Evaluation of the effectiveness of Environmental Impact Assessment in promoting sustainable development in the energy sector of South Africa

Shonisani Felix Madlome

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Student No: 727636

Supervisor: Professor Danny Simatele

Declaration

I declare that this research is my own, unaided work. It has not been submitted for the Degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

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2nd day of September 2016 in Johannesburg

Abstract

This study evaluates the Environmental Impact Assessment (EIA) practice in the South African energy sector against a criteria developed by the researcher to determine the extent to which the EIAs contribute towards sustainable development. A questionnaire survey was conducted to gather information on the performance of the EIA practice of Eskom, which in this study represents the energy sector of South Africa. A review of the quality of a sample of EISs was also done against the modified Lee and Colley review package. The study revealed some strengths and weaknesses of EIA, as practiced by Eskom. The strengths include effective mitigation, public participation, training and the use of resources within ecological limits. The EISs were found to be generally of satisfactory quality. The weaknesses which limit EIA in the energy sector to reach its full potential in promoting sustainable development include inadequate monitoring, inadequate consideration of cumulative impacts and alternatives and inadequate engagement with community members directly affected by development projects on a personal level. Despite these weaknesses, the study concludes that EIA in the energy sector contributes, to some extent, towards the promotion of sustainable development.

Key words: Environmental Impact Assessment, EIS, sustainable development, monitoring, mitigation, public participation, alternatives, ecological limits

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ABBREVIATIONS

DEA : Department of Environmental Affairs

DEAT : Department of Environmental Affairs and Tourism

EIA : Environmental Impact Assessment

ECA : Environment Conservation Act

EMP : Environmental Management Plan

EIS : Environmental Impact Statement

NEMA: National Environmental Management Act

NEPA : National Environmental Protection Act

OECD : Organisation for Economic Co-operation and Development

SPSS : Statistical Package for the Social Sciences

WCED: World Commission on Environment and Development

CHAPTER 1

FRAMES OF REFERENCE

1.1 Introduction

The concern for the environment has been on the rise in recent years. Many workshops, symposia and conferences have been held to discuss the need for incorporation of environmental management into public policy. In today's society, proposed developments are scrutinised for their environmental impacts. Most governments require project proponents to conduct Environmental Impact Assessment to examine potential environmental impacts and propose possible mitigation measures for the protection of the environment.

Environmental Impact Assessment (EIA) is a process that is applied in a development project proposal to examine the potential environmental consequences of implementation of that project (Glasson, Therivel and Chadwick, 1999). Fuggle and Rabie (2009) define EIA as a tool used to evaluate the potential effects of major projects with significant effects on the natural and man-made environment. Glasson *et al.* (1999) identified the three main purposes of conducting an EIA which include: guidance in making informed decisions, preparation of development plans and contribution towards sustainable development. The environment comprises the surroundings where humans exist, consisting of land and water resources, the atmosphere, living organisms, and interrelationships among them (DEAT, 2000). The environment impacted by development projects in the context of EIA includes the biophysical, social and economic environment.

EIA, according to the Endangered Wildlife Trust (2013) serves, inter alia, the following purposes:

(i) Identification of negative impacts on the environment and their consideration in the decision making process;
(ii) Avoidance of serious negative environmental impacts and/or the reduction/mitigation of impacts;
(iii) To allow for public engagement;
(iv) To control development;
(v) To ensure that authorities make informed decisions which promote protection of the environment; and

(vi)Contribution towards sustainable development.

Many definitions for sustainable development have been put forward but the widely used definition of sustainability is the one put forward in the Brundtland Report. Sustainable development is defined as development that allows for the present generation to meet their own needs without depriving the future generations a chance to meet their own needs (Sneddon, Howarth and Norgaard, 2006). Thus the aim of sustainability is to attain both intra-generational and inter-generational equity (Pearce, Markandya and Barbier, 1992). Glasson *et al*. (1999) note that sustainable development is not only about passing man-made capital and human capital, but also natural capital. Sustainability is attained where there is a balance between social, economic and environmental goals (Saadatian, Tahir and BintiDola, 2010). Sustainability is regarded as the overarching goal of EIA, but it has been established that most EIA practices are not very effective in the achievement of sustainability goals.

While EIA is recognised as a useful tool which provides recommendations for the mitigation of negative environment impacts, questions are being raised as to whether the EIA system in South Africa is effective, or EIAs are just done by developers as a way of acquiring environmental authorisation. Cashmore *et al.* (2004) acknowledge that although EIA has its own limitations as a decision making tool, it can go a long way in promoting sustainable development.

While strides have been made in improving the South African EIA system as a whole, some fatal flaws have been identified in the current EIA practice. This reflects the picture of the entire South African EIA system. This research thus seeks to focus specifically on EIAs in the energy sector to determine ways in which they contribute towards sustainable development.

1.2 Research statement

South Africa, like any other developing country, is experiencing rapid population growth, coupled with economic growth and industrialisation, and this may impact negatively on the environment. Faced with challenges such as service delivery and unemployment, South Africa tends to prioritise development to trigger economic growth and employment creation. The result is expansion of physical infrastructure and quite often attempts are made to speed up decision making about development projects. The moves taken to hasten

the decision making process may weaken the value of EIAs in protecting the environment and promoting sustainable development.

The rapid population growth and industrialisation put pressure on energy and other resources. The electricity sector is affected to a large extent by this growth. Eskom, South Africa's major power generation utility is under pressure to meet the ever increasing demand. Eskom is a government entity with a mandate to ensure provision of adequate electricity. It is among the biggest institutions with a very significant amount of ecological footprint. While South Africa is among the countries that produce the cheapest electricity in the world, its power stations use very poor quality coal to produce that electricity. The use of low quality coal results in elevated pollution levels, which in turn have negative effects on human health and well-being.

Although Eskom is the biggest producer of electricity in Africa, South Africa still faces power shortages as witnessed by load shedding done across the country since 2008 (Fawkes, 2005). This challenge emanates from the fact that the South African economy is energy intensive. Electricity usage in South Africa is about ten times as much as the African average, and two times as much as the world average and well above fifty percent of the Organisation for Economic Co-operation and Development (OECD) countries' average (Fawkes, 2005). This can be attributed to huge primary minerals extraction and processing industries.

To ease the problem of power shortages, Eskom is in the process of constructing additional power stations such as the Medupi Power Station and the Kusile Power Station in Limpopo and Mpumalanga respectively. Such large scale projects emit greenhouse gases which have negative impacts on the environment, affecting human health and damaging other organisms and infrastructure as well as contributing to climate change and global warming (DEAT, 2003). Water resources, biodiversity and social structures are also affected by these development projects. The South African legislation requires that such large scale projects be done after EIA. Now the question that needs to be addressed is how these EIAs are implemented and whether they are implemented in an effective manner which promotes sustainable development.

Eskom is an affiliate of the World Business Council for Sustainable Development, and is thus expected to display leadership in sustainability issues. The energy sector is long term and large scale in nature, and many decisions associated with this sector often have

implications on the environment for decades. Given the size and scale of economic, social and environmental footprint of Eskom, it is worthy investigating the extent to which the power utility's EIA system contributes towards sustainable development. Electricity has been chosen among other sub-sectors of the energy sector because it is the most dominant in the South African energy industry and it has a major impact on other sectors of the economy.

While the EIA procedure is known to improve decision making, it is considered by some to be insufficient in attaining sustainability goals (Cadwell, 1993). Many studies have been carried out to investigate the capacity of EIA in achieving the goals of sustainable development in theory. It is also very important to conduct some research on the effectiveness of EIA in achieving the goals of sustainability in practice (Cashmore *et al.*, 2004).

Critiques believe that there are still some weaknesses in the ways in which South Africa deals with issues pertaining to sustainable development. In developing countries, South Africa included, tools like EIAs are most often regarded as barriers to development and are therefore not easily accepted. Such a mind-set could potentially taint the value of EIA in attaining the goal of sustainable development. Murombo (2008) notes that EIA does not adequately meet expectations of the public as far as sustainable development is concerned.

This study thus seeks to have an insight into the extent to which the EIA practice by Eskom contributes towards sustainable development and the challenges faced in the implementation process. Emphasis will be placed on the extent to which mitigation measures stated in the Environmental Impact Statements (EISs) are implemented and the level of enforcement and monitoring. The study is also going to establish whether there is adequate public participation in both pre- decision and post decision stages of projects.

1.3 Research questions

In view of the thematic focus above, the following research questions guided this study:

(i) In what ways does the EIA system at Eskom contribute to sustainable development?

In answering the above question, the following sub-questions which form part of the study have to be answered:

(ii) In what ways are the EIAs in the energy sector of South Africa implemented?

(iii) What are the challenges faced in the implementation of EIAs in the energy Sector?

1.4 Aims and objectives of the study

This research aims to investigate the extent to which EIA practices in the energy sector of South Africa promote sustainable development.

The following are the objectives of the study:

(i) To develop a conceptual framework for the meaning of sustainable development in the context of EIA in the energy sector of South Africa;
(ii) To design a sustainability appraisal tool to evaluate the effectiveness of the energy sector EIAs in promoting sustainable development; and
(iii) To investigate the effectiveness of EIA practices in the energy sector of South Africa in promoting sustainable development by reviewing sample EIAs.

1.5 Preliminary literature review

Many studies focusing on the effectiveness of EIA have been carried out. For this research, the following issues need to be investigated to gain an insight into the role that EIA plays in contributing towards sustainable development.

1.5.1 The purpose of EIA

As mentioned earlier, EIA is a process applied for the minimisation or prevention of negative impacts of major development projects, such as dams, industrial complexes, power stations etc. (Glasson *et al*., 1999). Minimisation or prevention of environmental impacts is necessary for development to be sustainable. The aims and objectives of EIA can be categorised as immediate and long-term (Sadler, 1996). The immediate aim of EIA is to aid in the decision making process by identifying significant environmental impacts of proposed projects, while the long-term aim is the promotion of sustainable development by making sure that development does not subvert natural resources and the wellbeing of communities who rely on them (Sadler, 1996). According to Sadler (1996), the immediate objectives are to:

(i) Ensure appropriate and efficient utilisation of natural resources;
(ii) Improve the design of development proposals;
(iii) Propose appropriate mitigation measures for potential impacts; and
(iv) Aid decision makers in making informed decisions about the acceptability of the proposed development.

He also points out the following as the long-term objectives of conducting an EIA:

(i) Protection of human health and well-being;
(ii) Prevention of serious harm to the environment;
(iii) Protection of valued resources and natural areas; and
(iv) Enhancement of the social aspects of the project.

1.5.2 Sustainable development

The term sustainable development is complex and many meanings of the concept have been put forward. According to Fowke and Prasad (1996), more than eighty definitions of sustainable development exist. Sometimes the definitions are contradictory (Fowke and Prasad, 1996). However, as stated earlier, the widely used definition is the one put forward by the World Commission on Environment and Development (WCED). Sustainable development is attained where the present generation meets their needs without denying future generations a chance to satisfy their own needs (WCED, 1997). Similarly, Miller (2004) states that an environmentally sustainable society is one in which resource use satisfies the present generation's basic needs and avoids exhaustion of natural resources to ensure that current and future generations have access to the natural resources to meet their needs. These two definitions indicate that resource use needs to be done in a way that ensures the success of the present generation and at the same time ensures that future generations also have access to resources.

1.5.3 EIA and sustainable development

As has been stated in the previous sections, EIA's ultimate purpose is achievement of sustainable development. The identification, avoidance and/or mitigation of impacts during the EIA process (Glasson *et al*., 1999), can be viewed as measures which promote sustainable development. In addition, EIA is widely viewed as a tool which allows for the consideration of social, economic and environmental impacts of major development projects (Morrison-Saunders and Arts, 2004a). This implies that EIA considers the three imperatives necessary for sustainable development.

It is acknowledged that the practice of EIA has significantly developed over time and the practice is more significant than in the past. While EIA is recognised as a useful tool which provides recommendations for the mitigation of environmental impacts, questions are being raised on its contribution towards sustainable development in practice. There are many issues noted in literature that leave a lot to be desired. For example, Wood (2003)

stresses that despite EIA being generally regarded as an important tool in making decisions on issues affecting the environment, it seems to marginally serve its intended purpose.

Murombo (2008) notes that in South Africa, public participation in the case of EIAs in chapter 5 of NEMA and chapter 6 of the regulations appears not to go beyond authorisation or rejection of a project. From that stage, the only remedy remaining for the interested and affected parties, if they are not satisfied with the decision is to appeal against the decision (Murombo, 2008). Mitchell, Kaatz and Quayle (2000) recognise that the public participation process in South Africa does not favour the disadvantaged group of the community.

Wood (1999) stresses that there is a huge gap between legislation and actual enforcement, which can be attributed to a lack of funding and inadequate staff at provincial and local authorities. Ultimately, authorities will have to rely on complaints from neighbours or on the credibility of developers and their consultants about non-compliance, with the latter being very unlikely (Wood, 1999). Fuggle and Rabie (2009) point out that although authorities receive complaints about non-compliance, they seldom take appropriate action to deal with the problem due to a lack of capacity or some other reasons. Fuggle and Rabie (2009) also acknowledge that NEMA addresses this problem for ongoing monitoring of impacts throughout the life cycle of an activity. They however point out that NEMA makes this provision on paper, and the effectiveness of monitoring depends on the availability of staff, which in turn depends on political will.

1.5.4 Measurement of EIA effectiveness

There has been a lot of debate concerning the measurement of EIA effectiveness in environmental management. It is difficult to identify the most appropriate criteria to measure the effectiveness of an EIA process because the process consists of a number of stages, which makes it difficult for one to accurately quantify the overall effectiveness of the EIA process (Wood, 2003). Another challenge faced in the measurement of effectiveness is the way in which different stakeholders interpret EIA effectiveness (Cashmore *et al*., 2004). For example, some project proponents perceive EIA as a time wasting process, while NGOs align it to the accountability of the decision makers (Cashmore *et al.,* 2004). Furthermore, assessment of EIA effectiveness requires a lot of information, which in most cases is not available due to a host of reasons (Fuggle and Rabie, 2009). Fuggle and Rabie (2009) also stress that little empirical data has been

collected as a result of low levels of EIA follow-up, enforcement and compliance monitoring. This can be attributed to a lack of manpower (Fuggle and Rabie, 2009).

Despite these difficulties, efforts have been made to measure the effectiveness of an EIA process. Sadler (1996) points out that the effectiveness of an EIA process can be measured by the extent to which the EIA process achieves the goal of environmental protection. In addition, Cashmore *et al*. (2004), stress that EIA effectiveness can be measured by assessing the ability of an EIA to achieve its intended objectives, with minimum delay and at the least cost, and without bias and compliance with specific requirements. Du Preez, Haynes and Paton (1997) express concern over little reference to the procedure of mitigation at the post decision stage of a project. They propounded that this often leads to decision making based on the options perceived to be the most environmentally sound, and identification of mitigation measures in the absence of formal provision for implementation of recommendations. In an attempt to quantify the overall effectiveness of EIA, various frameworks and review packages have been devised. The Lee and Colley review package (1992) is among the commonly used packages to measure the quality of EIAs.

1.6 Methodology

This section aims to describe the methodology that was used in this study. It describes the research positionality, sampling techniques employed, data collection tools, statistical procedures for data analysis and limitations of the study.

1.6.1 Research positionality

There are a number of research philosophies or research paradigms which can be adopted by a researcher when conducting research. The two key research philosophies are positivism and interpretivism/constructionism. This study adopts an interpretivist or constructivist position, also referred to as post-positivist (Blaikie, 1993) or anti-positivist (Hatch and Cunliffe, 2006). The motivation for taking this position in this research is the argument that in a social world, individuals and groups use experience, memories and expectations to make sense of situations. Interpretivists are of the opinion that meaning is constructed over time through experience resulting in different opinions of situations (Denzin and Lincoln, 2003). This research aims to inquire individuals' perspectives with respect to the issue under investigation.

1.6.2 Site description

Information was gathered around the Gauteng and Mpumalanga regions. Questionnaire surveys were conducted in Sunninghill, Johannesburg (26° 2' 7″ S 28° 3' 55″ E) at the Eskom head offices and private EIA consultants' offices. Data from the Department of Environmental Affairs (DEA) was gathered from the national office situated in Arcadia, Pretoria (25° 45' 12″ S 28° 11' 13″ E). Gauteng was chosen because the main offices are located in this region, and information is readily available. Information from members of the community was gathered around Kusile power plant in Mpumalanga. Mpumalanga was chosen because it has the majority of coal fired power plants which have a huge impact on the environment. The two regions have also been chosen because of their proximity to the researcher.

1.6.3 Research design

This study employed a mixed methods design for data collection and analysis. This approach makes use of both primary and secondary data, and also uses a case study research to meet the objectives of the study and answer research questions. Both quantitative and qualitative data is collected and analysed in a mixed methods research design (Driscol *et al*., 2007). The combination of primary data, secondary data and case study research was deemed necessary for this study since the three complement each other in gathering the necessary data and allow for a more complete analysis of the problem.

1.6.4 Data collection tools

This study utilised both primary and secondary sources of data. Primary data was gathered from a questionnaire survey. Two questionnaires (one for environmental specialists and another one for community members) were utilised to gather primary data. Secondary data was gathered from a review of relevant literature and from a sample of Environmental Impact Statements (EISs) submitted to the Department of Environmental Affairs on behalf of Eskom. Literature review focused on the views and opinions of numerous authors, scholars and researchers with an interest on the subject matter. The sources of literature that were reviewed include journals, publications, texts and other relevant academic materials. The review of relevant literature was useful in the formulation of the conceptual framework as well as the design of the questionnaires.

1.6.5 Population and sampling procedure

The population for this study comprises two distinct groups (i.e. environmental specialists and community members). Environmental specialists include DEA environmental

officers/managers, Eskom environmental managers and environmental consultants. Community members living around Kusile power station were considered. The snowball sampling technique was employed to draw a sample on which the questionnaire survey was conducted. The reason for choosing this technique was the unavailability of a clearly defined sampling frame. The sampling technique employed is a non-random sampling technique which implies that there are chances of introduction of sampling bias. The sampling procedure for environmental specialists started by approaching public relations officers of the organisations or institutions involved, and they helped in identifying one or two suitable persons for the study. Those who were identified were then asked to recommend other potential subjects suitable for the study. The recruitment process for community members started by approaching community leaders who then assisted in identifying possible candidates for the study. Those who were identified were then asked to recommend other potential subjects suitable for the study. The process continued until the required sample size was obtained. The sample was made up of the following subgroups:

(1) 20 environmental managers/officers from Eskom
(2) 17 environmental officers/managers from the Department of Environmental Affairs
(3) 18 environmental consultants
(4) 15 members of the community living around Kusile power station.

A sample of five Eskom Environmental Impact Statements (EISs) was selected and their quality critically examined to assess the effectiveness of EIA practices of the power utility in promoting sustainable development.

1.6.6 Data analysis

The Statistical Package for the Social Sciences (SPSS) Version 22 was used to analyse the data collected from the questionnaire survey. The review of the quality of EISs was done against the Lee and Colley review package (Lee and Colley, 1992). The Lee and Colley review package has been extensively used in past studies (Sandham, Hoffman and Retief, 2008). Although an EIS is only a final output of the EIA process, it however gives an indication of the overall quality of the process. The study used EIS quality as an indication of the effectiveness of an EIA process in contributing towards sustainable development since quality is determined by a number of aspects.

1.6.7 Scope of the study

The aim of the study is to investigate the contribution of energy sector EIAs towards sustainable development and the challenges faced. However, the results obtained may not represent the entire energy industry since the study is only based on the EIA practice by Eskom. Data collection is limited to the Gauteng and Mpumalanga regions. The opinions of the chosen sample may not reflect the opinions of the entire population in all the nine provinces of South Africa. The small sample size and the sampling procedure place some limitations to generalisation of the results of the study to the population.

1.6.8 Ethical considerations

A study which involves human subjects requires that before the study can resume, the researcher should seek ethical clearance from relevant authorities. Before the study resumed, ethical clearance was sought and obtained from the Wits Human Research Ethics Committee (See Appendix 3). Clearance was sought for the following reasons:

(i) To ensure that participants give formal consent to participate in the study;

(ii) To ensure that no harm is done to the participants;

(iii) To ensure confidentiality and anonymity; and

(iv) To ensure that permission is granted to conduct the research.

Prior to the questionnaire survey, respondents were given participant information sheets (see Appendix 2) to enlighten them on the nature and purpose of the study. The participants were asked to give their consent to participate in the study. The respondents were informed that they were free to withdraw from the study at any time, and were free not to answer some of the questions they did not like to address. It was explained to the participants that participation was voluntary and there was no remuneration offered for participating in the study. The participants were also assured of anonymity and confidentiality, and were informed that the information they provide will be used strictly for academic purposes.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter is dedicated to literature review. The purpose of literature review is to present what other authors have proposed or observed with regard to the issues under investigation, and to identify the "gaps" in knowledge (May, 2001). To address the research questions discussed in the previous chapter, literature relevant to this study is discussed in the following sections under the following thematic topics: environmental impact assessment, sustainable development, EIA and sustainable development, measurement of EIA effectiveness, the EIA process, EIA in South Africa, South African energy industry, impacts associated with energy projects, and development of the conceptual framework.

2.2 Environmental Impact Assessment (EIA)

2.2.1 Definition of EIA

Environmental Impact Assessment (EIA) is defined as a process in which the potential environmental impacts of a major development project on the natural and man-made environment are examined (Fuggle and Rabbie, 2009). Glasson, Therivel and Chadwick (2005) stress that EIA aims to examine potential environmental effects associated with development and that it ensures consideration of environmental consequences during project design. EIA identifies potential environmental impacts (including bio-physical, socio- economic and cultural) and explores alternatives and measures that can be applied to minimise negative impacts and maximise positive ones for the protection of the environment (Centre for Environmental Management (CEM), 2006). Glasson *et al*. (1999) state the following as the main purposes of EIA: an aid to decision making, preparation of development plans and contribution towards sustainable development.

Environmental impact Assessment is recognised the world over as an essential tool for sustainable development as it considers the social, economic and environmental effects of major development projects (Morrison-Saunders and Arts, 2004a). The Endangered Wildlife Trust (2013) states the following as the purposes of EIA:

(i) To ensure that the environmental impacts of development projects are considered during the decision making process;

(ii) To ensure that development activities do not have serious negative impacts on the environment, and to reduce or mitigate those impacts;
(iii) To ensure involvement of interested and affected parties;
(iv) To facilitate informed decision making; and
(v) To promote sustainable development.

Sadler (1996) notes that EIA has two main substantive purposes. The first one, which is the immediate aim, is to ensure sound decision making which takes into consideration environmental issues (Sadler, 1996). The second aim is usually (but not universally) achieving the ultimate goals of environmental protection and sustainable development (Sadler, 1996).

2.2.2 Evolution and purposes of EIA

A remarkable increase in the awareness of environmental issues has been seen over the last three decades as witnessed by the introduction of legislation focusing on environmental protection in many countries (Hoffman, 2007; Glasson *et al*., 2012). The USA and UK are among the pioneers to formally adopt EIA legislation as far back as 1969 and 1985 respectively (Hoffman, 2007). The US Congress enacted the National Environmental Policy Act (NEPA) in 1969 in response to adverse environmental damage arising from human activities (Weston, 2004; Jay *et al*., 2007). NEPA was enacted to safeguard the environment and the biosphere from serious damage. This environmental policy was intended, inter alia, to ensure that each generation acts as a trustee for future generations (Jay *et al*., 2007). The policy called for the Federal Government to create conditions that allow man to exist in harmony with nature, and satisfy the present and future generations' social, economic and other needs (Jay *et al*., 2007). This can be viewed as the foundation of the concept of sustainable development.

Realising that the policy alone was insufficient to ensure environmental protection, it became mandatory, under NEPA, that a statement highlighting the significant environmental impacts of any major developments be included in recommendations (Jay *et al*., 2007). This marked the origin of the Environmental Impact Statement (EIS) and the term Environmental Impact Assessment (Weston, 2004). EIA was adopted to achieve the much needed protection of the environment from damage caused by major development projects (Institute for Environmental Management and Assessment (IEMA), 2004)

The enactment of NEPA had far reaching consequences. It had a major influence on the United Nations Conference on the Environment in Stockholm in 1972, during which issues pertaining to rapidly growing development and its associated environmental problems were discussed (Jay *et al*., 2007). EIA was also discussed as a means through which these environmental problems could be resolved (Jay *et al*., 2007). To this effect, member states of the European Communities adopted mandatory EIA in the mid 1980's (Commission of the European Communities, 1985). NEPA was instrumental in the development of other EIA systems (Macintosh, 2010; Glasson *et al*., 2012).Today, more than 100 countries practice EIA (Donnelly, Dalal-Clayton and Hughes, 1998; Wood, 2003).

In the early days, EIA's main focus was on the assessment of impacts of development on biophysical aspects (i.e. impacts on water, air, soil, biodiversity, etc.) (University of Pretoria (UP), 2012). The late 1980's saw public participation and social impact assessment being embedded into formal EIA practice (UP, 2012). The use of EIA was still limited during this period, but it included some developing countries (e.g. Thailand, China and the Philippines) (Sadler, 1996). From the '80's to the early '90's, the EIA practice strengthened as attention was given to cumulative impacts, monitoring and other follow-up mechanisms (Sadler, 1996). This period saw many more countries adopting the EIA practice (Scott Wilson Ltd, 1996). From the early '80's to date, impact assessment became more strategic and sustainability orientated, with EIA enshrined in international agreements (Scott Wilson Ltd, 1996). Sadler (1996) notes that there has been a considerable increase in training, capacity building and networking, and that EIA has become a multipurpose process, placing more emphasis on long-term, societal goals that coincide with sustainable development ideas. According to Sadler (1996), these goals include, inter alia, the following:

(i) Protecting valuable ecological processes and heritage sites;
(ii) Preventing irreversible depletion of natural capital;
(iii) Making certain that development is done within ecological limits;
(iv) Ensuring optimum use of natural resources and conservation;
(v) Protecting human health and wellbeing; and
(vi) Addressing concerns related to disruption of traditional ways of life.

Sadler (1996) also identifies some supporting and secondary aims of EIA, which include the following:

(i) Enhanced coordination among parties involved;
(ii) Ensuring well planned and designed development projects (i.e. cost effective and greener projects);
(iii) Capacity building and empowering communities through participation; and
(iv) Internalising environmental costs (i.e. the polluter pays principle).

EIA plays an important role as an aid to decision making (Glasson *et al*., 1999). An EIS, which is a result of the EIA process informs the decision makers of the potential environmental consequences of implementing a development project, and thus enables them to reach a more rational and informed decision on the acceptability of the project (Lee *et al*., 1999; Glasson *et al*., 1999; IEMA, 2004). EIA also plays an important role of aiding the project proponent, despite being regarded by some developers as time consuming and costly (Glasson *et al*., 1999). The EIA process enables the project proponent to identify potential environmental problems, and minimise or eliminate them (Glasson *et al*., 1999). This helps to improve relations between the developer, the local communities and local authorities, as well as protection against liability and establishment of a "green profile" (Glasson *et al*., 1999; Morrison-Saunders and Arts 2004b).

As noted earlier, the ultimate purpose of EIA is achievement of sustainable development. The identification, avoidance and/or mitigation of impacts during the EIA process (Glasson *et al*., 1999) can be viewed as measures which promote sustainable development. In addition, EIA is widely viewed as a tool which allows for the consideration of social, economic and environmental impacts of major development projects (Morrison-Saunders and Arts, 2004a). EIA thus considers the three imperatives necessary for sustainable development. It must be noted, however, that post decision monitoring and auditing are required to ensure sustainable development (Arts and Nootebloom, 1999). It has been quoted in literature, however, that follow-up in EIA is a major weakness limiting the potential of EIA as an aid to achieving sustainable development goals.

2.3 Sustainable Development

The concept of sustainable development has gained considerable interest at local, national and global levels. Many definitions of Sustainable development have been proposed and they differ when applied in different contexts and at different levels (Weaver *et al*., 2008:92).

The World Commission on Environment and Development (WCED) (1987) define sustainability as "the level of human consumption and activity which can continue into the foreseeable future, so that the systems which produce goods and services to humans persist indefinitely". Milman and Short (2008) define sustainability as "the ability of a system to adopt to change and continue to function over a long time span". Sustainable development is defined by NEMA 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 (NEMA Act 107 of 1998).The South African Constitution emphasises the need for sustainable development which promotes "justifiable economic and social development" (Constitution of South Africa, Act 108 of 1996).The widely used definition of sustainability is the one put forward by the Brundtland Commission which defines it as "a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Sneddon *et al*., 2006).

The definitions of Sustainable development given above have three common elements, that is:

(i) Optimising human welfare - This includes issues such as income, consumption levels, health, education, human rights and equality;
(ii) Compatibility of the physical and economic activities with the surrounding environment – Resource use should not go beyond ecological limits; and
(iii) Intra-generational and inter-generational equity.

The notion by Saadatian *et al.* (2010) that sustainability is attained where there is a balance between social, economic and environmental goals concurs with the above observations. O'Riordan (2000) also notes that sustainability is based on three pillars namely: ecological, social and economic pillars, popularly known as the "triple bottom-line" approach (Goodland and Dally, 1996).

Sustainability can also be defined in terms of the five capitals approach encompassing five capitals namely: natural, human, social, manufactured and financial capital (Porrit, 2009). For an organisation or a system to achieve its goals of sustainability, the stocks of the five capitals need to be maintained or enhanced (Porrit, 2009).

Sustainability can be classified as either weak or strong (Du Plessis and Landman, 2002; Hatting, 2003).The concept of "weak" and "strong" sustainability is based on the "capital stock theory" centred on natural, human and man-made capital (Turner, Pearce and Bateman, 1994). Weak sustainability is the notion that different capitals can be fully interchanged, and that natural capital can be used up as long as it is converted into manufactured capital (Hatting, 2003). Strong sustainability is the notion that economic activity should not be done beyond the ecological limits of the environment (Hatting, 2003).

2.4 EIA and sustainable development

It is acknowledged that the practice of EIA has significantly developed over time and the practice is more significant than in the past. Ideally, the purpose of implementing mitigation measures is to ensure that negative impacts of development projects are avoided, minimised or compensated (Glasson *et al*., 2005). As such, mitigation can be viewed as key to sustainable development. The general consensus among EIA researchers is that proper EIA has the potential to minimise environmental impacts by identifying them and suggesting possible ways to mitigate those impacts (Gwimbi, 2014). Ultimately, EIA assists in contribution towards sustainable development (Glasson *et al*., 1999). Rhodes' (2012) assertion concurs with the above statement, noting that EIA is an internationally recognised process which could aid in achieving the goal of sustainable development.

While EIA is recognised as a useful tool which provides recommendations for the mitigation of negative environmental impacts, questions are being raised on the effectiveness of the EIA system in South Africa. In their comments on the efficacy of the current EIA regime in South Africa, Brownlie, Coetzee and Morris (2013), stress that the current EIAs are mainly done in line with procedural and reporting requirements as per NEMA EIA regulations, and do not focus on sustainability issues. They also note a lack of trade-off rules and denotative decision making criteria to uphold the sustainable development goal. Another potential explanation for the limitation of EIA in its contribution towards sustainable development is the unavailability of a "unique" definition of the concept of sustainable development (O'Riordan, 2000). However, the general consensus is that sustainable development is based on three pillars, i.e. ecological, social and economic pillars, popularly known as the "triple bottom-line" approach (Goodland and Daly, 1996).

Furthermore, to assess EIA effectiveness, a lot of information needs to be gathered, which in most cases is not available due to a host of reasons (Fuggle and Rabie, 2009). Fuggle and Rabie (2009) also point out that little empirical data has been collected as a result of low levels of EIA follow-up, enforcement and compliance monitoring. One potential reason for this shortcoming could be a lack of manpower (Fuggle and Rabie, 2009). Wood (2003) stresses that despite EIA being generally regarded as an important tool in making decisions on issues affecting the environment, it seems to marginally serve its intended purpose.

The EIA process includes screening, scoping, consideration of alternatives, identification of impacts and evaluation of impacts, mitigation, communication and public participation. The following sections present some literature on how some of these steps and other related issues are related to sustainable development.

a) Alternatives

It appears generally to be recognised that consideration of alternatives is often a weakness in developing country EIAs (Wood, 2003). In particular, the no-action alternative is often considered an unviable alternative in most developing countries which prioritise issues such as starvation and poverty (Wood, 2003). In most cases, even the environmentally preferred alternative is not considered either (Wood, 2003). Bisset (1992) also agrees that environmentally sound alternatives are rarely chosen in most developing countries. He however notes that choosing an environmentally sound option can be achieved in developing countries just like in developed countries (Bisset, 1992).

b) Impact prediction

It has been noted in literature (e.g. Lohani *et al*., 1997) that there is a tendency of neglecting certain impacts in development country EIAs. Scholarly works of Chadwick (2002) and Cooper and Sheate (2002) reveal that current EIA practice shows little or no consideration of social, cumulative, long term and indirect impacts, reflecting the traditional trade-offs between socio-economic gains (usually in the form of employment) and environmental degradation. The sustainable development concept aims to prevent such trade-offs (Hare, 1991). Lohani *et al*. (1997) also note that cumulative impacts and indirect impacts are not satisfactorily addressed in the majority of developing country EIA reports. Benson (2003) defines cumulative impacts as those impacts that arise as a result of concurrent projects or

impacts that accumulate over time. According to Glasson *et al*. (1999), indirect impacts arise from other developments.

c) Mitigation

It is generally presumed that implementation of proposed mitigation measures would result in protection of the environment (Tinkler, Cobb and Cashmore, 2005). Mitigation measures are perceived to be a means by which adverse impacts can be alleviated and a means for achieving the goal of sustainable development (Environmental Law Alliance Worldwide (ELAW), 2010). Glasson *et al*. (2005) classify mitigation goals as short term (influencing decision making) and long term (promoting sustainable development). They further point out that the success of the long term goal (sustainable development) depends upon the success of the short term goal (influencing decision making) (Glasson *et al*., 2005).

Mitigation is arguably the foundation and at the core of EIA (Wood, 2003; Tinkler *et al*., 2005). The basis of this argument is the understanding that through mitigation, adverse impacts are avoided, minimised, remediated or compensated (Marshall, 2001). Some authors (e.g. Marshall, 2001; Wende, Herberg and Herzberg, 2005) contend that mitigation is a process which follows a hierarchical order of: avoidance, reduction, repair and compensation of impacts to enhance the environment. Although authors differ in opinion on what actions constitute mitigation (Gwimbi, 2014), a vast majority of literature state the three main actions of mitigation namely: avoidance, reduction and compensation.

The main focus of avoidance is to prevent environmental damage, and to ensure that environmental quality does not change from its baseline condition (Marshall, 2001). It is impossible, however, to avoid all impacts hence the existence of other mitigation measures. In cases where impacts cannot be avoided, measures that reduce the amount of residual effects of development projects may be adopted (Marshall, 2001). Such measures include inter alia, introduction of new and/or efficient technology, reducing harmful practices (Marshall, 2001). Both avoidance and minimisation help to ensure inter-generational equity, which is an important issue as far as sustainable development is concerned.

On the other hand, compensation encompasses restoration, relocation, enhancement and preservation (Villarroya and Puig, 2010). ELAW (2010) views compensation as actions of rehabilitation, restoration and reclamation. Compensation can be viewed as a means

through which negative effects are turned into positive ones (Wende *et al*., 2005). It is thus an important determining factor of intra-generational equity in the context of sustainable development.

Du Preez *et al.* (1997) express concern over little reference to the procedure of mitigation at the post decision stage of a project. They propounded that this often leads to decision making based on the options perceived to be the most environmentally sound, and identification of mitigation measures in the absence of formal provision for implementation of recommendations.

d) Participation

It is generally agreed that stakeholder involvement leads to development that delivers social and environmental gains, and curbs conflicts (Wood, 2003). In South Africa, NEMA states the following in chapter 1 (section 4f):

"The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured" (NEMA, Act 107 of 1998). Despite these provisions, and the gains offered by participation, many commentators believe that the current EIA practice leaves a lot to be desired. For example, (Lee, 2000) notes that consultation and stakeholder participation is deficient in many developing countries. In many developing countries, public participation in decision making is considered to be revolutionary (Wilbanks *et al*., 1993), and is thus excluded in some countries (Boyle, 1998). According to Enserink and Monnikhof (2003), participation should be viewed as a means to an end, and not a privilege.

Murombo (2008) notes that public participation in the case of EIAs in chapter 5 of NEMA and chapter 6 of the regulations appears not to go beyond authorisation or rejection of a project. From that stage, if interested and affected parties are not satisfied with the decision, they can only redress it by appealing against the decision (Murombo, 2008).To ensure that participation is effective, it should not be a once-off event, but an ongoing process beginning at the stage of problem identification and goes on to project formulation and approval (Murombo, 2008). Public participation is very important during project implementation and monitoring. Compliance to an environmental authorisation needs to

be monitored, and the public needs to be included in the monitoring process. However, participation at this stage requires access to information pertaining to conditions of authorisation, which in most cases is not readily available (Murombo, 2008).

Mitchell *et al.* (2000) recognise that the public participation process in South Africa tends to be affected by social differentiation where the privileged members of a community are the ones who are more dominant and they effect decisions. In some instances the privileged few may derail the EIA processes that have been run by consultants to meet their own agendas (Du toit, 2000). Quite often the poor rural communities are often denied a chance to effectively participate due to illiteracy, lack of access to information, time or cost constraints, language barriers and cultural diversity (Bisset, 2002; Murombo, 2008). Furthermore, some disadvantaged communities lack knowledge with respect to impacts of development projects (Bisset, 2002). Such issues result in public participation not effectively adding value to the EIA process, and undermine the goal of sustainable development.

Lohani *et al*. (1997) note that the requirements for public participation are generally weak in developing countries. They however note that with increasing recognition of participation as an important aspect in the EIA process, there is a gradual increase in the use of public participation. It is very important that indigenous people are consulted for the success of projects. Through participation, consultants also get a chance to benefit from indigenous knowledge (Appiah-Opoku, 2001).

e) Socio-economic impacts

It is generally understood that social and environmental issues are intertwined, and should thus be treated equally within the context of EIA (Stolp, 2006). Storm and Bunge (1999) stress the need for integration of social impacts into the EIA process since human beings are a component of the environment. The balance between social and ecological issues is critical for sustainable development. The condition that social issues should be treated equally as ecological ones is imbedded in the legal frameworks of EIA in many countries that practice EIA (Gwimbi, 2014). It is generally agreed that social and economic impacts should be incorporated into EIAs, and emphasis should be placed on both positive and negative impacts (World Bank, 1991; Biswas, 1992; Organisation for Economic Co-operation and Development (OECD), 1992). However, socio-economic impacts are often not well covered in most developing country EIAs. This could be attributed to the fact that

some baseline socio-economic and environmental data may be inaccurate, difficult to obtain or non-existent in some developing countries (Wilbanks *et al*, 1993).

f) Decision making

Some flaws have been reported with regard to decision making in EIA. While economic and social factors may influence decision making, corruption may also play a part in influencing decisions (Boyle, 1998; Donnelley *et al*., 1998). Furthermore, Mwalyosi and Hughes (1997) state that some mechanistic EIA reports produced in some developing countries have little or no effect on decisions. In agreement to this observation, it has been reported that in South America, EIA has a very limited potential of influencing decision making (Brito and Verocai, 1999). This problem may be attributed, in part, to the fact that environmental assessment is viewed as a constraint to investment, threatening political stability, which is dependent on economic growth (Brito and Verocai, 1999). Kakonge (1999) also notes that it is very rare for projects in African countries to be cancelled as a result of EIA.

g) Monitoring

Monitoring has been neglected in many EIA systems. Wood (1999) stresses that there is a huge gap between legislation and actual enforcement which can be attributed to a lack of funding and inadequate staff at provincial and local levels. Ultimately, authorities will have to rely on complaints from neighbours or on the credibility of developers and their consultants about non-compliance, with the latter being very unlikely (Wood, 1999). Fuggle and Rabie (2009) point out that although authorities receive complaints about non-compliance, they seldom take appropriate action to deal with the problem due to a lack of capacity or some other reasons. There is often a lack of commitment to follow-up in many EIA systems (Lohani *et al*., 1997). In most cases there is no assurance given as to whether conditions attached to environmental authorisation would be satisfied before development can start. Monitoring of compliance in South Africa still remains a challenge although it is covered under NEMA. Fuggle and Rabie (2009) acknowledge that NEMA addresses this problem for ongoing monitoring of impacts throughout the life cycle of an activity. They however point out that NEMA makes this provision on paper, and the effectiveness of monitoring depends on availability of staff, which in turn depends on political will.

Ahmad and Wood (2002) identified a lack of monitoring in Egypt, Turkey and Tunisia. Some developers in developing countries have a tendency of making alterations to the project once it has been authorised, and in most cases environmental controls may not be monitored or observed (Wood, 2003). Some authors (e.g. Biswas, 1992) suggest that this challenge could be alleviated if compliance monitoring is made a condition of assistance. George (2000) suggests that environmental management systems like ISO 14001 be implemented to avoid or minimise negative impacts of projects. However, Wood (2003) acknowledges that implementation of monitoring measures can be costly. George (2000) suggests that where financial constraints exist, resources should be channelled towards those impacts deemed to be the most significant.

h) Ecological limits

It is often common practice that employment creation during the construction phase of projects is used as the reason for the project being socially justifiable. Quite often, many projects are authorised without guarantees that such projects will contribute towards sustainable development. Economic growth is often used as a justification for the loss of natural resources and biodiversity (World Bank, 1991; Biswas, 1992). For development to be sustainable, there is a need to ensure compatibility of the physical and economic activities (Biswas, 1992). In essence, development must be done in such a way that resource use does not go beyond ecological limits. This aspect of development is crucial for inter-generational equity. Depletion of natural resources will negatively affect the well-being of humans, especially the poor who directly depend on natural resources.

i) Training

Numerous authors agree that training is key to improving human resource capacity in developing country EIA practice (Ahmad and Sammy, 1985; Briffett, 1999; Clark, 1999). However, some developing countries have a lack of skilled EIA professionals, as in the case of Asia (Lohani *et al*., 1997). Some commentators feel that EIA courses are often not sufficiently practically orientated (Wood, 2003). Wood (2003) suggests that this challenge could be dealt with by offering multidisciplinary and practically orientated courses rather than focusing on theoretic aspects of EIA. For effective EIA execution, intensive training

is needed, not only to government officials, but also to personnel in research institutions, universities and consultancies (Wood, 2003).

j) Polluter pays principle

Whilst the project proponent has a duty to bear the costs of avoidance, elimination or mitigation of impacts identified during the EIA process, the polluter pays principle further calls for actual compensation for the damage done to the environment (Umweltbundesamt (UBA), 2004). In addition to covering the actual costs of the development, the developer shall also cover external or societal cost (Storm, 2003). Early and honest consideration of alternatives and project modifications during the EIA process are important aspects of the polluter pays principle (Wende, 2002). Moreover, monitoring is very important and the developer should take responsibility for monitoring (Bunge, 1988).

k) EIS preparation

The EIA process leads to the preparation of an Environmental Impact Statement (EIS) which is submitted to the competent authority for authorisation of the development project. An EIS presents the findings of an EIA process and informs the competent authority of the proposed project, its potential impacts and proposed mitigation measures (Morrison-Saunders *et al.*, 2001).

It has been noted that most EIA reports in developing countries are often not easy to read and are weak on coverage of alternatives, scoping, prediction of impacts and justification of proposals (Lee, 2000). Clark (1999) notes that difficulties related to EIS preparation can be attributed to a lack of trained human resources which often result in inadequate and irrelevant reports. EIA reports are reported to be inaccessible in many developing countries. For example, it has been reported that a very few EIA reports have been accessible to the public in Egypt (Ahmad and Wood, 2002).

2.5 Measurement of EIA effectiveness

There has been a lot of debate concerning measurement of EIA effectiveness in environmental management. It is difficult to identify the most appropriate criteria to measure effectiveness of an EIA process because the process consists of a number of stages, which makes it difficult for one to accurately quantify its overall effectiveness (Wood, 2003). Another challenge faced in measurement of effectiveness is the way in

which different stakeholders interpret EIA effectiveness (Cashmore *et al*., 2004). For example, some project proponents perceive EIA as a time wasting process, while NGOs align it to the accountability of the decision makers (Cashmore *et al.*, 2004). Furthermore, the problem is exacerbated by difficulties encountered in coming up with a universal definition of EIA effectiveness (Baker and McLelland, 2003). However, strides have been made in defining EIA effectiveness despite these challenges.

Sadler (1996) asserts that effectiveness is "how well something works or whether it works as intended and meets the purpose for which it is designed". Sandham *et al*. (2013) define EIA effectiveness as the extent to which an EIA system meets its targets, with minimum delay and without bias or prejudice. Other authors (e.g. Sadler, 1996; Glasson *et al*., 2005) agree that the goals of EIA can be used as a basis for measuring EIA effectiveness. According to Cashmore *et al*. (2004), EIA effectiveness can be measured by assessing the ability of an EIA to achieve its intended objectives, with minimum delay and at the least cost, and without bias and compliance with specific requirements. Furthermore, Glasson *et al*.(2005) note that the purpose of setting goals is to provide guidance on the appropriate course of action to take, and minimise uncertainly as well as to provide a basis for measuring EIA effectiveness. This assertion concurs with Baker and McLelland's (2003) postulation that the main concern of EIA effectiveness is uncertainty, with sustainable development as the main goal of EIA.

EIS quality can also be used as a measure of EIA effectiveness. The preparation of an EIS is a crucial step in the EIA process. Pinho, Maia and Monterroso (2007) regard the EIS as an essential source of scientific knowledge presented to the decision makers for them to make environmentally sound decisions, and protect the environment. It presents EIA findings and informs the competent authority of the proposed project, its potential impacts and proposed mitigation measures (Morrison-Saunders *et al.*, 2001). It is believed that more often than not, the quality of an EIS highlights on the effectiveness of the entire EIA process (Morrison-Saunders *et al*., 2001). Scholarly works of Marshall (2001) and Sanchez and Hacking (2002) reveal that there is increased recognition of EISs' influence on decision making resulting in environmentally sound decisions that ensure avoidance, reduction or compensation of negative impacts and enhancement of the benefits. As such, an EIS of good quality is assumed to inform high quality decisions that ensure sustainable development (Glasson *et al*., 2005). However, Tinkler *et al*. (2005) reveal that up to 50%

of mitigation measures contained in the EISs are not translated into the Environmental Management Programmes (EMPs). Consequently, this compromises EIA effectiveness.

In an attempt to quantify the overall effectiveness of EIA, various frameworks and review packages have been devised. One review package which is commonly used to measure the quality of EIAs is the Lee and Colley review package (1992).

2.6 The EIA process

According to the United Nations Environmental Programme (UNEP) (1988), the EIA process comprises the following steps: scoping, prediction, evaluation, mitigation, communication and monitoring. Glasson *et al.* (2005) identify the following as the steps involved in the EIA process: screening, scoping, consideration of alternatives, identification and evaluation of impacts, mitigation, communication and public participation. These steps can be divided into two stages namely pre-decision and post decision. In the pre-decision stage the scope of the project is determined and possible impacts of the project are predicted (UNEP, 1988). Prediction of potential impacts of a development project is done to identify the necessary measures to be applied to minimise environmental costs through avoidance and compensation, and maximise social and economic benefits (UNEP, 1988). The findings of an EIA process are presented in an EIS for submission to the competent authority informing them of the proposed project, its potential impacts and proposed mitigation measures (Morrison-Saunders *et al.*, 2001).

2.7 South African energy industry

The South African economy is regarded as an energy intensive economy. It uses ten times as much electricity per capita as the African average (Fawkes, 2005). The energy sector of South Africa is very important to the economy since the country relies on its large-scale, energy intensive coal mining industry (US Energy Information Administration, 2015). South Africa has the largest energy consumption in Africa, accounting up to 30% of the total primary energy consumption on the continent (BP Statistical Review of World Energy, 2014). In 2013, 72% of South Africa's total primary energy came from coal, followed by oil (22%), natural gas (3%), nuclear (3%) and renewable (less than 1%) (BP Statistical Review of World Energy, 2014).

The South African electricity sector uses more than half of the coal used in the country (Eskom Factsheet, 2014). Eskom supplies approximately 95% of the electricity while the

rest comes from Independent Power Producers (IPPs) (US Energy Information Administration, 2015). Eskom exports electricity to and imports from neighbouring countries.

South Africa started experiencing power problems in 2008, to the effect that in 2013 Eskom requested industrial consumers to cut consumption by 10% to avoid load shedding (US Energy Information Administration, 2015). As the demand for electricity rises, Eskom plans to increase its power generation capacity by 12 000 MW, which means a need for construction of more infrastructure and power generation plants. Two coal-fired power plants are already under construction, that is, Medupi and Kusile in Limpopo and Mpumalanga respectively. South African legislation requires that such large scale projects be done after EIA.

It is imperative that we examine the impacts of energy projects so that we can have an insight into environmental problems associated with such projects. Since generation of electricity in South Africa is heavily reliant on coal, this has many environmental impacts. The combustion of coal and other fossil fuels leads to the emission of greenhouse gases (GHGs), oxides of nitrogen (NOx), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter and many other pollutants (DEAT, 2003). Water resources, biodiversity and social structures are also affected by development projects (DEAT, 2003). South Africa is one of the leading emitters of carbon dioxide on the continent (approximately 40%) due to its heavy dependency on coal (US Energy Information Administration, 2015). Energy projects are often done on a large scale and are long term, and lead to the emission of greenhouse gases with serious impacts on the environment, affecting human health and damaging other organisms and infrastructure as well as contributing to climate change and global warming (DEAT, 2003).

The problems discussed above bear testament that energy projects, if not properly implemented could have devastating impacts on the environment. It is thus important that proper and effective EIA practices be undertaken to mitigate impacts attributed to energy projects. However, many authors argue that most EIA practices are weak and minimal effort is put with respect to implementation and monitoring of proposed mitigation measures (Gwimbi, 2014).

2.8 EIA in South Africa

Environmental Impact Assessment in South Africa started in the early 1970s. Formal EIA legislation started under the guidance of the Environment Conservation Act (Act No 73 of 1989) (ECA). ECA was promulgated at around the same time the National Department of Environmental Affairs was established (Aucamp, 2009). Prior to this, EIA was carried out on a voluntary basis (UP, 2012). The Constitution of South Africa of 1996 (Act 108 of 1996) and the National Environmental Management Act (NEMA) of 1998 are the most important and comprehensive pieces of legislation in South Africa. The current EIA regulations are enforced under Sections 24(5), 24M and 44 of NEMA (Act 107 of 1998) (Urquhart and Atkinson, 2000), which superseded the ECA (Hoffman, 2007). EIA allegiance is embedded in the international sustainable development agenda, which includes among others, the Johannesburg Plan of Action, Agenda 21 and the Rio Principles.

The Department of Environmental Affairs is the competent authority responsible for environmental authorisations at both national and provincial levels (SADC Environmental Legislation Handbook, 2012). NEMA makes provision for two bodies responsible for advisory and coordinating roles, that is, the National Environmental Advisory Forum and the Committee for Environmental coordination (SADC Environmental Legislation Handbook, 2012). Most EIAs for development projects are submitted to provincial departments, with the exception of some cases, when the Minister acts as the competent authority. For instance, the Minister takes the role of competent authority when a project is done by a national department, a provincial department of environmental affairs, or a statutory body (SADC Environmental Legislation Handbook, 2012).

2.9 Development of the conceptual framework

The facts outlined in both international and local literature above led to the development of a conceptual framework for sustainable development in the context of EIA, instead of giving a concrete definition. The following issues were considered in the development of the conceptual framework:

(i) Public participation and access to the decision making process (e.g. Mitchell *et al.*,2000; Wood, 2003; Murombo, 2008);
(ii) Training on sustainability issues (e.g. United Nations Conference on Environment and Development (UNCED), 1992; Briffett, 1999; Wood, 2003);

(iii) Consideration of a full range of impacts, including cumulative and indirect impacts (e.g. Chadwick, 2002; Cooper and Sheate, 2002);

(iv) Consideration of alternatives and mitigation measures (e.g. Bisset, 1992; Wood, 2003; Tinkler *et al*., 2005);

(v) Consideration of ecological, economic and social issues (e.g. World Bank, 1991; OECD, 1992);

(vi) Polluter pays principle (e.g. Wende, 2002; Storm, 2003; UBA, 2004);

(vii) Ecological limits (e.g. Word Bank, 1991; Biswas, 1992);

(viii) Inter-generational and intra-generational equity (e.g. Marshall, 2001; Wende *et al*., 2005);

(ix) Consideration of socio-economic impacts (e.g. Biswas, 1992; OECD, 1992; Wilbanks *et al*., 1993); and

(x) Monitoring (e.g. Lohani *et al*., 1997; Wood, 1999; Fuggle and Rabie, 2009).

2.10 Gaps in knowledge

This chapter presented scholarly works relevant to the issues under investigation. The review of literature helped in the development of the conceptual framework for sustainable development in the context of EIA. It also helped the researcher to develop the questionnaires used to gather data for this study. There is a wealth of international literature and literature on EIA effectiveness in general. A majority of the literature covers EIA in general. However, there is limited literature focusing on the effectiveness of EIA in the energy sector of South Africa. This provides a justification for conducting this study. Building on from the literature cited in this chapter, the chapter that follows presents the methodology employed to conduct this study.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter is dedicated to the methodology that was employed for data collection and analysis to address the central research questions of this study. A methodology is an essential part of a research project which lays out how all the major parts of the study have been put together to address the research questions. It provides adequate information for an experienced researcher to replicate the research project. This chapter aims to expound the research methodology adopted by this study under the following themes: research positionality, research aims and objectives, site description, research design, study population and sampling techniques, data collection tools and data analysis tools.

3.2 Research positionality

The term research positionality refers to a belief concerning the way in which information about a phenomenon ought to be collected, analysed and used (Galliers, 1991). There are two major research philosophies that a researcher can subscribe to when conducting research, namely: positivism and interpretivism (also called anti-positivism) (Hatch and Cunliffe, 2006; Galliers, 1991).

Positivists contend that reality is stable, and believe that one can observe and describe it from an objective point of view (Levin, 1988). This implies that there is no interference with the phenomena under investigation. It is understood that under this research philosophy, observations should be repeatable. From the positivist point of view, one can make predictions about certain phenomena based on previous observations and their inter-relationships (Levin, 1988). Positivism is perceived to be more suitable for physical and natural sciences, and there has been debate on the suitability of this paradigm for social sciences (Hirscheim, 1985).

On the other hand, interpretivists believe that reality can only be fully comprehended through subjective interpretation of and interference with reality. They acknowledge that scientists interfere with phenomena under investigation (i.e. there is no separation of the subject and the object). Meanings thus emerge from the research process through dialogue between the researcher and the respondent (Denzin and Lincoln, 2003). Interpretivists also

contend that meaning is constructed over time through experience resulting in different interpretations of reality (Denzin and Lincoln, 2003).

This study subscribes to the interpretivist philosophy to ensure that the research is relevant to the research questions. The study seeks the opinions of the study subjects on EIA effectiveness in promoting sustainable development, and make recommendations on how the system can be improved, based on the analysis of the current situation. This is impossible without the interference of the researcher. Furthermore, it can be argued that in a social world, individuals and groups use experience, memories and expectations to make sense of situations. It is expected that, in a questionnaire based research like this one, individuals will have different opinions with respect to the issue under investigation.

3.3 Aims and objectives of the study

As mentioned in chapter 1, the research aims to investigate the extent to which EIA practices in the energy sector of South Africa are promoting sustainable development.

The objectives of the study are as follow:

(i) Development of a conceptual framework for the meaning of sustainable development in the context of EIA in the energy sector of South Africa;
(ii) To design a sustainability appraisal tool to evaluate the effectiveness of energy sector EIAs in promoting sustainable development; and
(iii) Investigation of the effectiveness of EIA practices in the energy sector of South Africa in promoting sustainable development by reviewing sample EISs.

3.4 Site description

The objectives of the study were achieved by gathering information around the Gauteng and Mpumalanga regions. Gauteng was chosen because the main offices are located in this region, and information is readily available. Mpumalanga was chosen because it has the majority of coal fired power plants which have a huge impact on the environment, so it was deemed necessary to investigate the opinions of community members living in this region. Moreover, Kusile power station in Mpumalanga, where a survey of community members was conducted is a recent development, and the residents have the much needed information about the project and the public participation process. The Gauteng and Mpumalanga regions were also chosen because of their proximity to the researcher. Information regarding the potential candidates for the questionnaire survey was obtained

from Sunninghill, Johannesburg (26º 2' 7″ S 28º 3' 55″ E) where the Eskom head offices (Megawatt Park) and private consultants' offices are located. Information about potential candidates for the survey from the Department of Environmental affairs was obtained from the national office situated in Arcadia, Pretoria (25º 45' 12″ S 28º 11' 13″ E). Information from members of the community was gathered around Kusile power plant near Witbank, Mpumalanga (25º 54' 59″ S 28º 55' 02″ E). The locations of data collection points are shown in Figure 3.1 below.

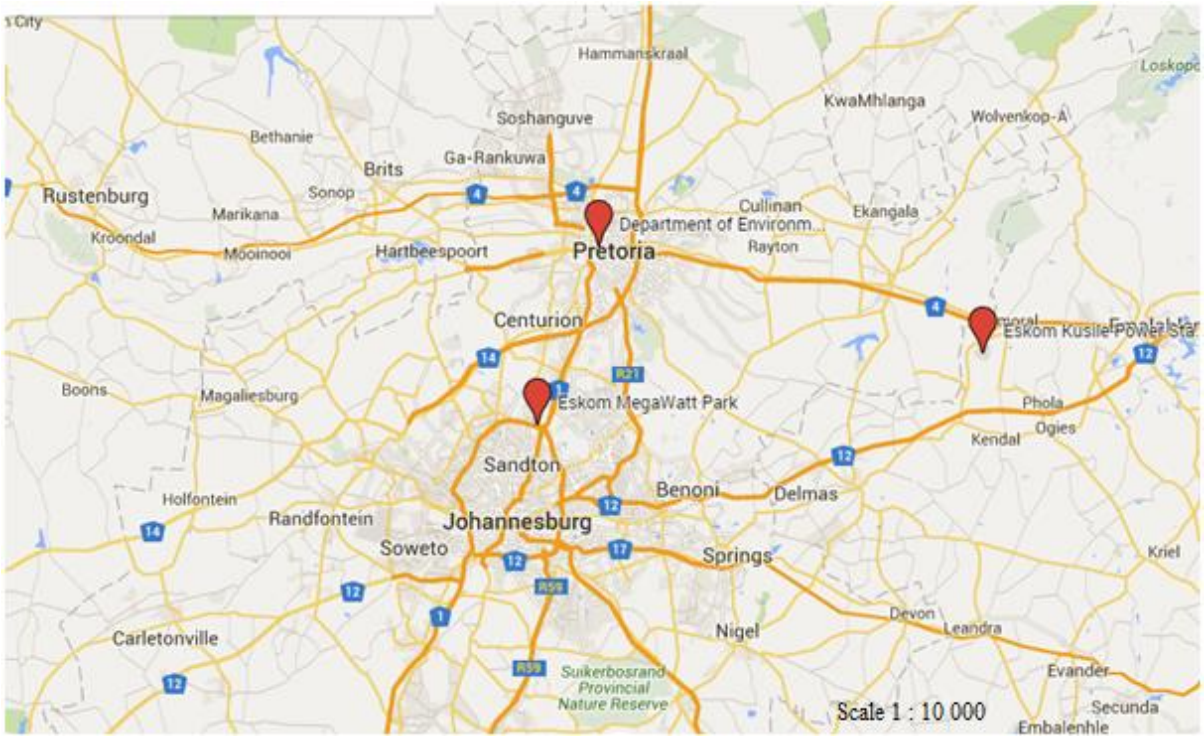

Figure 3.1 Location of data collection sites

(Source: Google maps)

3.5 Research design

A mixed methods research design was used for the collection and analysis of data so as to achieve the aim of the study. This approach makes use of both primary and secondary data to meet the objectives of the study and answer research questions (Driscol *et al.*, 2007). The combination of primary and secondary data is necessary for this study since it allows for a more complete analysis of the problem. Firstly, a review of literature (secondary data) was done for the development of the conceptual framework. A review of literature was also crucial for the researcher to design the study within a reference context for identification of conclusions already reached on the subject matter, and to identify the

"gaps" in knowledge (May, 2001). The information gathered through literature review was also used to construct questions for the questionnaire survey which provided primary data. The views of community members living around one purposively selected study site (Kusile power station) and environmental specialists were obtained through a questionnaire survey. A quality review of sample EISs was done to complement findings from the questionnaire survey. Therefore a mixed methods design was used for a complete analysis of the problem under investigation.

3.5.1 Population and Sampling procedures

A sample of respondents was thoughtfully selected from the population to gain an insight into the viewpoints of a reasonably wide range of EIA stakeholders, and minimise biased responses due to the respondent's background. A population is an entire group of items or individuals that allows data to be collected and investigated (Schindler, 2010). The population for this study consists of environmental specialists from government and the private sector, and community members. Three sub-groups of environmental specialists were identified namely: Department of Environmental Affairs (DEA) environmental officers/managers, Eskom environmental officers/managers and Environmental consultants. It was deemed necessary to draw a sample from DEA because the Department is the competent authority responsible for environmental authorisation. It was also deemed necessary to investigate Eskom officials' perceptions on the issue under investigation since Eskom is the proponent of energy projects. Environmental consultants were targeted because they are the ones responsible for carrying out EIAs. Community members were targeted because they are the ones affected by the implementation of projects in their community.

A sample is a portion of the population selected for investigation. Robson, Skarmeas and Spyropoulou (2006) define sampling as "the process of selecting few individuals from the target population". Sampling is necessary since it can be difficult or impossible to investigate the entire population (Robson *et al*., 2006). Samples are thus used to draw conclusions about the populations from which they are drawn (Robson *et al*., 2006).

Sampling can be divided into two broad categories namely: probability sampling and non-probability sampling. In probability sampling, there is a known chance of selecting each item or individual (McKinney, 2011). The types of random sampling include simple random sampling, stratified sampling, systematic sampling and cluster sampling

(McKinney, 2011). On the other hand, non-random sampling is characterised by unknown probability of selection of each item or respondent (Newman, 2006). The types of non-probability sampling include quota sampling, convenience sampling, purposive sampling and snowball sampling (Newman, 2006).

A clearly defined sampling frame was not available, and as a result the snowball sampling technique was employed to draw a sample on which the questionnaire survey was conducted. The snowball sampling technique used is a non-random sampling technique, and as such bias might have been introduced. The sampling procedure for environmental specialists started by approaching public relations officers of the organisations or institutions involved, and they helped in identifying one or two suitable persons for the study. Those who were identified were then asked to recommend other potential subjects suitable for the study. The recruitment process for community members started by approaching community leaders who then assisted in identifying possible candidates. The selection criterion for community members was based on the knowledge of the community, the environment and activities around the area. The community members chosen were also part of the interested and affected parties for the project. Those who were identified and agreed to participate suggested other potential candidates. The process continued until the required sample size was obtained. A total of 70 out of 80 participants completed the questionnaire survey. This figure represents a response rate of 88%. The numbers of participants who completed the questionnaires from each subgroup were as follows:

(i) 17 DEA environmental officials
(ii) 20 Eskom environmental officers/managers
(iii)18 environmental consultants
(iv)15 community members.

A sample of Eskom EISs was critically reviewed to assess the effectiveness of EIA in promoting sustainable development in practice in the energy sector of South Africa. Only a few EISs were selected (n=5) instead of a large number of EISs for analytical generalisation of the extent to which Eskom EIAs promote sustainable development. It should be noted that the aim of this research is not provision of information for statistical generalisation by reviewing a huge number of EISs. Some authors (e.g. Yin, 1994; Novek, 1995) give examples of studies in which as little as two EISs were reviewed and nonetheless, meaningful results were produced.

3.5.2 Data collection tools

The data that informed the study was obtained from both secondary and primary sources. Sources of secondary data include literature review and sample EISs. Primary data was gathered through self-administered questionnaires from environmental managers/officers and consultants, and researcher administered questionnaires for the community members living around Kusile power station.

The first step in data collection was achieved by reviewing literature. This was necessary for the development of the conceptual framework that guided the study and the design of the questionnaires. Primary data was gathered from a questionnaire survey. Babbie (1998) defines a questionnaire as a document with a set of questions designed with the intention of obtaining respondents' opinions on the topic under investigation. A questionnaire is commonly used where a relatively large amount of respondents is required (Goodwin, 2004). A questionnaire survey was chosen because of the benefits it offers, put forward by Denzin and Lincoln (2005) as follows:

(i) A questionnaire can be conducted at a relatively low cost;
(ii) Questionnaires give respondents enough time to formulate correct responses;
(iii) Questionnaires produce quick results;
(iv) Analysis of questionnaires is relatively easy; and
(v) Questionnaires allow for stable, consistent and uniform data collection.

However, one shortcoming of a questionnaire can be seen in its tendency to give "superficial data" (Denzin and Lincoln, 2005). This is usually caused by little or no checking of the frankness or seriousness of responses (Denzin and Lincoln, 2005). There are also chances of a low response rate or missing data. However, the response rate may be effectively improved by a good covering letter (Baumgartner and Heberlein, 1984). The response rate may also be increased by follow-ups, such as reminders (Fowler, 2002).

The questionnaires were made up of Likert type response alternatives where the respondents were required to choose and tick their preferred responses. Literature review and objectives of the study were used as the basis for questionnaire design. Closed questions were used, and no open ended questions were used. The rationale for taking this decision is the fact that closed questions give the impression that the questionnaire can be easily completed, thereby encouraging respondents to complete it, which in turn increases the response rate (Denscombe, 1998). Different sets of questionnaires were designed for

environmental specialists and community members. For the environmental specialists, self-administered questionnaires and consent forms were dispatched directly to the respondents. For the local community members, the questionnaires were administered by the researcher with the assistance of a pre-trained research assistant with the knowledge of the local languages. Contents of the consent form were read out to the participants before they were asked whether they were interested in participating in the survey. The questions were asked in the local language and the responses were recorded in English.

3.6 Data analysis

The analysis of data gathered from the questionnaire survey was done using the Statistical Package for the Social Sciences (SPSS) Version 22. The review of EISs was done against the Lee and Colley review package (Lee and Colley, 1992) established in the United Kingdom. The review package has been extensively used in past studies (Sandham *et al*., 2008). A model specifically tailored to the South African needs was employed to review the quality of a sample of five EISs. It is generally argued that the quality of an EIS would usually reflect on the effectiveness of the EIA process since decision making is usually based on the information provided in the report (Sandham *et al*., 2008). Despite the fact that an EIS is only a final output of the EIA process and cannot always represent the entire process, it however gives a reflection of the overall quality of the process. The quality of an EIS in this study was used as an indication of the effectiveness of an EIA process in contributing towards sustainable development since quality is determined on a number of aspects. The package focuses on the following review areas:

(i) Description of the development project, the local environment and the baseline conditions;
(ii) Identification and evaluation of key impacts;
(iii) Alternatives and mitigation; and
(iv) Communication of results.

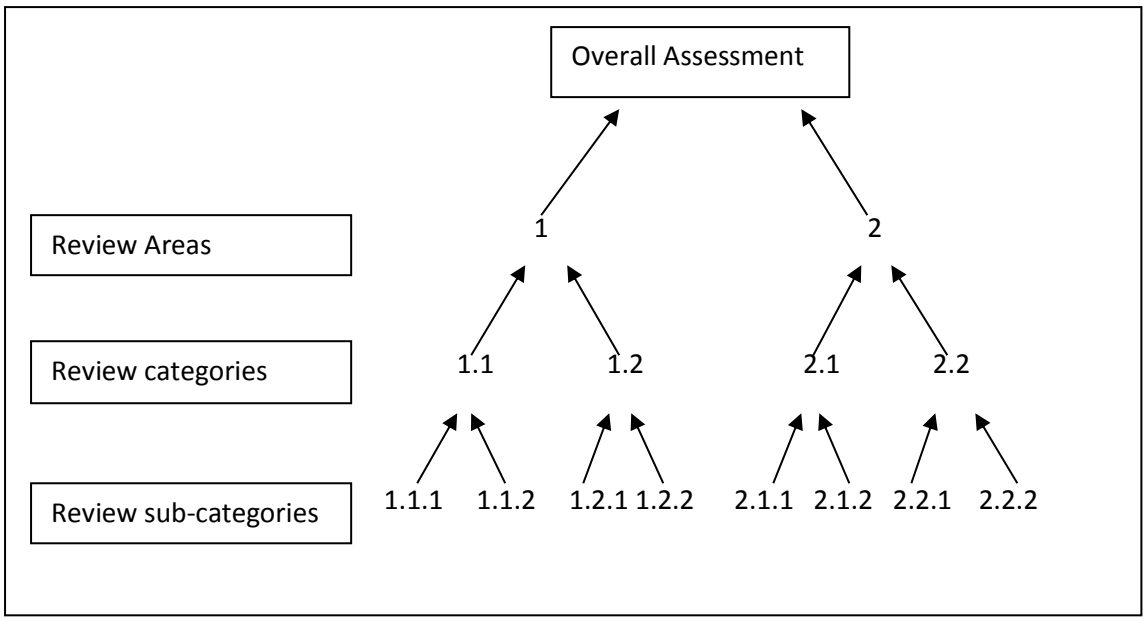

Figure 3.2 Lee and Colley review package

Source: Lee *et al*. (1999)

The package is hierarchical in nature with four levels (Figure 3.2). Assessment is done in four levels, that is, Level 1: Assessment of review sub-categories, Level 2: Assessment of review categories, Level 3: Assessment of review areas, and Level 4: overall assessment**.** The review procedure starts at the lowest level on the hierarchy, and a grade is allocated ranging from A to F, indicating how well a task has been completed. The results are recorded on a collation sheet. The following are the grading symbols used and the explanation for each:

Table 3.1 Grading symbols used in the Lee and Colley package

Symbol	Explanation
A	Generally well performed, no important tasks left incomplete
B	Generally satisfactory and complete, only minor omissions and inadequacies
C	Can be considered just satisfactory despite omissions and/or inadequacies
D	Parts are well attempted but must, as a whole, be considered just unsatisfactory because of omissions or inadequacies
E	Not satisfactory, significant omissions or inadequacies
F	Not satisfactory, important task(s) poorly done or not completed

Source: Lee *et al*. (1999)

It is recommended that two reviewers independently review an EIS to avoid bias (Lee *et al*., 1999; Peterson., 2009). The reviewers should then meet to discuss any differences in observations and jointly finalise the review (Lee *et al*., 1999). However, this study used only one reviewer due to time constraints and unavailability of another reviewer willing to take part in the research. The researcher re-reviewed the EISs in a bid to minimise bias, an approach used by Bond and McGrath (1997).

3.7 Reliability analysis

A reliability test was done on the two questionnaires. The overall internal consistency of the items was measured by using the Cronbach's alpha reliability coefficient which ranges from 0 to 1. The Cronbach's alpha coefficients were 0.724 and 0.826 for environmental specialist' and community members' questionnaires respectively, which according to George and Mallery (2003) are both acceptable. The guideline is: ">0.9 – excellent, >0.8 – good, >0.7 – acceptable, >0.6 – questionable, >0.5 – poor and <0.5 – unacceptable" (George and Mallery, 2003).

CHAPTER 4

EMPIRICAL EVEDENCE

4.1 Introduction

This chapter is dedicated to the presentation of research findings. The chapter first presents the conceptual framework for sustainable development in the context of EIA. This is followed by the presentation and interpretation of questionnaire findings gathered from environmental specialists and community members, and then presentation of findings from the EIS review.

4.2 Data and method of analysis

As mentioned in the preceding chapter, data was gathered from a questionnaire survey and from a sample of EISs. Questionnaire data was analysed using the SPSS version 22.The responses from the questionnaire survey were analysed to find out how effective EIAs are in contributing towards sustainable development in the energy sector. The results of the analysis are presented in tables, pie-charts, bar graphs and interpretations. A reliability test was also carried out to determine the reliability of the two sets of questionnaires used in this research (see Chapter 3, section 3.7). The review of EISs was done using the Lee and Colley Review package as stated in chapter 3. The results of the EIS review are presented in tables and bar charts. This report only discusses the results of the Review areas and Review Categories. The results of Sub-Categories were deliberately left out due to the amount of detail involved.

4.3 Sustainable development conceptual framework

Figure 4.1 below shows the conceptual framework for sustainable development in the context of EIA developed from a review of relevant literature. Despite the difficulties encountered in defining sustainable development and EIA effectiveness as outlined in chapter 2, a review of relevant literature enabled the researcher to come up with the conceptual framework which was used to guide the research. The design of the research instrument (questionnaire) used to investigate the respondents' views on the EIA system to evaluate effectiveness was guided by the conceptual framework.

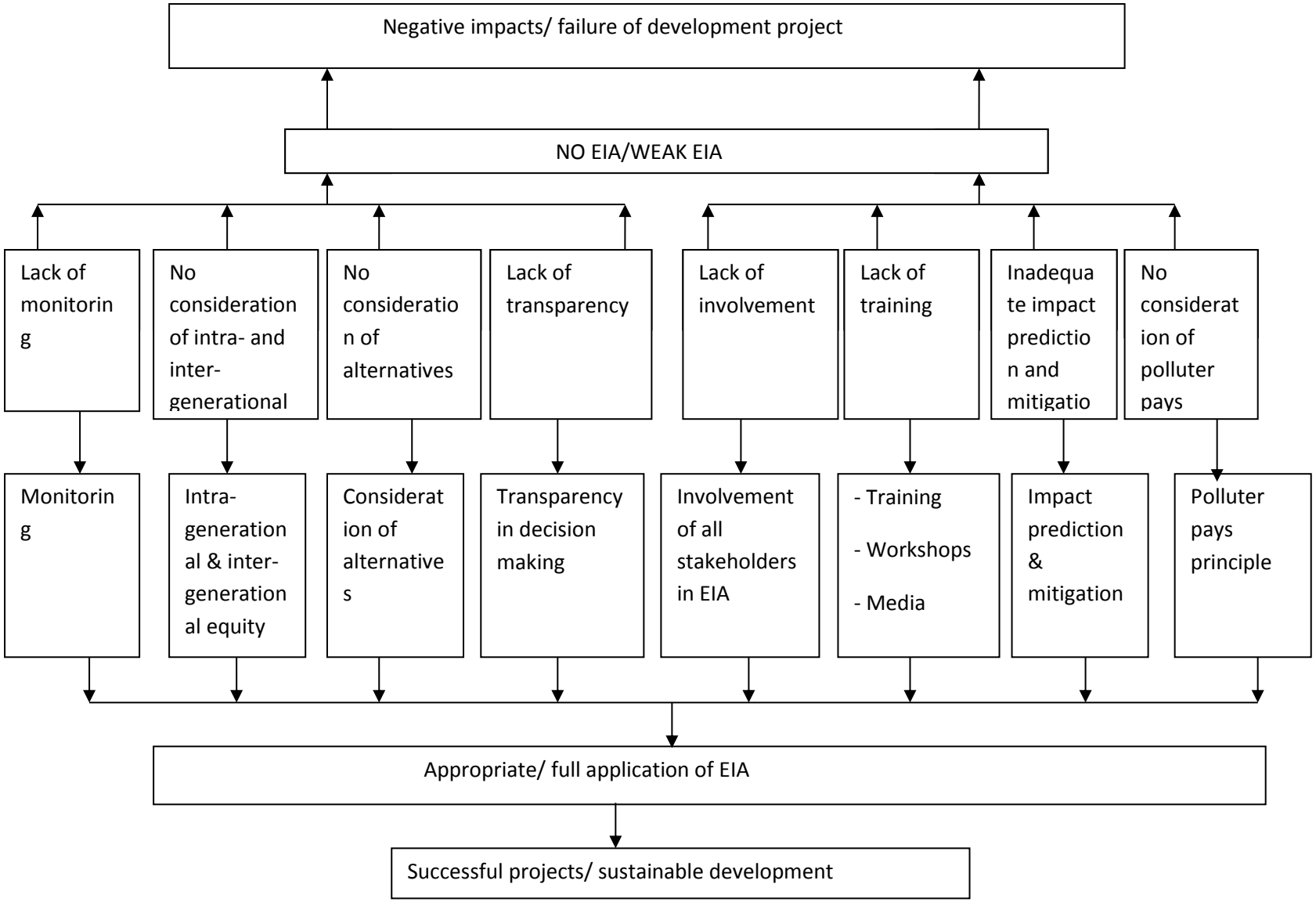

Figure 4.1 Sustainable development conceptual framework

4.4 Environmental specialists' perceptions on Eskom EIA system

As stated in chapter 3, 55 responses from environmental specialists were analysed. This group of respondents consisted of 20 Eskom environmental practitioners, 18 environmental consultants and 17 DEA environmental managers/officers. Section A of the questionnaire provides the profiles (demographic data) of the respondents, while Section B provides the opinions of the respondents on implementation and monitoring of mitigation measures proposed in EIA reports (see Appendix 4).

4.4.1 Profiles of environmental specialists

The profiles of the respondents help one to have an understating of the representativeness in the research.

a) Gender of respondents (environmental specialists)

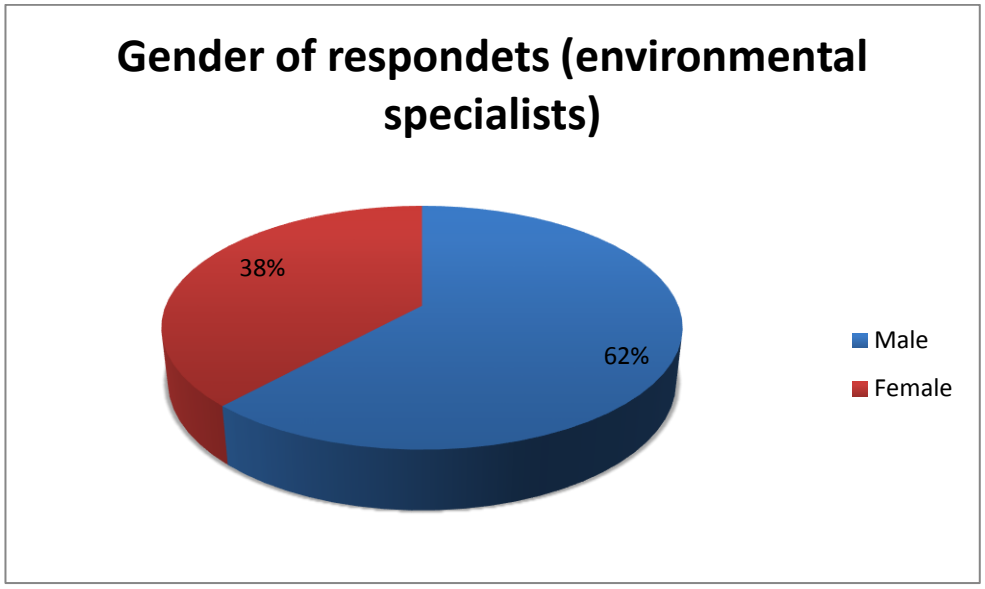

Figure 4.2 Gender of respondents (environmental specialists)

Figure 4.2 above shows that out of the 55 respondents, 62% (34) are male, while 38% (21) are female. This shows us that the sample was made up of more male respondents than females. This reflects that there are more males involved in the environmental field than females.

b) Age of respondents

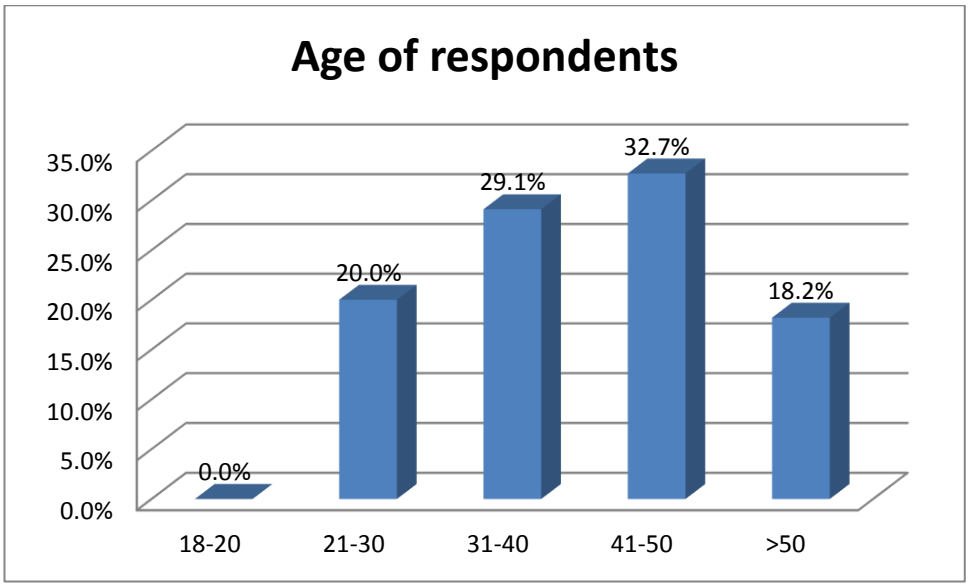

Figure 4.3 Age of respondents

It can be seen in Figure 4.3 above that 20% of the respondents are in the age group 21 – 30; 29.1% in the 31 – 40 age group; 32.7% in the 41 – 50 age group and 18.2% are above the age of 50 years. No respondents fall within the 18 – 20 age group. These results show us that the age group 41 – 50 constitutes the majority of the respondents. The results also reflect that only mature respondents were surveyed since no respondents fall within the 18 – 20 age group.

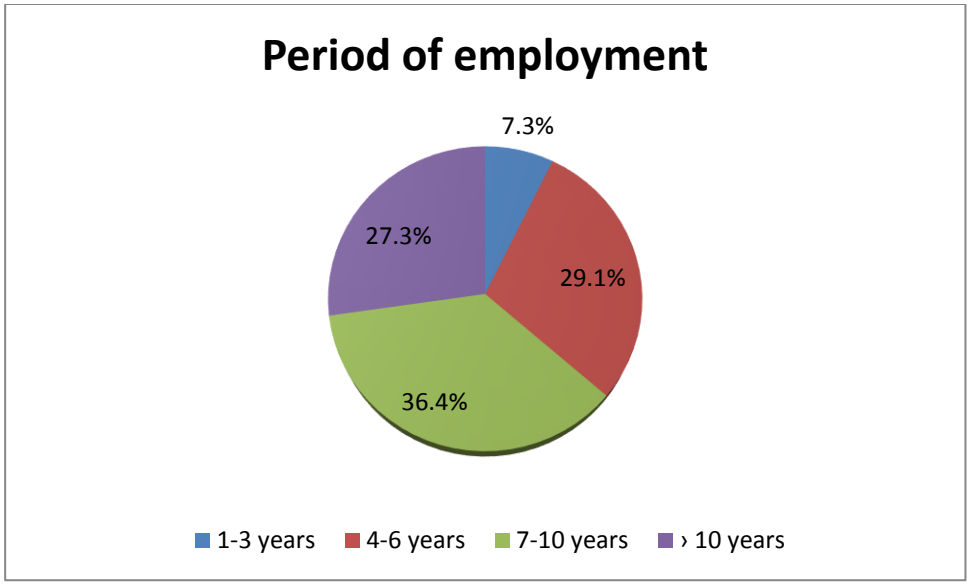

Figure 4.4 Period of employment

c) Period of employment

Figure 4.4 above shows that 7.3% of the respondents were employed for one to three years. An additional 29.1% of the respondents were employed for four to six years while almost a similar proportion of the respondents (27.3%) were employed for over ten years. The highest number of respondents (36.4%) were employed for seven to ten years. These results imply that the sample has a large number of experienced respondents in the environmental field, taking into account the fact that in total, 92.8% of the respondents worked for a period of at least 4 years for their respective companies.

4.4.2 Effectiveness of mitigation measures proposed in EIA in reducing environmental impacts caused by Eskom

Figure 4.5 below shows that a majority (67.2%) of the respondents agree that mitigation measures proposed in EIA reports are effective in reducing environmental impacts caused by Eskom, while 9.1% strongly agree to the statement. An additional 18.2% of the respondents are neutral while 5.5% disagree with the statement. The high percentage (67.2%) of respondents agreeing to the statement indicates that there is some level of commitment to protection of the environment. When comparing these results with those obtained from a survey of a sample of community members (see Figure 4.9) on the same issue, it can be seen that the results are almost similar. The results discussed above suggest that both environmental professionals and community members surveyed have confidence in the mitigation measures proposed for Eskom projects. As has already been noted in chapter 2 under section 2.4(c), mitigation is at the centre of EIA (Wood, 2005).

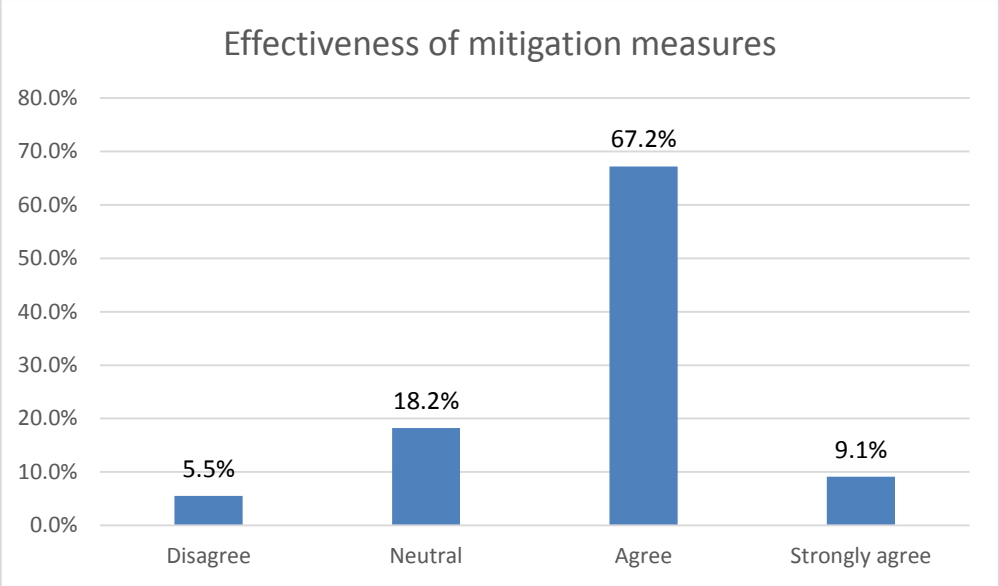

Figure 4.5 Effectiveness of mitigation measures proposed in EIA in reducing environmental impacts caused by Eskom

4.4.3 Frequency of complaints received from communities about environmental problems

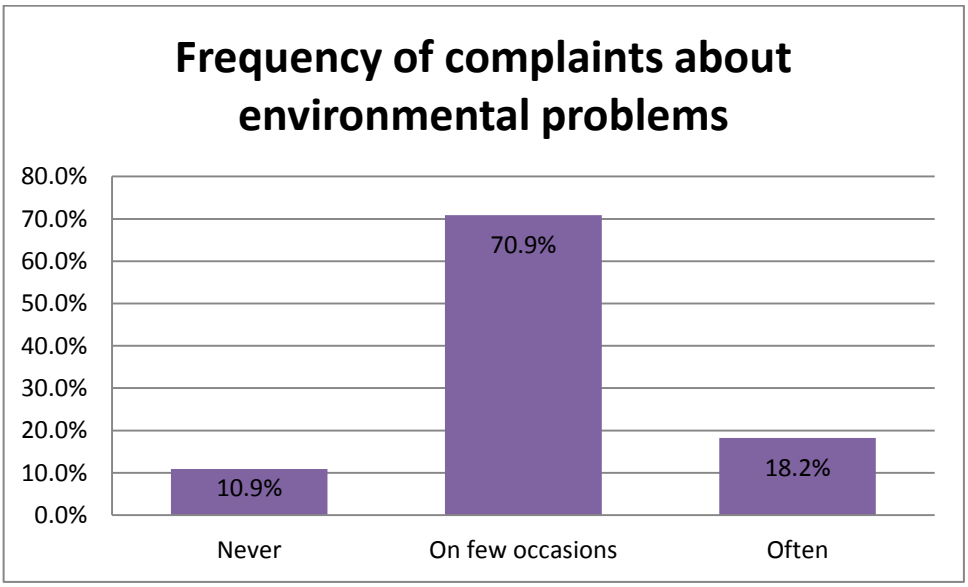

Figure 4.6 Frequency of complaints received from communities about environmental problems

The results of the study revealed that 18.2% of the respondents receive complaints often while a majority of the respondents (70.9%) receive complaints from communities about environmental problems on few occasions, as shown in Figure 4.6 above. A small proportion (10.9%) of the respondents indicated they never receive complaints from community members. These figures seem to give us an impression that a majority of environmental specialists do not receive complaints on a regular basis from communities, suggesting that the mitigation measures proposed in the EISs indeed help to protect the environment.

4.4.4 Environmental specialists' views on the extent of success of Eskom EIAs

Table 4.1 below shows the results of the opinions of environmental specialists on the level of success of Eskom EIAs on some selected areas. Below the table are the explanations of the results.The greater the mean of an item, the greater the level of success as far as that item is concerned.

Table 4.1 Extent of success of Eskom EIAs in selected areas

Description of item	Sample size	Mean	SD	Not successful/ marginally successful	Moderately successful	Successful/ very successful	Total
Including a full range of impacts	55	2.91	1.005	36.4%	32.7%	30.9%	100%
Reducing environmental impacts	55	3.36	1.161	31.0%	9.1%	60.0%	100%
Identifying appropriate mitigation measures	55	3.31	0.940	18.2%	30.9%	50.9%	100%
Providing clear information for decision makers	55	3.09	1.023	25.5%	40.0%	34.6%	100%

Assisting developers	55	3.61	1.240	21.8%	14.5%	63.7%	100%
Contribution towards sustainable development	55	3.31	0.920	14.5%	40.0%	45.5%	100%

a) Inclusion of a full range of impacts

Table 4.1 above shows the success of Eskom EIAs in six selected areas. The table shows that the largest proportion of the respondents (36.4%) are of the opinion that the EIAs are either not successful or only marginally successful in including a full range of impacts. An additional 32.7% of the respondents believe that the EIAs in the energy industry are moderately successful in including a full range of impacts while the least number of respondents (30.9%) are of the opinion that the EIAs are successful or very successful in including a full range of impacts. These results imply that environmental specialists surveyed feel that the EIA system in the energy sector is weak in covering a full range of impacts, considering the fact that a majority of the environmental specialists surveyed believe that the EIA system is marginally successful or not successful. It should be noted, however, that the margins in the results are small.

b) Identification of appropriate mitigation measures and reducing environmental impacts

With regard to identification of appropriate mitigation measures, 50.9% of the respondents indicated that Eskom EIAs are successful or very successful (see Table 4.1). This is more than the proportion of those who believe that the system is not successful/marginally successful (18.2%). An additional 30.9% of the respondents are of the opinion that the EIAs are moderately successful in the identification of appropriate mitigation measures. The respondents were also asked how they feel about the extent to which EIAs in the energy sector help to reduce environmental impacts. This question is related to the question on the mitigation measures discussed above, and the results seem to show some similarities in the opinions of the respondents. From Table 4.1, it can be seen that a majority of the respondents (60.0%) agree that Eskom EIAs are successful or very successful in reducing

environmental impacts. Another 31.0% of the respondents are of the opinion that the system is either not successful or only marginally successful, while 9.1% believe that the system is moderately successful in reducing environmental impacts.

c) Providing clear information for decision makers

It can be seen in Table 4.1 that a majority of the environmental specialists (40%) believe that Eskom EIAs are moderately successful in providing clear information for decision makers. An additional 34.5% of the respondents feel that Eskom EIAs are either successful or very successful in providing clear information for decision makers. The least number of respondents (25.5%) are of the opinion that the system is marginally successful or not successful in providing clear information for decision makers. These responses imply that more respondents are positive about the extent to which Eskom EIAs provide clear information for decision makers as opposed to some previous studies which point out that the potential of EIA in influencing decision making is very limited (e.g. Mwalyose and Hughes, 1997; Brito and Verocai, 1999; Kakonge, 1999).

d) Assisting developers

From Table 4.1 it is clear that a majority of the respondents (63.7%) are of the opinion that the EIA system of Eskom is successful or very successful at assisting developers. The table also shows that 21.8% of the environmental specialists surveyed feel that the EIAs are not successful or marginally successful in assisting developers, while the least proportion of the respondents (14.5%) believe that the system is moderately successful. One of the purposes of EIA, as highlighted in literature, is aiding the project proponent as it helps to improve relations between the developer, the local communities and local authorities and establishes a "green profile" (Glasson *et al*., 1999; Morrison-Saunders and Arts 2004b). The implication of the results discussed above is that there is a consensus among a majority of environmental specialists surveyed that Eskom EIAs are successful in serving one of the purposes of EIA, i.e. assisting the developer.

e) Contribution towards sustainable development

Table 4.1 shows that 45.5% of the respondents, representing the largest proportion of the sample, are of the opinion that Eskom EIAs are successful or very successful in contributing towards sustainable development. A slightly lesser proportion of the respondents (40.0%) are of the view that the EIAs are moderately successful in contributing

towards sustainable development. Only 14.4% of the respondents indicated that the EIAs are not successful or are only marginally successful in contributing towards sustainable development. The fact that a majority of the respondents believe that the EIAs are successful or very successful implies that there is indeed a commitment, to some extent, towards achieving the goal of sustainable development. Contribution to sustainable development has been noted in literature as one of the purposes of EIA (e.g. Sadler, 1996; Glasson *et al*., 1999). The results thus seem to indicate that the environmental specialists surveyed feel that the EIAs in the energy sector serve, to some extent, one of the purposes for which they are intended.

4.4.5 Perspectives of environmental specialists on some sustainable development issues related to EIAs

Table 4.2 gives responses of environmental specialists to some of the issues regarded as key determinants of sustainable development as far as EIA is concerned (as outlined in literature and the conceptual framework). The greater the mean of an item, the greater the level of success as far as that item is concerned. A detailed explanation of the results of environmental specialists' opinions is given below the table.

Table 4.2 Perspectives of environmental specialists on some sustainable development issues related to EIAs

Description of item	Sample size	Mean	SD	Poor/ very poor	Satisfactory	Good/ very good	Total
Social impacts are considered equally as ecological ones	55	2.89	0.936	29.1%	50.9%	20.0%	100%
Economic impacts are considered equally important as ecological ones	55	3.04	1.088	30.9%	32.7%	36.4%	100%
Monitoring	55	2.38	1.130	54.6%	29.1%	16.3%	100%

Mitigation measures	55	3.04	0.860	27.3%	43.6%	29.1%	100%
Ecological limits	55	3.24	0.666	12.7%	50.9%	36.4%	100%
Intra-generational equity	55	2.91	0.800	32.7%	41.8%	25.5%	100%
Inter-generational equity	54	3.06	1.106	29.6%	40.7%	29.7%	100%
Stakeholder participation	55	3.40	0.873	10.9%	41.8%	47.3%	100%
Transparency in decision making	55	2.96	0.962	31.0%	41.8%	27.3%	100%
Consideration of long term cumulative impacts	55	2.58	0.956	45.4%	36.4%	18.2%	100%
Consideration of indirect impacts	55	2.98	1.027	27.3%	40.0%	32.7%	100%
Consideration of socio-economic impacts	55	3.09	1.093	34.5%	30.9%	34.5%	100%
Polluter pays principle	55	2.71	0.854	14.5%	47.3%	38.2%	100%
Training	54	3.09	1.051	27.7%	35.2%	37.0%	100%

a) Social impacts are considered equally important as ecological ones

Table 4.2 shows that 50.9% of the respondents feel that the EIA system at Eskom is just satisfactory in ensuring that social impacts are considered equally important as ecological ones. An additional 29.1% of the respondents are of the opinion that the system is poor or very poor in considering social impacts equally important as ecological ones. The least proportion of the respondents (20.0%) indicated that the system is good or very good in

ensuring that social impacts are considered equally important as ecological ones. For the requirements of sustainable development to be fully met, there must be a balance between the social, economic and ecological environment. Although a majority of the respondents believe that the EIA system is satisfactory in balancing social and ecological impacts, the proportion of respondents who indicated that the system is very good or good is slightly lower than that of those who believe that the system is poor or very poor in this regard. These results indicate that this area needs closer attention.

b) Economic impacts are considered equally important as ecological ones

It can be seen in Table 4.2 that the highest proportion of the respondents (36.4%) indicated that the EIA system of Eskom is good or very good at maintaining a balance between economic impacts and ecological impacts. Another 32.7% of the respondents feel that the system is just satisfactory at ensuring that economic impacts and ecological impacts are treated equally while the smallest proportion of respondents (30.9%) indicated that the system is poor or very poor in treating economic and social impacts equally. The implication of these results is that EIAs in the energy sector of South Africa are performing well in terms of balancing economic impacts and ecological impacts. It should be noted, however, that the margins are small.

c) Monitoring

It is evident from Table 4.2 that monitoring of impacts and associated mitigation measures is one of the major problems within the EIA system of Eskom. The table shows that 54.6% of the respondents are of the opinion that monitoring is done poorly or very poorly while 29.1% of the respondents indicated that monitoring is done to a satisfactory level. An additional 16.3% of the respondents believe that the system is good or very good at monitoring. Although some strengths within the system have been identified, monitoring can be seen as a problem area which could potentially limit the full potential of EIA in achieving the goal of sustainable development. This observation concurs with observations made by many previous studies. For example, Glasson (1994) states that monitoring is often a weak element in EIA practices of many countries.

d) Mitigation measures

Table 4.2 shows that 43.6% of the respondents are of the view that mitigation measures proposed in Eskom EIAs are addressed to a satisfactory level, while 29.1% of the

respondents are of the opinion that mitigation measures are good or very good. The least proportion of the respondents (27.3%) indicated that the proposed mitigation measures are poor or very poor. The results show that there are more environmental specialists surveyed in this study who are confident with the mitigation measures proposed in Eskom EIAs than the ones who feel that the mitigation measures are poor or very poor. It is generally understood that proper implementation of proposed mitigation measures would usually result in protection of the environment (Tinkler *et al*., 2005). Mitigation measures are also perceived to be a means for achieving the goal of sustainable development (ELAW, 2010).

e) Ecological limits

With regards to Eskom EIAs ensuring that development projects are done within ecological limits, 50.9% of the respondents are of the view that the system is just satisfactory. An additional 36.4% of the respondents believe that the EIAs are good or very good, while 12.6% are of the opinion that the system is poor (poor or very poor) as far as utilisation of resources within ecological limits is concerned. The implication is that a few respondents indicated that the system does not ensure operation within ecological limits, while a larger proportion of respondents are positive on this issue. Resource use within ecological limits is crucial for inter-generational equity, which is one important aspect of sustainable development.

f) Intra-generational and inter-generation equity

From Table 4.2, it can be seen that 40.7% of the respondents indicated that the Eskom EIA system is just satisfactory in promoting inter-generational equity. An additional 29.7% of the respondents are of the opinion that the system is good (good/very good) in ensuring inter-generational equity, while 29.6% of the respondents indicated that the system is poor (poor/very poor) in this regard. On the other hand, 41.8% of the respondents feel that the system just ensures intra-generational equity to a satisfactory level. Another 32.7% of the respondents are of the view that the system is poor or very poor in ensuring intra-generational equity, while the least number of respondents (25.5%) indicated that the system is good (good/very good) in ensuring intra-generational equity.

Inter-generational and intra-generational equity are very important issues in sustainable development. The results show that more respondents are positive about the contribution made by Eskom EIAs towards ensuring inter-generational equity. On the other hand, there

are more respondents who feel that the system is weak as far as intra-generational equity is concerned than the ones who hold positive views on the matter. However, the largest proportion of environmental specialists surveyed are of the opinion that the system is satisfactory in ensuring intra-generational equity.

g) Stakeholder participation

Table 4.2 shows that 47.3% of the environmental specialists surveyed are of the view that the EIA system of Eskom is good or very good at facilitating stakeholder participation, while 41.8% of the respondents are of the opinion that the system is just satisfactory when it comes to stakeholder participation. The smallest proportion of the respondents (10.9%) indicated that the system is poor or very poor as far as stakeholder participation is concerned. The implication of these results is that stakeholder participation is one of the strengths of the EIA system considering the fact that a majority of the respondents have confidence with the EIA system of Eskom as far as stakeholder participation is concerned. Stakeholder participation is one mechanism within the EIA process which allows interested and affected parties to have a say in environmental decisions. It can thus be seen as one of the significant means of contribution towards the goals of sustainable development.

h) Transparency in decision making

It is shown in Table 4.2 that 41.8% of the respondents are of the opinion that the EIA system of Eskom is satisfactory as far as transparency in decision making is concerned. An additional 31.0% of the respondents indicated that the system is poor/very poor on transparency in the decision making process. The least proportion of respondents (27.3%) indicated that the system is good or very good as far as transparency is concerned. The implication of these results is that a majority of the respondents feel that the EIA system of Eskom is just satisfactory in transparency. It can be seen from the results that there are more respondents who agree that the system is poor in ensuring transparency than those who indicated that it is good. Transparency in decision making is thus one of the areas that need improvement to ensure that development projects are sustainable. It should be noted, however, that there is a very small margin between those who are of the opinion that the system is poor and those who believe that the system is good in terms of transparency.

i) Consideration of cumulative impacts

With regards to the consideration of cumulative impacts, 45.4% of the respondents are of the opinion that EIA as practiced by Eskom is poor (poor/very poor) on this particular area.

An additional 36.4% of the respondents are of the view that the EIAs are satisfactory, while another 18.2% feel that the system is good (good or very good) as far as consideration of cumulative impacts is concerned. The implication is that a majority of the respondents indicated that the system does not address the issue of cumulative impacts. This seems to be in agreement with most literature. For example, Lohani *et al*. (1999); Chadwick (2002) and Cooper and Sheate (2002) agree that most EIA practices tend to pay little or no attention to cumulative, social and indirect impacts. It is evident from the results given above that the issue of cumulative impacts is one of the problem areas that require close attention.

j) Consideration of indirect impacts

From Table 4.2, it can be seen that 40.0% of the respondents are of the opinion that indirect impacts are satisfactorily addressed in Eskom EIAs. An additional 32.7% of the respondents indicated that Eskom EIAs are good (good/very good) in covering indirect impacts, while 27.3% are of the view that the system is poor (poor/very poor) in this regard. Contrary to what is quoted in most literature (e.g. Lohani *et al*.,1999; Chadwick , 2002; Cooper and Sheate, 2002), these results show that more respondents are satisfied with the way in which Eskom EIAs address the issue of indirect impacts than those who are negative about the EIAs in this regard.

k) Consideration of socio-economic impacts

On the consideration of socio-economic impacts, a survey of environmental specialists' opinions revealed that 34.5% of the respondents are of the view that the EIAs are good/very good, as illustrated in Table 4.2. An equal proportion of the respondents indicated that the system is poor/very poor with regards to consideration of socio-economic impacts while an additional 30.9% of the respondents felt that the system only addresses socio-economic impacts to a satisfactory level. The implication of these results is that there is a same proportion of respondents who believe that Eskom EIAs are poor at considering socio-economic impacts as those who are of the opinion that the EIAs are good in this regard. However, when combined, those who believe that the system is satisfactory and good or very good constitute a huge portion of the sample. Thus it can be concluded that EIA, as practiced by Eskom is just satisfactory as far as consideration of socio-economic impacts is concerned.

l) Polluter pays principle

Table 4.2 shows that 47.3% of the environmental specialists surveyed in this study are of the opinion that the EIA practice by Eskom is just satisfactory as far as the polluter pays principle is concerned. An additional 38.2% of the respondents are of the view that the system is good or very good, while 14.5% of the respondents mentioned that the system is poor or very poor in promoting the polluter pays principle. The implication of these results is that more respondents have confidence in the extent to which Eskom EIAs address the polluter pays principle than those who have negative views on this issue. This particular area can be viewed as one of the areas of strength in the system, taking into account the fact that only a small proportion of the respondents have negative feelings about the way in which Eskom handles the polluter pays principle.

m) Training

According to the results on Table 4.2, 37.0% of the respondents were of the view that the EIA system at Eskom is good or very good at facilitating training. In addition 35.2% of the respondents were of the opinion that the system is satisfactory, while the least number of the respondents (27.7%) indicated that the system is poor or very poor in facilitating training. The implication of these results is that there are more respondents who have positive views than those who have negative views about the EIA system as far as training is concerned. Training is part of capacity building, which for many years has been considered a crucial strategy for information dissemination and improvement of the EIA practice (Wood, 2003).

4.5 Results from a survey of community members

4.5.1 Profiles of community members

a) Gender of respondents: Community members

Figure 4.7 below shows that out of a sample of 15 community members living around Kusile power station, 67% (10) are male, while 33% (5) are female. These figures clearly show that the number of males in the sample is twice as much as the number of females. This implies that females are not well represented in the sample.

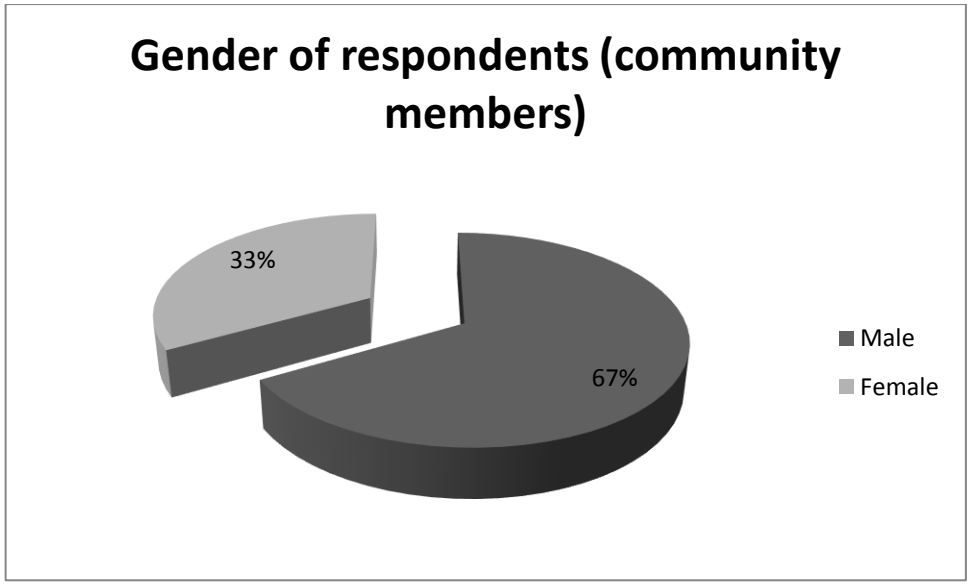

Figure 4.7 Gender of respondents (Community members)

b) Age of respondents

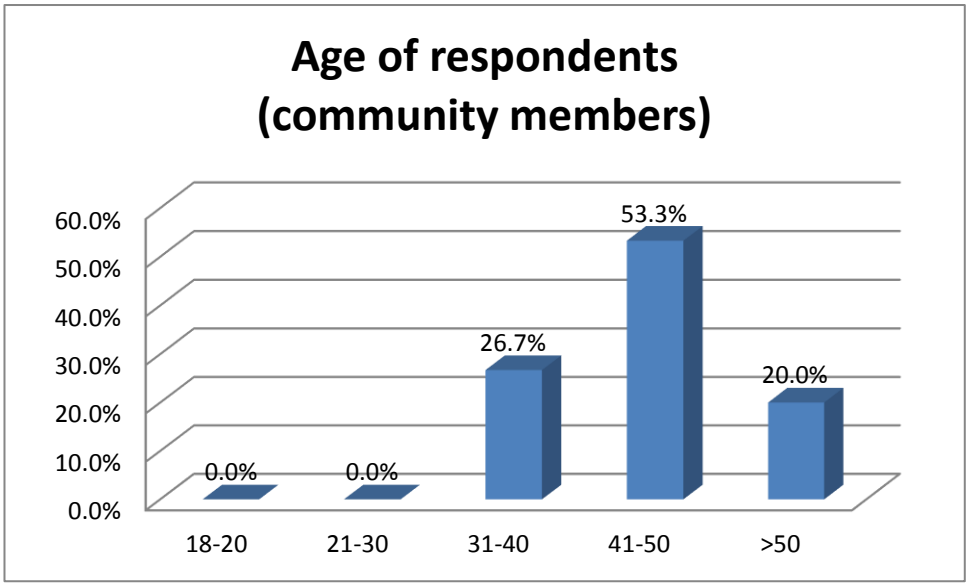

Figure 4.8 Age of respondents

Figure 4.8 above shows that 53.3% of the community members in the sample are in the age group 41 – 50; 26.7% in the 31 – 40 age group; and 20.0% are above the age of 50 years. No respondents fall within the 18 – 20 age group, implying that the sample of community members was made up of adults.

c) Duration of residence in the area

Table 4.3 Duration of residence in the area

	Frequency	Percent
>1 year	0	0.0
1 – 3 years	0	0.0
4 – 6 years	0	0.0
7 – 10 years	0	0.0
>10 years	15	100.0
Total	15	100.0

According to the results illustrated in Table 4.3 above, it can be seen that all (100%) of the community members included in the sample have been staying around Kusile power station for more than ten years. This implies that the sample is made up of people who are knowledgeable about the activities that have been going on in the area. The sample was deliberately chosen to include only those who have been staying in the area for more than 10 years in order to obtain adequate information on the EIA process for the Kusile power station project.

4.5.2 Awareness of EIA carried out for Eskom projects

Table 4.4 Awareness of EIA carried out for Eskom projects

	Frequency	Percent
Yes	15	100.0
No	0	0.0
Total	15	100.0

All of the respondents agree that they are aware of EIA carried out for Eskom projects as shown in Table 4.4 above. This implies that efforts are being made to ensure that all interested and affected parties are aware of proposed developments and associated environmental issues. Awareness of the EIA implies that the project was well popularised to ensure that all interested and affected parties have a chance to participate in the meetings.

4.5.3 Relevance of mitigation measures

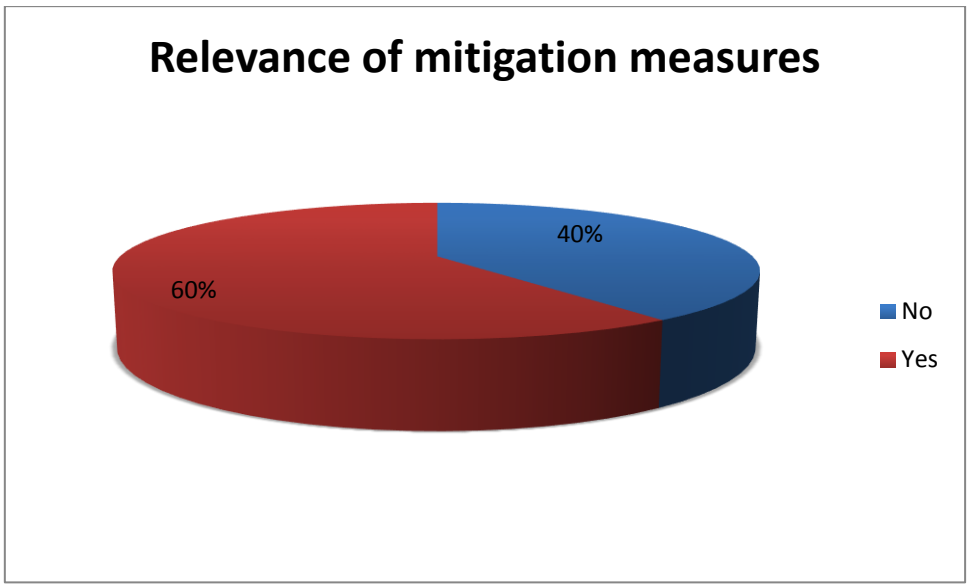

Figure 4.9 Relevance of mitigation measures

From Figure 4.9 above, it can be seen that 60% of the respondents agree to the statement that mitigation measures proposed during the EIA process are relevant while 40% of the respondents disagree with the statement. These figures indicate that a majority of the community members are satisfied with the way in which Eskom EIAs deal with mitigation measures. A majority of the environmental specialists also indicated that proposed mitigation measures are relevant and effective in reducing environmental impacts (see Figure 4.5).

4.5.4 Frequency of environmental problems

Figure 4.10 below shows that 63.7% of the community members surveyed encounter environmental problems on a few occasions while 21.8% encounter environmental problems very often. The smallest proportion of respondents (14.5%) indicated that they encounter environmental problems often. The implication of these results is that environmental problems are encountered on few occasions. One possible explanation of this trend could be the implementation of mitigation measures which minimise environmental impacts. Effective implementation of mitigation measures identified during the EIA process helps to reduce or prevent environmental problems.

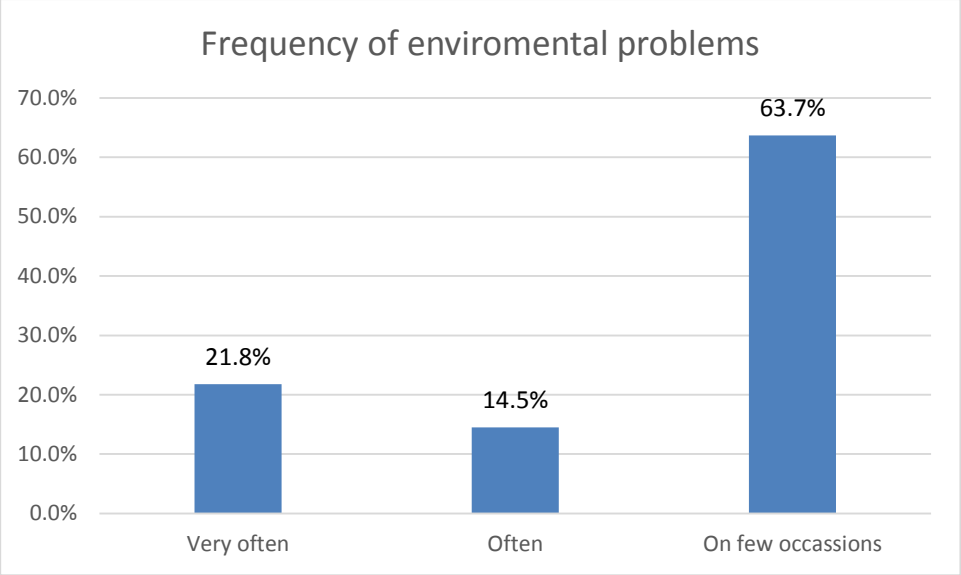

Figure 4.10 Frequency of environmental problems

4.5.5 Success of the public participation process

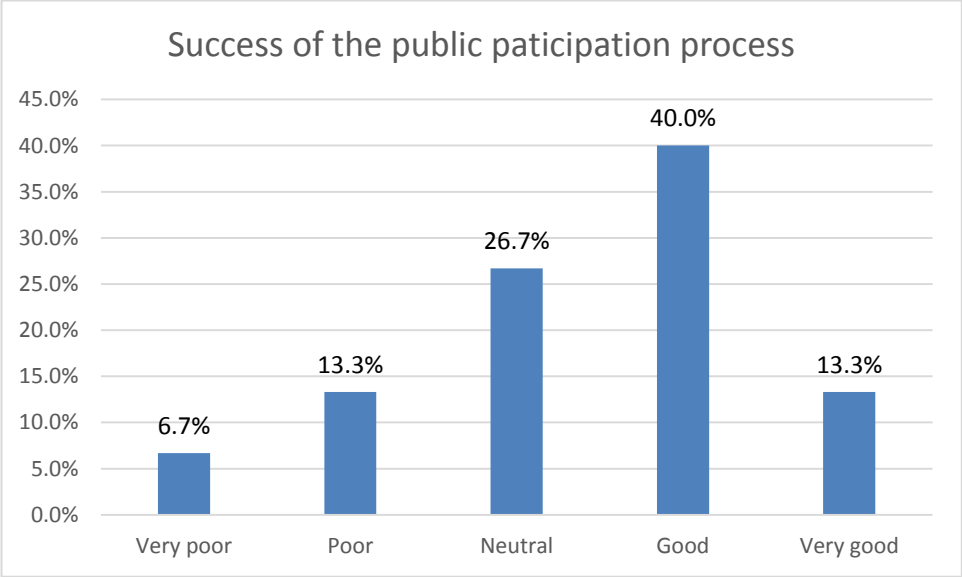

Figure 4.11 Success of the public participation process

Figure 4.11 above shows that 40% of the community members agree to the statement that the public participation process was good while 27.6% are neutral to the statement. An additional 13.3% of respondents agree that the public participation process was very good, while an equal percentage of the respondents are of the opinion that the public participation process was poor. Only 6.7% of the community members feel that the public participation process was very poor. These results indicate that a majority of the community members are satisfied with the public participation process. As already noted in chapter 2,

stakeholder involvement is understood to lead to development that delivers social and environmental gains, and curbs conflicts (Wood, 2003).

4.5.6 Extent of success of Eskom EIAs in selected areas: community members' perspectives

Table 4.5 below illustrates the views of community members on the success of Eskom EIAs in six selected areas. The greater the mean of an item, the greater the level of success as far as that item is concerned.

Table 4.5 Extent of success of Eskom EIAs in selected areas

Description of item	Sample size	Mean	SD	Not successful/ marginally successful	Moderately successful	Successful/ very successful	Total
Including full range of impacts	15	2.67	1.345	46.7%	20.0%	33.4%	100%
Reducing environmental impacts	15	3.13	1.407	40.0%	13.3%	46.7%	100%
Identifying appropriate mitigation measures	15	3.20	1.387	20.0%	40.0%	40.0%	100%
Providing clear information for decision makers	15	3.07	1.580	40.0%	6.7%	53.3%	100%
Assisting developers	15	3.00	1.464	40.0%	20.0%	40.0%	100%
Contribution towards sustainable development	15	3.20	1.424	26.7%	26.7%	46.7%	100%

a) Inclusion of a full range of impacts

Table 4.5 shows that the largest proportion of the community members (46.7%) indicated that EIA, as practiced by Eskom is either not successful or only marginally successful in including a full range of impacts. An additional 33.4% of the respondents are of the opinion that the EIAs are successful or very successful in including a full range of impacts while the least number of respondents (20.0%) indicated that the EIAs are moderately successful in including a full range of impacts. These results seem to suggest that the community members are not satisfied with the coverage of impacts by EIAs in the energy sector. A survey of environmental specialists in this study also revealed that the EIAs are not successful or marginally successful in this regard. The failure to cover the full range of impacts can be regarded as one of the shortcomings of the EIA practice by Eskom. The study also revealed that cumulative impacts are not satisfactorily addressed, which could be one possible reason why the respondents feel that the EIA practice of Eskom is weak in terms of including a full range of impacts.

b) Identification of appropriate mitigation measures and reduction of environmental impacts

From Table 4.5 above, it can be seen that a majority (46.7%) of the community members surveyed agree that Eskom EIAs are successful or very successful in reducing environmental impacts. An additional 40.0% feel that the system is not successful or marginally successful in reducing environmental impacts while 13.3% are of the opinion that the system is moderately successful in this regard. These results imply that a greater proportion of the community members in the sample indicated that mitigation measures proposed during the EIA process play an important role in the reduction of environmental impacts. On the identification of appropriate mitigation measures, Table 4.5 shows that 40.0% of the respondents are of the opinion that Eskom EIAs are successful or very successful. The results in the table also reveal that exactly the same proportion of respondents (40.0%) are of the view that the system is moderately successful, while 20.0% of the respondents indicated that the EISs are not successful/marginally successful in the identification of appropriate mitigation measures.

c) Providing clear information for decision makers

It can be seen in Table 4.5 that a majority of the community members (53.3%) agree that Eskom EIAs are successful or very successful in providing clear information for decision makers. An additional 40.0% of the respondents are of the opinion that Eskom EIAs are either not successful or are only marginally successful in providing clear information for decision makers. The least number of respondents (6.7%) indicated that the system is moderately successful in providing clear information for decision makers. These responses imply that more respondents are positive about the extent to which Eskom EIAs provide clear information for decision makers compared to those who have negative views on this issue.

d) Assisting developers

Table 4.5 shows that 40.0% of the respondents feel that EIA, as practiced by Eskom is successful or very successful at assisting developers. A similar proportion of the respondents indicated that the system is not successful or only marginally successful, while a few respondents (20.0%) are of the opinion that the EIAs are moderately successful in assisting developers. As highlighted in literature, one of the purposes of EIA is aiding the project proponent. It helps to improve relations between the developer, the local communities and local authorities and establishes of a "green profile" (Glasson *et al*., 1999; Morrison-Saunders and Arts 2004b). The implication of the results discussed above is that there is consensus among community members surveyed that Eskom EIAs perform satisfactorily in serving one of the purposes of EIA, i.e. assisting the developer.

e) Contribution towards sustainable development

The results in Table 4.5 show that 46.7% of the community members surveyed, representing the largest proportion of the respondents, are of the opinion that Eskom EIAs are successful or very successful in contributing towards sustainable development. An additional 26.7% of the respondents are of the view that the EIAs are moderately successful in contributing towards sustainable development, while the same proportion (26.7%) of the respondents indicated that the EIAs are not successful or are only marginally successful in contributing towards sustainable development. The fact that a majority of the respondents believe that the EIAs are successful or very successful implies that there is indeed a commitment to some extent towards achieving the goal of sustainable development. Just

like the environmental specialists, a significant proportion of the community members also indicated that EIA, as practiced by Eskom meets one of the purposes for which it is intended mentioned above.

4.5.7 Effectiveness of public participation: views of community members

Table 4.6 below provides questions which probe the effectiveness of the EIA process conducted for Kusile power station. The questions specifically focus on public participation which is an integral part of the EIA process. According to the reviewed literature (see section 2.4 (D)), a successful participation process includes among other things the following: early involvement of the public, representation and access to information, adequate information, enhanced decision making and an educative process.

Table 4.6 Effectiveness of public participation: views of community members

Description of item	Sample size	Mean	SD	Disagree/ strongly disagree	Neutral	Agree/ strongly agree	Total
The need and purpose of the project were clearly explained during the inception of the EIA	15	3.47	1.187	20.0%	26.7%	53.3%	100%
Negative and positive impacts of the project were clearly stated	15	2.87	1.457	40.0%	20.0%	40.0%	100%
You were given sufficient time to assess the project and submit your comment	15	3.40	1.454	33.4%	13.3%	53.3%	100%
The public was consulted during the early stages of project planning and design	15	3.13	1.407	33.3%	13.3%	53.3%	100%

Everyone was given equal chances to participate	15	3.07	1.335	40.0%	13.3%	46.6%	100%
Individuals that were directly affected by the project were consulted personally	15	2.67	1.447	53.4%	13.3%	33.3%	100%
The meetings were held at convenient times	15	3.60	1.183	20.0%	13.3%	66.7%	100%
The meetings were held at accessible venues	15	3.27	1.223	33.4%	13.3%	53.3%	100%
Participants were allowed to air their views	15	3.47	1.125	20.0%	20.0%	60.0%	100%

a) The need and purpose of the project were clearly explained during the inception of the EIA process

From Table 4.6, it is clear that a total of 53.3% of the community members agree or strongly agree that the need for and purpose of the project were clearly explained during the inception of the EIA process. Another 26.7% of the respondents are neutral to the statement while a total of 20 % disagree (disagree and strongly disagree). This implies that a majority of the respondents feel that the need for and purpose of the project were clearly stated during early stages of the EIA process. It is very important that the EIA team provides clear information concerning the need for and purpose of the development project in order to have an insight into the views of the interested and affected parties.

b) Negative and positive impacts were clearly stated

With regards to provision of clear information on the negative and positive impacts of the project, a total of 40% of the community members agree (agree and strongly agree), while a similar number of respondents (40%) disagree (disagree and strongly disagree) with the statement. An additional 20% of the respondents are neutral to the statement that negative and positive impacts were clearly stated. A considerably high proportion of respondents

are of the opinion that the negative and positive impacts were not clearly stated, and this seems to suggest that this particular area requires attention in order to improve EIA effectiveness. It was also revealed by responses from both environmental specialists and community members that Eskom EIAs are not that satisfactory in the consideration of a full range of impacts. Similar results were also reflected on the issue of coverage of cumulative impacts.

c) You were given sufficient time to assess the project and submit your comment

It can be seen from Table 4.6 that just over half of members of the community (53.5%), which represents a majority, were satisfied (agree and strongly agree) with the amount of time allowed for them to assess the project and submit their comments. An additional 33.4% of the respondents were dissatisfied (disagree/strongly disagree) with the amount of time for assessment of the project and submission of concerns, while 13.3% were neutral to the statement. The implication of these results is that the EIA team gave members of the community adequate time to assess the project in order for them to be able to add their valuable input and express their fears and concerns about the project.

d) The public was consulted during the early stages of project planning and design

It can be seen from Table 4.6 that the largest proportion of the respondents (53.3%) agree (agree/strongly agree) that they were involved during the early stages of the project. A total of 33.3% of the respondents disagree (disagree/strongly disagree) with the statement, while 13.3% are neutral on this issue. These results indicate that the public was involved during the early stages of project planning and design to voice their needs and concerns about the project. The public's input can thus be considered to be significant since important decisions were made after consulting the public. The results of the study seem to suggest that the majority of community members are satisfied with the public participation process, which implies that long-term sustainability of the project can be guaranteed.

e) Representation

A total of 46.6% of the community members surveyed feel that everyone was given equal chances to participate. A total of 40.0% disagree (disagree and strongly disagree), while 13.3% are neutral to the statement (Table 4.6). This implies that a majority of the community members surveyed in this study agree that the EIA process afforded interested and affected parties equal chances to participate. It should be noted, however, that a

considerable proportion of respondents were dissatisfied with the level of representation during the EIA process although it is less than that of those who were satisfied.

Table 4.6 also shows that a significant proportion of the respondents (60%) indicated that they were free to air their views pertaining to the project. A total of 20% disagree (disagree and strongly disagree), while another 20% are neutral. The implication of these results is that there was freedom of expression during the EIA process for the project. This means that those who participated in the meetings contributed to the decision making process.

f) Individuals that were directly affected by the project were consulted personally

The results in Table 4.6 show that a majority of the respondents (53.4%) disagree (disagree and strongly disagree) that those who were directly affected by the project were consulted personally. However, 33.3% of the respondents agree (agree and strongly agree) that those who were directly affected were consulted personally, while 13.3% are neutral. Considering the high percentage of respondents who disagree with the statement, we can see that those individuals who were directly affected by the project were not personally consulted. It is very important that those who are directly affected by a project are consulted personally regarding their properties, values and lifestyles.

g) Accessibility of meeting venues and convenience

It can be seen from Table 4.6 that a majority of community members (53.3%) agree that the meetings were held at accessible venues. However, some of the respondents (33.4%) are of the view that the venues were inaccessible, while an additional 13.3% are neutral. The table also shows that 66.7% of the respondents indicated that the meetings were held at convenient times. Another 20% of the respondents are of the opinion that the times at which the meetings were held were not convenient, while 13.3% are neutral. Issues such as lack of transport, domestic chores, work related issues, and so on could be the possible reasons why some of the community members indicated that the meetings were held at inconvenient times and at inaccessible venues. Overall, a majority of the respondents responded positively, which suggests that the meetings were properly planned.

Table 4.7 Summary of EIS quality review: Overall EIS, Review Area and Review Category grades

Review category	Summary of category grades	A	B	C	D	E	F	% A-C	% A-B	% C-D	% E-F
1.1	Description of the development	2	2	1	0	0	0	100	80	20	0
1.2	Site description	0	1	3	1	0	0	80	20	80	0
1.3	Waste and residuals	1	0	4	0	0	0	100	20	80	0
1.4	Environmental description	3	1	1	0	0	0	100	80	20	0
1.5	Baseline conditions	1	1	2	1	0	0	80	40	60	0
2.1	Definition of impacts	0	1	3	0	1	0	80	20	60	20
2.2	Identification of impacts	2	1	1	1	0	0	80	60	40	0
2.3	Scoping	2	2	1	0	0	0	100	80	20	0
2.4	Prediction of impact magnitude	1	3	0	1	0	0	80	80	20	0
2.5	Assessment of impact significance	0	2	2	1	0	0	80	40	60	0
3.1	Alternatives: Feasible alternatives considered	1	0	2	2	0	0	60	20	80	0
3.2	Scope and effectiveness of mitigation measures	0	1	2	1	1	0	60	20	60	20
4.1	Layout of the statement	1	2	1	1	0	0	80	60	40	0
4.2	Presentation	1	2	1	1	0	0	80	60	40	0
4.3	Emphasis	2	1	1	1	0	0	80	60	40	0
4.4	Executive (non-technical) summary	0	1	2	2	0	0	60	20	80	0
Review area	**Summary of review area grades**										
1	Description of the development and the environment	1	2	2	0	0	0	100	60	40	0
2	Identification and evaluation of key impacts	1	2	2	0	0	0	100	60	40	0
3	Alternatives and mitigation	0	2	1	1	1	0	60	40	40	20
4	Communication of results	1	2	1	1	0	0	80	60	40	0
	Overall EIS grades	1	1	2	1	0	0	80	40	60	0

Key to the grades: A – Well performed, B –Satisfactory, minor omissions, C – Just satisfactory, omissions and inadequacies, D – Just unsatisfactory, E – Very unsatisfactory, poor attempt, F – Very unsatisfactory, did not attempt, %Satisfactory (A – C) %Boundary grades (C – D).

4.6 Results and discussion of EIS review

To complement the results of the questionnaire survey, a sample of five Eskom EISs was critically reviewed and the results of the review are given in Table 4.7 above. As mentioned earlier in this chapter, this study only gives a brief discussion of the Review areas and Review categories. The results of the sub-categories were deliberately excluded from this report due to the amount of detail involved**.**

4.6.1 Overall quality of the reviewed reports

Table 4.7 gives a summary of the results from the review of a sample of EISs using the Lee and Colley review package. An analysis of the overall quality of the EISs (Table 4.7 and Figure 4.12) indicates that 80% of the reviewed EISs had a satisfactory rating (grades A to C). Of the four EISs with a satisfactory rating, one (20%) was rated as well performed (A), one (20%) was rated as satisfactory with minor omissions and/or inadequacies and two (40%) were rated as just satisfactory. One (20%) of the reports was found to be unsatisfactory (D). Of all the reviewed EISs, none were graded as E (poor attempt) or F (not attempted). The overall assessment indicates that the most common grade was C (Satisfactory) while grades A, B and D yielded similar results. It can thus be concluded that the EISs submitted to the competent authority on behalf of Eskom are generally of satisfactory quality. Figure 4.12 below illustrates the overall grades for the reviewed sample of EISs.

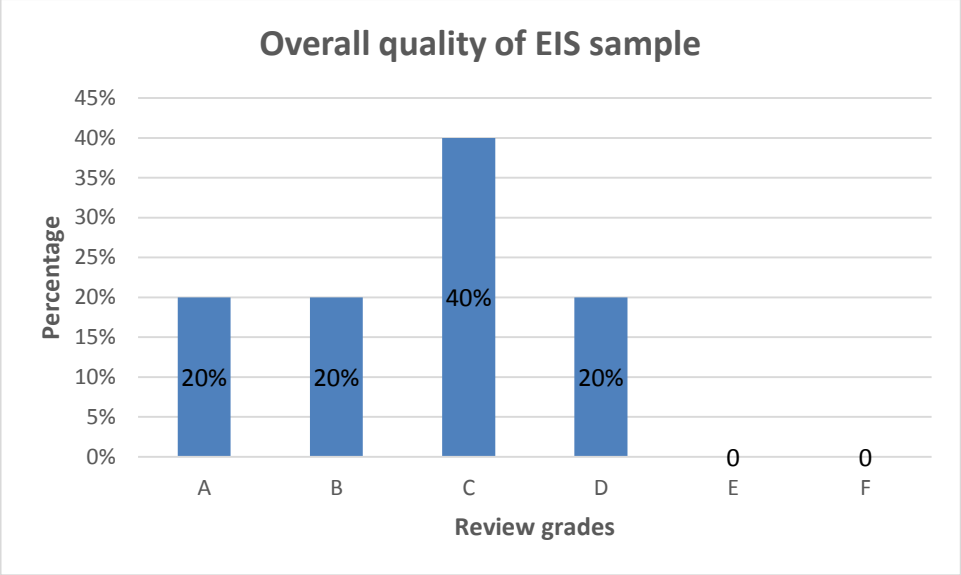

Figure 4.12 Overall EIS quality grades

4.6.2 Quality of Review Areas

a) Review Area 1 - Description of the development, the local environment and baseline conditions

This Review Area gives a complete picture of the proposed development against the local environment and baseline conditions. It focuses on the prediction, assessment and analysis of the potential impacts of the proposed development. Review Area 1 is divided into four review categories (see Table 4.7 and Figure 4.13).

The review shows that the whole sample (100%) of EISs addresses the requirements of Review Area 1 to a satisfactory level (A – C). It can be seen from the table that 60% of the reviewed reports attained grades A to B, while 40% of the reports received satisfactory grades despite omissions and/or inadequacies. According to the review of Review Area 1, no report was rated as unsatisfactory (D), poor attempt (E) or no attempt (F). Grade C (satisfactory with minor omissions) was the most common grade. All the Review Categories within Review Area 1 attained satisfactory grades (A – C). Description of the development (1.1) is among the review categories that received 80% of the highest grade (A-B). Two of the EISs had unsatisfactory grades (D) on review categories: site description (1.1) and baseline conditions (1.5).

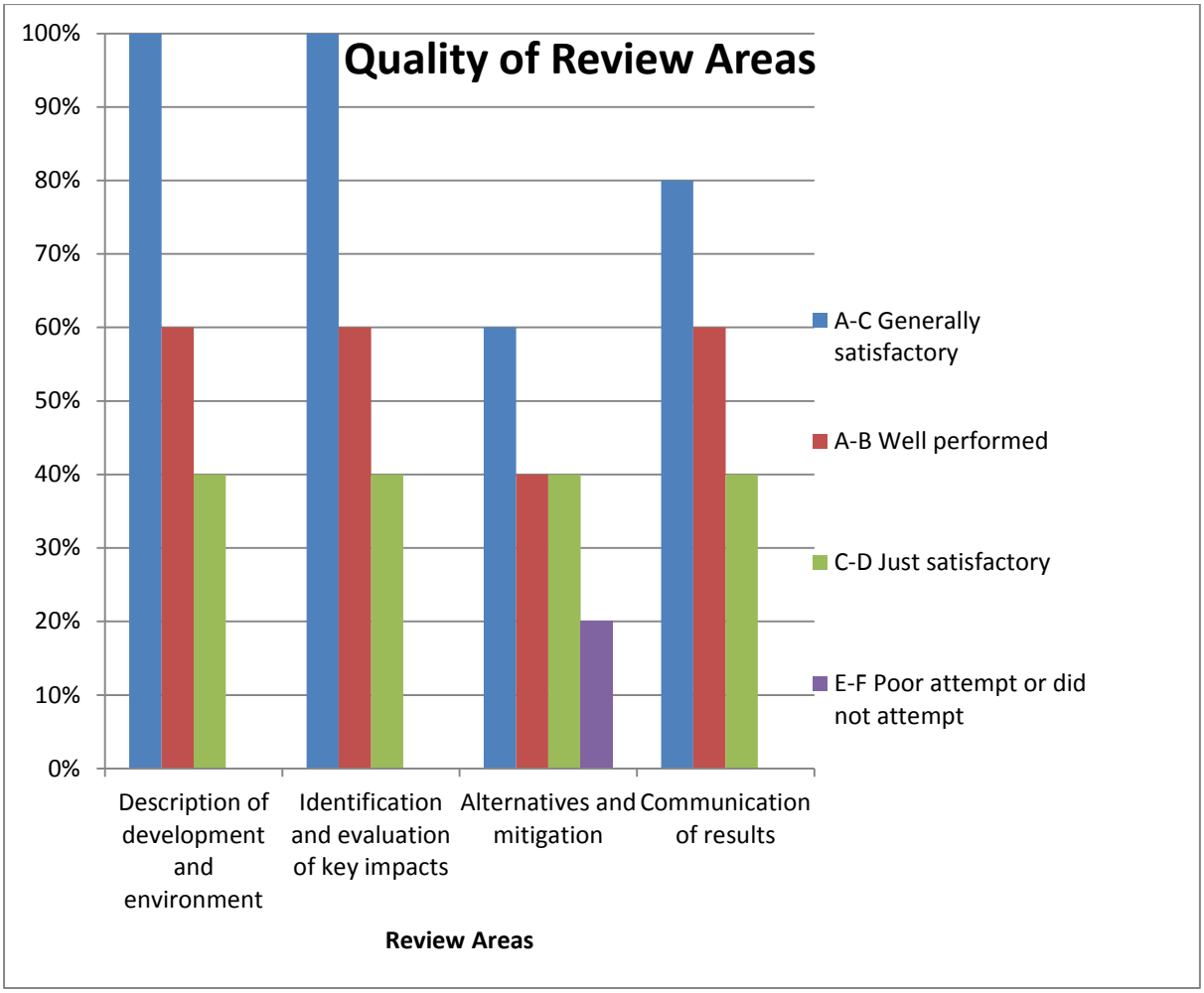

Figure 4.13 Quality of Review Areas

b) Review Area 2: Identification and evaluation of key impacts

Review area 2 outlines how well environmental impacts have been identified, predicted and assessed. This is generally regarded as the main purpose of carrying out the EIA process since it is used to make decisions on whether a project can be implemented or not depending on the nature of the impacts.

Just like review area 1, review area 2 was addressed to a satisfactory level (A-C) in all EISs. Out of the 5 EISs reviewed, 60% attained A-B grades while 40% of the reports received satisfactory (C) grades. None of the reports were rated as unsatisfactory (D), poor attempt (E) or no attempt (F).

c) Review Area 3: Alternatives and mitigation

Review area 3 aims to evaluate the level to which an EIS addresses alternatives and mitigation measures. Alternatives and mitigation measures form a fundamental part of the EIA process and should be critically reviewed. Pretorius (2006) stresses that consideration of alternatives indicates that alternative approaches to the project and the means of preventing environmental damage have been considered. Figure 4.13 shows that 60% of the reviewed EISs achieved satisfactory grades (A-C) on the description of feasible alternatives and mitigation measures, while 40% of the reports obtained A-B grades and 40% obtained C-D grades. However, 20% of the reports obtained unsatisfactory grades (E-F), which makes Review area 3 the least attempted area for the reviewed reports. Review category 3.1 was not thoroughly addressed and this could be noticed from the limited number of feasible alternatives proposed and inadequate assessment of the no-action alternative in most EISs reviewed.

The problem of a limited number of alternatives can be attributed to the fact that in most cases EIA exercises are conducted rather late during the project planning and design feasibility stages. As a result, the consideration of alternative sites, technology and mitigation are not satisfactorily addressed. This phenomenon is common in most developing countries (Wood, 2003). In most cases reports are submitted after the project definition and the site has been acquired (Wood, 2003).

d) Review Area 4: Communication of results

This review area outlines how well EIA results have been communicated in the report. It is crucial that the results of the EIA process are well communicated to the stakeholders and decision makers. According to the review, 80% of the EIS sample obtained satisfactory (A-C) grades. This indicates that this review area was satisfactorily performed. However one (20%) of the reports had omissions and deficiencies on this particular review area (see Table 4.7).

CHAPTER 5

ANALYSIS AND DISCUSSION

5.1 Introduction

This chapter aims to provide an analysis and discussion of the key findings of the study. The chapter also highlights how the results relate to expectations and previously published literature. The first section focuses on the key findings from the questionnaire survey while the second section presents major findings from the EIS review.

5.2 Key findings from the questionnaire survey

The questionnaire survey revealed areas of strength and weakness within the EIA system by Eskom. It is necessary to evaluate the strengths and weaknesses of the current practice in order for us to have an insight into the areas that need more attention so as to suggest measures that can be put in place to enhance the role of EIAs in the energy industry and improve effectiveness. The responses provided by both the environmental specialists and members of the community show that the EIA system of Eskom is generally satisfactory in a number of aspects. The system seems to meet a significant proportion of the evaluation criteria developed for this study. It can thus be expected to deliver, to some extent, the intended benefits of environmental protection and ultimately sustainable development. However, some areas of weakness which need to be addressed have been identified.

It is highlighted in literature that EIA has three main purposes, and its effectiveness can be determined by the extent to which these purposes are achieved (Glasson *et al*., 1999). Effectiveness is defined by Sadler (1996) as a measure of "how well something works or whether it works as intended and meets the purpose for which it is designed". As part of this study, environmental specialists and community members were asked whether they feel that the EIA practice by Eskom is effective in helping developers, helping decision makers and contributing to sustainable development (see Tables 4.1 and 4.5). These three areas are the purposes of EIA (Glasson *et al*., 1999) referred to above. Responses from both environmental specialists and community members indicate that a majority of the respondents are of the opinion that the system is successful in achieving the three main purposes mentioned above.

Therefore, the results seem to suggest that there is a general feeling among respondents that EIAs in the energy sector are indeed successful in achieving the main purposes of EIA.

A study conducted by Harmer (2005) in the UK also shows that a majority of the participants agreed that EIA in the UK is effective at achieving the three purposes of EIA mentioned above. However, an examination of 40 planning applications by Wood and Jones (1997) to examine the effectiveness of EIA in the UK Planning system revealed that the influence of EIA on decision making was reported in only one case. Additionally, Wood (2003) concluded that although EIA does influence decision making, EIA findings are often disregarded while issues such as political factors and non-environmental motives take priority.

Contrary to what most literature suggest, public participation appears to be one of the strengths of the Eskom EIA system according to the study results (see Tables 4.2 & 4.6 and Figure 4.11). The current EIA practice in South Africa and the world at large is often criticised for having little or no public participation at all. For example, McEwan (2003) argues that there is often a lack of participation in most EIA processes. Literature focusing on the South African EIA practice suggests that public participation seems to be one of the weaknesses of the system (e.g. Mitchell *et al*., 2000; Murombo, 2008). In addition, Lee (2000) also notes that public participation is often deficient in developing countries. Yet, this study shows that well above 50% of the community members surveyed were satisfied with the public participation process. The results of the study also show that 53.5% of the community members indicated that they were given sufficient time to assess and submit their comments, while 53.5% agreed that the public was consulted during the early stages of project planning and design.

Furthermore, a majority of the community members who were part of the public participation process indicated that the meetings were held at accessible venues and at convenient times (see Table 4.6). In addition, a majority (47.3%) of the environmental specialists surveyed agree that the EIA system is good or very good in terms of stakeholder participation, while an additional 41.8% are of the view that the system is satisfactory in this regard. This is an encouraging sign of the EIA practice in the energy industry of South Africa, showing that there have been improvements in the system as far as public participation is concerned. The results indicate that the EIA system facilitates empowerment which is essential for sustainable development. The results also imply that the long-term sustainability of the projects can be guaranteed.

Public participation is understood to be vital in influencing the decision-making process (Morrisey, 2000). It is understood that active participation of interested and affected parties will build trust, confidence, credibility and acceptability of the project (Chilvers, 2008). Inclusion of the public in decision making also encourages the public to participate in other public participation processes (Chilvers, 2008). Furthermore, UNCED (1992) emphasises the need for public participation for the achievement of sustainable development goals. Surprisingly, more environmental specialists are of the opinion that there is a lack of transparency compared to those who believe that the system is good or very good in this regard, although the margin is small. However, a majority of the surveyed environmental specialists are of the view that transparency in decision making is satisfactory.

The results of the study show that a majority of the respondents agree that the mitigation measures proposed in EISs are relevant and effective in reducing environmental impacts (see Figures 4.5 & 4.9). The identification of appropriate mitigation measures can be seen as one of the strengths, according to the study results. The study revealed that 60% of the environmental specialists agree that the EIA practice of Eskom is successful at reducing environmental impacts, which suggests that the mitigation measures are effective (see Table 4.1).This is an encouraging sign of the EIA practice, as the results highlight that there is some commitment to environmental protection. We can see that a majority of the environmental specialists surveyed view the EIA practice in the energy industry as less of a mere tick box exercise. These results seem to divert from some of the findings of previous studies. For example, it has been noted that mitigation is often given little emphasis in most developing countries (OECD, 1992; Du Preez *et al*., 1997). Similarly, studies carried out by Mwalyosi and Hughes (1997) and Ahmad and Wood (2002) in Tanzania and Egypt respectively revealed that mitigation measures considered during the EIA process are often not implemented.

The results of this study on mitigation seem to explain why a majority of environmental specialists indicated that they receive complaints from surrounding areas on a few occasions (Figure 4.6). Similarly, the community members also revealed that they encounter environmental problems on a few occasions (Figure 4.10). These two findings suggest that the mitigation measures implemented help to protect the environment.

A majority (47.3%) of the environmental specialists surveyed are of the opinion that the polluter pays principle is addressed to a satisfactory level, while an additional 38.2% are of the view that the system is good or very good in this regard (see Table 4.2). These figures appear to confirm the views of environmental specialists on the issue of mitigation measures. The polluter pays principle is an environmental policy that aims to allocate costs for the prevention of pollution and controlling measures to enhance sustainable use of natural resources (Beder, 2006). While the principle is hailed as a great concept (Singo, 2015), some commentators feel that it has flaws since the payment for pollution can be viewed as promotion of pollution (Beder, 2006).

Literature points out to a number of issues considered to be problem areas during the EIA process, including consideration of cumulative impacts, indirect impacts, socio-economic impacts, trans-boundary effects and alternatives (e.g. Sadler, 1996). The responses obtained in this study point to different capabilities of energy sector EIAs in dealing with environmental impacts of development projects (see Table 4.2). A majority of the environmental specialists surveyed (45.4%) are of the view that the system performs poorly or very poorly in the consideration of cumulative impacts, compared to 18.2% of the respondents who are of the opinion that the system is good or very good in this regard. These results clearly reveal that this particular area needs to be addressed to improve EIA performance in the energy industry. However, a considerably significant proportion of the respondents (36.4%) indicated that the system is satisfactory in this regard. The problem of insufficient consideration of cumulative impacts is not new, as a lot of literature on this issue testifies. For example, Morgan (2012) observes that cumulative impact assessment is still under-developed in most EIA systems. In addition, it is acknowledged that although most EIA systems require that cumulative impacts be considered, they are not addressed or inadequately addressed in practice (Duinker and Greg, 2006; Gun and Noble, 2011). Gun and Noble (2011) suggest that a lack of clear understanding on what constitutes ‘cumulative impacts’ could be one possible reason for the poor consideration of cumulative impacts.

It is of concern that more environmental specialists are of the view that social impacts are not given a balanced treatment as ecological ones than those who are positive, although a majority of the respondents indicated that the system is satisfactory in this regard (see Table 4.2). On the contrary, a majority of respondents (36.4%) are of the opinion that economic impacts are treated equally as ecological impacts, while a further 32.7% feel that this issue

is satisfactorily addressed. Furthermore, more than 60% of the respondents are of the opinion that the EIA practice is satisfactory or good (good/very good) with regards to consideration of socio-economic impacts, which is an encouraging sign. Given the above inadequacies in addressing some impacts, it is not surprising that the current EIA practice of Eskom is considered to be generally weak (marginally successful or not successful) in including a full range of impacts by 36.4% of the environmental specialists and 46.7% of the community members surveyed (see tables 4.1 and 4.5).

With regards to ensuring the use of resources within ecological limits, almost half of the environmental specialists surveyed are of the opinion that the system is satisfactory, while a further 36.4% believe that the system is good or very good in this regard (Table 4.2). Only 12.6% feel that the system is poor or very poor in this regard. This implies that there is some commitment to safeguard the environment and ensuring that our posterity have access to natural resources. This is supported by the results of the question on inter-generational equity. The results show that a majority of the respondents (40.7%) indicated that the system is satisfactory in ensuring inter-generational equity, while 29.7% are of the opinion that the system is good or very good in this regard. However, there is a very small margin between respondents who feel that the system is poor or very poor (29.6%) and those who are of the view that the system is good or very good (29.7%) in ensuring inter-generational equity. One possible explanation for this could be the fact that a majority of respondents indicated that the issues of cumulative impacts as well as social impacts are not handled satisfactorily.

On the other hand, Table 4.2 also illustrates that 41.8% of the environmental specialists surveyed feel that EIA, as practiced by Eskom is satisfactory in ensuring intra-generational equity, while 32.7% of the respondents are of the opinion that the EIAs are poor or very poor. An additional 25.5% indicated that the EIAs are good or very good in this regard. Although a majority of the respondents agree that the EIA practice of Eskom ensures intra-generational equity to a satisfactory level, it is of concern that the proportion of those who indicated that the practice is poor is more than that of those who believe that the practice is good in this regard. This could possibly be attributed to some issues that have been identified as areas of weakness in this study. For example, this study revealed that a majority of the community members surveyed are of the view that individuals who were directly affected were not consulted personally, although they indicated that they were satisfied with the public participation process. Comparable results were obtained by

Aregbeshola (2009) in a study to investigate the effectiveness of public participation as a sustainable development tool for the Gautrain project.

A closer look at Table 4.2 shows that EIA, as practiced by Eskom promotes capacity building through training programmes on sustainability issues, considering the fact that 37.0% of the environmental specialists feel that the system is good or very good, while 35.2% are of the opinion that the system is satisfactory in this regard. As elaborated in chapter 2, training is understood to be a means of enhancing the EIA practice and its influence (Jay *et al*., 2007). It equips participants with the necessary skills required for the identification of potential impacts of proposed development projects, and how to mitigate those impacts for the protection of the environment. Training is thus important for sustainable development.

Although there appears to be a general consensus that the current EIA practice in the South African energy industry contributes to sustainable development to some extent, monitoring seems to be one of the major challenges within the EIA system of Eskom, as indicated by the study results. A majority of the respondents (54.6%) indicated that the EIA system is poor or very poor as far as monitoring of impacts is concerned, compared to only 16.3% who believe that the system is good or very good in terms of monitoring. This seems to suggest that monitoring in EIA is one of the areas that require closer attention in order to improve the EIA practice. These results on monitoring seem to concur with the results of previous studies. For example, Arts and Nootebloom (1999) note that despite monitoring being acknowledged as a means for providing information to ensure sustainable development, its undertaking in practice still remains a challenge. In addition, Du Preez *et al*. (1997) stress that this problem is exacerbated by inadequate enforceability of environmental protection measures. One of the possible reasons for this problem is the fact that developers are not obliged to implement the Environmental Management Plan (EMP) since it is not recognised as a legally binding environmental protection measure.

Furthermore, research has shown that having regulations that make follow-up mandatory does not necessarily ensure the occurrence of monitoring in practice. For instance, a study conducted by Van Lamoen and Arts (2003) in the Netherlands revealed that out of 800 projects, follow-up was done for only 60 projects since follow-up was made mandatory. In addition, Wood (2003) asserts that monitoring is not taken seriously in developing countries. Lohani *et al*. (1997) also pointed out that EIA practices of most Asian countries

fall short of commitment to monitoring. It has also been noted that in countries such as Egypt, Tunisia and Turkey, monitoring is almost non-existent (Ahmad and Wood, 2002).

Monitoring is understood to produce the following benefits for the developer: protection against liability, maintaining acceptance by the community, improved project management and establishment of a "green profile" (Morrison-Saunders and Arts, 2004b). Monitoring also benefits the environment by ensuring that impacts are reduced or prevented. Improvements in monitoring could potentially improve the EIA practice in the energy industry and ultimately enhance the extent to which EIA contributes to sustainable development.

5.3 Key findings related to the review of selected EISs

The results obtained from the review of EISs revealed that a majority of them are of satisfactory quality. Other studies (e.g. Sandham and Pretorius, 2008; Sandham *et al*., 2008) also reveal that EISs produced in South Africa are of satisfactory quality thus far. The overall scores for review areas were higher than that of review categories and sub-categories. Some sub-categories were not satisfactorily addressed, but this is not reflected on the final score. This is so because review categories tend to be addressed much better compared to sub-categories, and thus a good final score will be obtained. Best performance of review categories was seen in review area 1(description of development and environment) and review area 4 (communication of results). The review categories of review area 3 were poorly addressed.

The findings of this study with regards to the quality of EISs share some similarities with findings of previous studies. In this study, consideration of alternatives was found to be deficient. This is in agreement with Wood's (2003) observation that the consideration of alternatives is generally weak in developing country EIAs. In particular, the no-action alternative is often not regarded a viable option in developing countries where poverty and starvation are predominant issues (Wood, 2003). A report by the Commission of the European Communities (2009) also identified consideration of alternatives as one of the areas which require improvement. In addition, a study by Lee (2000) also revealed that most EISs in developing countries are weak on coverage of alternatives and impact prediction. The consideration of alternatives requires more attention for improvement of the quality of EISs.

As has already been elaborated in chapter 3, it is argued that an EIS of good quality would usually reflect on the overall effectiveness of the entire EIA process (Sandham *et al*., 2008). Despite the above-mentioned weaknesses, the quality review has revealed that EISs submitted to the competent authority on behalf of Eskom are generally of satisfactory quality. This implies that the EISs influence informed decisions to some extent, which is crucial for the protection of the environment and promotion of sustainable development.

5.4 Conclusion

An analysis of the research findings in this chapter provided an insight into the extent to which EIA in the South African energy sector contribute to sustainable development. The research revealed some strengths and weaknesses of the EIA system in the energy sector. The results of this study are a basis for the recommendations that will be outlined in the following chapter to improve the current EIA practice.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The aim of this study was to evaluate the effectiveness of the EIA practice in the energy sector of South Africa in contribution towards sustainable development. The evaluation revealed the strengths and weaknesses of the system which can be used to suggest ways of improving the performance of the system. The evaluation was done against a criteria developed from a review of relevant literature and the sustainable development framework developed by the researcher. The study produced some unexpected results, contradicting findings from other studies. This can be viewed as a sign of improvement in the current EIA practice. However, some of the research findings confirm the findings of previous studies. According to the analysis of the results of this study, the EIA system in the energy industry seems to meet a significant proportion of the evaluation criteria developed for this study to a satisfactory level. However, as mentioned earlier, some shortcomings have been identified. The system can be said to be just satisfactory as far as contribution towards sustainable development is concerned despite the weaknesses within the system. Sadler (1996) acknowledges that EIA does contribute to meeting the goal of sustainable development but does not reach its full potential due to certain shortcomings.

South Africa has a comparatively strong legal basis for environmental management. As Wood (2002) puts it, the South African EIA system possesses many features of a sophisticated EIA system of a developed country. Given this strong legal basis for environmental protection, the benefits of environmental protection and sustainable development can be enhanced if the areas of weakness are addressed.

In summary, the questionnaire survey and the review of EISs revealed the following strengths of the EIA practice in the energy sector:

(i) the EIA system promotes public participation;
(ii) the identification of appropriate mitigation measures is satisfactorily done;
(iii) proposed mitigation measures are relevant and effective in reducing environmental impacts;
(iv) the EIAs assist the project proponent;

(v) the system ensures the use of resources within ecological limits – i.e. ensuring inter-generational equity;
(vi) The system promotes capacity building through training programmes;
(vii) socio-economic impacts are considered satisfactorily in EIAs;
(viii) The system is effective at achieving the purposes of EIA (i.e. assisting the developer, aiding in the decision making process and contribution to sustainable development); and
(ix) The quality of the EISs is satisfactory.

Although the results of the study show that EIA contributes, to some extent, towards sustainable development in the energy industry, some challenges exist, which limit EIA's ability to reach its full potential as far as contribution to sustainable development is concerned. The EIA practice in the South African energy sector can be improved by addressing the following shortcomings, particularly the factors that give rise to the weaknesses:

(i) monitoring still remains one of the major challenges in the application of EIA in the South African energy sector;
(ii) the system does not consider a full range of impacts (especially cumulative impacts);
(iii) the environmental specialists indicated that there is inadequate transparency in the decision making process;
(iv) failure to personally contact members of the community who are directly affected by development projects; and
(v) little attention is paid to alternatives.

6.2 Recommendations

In light of the research findings and the above-mentioned weaknesses, the following recommendations have been made:

(i) Insufficient monitoring of mitigation measures proposed in the EISs emerged as one of the major barriers preventing EIA in the energy sector from contributing to sustainable development to a full extent. This study recommends that a mechanism should be put in place to ensure monitoring of project impacts for the protection of the environment. This could possibly be achieved by establishing stronger links between projects and ongoing environmental management. This will assist in the identification and rectification of impacts that were not detected during the EIA process;

(ii) The findings of the study revealed the consideration of cumulative impacts during the EIA process as one of the problem areas in the current EIA practice in the energy sector. This study suggests that the current EIA practice should be upgraded to improve the consideration of cumulative impacts. This requires the application of innovative tools and measures (e.g. the use of economic tools to fully implement the polluter pays principle and to strengthen the integrity of the EIA practice). A long term holistic approach should also be adopted to successfully address the issue of cumulative impacts. As envisaged by Gun and Noble (2011), an increased use of measures such as scenario analysis in the consideration of cumulative impacts could also be considered to improve performance in this particular area of EIA;

(iii) It was evident from the quality review of EISs that consideration of alternatives was poorly performed. More effort should be put into the investigation and consideration of alternatives;

(iv) Although participation is promoted, according to the survey of environmental specialists, a considerable proportion of the participants indicated that there is inadequate transparency in the decision making process. More effort should thus be put on ensuring transparency in decision making; and

(v) This study also recommends that the project proponent, through the EIA team, should engage members of the community that are directly affected by projects at a personal level.

6.3 Future research

The following are the areas that have been identified as needing further exploration in future studies:

(i) The findings of this study are based on investigations of only one company, i.e. Eskom and thus limited in terms of covering the entire energy sector of South Africa. Future research should examine the same issue in other companies in the energy sector to identify similarities and differences in opinions on the subject matter.

(ii) Data collection for this study was limited to the Gauteng and Mpumalanga provinces for the reasons outlined in chapter 3. As a result, the investigation can be said to be geographically limited. The findings of this research may be irrelevant in other areas. Future research should thus extend the investigation to cover more provinces in order to detect similarities and differences.

(iii) Monitoring was found to be one of the problem areas in the current EIA practice. Future researchers need to further explore the issue of monitoring in the energy industry to solve this problem.

(iv) The findings of the study also revealed that energy sector EISs do not address the issue of alternatives satisfactorily. More research specifically focusing on alternatives needs to be done to investigate the issue and find a permanent solution to the problem.

(v) The findings of the study also revealed that energy sector EIAs do not address the issue of cumulative impacts satisfactorily. More research focusing on cumulative impacts needs to be done to investigate the area and find ways of dealing with the problem.

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APPENDIX 1

CONSENT FORM

Effectiveness of environmental impact assessment in promoting sustainable development in the energy sector of South Africa

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I have been given full details about the research on "The evaluation of effectiveness of Environmental Impact Assessment in promoting sustainable development in the energy sector of South Africa" by Mr.Shonisani Felix Madlome who is doing a Master's degree at the University of the Witwatersrand under the supervision of Prof. Danny Simatele.

I have been informed that:

- Participation is voluntary
- That I can withdraw from the research at any time without any repercussions
- That my participation in the research is voluntary and that I will remain anonymous
- That the information I will provide will be treated with utmost confidentiality
- That I will not receive any benefit or reward for participating in the research, and that
- The information will be used for academic purposes only (research report).

By signing below I am indicating that I agree to participate in the research.

Signature Date

……. ……../……/…….

APPENDIX 2

PARTICIPANT INFORMATION SHEET

School of Animal, Plant and Environmental Sciences

Private bag 3, Wits 2050

Effectiveness of environmental impact assessment in promoting sustainable development in the energy sector of South Africa

Dear sir/madam

By way of introduction, my name is Shonisani Felix Madlome and I am an Environmental Sciences MSc student at the University of the Witwatersrand. The reason I am writing to you is to solicit your participation in a survey entitled "Evaluation of the effectiveness of Environmental Impact Assessment (EIA) in promoting Sustainable development in the energy sector of South Africa". The purpose of the study is contribution towards the research component of a Master's degree in Environmental Sciences. The research aims to investigate the role that effective environmental impact assessment makes in promoting sustainable development in South Africa. The study uses a case study of Eskom and seeks to have an insight into how the EIA practices by Eskom contribute towards sustainable development. I am inviting you to be part of this study. To obtain your views, I have designed a questionnaire for you which takes about 20 to 30 minutes to complete. I hope you will find time to complete it and the information will be valuable in informing the contents of my dissertation.

The information you are going to provide will be treated with utmost confidentiality. I would like to assure you of your anonymity in participating in this research should you agree to partake in this survey. None of your personal details or any features that may contribute in identifying you will be kept on record. I would also like to assure and inform you that you have the right to withdraw from the survey at any time and you may not respond to some parts of the questionnaire that you do not wish or feel comfortable to address or answer. Your participation is completely voluntary, and there is no remuneration for participating in this research process. The results of the research will be used strictly for academic purposes.

Should you require any additional information about the research please contact me on727636@students.wits.ac.za or on 0798362005 or my supervisor Professor Danny Simatele on Danny.Simatele@wits.ac.za or on 011 717 6517.Many thanks in advance.

Yours sincerely

Shonisani Felix Madlome

APPENDIX 3

WITS ETHICS COMMITTEE CLEARANCE

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Madlome

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H15/10/16**
PROJECT TITLE	Evaluation of the effectiveness of environmental impact assessment in promoting sustainable development in the energy sector of South Africa
INVESTIGATOR(S)	Mr S Madlome
SCHOOL/DEPARTMENT	APES/
DATE CONSIDERED	23 October 2015
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	19 November 2018

DATE 20 November 2015 **CHAIRPERSON** J. Knight
(Professor J Knight)

cc: Supervisor : Dr D Simatele

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Rodlome
Signature

27, 11, 2015
Date

APPENDIX 4

SELF-ADMINISTERED QUESTIONNAIRE FOR ENVIRONMENTAL SPECIALISTS

Please answer the following questions by placing a tick (✓) next to the answer that best suits your opinion where necessary.

Section A: Respondent details

1. Gender

Male	1
Female	2

2. Age group in years

18 - 20	21 - 30	31 - 40	41- 50	>50
1	2	3	4	5

3. How long have you been working for this company/organisation?

<1 year	1 – 3 years	4 – 6 years	7 – 10 years	>10 years
1	2	3	4	5

4. What is your role?

Eskom Environmental officer	DEA environmental officer	Environmental consultant
1	2	3

Section B: Implementation and monitoring of mitigation measures proposed in EIA reports.

5. Do you think mitigation measures proposed in EIA Reports are effective in reducing environmental impacts caused by Eskom?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

6. How often do you receive complaints from the surrounding community about odours, noise, dust, effluents, water pollution, or aesthetic appearance etc.?

Never	On few occasions	Often	Very often
1	2	3	4

7. To what extent are Eskom EIAs usually successful in the following areas?

		Not successful	Marginally successful	Moderately successful	Successful	Very successful
7.1	Including full range of impacts e.g. social, ecological, economic)	1	2	3	4	5
7.2	Reducing environmental impacts	1	2	3	4	5
7.3	Identifying appropriate mitigation measures	1	2	3	4	5
7.4	Providing clear information for decision makers on the potential impacts of projects	1	2	3	4	5
7.5	Assisting developers	1	2	3	4	5
7.6	Contribution towards sustainable development	1	2	3	4	5

8. How well do you think Eskom EIAs address the following sustainable development issues?

		Very poor (1)	Poor (2)	Satisfactory (3)	Good (4)	Very good (5)
8.1	Social impacts are considered equally important as environmental ones	1	2	3	4	5
8.2	Economic impacts are considered as equally important as environmental impacts	1	2	3	4	5
8.3	Monitoring	1	2	3	4	5
8.4	Mitigation measures	1	2	3	4	5
8.5	Ecological limits	1	2	3	4	5
8.6	Intergenerational equity	1	2	3	4	5
8.7	Intra-generational equity	1	2	3	4	5
8.8	Stakeholder participation	1	2	3	4	5
8.9	Transparency in decision making	1	2	3	4	5
8.10	Consideration of long term cumulative impacts	1	2	3	4	5
8.11	Consideration of indirect impacts	1	2	3	4	5
8.12	Consideration of socio-economic impacts	1	2	3	4	5
8.13	Polluter pays principle to ensure that it bears the financial consequences of its developments	1	2	3	4	5
8.14	Training of EIA practitioners on Sustainable Development issues	1	2	3	4	5

APPENDIX 5

RESEARCHER ADMINISTERED QUESTIONNAIRE FOR COMMUNITY MEMBERS

Please answer the following questions by placing a tick (✓) next to the answer that best suits your opinion where necessary.

Section A: Respondent details

1. Gender

Male	1
Female	2

2. Age group in years

18 - 20	21 – 30	31 - 40	41 – 50	>50
1	2	3	4	5

3. How long have you resided around this area?

<1 year	1 – 3 years	4 – 6 years	7 – 10 years	>10 years
1	2	3	4	5

Section B: Implementation of mitigation measures proposed in EIA reports and public participation

4. Are you aware of the EIA carried out for Eskom projects?

No	0
Yes	1

5. Do you think mitigation measures recommended in EIA reports are relevant?

No	0
Yes	1

6. How often do you encounter problems related to odours, noise, dust, effluents, water pollution, or aesthetic appearance etc.?

Never	On few occasions	Often	Very often
1	2	3	4

7. To what extent are Eskom EIAs usually successful in the following areas?

		Not successful	Marginally successful	Moderately successful	Successful	Very successful
7.1	Including full range of impacts (e.g. social, ecological, economic)	1	2	3	4	5
7.2	Reducing environmental impacts	1	2	3	4	5
7.3	Identifying appropriate mitigation measures	1	2	3	4	5
7.4	Providing clear information for decision makers on the potential impacts of projects	1	2	3	4	5
7.5	Assisting developers	1	2	3	4	5
7.6	Contribution towards sustainable development	1	2	3	4	5

Public participation

8. Were you part of the public participation process when the Kusile power station project started?

No	0
Yes	1

9. If your answer to the above question is yes, please rate your level of satisfaction with the information provided when the project started.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
9.1	The need and purpose of the project were clearly explained during the inception of the EIA	1	2	3	4	5
9.2	Negative and positive impacts of the project were clearly stated	1	2	3	4	5
9.3	You were given sufficient time to assess the project and submit your concerns	1	2	3	4	5
9.4	The public was consulted during early stages of project planning and designing	1	2	3	4	5
9.5	Everyone was given equal chances to participate	1	2	3	4	5
9.6	Individuals that were directly affected by the project were consulted personally	1	2	3	4	5
9.7	The meetings were held at convenient times	1	2	3	4	5
9.8	The meetings were held at accessible venues	1	2	3	4	5
9.9	Participants were allowed to air their views	1	2	3	4	5

10. In your own opinion, how good was the whole public participation process?

Very poor	Poor	Neutral	Good	Very good
1	2	3	4	5

11. Please indicate your satisfaction with the feedback process.

		Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
11.1	How satisfied are you with the frequency of contact between the project proponent and the interested and affected parties?	1	2	3	4	5
11.2	How satisfied are you with the approval of the project?	1	2	3	4	5

12. Do you still participate in the project meetings after the project was approved?

No	0
Yes	1

APPENDIX 6

LIST OF REVIEWED EISs

No	Environmental Impact Statement	Year
1	Proposed construction of a new 2 x 400kv power line from Glockner substation to Etna substation, Gauteng	2007
2	Proposed underground coal gasification pilot project and associated infrastructure in support of co-firing of gas at the Majuba power station, Amersfoort, Mpumalanga	2014
3	Proposed coal-fired power station and associated infrastructure in the Witbank area	2007
4	Proposed decommissioning and relocation of the three gas turbine units at Acacia power station and one gas turbine unit at Port Rex power station to the existing Ankerlig power station in Atlantis Industria	2008
5	Construction of the proposed Westgate Tarlton Kromdraai 132kv powerline, Kromdraai substation and associated infrastructure , Mogale City and Randfontein Municipalities, Western Gauteng	2007