

**A critical review of the consideration of energy
alternatives in Environmental Impact Assessment
(EIA)**

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Abstract

Climate change, as well as the recent energy crisis in South Africa, has placed renewed emphasis on the need to consider alternative energy options for future developments. EIA can and should play an important role in ensuring that energy alternatives are considered in developmental decision making. The need to consider energy alternatives has already been highlighted as EIA good practice in various guidelines, as well as being explicitly required in relevant application forms. The purpose of this research was twofold. Firstly, to determine the extent to which energy alternatives were considered in EIAs for Metropolitan developments. Secondly, to identify the barriers towards improving the uptake and consideration of energy alternatives by environmental assessment practitioners, environmental authorities and developers. The results show that the consideration of energy alternatives is almost non-existent with very few cases of best practice. The barriers towards introduction of energy alternatives seem to be related to a lack of information and knowledge, institutional resistance to change, as well as general expediency.

Key words: climate change, energy crisis, energy alternatives, barriers.

Opsomming

Klimaatsverandering en die energiekrisis wat onlangs in Suid Afrika beleef is, het klem gelê op die belangrikheid van die oorweging van energie-alternatiewe vir ontwikkelings. Omgewingsimpakstudies kan en behoort 'n belangrike bydrae te maak tot die oorweging van energie-alternatiewe. In verskeie riglyne mbt omgewingsimpakstudies word die oorweging van energie-alternatiewe reeds voorgeskryf as beste praktyk. Die oorweging van energie alternatiewe word ook op sommige omgewings impak studie aansoekvorms as vereiste aangedui. Die doel van die studie was tweeledig. Eerstens is daar gepoog om vas te stel in watter mate energie-alternatiewe oorweeg is in omgewingsimpakstudies in 'n Metropolitaanse gebied. Tweedens is daar gepoog om die struikelblokke te identifiseer wat die gebruik van energie-alternatiewe sal verhoed deur rolspelers soos omgewingsassesseringspraktisyne, omgewingsowerhede en ontwikkelaars. Die bevindings het aangedui dat energie-alternatiewe bykans nooit oorweeg word nie, met 'n paar uitsonderings wat gerig was op uitnemendheid. Die struikelblokke wat verhoed dat energie-alternatiewe ingestel word, blyk 'n tekort aan inligting en kennis te wees, asook 'n ingesetelde weerstand teen verandering en 'n verset teen algemene raadsaamheid.

Sleutelwoorde: Klimaatsverandering, energiekrisis, energie-alternatiewe, struikelblokke

Declaration

I declare that this research report, apart from the contributions mentioned in the acknowledgements, is my own, unaided work. It is being submitted for the Degree Master of Environmental Management at the North-West University, Potchefstroom Campus. It has not been submitted before for any degree or examination at any other university.

(Signature of candidate)

_____ Day of _____ 2010

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Acronyms

AE	Alternative Energy
CCP	Cities for Climate Protection
CDM	Clean Development Mechanism
CEF	Central Energy Fund
CTMM	City of Tshwane Metropolitan Municipality
DSM	Demand Side Management
EAs	Energy Alternatives
EAPs	Environmental Assessment Practitioners
EIA	Environmental Impact Assessment
Esco	Electricity Services Company
GBCSA	Green Building Council of South Africa
GWh	Giga Watt hour
I&AP	Interested and Affected Parties
ICLEI	International Council for Local Environmental Initiatives
kV.A	kilo Volt Ampere
LTMS	Long Term Mitigation Strategy
MFMA	Municipal Financial Management Act
MSA	Municipal Systems Act
NMBMM	Nelson Mandel Bay Metropolitan Municipality
PV	Photo Voltaic
PPA	Public Private Agreement
RE	Renewable Energy
RET	Renewable Energy Technology
SEA	Sustainable Energy Africa
SWH	Solar Water Heater
TIEP	Tshwane Integrated Environmental Policy
USAID	United States Agency for International Development
WEC	World Energy Council

Chapter: 1 : Introduction

This chapter introduces the research and is structured as follows:

Section 1.1 provides background to this research, followed by the problem statement in section 1.2 and research questions in section 1.3. The chapter concludes in section 1.4 with a description of the structure of the research.

1.1 Problem Statement and research aim

The wise words of Thomas Jefferson: "*Then I say the earth belongs to each generation during its own course, fully and in its own right, but no generation can contract debts greater than can be paid during the course of its own existence*" quoted by Duerksen (2008) point to the importance of choices we make in our interaction with our environment.

The ultimate goal of this study was to explore to what extent "Energy Alternatives" (EAs) are considered and/or promoted during EIA processes. Environmental issues are assessed during the EIA process and alternatives (including energy alternatives) need to be assessed as required by legislation and policies. Developers are currently relying on conventional energy (in the South African context mainly generated by fossil fuel) when considering the energy use options for projects.

Energy is a critically important parameter for consideration when assessing the impacts of a particular project on the environment. The type of energy planned for new developments is supposed to be in line with legislation and government policies such as climate change, renewable energy and energy efficiency.

This study is structured around the importance of EAs and the barriers / drivers that can hinder or support its implementation. It investigates international and local examples. The legislation policies and strategies that guide energy on the local scene are mentioned and then the focus moves towards the EIA process in particular. The use of EAs in the EIA process is evaluated as EIAs are part of the tools that can be used in support of sustainable development. The

research finding is interpreted in terms of the use of EAs in EIA taking its project level status into consideration but also looking at the possibility that it can contribute to the bigger picture, with specific reference to climate change and the energy crisis in South Africa.

Winkler (2007) shows that the over reliance on fossil fuel based options makes South Africa a main contributor to CO₂ emissions and climate change. Sebitosi (2008) mentions that South Africa has been indicated as the world's 7th biggest emitter of green house gas (GHG) emitters. The emissions from the coal-fired power stations during the energy crisis that peaked in 2008 further contributed to the climate change equation. This came about due to the coal shortage that was experienced which led power stations to burn lower quality coal. According to Van Rensburg (2009) burning lower quality coal requires more coal as input to get the same energy output, with the obvious result of higher emissions.

Numerous studies have shown that the anthropogenic influences are causing environmental changes of which climate change is identified as one of the major threats due to the rise in temperatures, flooding, droughts, melting of glaciers and extreme weather conditions (Bryan *et al.*, 2009).

Zipplies, (2008) provides a bleak picture of the impact of climate change as the environmental change will cause an impact on the economic aspects such as reduced crops in agriculture, reduced trade from carbon conscious countries with those countries clinging to coal driven industries and reduced tourism due to biodiversity loss. The social dimension of society will be affected by hunger, increased health risks such as malaria due to floods, poverty due to job losses (as a result of the impact on the economy) and a potential increase in conflict due to pressure on water and food resources.

To make climate change more visible and bring it closer to home, the research of Professor William Bond of UCT is mentioned by Joubert (2006) regarding research in Hluhluwe-iMfolozi Park where he indicated the shift from savannah to woodland due to increased CO₂ concentrations. Another South African example is that of Foden who proved the prediction that the desert is moving in

a southern direction (Namibia to Namaqualand) according to research done on quiver trees (Joubert, 2006).

In the NFSD National Framework for Sustainable Development in South Africa (DEAT, 2006 a), climate change and air quality are specifically highlighted and it is indicated that a strategy is required to include areas such as clean coal technologies and renewable energy to combat the problem.

Over the last number of years Eskom has experienced an increasing gap between supplying electricity and the growing demand. The predicted shortfall became too clear to all electricity users in the country, when they started experiencing load shedding in the beginning of 2008. Sebitosi and Pillay (2008) quantify this shortfall to approximately 5 000MW (or just over 10%) of the South African electricity needs at the time.

Reliable, affordable and more sustainable energy options are available to assist with climate change mitigation requirements and could certainly assist to alleviate the current energy crisis in South Africa. Energy use with its undeniable impact on the environment should be one of the main impacts addressed by EIA. EIAs have the potential to enhance and support the use of EAs at the project level.

EAs can be seen as an aspect that can contribute exponentially towards sustainable development. Various supportive measures for the use of EAs have been identified, such as the South African sustainable development objectives (DEAT, 2006 a). Byer and Yeomans (2007) come to the conclusion that the reduced impact of climate change could be calculated when doing an environmental impact assessment. The energy alternative impact is measured against the fossil fuel energy equivalent, required for the proposed development. The GHG reduction of the EA can then be indicated as the "*avoided future emissions*" and the project's contribution to mitigation objectives (Byer and Yeomans, 2007).

On the other hand, there are also barriers preventing the implementation and use of EAs. Chineke and Ezike (2010) identify political will as a key requirement for the introduction of renewable energy (RE) options in

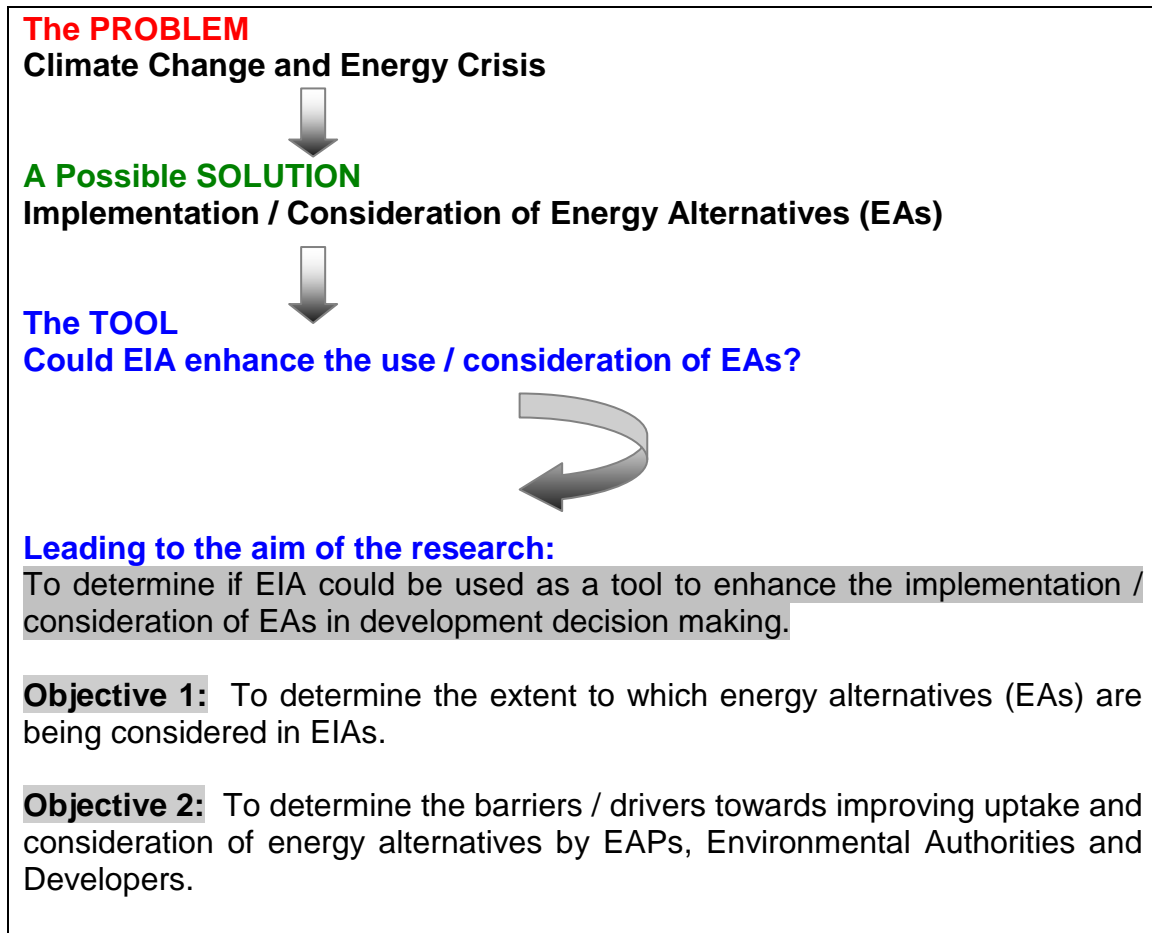
development. The lengthy process to get environmental authorisations, outdated legislation and “complicated building laws” to guide the building of wind generators are examples of the obstacles preventing EAs (Sebitosi and Pillay, 2008).

Despite the need to transform the energy system and the government objective to raise the proportion of renewables, the basis of energy supply is still firmly driven by the huge South African coal supplies. Tsikata and Sebitosi (2010) point to the impact on the environment by industries linked to energy supply such as coal mines. The shortage of skills to manufacture, finance and install RE, no enabling legislation and no common framework among the different spheres of government to promote the uptake of EAs are seen as constraints (Tsikata and Sebitosi, 2010).

The pressure on the energy supply can be relieved substantially if the potential of RE: “50% of total energy from RE by 2050” as sketched by Banks and Schäffler (2005) is implemented. The credibility of these “green technologies” is still doubted by the faithful from the coal power generation era. This viewpoint is supported by the latest National Integrated Resource Plan (NIRP) that indicates the insufficient ability of EAs to meet the country’s energy requirements (NERSA, 2008). One can come to the conclusion that EAs have been pushed to the sideline. Our dependence on coal seems to be confirmed and the prospect of sustainable energies is not seen to be such a significant contributor to the economy and growth as is the case in many other developing countries.

Figure 1.1 provides a conceptual summary of the research problem and related research objectives. In short, it argues that the consideration of EAs can contribute towards South Africa effectively dealing with both the climate change and energy crisis. However, the consideration of energy alternatives in developmental decision making remains problematic. In view of the latter, one of the possible solutions would be to use the EIA system to introduce the consideration of EAs. Therefore, the objective of this research is to explore if EIA could indeed be used as a tool to enhance the consideration and implementation of EAs in developmental decision making.

Figure 1.1 Conceptualisation of the research aim.



1.2 Research questions

The main research question to address the problem statement described in the previous section is:

Can EIA be used as a tool to enhance the implementation / consideration of EAs in development decision making?

To address the research question above, the following sub-research questions will be answered:

1. What is the legal context and policy framework guiding the consideration of energy alternatives (EAs) within the South African context?
2. What provision is made for energy alternatives (EAs) to be considered in EIA?
3. To what extent are energy alternatives (EAs) considered in EIA?

4. What are the **barriers** to improving the uptake and consideration of EAs by Environmental assessment Practitioners (EAPs), Environmental Authorities and Developers?
5. What are the **drivers** for improving the uptake and consideration of EAs by EAPs, Environmental Authorities and Developers?

1.3 Structure of the research

Table 1.1 illustrates the phases in the research process as well as the link between the research questions, methods used to address the question and the chapters in the mini-dissertation.

Introduction and Methodology

- Chapter 1: Introduction – the research is introduced referring to the problem statement, the main aim and research questions.
- Chapter 2: Methodology – a description of the methodology used to assess the research questions stated in chapter 1.

Phase 1: Definition and the design of the research

This phase addresses the sub-research questions 1 and 2 as indicated in section 1.3.

- Chapter 3: The concept of EAs and the legal / policy framework.
- Chapter 4: EAs and the provision for it in EIA

Phase 2: Preparation, collection and analysis of survey data

This phase addresses the sub-research questions 3, 4 and 5 as indicated in section 1.3.

- Chapter 5: Data analysis and survey results

Phase 3: Conclusion

In this phase conclusions and recommendations are made after reflecting on the literature and research results.

- Chapter 6: Conclusion

Table 1.1 Structure of Dissertation

RESEARCH QUESTIONS (see sections 1.3)	METHODS (see Chapter 2)	RESEARCH PROCESS (see section 1.4)		CHAPTERS (see section 1.4)
Sub Research Questions 1. What are the legal context and policy framework guiding the consideration of energy alternatives (EAs) within the South African context?	Literature review (see section 2.3)	Phase 1: Define and design	Step 1: Conduct a literature review on the: Concept of EAs Legal context Policy framework guiding EAs within the SA context.	Chapter 3: The concept of EAs and the Legal / Policy framework.
2. What provision is made for EAs to be considered in EIA?	Literature review (see section 2.3)		Step 2: Conduct a literature review to analyze the provision for EAs to be considered in EIA.	Chapter 4: EAs and the provision for it in EIA.
3. To what extent are energy alternatives (EAs) considered in EIA?	Survey: - Document Review - Interviews (see section 2.4)	Phase 2: Prepare, collect and analyse	Step 3: Assess the use of EAs in EIA documents	Chapter 5: Data Analysis and Survey results.
4. What are the barriers to improving uptake and consideration of energy alternatives by EAPs, Environmental Authorities and Developers?	Survey: - Document Review - Interviews (see section 2.4)		Step 6: Conduct interviews regarding the support of EAs in EIA practice	
5. What are the drivers for improving uptake and consideration of energy alternatives by EAPs, Environmental Authorities and Developers?	Survey: - Document Review - Interviews (see section 2.4)	Phase 3: Conclude	Step 5: Draw conclusions	Chapter 6: Conclusions
OVERALL RESEARCH QUESTION To determine if EIA can be used as a tool to enhance the implementation / consideration of EAs in development decision making.			Step 6: Reflect on literature and research results	

Chapters 1 and 2: Introduction and Methodology

Chapter: 2 : Methodology

This chapter describes the research methodology applied to address the main research question introduced in chapter 1, namely:

Can EIA be used as a tool to enhance the implementation / consideration of EAs in development decision making?

The following is an outline of the sections contained in this chapter:

Section 2.1 introduces the research design and then deals with the terminology concerning energy alternatives. This is followed by an explanation of the literature review, document reviews and interviews in sections 2.2 to 2.4. The chapter concludes by highlighting certain challenges for the research in section 2.5.

2.1 Research design

A “mixed research strategy” was followed that included a literature review, document review and interviews. The purpose of the research is to evaluate the extent to which EAs are considered in EIA documentation within the City of Tshwane Metropolitan Municipality (CTMM). The evaluation research design as explained by Robson (2002) is a systematic approach to assess policy interventions and their application, which seems very applicable to this research and was therefore adopted.

Against this framework, the researcher attempted to describe the background and to indicate to what extent the EIA can act as a decision aiding tool to assist in implementing legislation and policies, relating to energy.

The data for the research were collected in the following ways:

- ✿ A number of EIA reports were assessed to determine if energy alternatives were addressed and to what extent they influenced the energy requirements of a project. The documentation review also indicated the attempt made by Developers in the Tshwane Metro to assess alternative energy options when submitting EIA Applications.

- ✿ Secondly, semi-structured interviews were conducted. The use of interviews was chosen as the most suitable data collection method as it provided a cost- and time-effective approach to acquire information. Robson (2002:270) indicates that interviews can be used as primary approach for a survey.

The semi-structured interview design was used. Kvale (1996) defines qualitative research interviews as "*attempts to understand the world from the subjects' point of view, to unfold the meaning of peoples' experiences, to uncover their lived world prior to scientific explanations.*" The interview option is a powerful tool for the planned small scale survey and can provide the researcher with good qualitative information.

This study wanted to identify action or inaction taken by authorities when assessing energy use in proposed developments. They need to take into account that the use of EAs will ultimately have a positive impact on global warming / climate change and the energy crisis. Another objective with the interviews was to establish whether the relevant authorities were planning to address these impacts and their proposed solutions for shortcomings.

The interviews enabled the researcher to get responses from developers, government officials in local government and the environmental authority involved with the EIA process, as well as Environmental Assessment Practitioners (EAPs). The responses of the four survey groups were analysed, discussed and interpreted to draw conclusions in relation to the defined problem.

Table 2.1 Advantages / Disadvantages of interviews (adapted from Robson, 2002).

Advantage	Disadvantage
Flexible and adaptable	Lack of standardisation can raise concern about reliability
Can ask people directly if a response is not clear	Biases difficult to rule out.
Can modify the enquiry when detecting an interesting response or underlying motives.	Time consuming
High response rate	Can be difficult to achieve rapport
Misunderstandings can be corrected	Interviewer needs to be skilled

A descriptive literature study was used to illustrate the energy alternative concept and its influence on environmental issues in South Africa. It was further used to highlight legislation, policies and guidelines available to enhance the use of EAs, specifically pointing to the provision that is made for its use in EIA.

The research was conducted against the background of developments within the City of Tshwane Metropolitan Municipality (CTMM) area. The CTMM was regarded as a good example to use in this study for various reasons. The Metropolitan Municipality operates within the boundaries of the capital city with their objective to provide sustainable municipal services, to enhance the quality of living of all residents through coordination, oversight and monitoring. A requirement of local government is to act as a necessary innovator and implementer of sustainable development and against this background the CTMM has initiated a number of “green projects”. The potential contribution of EAs to sustainable development was realised by some officials and a number of projects were implemented.

The metropolitan area was determined as the focus boundary and enabled the researcher to make meaningful interpretations for the mini-dissertation. The municipal area was also “demarcated” or defined as the study area. Within this identified area it was determined, to what extent energy alternatives (EAs) were considered in terms of EIA requirements.

2.2 Dealing with terminology

In order to avoid confusion it is important to clearly explain what is meant by energy alternatives (EAs) versus other related concepts such as renewable energy (RE) and energy efficiency (EE). For this study all energy other than the conventional option of electricity generated via a coal-fired station were seen as energy alternatives (EAs).

2.3 Literature review

A review of literature was conducted to obtain a broad overview of key concepts related to EAs and their role in environmental issues. The types of literature studied, included academic articles, government documents, reports, framework- and guideline documents and legislation.

Scientific articles were consulted to find and identify practical alternative energy options to be considered in the study. Drivers and the barriers, which can contribute to enhancing or preventing the use of energy alternatives, were also explored. EA options and their potential benefits / implications for the EIA process or requirements were investigated. A qualitative measurement of the possible contribution of EAs was linked to the EIA. The possibility of the EIA process contributing to the increased use of EAs within the metropolitan area was seen as the desired outcome.

In the case of achieving the above-mentioned result it could further indirectly contribute to reducing South Africa's large dependency on fossil fuels (coal) and the energy demand, as well as supporting climate change mitigation efforts.

This overview shows that there is an international trend to move away from the use of conventional energy and to promote the use of energy alternatives. The descriptive literature study also provides the background to gain a full understanding of the topic.

In view of the current world wide climate change challenge and more specifically the energy crisis in South Africa it seems as if there is an information explosion with regard to energy considerations. It is problematic to keep up to date with the latest articles and information with regard to the

literature review. The information with regard to the role of the EIA in promoting sustainable development and specifically addressing EAs still seems to be very limited. This caused a problem in linking the review with the specific results of the records and interviews.

2.4 Review of Reports

Basic Assessment and Scoping reports were reviewed to determine the extent to which EAs were considered (See Annexure A for a list of the reports that was included in the review). These reports included mainly EIAs for Metropolitan Developments, such as residential development and office development. A total of 34 Environmental Reports were covered in the review.

Table 2.2 provides a summary of the findings, regarding the number of Basic Assessment Reports and Scoping Reports that were evaluated to get an indication of use of energy alternatives (EAs) within EIA reports.

Table 2.2 The number of Basic Assessment Reports and Scoping Reports evaluated

Nr of Reports	Nr of Reports with no indication of EAs use	Nr of Reports with an indication of EAs use
34	28	6

2.5 Semi-structured Interviews (refer to Annexure B for an interview schedule)

The structured interviews were used to obtain information from the respondents with regard to the use of EAs and to investigate the extent to which EIA could assist in enhancing the consideration of EAs.

Four distinct role players were identified for inclusion in the interview sample, namely:

- **Department of Environmental Affairs and Tourism (DEAT)**
DEAT is responsible for the issuing of environmental authorisations based on the content of EIAs. Therefore, their views are important to highlight what is expected from a regulators perspective.

- **Local Government (Environmental Management Department)**
They need to ensure that environmental legislation and policies are executed and need to assess all requests for development. They co-ordinate all development requests with city planning officials. They have to ensure that development projects comply with the IDP, environmental legislation / policies and are in line with spatial planning guidelines.

- **Developers**
They need to be informed about legislation, policies and requirements when planning a development. They can include EAs at the design stage of a project. They can also play an important role to influence energy choices in the construction and operational phases of the development.

- **Environmental Assessment Practitioners (EAPs)**
They need to have an overview of climate change, legislation and available options that can mitigate the impact of the development. EAPs need to minimise the negative environmental impacts of a development during the EIA process. The practitioners also need to guide the decision makers to evaluate alternatives in support of sustainable development. EAPs can “educate” and inform other stakeholders about the types and possibilities of EAs and how they can contribute to reduce GHG emissions. EAPs have an important role to be a “change agent” for EAs. As part of the EIA project team they can influence developers, architects and engineers about the positive environmental results that can be the result of implementing EAs.

The interviewer designed the questions to test the perceptions of respondents and their thoughts on the use of EAs in the EIA documents and process. As proposed by Leedy and Ormrod (2005:93), during the interviews the same questions were used in a short time-span, enabling the data collected to be comparable and to ensure that the study is repeatable and valid.

The interviews started with information about the purpose of the study and how the results from the interview would be used. The importance of the contributions of the respondents was highlighted. The questions were asked in

a specific order but the respondents were allowed to elaborate and to clarify their responses. Personal information required was limited. Questions were structured in such a way that responses could be cross-checked to assist with the process of verification (refer to Annexure C for the interview questions). At various stages the respondents were invited to make comments and to give their opinions and suggestions. This was done not only to test the quantitative aspects, but also to add a qualitative dimension to the survey.

Some of the typical questions asked during the interviews were:

1. How effective do you feel the use of alternative energy is in new developments within your metropolitan area?
2. How effectively do you believe developers focus on EAs at the planning stage of a development?
3. In your view, how strongly do current legislation/policies successfully support the use of alternative energy?
4. How strongly does the EIA process support the effective implementation of alternative energy?
5. Give the three most significant **drivers** that will support the successful implementation of alternative energy.
6. Give the three biggest **barriers** in the effective implementation of EAs by developers?
7. How effectively do you believe the EIA documentation/process addresses the EA issues within your metropolitan area?
8. If you believe that there are shortcomings within the EIA documentation/process, make **three recommendations** to enhance the effective use of EAs.
9. How significantly will the energy crises in South Africa be improved with the effective implementation of a policy that demands EAs?

Interviews were designed to

- ✿ better understand the links between Environmental Legislation/Policies and the use of Alternative Energy in Metropolitan Developments;
- ✿ test perceptions and capture the respondents' thoughts on how effectively EAs were addressed in the EIA process;
- ✿ establish specific constraints and solutions to the use of EAs;

- ✿ establish whether EIA could really affect the outcome of the use of EAs; and
- ✿ get comments and suggestions with regard to enhancing the use of EAs.

Ultimately the interviews aimed to address research questions 3, 4 and 5, as explained in Chapter 1.

2.6 Challenges for the research

The research presented the following challenges to be considered in the design and implementation of similar future research designs:

- The varied knowledge of stakeholders in terms of their understanding of energy alternatives and its role within EIA posed a challenge. It was clear during the interviews that different interpretations and views of seemingly commonly understood concepts such as sustainability, energy alternatives, global warming, etc. existed. Moreover, energy alternatives, green energy and renewable energy are all aspects that have a common thread but needs to be clarified / defined to assist and guide communities in promoting its use in a practical way. Therefore, the research had to consider these different interpretations and understandings in the analysis of results. The following serve as examples of the latter:
 - Sustainability as the framework for development seemed to be a “contested concept” to some officials.
 - The, at times, very narrow view of the concept of alternatives within EIA, was a challenge to the concept of energy alternatives not always featuring as options.
- Legislation and policies seem to be lacking clarity to guide stakeholders in terms of the consideration of energy alternatives and the part it is supposed to play to ensure overall sustainable development. Another area that posed a specific problem was the energy alternative and energy efficiency objectives in documents of the CTMM that were not well communicated and had no action plans / projects to ensure execution.

- Climate change and the challenge to deal with global warming did at times seem to be overwhelming to some of the interviewees.
- Finally, due to the dynamic changes in the legislation within the field of environment and energy alternatives, a cut off-date of the 10th of April 2010 was set for the research.
- It is important to note: In the part of the study that deals with legislation, a White Paper can be regarded as a statement of intent or a broad statement of government policy that is still open for comments (Sabinetlaw, 2010). In the White Paper on the Promotion of Renewable Energy and Clean Energy Development (DME, 2004) the Government's principles, goals and objectives for RE are stated with the objective: *"10 000 GWh renewable energy contribution to final energy consumption by 2013"*. Many people were unsure and frustrated by not knowing if this document could be regarded as the official policy or not.

Chapter: 3 : Key concepts of EAs and the legal and policy framework

This chapter aims to address **research sub-question 1**, namely:

What is the legal context and policy framework guiding the consideration of energy alternatives (EAs) within the South African context?

EAs is a much discussed topic but few people understand the impact on the environment and, even less, can point to the legislative and policy guidelines related to EAs. Therefore, the following chapter explores the key concepts and South African legislative framework related to EAs.

The following is an outline of the sections contained in this chapter:

The first section 3.1 introduces a definition and provides general information on Energy Alternatives (EAs) followed in section 3.2 to 3.5 by an indication of the legislation and policy framework guiding energy aspects within all three spheres of government. Finally conclusions are made in section 3.6.

3.1 Energy Alternatives: A Definition and general information

Renewable Energy (RE) as quoted in Verbruggen *et al.* (2010) is defined as: “energy obtained from the continuing or repetitive currents of energy occurring in the natural environment” (Twidell and Weir, 2006) and as “any energy source that is naturally regenerated over a short time scale and either derived directly from solar energy (solar thermal, photochemical, and photo-electric), indirectly from the sun (wind, hydropower, and photo-synthetic energy stored in biomass), or from other natural energy flows (geothermal, tidal, wave, and current energy)” (Cleveland and Morris, 2006).

DME (2004) regards Renewable Energy (RE) as energy coming from a source that is naturally available and a source to assist South Africa to be less

dependent on fossil fuels, and very important, to reduce emissions and support sustainable development.

Some authors refer to “green electricity” which, according to Hammons *et al.* (2000), is electricity generated without using fossil or nuclear fuel. This equation includes the view that Energy Efficiency (EE) contributes to saving the environment by allowing for the release of less harmful emissions.

In this study Energy Alternatives (EAs) include RE, EE and “green electricity”, as described in the above paragraph and including the following:

- ✿ Energy contributing to the sustainable design elements of a project.
- ✿ Energy-saving architectural features.
- ✿ Energy-conserving building shell.
- ✿ Energy-efficient mechanical devices such as water heaters and lights.
- ✿ Renewable energy from natural sources such as solar, wind, biomass and geothermal.
- ✿ Fossil fuels such as gaseous and liquid fuels, claimed to have a lesser impact on the environment than electricity produced via a coal-fired power station.

3.2 Climate Change

One of the most prominent documents and a relevant indicator regarding climate change, is the Stern Review published in 2006, (Stern, 2006). The Review highlights the risk that needs to be grasped by governments posed by the major changes in temperature and rainfall that are predicted. Stern (2006) further notes that “*The poorest countries are most vulnerable to climate change*” and this calls for strong action by everybody to reduce carbon emissions. The impact on the economies of developing countries will be threatened due to probable flooding, bio-diversity loss, drought, crop losses etc. Reducing poverty amongst any population under these circumstances will be anything but possible.

The Stern Review has made many realise that climate change is one of the greatest threats to our planet and that this serious issue requires governments to apply their minds when considering mitigation and adaptation policy

directions (DEAT, 2007 b). According to DEAT (2007 b) the Stern document is a sensible and pragmatic document that provides economic reasons to take action with regard to the climate change issue to ensure that future generations do not suffer due to this generation's lack of care.

Post Kyoto assessments of climate change all require that measures be implemented to support sustainable energy demand according to Streimikiene, and Girdzijauskas (2009:134). Elliott (2003) points to studies claiming that 80% of the world's energy needs could be met by RE means by the year 2100.

Burning fossil fuel to supply energy is deemed to be the most important contributor to climate change by increasing GHGs. Energy is required for development and if sustainable development is the aim, the focus should be to adapt or mitigate climate change according to Davidson *et al.*, (2003) in Kok and de Coninck (2007).

As suggested by DME (2004) and Winkler (2005) RE can assist in reducing the impact of emissions on the environment and produce energy in an affordable and environmentally sustainable way.

The South African government has set a target of 4% of all energy to be supplied by RE in 2013 (DME, 2004). Winkler (2005) mentions that the Sustainable Energy and Climate Change Partnership (SECCP) requested government to adapt the target to 10% electricity generated by RE by 2012.

We are falling far short of 4% by 2013 target as indicated by Marquard *et al.* (2008) who calculated that RE was contributing only 0.5% to the total electricity generation, see Figure 3.1. Van der Merwe (2009 b), noted the scepticism about the government reaching the stated target in view of DEAT's response, stating that "*the country was producing less than 1% of the renewable energy target*" at the time (2009).

In DEAT (2008) clear indications are given with regard to climate change interventions and the implementation and monitoring of actions. It also addresses the electricity crisis, clearly stating that Energy Efficiency (EE) and Renewable Energy (RE) policies / strategies should be brought in line with the

Long Term Mitigation Strategy (LTMS) targets. Another important objective in this document points to the planning to complete the final National Climate Change Response Policy and to publish it in 2010 (DEAT, 2008).

According to the (EIA, 2007) coal provides about 88% of the total primary energy and supports about 90% of electricity generation in South Africa. Electricity generation from coal contributed more than 53% to the national CO₂ emissions in 1994 (DEAT, 2000). The situation is illustrated in Figure 3.1.

Figure 3.1 Electricity Supply in South Africa by Energy Source (NERSA, 2007).

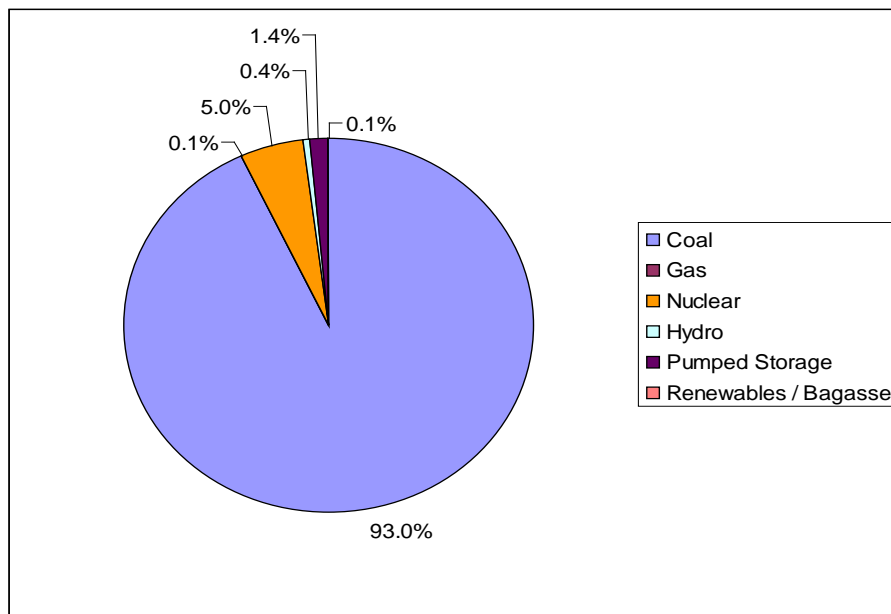
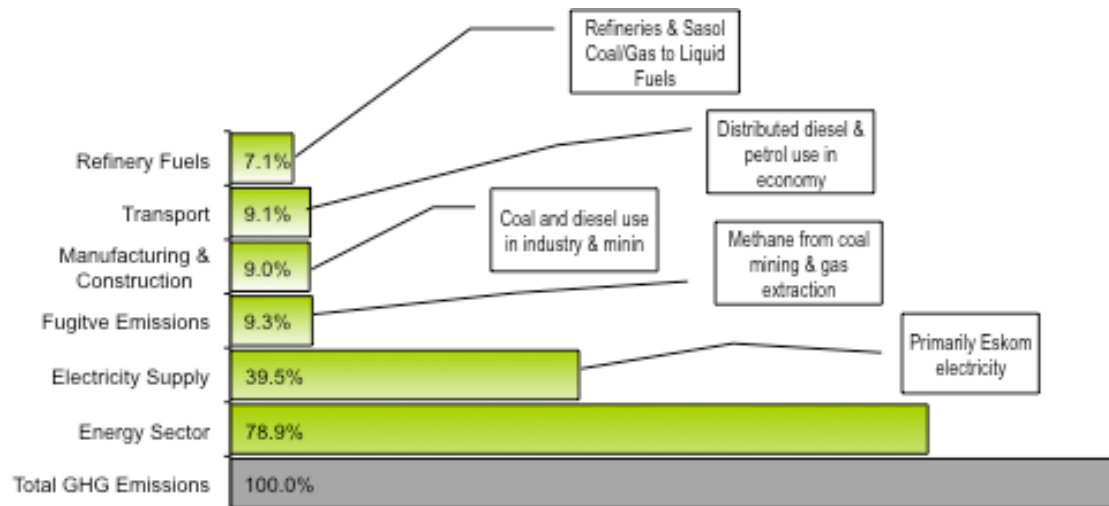


Figure 3.2 gives an indication of the emission profile in terms of its source within the South African economy, as well as highlighting the areas that will require special attention to reduce their impact (DoE, 2009).

Figure 3.2 Contribution of Energy Sector to South African GHG Emissions in 2000: Greenhouse Gas Inventory (DEAT, 2009).



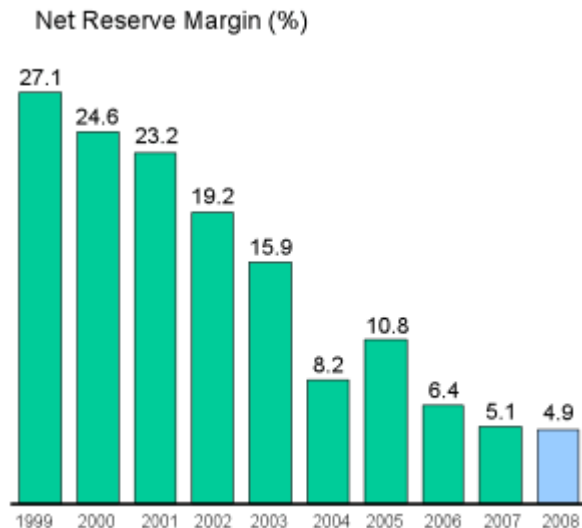
Therefore, the consideration of EAs is a crucial consideration in South Africa to reduce the impact of the carbon intensive energy sector and move closer to the set mitigation targets.

3.3 Energy Crisis

The energy crisis, predicted for South Africa during the late 1990s realised in April 2008, when load shedding was introduced and many businesses, households and commuters had to adapt to this “new reality” (Winkler, 2007). This situation was caused by various factors such as the decision to increase the capacity of private generation in 1998 to reversing the decision in 2004 (Eskom, 2008). The reserve margin of electricity supply which dropped to about 5% in 2008 is clearly illustrated by Figure 3.3. International best practice stipulates a reserve margin of between 15% and 25% (Eskom, 2008).

Other aspects that led to the energy crisis were the above-average economic growth that led to a higher demand for energy, a higher demand for export coal that led to a cut on quality and quantity for local supply and blockages in the logistical chain to the power stations applied further pressure on the operations (Eskom, 2008).

Figure 3.3: South Africa's net reserve margin since 1999 during the winter peak (Eskom, 2008).



Sebitosi and Pillay (2008) are very critical of the monopoly that exists within the electricity supply arena and are of the opinion that Eskom is not planning to divert from coal as the main energy source to generate electricity, despite a number of positive strategies to support RE. The lack of competition in the electricity supply market has been an aggravating factor leading to the supply shortage, but as stated previously, the government is to blame for the situation by dragging their feet and changing the policy backwards and forwards.

The Eskom business objectives reflect the viewpoint that their aim is to sell electricity generated by coal and they cannot afford to put an all out effort into developing alternative energy sources. Customers are at the mercy of Eskom's business decisions, whether good or bad. If they do not plan well or do not get the funds to build generation plants, they cannot ensure that the country's demand is met, and this further contributes to the energy crisis.

Other factors that could have contributed to the energy crisis are the lack of maintenance caused by funds routed to other areas. The lack of funds to do maintenance on electricity networks in municipalities causes a great risk to the infrastructure and could lead to system failures. Moreover, illegal connections increase the demand on the system to a capacity far above the designed capacity and also above safety standards. The commitment of government to ensure access to electricity to all by 2012, as indicated by Prasad (2007), will make the situation more challenging.

Kok and de Coninck (2007) states that energy security should be ensured via policies supporting reliable and affordable energy. Currently the “cheapest” energy is generated with fossil fuels and it contributes to making the situation more complex as the cost of health problems (caused by air pollution) is not added.

Winkler *et al.* (2006) show that the demand for energy from the residential sector in Cape Town was about 14% of the total energy requirements for the city. Table 3.1 shows the energy requirements of this sector. They further state that the economy and the population growth will be the main drivers for the demand for more energy. The criteria used in this study of the residential sector and its electricity requirements are providing a clear picture of how policies and technology for energy alternatives can be used to address the high demand. Just as public investment was used to establish the electricity grid and distribution system, public investment should now be used to selectively encourage cleaner and renewable energy.

Table 3.1 Residential energy consumption of the City of Cape Town in 2000 indicated in TJ, adapted from (Winkler et al, 2006).

	Low Income Households	Medium to High Income Households
Lighting	436	1088
Cooking	6817	1490
Water Heating	342	3836
Total	7595	6414

Kueck and Kirby (2003) warned the energy industry that, “*The distribution system of the future is going to be as much a revolution to the electric energy industry as the wireless telephone has been to the consumer electronics*”. The reality in South Africa shows that government funding for EAs is limited and predicted employment opportunities have not realised yet. More intensive support measures from government are required to promote and establish the EA industry. The efforts of Eskom for tenders to get independent power producers (IPPs) were depicted by Sebitosi and Pillay (2008) as a half-hearted effort.

On the other hand, government states that RE will be an important part of the plan to reduce South Africa’s dependence on coal-fired power stations and it is

the intention that the Integrated Energy Plan (IEP) will ensure that these alternative energy sources are developed (DME, 2004).

As indicated by DoE (2009) the measures guiding RE / EE are of the utmost importance to ensure that the emission reduction targets are reached in line with the LTMS commitments.

One of the ways to enhance the use of EAs, as suggested by Sebitosi (2008), is to convince government to reward customer's behaviour when energy efficient operations, regardless of the type of technology, are used to get the result. Growing the EA market will relieve the pressure on electricity demand.

3.4 Barriers that need to be overcome before introducing EAs

The literature review conducted for this research highlighted the following key barriers to the introduction of EAs.

Growing population and avoiding GHG emissions

The growing world population and its demands for cheap energy deprive most governments in developing countries of the opportunity to plan properly and to get policies in place to support the use of RE. According to Omer (2008) hardly any long-term energy planning is done with the environment and sustainability in mind. He further states that a Photovoltaic (PV) system with a 1kW capacity (150 kWh per month) can save as much as 150 kg of CO₂ from emissions and 473ℓ of water during a month.

Financial constraints

Alexandre and De Michelis (1996) address the importance of financial constraints that have to be overcome to ensure that EAs can be part of the energy market. This document further indicates that the payback time required by investors to get a return on their money seems to be one of the major "barriers". It is suggested that funding mechanisms should be established to encourage RE and EE schemes. Electricity utilities can offer rebates to customers if they comply with certain saving standards. On the other hand, they can sometimes make investments such as supplying energy saving lamps

to customers free of charge. The utility will pick up the savings of these EE savings over a period of time.

Looking at the South African scenario, Earthlife Africa (2009) mentions that illnesses and environmental damage caused by electricity generated via coal-fired power stations are not being taken into account when electricity tariffs are determined or new power stations are planned. These circumstances lead to the reinforcement of the perception that Eskom is supplying “cheap energy” and RE in comparison seems to be unable to compete on economic grounds.

✿ Lack of Knowledge

Martinot (2004) argues that progress has been made in terms of narrowing the cost gap between RE and conventional energy but the lack of knowledge by the public and policy makers has ensured that RE options are hardly considered to be part of developments.

The public should be informed and should play a bigger role to promote the understanding that EAs play an important part in avoiding GHG emissions. Apart from the environmental benefits, a number of studies also point to the favourable societal benefits, such as more employment opportunities in RE markets. Rajvanshi (2009) indicates that PV and SWH system technologies can provide 50–100 jobs per MW.

If the “hidden” cost of conventional energy is accounted for, the cost benefits of RE seems to be far better and the economic aspect of sustainability can also come into play. Technology improvements and more effective information to the markets can contribute to the support of EAs.

Nandi and Basu (2008) quoted by Sebitosi (2008) mention the lack of customer awareness, political interference and a lack of funding for EA investments as the main barriers.

✿ Lack of supportive policies

Developing policies and setting RE targets are an important part of the process to enhance the use of RE but the effectiveness and impact of these policies are the aspects that should be assessed, according to Martinot (2004). According to him it is of the utmost importance to increase the use of RE for

“economic, environmental, and geopolitical stability reasons” and he supports the view of Royal Dutch / Shell (2001) where they indicate that 50% of the world energy requirements could be supplied via RE by 2050.

Some efforts have been initiated in South Africa, such as the Vision 2050 project mentioned by Gewer (2009), where Eskom and members of World Business Council for Sustainable Development (WBCSD) have indicated that they are creating a framework to ensure sustainability by looking at strategies around the world to guide behaviour and practices.

The bigger picture should always be kept in mind when measures and policies are designed. The question that should be addressed is whether the measures and policies are benefiting the community as a whole and whether accurate information can be derived from it that will enhance good decision making. Good “Policy” should not only be good on paper but should be judged with respect to how effectively it addresses the needs of the citizens.

Common barriers experienced in South Africa

Reddy (2008) points to a specific number of barriers that prevent cities to roll out RE plans, such as:

- Absence of a national framework to support investment and production costs.
- Municipal Financial Management Act (MFMA) and Municipal Systems Act (MSA) preventing cities to take on contracts with private investors.
- NERSA preventing cities to add generation cost of RE to the end user.
- Technical and legal complexities to implement contracts and arrangements due to NERSA and Eskom requirements.
- Lack of available expertise in Municipalities.
- Process of EIA and feasibility assessments are deemed to be too long.
- Role of South African cities not clear on purchasing and selling green energy. The contradiction experienced is that cities are responsible for long-term growth but are not allowed to take the risk when planning for development and a “clean” environment.

✿ Lack of Political will.

Sebitosi and Pillay (2008) are very critical of the government regarding their commitment to RE as they indicate that statements in the White Paper on RE point to a number of actions that had to be taken, but since the document was written none of these “promises” have come to fruition.

It has been indicated by Sebitosi and Pillay (2008) that Metros such as the City of Cape Town and Nelson Mandela Bay Metropolitan Municipality (NMBMM) have plans to purchase power from private firms generating electricity via wind power. The Director Projects at NMBMM reported that they had to sign a contract with the Central Energy Fund (CEF) to avoid restrictions of the MFMA (pers comm. Neilson, 2008).

One way of getting around the barrier of establishing smaller IPPs is to allow long-term contracts, fixed prices and access to the grid (Winkler, 2005). New entrants on the RE scene need an opportunity to establish themselves and to get a reasonable contract to ensure that they can get their money back on the investment. The situation can be to the disadvantage of government and customers if a contract ties them down to non-competitive prices, as cautioned by Eberhard, (2000) and Clark (2001) in Winkler (2005).

Table: 3.2 Common Barriers to Renewable Energy, Adapted from (Martinot, 2004).

Category	Barrier	Possible Solution
Cost	◦ Fuel costs associated with conventional power	◦ Include Environmental cost.
Pricing	◦ RE High Capital cost but low operating cost.	◦ Financial incentives.
Marketing	◦ Lack of sufficient technical, geographical or commercial information.	◦ Establishment of technology support centres. ◦ Promotion of employment opportunities. ◦ Design standards, siting and permitting requirements, equipment standards. ◦ Contractor education and licensing.
Education	◦ In terms of conventional energy people are not educated in terms of the environmental damage and impact on health.	◦ Awareness programmes to show the real economic costs of environmental damages from fossil fuels (on human health, infrastructure, and ecosystems).
Legislation	◦ IPPs cannot sell electricity to grid without proper legislation.	◦ Lobby politicians to support alternative power suppliers. ◦ Provide access to transmission lines and reasonable pricing structures. ◦ Electricity feed-in laws. ◦ Reduce capital costs up front (via subsidies and rebates) ◦ Reduce capital costs after purchase (via tax relief). Offset costs through a stream of payments based on power production (via production tax credits) ◦ Provide concessionary loans and other financial assistance. ◦ Reduce capital and installation costs through economies of bulk procurement. ◦ Long-term performance related incentives
Political will	◦ Unwillingness of politicians to commit to RE targets and to support effective policies.	◦ RE Targets ◦ Pollution tax ◦ Support capacity building

3.5 Drivers of effective EAs implementation

Internationally it has been found that the major barriers to market penetration are a lack of awareness and policies - and the initially higher capital costs of solar water heaters (SWHs). Markets grow where government policies help in overcoming these barriers by promotion (awareness creation) and incentives with reference to countries such as Japan, Israel and Australia with mandatory requirements regarding SWHs for new buildings (Martinot, 2004).

Although Martinot (2004) argues that creating green energy markets will send out a positive message by government regarding the support of EAs, one needs to take cognisance of the fact that South Africa is a developing country

and in the opinion of Winkler (2005) not many people will be willing or able to pay a premium for “green energy”.

Since the 1970s people in the US have indicated that they are prepared to pay more for energy if they could get a cleaner environment as part of the deal. Chineke en Ezike (2010) have indicated that RE is supported by 87% of the people in Nigeria. These perceptions indicate that people value their environment and are prepared to make tradeoffs for alternatives. This viewpoint is supported by Hammons *et al.* (2000) where customers indicated their preference to purchase green electricity as that would give them the opportunity to make a tangible contribution to the environment.

Brown (2001) cautions that market failures could sometimes be experienced and that policies need to be formulated to assist in overcoming barriers. She further points to the importance of customer awareness and suggests information programmes to assist them with decision making, supplying technical assistance and product ratings to enhance the use of EAs. These small steps can contribute to support a bigger national effort of energy efficiency (Brown, 2001).

The city of Curitiba and Jaime Lerner as mayor, stand out as one of a number of examples of “daring mayors” across the world who initiated change to bring about sustainability and enhance the use RE (SCN, 1995).

In Sao Paulo, Brazil, Mayor José Serra pushed through legislation that made installing solar water heaters obligatory in new buildings and those undergoing major reconstruction Osava (2006) mentions the “barrier” of cost that had to be overcome with an electric water heater costing \$10 and an SWH \$600.

Bolinger *et al.* (2001) mention important incentives such as System Benefit Charges (SBC) to promote RE or clean energy technology in the USA. Examples mentioned by them are:

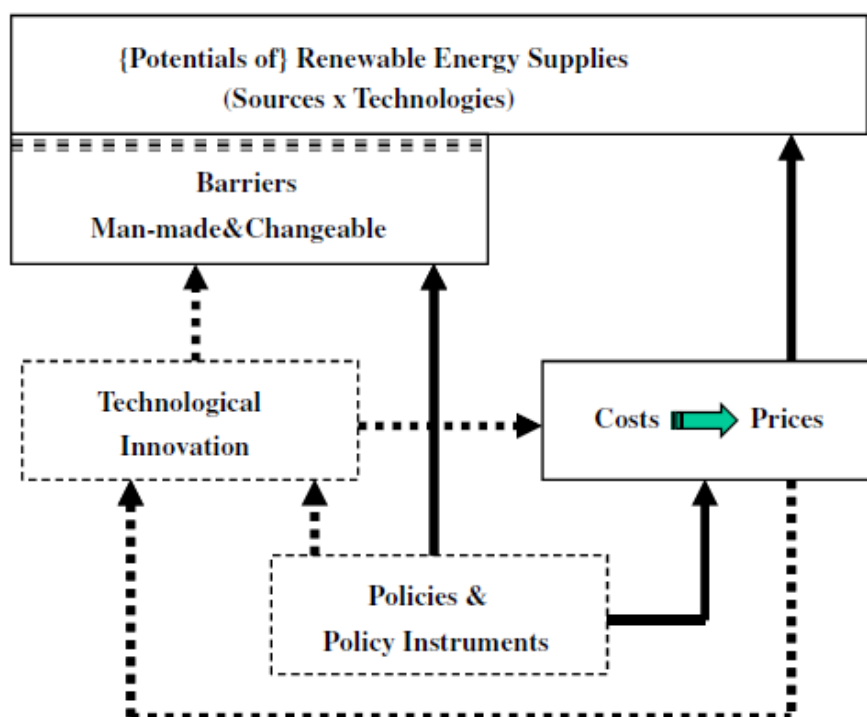
- Grants and productive incentives
- Equity and debt investments
- Tax incentives

Once large customers start to venture into the RE market there is a tendency of other customers to follow suite. This is possibly the result of more articles in the media that create a bigger interest / awareness and fulfilling the role of “educating” people about the value of green energy.

In the process to lessen the impact on the environment due to energy requirements, governments need to create the milieu (policies and market) to “motivate” people to support the use of EAs. Hadley and Short (2001) support this approach and mention that the environmental cost should be included in the cost of electricity provided and innovations to combat harmful emissions should be rewarded. They also argue that government should relax policy requirements such as the National Environmental Protection Act (NEPA) with stipulations such as avian, archaeological and flora/fauna studies for sites demarcated for RE sources. These suggestions to allow exclusions could cause confusion if implemented without proper consultation. If executed within a framework, guided by standards it could be received more positively.

Verbruggen *et al.* (2010) describe different options to integrate RE options into policies / markets and indicate the interconnections that exist between the different aspects. The relationships of the aspects such as barriers, cost policies and technologies are illustrated in figure 3.4.

Figure 3.4 Model indicating how perceived barriers and drivers interact with the potential of Renewable Energy supplies (Verbruggen et al, 2010).



The Green Building Council of South Africa has been established to promote green building practices. They develop guidelines with the aim to reduce the negative environmental impact of buildings and development. The importance of Green Building principles is emphasized from the start of the project until the end and is not seen as “add-on”, as it will be based on the Green Star rating system (Van Wyk, 2009).

The above-mentioned examples show what results can be achieved if communities recognise the importance of environmental and energy objectives and decisions backed with a political will can bring about the change that is so necessary to give EAs a foothold.

Miller (2007) argues that there is a tendency in developing countries, relying on fossil fuels (specifically coal), to focus on growing their economies and to overlook the dangerous impacts such as gas emissions (carbon dioxide, particulate matter, sulphur dioxide, toxic metals). The effect of energy on the environment should be just as important, as its availability and technology on its own cannot be the solution if we want to strive for sustainability.

Government needs to understand their role as regulator and to formulate and execute policy. In executing this role they have to deal with many forces that restrain progress (“barriers”) and other factors are facilitating progress (“drivers”). Government needs to take cognisance of these forces when designing policy / strategy to promote the use of EAs. They determine the rules of the game, but hopefully also consider the input of stakeholders. Most critics in South Africa agree that EAs and environmental policies are dealt with in separate silos. The Sustainable Development Strategy is a move in the right direction if it could be followed up with more specific actions. Once all policy / strategy aspects have been taken care of, the EIA can come into play to support the proposed EA actions at project level.

Legislation, pressure from NGOs and financing opportunities from the CDM, venture funds and banks can all form part of the “drivers” to create a more sustainable industry for EAs. These drivers can also reduce the cost of capital of renewables and reduce GHGs.

3.6 The use of EAs in the City of Tshwane Metro (CTMM) – impacts and lessons learned

Local Authorities must be accountable to the people in terms of services and the impact on the environment. The environment is usually shoved to the side when developments are concerned and the perception of many is that environmental processes are only regarded as a paper exercise. There seems to be ample examples of objectives that have been set in good faith, but hardly any action plans to ensure that these objectives are achieved. Electricity consumption in the City of Tshwane municipal area is escalating at about 11% per year, while the 68% of the coal utilisation in the area is used for electricity generation, which leads to environmental degradation (CTMM, 2003).

From the viewpoint of many energy providers there seems to be only one solution for all people and their needs, and that is electricity supplied via the grid and in most cases produced via coal-fired generation plants. Within the CTMM there are two coal-fired power stations of which one is so outdated that it does not seem to be viable to be upgraded to try and improve the quantity of emissions. Measured against the electricity shortage and the impact on the environment, anybody could have predicted that a blind eye would be turned on the impact on the environment if a power station could just squeeze out another Megawatt. In practical terms, EAs could be implemented extensively if barriers could be removed to increase the purchase and use of, for example, SWHs.

3.6.1 Liquefied Petroleum Gas (LPG)

In an area called Winterveld in the City of Tshwane Metropolitan Municipality, a project was launched to provide a poor community with LPG, as they were not considered for getting grid electricity for some time to come. Each household in the community was issued with an LPG cylinder / cooker and was then provided with a token equal to the value of 50 kWh of electricity, to place them on par with the “subsidy” or Free Basic Energy (FBE) provided to other city residents who were connected to the grid. This project broke new ground in the city, as politicians came to realise that there are alternative solutions to the provision of energy to residents and that one size does not fit all. Unfortunately the life of the project was cut short due to political

interference and crime. At least the project indicated that barriers can be overcome.

3.6.2 **Green Energy**

In 2007 Tshwane entered into a 3 year Public Private Agreement (PPA) with Amatola Green Power (AGP) for the purchase of green electricity which the municipality sells to customers serviced by the city – primarily to a locally based multinational company to meet its environmental commitments. This green energy is generated from bagasse in Kwazulu-Natal.

According to Banks and Schäffler (2005) Green electricity costs about the same as conventional electricity, but the costs (unaccounted for in the price) are paid for if the impact on the population's health and the impact on the quality of the environment are taken into account. The impact of the mining and transportation of coal adds to this equation.

3.6.3 **Photovoltaic project at Stinkwater**

A photovoltaic (PV) project was launched in 2006 to provide electricity to a few classrooms at a school near Stinkwater within the Metropolitan area. The funding for the project was shared by "Adopt a School Foundation" and the Department of Energy and Electricity of the City of Tshwane.

The installed PV system means that there will be no monthly cost incurred to provide electrical lights for these seven classrooms. This arrangement contributed to curb costs as the operational budget was usually not sufficient to take care of all the school's energy needs. With this project it was shown that, apart from the benefits to the school, decision makers in local / provincial government, as well as the private sector, could work in partnership and execute projects effectively.

3.6.4 **Solar Water Heater project**

Electric water heating is a part of life of the majority of South Africans. A conventional water heater consumes from 30% to 40% of the electricity in an average house, and these figures are higher for many households. Considering an alternative way to heat water - Solar Water Heating is a

promising alternative that could save up to 40% of the domestic electricity consumption with all the environmental benefits.

The CTMM Project to supply SWHs to low income households in the Metro was aimed to increase the access to the basic municipal services through the introduction of solar energy. This action was taken to illustrate the advantages of a sustainable and non-exhaustible free energy source that could be used for domestic water heating.

A manufacturing facility was established to produce the solar water heating collectors and storage tanks. With the assistance of USAID, CTMM and Eskom funding the project, the aim was to install 300 SWH systems as part of the first phase. It was planned to develop infrastructure for small businesses in the installation and maintenance of SWHs. There were also plans to get community members to market the products and assist with the provision of funds to purchase these systems.

Unfortunately the project took a long time to get off the ground due to slow production and then it nearly came to a standstill due to the marketing process. The lack of clear policy statements also hampered the progress and confused many residents.

Although it is important to provide SWHs to low income areas, one needs to take cognisance of the fact that a higher impact can be made to reduce the load on the electricity network if the provision of SWHs could be focused on middle and higher income groups.

3.6.5 Zinc Fuel Cell option

The Alternative Energy Development Corporation (AEDC) developed a zinc fuel cell that could provide energy to rural homes. The company claims that the zinc fuel cell (size of a shoe box) is the first environmentally friendly energy solution that can be mass produced. This cell can provide electricity 8 hours a day for a month before the anodes have to be replaced. The anodes cost about R55 for a set of 12. One fuel cell can provide power to 5-6 lights (12V), a radio and a small fridge.

The option was seen as the ideal solution to provide for the energy needs of people living in informal areas on dolomitic ground. A decision was taken by the Council not to supply grid electricity to people living in these areas. The people had to be removed to other areas where the geological structures were deemed less hazardous.

No decision was taken to assist the community with a more sustainable energy option and the people have been living under these conditions for years with no action been taken to move them away from the risk.

3.6.6 Methane Gas from landfill sites and Water purification plants

Landfill gas is generated by the decomposition of refuse in a landfill and results in the emission of the Green House Gas known as methane. The methane can be either flared in order to reduce the emission of GHGs or it can be used to generate heat in order to generate electricity, as it is flammable.

Sewage water treatment sites also produce a substantial quantity of methane gas which is currently primarily released into the atmosphere. A number of private companies indicated that they would be willing to enter into an agreement to finance develop and such a project.

This project was hampered by the Municipal Financial Management Act (MFMA) due to its stipulation that contracts could not be entered into for a period longer than 3 years. Due to the capital funds required and the longer payback period for such a project, hardly any progress has been made up to now. Other municipalities have managed to find solutions to this barrier, but it seems as if the political will is not there to get this project moving.

3.6.7 Demand Side Management (DSM) for CTMM buildings

The City of Tshwane Metropolitan Municipality demonstrated their support for the government-led initiative for energy efficiency and environmental improvement by appointing an Electricity Services Company (Esco) to advise on DSM savings for all buildings and services owned by the municipality. Funding was available for electricity savings projects through the Eskom

Demand Side Management (DSM) program. The focus was to indicate the possible electricity savings.

A report was completed and submitted to Eskom to approve the DSM project. An official “misplaced” the document which could not be assessed or approved. Due to the delay a senior official decided to assign the project to another Esco. The project never took off.

Much can be said about personal agendas getting in the way of efficiency. An opportunity to pick the low hanging fruit and contribute to energy efficiency went astray. At least the personnel responsible for building maintenance have taken a decision to replace incandescent lamps with energy efficient lamps.

3.6.8 Other “Green” Projects within the City

Balebogeng Primary School “Greening” Project was started to illustrate the possibilities of renewable energy, energy efficiency and the conservation of natural resources. This project demonstrated to the Mamelodi Community some of the energy technologies such as solar water heating systems, solar cookers and energy saving lights. The project is part of the Cities for Climate Protection (CCP) Campaign and funded by the International Council for Local Environmental Initiatives (ICLEI).

If we consider the scenario within the CTMM people want to know if renewable energy is viable. There are a number of people who believe that it is possible to stimulate the EA market and contribute to sustainable development. The problem of the energy crisis and climate change can be addressed but without incentives, or enforced regulations and policies, the demand for conventional energy will keep on escalating. The developers of new residential and industrial areas must have an incentive to make their developments environmentally friendlier. Houses and offices can be better designed using “green guidelines”.

3.7 Legislation and Policies – South African perspective

It is stated in DME (2004) that Government is tasked to “*develop, implement, maintain and continuously improve an effective legislative system to promote the implementation of renewable energy*”. In theory, the legislation may have a positive impact regarding environmental management and energy production. It can facilitate the planning for sustainability and environmental management principles. This may also facilitate co-operation between the different spheres of government responsible for protection of the environment and the provision of energy on a sustainable basis.

In South Africa legislation and policies with regard to energy are seen to be dominated by economic development, and environmental concerns normally play second fiddle. Sustainable and reliable energy production with the added factor of environmental compliance often increases planning delays and the gap between supply and demand gets more difficult to close.

The regulatory framework needs to ensure that the right balance between the need for economic development, environmental sustainability and energy security can be obtained. In addition to this, climate change requirements and conventional energy shortages need to be considered when new developments are required.

Developing countries enjoy a high level of development and it often leads to the degradation of the environment. This may not be because people are ignorant of conserving the environment, but rather because there is such a high pressure to provide for the seemingly unending needs of a growing population.

Adding to this constraint, Sebitosi and Pillay (2008) are of the opinion that South Africa has been planning their energy needs along the conventional route, while the rest of the world has been focusing on RE and the benefits that go with its growth. They also state that Eskom is to blame for the slow movement towards RE due to a negative viewpoint and sentiment that Eskom has communicated over a long period of time. Although South Africa has a “pro-environmental policy”, Sebitosi and Pillay claim that there is no political backing to get RE into its rightful place.

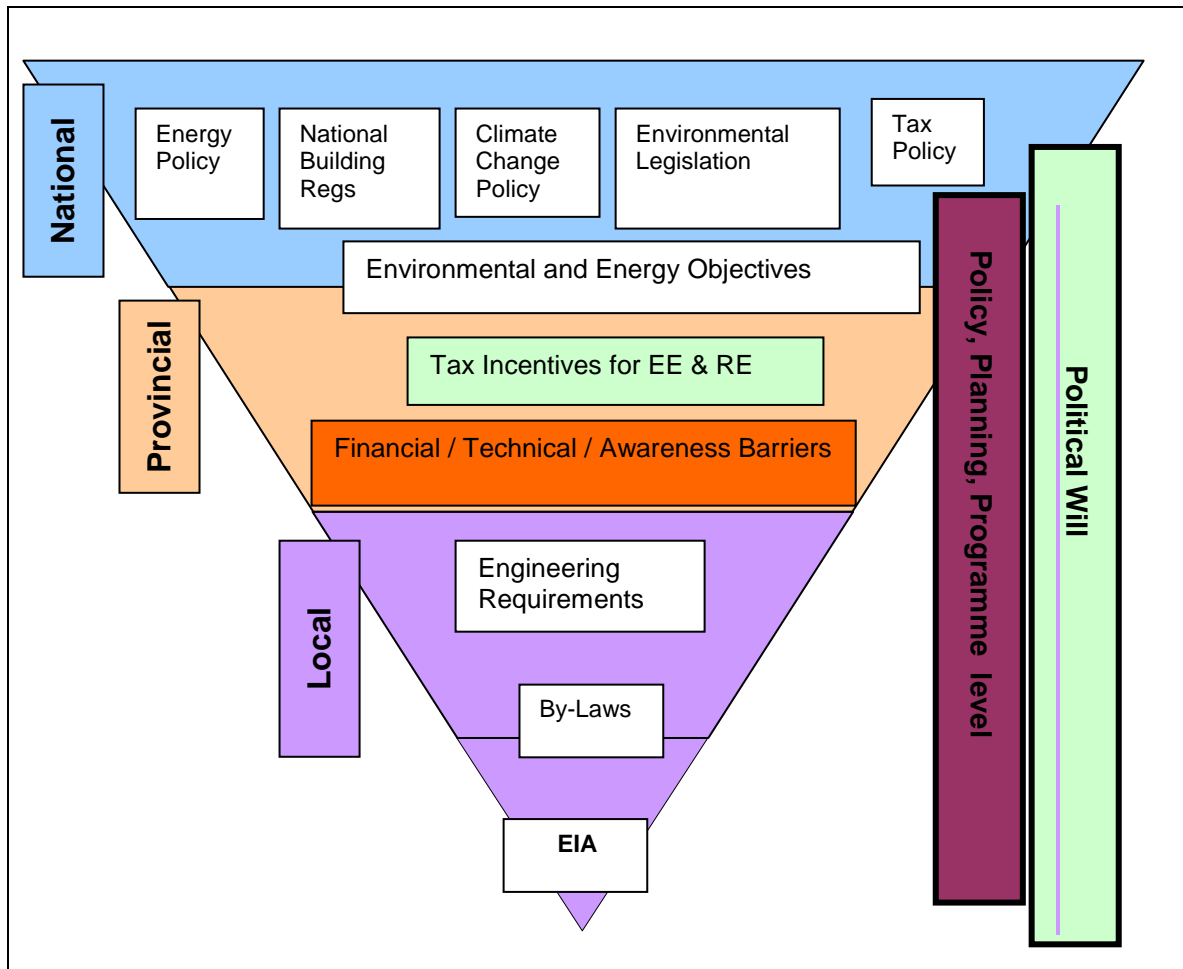
Decision makers agree that energy projects have a global impact and Marquard *et al.* (2008) focused on the importance of linking climate mitigation policy, energy policy and sustainable development to move South Africa into the fast lane and to embrace the benefit of cleaner technologies and an improved environment.

On the local level the lack of policy to support the use of EAs causes problems. The matter clearly came to the forefront in a recent public participation process as part of an EIA to develop a sub-station in the Mooiplaats area (part of the CTMM electricity supply area). Members of the community were keen on using EAs to support energy efficiency and mitigate the impact of GHGs but were stopped in their tracks due to the unavailability of policy to indicate the support indicated by national legislation (pers. comm., Gouws, 2010).

Recent legislation (SA, 2010) indicates that the Department of Environmental Affairs wants to ensure that energy-related projects move quicker through the EIA process with the announcement of the “*Guideline on Environmental Impact Assessments for Facilities to be Included in the Electricity Response Plan*”. The norms and standards anticipated in NEMA Section 24(10) (SA, 1998) come into play in this document to speed up the EIA procedure when development actions are required for the “generation, transmission or distribution of electricity”. This is seen as a step in the right direction, provided that RE becomes a player with equal status.

The legal context and policy framework guiding Energy Efficiency and Renewable Energy within the South African context are illustrated in Figure 3.1 and is summarised in Table 3.3, which provides more detail of the legislation, policies, strategies and guidelines that influence the use of EAs (with reference to the governmental spheres where it is initiated).

Figure 3.1 Legislation, policies, strategies and plans that influence the introduction of EAs across the three spheres of government.



Examples of barriers that exist on all levels and between spheres:

- Absence of a national framework to support investment and production costs
- Legislation preventing cities to take on contracts with private investors
- NERSA preventing cities to add generation cost of RE to the end-user
- Technical and legal complexities
- Lack of available expertise in Municipalities
- Process of EIA and feasibility assessment are deemed to be too long
- Role of SA cities not clear on purchasing and selling green energy

Table 3.3 Legislation and Policies that can influence the use of EAs

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
The Constitution Act No. 108 of 1996. (SA, 1996).	<ul style="list-style-type: none"> ◦ Section 24 – “Respect, protect, promote and fulfil the right of all citizens to an environment that can support their health and well-being. Government has the responsibility to protect the environment through reasonable measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”. ◦ Section 41 – Co-operative governance is compulsory for national, provincial and local spheres of government. ◦ Section 152 – One of the objectives of Local Government is to ensure that services are delivered in a sustainable manner. 	National	<ul style="list-style-type: none"> ◦ Sustainable Development is the “golden thread” and leads to the enactment of other legislation such as NEMA. Environmental Authorisation is specified in the EIA Regulations to regulate procedures and requirements for developments. ◦ Co-operative governance ensures that environmental legislation and actions are initiated and implemented in a co-ordinated manner. ◦ The Constitution ensures that other legislation such as NEMA creates an effective framework to support sustainable development. ◦ The “environment” is created to use EAs as part of sustainable development. ◦ EAs not mentioned in particular.
National Environmental Management Act, 107 of 1998 (SA, 1998)	<ul style="list-style-type: none"> ◦ The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act and all other laws concerned with the protection or management of the environment in South Africa. ◦ Section 2 - Principles as a framework within which environmental management must take place. ◦ Section 23 – Objectives to ensure IEM is addressed. ◦ Section 24 – Environmental Authorisations. 	National	<ul style="list-style-type: none"> ◦ Section 2(4) (a-r) can be regarded as the guideline for sustainable development and can be used as a “checklist” if an EIA has to be assessed. ◦ Impact on the environment must be avoided or mitigated by BPEO. ◦ Managing the risk of development by assessing alternatives. ◦ EAs is an important option that can contribute to lessen the impact on the environment.
Green Paper: National Strategic Planning (SA, The Presidency, 2009)	<ul style="list-style-type: none"> ◦ Emphasis is put on co-operative governance. 	National	<ul style="list-style-type: none"> ◦ Vision 2025 requires the economy to grow and ensures the sustainable use of natural resources and technology. ◦ Without applying sound co-operative governance principles, the implementation of environmental principles will prove to be extremely difficult, if not impossible. ◦ Not mentioning EAs or RE.

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
Energy and Climate Change Roadmap (DoE, 2009).	<ul style="list-style-type: none"> ◦ A comprehensive situational assessment of strategic issues and priorities within the energy sector pertaining to climate change, energy security, energy planning, socio-economic development and adaptation requirements, amongst other aspects. ◦ Lack of an overarching energy plan and framework ◦ Insufficient transparent inclusion of climate change criteria in planning. 	National	<ul style="list-style-type: none"> ◦ Different instruments and measures are not aligned towards specific targets (REFIT, NIRP, National Energy Act, RE White Paper). ◦ No maximum RE amounts specified ◦ RE targets not linked to LTMS ◦ EAs use can be enhanced through the alignment of legislation and strategies. ◦ RE / EAs are mentioned.
Electricity Regulation Act 4 of 2006 (SA, 2006 a)	<ul style="list-style-type: none"> ◦ To regulate the energy resources in South Africa and to make provision that it is used in a sustainable manner and protect the environment. 	National	<ul style="list-style-type: none"> ◦ Energy is the vital input for economic and social development of any country. The option of knowledge and technology is addressed to use energy resources more effectively. ◦ EAs not mentioned
The National Energy Act, 34 of 2008 (SA, 2008 b)	<ul style="list-style-type: none"> ◦ To ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation. ◦ Focus more on supplying energy and the economy and not linked to NEMA. 	National	<ul style="list-style-type: none"> ◦ Obligation of the Minister to take environmental management requirements into account. ◦ Energy planning, RE and contingency energy supply is part of the picture in stark contrast with the past where electricity (generated from coal) was seen as the only option. ◦ EAs are mentioned.
White Paper on Energy Policy (DME, 1998)	<ul style="list-style-type: none"> ◦ Government's policy with regard to the supply and consumption of energy for the next decade and links energy sector development with national socio-economic development plans. 	National	<ul style="list-style-type: none"> ◦ Potential of RE is recognised. ◦ Environmental impacts (energy related) are addressed. ◦ Energy supply needs to be diversified. ◦ Energy sector needs to manage the risk of climate change. ◦ The contribution of EAs / RE is acknowledged.
White Paper on the Promotion of Renewable Energy and Clean Energy Development. (DME, 2004)	<ul style="list-style-type: none"> ◦ Government's principles, goals and objectives for RE. ◦ Objective: <i>"10 000GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels".</i> 	National	<ul style="list-style-type: none"> ◦ Air Pollution needs to be addressed. ◦ RE promoted, used optimally. ◦ Integration of RE into mainstream energy market. ◦ Diversity of energy supply to improve energy security. ◦ Promoting sustainable development. ◦ Significant effort to promote EAs.

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
Refit Guidelines (DME, 2009a)	<ul style="list-style-type: none"> ◦ Renewable Energy Feed-In Tariff (REFIT) developed by NERSA in response to national policy direction. The guidelines establish the institutional framework, the role of the key players and the tariff conditions. ◦ Promoting development of private generation capacity. 	National	<ul style="list-style-type: none"> ◦ Opportunity to increase the use RE and supporting sustainable growth. ◦ Building capacity on RE and EE. ◦ RE acknowledged as a major aspect to combat climate change with environmental, economic and social benefits. This brings it into line with the requirements of the Constitution and other environmental legislation. ◦ Significant effort to promote EAs.
Integrated Energy Plan for SA (DME, 2003)	<ul style="list-style-type: none"> ◦ To balance energy demand with supply resources in concert with safety, health and environmental considerations. 	National	<ul style="list-style-type: none"> ◦ A framework within which specific energy development decisions can be made. ◦ EAs is an option and seen as an important consideration to prevent environmental degradation.
Energy Efficiency Strategy 2009 (DME, 2009b)	<ul style="list-style-type: none"> ◦ To contribute towards affordable energy for all ◦ To minimise the negative effects of energy usage upon human health and the environment. ◦ Objectives can be achieved by encouraging sustainable energy development and energy use through efficient practices. Target for EE improvement of 12% by 2015. 	National	<ul style="list-style-type: none"> ◦ Reduce environmental pollution. ◦ Reduce carbon dioxide emissions and other GHGs. ◦ Enhance energy security. ◦ Delay the need to build new power stations. ◦ EAs can be defined is definitely addressed by this strategy.
National Environmental Management: Air Quality Act, 39 of 2004 (SA, 2004 a)	<ul style="list-style-type: none"> ◦ To protect the environment from pollution through air quality measures, monitoring and standards. ◦ S39 – Licensing requirement of a proposed development reiterate the importance of pollution prevention, control or mitigation aspects and requiring that the BPEO should be used as a standard of measure. Requirements can be linked to NEMA. 	National	<ul style="list-style-type: none"> ◦ The impact of air quality on the impact of people's health. ◦ High social, environmental and economical cost of air quality is acknowledged. ◦ Effect on environment caused by GHGs. ◦ Link to s24 of Constitution of people's right to an environment not contributing to bad health or negatively on well being. ◦ Promote conservation and ecologically sustainable development that can be linked to EIA when new developments need to be assessed. ◦ Ambient air quality is assessed for new developments. ◦ EAs not specifically mentioned but cleaner technologies and cleaner production measures are required.
Long Term Mitigation Strategy (LTMS) (DEAT, 2007 a)	<ul style="list-style-type: none"> ◦ LTMS would provide a sound scientific analysis from which Cabinet could draw up a long-term climate policy. ◦ Strategic mitigation options for GHGs. 	National	<ul style="list-style-type: none"> ◦ SA emissions higher per capita than China and India. ◦ Energy sector contributed 45% of emissions in 2003. ◦ Need to be responsible and plan for mitigation. ◦ New technologies can contribute to mitigation scenario. ◦ Very ambitious targets for RE and EE. ◦ RE White Paper need to be co-ordinated with LTMS. ◦ Development and climate objectives need to be aligned. ◦ EAs for mitigation and adaptation.

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
Clean Development Mechanism (CDM); (UN, 1998).	<ul style="list-style-type: none"> ◦ A project-based mechanism established by the Kyoto Protocol and elaborated in the Marrakech Accord to invest in (GHG) mitigating activities in developing countries. ◦ To assist in reducing the environmental impacts of developmental projects and to support sustainable development. ◦ International arrangement supported and co-ordinated by DME. 	National	<ul style="list-style-type: none"> ◦ Can assist with the establishment of a RE industry. ◦ Huge potential for GHG emissions reduction projects in SA ◦ Barriers identified include lack of: <ul style="list-style-type: none"> ◦ awareness and understanding of the CDM ◦ lack of clarity regarding the tax regime to be used for CDM projects ◦ lack of clarity on the applicability of the (MFMA). ◦ Listed activity can trigger EIA ◦ Certified Emissions Reduction (CER) is an internationally tradeable commodity. ◦ EAs are mentioned as a definite option to reduce emissions.
National Building Reg and Building Standards Act 103 of 1977 (SA, 1977)	<ul style="list-style-type: none"> ◦ To provide for the promotion of uniformity in the law relating to the erection of buildings. ◦ Prescribing of building standards; and for matters connected therewith. 	National	<ul style="list-style-type: none"> ◦ Option to formulate Policies to increase EE of commercial buildings. ◦ Amendment of the act will speed up the starting date of the South African Energy and Demand Efficiency Guidelines (SAEDES) standards, which aim to reduce commercial building energy consumption (excluding lighting) by 25%.
SANS 204 – Standards for energy efficiency in buildings (SANS, 2008).	<ul style="list-style-type: none"> ◦ Aims to specify design and construction requirements for new buildings to provide EE. Recommends good practice maximum values of energy consumption, set out in kWh per square metre per year. 	National	<ul style="list-style-type: none"> ◦ Standards to be incorporated into the National Building Regulations. ◦ Contribute to Climate Change efforts. ◦ The Standard is a good foundation to support the use of RE. ◦ EAs mentioned.
Strategic Framework for Sustainable Development (DEAT, 2006 a).	<ul style="list-style-type: none"> ◦ To facilitate, strengthen and realign activities of government, which includes legislative implementation and enforcement, to achieve sustainable development. ◦ Points to Government's legal duty to act as a responsible custodian of the nation's environment. ◦ MDG – To ensure environmental sustainability – led to SA goal: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. 	National	<ul style="list-style-type: none"> ◦ Depletion of natural resources, inadequate and inappropriate energy options, rising waste levels, soil degradation and poor air quality undermine sustained economic growth. ◦ National Framework for Local Economic Development and the NFSD need to be connected and integrated. ◦ Governance for sustainable development need to be improved - National Environmental Monitoring System exist but not effective. ◦ Support to Sustainable Development and Environment in the North West Province (SESDNW) project, objective of this Programme to ensure that environmental sustainability is considered in all economic and land use activities and decision-making. ◦ Department of Housing "Breaking New Ground (BNG)" another example that sustainable options can be implemented. ◦ RE Projects are mentioned and sustainable options implicate EAs.
South African Integrated Resource Plan (DoE, 2010)	<ul style="list-style-type: none"> ◦ To develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty five years. 	National	<ul style="list-style-type: none"> ◦ GHG emission targets need to be considered ◦ EAs no targets set

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
National Treasury: Market Based Instruments: Draft Policy Paper (NT, 2006)	<ul style="list-style-type: none"> ◦ Aims to outline the role that market-based instruments, specifically environmentally related taxes and charges, could play in supporting sustainable development in South Africa. ◦ Proposed instruments to influence the behaviour of polluters or users of natural resources by providing an economic, rather than legal, incentive to reduce pollution. 	National	<ul style="list-style-type: none"> ◦ National Treasury proposed a 2c/kWh tax on energy generated from non-renewable sources (2008). ◦ Levy on large industrial sources of CO₂ gases from 2009. ◦ Problem with the levy is that it will simply be passed on to consumers - no possibility that Eskom will adapt policy. ◦ Proposed that companies invest in EE equipment - allowance of up to 15%, Economic/market-based instruments constitute policy tools that can be used to achieve environmental goals. ◦ Government intends to provide the necessary incentives to enhance the use of RE / EAs.
Income Tax Act 52 of 1962 (SA, 1962)	<ul style="list-style-type: none"> ◦ To consolidate the law relating to the taxation of incomes and donations, to provide for the recovery of taxes on persons, the deduction by employers from the remuneration of employees and for the payment into the National Revenue Fund of portions of the normal tax and interest and other charges in respect of such taxes, and to provide for related matters. 	National	<ul style="list-style-type: none"> ◦ Provides for a three year 50%, 30%, and 20% accelerated depreciation allowance for investments in RE and biofuels production. ◦ Financial instruments to assist with the promotion of EAs.
Framework for environmentally sound housing (Dept of Housing, 1999)	<ul style="list-style-type: none"> ◦ Aims to encourage environmentally sound practices in the housing sector, and to support environmentally sound housing initiatives. ◦ Mentions the Housing Policy and Strategy for South Africa. 	National	<ul style="list-style-type: none"> ◦ Focuses on maximising local social and economic benefits while minimising environmental impacts. A wide range of innovative technologies, designs and management options are being investigated and modelled. ◦ Habitat Agenda - a vision of sustainable human settlements. ◦ Stipulates that policies, administrative practice and legislation should promote efficient and integrated development by facilitating and encouraging environmentally sustainable development.
Gauteng Department of Housing Five Year Strategic Plan (GPG, DoH, Undated)	<ul style="list-style-type: none"> ◦ One of the objectives is to contribute to National policy processes and address gaps that hinder sustainable development. 	Provincial	<ul style="list-style-type: none"> ◦ Future projects to meet the criteria of sustainable development. Constraint mentioned is that sustainable development seems to be a foreign concept to many.
Gauteng Integrated Energy Strategy GPG, Dept of Local Gov and Housing, 2010)	<ul style="list-style-type: none"> ◦ Integrated guideline to direct supply and use of energy in Gauteng province during the next 5 years (2015); 15 years (2025); 45 years (2055). 	Provincial	<ul style="list-style-type: none"> ◦ Opportunities to deploy RE. ◦ Integrated Energy Planning, environmental health and technology action. ◦ Provinces reliant on National guidelines to progress. ◦ Energy initiatives hampered by lack of resources and capacity. ◦ Significant share of renewable energy sources ◦ RE / EAs are addressed.

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
Municipal Financial Management Act (MFMA 56 of 2003; (SA, 2003)	<ul style="list-style-type: none"> ◦ To secure sound and sustainable management of the financial affairs of municipalities. Aims to modernise budget and financial management practices. 	Local	<ul style="list-style-type: none"> ◦ Municipal tariffs and -taxes (especially reducing it) could be a very powerful incentive to motivate environmental compliance. ◦ The Act has been identified by many to be an obstacle in the process where long-term agreements are required with organisations willing to develop EA projects. ◦ EAs not addressed but the tools are available to enhance the use of it.
Municipal Systems Act (MSA), 32 of 2000 (SA, 2000)	<ul style="list-style-type: none"> ◦ To provide for the core principles, mechanisms and processes necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure access to essential services. ◦ Municipality needs to be capable of integrating the activities of all spheres of government for the overall social and economic upliftment of communities in harmony with their local natural environment. ◦ 	Local	<ul style="list-style-type: none"> ◦ States that municipalities are obligated to render services that are financially and environmental sustainable, while being equitable and accessible to its community. ◦ Local authorities are in a key position to reduce inefficient energy use and, consequently, GHGs that occur in their jurisdictions. ◦ EAs are not addressed in particular.
Tshwane Local Authority Energy Strategy (TLAES); (CTMM, 2006)	<ul style="list-style-type: none"> ◦ Encourage and promote shift to cleaner (emitting less pollutants and GHGs), more efficient and diverse energy use and supply. 	Local	<ul style="list-style-type: none"> ◦ Diversify energy supply and increase RE energy sources by 10% in 2020. ◦ Shortfall of these targets - not implemented into practical action plans. ◦ EAs are mentioned.
Energy Declaration in Cape Town, 2003 (CTMM, 2006)	<ul style="list-style-type: none"> ◦ CTMM endorsed by Mayoral Committee on 20 January 2004. ◦ To support global imperatives around climate change due to anthropogenic greenhouse gas emissions (GHGs). 	Local	<ul style="list-style-type: none"> ◦ Proposed objectives: ◦ Diversify energy supply and increase RE energy sources by 10% in 2020. ◦ Reduce energy consumption in all council operations by at least 20% in 2005 ◦ Pass legislation requiring SWH in housing in 2006 ◦ Install insulated ceilings in new low-cost housing - introduced by 2005 ◦ Provision of sustainable energy and reduced SO₂ emissions ◦ EE in Municipal Buildings, Industry and Commerce, Transport and Residential sectors. ◦ Promote energy that supports economic competitiveness and increases employment. ◦ Promote RE. ◦ No baseline or action plans has been rolled out yet. ◦ EAs are mentioned.

Act / Policies / Strategies or Guidelines	Purpose	Sphere of Government as shown in Fig: 3.1	Potential contribution to the use of EAs
Tshwane Integrated Environmental Policy (CTMM, 2005)	<ul style="list-style-type: none"> ◦ Overall policy framework dealing with environmental matters in the context of sustainable development. ◦ To integrate environmental activities. ◦ Base for all environmental strategies and programmes. 	Local	<ul style="list-style-type: none"> ◦ Formulated in line with the LA21 process, to integrate social justice, economic viability and environmental concerns at local level. ◦ TIEP be incorporated in the IDP as the main driver of the environmental programme. ◦ One of the objectives is to ensure sustainable energy within the CTMM. ◦ EAs as part of RE / EE and sustainable development is mentioned.
Proposed CTMM Green Building Development Policy (CTMM, 2009)	<ul style="list-style-type: none"> ◦ To encourage, the development of a more sustainable built environment ◦ Other instruments included: Green Building Development By-Laws and Green Building Development Incentive Scheme within the Metro. ◦ To improve the performance of the built environment in CTMM to reduce environmental impacts and improve quality of life within the city. ◦ GBCSA launched the Green Star South Africa Environmental Rating System for Buildings in 2008. 	Local	<ul style="list-style-type: none"> ◦ Promote compliance with environmental legislation in general, especially section 2 of the National Environmental Management Act, 1998 (Act 107 of 1998) which contains environmental principles such as the precautionary approach, continual improvement, and sustainable development. ◦ Supplementary to the National Building Regulations ◦ Mandatory standards and promoted standards. ◦ EAs important aspect of the Green Building concept.
CTMM, 2002. Engineering Requirements	<ul style="list-style-type: none"> ◦ To guide electricity reticulation in terms of cable size, transformer size and other requirements to ensure that a new development does not have an energy capacity problem. 	Local	<ul style="list-style-type: none"> ◦ Multiple Residential or Special and Undetermined, for a specific use which, in the opinion of the Strategic Executive Officer: Energy and Electricity, is in accordance with Multiple Residential. 13,8kV.A per potential dwelling. ◦ EAs are not mentioned.
IDP (DEAT, 2003)	<ul style="list-style-type: none"> ◦ The "<i>principal strategic planning instrument which guides and informs all planning, budgeting, management and decision making in a municipality</i>" ◦ Provides a framework for development and promotes sustainable development. 	Local	<ul style="list-style-type: none"> ◦ Environmental management and sustainability could be more effectively addressed in the IDP process. ◦ Limited capacity to execute environmental management functions, let alone EAs. ◦ EAs not mentioned in particular but should be included as part of sustainable development.

3.8 Conclusions

EAs include energy sources that are naturally regenerated and can contribute to saving the environment by allowing for the release of less harmful emissions. The use of fossil-based energy within the South African context has a negative impact on climate change and the energy crisis.

Legislation / Policies / Strategies are designed to enhance the use of EAs. Barriers and Drivers have been identified on the international, as well as local levels that interact with either enhancing or preventing the potential use of EAs. The country's capacity to make existing legislation / policies work is required and not more legislation / policies. The omission to set these policies and strategies in motion is a big concern. Political will, especially at local government level, seems to be an aspect that promotes the use of EAs and a number of examples exist as illustration of this important driver.

Legislation and policies in South Africa have been designed to support the use of EAs but one cannot but agree with Fakier (2009) that the South African energy situation is "*fragmented and lopsided*" and each national Department seems to be doing their planning in isolation. A holistic approach seems to be lacking and this is perhaps the biggest constraint that can be underlined in terms of the legislation, policies and strategies. Leadership is another aspect required to ensure that effective action is taken in the implementation of EAs.

Technology that can assist in securing energy and combating climate change needs to be embraced. The strategic goals, objectives and deliverables in all spheres of government need to be reviewed and coordinated to ensure the effectiveness of the legislative instruments and appropriate implementation within a cooperative governance frame.

South Africa is slowly but surely following the global trend to include RE / EE issues into legislation and policies with the aim for sustainable development. As the interest of investors grows, government interventions will be required to guide the commercialisation of EAs. Policy frameworks need to be designed to stimulate the markets, but it will still be some time before RE and EE will be

part of the mainstream energy supply. The next chapter will indicate the role of EIA and its contribution with regard to EAs.

Chapter: 4 : The consideration of EAs in EIA

This chapter aims to address research sub-question 2, namely:

What provision is made for EAs to be considered in EIA within the South African context?

In Chapter 3 the focus is on the consideration and incorporation of EAs within the broader legislative context. The following chapter explores the provision for the consideration of EAs within environmental legislation and more specifically the EIA Regulations.

The following is an outline of the sections contained in this chapter:

The first section (4.1) explores the purpose of EIA; the second section 4.2 identifies the legislation and policies guiding EIA; section 4.3 discusses the specific legislation requirements and section 4.4 the specific reporting requirements. The chapter concludes with section 4.5

4.1 Purpose of EIA

Guideline 7 (DEAT, 2007) defines an EIA: "as a process of examining the environmental effects of a development". EIA is essentially a planning tool for preventing environmental problems and a procedure for encouraging decision makers to take into account the possible effect of a project on the environmental quality and natural resources. The role of EIA is to guide and facilitate development and not to be a hurdle in the development process. Weaver and Sibisi (2006) noted that the EIA is sometimes experienced as a constraint to development due to authorities lacking capacity in numbers and inability as well as developers not understanding the process and not seeing the "bigger picture" or the impact of the development on a global scale. The EIA process should provide decision makers with an indication of the likely consequences of their actions.

Sowman and Brown (2006:702) are of the opinion that Environmental Impact Assessments (EIA) can be a central tool to assist communities in their efforts to achieve sustainable development. Lawrence (2003), on the other hand, argues that development is seldom considered with sustainability in mind and EIA documents are seen as the end of a requirement while losing focus of the whole objective of the authorisation. In practice, determining the contribution that a project will make to sustainability will require consideration of its consequent impacts on the environment, people and the economy and resolving the issues and concerns the public has in relation to those impacts.

According to Lee and George (2000:6) the role of EIA is to assess the environmental impact of all the aspects of a development proposal in a systematic way. It is noted that although EIA is mostly applied to influence project development decisions, there is a great need to apply it in a wider sense to policies, programmes, plans, biodiversity conservation and climate change issues (Abaza et al., 2004 and Lee and George 2000).

EIA is seen as a pre-decision tool by Bruhn-Tysk and Eklund (2001) that can be very useful to stakeholders, despite the fact that each one has his/her own viewpoint and goal in mind. Developments that have energy-related requirements will require sensible responses due to the concerns about climate change and energy efficiency. Authorities dealing with environmental authorisations need to have sustainable and reliable energy production / provision in mind when assessing applications and need to realise that EIA has mitigation potential in terms of energy options.

Smith, (1997), in Bruhn-Tysk and Eklund (2001), notes that the importance of EIA as a tool for public use should not be overlooked as the public has the right to get the opportunity to comment on the impact of the development on their environment. People affected by a planned activity are mostly concerned that by the time they get an opportunity to comment / participate in the process, it is too late to contribute to aspects pertaining to the design or location.

Alshuwaikhat (2005) states the concerns about the environment deteriorating despite the legislation and guidelines. One cannot classify the South African

EIA process as perfect, but there are always efforts to review and improve it. The ultimate aim of EIA is to ensure sustainable development and EAs can contribute to this. To ensure that the common thread of sustainability is maintained, government needs to participate and remove obstructions from the process. This can only be effective if a good measure of political will is evident with an energetic thrust to keep momentum.

Abaza et al., (2004) stresses the importance of EIA as project tool to gather and analyse information in the process of describing the impact of development. To investigate all options is the ideal way to improve decision making and it also provides the opportunity to evaluate other environmental considerations. In other words, the option exists to maximise the benefit of EIA.

In support of the viewpoint to broaden the use of EIA information Kidd and Retief (2008) argue that the information gathered for an EIA should not be limited to a project, but should be widely used to shape policy and values. On the other hand, one should take note of the EIA restrictions, as it is a tool designed to be used at project level and it cannot be all things to all men.

Although land use planning is not formally seen as part of the EIA, within the local authority environment it can influence energy use significantly due to by-laws, zoning, development plans and other requirements. These measures can form part of the EIA approval process and are incorporated in that way in the CTMM. The option to enhance the use of EAs exists within this procedure.

In the 2005 State of the Air Report (DEAT, 2009) it is noted that sulphur dioxide and particulate matter (PM) are in such high concentrations in some areas that they present a health hazard to people. It is also maintained in the SA Environmental Outlook (DEAT, 2006) that the socio-economic well-being and the physical environment are deteriorating.

4.2 Legislation and policies guiding EIA

Section 24 of the Constitution of the Republic of South Africa provides the legislative foundation for environmental matters providing the citizens of South Africa with a right to an environment that is not harmful to their health or well-

being and through this have the environment protected for the benefit of present and future generations (SA, 1996).

The Environment Conservation Act (ECA) No. 73 of 1989 was the first legislation in South Africa to implement EIA as a statutory requirement. Due to the importance of environmental matters addressed in the Constitution it became necessary to develop new legislation. In 1998 the National Environmental Management Act (NEMA) No. 107 of 1998 was promulgated and became the legislative base to deal with the environment.

NEMA – Section 2. Principles

The importance of this Section and its relevance to EIA:

It is mentioned that development must be sustainable and pollution must be avoided. If it cannot be avoided it must be mitigated and research must be done to get alternative options. Most developments are bound to use energy and stakeholders need to plan more carefully to avoid or mitigate the impact of electricity generated by coal. It seems to be too easy to state in an application that an electrical connection will be supplied by Eskom.

Impacts on the environment must be anticipated and people's rights must be taken into account. Environmental risks need to be identified and managed according to the required principles. The authorities need to ensure that the legislation and policies are applied in a coordinated way. In reality this does not seem to happen.

Another important aspect that is promoted in this section is the importance of people and their needs. It is specifically stated that the interests, needs and values of interested and affected parties (I&APs) need to be considered and taken into consideration. This point can only be effectively executed if I&APs get the opportunity to participate in the process of decision making and are allowed the opportunity to share their viewpoints and concerns.

NEMA – Section 23. Integrated Environmental Management (IEM)

The importance of this Section and its relevance to EIA:

It makes provision for environmental management tools that need to be used when impacts are assessed to ensure that IEM is implemented. It is essential

to use the principles of environmental management when dealing with potential impacts on the environment. The effects of an impact need to be considered at project level but the bigger picture needs to be part of the plan as well. The Best Practicable Environmental Option (BPEO) comes into play when options to mitigate or remedies for the impacts are evaluated.

NEMA – Section 24. Environmental Authorisations

The importance of this Section and its relevance to EIA:

Within this Section all aspects of the proposed development or listed activity are covered within IEM. The activity proposed for environmental authorisation needs to be “considered, investigated, assessed and reported”. The significance of an impact needs to be assessed by considering both the consequence and the likelihood of such an impact occurring and alternatives need to be considered. Mitigation measures need to be designed by keeping in mind all the stages of the project life cycle, as well as the management and monitoring aspects identified (SA, 1998).

Information and findings of the project and procedures need to be published and communicated to the public. The input from affected communities and the impacts on both the bio-physical and socio-economic environment must be considered when assessing the effects of a proposed development. The advantages of the development must be carefully weighed against the potential harm to the environment. These requirements are applicable whether it is for an application for a water-use licence or to develop a large residential estate.

The National Environmental Management Amendment Act (NEMAA), (Act 62 of 2008) was implemented in 2009 with amendments to some of the EIA provisions.

As a result of the stipulations in NEMA s24, the Regulations 385, 386 and 387 were issued under Government Notice R385 in *Government Gazette* 28753 of 21 April 2006. These Regulations list activities which may not be undertaken without an EIA process. The listed activities are identified by indicating certain thresholds such as: “the transmission and distribution of electricity above ground with a capacity of more than 33 kilovolts and less than 120 kilovolts”;

which is deemed an activity with a lesser environmental impact and requires a “basic assessment” (BA). Activities expected to have a more significant impact on the environment trigger a “scoping and EIA” (full EIA) requirement (SA, 2006).

Gilder *et al.*, (2008) note the requirement of the proposed amended Regulations (GN R. 658, GG 31144 of 13 June 2008) that the competent authority (CA) needs to take the implications of climate change into consideration “*When considering an application the competent authority must... – (b) take into account all relevant factors, including... – (ii) any implications of climate change*” (draft sub-regulation 8(b)(ii)). This requirement seems to be not that important as it was omitted in the next proposed amended Regulations (GN R. 524, GG 31885 of 13 February 2009). To date the proposed amended regulations have not been enacted and more clarity is definitely required if government wants to show that they are serious about environmental issues and the impact of development on climate change.

One cannot but agree with Gilder *et al.*, (2008) that NEMA and specifically the EIA Regulations need to be amended to deal with climate change specifically.

Gilder *et al.* (2008) make the following recommendations to get climate change on the agenda of considerations in EIAs:

- ✿ EAPs have to include climate change in the process, assessments and documentation.
- ✿ Identify activities that could have a significant impact on climate change or indicate geographical areas that are sensitive.
- ✿ Ensure IEM and other statutory requirements/ national and provincial guidelines regarding climate change are taken into consideration.

From this and other viewpoints it is clear that specific measures and tools to deal with the climate change issue need to be developed. Requirements to address this important issue within the EIA process will need specific attention. NEMA does make provision for the incorporation of international environmental instruments in s25 (SA, 1998). This action was taken by the Minister when the

Kyoto protocol was ratified, but no proposed measures have been taken to incorporate specific GHG mitigation requirements into the EIA process as yet.

EIA Regulations do not specifically require that climate change issues should be addressed during the assessment process. Gilder *et al.* (2008) argue that climate change should be tended too, due to the IEM objective, as well as NEMA's Environmental Management Principles and the required focus on sustainable development. Their argument that a proposed activity does have an impact on climate change and mitigation measures should be part of the process, makes sense and is supported by the author.

Byer and Yeomans (2007) indicate that climate change aspects have not been covered well in EIAs and caution that all the uncertainties contribute in making the process more complex. Hemming (undated) highlights the position of the EAP (as prescribed in NEMA) and argues that it poses an opportunity to address climate change issues while assessing the environmental impact of a proposed activity.

DEA&DP (2009 a) point to the importance of sustainable development and the task of decision makers involved with EIAs, to focus on the long term implications of developments and the requirements such as the strategic context, public interest and the NEMA principles. The fundamental objective of the EIA process is to balance the social, economic and environmental dimensions while ensuring that the assessment is guided by the legislative requirements.

4.3 Specific legislation requirements

The EIA Regulations stipulate that alternatives need to be assessed in all project proposals. Public involvement is also required to ensure that feasible and reasonable alternatives can be suggested to the proposed activity. Steinemann (2001) is of the opinion that the public has to know of a project when it is in an advanced stage of planning / approval; otherwise no alternatives that could influence the project in a significant way could be suggested.

NEMA states in s24 O (1)(b)(iv) that alternatives need to be considered to ensure that environmental harm is minimised when applications are made for developments (SA, 1998).

In the Regulations (DEAT, 2006), a definition of “alternatives” is found stating that the focus should be to find alternative / different ways to get to the same end result and specific aspects are pointed out like the location, the type of activity, technology or operational aspect. Table 4.1 provides a more practical view on the types of alternatives and options that can be evaluated for a proposed development.

Table 4.1 Types of Alternatives: adapted from (DEAT, 2004).

Type of Alternative	Example of an option that can be suggested for the proposed activity.
* Activity	Renewable rather than non-renewable?
* Location	Guided by strategic documents (IDP, LUMS, C-plans, etc.) Sometimes only one feasible location
* Process	Change in industrial processes (BPEO)
* Demand	More efficient water and electricity use Green Buildings
* Scheduling	Especially relevant to noise pollution
* Input	Building material
* Routing	Relevant to roads, power lines, etc
* Site layout	Relevant to township establishment
* Scale	Develop 15 instead of 50 housing units
* Design	Specific designs e.g. malls, industry
* “No go” Alternative	No action alternative is designed to provide baseline conditions by which to evaluate and compare the other alternatives

Regulation 29 (SA, 2006 b), dealing with the way in which issues and alternatives should be addressed also points to the importance of attending to the option of not going ahead with the development. Most authors are of the opinion that developments always get the go ahead in a developing world due to the socio-economic requirements such as poverty. Poverty is a nagging issue that can be “conquered” through development, as it creates opportunities for people to make a living.

In Regulation 8 (SA, 2006 b) competent authorities are given the responsibility to evaluate the alternatives proposed for a development as important criteria in their assessment to minimise the environmental harm by the proposed development.

“The role of alternatives is to find the most effective way of meeting the objectives of the proposal while ensuring the minimum negative impact on the environment” and this action is deemed as one of the most critical in the EIA process (DEAT, 2004).

Regulations 56 to 59 (SA, 2006 b) require public participation at both the Scoping phase and the later EIA stage. All stakeholders concerned need to be consulted and involved. People will feel part of the end result if they had an opportunity to participate in the process. In some EIA processes, participants indicated that they were treated like adversaries and that the process was inflexible and responded poorly to their input.

More alternatives can be generated during the public participation process and it might also have to be considered to get to a situation with a lesser impact on the environment.

According to the Regulations in DEA&DP (2009 b), the different role players need to be accountable for assessing alternatives. Table 4.2 indicates the expectations of each role player involved in considering alternatives within the EIA process.

Table 4.2 An indication of the responsibilities of some of the role players when considering alternatives (DEA&DP, 2009 b).

Role Player	Action in terms of Alternatives
EAP	<ul style="list-style-type: none"> ◦ Consider feasible and reasonable alternatives ◦ Get I&APS to provide input ◦ Disclose relevant information to the Applicant and CA. ◦ Document the process of identification, selection and evaluation of criteria used for alternatives ◦ Provide a comprehensive consideration of the impact of alternatives
Applicant	<ul style="list-style-type: none"> ◦ During the planning phase issues need to be evaluated within the strategic and environmental context ◦ Consider all feasible and reasonable options and not only those preferred ◦ Give EAP access to all information
I&APs	<ul style="list-style-type: none"> ◦ Assist in identifying alternatives from their position of having local knowledge ◦ Declare their interests ◦ Comment on proposed alternatives within time limits

The Competent Authority (CA) can view the lack of alternatives in an application as reason not to provide the environmental authorisation. The

availability of a technology, resources and time constraints can be a barrier in the process to assess alternatives. Tukker, (2000) in (Manuilova *et al.*, 2009) points to the important role that life cycle assessments can play when comparing different alternatives.

Energy alternatives release significantly less air pollution and greenhouse gases than conventional fossil fuel sources and should therefore be evaluated for all developments, as energy is an essential part of most projects. EAs should always be part of the EIA process due to its contribution to relieve the energy crisis in South Africa and climate change. If a broad approach to resource management inclusive of energy and climate change policies could be followed, it would support the holistic approach regarding impacts on the environment and promote sustainable development.

4.4 Specific reporting requirements

The importance of alternatives is also specified in Regulation 23(2)(g) for Basic Assessment (BA) reports, Regulation 29(1)(b) for Scoping Reports and Regulation 32(2)(f) for Environmental Impact Assessment (EIA) Reports (SA, 2006 b). The reason for requesting the assessment of alternatives is to provide options which are more sustainable than would otherwise be the case. The advantages and disadvantages of the development on the environment need to be reported. As noted in the next chapter these requirements are sometimes ignored by EAPs, as well as by the competent authorities.

On the form used in the Gauteng Province (GDACE, 2006) to guide the BA, the form in Section: A number three stipulates the requirement to assess alternatives such as activity, design, technology, etc., as well as the requirement to include the no-go option for all activities.

On the form in Section: D number four under the heading of design measures, specific answers are required in terms of the way in which energy efficiency is obtained in the activity. In the second instance the focus is on the use of alternative energy sources and an indication is required as to how provision has been made to address this issue.

4.5 Conclusions

The aim of the EIA process is to assess the environmental effects of a development. The process is guided by general and specific legislation / requirements amidst the framework of IEM. Specific guidelines to cater for climate change within the EIA process have been proposed in legislation amendments but removed in later versions.

Despite these shortcomings to deal with climate change the EIA process (legislation and documentation) makes provision for EAs. Alternatives are an aspect that needs to be assessed for each development proposal. EAs need to be addressed specifically and alternative energy options and energy efficiency potential need to be included as a specific requirement. This proves that authorities acknowledge the fact that EAs can play a significant role in mitigating the impact on the environment, as well as limiting GHGs to reduce the impact on climate change.

Within the local authority options exist to support the use of EAs via various measures such as the town planning requirements.

Despite setbacks, negative perceptions and the lack of policies or the co-ordination thereof, the EIA process has been designed with sustainable development in mind and EAs should, therefore, be an integral part of it.

In the next chapter the data analysis of the EAs in EIA will be indicated and the survey results will be discussed.

Chapter: 5 :Data Analysis and Survey Results

This chapter aims to address **research sub-questions 3, 4 and 5**, namely:

To what extent are energy alternatives (EAs) considered in EIA?

What are the **barriers** to improving uptake and consideration of energy alternatives by EAPs, Environmental Authorities and Developers?

What are the **drivers** for improving uptake and consideration of energy alternatives by EAPs, Environmental Authorities and Developers?

The following chapter explores the extent to which energy alternatives (EAs) are being considered in EIAs within the CTMM. It further points to the barriers / drivers towards improving the uptake and consideration of energy alternatives by EAPs, Environmental Authorities and Developers. This chapter was informed by the review of EIA documentation and survey results and interpretation of the interviews.

The following is an outline of the sections contained in this chapter:

The first section deals with the data in relation to the EIA documentation assessed and then the reasons for the findings of the interviews with the stakeholders are discussed. The chapter is concluded with the interpretation of the results within the local and broader context.

5.1 EIA Documentation review results

A number of Basic Assessment Reports and Scoping Reports were evaluated to get an indication of use of energy alternatives within EIA reports. The documentation to guide a Basic Assessment (BA) activity in the Gauteng province specifically requests information with regard to energy efficiency and alternative energy measures to be indicated for a listed activity. From these documents one could determine to what extent EAs were influencing the decisions regarding the energy demand of projects. The documentation

reviewed also indicated if any attempt was made by Developers in the Tshwane Metro to assess energy alternative options when submitting EIA Applications.

Of the 34 Reports assessed 82% gave no consideration to EAs. Below is the part of the BA form with the questions regarding energy use for the specific development. See Figure 5.1

Figure 5.1 Illustrating part of the BA form with the requirements pertaining to energy (GDACE, 2006)

SECTION D: RESOURCE USE AND PROCESS DETAILS

POWER SUPPLY

Please indicate the source of power supply eg. Municipality / Eskom / Renewable energy source

If power supply is not available, where will power be sourced from?

ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

The following were typical responses reflected in the reports regarding the use or suggested use of EAs for the proposed developments:

- “None” or “Not Applicable” – Surely an answer like this should not be acceptable to the competent authority. It possibly reflects the ignorance and lack of seriousness with which EAs are being considered in EIA.
- “No power required for operational phase apart from lighting and security” – This statement is clearly wrong and opportunistic.

- “A power station will be upgraded” – Surely it should be a sub station and the energy supplied is of the conventional type and not from a renewable source.
- “Generators” – Generators are normally regarded as a back-up system for other sources of electricity and can hardly be classified as alternative energy for a new development.

Five reports (15%) gave some consideration to EAs which included:

- Ripple relays on geysers
- Energy saving lamps – CFLs
- Building orientation design for heating and cooling
- Louvre screens, landscaping and underground parking
- A statement that the developer will encourage EE designs and the use of solar heating.

A single report stood out positively and mentioned the following EA interventions:

- Use computer energy simulations to determine energy saving measures
- EE lamps and electronic control gear to be used
- Electrical demand management will be implemented
- EE Building design and the use of natural light incorporated
- PV panels for batteries to supply UPS systems
- Operational phase: Establish “Energy Committee” and ensure energy audits, training and awareness campaigns are done.

5.2 Interview results

As a result of the findings indicated in 5.1, semi-structured interviews were conducted to determine the reason for the negative result. With this effort an attempt was made to determine whether members of the identified organisations concerned with development and the environment were informed about EAs and if they were applying this knowledge in an integrated way when assessing the impact of energy in proposed developments.

The participants were chosen from four groups representing the Environmental Authorities at national level, Local government officials dealing with environmental issues, Developers and Environmental Assessment Practitioners (EAPs).

Almost two thirds of the respondents viewed EAs as a critical part of sustainable development. One could make the conclusion that more focus should be placed on EAs if it is deemed to be so critical.

Table 5.1 The perceived importance of EAs to sustainable development.

How important is energy alternatives as a part of sustainable development?	
Important	Critical
8	14
36%	64%

How effectively do you believe the EIA documentation/process addresses the EA issues within your metropolitan area? About 71% indicated that the process does not support the use of EAs well. See Table 5.2.

Table 5.2 The perceived effectiveness of the EIA to address EAs

How effectively do you believe the EIA documentation/process addresses EA issues within your metropolitan area?			
Very effective	Effective	Average	Poor
0	0	6	15
0%	0%	29%	71%

It should be noted that some of the Developers were not sure what the EIA process could do to address EAs. The option that the EIA process can act as instrument to drive EA options does not appear to be positive if one takes this response into consideration.

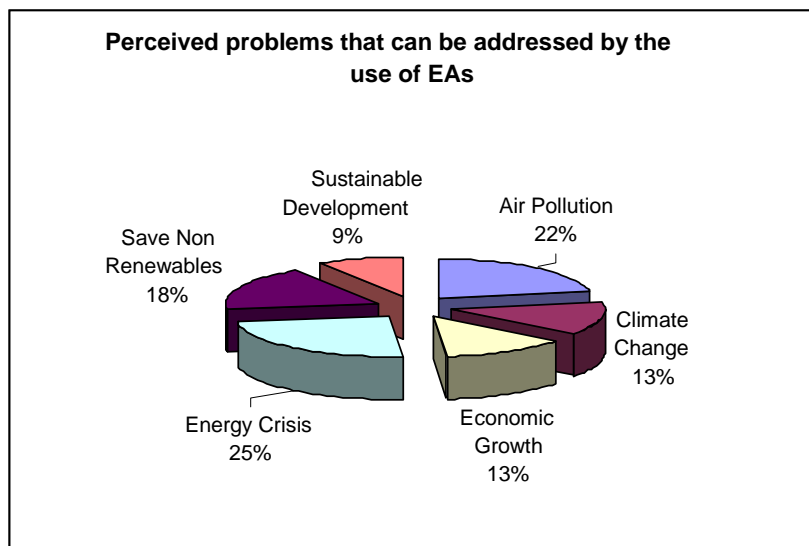
Some of the developers were keen on using EAs, but were restricted by municipal policies such as the requirement for average electricity capacity per household, indicated by the average kVA determined by identified areas (CTMM, 2002). If this requirement could be reduced, the infrastructure (cables etc) could be less expensive. This requirement can surely be changed if a developer can prove that he will be able to reduce the electricity demand of each household by implementing EAs.

The response from other developers illustrated the opposite as they did not know what was required by the EIA process. A typical comment was: “I pay the EIA consultant to get the approval”. Some did not know what EAs were available and said that the cost would only contribute to an increase in the price of the property.

Gregory *et al.* (1992) see the EIA process as central to significant environmental actions and values, and argue further that the assessment of other aspects should primarily be determined by technical experts. Technical expertise could be sourced for EAs and environmental expertise could play the role as the activator.

Figure 5.2 portrays the viewpoints of the respondents regarding problems that can be addressed via the use of EAs. At the top of the expected problems that can be addressed, was the energy crisis. This response could be a reaction to the “load shedding” experience which was still fresh in everyone’s mind at the time of the interviews.

Figure 5.2 The perceived problems that could be addressed by the use of EAs.



5.2.1 Barriers to the consideration of EAs in EIA

The respondents identified 4 main barriers to the incorporation of energy alternatives in EIA:

- Barrier 1: Half (50%) of respondents indicated cost
- Barrier 2: A third (33%) indicated awareness

- Barrier 3: Resistance to change by regulators and decision makers (9%)
- Barrier 4: The lack of legislation (8%)

Barrier 1: Cost

Respondents noted that Alternative Energy technologies required significant initial investment.

- To consider EAs in EIA is therefore considered unviable / unfeasible
- Individual developers cannot bridge the required funding and therefore EAs are not taken seriously
- EAs do not make economic sense over the short term at project level

It is evident from this finding that:

- A holistic long term approach is required – not project level thinking / tools
- Investment assistance and incentives are required from Government, i.e. 'green certificates'
- Environmental costs of conventional energy need to be taken into account in decision making
- Examples of Industry taking advantage of the opportunity that exists to explore new alternatives to existing energy supplies.

The most important problem seems to be financial/cost considerations preventing the consideration and adoption of EAs. We have to be aware that some alternative energy technologies will need significant initial investment. This type of assistance has already been put in place in some countries like Denmark and Holland, either through fixed prices for renewable energy products, or through the obligation to purchase green certificates as indicated by Morthorst (2000).

According to Martinot (2004) there are a number of reasons why cost seems to be such an issue when it comes to RE. He remarks that many policies attempt to compensate for cost-related barriers by providing additional subsidies, tax credits or incentives. The call to reduce subsidies of fossil fuels seems to fall

on deaf ears as there is no political will to put it into action. It also seems as if no comparison exists to determine the lifecycle costs of EAs.

Barrier 2: Awareness and Knowledge

From the interviews it seems that awareness and knowledge of EAs amongst key EIA role players are very limited.

- EAPs and developers are not aware of available EA options
- Environmental Authority is not fully aware of what type of EAs could / should realistically be considered in EIA applications

It is evident from the survey that there are certain aspects that are contributing to this aspect and causing it to be a major stumbling block:

- Lack of skills and information will increase uncertainties and hinder effective decision making in EIA
- Lack of visible EA projects increases the “awareness gap”, adding to perceptions that EAs have a greater technical risk than conventional energy sources
- Stakeholders should be provided with product literature including the testing and performance data of EAs
- Government officials can act as change agents at meetings, workshops to discuss the costs and benefits of EAs

The lack of visible EA projects and the “awareness gap” seem to lead to perceptions that EAs have a greater technical risk than conventional energy sources.

Barrier 3: Resistance to Change

Resistance to change was clearly highlighted by respondents:

- Metros / developers still opt for the proven technologies and EAs are perceived as risky.
- For example: The Tshwane Metropolitan area set the following objective in 2001, *“10% of the city’s electricity supply to be met from local renewable sources by 2020.”* To date no action has been taken, which reinforces the perception that authorities are not willing to act.

- ‘Resistance to change’ also seems to be used as a politically correct way of referring to / highlighting inaction and / or lack of implementation.

According to the results from this identified barrier it is evident that:

- Introducing EAs will require political commitment and strong policies.
- Sole reliance on EIA is bound to fail due to its project level focus.
- EA issues cannot be “dumped” on EIA thinking that this environmental tool will overcome the failures of other measures.

Barrier 4: Legislation

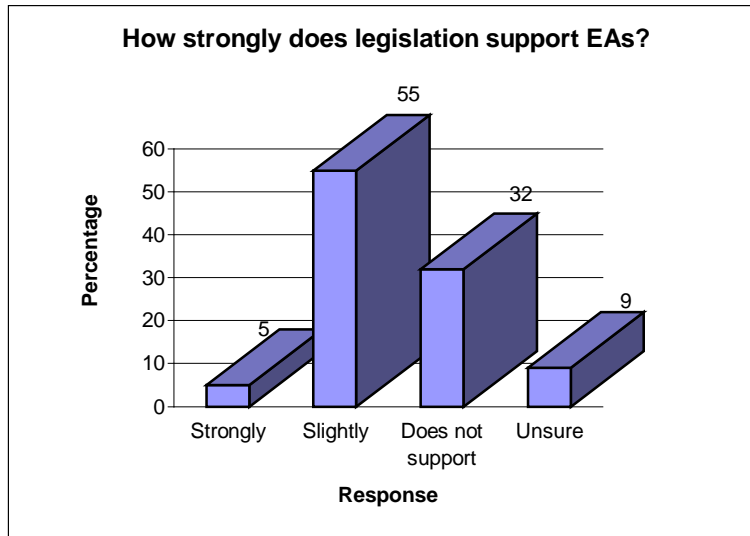
Strong opinions were voiced by interviewees concerning the implementation of relevant legislation to facilitate the introduction of EAs:

- The view was that EIA is not backed up by an appropriate policy and legislative framework to deal with EAs, as indicated by Figure 5.3.
- A specific opinion that was voiced: *“If you want people to do something, you need to force them through policy and legislation”*

It is evident from the barrier concerned with legislation that:

- “Command and control” approaches are not always that effective.
- EAs probably require a combination of Command and Control, Fiscal and Voluntary approaches.
- You can implement poor legislation with a strong public sector, but not the reverse.

Figure 5.3 An indication of the perceived support of legislation for EAs.



Barriers, reasons and solutions in terms of interview responses regarding the consideration of EAs are reflected in Table 5.3.

Table 5.3: Barriers, reasons and solutions in terms of interview responses.

Barrier	Reason	Solution
Cost of EAs	<ul style="list-style-type: none"> • Cost of technology • No willingness of Govt to provide funds 	<ul style="list-style-type: none"> • Obtain funding from Development Bank and other international financiers. • Cost will decrease if market increase • Build on examples of EA programmes in other countries
Lack of awareness and knowledge	<ul style="list-style-type: none"> • Reliability of EA products to be addressed • Motivate citizens to care for the environment • Poor communication • Authority with limited capacity 	<ul style="list-style-type: none"> • Establish standards • Information campaign • Find innovative solutions to bring information to all • Establish awareness and training programme (especially at school level)
Resistance to change	<ul style="list-style-type: none"> • EAs perceived as risky • Developers trust in conventional energy supply 	<ul style="list-style-type: none"> • Communication of success stories • Regulations to force compliance • Incentives to promote EAs
Legislation	<ul style="list-style-type: none"> • Other aspects are seen as a bigger priority • No political will 	<ul style="list-style-type: none"> • Need a co-ordinated drive to provide legislation • Follow through on visions with practical plans and political support

5.2.2 Drivers for the consideration of EAs in EIA

The respondents identified three drivers for the consideration of EAs in EIA:

- Driver 1: More than half (50%) of the respondents were of the opinion that legislation would be the most important driver to influence the incorporation of EAs.
- Driver 2: Almost a third (33%) of the respondents indicated that incentives would be the ideal driver.
- Driver 3: Raised awareness was indicated as the third most important driver (12%).

Driver 1: Legislation

- Many respondents recognised that the following actions would increase the use of EAs:
 - Norms and standards / guidelines for EA use could be linked to the listed activities.
 - Make it a compulsory requirement to address EA issues. The CA needs to ensure requirements are adhered to.
 - Provide a proper guideline to co-ordinate national/provincial/local spheres to communicate and enforce the same message.

In reflection on this “driver” it is interesting to note that when the first review of the EE Strategy was launched, Minister Dipuo Peters stated that EE needed to be legislated (Van der Merwe, 2009 a). The EE Strategy states that the aim is to minimise the negative effect on human health and environment due to the generation of electricity via coal-fired power stations, encourage sustainable energy development, embrace the cornerstones of sustainable development, link energy sector development with socio-economic development and co-ordinate this strategy with other government initiatives.

Most respondents were of the opinion that legislation would get the EA process going. As with other legislation it is meaningless to follow this route if there is no enforcement. City of Cape Town has tried for a number of years to pass by-laws to ensure SWHs for all new buildings and found it to be an uphill battle.

Driver 2: Incentives

- There was a considerable amount of agreement amongst interview respondents that incentives would be a positive step and some of the views stated were:
 - Improved support and funding needed for CDM projects.
 - The Draft Regulations under Income Tax Act, for the purposes of determining whether a project would result in improved energy efficiency were commended.

In reflecting on the incentives “driver” one can see that small steps have been taken to get this driver into motion as Brendt and Rodgers (2009) mention that the EU Green House Gas emission trading scheme of 2007 is in place and ranges between R0.04 and R0.40/kWh. The DME also has a RE Subsidy of 20% of the capital cost for RE projects in place and NERSA a household connection subsidy of about R4 500 per household.

Driver 3: Awareness

- The respondents’ views regarding the awareness aspect:
 - The need to have access to quality information regarding EAs.
 - Marketing of EAs to demonstrate / “show” people what skills are required and what possibilities exist.
 - The positive “impact” of EAs in terms of climate change and energy crisis needs to be communicated to all stakeholders in order to enhance the legitimacy of EAs.

In reflecting on the awareness aspect it is evident that EAs are not well considered in the EIA process due to the lack of awareness of EAPs, developers and environmental authorities alike.

The Drivers, proposed initiators and benefits regarding the consideration of EAs are reflected in Table 5.4.

Table 5.4: Drivers, proposed initiators and benefits regarding the consideration of EAs in terms of interview responses.

Driver	Initiator	Benefit
Legislation	◦ Authority	◦ Compliance with international agreements ◦ Aligned efforts to implement EAs
Incentives	◦ Authority	◦ Enhanced environmental improvement ◦ Promote sustainable development
Awareness of Policies	◦ Authority and EAPs	◦ Increased environmental awareness ◦ EIA can support policies
Awareness of Products	◦ Companies marketing EA products	◦ Increase use of EA products ◦ Stakeholders in EIA can promote the use of EA products

5.3 The results in the broader context

5.3.1 Barriers that can be addressed by EIA

There are tools available that can be adapted and used during the environmental assessment process to enhance the implementation of EAs. An example could be to use a framework such as the Leadership in Energy and Environmental Design (LEED) designed by the US Green Building Council. This rating system or tool covers a number of aspects, such as site selection, energy optimisation, renewable energy, water use, erosion, light pollution, etc. (US Green Building Council, 2001). As already mentioned earlier in the study, the Green Star programme has been launched in South Africa and could also play a significant role to enhance the use of EAs (Van Wyk, 2009).

On local level within the CTMM the proposed Green Building Policy, incentives and By-laws could go a long way to establish a good foundation. Unfortunately as with a number of environmental issues, most people get the idea that the politicians are not too keen to put an effort into this and it lags behind until somebody comes along with the political will to drive the issue.

One can assume that the EIA process could incorporate EAs if the impact assessments of the different technologies are properly classified, categorised and weighted. If this information is combined in an easy-to-use formula the chances of it being used by all the relevant role players are much higher. This will also assist in defining a clearer picture of the energy impact of a project. Ideally EAs should be mainstreamed as part of a general consideration of alternatives in EIA. Climate change and the energy crisis imperatives should / can assist with mainstreaming EA considerations.

A stable and adequate power supply was stated as a non-negotiable need by developers and it is a factor that must be taken into consideration for certain developments to ensure their competitiveness. If mitigation requirements come into play at EIA level it could come as a shock to some developers.

5.3.2 **Barriers that cannot be addressed by EIA**

The EIA process cannot assist in supporting policies that are not co-ordinated or enforced. As discussed in Chapter 3, a holistic approach seems to be lacking. Some stakeholders with a holistic approach tend to see EAs as part of a development but they seem to be too few and far between to make the required difference. The overall strategy needs to be designed regarding energy objectives and its impact on climate change, the energy crisis and the role that the Department of Housing and all other government role players should play. Once government has made the overall plan clear and ensured that action plans and responsibilities are clear, the EIA at project level can assist to support these strategies.

As indicated in Chapter 3 a number of policies and legislation exist that address EAs, but there seems to be a lack of implementation and enforcement. Apart from a policy indicating the role that the EIA can play to support sustainable development, there is also an opportunity to draft or update other policies to include extended fiscal measures in favour of energy alternatives and requirements needed in the revised building regulations.

In this study; sustainable development and climate change were rated low in responses to suggested problems that could be solved by EAs. Within the environmental fraternity a greater awareness and focus on the bigger picture is expected. These are people expected to be the change agents in the process. There needs to be a change of mindset not only to deal with current problems, but to think creatively and plan for the future.

Reality should always be kept in mind and policies should focus on environmental, economic and social dimensions as the picture needs to be addressed in a holistic way. Clear objectives and a roll-out plan for EAs are needed within the ambit of policy and legislation but the legislation / policies

will not be of much help if the market for EAs is not in a position to deliver the products and services required.

5.4 Conclusion

The aim of this research was to determine the extent of EAs in EIAs within the CTMM. When the documentation was reviewed it was concluded that EAs are rarely considered during the EIA process. There is a definite gap in the EIA process as EAs are hardly considered and not encouraged by the authorities. A small number of the developers were keen to use EAs, but were then hampered by bureaucracy in executing their plans.

A number of barriers and drivers were indicated by the respondents. Barriers such as finance, policy, market, technology and lack of awareness exist and prevent the use of EAs. These barriers need to be addressed at the highest government level and with appropriate action they could lead project role players (EIA level) to contribute more effectively and in line with what it was designed and in line with IEM.

Policies, incentives and awareness were identified as drivers that could potentially enhance the use of EAs. Policies and legislation cannot be devised in a vacuum. Implementation and enforcement need to be part of the deal. Incentives can assist in getting market forces to move in the right direction and all stakeholders need to be informed about products, requirements and possibilities.

In the next chapter the final conclusions and recommendations will be made.

Chapter: 6 : Conclusions and Recommendations

In this chapter the final conclusions and recommendations are made in terms of the research question introduced in chapter 1, namely:

Can EIA be used as a tool to enhance the implementation / consideration of EAs in development decision making?

The following is an outline of the sections contained in this chapter:

The first section gives a summary of the literature and research findings, followed by a discussion regarding the answer to the research question and a reflection on the findings and final conclusion. It concludes with recommendations and recommendations to further studies.

6.1 Summary of the literature and research findings.

The research was done against the background of the environmental assessment process, by assessing the contribution made by those involved in the process regarding the use of EAs in development projects. The research supported the literature and gave us an indication of the barriers and drivers that were present either as reality or as people's perceptions in implementing or preventing EAs.

The impact of development on the environment was assessed as it is a legal obligation required by the South African Constitution, section 24 stating the right that everyone has to a safe and healthy environment (SA, 1996). More specifically NEMA, section 24, stipulates that impacts on the environment must be "*considered, investigated, assessed and reported on*" in terms of the IEM objectives (SA, 1998). The guidelines in terms of the EIA process require the assessment of alternatives for proposed developments and on the BA form it specifically requires information about energy use and energy efficiency (GDACE, 2006).

Energy generation from coal has a major impact on the environment, specifically in terms of its contribution to climate change as indicated in

chapters 1 and 3. The type of energy suggested for developments should be in line with sustainable development requirements.

Energy Alternative options create opportunities not only as alternative measures within environmental assessments for development projects, but also demonstrate the interlinkage between environmental issues such as climate change and the use of conventional energy. When designing and striving to develop an activity on the principles of sustainability it is obvious that such a development will be inclined to use less energy more efficiently. Measures incorporated for such a development will prevent or mitigate harm to the environment.

The energy crisis in South Africa contributes to keeping the focus on coal generated energy to get the country out of the predicament. This is seen as taking a step backwards into the past and not embracing the “green energy potential”.

It has been argued in this dissertation that there is support from government to enhance the use of EAs as indicated by legislation and policies. Unfortunately, these policies are not well co-ordinated, no action plans are provided to follow up the stated objectives and hardly any legislation enforcement is taking place.

The barriers to implement EAs identified in the survey, namely cost, awareness, resistance to change and a lack of legislation, provide a good example of people’s perceptions and how it could influence their decision making. The barrier “lack of legislation” that has been noted, can be linked to the specific requirements in the EIA process (provide alternatives such as the energy requirements on BA form). As the result of the documentation review indicated, the required information was ignored by many. If these specific requirements to stipulate alternatives are not enforced, nobody could blame people to think that “new and better” legislation is bound to be treated in the same way.

Table 6.1 provides a summary of the literature and research findings and indicates possible opportunities that can be derived from the study. The opportunities are not discussed in the paper.

Table 6.1 A summary of the barriers / drivers found, and indicating possible opportunities that can lead to the improved use of EAs within EIA and in the bigger context.

Barriers and Drivers identified in the literature review (see section 2.3)	Barriers and Drivers identified in the research (see section 2.4)	Possible opportunities that can be derived from the study.
Barriers	Barriers	Opportunities
Abundant coal for electricity generation	Ignorance	Use tools such as LEED and Green Star to create framework
Eskom monopoly, change to new technology is slow	CA not enforcing requirements	Incorporate Climate change requirements in EIA Regulations
Relatively cheap electricity	No policies to encourage EA use in EIA	More incentives in terms of Tax law
Environmental cost of conventional energy not taken into account	Engineering requirements for reticulation of electricity	Remove obvious obstacles in legislation and policies
Small budgets for EAs	Resistance to change	Enforcement of requirements already in place
Financial obstacle such as long payback times	Cost	List of participators / contributors regarding EE and RE. Can be excluded from load shedding.
Ignorance (lack of knowledge)	Awareness	Planning Department in the Presidency: Co-ordinate policies
Absence of framework to support investment / production cost	Lack of legislation	EAs should be mainstreamed as part of EIA
MFMA long term contracts		EIA can be used at project level to support compliance with EA legislation / policies
NERSA policies on RE generation		EAPs can be "educated" in the use of EAs and will be able to advise more effectively on alternatives.
Lack of expertise		
EIA process deemed to long		
Role of SA cities into EAs not clear		
Cost of EAs		
EA market not developed		
Legislation not supportive		
No political will to support the use of EAs		
EIA as project level tool cannot be used to enforce EA use in absence of policies.		
Drivers	Drivers	
Sustainable Development	Legislation	
Reduce emissions	Incentives	
Vision 2050	Awareness	
Examples of EA projects		
"Daring" politicians		
Grants and incentives		
Education		
Legislation		
Constitutional support		

6.2 Answer to the research question

The government sometimes gives reason to think that they are, in principle, supporting EAs. The long term plans made to deal with the energy crisis point to no movement away from fossil-based electricity generation for the foreseeable future. Fundamental changes are required to reform the "conventional energy generation" business and to get everyone involved in a sustainable energy future.

EAs should be an important part of sensitive design to minimise the burden on the environment and to reduce emissions linked to new developments. Barriers and drivers were identified that could either prevent / enhance the use of EAs in the EIA process. The research indicated that EAs could enable EIAs to be more effective in terms of sustainable development. It also indicated the EIA as a tool designed for project level assessments not be used as an “alternative tool” to enhance the use of EAs in the absence of supporting legislation / policies.

International and South African literature confirm that provision should be made for the use of EAs in EIA and within the bigger context. Some South African legislation / policies are indicating the importance of EE and RE and there is little movement by government to use incentives to promote its use. The current and envisaged legislation and standards will definitely be a motivating factor and can lead to action and improved co-ordination via the different government spheres.

The results of the study are consistent with the opinion of authors such as Sowman and Brown (2006) who mention the importance of EIA as a central tool to achieve sustainable development, and others such as Lee and George (2000) who mention the need for EIA to be applied in a wider sense.

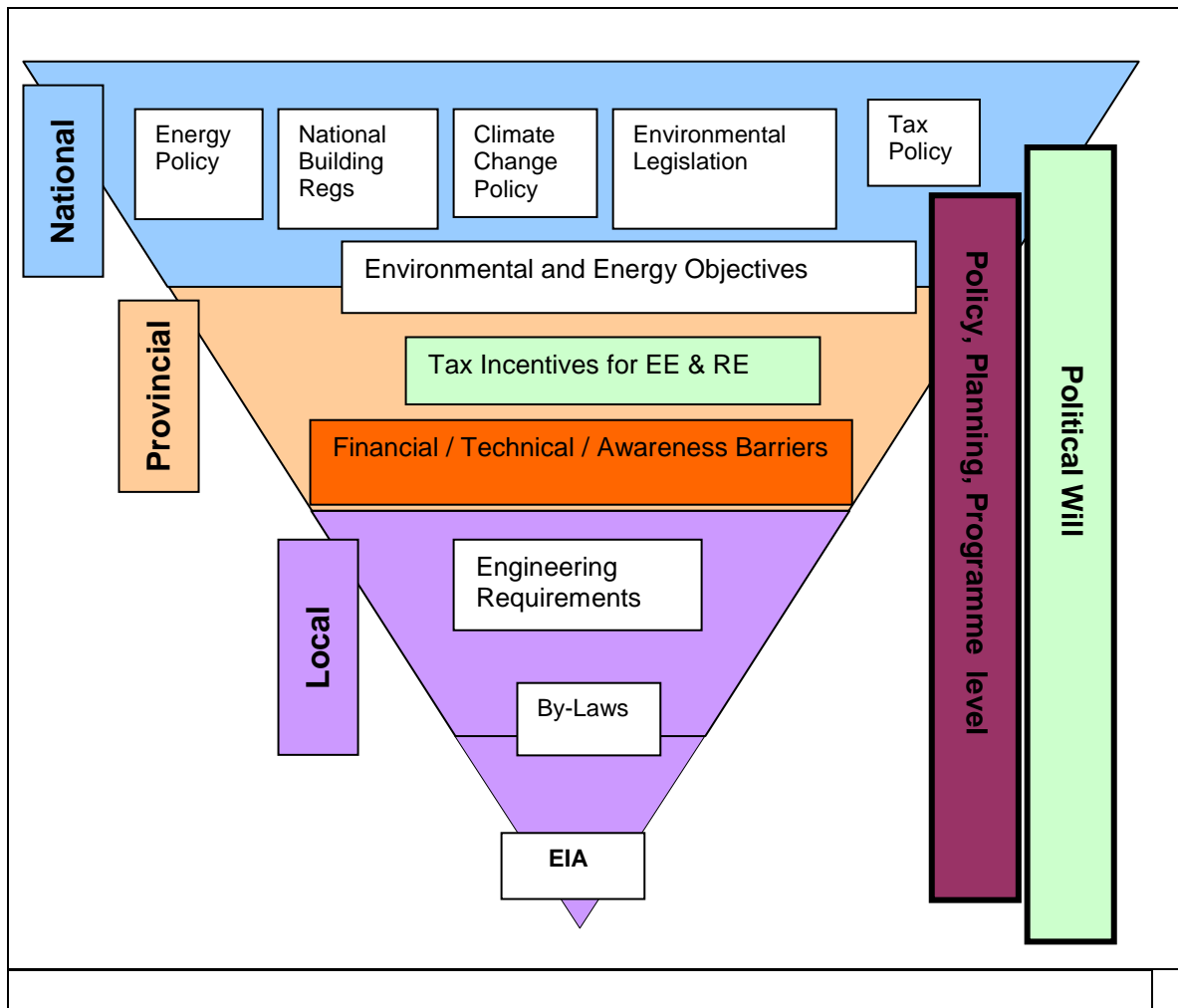
The need to consider energy alternatives has been highlighted as EIA good practice in various guidelines, as well as being explicitly required in relevant application forms. There is a need to inform the broader process about assessing purposes, impacts, mitigation and enhancement possibilities. These findings could inform decisions or guidelines to indicate the size of the “gap” between the current situation and what it should be if EAs play a more prominent role in EIAs.

Removing obstacles to implement EAs and a far greater commitment of resources and enforcement of legislation can turn the tide on EAs. Some requirements are already in place. Teddy Roosevelt once remarked: “a smile and a six-shooter” could bring about some action.

The EIA process can be more effective with the suggestion that EAs should be more prominent when decisions are made with regard to environmental impacts within Metropolitan areas. These environmental impacts can be dealt with at the project level, but policy (e.g. Climate Change Policy) at a higher level (planning level) needs to be designed and implemented as an aid to explicitly deal with important environmental values. Commitment to sustainable development objectives entails attention to a wider and more complex set of considerations than is now common in most environmental assessments.

Figure 6.1 illustrates the position of EIA and its role as an implementation instrument for EAs. In light of the context it is clear that the EIA as project tool has its limitations and can only assist with enforcement once such a decision has been taken at a higher level. If expected to stand in for policies that are lacking or not co-ordinated it will be like shooting a cannon from a canoe.

Figure 6.1 A graphical representation of EIA and its role as implementation instrument in terms of EAs against the background of legislation, policies, strategies and plans.



6.3 Recommendations

It is clear from this paper that, despite the Legal and Policy context, EAs are not explored to their full potential in EIA and in the broader context. Specific requirements in EIA documentation requesting an input on EAs are ignored. Decision makers just do not consider EAs and it could be due to ignorance or other reasons.

There is a tremendous amount of information available on how to plan, manage, and provide EA technology. There is no need to re-invent the wheel.

- Ignorance can be overcome by a willingness to get the required information.
- If a few political leaders can find the political will to drive EA actions the results will encourage others to participate.

- Policies should be better planned and coordinated and if officials in all government spheres adhere to the cooperative governance requirements it could lead to measurable results on ground level.
- In many instances people with the capacity to do research and implement EA options do exist. In some instances these people are marginalised due to internal politics or negative perceptions.
- On the Metropolitan level the overarching theme should be to support sustainable development. Decision makers in this sphere of government need to analyse ways to accelerate access to Renewable Energy Technologies (RET), rethink subsidies and policies that do not promote EE and diversification of energy supply.
- The current national incentive scheme for SWHs needs to be refined to enhance the use of solar water heaters in all new middle to high income residential areas. This action is required to reduce the energy demand on Eskom's capacity that is already under stress.
- The overall costs of "Green Electricity" will fall with a growth in the market due to economies of scale and technical developments. The process can be enhanced by well-considered government intervention.

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Annexure A: List of EIA and BA Reports

Nr	Name of Development	BA / EIA	Energy Suggestions AE & EE
1.	Monavoni AH 108 Township Dev	BA	No specific design criteria have been incorporated
2.	Magalieskruin x75 Township Dev Primarily Office Block	BA	Ripple relays on geysers Energy saving lamps Emergency generator Building orientation design for heating and cooling
3.	Telecomm Base Station Farm Strydfontein 306 JR	BA	Technological cellular operating systems are designed with EE in mind.
4.	Sinoville x32 40 Residential Units (2storeys)	BA	None
5.	Stinkwater x9 Township Dev Affordable Housing	EIA	None
6.	Klipfontein portions 147 and 148 Industrial Township	BA	None
7.	Rooihuiskraal x29 Township Development 100 Units per ha	BA	None
8.	Roodeplaat Dogschool Infrastructure	BA	Generators as alternative source
9.	Rietvlei x2 Township Dev	BA	None
10.	Raslouw AH 31, 32 Units Township Dev	BA	None
11.	Daspoort Student City Dev	EIA	None
12.	Pierre van Ryneveld Storage Park	BA	No power required for operational phase apart from lighting and security.
13.	Hartbeeshoek 303 JR, Security Village	BA	None
14.	Gem Valley, Franspoort 332 JR Township Development	EIA	None
15.	Wireless Base Station Eldoraigue	BA	None
16.	Doreg AH Residential and Retail establishment	BA	EE lamps
17.	Eerste Fabrieke Town Centre Development	EIA	None
18.	Erasmia x 13 Township Dev	BA	None
19.	Aerospace Village, Waterkloof 378 JR, Factories	BA	Building Orientation
20.	Booysens x3 Township Dev	BA	None
21.	Atteridgeville x19	EIA	None
22.	Lyttelton AH Township Dev	BA	EE comment - Orientation of buildings, louver screens, landscaping and underground parking.
23.	Klerksoord x25 Township Dev Light Industrial, Residential and Business	EIA	None
24.	Karenwood Township Dev Strydfontein 306 JR	EIA	Comment – A “power station” will be upgraded.
25.	Highveld x65 Township Dev	EIA	None
26.	Telecom base Station Brooklyn	BA	None
27.	Weighbridge in Akasia	BA	None
28.	Knoppieslaagte Residential Estate	EIA	None
29.	Onderstepoort x19 Township Dev	EIA	None
30.	Orchards x41 – 43 Township Dev	EIA	None
31.	Monavoni 92-95 Township Dev	EIA	None
32.	Mnandi x2 Township Dev	BA	Developer encourage EE designs and the use of solar heating
33.	Idle Winds Conference facility	BA	None
34.	Die Wilgers x70 Office Park Dev	BA	Use computer energy simulations to determine energy saving measures. EE lamps and electronic control gear. Electrical demand management. Building design and the use of natural light. PV panels for batteries to supply UPS systems. Operational phase: Establish “Energy Committee”, energy audits and training and awareness campaigns.

Annexure B: Interview schedule

Nr	Name	Group	Date
1.	Rudzani Makele	CTMM	24 April 2009
2.	Elizabeth Moatshe	CTMM	28 April 2009
3.	Siegwalt Küsel	CTMM	5 May 2009
4.	Leloko Puling	CTMM	28 April 2009
5.	Ilse Kotze	CTMM	28 April 2009
6.	Sam Mutswari	CTMM	28 April 2009
7.	Danie Smit	DEAT	13 May 2009
8.	Lene Grobbelaar	DEAT	12 May 2009
9.	Coenraad Agenbach	DEAT	12 May 2009
10.	Reggie Nkosi	DEAT	12 May 2009
11.	John Geeringh	DEAT	29 May 2009
12.	Robert Zietsman	Developer	5 May 2009
13.	Jan Zeederberg	Developer	6 May 2009
14.	Gerhard van Wyk	Developer	7 May 2009
15.	Christo Duminy	Developer	14 May 2009
16.	Johan Saayman	Developer	18 May 2009
17.	Stephanie Webber	EAP	8 May 2009
18.	Pieter vd Merwe	EAP	6 May 2009
19.	Johan Bothma	EAP	19 May 2009
20.	Pieter Aucamp	EAP	12 May 2009
21.	Madelein Oosthuizen	EAP	15 May 2009
22.	Nigel Coni	EAP	14 May 2009

Annexure C: Example of interview questions

Questions: Semi Structured Interview.

This study aimed to better understand the links between Environmental Legislation/Policies and the use of Alternative Energy (AE) in Metropolitan Developments.

Respondent Information:

Name : _____
 Organisation : _____
 Position / Title : _____
 Sex : Male / Female
 Your metropolitan area: _____

10. How effective do you feel the use of alternative energy is in new developments within your metropolitan area?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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11. How effective are you in implementing alternative energy within your home?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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12. Rate your knowledge of the topic of climate change

Limited	Average	Significant	Expert
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13. Rate your knowledge of the topic of alternative energy

Limited	Average	Significant	Expert
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14. How important is alternative energy as part of sustainable development?

Unimportant	Important	Critical
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Substantiate:

15. Do you view alternative energy as a *realistic* option to be implemented as a part of an energy policy?

Yes	No
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Give reasons for your choice:

16. How effectively do you believe the AE policy addresses energy needs on a sustainable basis?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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17. AE is an option to address concerns about global warming. Are you aware of the existence of policies that specifically address this issue?

Yes	No
-----	----

Give reasons for your choice:

18. Which of the following environmental concerns within your metropolitan area would you class as the top three in respect of importance : Water, Energy, Pollution and Waste, Population growth and Biodiversity.

1	
2	
3	

19. How effectively do you believe do developers focus on energy efficiency at the planning stage of a development?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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Substantiate:

20. How effectively do you believe do developers focus on AE at the planning stage of a development?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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Substantiate:

21. Give the three biggest barriers in the effective implementation of energy efficiency by developers?

22. Give the three biggest **barriers** in the effective implementation of AE by developers?

23. In your view, how strongly do current legislation/policies successfully support the use of alternate energy?

It strongly support AE	It slightly encourages AE	It does not support AE	I am unsure
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Substantiate:

24. Give the three most significant **drivers** that will support the successful implementation of alternative energy

25. In your view, how strongly does the EIA process support the effective implementation of alternative energy?

Strong support	Some support	Very little support	Poor support
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26. Rank the following advantages of AE from highest(1) to lowest(6) significance

Rank	Advantage
	Lower CO2 emissions
	Job Opportunities
	Reduced air pollution
	Enhance Research and Development for renewable options
	Improve the Climate change problem
	Less dependent on fossil fuels

27. Would you classify the use of AE as developer-driven or authority driven?

Developer-driven	Authority Driven
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Substantiate your view:

28. Which of the following means of communication is being utilised within your metropolitan area to ensure adequate awareness of the AE requirements within the EIA process?

Web site	Email	Fax	Hard Copy	Other
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Substantiate:

29. Explain the action taken by your organisation in responding to recent events such as Climate Change Summit, Energy Crisis? If your organisation has not responded, indicated **No Action** in the explanation

Explain:

30. Name your top five most viable AE options within the *Tshwane Metro*?

31. If partnership refers to a relationship between authorities, developers and citizens. How strongly do you believe this partnership supports effective implementation of AE?

Strong support	Some support	Very little support	Poor support
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Suggest some ideas of how this partnership can be enhanced:

32. Name the three most significant problems that can be solved by effective implementation of AE in your metropolitan area

33. How can your organisation play an active role in supporting AE

34. How effectively do you believe the EIA documentation/process addresses the AE issues within your metropolitan area

Very effective	Effective	Average	Poor

35. If you believe that there are shortcomings within the EIA documentation/process, make **three recommendations** to enhance the effective use of AE

36. Do you believe that one of the main focuses in the future should be to change the mindset and attitude of the main role players towards AE?

Yes	No
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How would you recommend that this could be achieved?

37. Which of the following do you recommend to encourage *developers* to use AE

Policy changes	Fines	Incentives	Partnerships with authorities	Other
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If you selected Other, name them:

38. Do you believe that a policy that demands AE to be implemented as a compulsory part of a development will reduce the profit of developers?

Yes	No
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39. In your opinion by what percentage would a policy that demands AE to be implemented as a compulsory part of a development reduce the profit of developers

No effect	1%-10%	11%-20%	21%-30%	More than
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				30%
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40. How significant will the energy crises in SA be improved with the effective implementation of a policy that demands AE?

Significantly Ineffective	Ineffective	Effective	Significantly Effective
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Explain:
