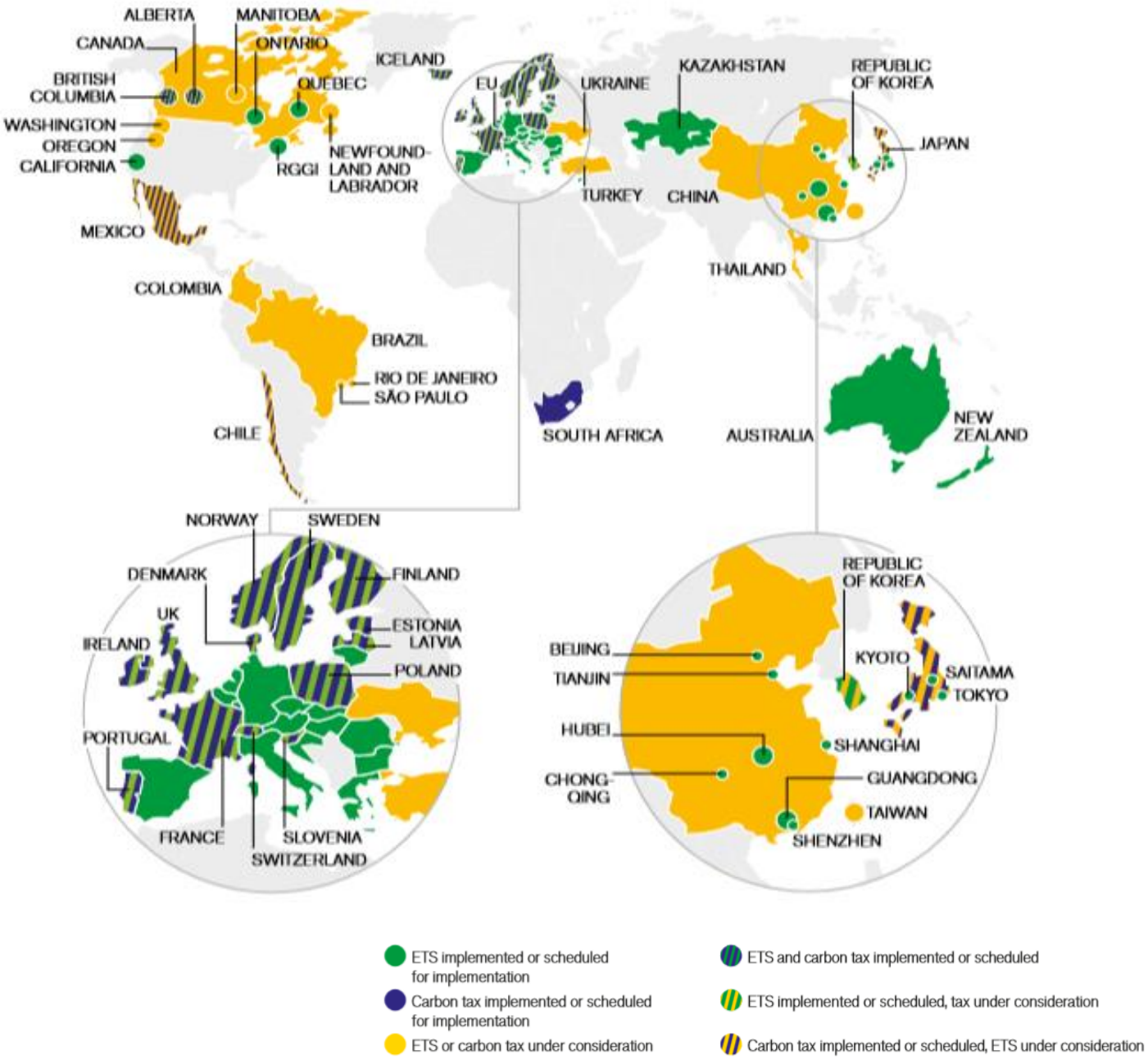

Figure 6: Overview of existing, emerging, and potential carbon pricing instruments

Source: Report prepared by the World Bank, Ecofys and Vivid Economics, 2016:12

3.2.2 Development in South Africa

South Africa ratified the UNFCCC treaty in August 1997 and, thereafter, acceded to the Kyoto Protocol on the 31st of July 2002. During the 2009 negotiations in Copenhagen at the 15th Conference of the Parties (COP), South Africa pledged to deviate its GHG emissions to 34% by 2020 and 42% by 2025 below the 'business-as-usual' trajectory. However, in accordance with Article 4.7 of the UNFCCC, the extent to which South Africa can achieve its climate change obligations will depend on the extent to which the developed nations provide the necessary financial, capacity-building and technology transfer support.

According to the National Climate Change Response White Paper (2011:5), South Africa finds itself in a precarious position since 1) it is extremely vulnerable and exposed to the impacts of climate change and 2) it is a relatively significant contributor of GHG emissions. South Africa has thus made a commitment to see its emissions peak between 2020 and 2025, and thereafter decline in absolute terms from 2036 onwards (see figure 10). At the time of this research paper, South Africa had no legally binding commitment to reduce its GHG output.

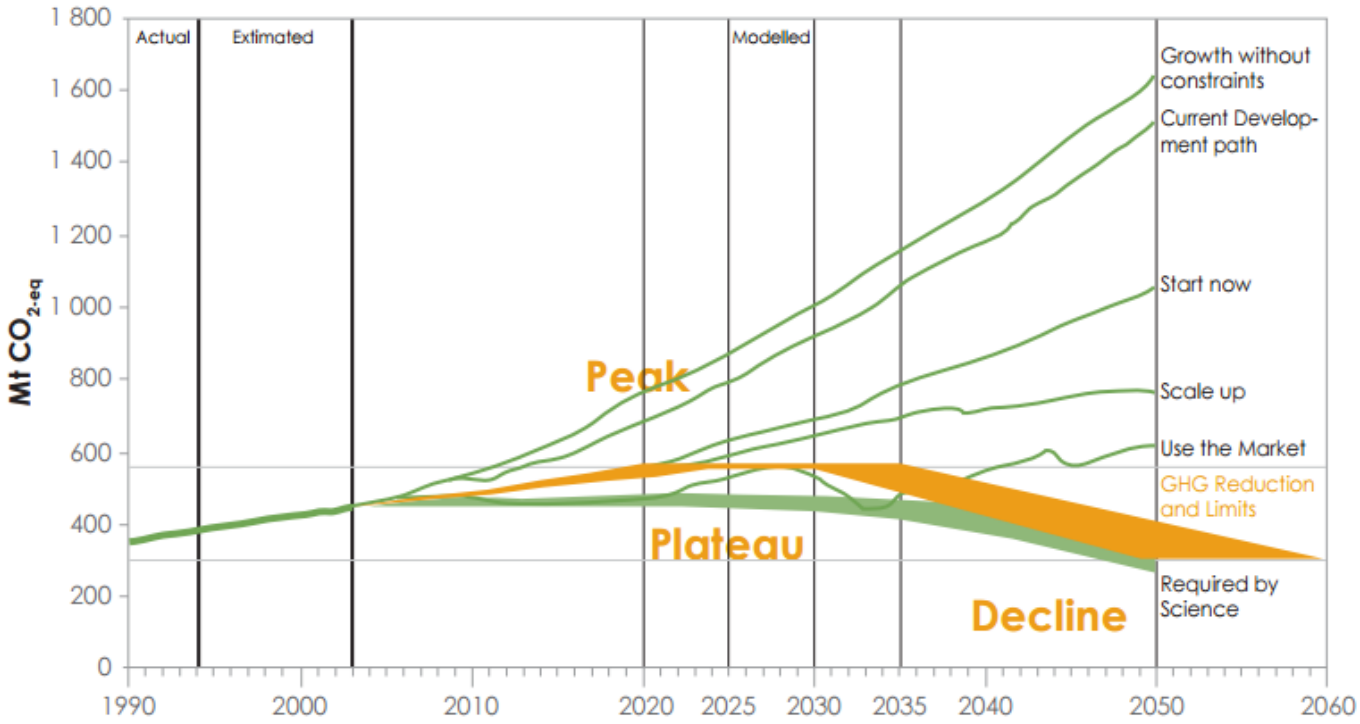

Figure 7: South Africa's 'Peak, Plateau and Decline' Commitments

Source: Department of Environmental Affairs

Thus, despite its standing as a non-Annex I country (i.e. developing country), it can be argued that South Africa is taking its climate change commitments relatively seriously. The table below

summarises notable actions taken by the South African government towards meeting its climate change obligations (see table 2). As can be seen, South Africa has taken a variety of measures towards achieving its climate change obligations, albeit with the convenient caveat contained within Article 4.7 of the UNFCCC which acknowledges that the necessary financial, capacity-building and technology transfer support will be required for developing countries.

Event	Date
Ratified the UNFCCC	1997
White Paper on Integrated Pollution and Waste Management	2000
Acceded to the Kyoto Protocol	2002
White Paper on Renewable Energy	2003
National Climate Change Response Strategy	2004
Establishment of Designated National Authority	2004
National Framework for Sustainable Development	2006
National Climate Change Response Green Paper	2010
Draft Carbon Tax Option	2010
National Climate Change Response White Paper	2011
National Statement during COP 17/CMP7	2011
National Development Plan	2012
Carbon Tax Policy Paper	2013
Draft Carbon Offsets Paper	2014
Draft Carbon Tax Bill	2015
Submitted INDC to the UNFCCC	2015
Draft National Greenhouse Gas Emission Reporting Regulations	2016
Carbon Tax Offset Regulations	2016
Draft Integrated Resource Plan	2016
Signed Paris Agreement	2016

Table 2: South Africa's Climate Change Commitments

Source: Author's compilation

However, Professor Mark Jury of the University of Zululand maintains that South Africa has not been contributing effectively towards its mandate, as a signatory of the UNFCCC, to reduce GHG emissions. Instead, Professor Jury (cited by Bond & Dada 2009:vii-viii) presents various indictments on South Africa's climate change performance, such as:

- South Africa contributes 1,8% of total GHGs, making it one of the top contributing countries in the world;
- with a domestic economy powered by coal, South Africa has experienced a fivefold increase in CO_2 emissions since 1950, and CO_2 emissions increased 18% between 1990 and 2000;
- in rural areas of South Africa, approximately three million households burn fuel wood for their energy needs, causing deforestation, reduction of CO_2 sinks, and indoor health problems and;
- since 1970, South Africa consistently has consumed the most energy and emitted the most carbon per dollar of GDP among major countries.

With recent lackluster economic growth, South Africa also experiences relatively high levels of inequality and unemployment (Baker *et al*., 2015:1). The CDM has the potential to contribute towards alleviating these ills through reducing GHG emissions whilst generating employment, developing skills, transferring technological innovation and injecting revenue into the economy (Ntuli, 2012). According to the UNFCCC website (accessed 14/02/2017), the CDM has led to the registration of more than 8,000 projects and programmes in 107 countries, and has issued more than 1.6 billion CERs. China and India lead in terms of attracting the most investment in CDM projects, with Africa continuing to lag behind its Asian and Latin American counterparts (Counsell, 2009; Labatt& White, 2007).

Only 90 projects have been registered in South Africa, with a mere 12 having successfully issued CERs as of the 19th of January 2016 (DoE, 2016). It can therefore be argued that South Africa has been relatively ineffective in capitalizing on the CDM - with articles from the press such as, “SA tardy in signing up for carbon credits” highlighting certain failings in this regard (Little, 2006:3). In comparison with other non-Annex I countries, including a few considered smaller than South Africa, “many have registered more projects than South Africa” (2006:3).

When the DNA was first established by regulations enacted through the NEMA, it was initially located within the Department of Minerals and Energy (DME). However, when this department was split in 2009 into the Department of Mineral Resources (DMR) and the Department of Energy (DoE), the DNA remained with the DoE. The main role of the DNA is to;

- Issue Letters of No Objection and Letters of Approval for CDM Projects;
- Confirm the project’s contribution to national sustainable development and;
- Raise awareness and capacity-building for CDM project activities.

Ntuli (2012:iv) summarizes the main barriers impeding the successful implementation of the CDM in South Africa as; “inadequate project development capacity, insufficient financing opportunities, low

electricity tariffs, post-2012 uncertainties, challenges in proving the additionality, price volatility of CERs, high CDM-transaction costs, and skepticism regarding the benefits of CDM". Another notable impediment for project developers is the high level of bureaucracy and resulting administrative costs involved in getting project approval (see figure 6). Furthermore, most projects usually also require the need to undergo the Environmental Impact Assessment (EIA) process in order to obtain the necessary authorizations and permits before they can proceed. This adds further complexity and administrative costs to an already costly administrative process.

Despite these regulatory, financial and capacity shortfalls, South Africa has made progress towards developing CDM projects whilst facilitating the development of its own domestic carbon market. Since the final DNA Status Report of 2011, a further sixty-nine projects were registered with the CDM Executive Board and a further four projects received CERs. Furthermore, the report suggested that "CDM proposals received in 2011 [had] a potential to generate about 42 193 jobs [with the majority of these falling within the] category of fuel switching, nitrous abatement, methane recovery and flaring" (DoE, 2011:4,10).

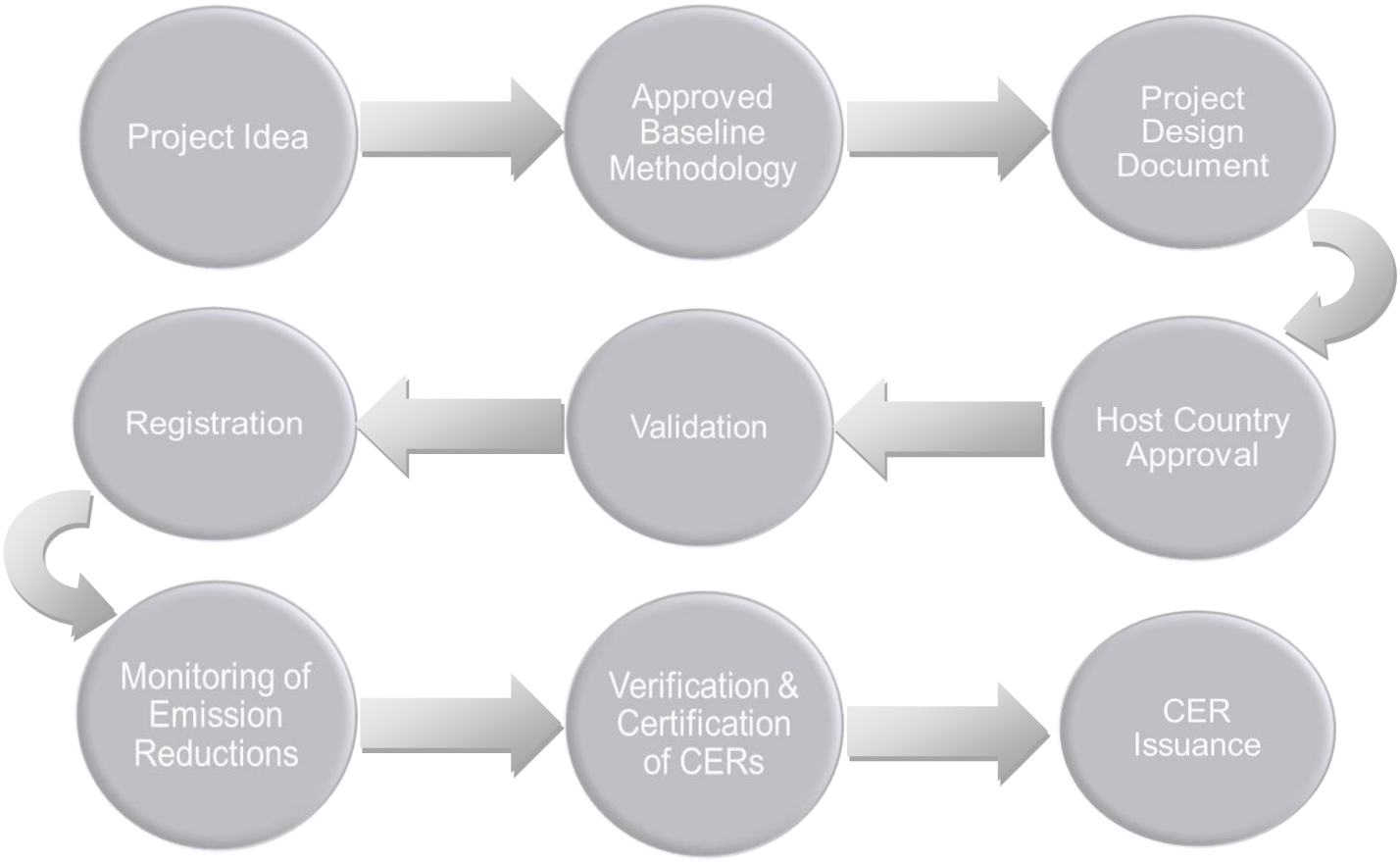

Figure 8: CDM Project Cycle

Source: Author's Compilation based on South African Designated National Authority for the Clean Development Mechanism Status Review, 2011

South Africa is currently in the process of implementing a carbon tax as well as drawing up regulations for carbon offsets which should spur investment towards carbon-offset projects and facilitate the domestic trade in CERs. The Carbon Tax Bill provides for a tax rate of R120 per tonne of carbon. One of a variety of relief measures includes the ability for market players to offset their tax liability by purchasing CERs. The amount of CERs purchased to offset this tax liability is however limited per sector (see table 3). Despite this cap, studies suggest the carbon tax will cover roughly 390 million metric tonnes of CO_2e per annum which would then amount to a demand of between five and twenty million tonnes per annum (DNT, 2014; Promethium Carbon, 2014).

Sector	Offset Allowance
Electricity	**10%**
Petroleum	**10%**
Iron & Steel	**5%**
Cement	**5%**
Glass & Ceramics	**5%**
Chemicals	**5%**
Pulp & Paper	**10%**
Sugar	**10%**
Agriculture, Forestry & Land Use	**0%**
Waste	**0%**
Fugitive Emissions from Coal Mining	**5%**
Other	**10%**

Table 3: Sectoral limits on the use of carbon offsets

Source: *Author's Compilation based on the Report on Carbon Trading in South Africa by Promethium Carbon, 2014*

The demand for carbon offsets in South Africa is thus forecast to grow in the wake of these pending regulatory developments. This increased demand for carbon offsets will thus more than likely spur the development of more carbon-offset projects to supply CERs to satisfy this demand (DNT, 2014). Furthermore, the Draft Regulations on Carbon Offsets clearly states that offsets purchased for the purpose of reducing an entity's tax liabilities must be purchased from an offset project that is wholly undertaken in the Republic of South Africa, further encouraging the development of local offset projects (DNT, 2016:4).

According to the current draft regulations for carbon offsets, projects will only be eligible to sell carbon credits if they are registered with the CDM, Verified Carbon Standard (VCS), Gold Standard, or any other standard approved by the Minister of Energy or a delegated authority (DNT, 2016:2). Therefore, despite the CDM being phased out by 2020, carbon-offset project developers have various alternatives for registering and verifying their carbon credits generated by an approved activity.

CHAPTER 4. CASE STUDY ANALYSIS RESULTS

"The coming into force of the Kyoto Protocol is a major stride forwards in the fight against global climate change and global warming"

- Press Statement by then Minister of Environmental Affairs and Tourism (Martinus van Schalkwyk, 2005)

4.1 Introduction/Background to the Bisasar Landfill CDM Project

Having been in operation since the 1980s, the Bisasar Road landfill was one of the busiest and largest landfills in Africa, accepting between 3000 and 5000 tonnes of municipal waste every day (Erion, 2007; Mohee & Simelane, 2015). According to a *Project Summary Document* by the eThekwini Municipality's Cleansing and Solid Waste Unit, the landfill site is situated within an unstable valley line deemed unsuitable for residential use and was therefore issued with a permit by the then Department of Water Affairs and Forestry (DWAF) in 1996, classifying it as a General Large Site (G:L:B+). The waste dumped is comprised of "municipal solid waste, with approximately 40% inert waste, [such as]: solid waste, garden refuse, rubble, condemned foods, mixed waste[2], sand, whole tyres, asphalt, polystyrene, light waste, sanitary waste and perishable foods" (Boswell *et al*., 2004:23).

During the apartheid era, the Group Areas Act of 1961 allowed the government to relocate citizens according to race. As a result, the government decided to relocate a predominantly Indian population to an area known as Clare Estate in Durban, next to a large quarry surrounded by trees and natural vegetation (Bond *et al*., 2009:93). However, as the local government began to run out of landfill space, they decided to convert the quarry into the landfill now referred to as the Bisasar Road landfill dump (2009:93). The decision to locate the landfill in close proximity to the local community sparked protest, which led the new government democratically elected in 1994 to assure local residents that the dump would be closed in 1996 and converted into a recreational area (2009:93). However, the landfill was not closed and remains in operation at the time of writing.

International experience with extracting landfill gas dates back as far as the 1960s, whilst Durban's landfills have been extracting landfill gas from as far back as the mid-1990s (Moodley *et al*., 2014:95). However, as explained by Moodley *et al*, this practice primarily centered on the health and safety impacts associated with the migration of landfill gas (2014:95). In 2002, the eThekwini (formerly known as Durban) Municipality began its investigations into capitalizing on this technology as a means to generate energy from waste. The main catalyst for this investigation was an offer of $15 million in

[2] Mixed loads are generally those loads that contain two or more of domestic, garden and rubble wastes.

carbon finance from the World Bank. According to the World Bank website (accessed 18/02/2017), "[c]arbon finance is the general term applied to resources provided to a project to purchase greenhouse gas (GHG) emission reductions ("carbon" for short)".

Bond (2012) attributes the positioning of the Bisasar Landfill site to apartheid's legacy of racial injustice and, despite having received awards for its performance towards helping to sustain the environment, the Bisasar Landfill project is "possibly the most controversial CDM project to date and has easily garnered the most attention of international activists and media" (Erion, 2007:31-32). Therefore, and given NEMA's relatively broad definition of 'environment' and holistic interpretation of 'sustainable development', the following chapter critically analyzes the Bisasar Landfill project's contributions to sustainable development.

4.2 Development and Project Overview

According to the 2003 White Paper on Renewable Energy (2003:22), "South Africa disposes of almost all of its refuse to landfill sites [with an] energy content of the total domestic and industrial refuse disposed of in 1990 [amounting] to 40.5 PJ per annum". Given this potential to utilize waste as a source of energy, the authorities began to investigate the potential to generate energy from methane gas in landfills (DoE, 2003:23). The DoE emphasized the importance of this initiative by recognizing the integration of renewable energy derived from landfill gas "as one of its key focus areas in the future" (2003:31).

The Kyoto Protocol attaches a value to GHGs based upon their impact on climate change; this is referred to as global warming potential (GWP) (UNFCCC, 1998:6). The IPCC 3rd Assessment Report (2001 IPCC GWP values) makes provision for GWP conversion factors. According to this standard, one unit of methane (CH_4) is twenty-three times more potent in terms of its impact on climate change, than one unit of CO_2. In other words, CH_4 is twenty-three times more effective than CO_2 in trapping heat generated by solar radiation. Therefore, the release of methane from landfill sites is a relatively significant contributor to anthropogenic climate change and, according to a report by the eThekwini municipality, accounted for roughly 6% of eThekwini's GHG emissions in 2014 (2014:5).

Due to its high calorific value, methane from landfills can be captured and utilized to generate power instead of being released passively into the atmosphere. By doing so, not only does this avoid the release of a potent GHG, but it also displaces dirty fossil-fuel based energy with cleaner energy to the grid. However, utilizing methane from landfills is not economically viable due to the relatively cheap cost of electricity, generated mainly by the combustion of coal in South Africa (UNFCCC, 2004:4). Therefore, without the assistance of carbon finance, waste-to-electricity projects in South Africa are not economically feasible.

In 2002, South Africa hosted the World Summit on Sustainable Development (WSSD) in Johannesburg. During this event officials from the Prototype Carbon Fund (PCF), a fund organization managed by the World Bank, approached Durban Solid Waste (DSW) to propose the development of three landfill gas projects. The primary purpose of these projects would be to extract methane from landfills and use it to power generators supplying electricity to the national grid. Landfill gas is typically comprised of between 40% to 60% methane gas and 30% to 60% carbon dioxide (ESR, 2004:1). When landfill gas is combusted, the methane is converted to carbon dioxide, a GHG with a much lower GWP. With the potential to generate revenue from the sale of electricity and CERs, the proposal to generate electricity from landfill gas became financially viable.

However, strong public opposition was encountered during the environmental impact assessment (EIA) process. Most of this opposition was targeted at the Bisasar Landfill due to its close proximity to local residents and the potential presence of toxic substances within the landfill. According to Bond and Sharife, research director of the Cancer Association of South Africa Carl Albrecht describes the Bisasar Landfill dumpsite as a toxic 'cancer hotspot' (2009). These concerns led the city's managers to make the strategic decision to separate the Bisasar Landfill site from the other two sites, so that the latter two could continue with the CDM process whilst the Bisasar Landfill project was redesigned.

Thereafter, and despite its initial assistance and pledge to purchase CERs from the Bisasar Landfill waste-to-energy project, the World Bank decided to renege on its deal because of the strong public opposition that emerged during the EIA process. The publicity from this project went global, with a front-page story in the *Washington Post* in 2005 revealing how Sajida Khan, a community activist opposing the Bisasar Landfill project, suffered cancer as a result of toxic exposure from living in close proximity to the landfill (Bond, 2012).

Despite this initial resistance from the local community, the EIA dispute was later resolved and, after securing investments from the French Development Agency (FDA) and South Africa's Department of Trade and Industry (DT&I), the project was completed in April 2008. The Project Design Document (PDD) was also revised to deal with the public concerns raised during the EIA process and the Bisasar Landfill project eventually received CDM registration in March 2009. However, despite having the potential to reduce roughly 2,5 million tonnes in CO_2, the Bisasar Landfill project has only been issued with 65 711 CERs to date (DoE, 2016; UNFCCC, 2004).

4.3 Data Analysis

The literature covered during this research project provides relatively little evidence clearly showing that CDM projects have not complied with their sustainable development obligations in South Africa (DoE, 2011:32). Therefore, criticisms surrounding the Bisasar Landfill project seem to be unique in

nature and not evidence of a wide-spread trend. Similarly to the Bisasar Landfill project, some concerns were also raised around the Bellville South Waste Disposal (BSWD) dump in the north of Cape Town because of its close proximity to residential areas (Lohman, 2006:294-295). Despite these concerns, it went on to be awarded 'Gold Standard' status for meeting the highest standards for environmental and social sustainability (2006:295).

The literature therefore suggests that most of the criticism around the implementation of CDM projects centres around its 'greenwashing' effects, whereby business-as-usual is maintained within industrialised countries who use investments in carbon-offset projects as justification to continue polluting the atmosphere (Lohman, 2006). Rather than addressing the root cause of the problem and making fundamental, albeit costly, infrastructural adjustments within their own economies, developed countries are provided the opportunity to continue polluting as long as they are willing to invest in a developing country's carbon-offset project. The ethical dilemma at play here is expressed by Becker (cited by Bond *et al.*, 2006:4-5) whereby he states how "it's sort of the moral equivalent of hiring a domestic. We will pay you to clean our mess. [The concern being that] this could become a pay to pollute principle".

According to a report compiled by Achanta *et al* (2012:5); "the majority of studies on the impact of the CDM agree that the CDM has a positive impact on the various facets of sustainable development in the host countries". However, Frankhauser and Watson (2009:3-4) point out that it would not be prudent to make such a general assumption as there has been widespread criticism of the CDM's contribution towards sustainable development (Boyd et al., 2007; Bond *et al*., 2007; Bond *et al*, 2012; Olsen, 2007; Schneider, 2007; Sutter & Parreño, 2007; UNDP, 2006).

However, these criticisms usually stem from the variability associated with the extent to which some project types contribute towards this obligation (e.g. fuel switch projects contribute very little, if anything, towards sustainable development); the fact that developing nations are allowed carte blanche on defining sustainable development; and the fact that very little, if any, verification is conducted on whether these projects meet their sustainable development commitments (Frankhauser & Watson, 2009). One means of counteracting this lack of institutional guidance is to have robust local legislation, such as the EIA process in South Africa, to ensure negative sustainable development impacts are avoided (Olsen, 2013).

The scores collected from the four questionnaires have been aggregated and their results presented in the below graph using Excel®:

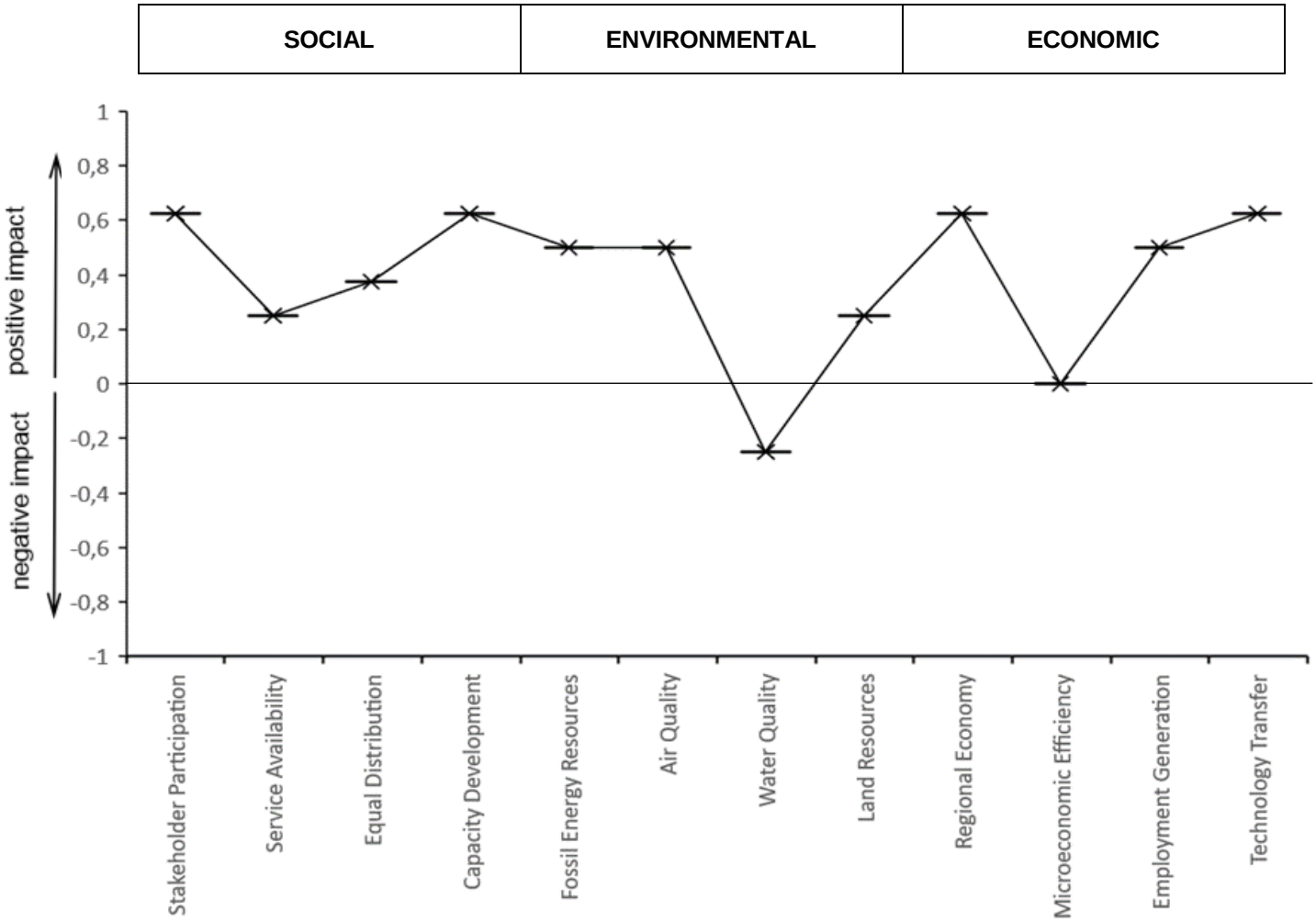

Figure 9: MATA-CDM results for Bisasar Landfill Project

Source: Aggregated results using Excel 2016 ®

The format and design used for graphically representing the data is closely aligned with the technique utilized by Sutter (2003). The headings above the graph further distinguish between the three subcategories that make up the definition of sustainable development as defined within the CDM paradigm (as previously explained in section 2.4). The following section thus unpacks the data obtained from the various questionnaires, PDD and ESR. For the purposes of this mini-dissertation, each subcategory was unpacked and analyzed individually.

Therefore, each subcategory was unpacked by critically analyzing the respondent's answers and justifications for each criterion against the expected impacts as predicted within the PDD and EIA

documents. Also, insights gathered from the literature review process were also used to assess whether the Bisasar Landfill project conformed to the general expectations and opinions of academics and professionals that have written on the subject of CDM projects and their sustainable development contributions.

4.3.1 Social

Stakeholder participation scored relatively well compared to the other results, with all respondents offering a positive score. This criterion looks at the extent to which stakeholders were able to participate in the project's development. This positive result was mainly due to the EIA process having well-established regulations around the process to be followed around public participation (PDD, 2015:59-60). As explained by the ESR, a Background Information Document (BID) was distributed to Interested and Affected Parties (I&APs) and advertisements were placed in the local press encouraging I&APs to provide input into the "Scoping process by conducting two public meetings, as well as focus group meetings with key stakeholders" (Boswell *et al*., 2004:x).

Thereafter, a formal public participation process was initiated in November 2003, which resulted in certain amendments being made to the PDD towards outlining concerns raised during this process and how the project would address them (PDD, 2004:23). Therefore, given the relatively rigorous process required by EIA regulations with regards to the public participation process, it is expected that stakeholder participation should, under normal circumstances, never score negatively when implementing large-scale carbon-offset projects in South Africa. However, Professor Bond raised a point of criticism towards this process by pointing out that although I&APs could voice their opinions and concerns, they were not empowered to make any material contribution to the decision-making process.

A positive score was also awarded in relation to the project's impact on ***service availability***. This was mainly due to arguments being put forward that the removal of harmful GHGs as well as the provision of electricity to the municipal grid can be viewed as making a positive contribution towards service availability for the local community (Boswell *et al*., 2004:77). However, given that the electricity supplied by the project made no material difference to the cost of electricity for consumers, coupled with the fact that the extended life of the landfill increases any potential risks for residents to be exposed to harmful emissions from the landfill, any positive contributions made towards service delivery would therefore be negligible. As a consequence, three of the respondents scored this aspect with a zero (i.e. no negative or positive impact on the availability of services).

The project scored positively for its impact on ***equal distribution***, which looks at the amount of turnover benefiting disadvantaged people. Reasons for this positive impact mainly centred on the

potential for revenues generated from the sale of CERs to be used by the municipality towards further uplifting the disadvantaged portion of the local community through various initiatives already underway. However, given that the project has not generated as much, if any, revenue from the sale of CERs as first anticipated, the evidence therefore suggests that the amount of turnover benefiting disadvantaged people is negligible. However, this does not negate the potential that any future revenue generated through the sale of CERs could be used towards community upliftment.

The project had a positive score for contributions made towards ***capacity development***. Reasons provided for this mainly related to the benefits accrued from a number of bursaries (around four) provided to students by Durban Solid Waste (DSW). Furthermore, the project also provides continual training for employees operating and maintaining the equipment. As such, given the capacity requirements needed to maintain the equipment along with the bursaries provided to students, the evidence suggests that the project has had a positive impact on providing opportunities for more sophisticated capacity development.

4.3.2 Environment

The project received a positive score in relation to its impact on ***fossil energy resources***. This criterion looks at the projects' ability to reduce reliance on fossil-based energy resources. The main argument made in this regard centred on the 6,5MW of energy supplied to the municipal grid by onsite generators combusting landfill gas. Although this amounts to only around 0,02% of Eskom's full generating capacity during 2016 (Eskom website accessed 01/06/17), it can be regarded as a relatively large source of energy that is being produced from a non-fossil fuel resource.

The project also received a positive score for its impact on ***air quality***. Similarly to the arguments made in favour of a positive impact on service delivery, the main thrust of these arguments focused on the combustion of harmful GHG emissions that might otherwise have caused a health hazard. The ESR states that, although there was a lack of background information for establishing an effective baseline, "[i]nvestigations undertaken during the period 1999-2001 by an independent registered occupational hygienist have indicated that the landfill site poses no health risks to the surrounding community" (Boswell *et al*., 2004:25). However, due to the fact that the continued operation of the landfill increases the potential risk for residents to be exposed to airborne pollutants dispersed from this activity, any positive impact will thus be negligible.

The data obtained for water quality impacts revealed a minor negative impact on ***water quality***. Storm water is controlled by a drainage system which diverts storm water away from the waste site. Furthermore, boreholes have also been installed on the upper slope of the site so as to pump water away from the area and thus limit the flow of groundwater towards the site. Finally, the LFG extraction

system is engineered to encourage the ingress of leachate which is then pumped into the municipal sewerage system. Despite the project reducing the risk of contaminating surface and groundwater supplies through its various engineering controls, the possibility remains that drainage inadequacies could result in storm water contamination by leachate (2004:x,33).

These events could then have negative downstream impacts on the quality of the surrounding fresh water system. Additionally, given the difficulty of ensuring an even sloped surface, ponding during heavy rain events could increase the infiltration of water and therefore the quantity of leachate produced. Two of the respondents believed there was no impact on fresh water resources, whilst the other two believed the project exerted a moderate increase in pressure on regional fresh water quality/quantity. Their arguments for this aligned with the ESR, in that the continued use of the landfill would result in continued leachate being produced which could potentially have a negative impact on water quality.However, given the status quo of the surrounding water quality, this negative impact is predicted to be negligible at most (2004:54).

The project scored a positive result towards decreasing pressure on the ***land resources***. This was mainly due to the idea that active extraction of landfill gas extended the life of the Bisasar Landfill by accelerating the rate of settlement of compacted municipal solid waste (Blignaut & De Wit 2004:327). A study by Blignaut and De Wit concluded that this activity would increase Bisasar's capacity by almost 15% and thereby provide for an extra 2 to 3 million m^3 of landfill space (2004:327). Not only would this amount to a saving of approximately R60 million, but it would also reduce the need for additional landfills (2004:327). This reduction in the demand for more land to construct landfills can therefore be seen as a positive environmental externality as it reduces the need, in the short-term at least, for developing further landfill space.

4.3.3 Economic

The project scored a positive result on its impact on ***regional economy,*** which looks at its ability to generate wealth in a disadvantaged region. This was due to the fact that the project was situated within a region that was a mixture of economically average and/or disadvantaged citizens. As such, any wealth created through the supply of jobs and bursaries would benefit this disadvantaged local community. Evidence of this includes engineering bursaries supplied to disadvantaged students from the surrounding area, local residents being provided the opportunity to scavenge the site, and a few jobs that were created.

However, Professor Bond is of the opinion that although the project is based within an economically disadvantaged area, the bulk of the benefits accrued empowered only an elite few, and not the surrounding population as envisioned. Furthermore, the ESR mentions the negative impact the project

could have on property values surrounding the landfill (Boswell *et al*., 2004:63). Such projects need to balance the opportunities for increased wealth generation from operating the site and determine who exactly enjoys these benefits -against the negative impacts on the population living adjacent to the landfill project.

There was no impact, either positive or negative, made towards ***microeconomic efficiency***. Although the answers provided by the respondents for the project's internal rate of return (IRR) varied, none provided an answer that assumed a negative IRR. Reasons provided for this modest IRR centred on the low cost of energy supplied by Eskom, coupled with the CER price crash during 2012. These two factors, coupled with the Prototype Carbon Fund reneging on the initial deal to purchase CERs, contributed towards the Bisasar Landfill project's relatively low IRR.

The ESR predicted that the project would create a number of jobs "from unskilled to highly skilled, both during construction and operation of the proposed project" (Boswell *et al*., 2004:33). The PDD also assumed that the project would "result in a small increase in the area of skilled jobs for operation and maintenance of the equipment" (2006:2). The results from the respondents confirmed these assumptions, with all the respondents agreeing that a small number of jobs had been created as a consequence of this project's implementation. Also, one of the respondents mentioned how various knock-on projects and companies were more than likely developed because of the Bisasar Landfill waste-to-energy initiative. Thus, the project scored a positive result towards its impact on ***employment generation***.

The project scored a positive result for its impact on ***technology transfer*.** This criterion looks at its impact on applying and employing innovative and locally manageable technology. The main reason for this extends from the fact that Durban Solid Waste (DSW) acts on behalf of the eThekwini municipality to operate and maintain the equipment throughout the lifespan of the operation. As such, local skills are used to maintain and manage the technology in the form of landfill gas extraction wells, flare units and landfill gas generators (PDD, 2006:3). As such, given the capacity to develop and use local skills to maintain and operate the equipment, the Bisasar Landfill project made a notable contribution towards transferring not only the technology needed, but also the requisite skills needed to maintain it.

4.4 Comparative Analysis and Review

The below graph is an aggregated representation of three other CDM projects that were assessed by Sutter (2003) using his original MATA-CDM methodology. The scores have been presented in the same graphical format as the Bisasar Landfill case study using Excel®.

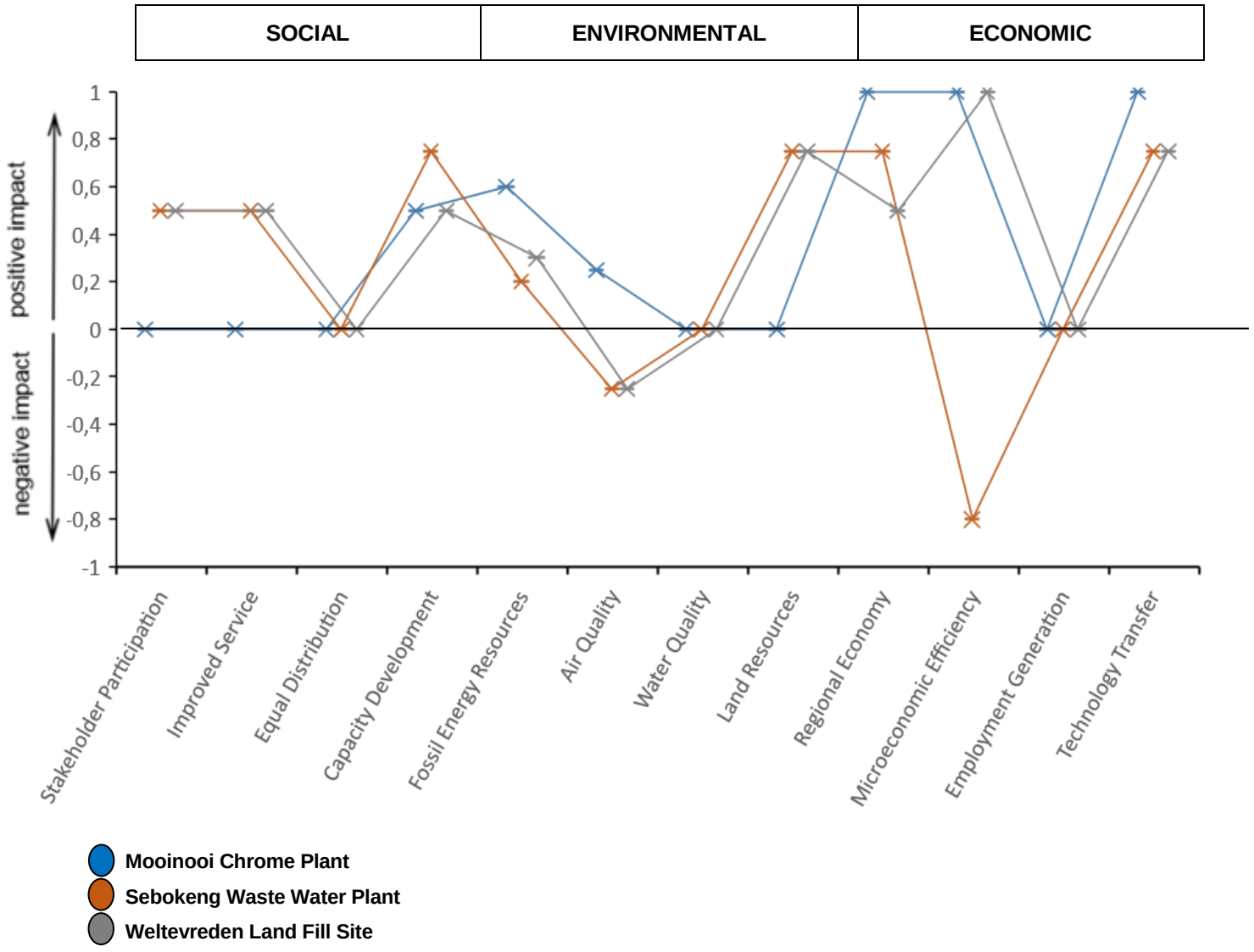

Figure 10: Aggregated MATA-CDM results of three different CDM projects in South Africa

Source: Author's compilation of aggregated data from Sutter, 2003:111-119

As evidenced by the above graph, as well as the Bisasar Case study (see figure 14), it can be argued that the overall contribution by these CDM projects towards sustainable development in South Africa has been positive. The below table combines the utility scores of each criterion for the above-mentioned four projects in order to assess their overall contribution towards sustainable development

in South Africa (see table 4). Furthermore, this table provides a means of assessing which projects made the most significant contribution to sustainable development in South Africa. As indicated below, all the projects scored positively with regards to their overall contribution to sustainable development.

	Bisasar Landfill Site	Mooinooi Chrome Plant	Sebokeng Waste Water Plant	Weltevreden Land Fill Site
Stakeholder Participation	0,50	0	0,5	0,5
Service Availability	0,25	0	0,5	0,5
Equal Distribution	0,38	0	0	0
Capacity Development	0,63	0,5	0,75	0,5
Fossil Energy Resources	0,50	0,6	0,2	0,3
Air Quality	0,38	0,25	-0,25	-0,25
Water Quality	-0,13	0	0	0
Land Resources	0,25	0	0,75	0,75
Regional Economy	0,38	1	0,75	0,5
Microeconomic Efficiency	0,13	1	-0,8	1
Employment Generation	0,38	0	0	0
Technology Transfer	0,75	1	0,75	0,75
Total	4,38	4,35	3,15	4,55

Table 4: Aggregated utility scores of four different CDM projects in South Africa

Source: Author's compilation of aggregated data from Bisasar case study and Sutter, 2003:111-119

This data therefore presents evidence supporting the hypothesis that CDM projects have made a net-positive impact on sustainable development in South Africa. Interestingly, the landfill projects scored highest in regard to their impacts on sustainable development in South Africa. However, it is important to note that the methodology used to assess the sustainable development impacts of the Bisasar Landfill project is slightly modified, compared to the methodology first employed by Sutter (2003). Yet, despite these methodological nuances, both assessments yielded similar results.

It is thus evident that carbon-offset projects provide valuable GHG mitigation services whilst positively contributing to South Africa's sustainable development initiative. This is further evidenced by three of the four respondents agreeing to the statement that '*in general, the CDM has contributed positively towards sustainable development in South Africa'*. Climate change is a key sustainability issue requiring various actions including, but not limited to, the need for a transition away from carbon-intensive energy sources and industrial activities. Carbon-offset projects provide one solution towards facilitating this transition in a manner that supports a sustainable development agenda.

CHAPTER 5. CONCLUSION

"Clean air, water and a liveable climate are inalienable human rights. And solving this crisis is not a question of politics it is a question of our own survival."

- Leonardo DiCaprio (Before the Flood, 2015)

5.1 Concluding Remarks

The Bisasar Landfill project remains controversial because of allegations around the infringement of the environmental rights of residents living in close proximity to the landfill's activities. Given the anthropocentric tenet associated with NEMA's interpretation of sustainable development, the argument could be made that the Bisasar Landfill project therefore does not fully and adequately align with South Africa's legal interpretation of sustainable development. However, NEMA 2(4)(viii) further stipulates that "where negative impacts on people's environmental rights cannot be altogether prevented, [they] are minimised and remedied". This caveat might allow such projects to proceed, given that they can prove due diligence towards remedying any negative environmental externalities in accordance with the applicable legislation.

The CDM experience in South Africa has thus raised concerns around the potential negative impacts these projects can have on sustainable development. In the case of South Africa, the evidence suggests that the main thrust of these issues (i.e. negative sustainable development impacts) mainly revolve around two issues. Firstly, the cheap cost of electricity makes energy generated from these projects uneconomical whilst, secondly, there are potential negative impacts on the health and well-being of residents living near projects seeking to combust methane-rich gas (Sutter, 2003:114-116).Although some studies indicate that the emissions released from the combustion of methane are "significantly less harmful than the continued uncontrolled release of landfill gas", the continuation of either activity still provides negative impacts for community members living in close proximity to them (Nussbaumer, 2006:G-2).

Therefore, due to the legacy of environmental racism endured by non-white citizens during the Apartheid era, there exists the potential for CDM projects, or carbon-offset projects in general, to maintain or perpetuate this status quo. The Bisasar Landfill project can be characterized as one of those projects that imposed certain negative externalities on the surrounding community without obtaining the requisite support and/or consent from the impacted community prior to development. South Africa has made significant strides towards correcting many of these injustices, such as the development of a world-class Constitution that protects the environment for everyone as well as a relatively comprehensive set of EIA regulations.

As evidence of this, the Bisasar Landfill project showcased the extent to which public participation can impact upon the development of a project. Unfortunately for the project developers, this resulted in costly delays. However, the Bisasar Landfill project provides an example of how project developers need to take South Africa's legacy of environmental injustice into account before moving ahead with a project proposal. The Bisasar Landfill case study has revealed this requirement, as well as showcasing how even under extreme conditions of falling CER prices and community resistance, carbon-offset projects can still contribute positively towards South Africa's sustainable development goals.

The findings from this research on the Bisasar Landfill case study suggest that the CDM can and has made a positive contribution towards South Africa's sustainable development, as envisioned within the NEMA. It has done so by generating employment, transferring skills and technology, promoting foreign direct investment into the economy, reducing pressure on finite environmental resources whilst reducing GHG emissions, thereby mitigating the harmful effects associated with climate change. Therefore, this mini-dissertation concludes that, based upon an assessment of the literature as well as the Bisasar Landfill case study, CDM or carbon-offset projects in general can and have made a net-positive contribution to sustainable development in South Africa.

Thus, when implemented in a manner that adheres to the strict and thorough regulations around the process of due diligence (i.e. DNA approval and EIA process), CDM projects, or carbon-offset projects more generally, do positively contribute to sustainable development in South Africa. However, section 2(2) of NEMA stipulates how environmental management must place people and their needs at the forefront of its concern. Therefore, when conducting a sustainability assessment of any project or policy, cognizance should always be maintained around the anthropocentric nature of this definition (Mafunganyika, 2009:48-50).This is important to note, given that this research concurs with the findings of Dr Surendran Pillay: namely that CDM projects in South Africa prioritise GHG reduction as their main focus, with sustainable development benefits being merely a by-product of this activity (2015:788).

While the process of vetting and monitoring CDM projects, and carbon-offset projects generally, could be improved towards enhancing their sustainable development impacts, it is evident that they provide an important opportunity for South Africa to transition to a low-carbon economy in a manner that promotes sustainable development. Given that South Africa has made various commitments towards reducing its GHG emissions, it would therefore be in its interest to provide a regulatory environment that encourages investment towards the development of carbon-offset projects as one means of facilitating the transition towards a low-carbon economy. Yet, it must do so in a manner that forces carbon-offset project developers to prioritise sustainable development benefits along with GHG reductions.

5.2 Recommendations

In order to promote the development of carbon-offset projects in South Africa in a manner that ensures they contribute positively towards sustainable development, the following recommendations provide possible solutions and areas for further research.

5.2.1 Recommendations for Industry and Government

A report by Promethium titled *Fast-Tracking Low Carbon Development in South Africa* (2016) states that at least 37 local municipalities mentioned climate change in their Integrated Development Plans (IDPs) when considering disaster management and ecosystem preservation in their respective jurisdictions. Carbon-offset projects are then well suited for municipal IDPs, as they are longer-term initiatives that supply continuous benefits towards local sustainable development whilst simultaneously addressing climate change.

However, the South African Cities Network (SACN) explains how "municipalities must operate in compliance with the Municipal Finance Management Act (MFMA) (Act 56 of 2003) [as it] aims to modernise budget and financial management practices in municipalities in order to maximise the capacity of municipalities to deliver services to all their residents, customers and users" (Kambare *et al*., 2014:20). According to Agyepong (2014:42), "the main aim of the MFMA is to improve municipal financial management and service delivery".

The obstacles presented by the MFMA lie in the fact that a municipality must purchase CERs and/or electricity over an extended period of time. In the Bisasar Landfill case, all electricity produced is sold to eThekwini Electricity through a ten-year Power Purchase Agreement (PPA) at parity with the Eskom Local Authority Tariff (Ribbink, 2011). However, the MFMA mainly looks at the process followed when procuring goods and services and sets requirements on the process followed, such as limited timeframes not exceeding three years and the requirement that goods or services are procured via a competitive tender process from which the most cost-effective bidder is chosen.

According to Strachan (2010:1), difficulties presented by the MFMA are the "chief reason for the scarcity of Municipal CDM projects throughout the country". More specifically, it is the Supply Change Management Policy adopted by municipalities that presents significant tight legal constraints on the development of CDM projects, particularly around the sale of carbon credits (2010:2). This policy constraint might therefore be an unwarranted impediment to the national aspiration of promoting sustainable development, given that the "local government sector arguably holds the highest potential for leading the way with the development of CDM projects" (2010:2).

Furthermore, this Act impedes upon the ability of project proponents to draft contracts in a manner that incentivizes potential investors to invest in long-term carbon-offset projects, and therefore undermines the potential for municipalities to maximise their capacity for service delivery and, ultimately, sustainable development. The MFMA should thus be amended in such a way that any and all unnecessary regulatory obstacles are removed, to allow for increased certainty and clarity around the structuring of long-term procurement contracts for carbon-offset projects.

According to Lochner *et al*. (2008:92); EIA practitioners wield the potential to break the conventional mould of EIA and utilise the concept of sustainability to 'push the vectors'. By 'pushing the vectors', Lochner *et al.* (2008) express the idea that the EIA process can contribute positively towards delivering tangible results in enhancing the sustainable development impacts of projects. Rather than following a 'tick-box' approach, whereby the EIA process is followed in an attempt to merely minimise negative environmental impacts, EIA practitioners should think outside the box and proactively seek opportunities that can make a material contribution towards sustainable development. One possible means of doing this would be the inclusion of a social impact assessment (SIA) as a mandatory component of the EIA process.

As such, the authorities should investigate means of making SIAs mandatory, particularly in cases where a project could have far-reaching impacts on sustainable development for local communities. The Bisasar Landfill study has revealed the potential pitfalls that occur when project proponents do not conduct a SIA early on in the project-development cycle. By doing an SIA, project proponents are able to get a better understanding of community sentiment around the proposed project development. Not only would this initiative align the EIA process more closely with South Africa's anthropocentrically based environmental legislation, it could also mitigate the potential for costly EIA delays due to strong community resistance.

A comprehensive SIA could ensure that, where a project has significant and/or far-reaching social impacts, any and all community concerns are placated before further, more-expensive studies are initiated. Therefore, it could be in the interest of both project proponents and the relevant authorities for there to exist increased regulatory certainty and guidance around when and how SIAs should be conducted. Not only would this align the mandate of the EIA process more strongly with section 24 of the Constitution, but it would allow EIA practitioners increased scope to 'push the vectors' through aligning project objectives in a manner that ensures positive sustainable development impacts are prioritized.

5.2.2 Future Research and Methodological Recommendations

Achanta *et al.* (2012:5) point out that renewable energy, as a carbon-offset project, generated relatively more co-benefits towards sustainable development than other project types (e.g. industrial gas). Therefore, it may be of use to further investigate which project types are more conducive towards promoting sustainable development - and thereby align policies to incentivize the development of these project types. For example, the new legislation within South Africa (i.e. Draft Regulations: Carbon Offsets) does not allow renewable energy projects to sell carbon credits to local emitters seeking to offset their carbon tax liabilities. Further research in this area could facilitate government towards making policy and regulatory decisions that empower the most sustainable carbon-offset project types, such as renewable-energy projects.

Also, further research should be conducted on how environmental assessment practitioners (EAPs) might better integrate the concept of sustainability more effectively into the EIA process. Furthermore, this research could facilitate the development of possible guidelines on how to conduct follow-up audits that include an assessment of the project's sustainable development impacts in South Africa. As such, research should be focused towards conducting a more thorough assessment on the sustainable development impacts of activities in South Africa that trigger the need for an EIA. One possibility would be to investigate the relationship between conducting a thorough SIA and the potential impact this has on improving the sustainable development impacts of projects.

Given certain constraints - such as time, resources and the fact that there exist only 12 registered CDM projects that have generated CERs that can be studied - this mini-dissertation focused on assessing only one project for the case study component of the research. When the carbon tax is finally implemented in South Africa along with the associated carbon=offset regulations, the assumption exists that there will be a boom in the carbon-offset market, resulting in more projects being developed to accommodate this new demand for carbon credits. This could provide potential researchers with a plethora of potential case studies to choose from to augment this, and other research projects, that have investigated the sustainable development impacts of carbon-offset projects in South Africa. Thus, it is recommended that research should, where possible, investigate multiple case studies to provide a more holistic data set.

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Appendix A

The Clean Development Mechanism's Contribution towards Sustainable Development in South Africa

Stakeholder Questionnaire

by

JAMES JOHNSON

A thesis submitted in partial fulfilment of the requirements for the degree of

M. ENV. MAN.

NORTH-WEST UNIVERSITY

2017

Supervisor: Dr. Jan-Albert Wessels
Dr. Jenny Pope

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

School of Geo and Spatial Sciences
Geography and Environmental Management
North-West University
25 January 2017

To: Whom it may concern

REQUEST FOR YOUR PARTICIPATION IN A RESEARCH PROJECT.

Dear Sir/Madam

This letter serves as a request for you to participate in this research project by personal interview or, where logistics do not allow, via a Skype chat or telephone call.

This research is conducted for the purposes of a Masters Thesis titled: The Clean Development Mechanism's Contribution towards Sustainable Development in South Africa. The questionnaire has been developed by James Johnson, Masters student in Environmental Management at the North-West University. The aim of this research is to provide insight into extent of the Clean Development Mechanism's contribution towards sustainable development in South Africa.

The objectives of the research are to:

1) Understand where the CDM can contribute towards sustainable development;
2) Analyze the extent to which the CDM has contributed to sustainable development, with particular focus on the Bisasar Landfill project and;
3) Determine what lessons learnt could facilitate improvements for future carbon-offset projects.

Please note that the information gathered during the course of these interviews shall be used purely for study purposes. Furthermore, the degree of confidentiality shall be left to the discretion of the respondent.

Your consideration on this matter is highly appreciated.

Yours sincerely

James Johnson

Questionnaire

A) Background Information of Interviewee

Personal Details

Name : _____

Organization : _____

Current occupation : _____

E-mail : _____

Tel : _____

1) Are you currently involved in the CDM?

_____

2) How many years of experience do you have in the CDM field and in what capacity are/were you involved with the CDM?

_____

3) How many years of experience do you have with the Bisasar Landfill Project and in what capacity are/were you involved with this project?

_____

4) How many CDM projects in South Africa have you been involved in?

_____

5) Have you published any literature around the topic of CDM in South Africa? If yes, how many articles have you published on this topic?

_____

B) MATA-CDM

Social Criteria

1) To what extent can stakeholders participate in the project development?

A	Stakeholders can participate in the decision process	
B	Stakeholders are invited to give inputs / raise concerns	
C	Stakeholders are informed	
D	Stakeholders are only informed upon request	
E	Stakeholders are not involved at all, no access to data is possible	

2) To what extent does the project contribute to improved availability of essential services?

A	Significant increase in availability of core services	
B	Significant increase in availability of other services / moderate increase in availability of core service	
C	No change	
D	Significant decrease in availability of other services / moderate decrease in availability of core services	
E	Significant decrease in availability of core services	

3) To what extent does the share of turnover benefit disadvantaged people?

A	Significant proportion of turnover goes to disadvantaged people	
B	A small proportion of turnover goes to disadvantaged people	
C	None of the turnover goes to disadvantaged people	
D	A small loss in turnover incurred by disadvantaged people	
E	Significant loss in turnover incurred by disadvantaged people	

4) To what extent does the project generate opportunities for additional capacity development?

A	Considerably more opportunities or more sophisticated capacity development	
B	Slightly more opportunities or more sophisticated capacity development	
C	No change in capacity development	
D	Slightly less opportunity or less sophisticated capacity development	
E	Considerably less opportunities or less sophisticated capacity development	

Environmental Criteria

1) To what extent does the project contribute to a reduction in the consumption of fossil energy resources?

A	Significant reduction in the consumption of fossil energy sources	
B	A small reduction in the consumption of fossil energy sources	
C	No change in the consumption of fossil energy sources	
D	A small increase in the consumption of fossil energy sources	
E	Significant increase in the consumption of fossil energy sources	

2) Does the project contribute to decreasing pressure on the regional air quality?

A	Considerable decrease in respiratory diseases or carcinogens	
B	Considerable decrease in odour / moderate decrease in respiratory diseases or carcinogens	
C	No change to baseline	
D	Considerable increase in odour / moderate increase in respiratory diseases or carcinogens	
E	Considerable increase in respiratory diseases or carcinogens	

3) Does the project contribute to decreasing pressure on the regional fresh water quality/quantity?

A	Considerable decrease in pressure of one or more issues / moderate decrease of two issues	
B	Moderate decrease in pressure of one issue	
C	No change to baseline	
D	Moderate increase in pressure of one issue	
E	Considerable increase in pressure of one or more issues / moderate increase of two issues	

4) Does the project contribute to decreasing pressure on the regional land resource?

A	Considerable decrease in pressure on land resources	
B	Moderate decrease in pressure on land resources	
C	No change to baseline	
D	Moderate increase in pressure on land resources	
E	Considerable increase in pressure on land resources	

Economic Criteria

1) Does the project contribute to generation of wealth in a disadvantaged region?

A	Project location economically disadvantaged	
B	Project location economically average	
C	Project location economically privileged	
D	Project at economically average location hinders project at disadvantaged location	
E	Project at privileged location hinders project at disadvantaged location	

2) Does the project have a high internal rate of return (IRR)?

A	Internal rate of return is over 20%	
B	Internal rate of return is between 10% and 20%	
C	Internal rate of return is 10%	
D	Internal rate of return is between 0% and 10%	
E	Internal rate of return is negative	

3) Does the project create jobs?

A	Significant increase in jobs created	
B	Small number of jobs created	
C	No change in jobs created	
D	Small number of jobs lost	
E	Significant amount of jobs lost	

4) Does the project apply innovative, locally manageable technology?

A	The potential capacity exists locally to maintain and manage the implemented technology	
B	Local skills can be developed with the assistance of external expertise	
C	No technology transfer is involved	
D	External skills must be imported with the transferred technology	
E	The transferred technology cannot be maintained and managed in the long term	

C) Concluding Remarks

1) Please indicate the level to which you either agree or disagree**.**

	Strongly Disagree	Disagree	Agree	Strongly Agree
In general, the CDM has contributed positively towards sustainable development in South Africa				
The Bisasar Landfill CDM project has contributed positively towards sustainable development in South Africa				
The current vetting, implementation and monitoring system currently in place is sufficient for ensuring that CDM projects in South Africa uphold their sustainable development commitments				
Where a project has the potential to significantly offset carbon emissions, but with minor sustainable development drawbacks, it should proceed				

2) What lessons can we learn from the Bisasar Landfill CDM experience that might improve the process of vetting, implementing and/or monitoring these types of projects?

_____

3) What is the future for carbon-offset projects in South Africa?

_____

Thank you sincerely for your contribution towards this research project.

Sincerely,

J. Johnson

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