# How is climate change incorporated into Environmental Impact Assessments (EIAs) in South Africa?

Abdulhakim Aljareo

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Supervisor: Ingrid Watson

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## Declaration

I, Abdulhakim Aljareo, declare that this research report, apart from the contributions mentioned in the acknowledgements, is my own, unaided work. It is submitted for the Degree of Master of Science by coursework and research report to the University of the Witwatersrand. It has not been presented before for any degree or examination to any other University.

(Signature of candidate)

23rd day of October 2014

## Abstract

Climate change is an issue of global significance resulting in trans-boundary environmental and socio-economic impacts. South Africa is involved in the international efforts to address climate change, has accepted the findings of the Intergovernmental Panel on Climate Change (IPCC) Assessment Report and developed a National Climate Change Response Policy, listing the impacts of climate change on the sustainable development in South Africa. The main causes of climate change are Greenhouse Gases (GHGs), which have been emitted from different development activities over temporal and spatial scales. In order to reduce the emissions of GHGs and protect proposed development projects from climate change impacts, climate change mitigation and adaptation measures should be incorporated into Environmental Impact Assessment (EIA). This research aimed to describe climate change incorporation into the EIA legal regime and practice in South Africa, based on climate change impacts on sustainable development and the role of EIA in considering climate change. The methodology involved reviewing EIA regulations and related legislation, EIA case studies from Gauteng province conducted between 2010 and 2013, key informant interviews with Environmental Assessment Practitioners (EAPs), and discussion on the linkedin group of the International Association for Impact Assessment of South Africa (IAIAsa). The study concluded that climate change is not explicitly incorporated into the EIA regime, but it is implied in the EIA regulations and related legislation. Largely as a result of the lack of climate change incorporation in the EIA legal regime, climate change is not adequately considered in the EIA practice. In order to support the contribution of EIA to sustainable development in South Africa, It is recommended that climate change should be incorporated into EIA regulations in the next amendment of NEMA. This can be done through including listed activities that require climate change incorporation into the EIA based on type of an activity and/or specific receiving environments. It is also suggested that EIA guidelines for climate change consideration be developed. Further recommendations include supporting the role that Strategic Environmental Assessment (SEA) and Environmental Management Framework (EMF) play, in conjunction with the EIA, in considering climate change; increasing the availability of accurate, local climate change data and modelling technology; developing staff capacity and awareness about climate change, and building EAP's ability to incorporate climate change in the EIA through the support of government related authorities and associations such as IAIAsa and EAPSA.

**Key words:** climate change, EIA, mitigation, adaptation, EIA legal regime, EIA practice.

## Dedication

I dedicate this research report to my father (Salem. F.Aljareo), mother (Hana. A. Aljareo), brothers (Farage, Abdulmenam, and Mohammad Aljareo) and sisters (Fatma, Asma. Amena, Eman and Saeeda Aljareo) for their support throughout my studies. I also pay attribute to my friends in South Africa (M. Gonsalves), (S, Barka), (Osama, Hosni), (Aymen, Elgonote), (Abdullah, Algerme) and (Ali, Al-ritame), also my friends in Libya namely (Hussan, Basher), (Khaled, Farage), (Salem, Farhat) and (Mustafa, Al-madane) for their continuous love and support throughout my studies and residency in South Africa.

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## List of Abbreviations

| | |
|---|---|
| AEL | Atmospheric Emission License |
| BA | Basic Assessment |
| $CO_2$ | Carbon Dioxide |
| $CH_4$ | Methane |
| DEA | Department of Environmental Affairs |
| DEAT | Department of Environmental Affairs and Tourism |
| EAPASA | Environmental Assessment Practitioners Association of South Africa |
| EAPs | Environmental Assessment Practitioners |
| ECA | Environment Conservation Act |
| EIA | Environmental Impact Assessment |
| EIR | Environmental Impact Report |
| EIS | Environmental Impact Statement |
| EMFs | Environmental Management Frameworks |
| EMP | Environmental Management Program |
| ERC | Energy Research Centre |
| GCCRS | Gauteng Climate Change Response Strategy |
| GDARD | Gauteng Department of Agriculture and Rural Development |
| GHGs | Greenhouse Gases |
| GWC | Growth without Constraint |
| $H_2O$ | Water Vapour |
| HFCs | Hydrofluorocarbons |
| IA | Impact Assessment |
| IAIA | International Association for Impact Assessment |
| IAIAsa | International Association for Impact Assessment, South African affiliate |
| I&APs | Interested and Affected Parties |
| IEM | Integrated Environmental Management |
| IEMA | Institute of Environmental Management & Assessment |
| IFC | International Finance Corporation |
| IPCC | Intergovernmental Panel on Climate Change |
| LTMS | Long-Term Mitigation Scenario |
| MPRDA | Mineral and Petroleum Resource Development Act |
| $N_2O$ | Nitrous Oxide |
| NEPA | National Environmental Policy Act |
| $O_3$ | Ozone |

| | |
|---|---|
| OECD | Organization for Economic Co-operation and Development |
| PFCs | Perfluorocarbons |
| RBS | Required By Science |
| RoD | Record of Decision |
| SADC | South African Development Community |
| S&EIR | Scoping and Environmental Impact Report |
| SEA | Strategic Environmental Assessment |
| SNC | Second National Communication |
| ToR | Terms of Reference |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |

# Chapter 1.0 Introduction

The National Climate Change Response Policy (White Paper) has mentioned that the unique environmental and socio-economic conditions of South Africa have made it more vulnerable to climate change effects (Department of Environmental Affairs (DEA), 2011a). South Africa is a developing country that relies heavily on exploiting mineral resources such as coal, which is one of the main sources of GHG emissions. South Africa also suffers from high levels of poverty, which leads to susceptibility of its socio-economic situations to climate change impacts, particularly the livelihood sources of poor communities (DEA, 2011a). Sustainable development is very likely to be affected by climate change due to the current state of the environmental and socio-economic components of South Africa (DEA, 2011a).

The International Panel on Climate Change (IPCC) has considered climate change as an issue that affects the environment, economy and societies (IPCC, 2007). It has occurred as a result of activities, which emit GHGs such as carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$) during construction, operation and disclosure stages of implementing development proposals. These GHGs are produced at the project-level in which they should be addressed. Internationally, measures for climate change mitigation and adaptation have been considered in the Impact Assessment (IA) tools such as Environmental Impact Assessment (EIA) (Byer, et al., 2012; Agrawala, et al., 2012; International Association for Impact Assessment (IAIA), 2013; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). These measures aim to reduce GHG emissions through mitigation options, and enhance proposed project benefits and protection from climate change impacts through adaptation measures.

## 1.1. Problem statement and research questions

The purpose of an EIA is to identify, predict and mitigate impacts associated with projects. As such EIA is a tool that could contribute to addressing the impacts associated with climate change, as has been the case internationally(Byer, et al., 2012; Agrawala, et al., 2012; International Association for Impact Assessment (IAIA), 2013; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). This research aims to understand the situation in South Africa.

The overarching research question, How is climate change incorporated into Environmental Impact Assessments (EIAs) in South Africa? is based on the importance of climate change impacts on sustainable development in South Africa as elaborated in the White Paper (DEA, 2011a). It is also based on the role that EIA can play at the project-level for climate change mitigation and adaptation. Development project can both contribute to climate change and be impacted by climate change, and so should be considered in the EIA process guided by legal framework. The early consideration of mitigation and adaptation options of climate change impacts in the EIA process leads to reduction in GHG emission and vulnerability to climate change impacts.

The research question posed in this research, to further interrogate this issues, are;

1. How is climate change incorporated in the EIA legal regime in South Africa?
2. How is climate change addressed in the EIA practice in South Africa, using Gauteng province as a case study?

The objectives of this study consists of two parts, which will lead to answer the research main question. The first part aims to identify (review and describe) climate change incorporation into the EIA legal regime, which includes policy and legislation regulating EIA and climate change in South Africa. The second part aims to identify the EIA practice and consideration of mitigation and adaptation measures of climate change impacts in the EIA process.

## 1.2. Methodological approach

The research approach includes both a theoretical and a practical aspect. Literature, policy documents and legislation were reviewed to better understand the issues. It also included the international context and how climate change is incorporated into the legal regime in South Africa. Using the Gauteng province as a case study, 21 EIAs conducted between 2010 and 2013 were analyzed to identify direct and implied consideration of climate change in EIAs. This was followed by key informant interviews with EAPs in Gauteng province, and discussion on the website of IAIAsa. Both the interviews with EAPs and IAIAsa linkedin group discussion included a discussion of the research results, EAPs local and international knowledge and experience about climate change and EIA.

The research focused only on EIAs in the South African context. It did not include Basic Assessment (BA) or Strategic Environmental Assessments (SEA). It also concentrated

on EIA practice after 2010, based on the latest EIA regulations. The methodology chapter explains the study scope and limitations in more details.

## 1.3. Research report structure

The report is structured into different chapters, starting with a review of the literature related to climate change and EIA. A detailed methodology is presented in Chapter 3, followed by a presentation of the results. The information, arguments and data from these chapters are discussed in Chapter 5 before providing concluding remarks with recommendations. These chapters feed each other in a coherent approach, in order to respond to the research questions posed.

# Chapter 2.0 Literature Review

## 2.1. Climate change

Effective environmental protection and management is a real challenge in the social and economic development of the world. As a result of human needs for development and the adverse consequences of human activities to achieve development targets, the environmental components, systems, functions, and resources have been threatened, and environmental tragedies such as habitat loss, degradation, damage, and environmental pollution have happened. On the other hand, human population particularly vulnerable communities (such as poor societies) are likely to be adversely affected by environmental problems. For instance, climate change is an international and long-term environmental issue, which has occurred as a result of economic development. Climate change has been defined as 'any change in climate over time, whether due to natural variability or as a result of human activity' (IPCC fourth assessment report (4th), 2007, p.30). The United Nations Framework Convention on Climate Change (UNFCCC) has also described it as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods' (UNFCCC,1992, p.3). The IPCC is the leading organization for climate change assessment. It was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization. It aims to provide the world with a clear scientific view on the current state of climate change knowledge, and its possible environmental and socio-economic impacts.

The third (3rd) assessment report of IPCC of 2001 indicated that changes in the climate happen due to both, internal variability within the climate system, and external factors (both natural such as changes in the solar output or explosive volcanic activity, and anthropogenic such as increasing the concentration of GHGs). The changes in the surface temperature of the earth due to the previous factors is called radiative forcing. It could be positive representing the increase of the surface temperature, or negative representing the decrease of the surface temperature. The radiative forcing has been defined as 'a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism' (IPCC, 2007, p.36).

The main cause of climate change (anthropogenic climate change) are GHGs. They are emitted from anthropogenic sources (human activities such as burning fossil fuel, agricultural activities and deforestation, energy and waste activities) (IPCC, 2007). The

long-lived GHGs as described in the IPCC report are mainly $CO_2$, $CH_4$ and $N_2O$, which cause the greenhouse effect. The greenhouse effect is based on the changes of the absorption, scattering and emission of radiation particularly infra-red radiation within the atmosphere and the earth's surface resulting in temperature changes. There are also another GHGs such as water vapour ($H_2O$), Halocarbons (such as Hydrofluorocarbons (HFCs) and Perfluorocarbons (PFCs)), and Ozone ($O_3$). According to the IPCC 4$^{th}$ assessment report of 2007 the atmospheric concentrations of anthropogenic GHGs particularly $CO_2$, $CH_4$ and $N_2O$ have been increasing since 1750 due to human activities. As a result, the global average temperature of the surface has increased.

Climate change can cause environmental, social, and economic impacts. It has been stated that climate change affects communities, particularly poorer communities at different scales from individuals to localities and the whole regions (Laukkonen, et al., 2009). Climate change adversely affects the livelihood sources of poor societies, which have limited capacity to tolerate present and future climate change variability. This leads to increasing the challenges to deal with poverty issue within poorer societies (Laukkonen, et al., 2009). From an environmental perspective, geophysical and biological functions and processes are susceptible to climate change. For example, it has been mentioned that issues such as increasing global air and ocean temperature, changing wind and precipitation frequency (resulting in drought and flooding events), rising sea level, and melting of snow and ice are associated with climate change (IPCC, 2007). In support of increasing global temperature, Hansen, et al. (2006) illustrated that in the last 30 years, the global surface temperature has increased by 0.2°C. From an economic perspective aligned with increasing global human population, Schmidhuber and Tubiello (2007) stated that climate change has a significant impact on food security (such as food availability, stability, utilization, and access). According to their research, the extent and magnitude of climate change effects on food security will depend on regions scale, temporal scale, and the socio-economic situation of a country.

According to the IPCC 4$^{th}$ assessment report (IPCC, 2007), climate change can cause wide range of future impacts on different systems, sectors and regions. Some systems, sectors and regions are likely to be especially affected by climate change due to their vulnerable characteristics. For example, range of climate change impacts were mentioned in the report of IPCC of 2007 as following;

- Particular terrestrial ecosystems such as tundra, boreal forest and mountain regions are susceptible to climate change because of their sensitivity to warming,
- Water resources in some dry regions at mid-latitude and in the dry tropics, due to changes in rainfall and evapotranspiration,
- Human health in populations with low adaptive capacity,
- Particular regions such as Africa due to low adaptive capacity,
- Small islands, which are highly populated and have large infrastructure systems
- Asian and African mega deltas, because of large populations and high exposure to sea level rise, storm surges and river flooding, and
- The Arctic, due to the impacts of high rates of projected warming on natural systems and human communities.

The IPCC 4$^{th}$ assessment report has identified climate change mitigation and adaptation as a way to respond to climate change impacts. Climate change mitigation means reducing GHG emissions, whereas climate change adaptations means adapting to climate change impacts. There are factors that determine the capacity of climate change mitigation and adaptation, which are socio-economic and environmental conditions, and availability of information and technology (IPCC, 2007). Various industrial and agricultural activities depend on natural resources, particularly fossil fuels which are the main source for GHGs emissions. Industrial technologies, customer behavior, economic and political barriers exacerbate the rate of increase in GHG emissions, and may affect the reduction and adaption responses. The IPCC fifth (5$^{th}$) assessment report of 2014 report represented different mitigation options, practices and behavioral aspects in order to reduce GHG emissions. These options based on replacing unabated fossil fuel usage with technologies with lower GHG emissions such as renewable and nuclear energy sources. Also options to mitigate GHG emissions from the extraction, transport and conversion of fossil fuels by increased efficiency, fuel switching, GHG capture and storage. There are number of climate change mitigation challenges, which have been stated (IPCC, 2014) such as;

- Difficulty of reconciling or competing different priorities beside climate change in pursuing a sustainable development agenda,
- Uncertainty and risk management,
- Encouraging international collective action,
- Promoting investment and technology change, and

- Rising attention to adaptation strategies.

Climate change vulnerability can be affected by other factors such as; current climate change hazards, poverty, unequal access to resources, food insecurity, trends in economic globalization, conflict and incidence of disease (IPCC, 2007). Successful climate change adaptation results in reduced vulnerability and increased resilience to climate change impacts. Different adaptation measures for climate change have been set by IPCC for diversity of sectors and stakeholders, taken into account not all adaption needs will be met, and not all adaptation measures will be possible, due to adaptation measures constraints, limits, less information about cost and effectiveness (IPCC 2007, 2014).

In addition, there is a link between climate change mitigation and adaptation and sustainable development. Sustainable development has been defined as 'Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations World Commission on Environment and Development, 1987, p.16). Climate change may directly or indirectly effect sustainable development, due to its impacts on environmental and socio-economic components (IPCC, 2007). Climate change mitigation and adaptation measures can play an important role in supporting sustainable development in the face of climate change. Mitigation measures can potentially decrease climate change impacts, while adaptation measures can enhance the ability of various systems to be resilient to the effects of climate change. For example, climate change mitigation policies in the energy sector such as energy efficiency technology and renewable energy can assist in improving energy security, reducing emissions and saving natural resources (IPCC 1995, 2007 & 2014).

## 2.2. Climate change consensus

There has been some argument as to the validity of anthropogenic climate change. This research report based on the assumption that climate change is a reality, and that the predictions of the IPCC are correct. In this research, I am going to accept the prevailing consensus on climate change, in order to describe climate change incorporation into EIA regime in South Africa.

There is substantial scientific consensus on anthropogenic climate change. A study has shown that there is an overwhelming consensus about the reality of global

warming and the cause of it, which is human activities, especially among climate science experts and the public (Doran & Zimmerman, 2009). Additionally, it has been stated that there is a scientific consensus on the reality of anthropogenic climate change and human activities are causing the global warming (Oreskes 2004, 2007). Despite the scientific consensus on climate change and the cause of it, there is some opposition to climate change occurrence. The group of people who do not agree with climate change called climate change deniers or/and skeptics.

A classification of climate change deniers has been illustrated (Rahmstorf, 2004), which classifies climate change skeptics to three groups. The first group is called trend sceptic. This group deny there is a significant global warming, claiming that the measured temperature by weather stations is affected by urbanization around those stations (Rahmstorf, 2004). They also claim that the calculated temperatures from the atmospheric microwave radiation using satellite, show no or weak warming trend since these measurements started in 1979.

The second group is called attribution sceptics, they do not deny climate change, but they attribute it to natural causes not to anthropogenic causes (human-induced). They claim that there are natural causes for global warming trend such as the released atmospheric $CO_2$ from the ocean due to natural processes, and changes in solar activity and/or cosmic rays (because of their impact on cloud formation). They also argue that additional $CO_2$ emission does not result in noticeable warming, claiming that $CO_2$ absorption bands are already saturated, and so additional release of $CO_2$ will hardly cause changes in the radiation balance.

The last group is called impact sceptics, they argue that climate change is not harmful but it could be beneficial. They claim that climatic warming can lead to positive consequences such as an opportunity for agriculture activities in higher latitudes. In support of climate change consensus, a study based on reviewing extensive datasets of climate researches showed that, the scientific consensus on climate change among climate researchers is more prominent and stronger, than the view of unconvinced researchers of anthropogenic climate change (Anderegg, et al., 2010).

## 2.3. Climate change in South Africa

Climate change is affecting all countries all over the world without exception, whether developed or developing countries. South Africa is a developing country that contains special environmental and socio-economic characteristics. South Africa needs to have

climate change policy, in order to deal with climate change environmental and socio-economic effects. This policy should aim to support sustainable development achievement, which South Africa has considered as priority in decision-making process.

### 2.3.1. National Climate Change Response Policy for South Africa

South Africa is a water-stressed developing country, which is both a contributor to, and affected by, global climate change due to its energy-intensive, fossil-fuel powered economy and vulnerability to climate change impacts (DEA, 2011a). Internationally, South Africa has accepted the IPCC conclusion in its 4$^{th}$ Assessment Report, which stated that global warming is happening and anthropogenic GHGs are the main cause of climate change. South Africa has also ratified the UNFCCC in 1997, and agreed to Kyoto protocol in 2002. Based on South African agreement with international conventions, protocols, and the role of South Africa as a developing country, which emits GHGs and affected by climate change. South Africa developed a draft of National Climate Change Response Policy in 2010, which was called the Green Paper.

The DEA published a National Climate Change Response White Paper in October 2011, after the comments on the Green Paper 2010. This White Paper expresses the vision of South African Government for an effective climate change response and the long-term, just transition to climate-resilient and lower-carbon economy and society. The National Climate Change Response Policy has two objectives, which are 'Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity', and secondly 'Make a fair contribution to the global effort to stabilize GHG concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner' (DEA, 2011a, p.5).

According to the National Climate Change Response Policy for South Africa, South Africa is a developing country that is contributing significantly to global climate change issue with significant emissions of GHGs. On the other hand, it is extremely vulnerable to the impacts of climate change issue due to its sensitive socio-economic and environmental situations (DEA, 2011a). An increased level of atmospheric $CO_2$ concentrations has been measured at the Global Atmospheric Watch station at Cape

Point (DEA, 2010). Additionally, predicted climate change impacts have been mentioned for South Africa (Climate Change Conference, 2011) as following;

- Warming of the coastal regions by around 1-2°C by about 2050, and around 3-4°C by about 2100,
- Warming of the interior regions by around 3-4°C by about 2050, and around 6-7°C by about 2100,
- Significant changes in the rainfall patterns associated with increased evaporation, resulting in significant changes in the water availability, particularly in the western side of the country,
- Predicted impacts on biodiversity systems such as grasslands and fynbs,
- Impacts on agriculture sector particularly small scale farmers in dry regions,
- Increase of alien invasive plant species,
- Rising sea-level,
- Health issues due to climatic variability, and
- Economic losses due to climatic variability such storms, fire and flooding.

In order to accomplish the objectives of the South African National Climate Change Response Strategy, strategic priorities were set out in the White Paper (DEA, 2011a) which are;

- Risk reduction and management,
- Mitigation actions with significant outcomes,
- Sectoral responses,
- Policy and regulatory alignment,
- Informed decision making and planning,
- Integrated planning,
- Technology research,
- Development and innovation,
- Facilitated behavior change,
- Behavior change through choice, and
- Resource mobilization.

These strategic priorities were established in the White Paper using the principles of the Constitution, Bill of Rights, National Environmental Management Act (NEMA), No. 107 of 1998, and the UNFCCC such as equity, special needs and circumstances, informed participation, and uplifting the poor and vulnerable. Also using overall strategic approaches, which are needs-driven and customized, developmental,

transformational, empowering and participatory, dynamic and evidence-based, balanced and cost effective, integrated and aligned (DEA, 2011a).

The National Climate Change Response Policy White Paper (DEA, 2011a), included adaptations responses. Based on risk-based process to identify priority short- and medium-term adaptation intervention measures, which potentially can be used to create many jobs (green Jobs) and contribute to sustainable development. These adaptation measures will be incorporated into sector plans. Namely; water, agriculture, forestry, health, biodiversity sectors and human settlements. The White Paper also mentioned that coordination between sectors and departments is an important element for effective adaptation measures.

In addition to the recognition of the importance of adaptation responses to increase the resilience to climate change variability and impacts, the White Paper presented the role of mitigation measures, in order to contribute to the international effort of minimizing GHG emissions and support South African sustainable development trend. The mitigation measures in the White Paper are based on the following points;

- Setting the performance benchmark using the national GHG Emissions Trajectory Range,
- Identifying desired sectoral mitigation contributions,
- Defining carbon budgets for significant GHG emitting sectors and/or sub-sectors,
- Mitigation plans,
- Using different types of mitigation approaches, policies, measures and actions,
- Deploying a range of economic instruments to support the system of desired emissions reduction outcomes, and
- Monitoring and evaluation.

Moreover, the White Paper demonstrated interesting points about climate change in relation with firstly, job creation through green economic development and productive resources. Secondly, required review of polices, strategies, legislation, regulations and plans falling under the jurisdiction of all government departments and state-owned enterprises, in order to ensure the alignment with the National Climate Change Response Policy within two years of the publication of the White Paper. Thirdly, cooperation between all government departments, in terms of educating communities and shared responsibilities about climate change, and ultimately, provide the needed financial and human resources, and country wide monitoring system, in order to address climate change (DEA, 2011a). Specific sectors have been identified for

climate change adaptation and mitigation responses in the National Climate Change Response Policy for South Africa, which are for adaptation; water, agriculture, human health, and for mitigation; energy, industry and transport. In the White Paper, climate change policy of South Africa has been described and measures have been identified particularly mitigation and adaption. Through the arrangement of climate change mitigation and adaptation measures on specific sectors, climate change could be easily considered at the project-level. Two important points were mentioned in the White Paper that support climate change consideration into EIA. These points consider review of legislation related to climate change and the environment, and climate change education and cooperative governance between and across departments. The effective consideration of climate change at the project-level EIA needs legal requirement, awareness and understating of climate change, and cooperation between responsible departments.

### 2.3.2. Governance of climate change in South Africa

Climate change has been considered as a barrier issue for future development of the country, which needs coordinated approach among national government departments to respond to climate change. This can be achieved through understanding climate change mechanism, impacts on development and economic planning as well as the vulnerability to climate change (*National Environmental Management: Air Quality Act No, 39 of 2004*) (*NEM: AQA*). Climate change has been incorporated in South African law particularly in *NEM: AQA*. Different plans were mentioned in *NEM: AQA*, which have been established in order to address climate change as illustrated in table 1.

***Table 1: South African climate change response planned targets (National Environmental Management: Air Quality Act, 2004, p.112)***

| Key milestone | Target date |
|---|---|
| Long term mitigation scenario process finalized | 2008/9 |
| Climate change policy development process initiated | 2007/8 |
| Sectoral climate change mitigation and/or adaptation plans in place | 2009/10 |
| National communication under the United Nation Framework Convention on Climate Change | 2008/9 |

In terms of climate change governance in South Africa, the DEA has published informed recommendations for suitable governance and coordination mechanisms, in order to support the integration of climate change within all levels and spheres of

government departments in South Africa (DEA, 2011b). These coordination mechanisms are designed to be implemented within all government departments (national, provincial and local), with stakeholder participation. It was mentioned that the national challenges (DEA, 2011b), which face the mainstreaming of climate change in all government levels are;

- A perception that climate change mainstreaming is a constraint to development priorities,
- The range of definitions that exist regarding what successful climate change mainstreaming, and
- The highly fragmented environmental policy space into which climate change needs to be integrated.

It has been stated that one government department cannot alone manage climate change mitigation and adaptation, due to the complexity and wide-range of climate change effects. Effective climate change mainstreaming needs buy-in and prioritization of climate change within all three levels of government departments (national, provincial and local), and across the administration (DEA, 2011b).

Three coordination mechanisms and recommendations for enhancing and supporting climate change governance were provided (DEA, 2011b), the first mechanism is Horizontal Coordination within and across the different department at the national level. This mechanism addressed the importance of climate change mainstreaming within and across all levels of national departments. Showing that institutional and legislation fragmentations are the main issue within and across government departments, which affect climate change integration beside the issue of moving from policy to implementation. The second mechanism is Vertical Coordination among the different spheres of government related directly to climate change and environmental management. The challenges of climate change mainstreaming through vertical coordination are related to the structure and function of government departments. Horizontal and vertical coordination ensure experience, knowledge and know how are effectively shared about climate change issue within and across all government departments. The third mechanism is Stakeholder coordination, stakeholder engagement or public participation in cooperative environmental governance is an important approach for climate change mainstreaming. Stakeholder approach in the context of climate change is complex activity because of different (and often opposing) interests, ideologies, capacities and varying degrees of political influence of the different stakeholder groupings (DEA, 2011b).

### 2.3.3. Examples of climate change policy actions in South Africa

In South Africa different plans have been initiated in order to address climate change, and limit its impacts on sustainable development as highlighted in table 1. Some of the initiated plans were mentioned in the environmental law such as *NEM: AQA*, and others were established by government departments. An explanation of some plans has been provided as following;

**Firstly, the Long-Term Mitigation Scenario (LTMS) process.** It is a process mandated by Cabinet, led by the Department of Environmental Affairs and Tourism (DEAT) which is currently known as DEA, and project managed by the Energy Research Centre (ERC). Its aim is to outline different climate change mitigation scenarios for long-term South African national climate change policy, and to provide a solid basis for our position in multi-lateral climate discussion on a post -2012 climate regime (ERC, 2007). The ERC is a multi-disciplinary research centre, based in the Faculty of Engineering and the Built Environment at the University of Cape Town. It undertakes high quality, targeted and relevant research as well as offering students opportunities for postgraduate studies. The process of LTMS involves key stakeholders, best available information and the work of Scenario Building Team with a range of government departments, key industry players and society. The LTMSs are data-based scenarios which represent the possible future of climate change.

The LTMS has defined a scenario framework, which is limited by Growth without Constraint (GWC) and Required by Science (RBS). It was outlined that if the economic growth in South Africa continues without constraints, GHGs emissions will dramatically increase from 446 Million tons of $CO_2$-equivalent in 2003 to 1640 Million tons of $CO_2$-equivalent in 2050 (about four-fold increase in GHG emissions) (ERC, 2007). On the other hand, the LTMSs required by science assumes a scenario of continuing increase of GHG emissions for a short time reaching 473 Mt of $CO_2$-equivalent in 2020, and then significant decrease by 35% per a year, which will lead to 290 Mt $CO_2$-equivalent in 2050 (ERC, 2007). This dramatic decrease in GHGs emissions by using RBS scenario, is a result of implementing GHGs mitigation scientific measures through the process of Current Development Plans, if extended into the future. Figure 1 illustrates the difference in energy scenarios for GHGs under GWC and RBS scenarios. The gap between GWC and RBS scenario shows the increase of GHGs in the GWC scenario without mitigation measures, and reduction in the RBS scenario with mitigation measures over period of time.

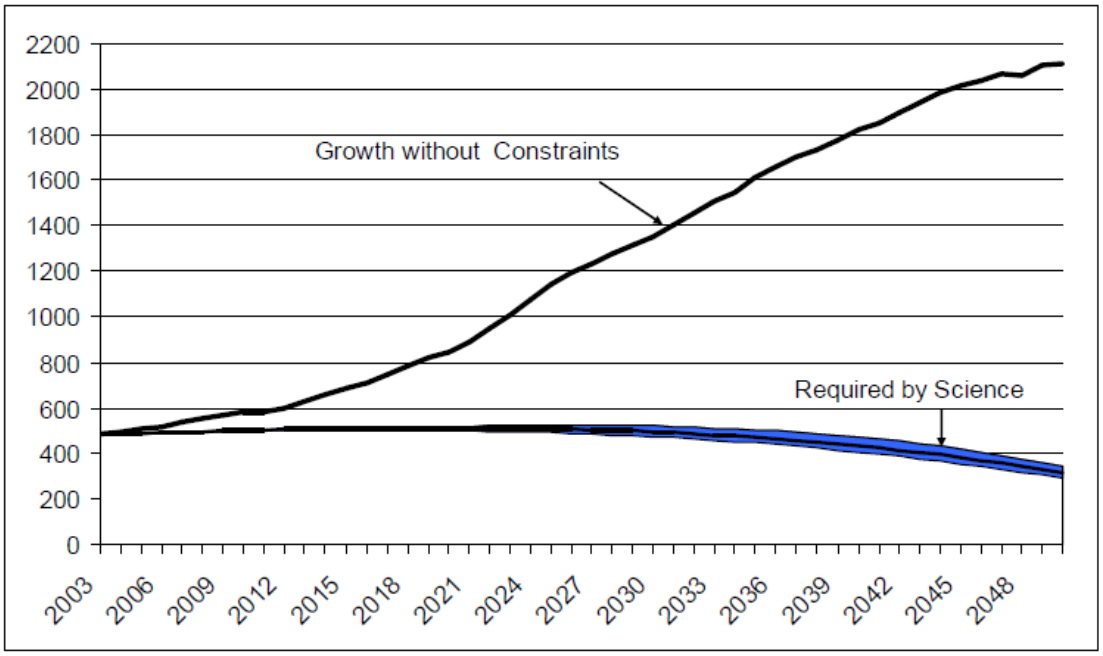


***Figure 1: Emission Trajectories for GWC and RBS (Energy Research Centre, 2007, p.5)***

**Secondly, South Africa's Second National Communication of 2011 under the UNFCCC.** The Second National Communication (SNC) has illustrated deeper understanding of national climate change issues. It was developed following the UNFCCC guidelines and the 2000 National GHG inventory for South Africa. The First National Communication was prepared in 2004 in accordance with Article 12 of the UNFCCC. The SNC included a general description for implementing the UNFCCC (such as LTMS), facilitation of climate change mitigation and adaptation measures, information about monitoring and research, technology transfer, systematic observation, public awareness and capacity building (DEA, 2011c). It has also included the national constraints, gaps and related financial, technical and capacity issues such as;

- Development of human resources and project finance constraints for the adoption of climate change mitigation and adaptation technologies,
- Improving education, training and awareness capacity of climate change among scientists, policy-makers and stakeholders, and
- Climate change impacts prediction and simulation models constraint.

**Thirdly, Gauteng Climate Change Response Strategy (GCCRS) and Action Plan.** The Gauteng Department of Agriculture & Rural Development (GDARD) has developed the Gauteng Climate Change Response Strategy (GCCRS) and Action Plan in 2011, in order to address climate change issue. Admitting the fact that climate

change is an inter-disciplinary and cross-cutting issue, which threatens the sustainable development of South Africa. Gauteng province is the economic hub of South Africa, which is considered as a major contributor to GHGs emission, while it is exposed to the adverse effects of climate change. According to the GDRAD report (2012), the province of Gauteng has initiated the GCCRS and Action Plan to address climate change, which is aligned with National Climate Change Response Strategy, Gauteng Integrated Energy strategy, Gauteng Economic Growth & Development Strategy, Gauteng Green Strategic Programme, and relevant provincial, municipal policies and strategies.

The GCCRS and Action Plan represent two ways to address climate change. Firstly, Gauteng Climate Change Mitigation Strategy and Action Plan, which aims to minimize GHGs emissions. Secondly, Gauteng Climate Change Adaptation strategy and Action Plan, which aims to adapt to climate change impacts for sustainable development. According to the GDARD report (2012), climate change policy will need a strong political commitment, financial investment and administrative actions in order to accomplish the desired outcomes of climate change response. GDARD has initiated the Gauteng Province Air Quality Management Plan, in which an analysis of climate change with relation to energy has been described. The 2009 report of GDARD showed that climate change and GHGs emission caused by burning fossil fuels, lack of alternative energy sources and limited co-generation of industrial operations, on the other hand, it has also mentioned a general way of addressing climate change, based on access to alternative energy sources, use of alternative fuels and co-generation of industrial operations.

Climate change has been considered by South African government. Plans and solutions for climate change issues and challenges have been presented as described. Those plans and efforts did not include the role of EIA in terms of reducing GHG emissions (climate change mitigation), and increase project resilience to climate change (climate change adaptation). It is very important to establish and incorporate climate change mitigation and adaptation measures into the policy of government departments. Meanwhile, climate change should be addressed at the project-level and supported by effective policy and law within the government levels.

### 2.3.4. Assessment of South African Climate Change Policy

The alignment between South African energy policy and climate change mitigation vision has been assessed, which study concluded that the energy policy is misaligned with the vision of climate change mitigation, because of vested interests which affect the energy paradigm, energy institution orientation and capacity (Tyler, 2010). In order to solve this issue, ensuring sufficient capacity, influence and leadership within energy institutions are the solution for effective alignment with climate change mitigation policies (Tyler, 2010). In terms of climate change planning, two South African municipalities in the Northern Cape Province and the Western Cape Province have been assessed (Faling, et al., 2012). This study stated that despite South African laws and legislations for disaster risk reduction, and measures for climate change planning initiated in 2008, by South African National Disaster Management Centre for local governments to be implemented. Climate change planning was not achieved in the two municipalities.

Additionally, it was described that climate change mitigation and adaptation in South Africa faces some challenges (Faling, et al., 2012) such as;

- Conflicting situation between environmental stresses and development needs within the government spheres,
- The lack of understanding climate change impacts within local municipalities, and
- Workload and lack of time to invest in climate change issues.
- The lack of information availability on climate change in South Africa (GDARD, 2009).
- Further challenges have been mentioned (Roberts, 2008 cited in Faling, et al., 2012) such as;
- Insufficient human and financial resources,
- Inability of technological adaption to climate change,
- Failure to incorporate climate change consideration in political, and
- Administrative decision making, and lack of political support to climate change.

Ultimately, South Africa has considered different plans for climate change mitigation and adaptation. It has focused on a number of challenges and gaps with the implementation of the National Climate Change Response Policy such as political, economic, legislative and governmental obstacles. These include for example a concern that climate change may impede much needed development.

## 2.4. The EIA process

EIA is an informed decision-making tool, it provides information for decision-maker regarding the environmental and socio-economic impacts of a development proposal. In the following subsections a brief of EIA history, EIA global process and benefits are illustrated

### 2.4.1. EIA history

EIA has been defined as “the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made” (Senécal, et al., 1999, p.2). EIA is a systematic, integrative, anticipatory, participatory environmental management process. It provides decision-makers with the appropriate information about the potential environmental, social, and economic impacts of proposed project, in order to decide whether or not the project can go forward. EIA aims to prevent projects which can cause unacceptable environmental impacts, and mitigate to the level that can be environmentally tolerated.

EIA is a form of IA, it was first developed in the United States in the National Environmental Policy Act of 1969 (NEPA) (Wood, 2003). After the NEPA and the United Nations Conference on the Environment in Stokholm in 1972, EIA was internationally adopted among different developed countries (such as Australia, Canada, New Zealand, Columbia, Thailand and France), and many international organizations such as the Organization for Economic Cooperation and Development (OECD), the Council of the European Communities and The UNEP (Wood, 2003).

In 1992, EIA was fully accepted at the United Nations Conference on Environment and Development held in Rio de Janeiro. Multi-lateral development banks have adopted and developed EIA systems such as the World Bank. The international finance institutions have adopted the Equator Principles such as International Finance Corporation (IFC) which involve EIA, based on environmental and social performance standards (International Association for Impact Assessment (IAIA), 2009). EIA objectives have been described (Senécal, et al., 1999) as following;

- The incorporation and consideration of the environment into decision-making process,

- Predict, avoid, minimize or offset the potential environmental, social and other impacts of the proposed developments,
- Functions and productivity protection of the natural systems and ecological process, and
- Contributing to sustainable development.

EIA as an environmental management tool contributes to sustainable development, by taking into consideration the potential environmental and socio-economic impacts of an activity during decision-making process. This helps to reach informed decisions, which ensure environmental protection, sustainability of the environment and its natural resources. It has been believed that EIA is a powerful tool for informed decision-making, which can be an effective tool for achieving sustainability (UNEP, 2002). Climate change is an issue which has adverse impacts on the environment, economic development proposals and communities. It affects sustainable development, which means an imperative consideration of climate change into the environmental instruments such as EIA is needed. EIA can assist in mitigating GHG emissions, which are the cause of climate change. On the other side, it can protect the development proposal from climate change effects, through consideration of adaptation measures.

### 2.4.2. EIA process globally

EIA process includes different stages, which look at the potential impacts of a development activity, and what can be done to implement environmentally-friendly projects. EIA has been practiced following almost the same structure globally (UNEP, 2004), which are;

**Screening,** this step is used to decide if a particular project needs an EIA process or not. The determination of conducting an EIA varies from country to country, depending on specific requirements (such as conduct an EIA depending on legislation for list of activities, monetary value or EIA for every project). For example, in South Africa EIA is conducted according to Listing of activities determined in the EIA regulation in NEMA.

**Scoping,** during scoping stage, the likely and significant effects of a project must be identified, and unimportant impacts eliminated. The identified impacts will be used in the preparation of Terms of Reference (ToR) for the EIA. Scoping is considered as the foundation of an effective and efficient EIA, which involves public participation for all

stakeholders to ensure that raised important issues and alternative from stakeholders are not neglected in the ToRs of the EIA.

**ToR,** it is the roadmap for EIA preparation, which helps to not waste time and money on insignificant studies and investigations. It usually includes the following; description of the project, competent authorities responsible for decision-making, description of the project location, EIA legal requirements for the project, identified impacts, mitigation and monitoring measures, legal requirement for public participation, key stakeholders, timeframe for EIA completion and budget. ToR should be available for public review for comment.

**EIA work and impact studies,** the predication and evaluation of the potential significant impacts of a project, and its alternatives identified in the ToR are essential parts of conducting the EIA. The process of impact predication is based on an environmental baseline assessment for the receiving environment, where the development proposal will be implemented. This helps to sit the appropriate mitigation measures for project impacts, then an evaluation of residual impact significance can be determined. Through using these information, decision-makers can understand the development proposal impacts on the environment, and environmental tolerance to these impacts.

**Mitigation and Environmental Management Plan (EMP),** through this step, mitigation measures for the likely significant impacts of the project will be identified. Mitigation is the practical stage of the EIA process, in which the adverse impacts of an activity can be mitigated, through consideration of alternatives such as project design, location and operation. Mitigation measures also enhance the environmental and social benefits of a development proposal. The mitigation measures for the project impacts should be arranged according to the significance of impacts, using a mitigation hierarchy. The mitigation measures hierarchy starts with prevention or avoidance of adverse impacts, minimization or reduction of remaining impacts, and offset residual impacts through rehabilitation and compensation measures. The following important step in the EIA is the implementation of the mitigation measures, here the role of EMP comes, which contains the implementation details for the mitigation measures.

**Preparation of Environmental Impact Report (EIR),** it is also called Environmental Impacts Statement (EIS) in some countries. EIA report should contain the necessary information about the development proposal impacts, which were specified in the ToR. The EIR purpose is to provide the decision-making body or competent authority with sufficient information about the adverse consequences of an activity, in order to decide

if a project deserves approval or not which is called environmental authorization. EIR should be also publically reviewed, therefore, it should be written and organized in a way that can be easily understood.

**Review of EIR,** before EIA report submission to the competent authority for decision-making, it should be reviewed to make all the necessary information including public comments on the EIR are in the final report.

**Impact management and monitoring,** it is the process of implementing mitigation measures in accordance with mitigation actions mentioned in the EMP. It should be adjustable in order to tolerate and respond to any unexpected impacts or changes. Monitoring is part of impact management, which contains steps and actions to control the adverse environmental consequences of project implementation.

**EIA follow-up and evaluation of performance,** they assist in improving future applications for EIA practice, procedure and methods. This can be achieved through monitoring, auditing and evaluation of approved EIAs.

**Who prepares an EIA?** EIA is a process consisted of different steps, which requires skills, background and knowledge in the environmental, natural and social sciences in order to prepare an EIA. The responsibility for EIA preparation depends on the EIA system, which differs from country to country. There are mainly two bodies responsible for EIA preparation. The first one is government agency or ministry, the second is the project proponent (the applicant). Commonly, both of them rely on environmental consultant to prepare the whole EIA or portion of it. For example, in South Africa the project proponent is responsible for assigning and paying an environmental consultant, who is called EAP. Different environmental, economic and social advantages can be accomplished through EIA process.

The following points illustrate EIA benefits according to the United Nations Economic Commission (n. d.);

- EIA process assists in identifying the potential significant environmental issues of proposed activity, and consideration of the environmental consequences of activity implementation. It helps in the compliance with the environmental standards,
- It provides opportunities for better designs and feasible alternatives for the proposed project location and the needed technology, in order to reduce the potential project impacts. This also helps the applicant or developer to reduce

financial loss and waste of time for application approval, if EIA process conducted early prior project implementation,

- It predicts the potential impacts of the projects, and provides the suitable mitigation measures, to minimize and offset the predicted impacts for environmental protection,
- It allows communities and Interested & Affected Parties (I&AP) to participate in the EIA process, and share their interests, expectations and fears about the proposed project. This also helps in terms of improve project design, project location and technology alternatives, and mitigation measures for project potential environmental impacts. It also ensures public participation involvement in government decision-making,
- It provides the decision-makers with the appropriate information about the potential impacts of the project and their mitigation measures for better informed decision,
- It helps in protecting the project from the environmental problems and additional costs. For example, EIA allows for opportunities to consider climate change adaptation, in order to protect the activity itself from climate change impacts, and
- It contributes in the promotion and achievement of sustainable development.

Few important points have been considered in the EIA process implementation, in order to ensure achieving EIA benefits (Senécal, et al., 1999) such as; applying EIA process as early as possible during decision-making process and proposed activity, applying EIA process for all projects that could result in harmful impacts, considering all the impacts which could be caused by the project, and opportunity for public participation during EIA process.

According to the mentioned benefits for EIA process implementation, there is an opportunity to consider climate change mitigation and adaptation, during the identification of the alternatives and measures to minimize the potential impacts of an activity. Measures to decrease GHG emissions from project construction and implementation can be also identified if the project emits GHGs. EIA also supports the economic benefits the proposed development, through increasing project resilience and adaptation to climate change impacts. The consideration of both climate change mitigation and adaptation where relevant in the EIA process enhances environmental protection and development benefits, which are about sustainable development achievement.

## 2.5. EIA procedural framework in South Africa

EIA regime in South Africa comes under NEMA. It has gone through different stages of development. EIA is linked to IEM in NEMA, which is linked to sustainable development in South Africa. The following subsections provide an explanation to South African EIA regime.

### 2.5.1. Development of EIA in South Africa

EIA is a very detailed process in South Africa, it has been defined as 'a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and Scoping & Environmental Impact Reporting (S&EIR))' (*NEMA 1998, 2010 EIA Regulations (R.543), C1, p.10*). EIA system in South Africa went through different stages of development over time. EIA started in the mid-1970s on a non-mandatory basis. It was voluntarily used and practiced as part of IEM (Sandham, et al., 2012). In September 1997 EIA regulations were announced in South Africa in terms of the Environment Conservation Act (ECA), No. 73 of 1989. Under ECA regime, EIA process consisted of the following steps (Sandham & Pretorius, 2008);

- Pre-application consultation,
- Plan of study for scoping,
- Scoping report (including public involvement),
- Plan of study for EIA,
- EIR including public involvement,
- Authority review, and
- Record of Decision (RoD) (including conditions of approval).

Shortcomings of EIA system within ECA regime have been described (Wood, 1999), as the lack of monitoring and auditing plans, environmental management provisions, extension of EIA to certain land use, plans and policies. ECA also included fairly limited list of identified activities, which some of them was vague.

NEMA No.107 of 1998 was promulgated as a comprehensive environmental management legislation with EIA regulations. In 2006, NEMA was amended in order to improve the effectiveness of EIA process and expedite the authorization process (Kidd and Retief, 2009 cited in Sandham, et al., 2012). The regulatory changes that have been made in EIA regulations in 2006 NEMA regime were illustrated (Sandham,

et al., 2012) as following; setting timeframes for the authorization process (Government Notice No.R.385), listed activities require BA (R.386), listed activities require EIA (R.387), and provision for post decision follow-up. The 2006 EIA regulations within NEMA made distinguished between BA and EIA as well as focused on cumulative impact unlike EIA regulations within ECA regime.

In 2010, NEMA was also amended including regulatory changes in EIA regulations. The amendments have been stated (*NEMA 1998, EIA regulations 2010*), which were; setting out the environmental authorization process (R.543), list of activities that require BA (List Notice 1, R.544), EMP submitted for BA, list of activities that require S&EIR (List Notice 2, R.545), list of activities that require environmental authorization if carried in specified geographical areas (List notice 3, R.546), EMF regulations (R.547), and time framework for decision-making regarding EIA application. The difference between EIA regulations within ECA, 2006 NEMA and 2010 NEMA regime shows big improvement in the regulations as can be seen from the above overview.

### 2.5.2. Current EIA process in South Africa

EIA process framework in South Africa is similar to the abovementioned steps of EIA globally. EIA process in South Africa is undertaken by EAP, who is assigned and paid by the developer (applicant). EAP has been described as 'the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments introduced through regulations' (*NEMA 1998, p.10*). According to the latest EIA regulations of 2010 NEMA regime, the first step is screening. At this stage, conducting BA or EIA process is determined by the lists of activities that have been established in the EIA regulations. That means the type of IA process for an activity will be decided according to the list notices 1, 2 and 3. If an activity comes within the list notice 2, then S&EIR (EIA) process is required, which starts with scoping process and EIA report, specialist studies, public participation and EMP. The purpose of screening phase in the IA process is replaced by the lists of activities in the EIA regulations, which allocate BA or S&IR according to specific type of activities.

During scoping process, different points have to be included in the scoping report such as the potential impacts of the activity on the environment, the impacts of the environment on the activity, and cumulative impacts. Public participation is an essential

part of EIA process. It takes place throughout EIA process. For example, before the submission of final scoping report, and before the submission of final EIA report and EMP to competent authorities, all the I&APs must be informed about the activity and the EIA process, using different methods such as given written notices, advertisements and notice boards on site and the vicinity of the activity (South African Development Community (SADC), 2012). The I&APs has been defined as 'any person, group of persons or organization interested in or affected by such operation or activity; and any organ of state that may have jurisdiction over any aspect of the operation or activity' (*NEMA 1998, p.11*). Public participation process allows I&APs to share their concerns and thoughts about an activity, which helps to improve EIA final outcome for better sustainable development. The following diagram illustrates EIA process in South Africa according to 2010 EIA regulations in NEMA.

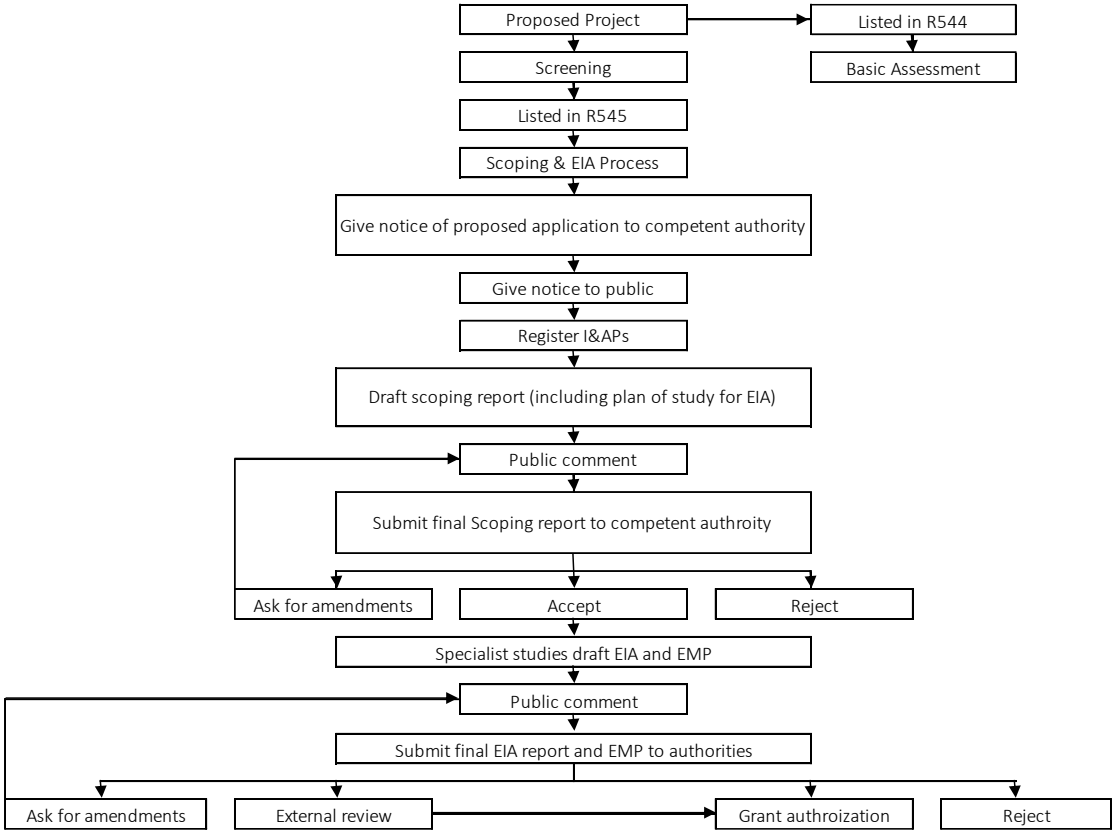


***Figure 2: EIA process in South Africa (South African Development Community, 2012, p. 338)***

### 2.5.3. The linkage between EIA, IEM objectives and sustainable development

EIA process is considered in NEMA as an environmental instrument, which works to achieve the objectives of the IEM, in order to accomplish sustainable development.

IEM has been defined in the South African context as 'IEM provides an holistic framework that can be embraced by all sectors of society for the assessment and management of environmental impacts and aspects associated with each stage of the activity life cycle, taking into consideration a broad definition of environment and with the overall aim of promoting sustainable development' (DEAT, 2004a, p.2). According to NEMA (*NEMA 1998, p.24, 25*), the IEM objectives are;

- 'To promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment',
- 'To identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits, and promoting compliance with the principles of environmental management set out in section 2',
- 'To ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them',
- 'To ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment',
- 'To ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment', and
- 'To identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2'.

Section 2 in NEMA provided principles for environmental management, which acknowledged the importance of the environmental protection during decision-making for the people. Additionally, NEMA provided a definition for South African sustainable development, which is 'the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generation' (*NEMA 1998, p.14*). NEMA made the linkage between EIA as an environmental management tool with sustainable development in South Africa, through the achievement of IEM objectives. This linkage implies that EIA process implementation should aim to accomplish sustainable development in South Africa, in parallel with the other environmental instruments mentioned in NEMA. This leads to implied legal requirement to consider any potential environmental effects from proposal development during EIA process implementation such as climate change. In

support of EIA role in contributing towards sustainable development, it has been believed that EIA is an effective tool in achieving sustainability (UNEP, 2002).

## 2.6. EIA role in considering climate change

EIA role is to consider any potential effects may a development proposal cause, and contributes to sustainable development. Therefore, it is imperative to consider climate change before, during and after a project implementation as a potential impact, in order to provide decision-makers with the required information about the necessary climate change mitigation and adaptation measures for sustainable development. This can be accomplished using IA tools such as EIA and SEA. The following subsections explain climate change mitigation, adaptation and baseline adaptation measures consideration into EIA, and their challenges.

### 2.6.1. Consideration of climate change mitigation into EIA process

Climate change mitigation consideration in the EIA process was mentioned by a number of authors (Byer, et al., 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003; *Institute of Environmental Management & Assessment (IEMA), 2010*) . Climate change mitigation measures should be identified during the scoping stage of the EIA process. At this stage, GHG emissions from a proposed project should be identified. Then alternatives and options for GHG emission avoidance, reduction and offsetting should be addressed. The early implementation of EIA process with consideration of climate change mitigation for an activity, leads to better performance for the mitigation measures of climate change. If GHG emissions cannot be avoided, measures for GHG emissions reduction have to be implemented during all stages of a project (such as design, construction and operation). Following the consideration of GHG emission reduction, compensation measures should be taken for unavoidable GHG emissions. Furthermore, after addressing climate change mitigation in the scoping stage, and identify the needed measures for GHG emission prevention, minimization and offsetting, auditing and monitoring of the specified measures in the scoping and EIA report should be conducted, which are implemented during EMP process.

### 2.6.2. Consideration of climate change adaptation into EIA process

Climate change adaptation consideration in the EIA process, as projects generate different environmental impacts such as climate change, they are also affected by such impacts. Climate change affects development projects and leads to many damages and losses (such as economic losses). As the case in climate change mitigation, adaptation measures for climate change should be identified during the scoping stage, in order to increase project resilience, decrease project vulnerability and sensitivity to climate change. Climate change adaptation objectives can be established in the EIA process, through assessing project vulnerability and baseline environmental assessment to climate change. Then identify alternatives and options for climate change adaptation targets implementation (Byer, et al., 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). Consideration of climate change adaptation in the EIA process maximizes the benefits of proposed activities, through protecting them from climate change effects. This works toward accomplishing sustainable development (*IEMA, 2010*). It has been mentioned that incorporating climate change adaptation into EIA process is significant. In order to protect the project from risks imposed by climate change and increase project resilience to climate change impacts (Agrawala, et al., 2012). Additionally, an explanation of considering climate change mitigation and adaptation into EIA process has been made by (IAIA, 2013). It was outlined that mitigation plans should be established at project-level EIA, and implemented through EMP.

Significant factors should be considered during climate change incorporation into IA tools such as EIA, which are; consideration of various socio-cultural, economic vulnerabilities and adaptive capacities within communities, while assessing climate change impacts, consideration of scientific information, reliability of data analysis and uncertainties about climate change, which are associated with decision-making, consideration of transparency and community participation, and consideration of climate change effects during monitoring and evaluation process, using the generated data to improve the management process in adaptive manner (Byer, et al., 2012).

### 2.6.3. Consideration of climate change baseline adaptation into EIA process

Climate change mitigation and adaptation are the main approaches, which have been looked at in terms of considering them in EIA process. There is also a new approach

of considering climate change impacts in EIA, which is baseline adaptation. For example, a study has been done to find out how climate change has been considered in the EIA report in Denmark (Larsen, 2013). The methodology was used based on three pillars namely; mitigation, adaptation and baseline adaptation. Mitigation and adaptation aim to reduce estimated GHG emissions and protect the project from climate change impacts respectively, while baseline adaptation looks at the effects of climate change on the baseline environmental assessment and possible measures (Larsen, 2013). The baseline assessment is an important part of the EIA process in that it describes the current state of the environment. It is useful for assessing the potential impacts of a project on the environment. The issue is that baseline assessment is becoming a challengeable process because of climate change. Climate change continuously affects the environment, which makes the characteristics of the environment continuously changing. Thereby, baseline assessment should include the changes caused by climate change on the environment. For example, climate change affects precipitation patterns, which then affects flooding frequency. Baseline adaptation is a precondition for adaptation, which assists in setting adaptation measures (Larsen & Kørnøv, 2009). It has been mentioned that comparing to adaptation and baseline adaptation, mitigation measures has been considered in the EIA more than the first two, because they are new approaches (Larsen, 2013). It was also pointed out that SEA should work in parallel with EIA to effectively deal with climate change issue (Larsen, 2013).

### 2.6.4. Climate change consideration into SEA

In parallel with EIA, SEA is considered as an effective tool to deal with climate change consequences at the strategic-level of plans, programs and policies of development proposals. It has been believed that SEA process can systematically enhance climate change mitigation and adaptation at the strategic-level of development planning, due to its practical, analytical, participation component, and its ability to involve legal issues and reconcile competing agendas (Posas, 2011). The integration of climate change adaptation through SEA process has been outlined at the national overarching policies, plans and programmes, and the national sectoral policies, plans and programmes by the Organization for Economic Co-operation and Development (OECD), 2008. Mitigation, adaptation, and baseline adaptation for climate change impacts have been recommended to be considered into SEA of river basin management plans of Denmark (Larsen & Kørnøv, 2009). South Africa does not have

legislation that require SEA, even though SEA aims to promote sustainable development by providing information about the environment and socio-economic elements at strategic-level of development plans, policies and programs. SEA is more effective in considering cumulative impacts of project than EIA, which is limited to project boundaries (Rossouw, et al., 2000). SEA has been defined in the White Paper on Environmental Management Policy for South Africa as 'SEA is a process to assess the environmental implications of a proposed strategic decision, policy, plan, programme, piece of legislation or major plan' (DEAT, 1998, p.85.86). SEA was mentioned in NEMA, No.107 of 1998 in section 24 (5A) (*b*A) as one of the environmental management instruments. Unlike EIA, SEA was mentioned in NEMA without regulations. SEA concepts, principles and general characteristics have been illustrated in by DEAT in (2004b), with relation to IEM and sustainable development in South Africa without clear consideration of climate change.

### 2.6.5. International climate change mainstreaming in EIA

The integration of climate change in the EIA process differs from one country to another. Countries like Australia and Canada have incorporated climate change into EIA implementation, while countries like Grenada and Kiribati have developed a guidance for climate change consideration into EIA (IAIA, 2013). There are also countries such as Spain and United Kingdom and multilateral organizations such as the World Bank, which are still in the level 1 in which they still develop a policy for climate change incorporation in the EIA (IAIA, 2013). Table 2 illustrates the consideration of climate change into EIAs across developed, developing and multilateral organizations. South African status in the international context of climate change consideration into EIA is not seen as can be noticed from table 2. This is supported from the review results of climate change response policy of South Africa, in which EIA was not considered to tackle climate change issue.

***Table 2: International adoption of climate change consideration into EIAs (Agrawala, S., et al. 2011 cited in International Association for Impact Assessment, 2013, p.1)***

| | **Level 1 Intension** | **Level 2 Guidance** | **Level 3 Implementation** |
|---|---|---|---|
| **Developed Countries** | Spain<br>European Union<br>Canada<br>United Kingdom | Australia<br>Canada<br>Netherland<br>New Zealand | Australia<br>Canada<br>Netherland<br>New Zealand |

| | | | |
|---|---|---|---|
| **Developing Countries** | Bangladesh<br>Dominica<br>Kiribati<br>Saint Lucia<br>Samoa<br>Solomon Islands<br>Caribbean community | Grenada<br>Kiribati<br>Trinidad and Tobago<br>Caribbean community | |
| **Multilateral Organization** | Asian Development Bank<br>Inter-American Development Bank<br>The World Bank | | |

### 2.6.6. Challenges for climate change incorporation into EIA.

Climate change incorporation into EIA process is not straightforward or easy process. Many challenges have been identified, which face climate change consideration into EIA practice (IAIA, 2013) such as;

- The lack of government policy and incentives to address climate change,
- The lack of political and agency interest to address climate change,
- The limited scope capacity of EIA to address climate change, and
- The lack of expertise and appropriate EIA tools to address climate change.

Other limitations for climate change incorporation into EIA have been mentioned such as; the lack of historical and future climate information, and the lack of cooperation between scientific community and EAPs (Agrawala, et al., 2012). Additionally, with regard to the gaps in climate change incorporation into EIA, it has been revealed that the faced challenges were;

- The ambiguity in the policy's language and lack of legislation regarding climate change (Yi & Hacking, 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003),
- The lack of theoretical foundation (uncertainty in climate research) (Yi & Hacking, 2012),

- The lack of scientific prediction and evaluation of GHGs in the EIAs (Yi & Hacking, 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003),
- The lack of standard protocols and guidance for EAPs (Yi & Hacking, 2012), and
- The lack of clear definition of GHG emission levels and significance of impacts (Ohsawa and Duinker, 2014).

EIA framework in the United States has faced challenges regarding climate change consideration, which are; scientific uncertainty, lack of addressing cumulative impacts and lack of evaluating the significance of project climate change effects (Slotterback, 2011). There are analytical approaches, which have been presented in order to deal with climate change impacts and its uncertainties in the EIA practice, which are scenario analysis, sensitivity analysis and probabilistic analysis (Byer and Yeomans, 2007). It has been also stated that for effective climate change incorporation into EIA, there are specific climate change related regulations and guidelines are needed to be applied in each step of EIA process, using strategic and sustainability assessment instruments, in parallel with EIA in considering climate change as well as broader economic tools and political commitments (Sok, et al., 2011). Recommendations for climate change consideration into EIA have been made which are;

- Effective stakeholder engagement regarding climate change impacts (IAIA, 2013),
- Improve the knowledge of planners, professionals, EAPs, and regulators about climate change (IAIA, 2013; Byer, et al., 2012),
- Implementation of guidance programs about climate change consideration (IAIA, 2013),
- Establishment of Cumulative Impact Assessment, SEA and Regional Environmental Assessment with regard to climate change and EIA (IAIA, 2013), and
- Coordination between departments, environmental authorities and institutions should be achieved (IAIA, 2013).

It seems that climate change incorporation into EIA regime needs more time and work to be effective. Climate change is a complex issue surrounded by skeptic trends, economic and political issues as well as technical and scientific issues, related to climate change modelling and data. The foregoing challenges for climate change consideration into EIA, illustrate many disadvantages for the legal and practice

frameworks of the current EIA regarding climate change. From the review of the literature, the legal regime of EIA inadequately incorporates climate change, which led to shortcomings of the EIA practice in terms of addressing climate change. This could be a result of low interest of the government attention towards climate change. Additionally, EIA process needs to be prepared in a way that can incorporate climate change in effective way. This requires regulations and guidelines for climate change and EIA as well as qualified EAPs and government staff in terms of climate change knowledge. There are also issues related to climate change such as data availability and modelling. This could add a burden to the EIA practice if climate change was considered. Despite the mentioned challenges, to some extent EIA can assist in GHG emission reduction, and proposed project protection from climate change impacts.

## 2.7. Summary

Internationally, Climate change has been given serious attention, due to its undeniable and unavoidable, global and local environmental, social and economic impacts. Efforts, measures and solutions to address climate change have been raised, by many international organizations such as UNFCCC and IPCC as well as developed and developing countries. The described information above, illustrated the reality of climate change, despite the argument about it. It also explained the issue of climate change and how it affects the stabilization of developed and developing countries, particularly their sustainable development. The reduction of GHG emissions and increasing the resilience to climate change, through climate change mitigation and adaptation measures were the overwhelming approaches for addressing climate change. EIA's role at the project-level in avoiding, minimizing and offsetting the potential impacts of an activity, which contributes to sustainable development, is given an attention to play an important role in addressing climate change. Mitigation and adaptation measures for climate change have been introduced to be considered in the EIA process. GHGs emit during construction and operation phases of a project, in some instances, even after the closure of an activity such as mining sites. The emission of GHGs contributes to climate change, which affects the old and new activities. Considering climate change mitigation and adaptation into EIA process, helps to decrease GHG emissions from an activity, and protect it from climate change effects. This was clear in the international interest about climate change incorporation into EIA process.

South Africa is a developing country affected by, and contributes to climate change. Its economic activities (which are based on mineral resources such as coal), and

environmental and socio-economic situation make South Africa vulnerable to climate change as mentioned in the White Paper. EIA in South Africa is well developed and structured. According to its legal framework, its aim as an environmental management instrument, is to meet the IEM objectives described in NEMA. The objectives of IEM are around accomplishing sustainable development in South Africa, taken into consideration, the priority for sustainable development in decision-making in South Africa, which is affected by climate change as described in the South African Climate Change Response Policy. From the link between EIA, IEM objectives and sustainable development, climate change incorporation into EIA regime is implied. According to the role of EIA in addressing any likely environmental issue of proposed project implementation such as climate change, and the threat of climate change to sustainable development in South Africa, climate change should be considered in the EIA practice where is relevant. In order to find an answer for the main research question (How is climate change incorporated into EIAs in South Africa?), an investigation for climate change incorporation into South African EIA legal regime and process will be undertaken which its methodology described in the next chapter of this research. The next chapter after the methodology is the results, then the discussion chapter.

# Chapter 3.0 Research Methodology

## 3.1. Aims and objectives

Climate change is an environmental issue that can be incorporated into, and considered through the EIA process. EIA as an environmental protection approach can play an important role in firstly, climate change mitigation through the consideration of climate change mitigation measures during the EIA process. The consideration of climate change mitigation measures into EIA helps to minimize GHGs emissions, which then lessens climate change effects and protects the environment. Secondly, EIA can protect an activity from climate change impacts, through the consideration of climate change adaptation measures during EIA process. Project protection from climate change effects leads to enhancing the project social and economic benefits. Both climate change mitigation and adaptation consideration into EIA contribute to sustainable development. This study aims to describe and assess how climate change is incorporated into EIA in South Africa. The objectives that were implemented as part of the main aim are; firstly, describing and assessing climate change concern and incorporation in the EIA legal regime. Secondly, describing and assessing the practice of climate change consideration into EIA in South Africa, using Gauteng province as a case study.

## 3.2. Rationale

EIA purpose is to identify, assess, evaluate, avoid (if possible) and mitigate (if not possible) the potential impacts of a project on the environment, economy and society. This leads to projects implementation with less environmental and socio-economic impacts. In fact, the need for continuous development is inevitable as a result of growing populations, which means different projects will continue to take place, based on exploiting the natural resources and impacting the environment, economy as well as the community. Climate change is an inevitable outcome of development needs, in order to meet the increasing demand of populations. Internationally, EIA has been a focus as an environmental tool that can play an important role in addressing climate change along with other tools as illustrated by (Byer, et al., 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003; Agrawala, et al., 2012). At the project-level where EIA takes place, reducing GHG emissions through consideration of appropriate measures (climate change mitigation), and decreasing project vulnerability to climate change (climate change

adaptation) can be considered during EIA process in parallel with different instruments such as SEA. This research aims to describe and assess how climate change mitigation and adaptation measures are incorporated into both, the EIA legal regime in South Africa, and EIA practice in Gauteng province. This aim was based on the international focus and interest in climate change consideration into EIA process, the impacts of climate change on sustainable development in South Africa, and the contribution of EIA towards sustainable development. South Africa significantly contributes to climate change through GHG emissions, and adversely affected by climate change effects according to the White Paper. EIA was mentioned in NEMA as an environmental instrument for IEM objectives accomplishment, which is about sustainable development in South Africa. Therefore, a description of climate change mitigation and adaptation incorporation into EIA regime in South Africa is needed.

### 3.3. Questions

The main question of the study is; how is climate change incorporated into Environmental Impact Assessments (EIAs) in South Africa? In order to answer this question the following sub-questions were addressed;

1. How is climate change incorporated in the EIA legal regime in South Africa?
2. How is climate change addressed in the EIA practice in South Africa, using Gauteng province as a case study?

## 3.4. Methodology and Data Collection

This research report is descriptive in nature based on qualitative methodology. It describes the incorporation of climate change in the EIA legal regime and practice in South Africa. Following the description of the legal and practice data of EIA and climate change, an assessment of the descriptive data was conducted, in order to describe and assess the relationship between EIA legal regime and practice in terms of climate change incorporation. The qualitative methodology of the research is based on three parts. The first part included reviewing and describing EIA regulations and related legislation in South African law. The second part involved reviewing and describing EIA case studies conducted in Gauteng province, which were done between 2010 and 2013. This part aimed to describe climate change mitigation, adaptation and baseline adaptation consideration into EIA practice. The last part included conducting in-depth

interviews of key informant EAPs in Gauteng province of South Africa. It also included a discussion on the website of IAIAsa linkedin group. This part aimed to discuss EAP's knowledge and experience about climate change and EIA locally in South Africa and internationally. This research report only concentrates on the EIA process in South Africa, taken into consideration the following;

- EIA process is conducted for projects, which are expected to cause serious or unforeseeable effects on the environment such as climate change, while BA process is undertaken for activities, which are unlikely to cause significant impacts on the environment (Wood, 1995 cited in Murombo, 2008). Therefore, only EIA was assessed as it can be assumed that this is where climate change can be considered,
- There is an international interest in considering climate change by SEA. In South Africa, SEA is mentioned in NEMA, No.107 of 1998 without regulations unlike EIA process. (See for example example Rossouw, et al., 2000; OECD, 2008; Larsen and Kørnøv, 2009). Therefore, it was not part of the research methodological approach, and
- This research reviews the named legislation in the next section of the methodological approach until the first of June 2014. Considering the fact that, legislation amendments occur based on government decisions.

### 3.4.1. Legal review

The first part of the methodological approach has addressed the first sub-question. The policy documents and legislation that was selected for the review are pieces of environmental legislation that deal directly with climate change and/or environmental impact assessment. These are pieces of legislation that Environmental Assessment Practitioner would use when conducting EIAs. The legal documents were downloaded from Juta Online publications in the library of the University of the Witwatersrand. Juta is the publishing house in South Africa for the legal information and publishes the most recent versions of legislation. The selected legislation which was reviewed related to both climate change and EIA in South Africa, namely;

- National Environmental Management Act, No.107 of 1998 (NEMA),
- 2010 EIA regulations in NEMA,
- National Environmental Management: Air Quality Act, No.39 of 2004 (NEM: AQA),

- 2013 National Framework for Air Quality Management in the Republic of South Africa under NEM: AQA,
- National Ambient Air Quality Standards (NAAQS) of (2009) under NEM: AQA,
- The list of activities which result in atmospheric emissions of (2010) under NEM: AQA,
- The list of activities which result in atmospheric emissions (2013) under NEM: AQA, and
- Declaration of greenhouse gases as priority air pollutants (14 March 2014) under NEM: AQA, (legislation still under the process of comment).

Figure 3 illustrates the arrangement of the reviewed legislation in hierarchical way. It starts with NEMA at the bottom of the pyramid as the 'mother' of all environmental legislation.

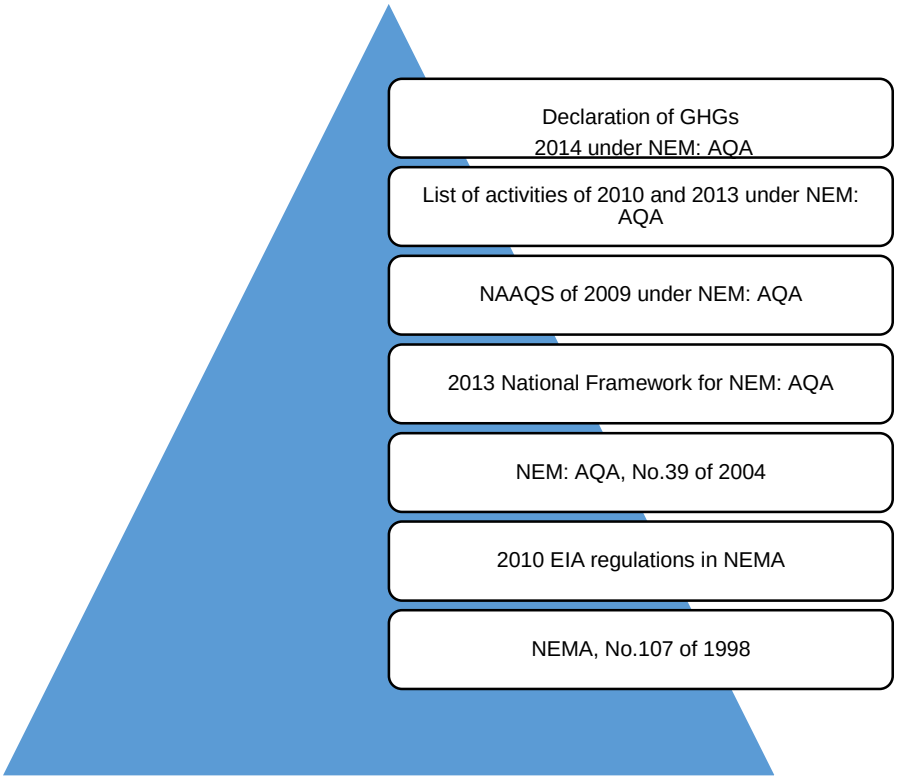


***Figure 3: List of reviewed legislation***

The technique used to review the selected legislation based on identifying the following words and abbreviations in the text; climate change, global warming, climate change mitigation, climate change adaptation, vegetation removal, vegetation clearance, methane ($CH_4$), nitrous oxide ($N_2O$), carbon dioxide ($CO_2$), greenhouse gases (GHGs) and emissions. These words and abbreviations have been used in the research

process to describe the legal incorporation of climate change in the EIA regulations, and in the other selected legislation with relation to EIA process.

The review techniques also included identifying direct and indirect climate change incorporation in the chosen legislation, which are elaborated as following;

Firstly, direct climate change incorporation in the selected legislation, which means where the word climate change and other related words and abbreviations have been used in the selected legislation. Words like climate change, global warming, climate change mitigation, climate change adaptation, methane ($CH_4$), nitrous oxide ($N_2O$), carbon dioxide ($CO_2$), greenhouse gases (GHGs), and GHG emissions. These words and abbreviations were used in the research process to find out and describe, where in the specified legislation these words and abbreviations have been stated and located. They give an indication of direct climate change consideration in the chosen legislation.

Secondly, implied (indirect) climate change incorporation in the selected legislation has been conducted. Words like vegetation removal and vegetation clearance were used in the research process in the chosen legislation, with additional search for the link between IEM objectives, sustainable development, climate change and EIA. The outcome of this review process indicates implied (indirect) climate change incorporation in the EIA regulations, and the related selected legislation.

### 3.4.2. EIA cases review

The second part of the methodology focused on answering the second sub-question. In order to describe how climate change has been integrated in the EIA practice in South Africa, using Gauteng province as a case study. This part of the research has adopted an approach done by Larsen (2013), which looked at climate change mitigation, adaptation and baseline adaptation incorporation into EIA in Denmark. Larsen's methodology was accepted and used in this research, because it has included three major pillars that are related to climate change and EIA. The major pillars are; consideration of GHGs emission reduction, consideration of climate change impacts on an activity and the baseline assessment. Additionally, Larsen's methodology has effectively explored and described how climate change was incorporated into EIA in Denmark according to his research results.

This part of the methodology involved reviewing 21 EIA applications, conducted between 2010 and 2013 in Gauteng province, in order to describe whether and how

climate change mitigation, adaptation and baseline adaptation have been considered into EIA cases, which have been defined by (Larsen and Kørnøv, 2009) as following;

Mitigation: It looks at the expected emissions of GHGs from a proposed project, and the identified measures that are needed to reduce GHGs emissions (climate change mitigation),

Adaptation: It describes how climate change might affect a project, and the required measures for enhancing project resilience to climate change (climate change adaptation), and

Baseline adaptation: It describes the consideration of the changes that might be caused on the environment by climate change in the baseline assessment, and its impacts on the possible adaptation measures.

A representative and random sample of 21 different EIA cases were collected, according to the following criteria:

- EIAs which have been conducted between 2010 and 2013 in Gauteng province. These would have been conducted using the latest EIA regulations in NEMA (2010 EIA regulations),
- EIAs for mining activities were not included in the research, because they are operated under the Minerals and Petroleum Resources Development Act (MPRDA), No. 28 of 2002, and
- Representative sample of EIAs for different projects, based on availability of EIA from government environmental departments, EAPs and different websites of environmental agencies.

Every EIA document application from the 21 EIAs was entirely reviewed and searched for specific keywords and abbreviations which are; climate change, global warming, climate change mitigation, climate change adaptation and baseline adaptation, mitigation measures, adaptation measures, baseline adaptation measures, vegetation removal, vegetation clearance, re-vegetation, methane ($CH_4$), nitrous oxide ($N_2O$), carbon dioxide ($CO_2$), greenhouse gases (GHGs) and emissions. After the data collection was done, EIA cases were analyzed according to the following;

- Title of EIA study to determine activity type with relation to GHGs emission,
- Number of specialist studies of the EIA as an indicator of EIA size,
- Project date to determine if the EIA was done following the latest EIA regulations, and

- Consideration of climate change mitigation, adaptation and baseline adaptation.

Appendix (1) shows the table analysis of the EIA cases, and appendix (2) shows the title of each EIA case has been used in this part of the research, in order to find out how climate change mitigation, adaptation and baseline adaptation have been incorporated into the collected EIA cases from Gauteng province. Both direct and indirect incorporation of climate change have been taken into consideration as following;

Firstly, direct climate change incorporation into EIA samples. Words and abbreviations like global warming, methane ($CH_4$), nitrous oxide ($N_2O$), carbon dioxide ($CO_2$), climate change mitigation, adaptation, baseline adaptation, greenhouse gases (GHGs) and emissions were used to search for climate change consideration in the EIAs, which represent clear and straight forward consideration of climate change in the EIA practice.

Secondly, implied (indirect) climate change consideration into EIA samples has been searched. Words like vegetation removal, vegetation clearance, re-vegetation, air pollution and air emissions with relation to climate change were used to search for climate change consideration into the EIAs, which represent indirect climate change consideration in the EIAs. This part was added to Larsen methodology, to describe implied climate change consideration in the searched EIA cases.

### 3.4.3. Key informant interviews and IAIAsa linkedin discussion

Key informant interviews with eight EAPs were conducted to discuss the research results and the EAP's local and international experience with EIA and climate change. EAPs undertake EIA process as described in NEMA, and work as independent environmental consultant and/or in environmental consultancy company in Gauteng province. EAPs were identified and approached in two ways. Firstly by contacting EAPs and environmental consultancies known by my supervisor to be experienced and respected in this area of work. Secondly through chain referral or snowball sampling, where EAPs referred to other EAPs working in the sector and experienced in this area.

Five opened questions were asked, which were about EIA legal regime and practice in South Africa as well as the international experience of EAPs in climate change and EIA. The interview protocol is part of the research appendix (appendix 3), and ethical

clearance (appendix 4). Additionally, an initiation for a discussion about the research question has been posted on the IAIAsa linkedin group. In order to obtain the views and experiences of IAIAsa linkedin group members about climate change and EIA. The data collected from the interviews and the IAIAsa linkedin discussion were analyzed according to the specific questions, which were asked.

# Chapter 4.0 Results

## 4.1. Review results of EIA legal regime and climate change

The first part of the research methodology focused on reviewing and describing the incorporation of climate change into EIA regulations in NEMA, and in the related selected legislation. The results are summarized in table 2.

***Table 3: Climate change incorporation in the reviewed legislation***

| No | Legislation have been searched | Direct incorporation of climate change into EIA | Implied (indirect) incorporation of climate change into EIA |
|---|---|---|---|
| 1 | NEMA | Not incorporated | Implied in the achievement of IEM objectives by using instruments such as EIA |
| 2 | 2010 EIA regulations | Not incorporated | ● Implied in the consideration of cumulative impact<br>●The list of activity No.1<br>●The list of activity No.4<br>●The list of activity No.5<br>●The list of activity No.17 |
| 3 | NEM: AQA | Not incorporated | Implied in the linkage between EIA and AEL process |
| 4 | 2013 National Framework for NEM: AQA, | Not incorporated | Implied in the linkage between EIA and AEL process |
| 5 | Declaration of GHGs as priority air pollutants under NEM: AQA (legislation still under the process of comment) | Not incorporated directly, but standard for GHG emissions has been set | Not incorporated indirectly, but standard for GHG emissions has been set |
| 6 | 2009 NAAQS under NEM: AQA | Not incorporated directly and no standards for GHG emissions | Not incorporated indirectly and no standards for GHG emissions |
| 7 | The list of activities which result in atmospheric emissions of 2010 under NEM: AQA | Not incorporated directly and no standards for GHG emissions | Not incorporated indirectly and no standards for GHG emissions |
| 8 | The list of activities which result in atmospheric emissions of 2013 under NEM: AQA | Not incorporated directly and no standards for GHG emissions | Not incorporated indirectly and no standards for GHG emissions |

**Climate change was not explicitly incorporated into EIA legal regime, therefore, mitigation and adaptation measures for climate change have not been incorporated directly into the EIA legal process. Climate change has been implied in the reviewed legislation in many places.**

**Firstly,** implied consideration of climate change into EIA was found in the linkage between IEM objectives, sustainable development and environmental management instrument. EIA is an environmental management instrument mentioned in NEMA 24 (5) (*b* A) (iii), its purpose is to achieve IEM objectives. One of the IEM objectives is to identify, predict and evaluate the potential impacts of an activity on the environmental and socio-economic conditions. Climate change is a potential effect that might occur as a result of implementing development activities. It adversely affects the accomplishment of IEM objectives, then the sustainable development in South Africa. Therefore, during EIA process climate change is implied to be considered by law.

**Secondly,** climate change consideration into EIA process was implied in two places in the 2010 EIA regulations. EIA regulations emphasized the consideration of cumulative impact during undertaking the process of EIA, which is related to climate change. Cumulative impacts have been defined as 'the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area' (*NEMA 1998, EIA regulations (R.543) 2010, p.10*). Climate change is a cumulative impact resulting from different activities across spatial and temporal scales. The second place is in Listing Notice 2, which includes the activities that require an EIA in terms of section 24(2) and 24D of NEMA, (Government Notice R545).

Activity No.1 'The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more' (*NEMA 1998, EIA regulations (R.545), p.110*). Electricity generation especially from burning fossil fuel is associated with GHG emissions particularly $CO_2$. As a result, climate change should be part of the identified impacts in the scoping stage of the EIA.

Activity No.4 'The construction of facilities or infrastructure for the refining, extraction or processing of gas, oil or petroleum products with an installed capacity of 50 cubic metres or more, excluding facilities for the refining, extraction or processing of gas from landfill sites' (*NEMA 1998, EIA regulations (R.545), p.110*). Oil activities such as refining is associated with GHG emissions.

Activity No.5 'The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No.544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008) in which case that Act will apply' (*NEMA 1998,*

*EIA regulations (R.545), p.110*). One of the major GHGs which is associated with waste disposal is methane. Therefore, during EIA process for waste license application, methane emission should be considered with mitigation measures.

Activity No.17 'the extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils' (*NEMA 1998, EIA regulations (R.545), p.113*). Vegetation disturbance is indirectly linked to climate change, which leads to increasing $CO_2$ concentration in the atmosphere.

**Thirdly,** climate change has been explicitly mentioned in NEM: AQA, where implied climate change consideration into EIA process was noticed through the linkage between Atmospheric Emission License (AEL) and EIA processes. The definitions of atmospheric emission and GHGs are respectively 'means any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution', 'means gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation, and includes carbon dioxide, methane and nitrous oxide' (*NEM: AQA, 2004, c.1, p.4.5*). These definitions implied that part of the atmospheric emissions which have been mentioned in NEM: AQA is GHGs (climate change). NEM: AQA has also considered climate change as a potential issue for future development. During the EIA process, information about the atmospheric emissions should be gathered through air quality impact assessment process, which includes climate change consideration. According to NEM: AQA, EIA must include an assessment of any potential environmental issues (such as climate change), precede and inform AEL process with these issues prior to decision-making that might include climate change. Based on the linkage between AEL and EIA processes, climate change consideration into EIA process is implied.

**Fourthly,** the results of reviewing the (2013) National Framework for NEM: AQA, the (2009) NAAQS, the list of activities which result in atmospheric emissions (2010) and (2013) of NEM: AQA showed that GHGs particularly $CO_2$, $CH_4$ and $N_2O$ have been mentioned without standards, which can be used when considering climate change in the EIA process to limit GHGs emissions. A declaration draft of GHGs as priority air pollutants under NEM: AQA has been published in 2014 for public comment, in which a standard for GHG emissions has been set. The declaration stated that 'A person conducting an activity set out in Annexure I to this Notice which involves the emission of greenhouses declared as priority air pollutant in paragraph 2 in excess of 0.1 Megatonnes ($10^9$ kg) (Mt) or more annually or measured as $CO_{2\text{-eq}}$ is required to submit

a pollution prevention plan' (*NEM: AQA 2004, Declaration of GHGs as priority air pollutants 2014, p.44*). In this declaration, the limit for GHG emissions ($CO_2$, $CH_4$ & $N_2O$) is the same.

## 4.2. Review results of EIA practice and climate change

The second part of the methodology process focused on reviewing a sample of 21 EIA cases, which have been done between 2010 and 2013 in Gauteng province in South Africa. For the purpose of this research report, 21 EIA cases were collected, this proved difficult. The aim was to collect a random sample of 30 EIAs from GDARD, but due to institutional difficulties of GDRAD, accessing EIAs was not possible. The substitute plan was to collect the EIAs from two sources, which are; the Internet websites of Environmental Consultation Agencies and EAPs in Gauteng. There were also faced difficulties from these sources in the process of EIAs collection. As a result of these difficulties 21 EIAs were collected. Based on the availability and limited access of EIA cases, the sample of 21 EIA was representative and random, because the researcher did not choose certain types of EIAs during the process of EIA collection, every EIA was available between 2010 and 2013 from the mentioned sources in Gauteng province has been taken and used in this part of the research. It is recognized that different project types and locations (The receiving environment) are more relevant to climate change. This point particularly highlighted in the discussion chapter, conclusion and recommendations. The results are summarized in the tables 3 and 4.

***Table 4: Classification of EIA cases according to EIA project type, EIA numbers, sources and EIA size***

| EIA Project Type | No. of EIAs | EIA source | No. of specialist Studies |
|---|---|---|---|
| **Waste license application** | 7 | 1.Envirolution Consulting (2 EIA)<br>2.Golder Associates (2 EIAs)<br>3.Newtown Landscape Architect (1 EIA)<br>4.Envirokey Management Services cc (1 EIA)<br>5.Shangoni Management Services (1 EIA) | 3 & 6<br>5 &12<br>8<br>5<br>13 |
| **Petroleum construction** | 1 | 1.Golder Associates (1EIA) | 6 |
| **Power line and substation construction** | 4 | 1.Savannah Environmental (2 EIAs)<br>2.Envirolution Consulting (1 EIA)<br>3.NEMAI Consulting (1 EIA) | 6 & 6<br>8<br>7 |

| EIA Project Type | No. of EIAs | EIA source | No. of specialist Studies |
|---|---|---|---|
| **Residential development** | 5 | 1.Newtown Landscape Architects (2 EIAs)<br>2.Golder Associates (1 EIA)<br>3.Tholoane Sustainable Development and Environmental Consultants (1 EIA)<br>4.Strategic Environmental Focus (Pty) Ltd (1 EIA) | 5 & 8<br>6<br>8<br>8 |
| **Smelter construction** | 1 | 1.Golder Associates (1 EIA) | 9 |
| **Furnace construction** | 1 | 1.Terra-pacis Environmental (1 EIA) | 5 |
| **Commercial development** | 1 | 1.Strategic Environmental Focus (Pty) Ltd (1 EIA) | 3 |
| **Tailing backfill plant & pipeline construction** | 1 | 1.GCS Water and Environmental Consultants (1 EIA) | 4 |

**Table 5: Results of climate change consideration into EIAs according to project type**

| EIA type | Climate change mitigation (direct/implied) | Climate change adaptation (direct/implied) | Climate change baseline adaptation (direct/implied) |
|---|---|---|---|
| **Waste license application** | None | None | None |
| **Petroleum construction** | None | None | None |
| **Power line and substation construction** | None | None | None |
| **Residential development** | None | None | None |
| **Smelter construction** | None | None | None |
| **Furnace construction** | None | None | None |
| **Commercial development** | None | None | None |
| **Tailing backfill plant & pipeline construction** | None | None | None |

The findings from reviewing the EIA cases showed that, direct and implied (indirect) climate change mitigation, adaptation and baseline adaptation were not mentioned or considered. All of the EIAs were searched carefully for every word and abbreviation, which can be attributed or related to climate change directly or indirectly. Two EIAs mentioned GHG emissions without mitigation or adaptation measures. The EIA cases

were from waste license applications, housing and commercial developments, power constructions and construction of mining facilitation units. None of them have mentioned climate change issue, to which the projects can contribute and can be affected by. Consequently, the results showed no examples of climate mitigation, adaptation and baseline adaptation consideration in the searched EIAs. It was also found that number of the analyzed EIAs showed negative contribution towards climate change, because of vegetation clearance activities, which have been associated with commencing the projects with lack of obvious re-vegetation strategies.

## 4.3. Results of key informant interviews and IAIAsa linkedin group discussion

To support the research report findings, eight EAPs were interviewed and asked questions related to climate change and EIA, their experience with EIA and climate change locally and internationally, their understanding of the environmental law in terms of climate change and EIA, and challenges for climate change consideration in the EIA process in South Africa, (see interview protocol and ethical clearance in the appendixes 2 and 3).The results of interviewing the EAPs were illustrated as following;

- None of the participants has considered climate change in the EIAs, which they participated in locally. They mentioned that there are no legal requirement or guidelines, which they can use to incorporate climate change into EIAs in South Africa,
- One out of eight has considered climate change in the EIA process internationally, based on IFC standards. It was said that they do consider climate change in the EIAs that they undertake internationally, because it is required by IFC standards. On the other hand, they do not consider it in South Africa, because it is not required,
- Two EAPs mentioned that climate change is implied in NEMA. They mentioned that climate change consideration into EIA is implied in NEMA, through the requirement of the achievement of IEM objectives using environmental management instruments such as EIA. They also linked EIA with sustainable development, claiming that climate change affects South African sustainable development and EIA works with other tools to accomplish IEM objectives and sustainable development,
- Seven EAPs mentioned that EIA can partially consider climate change with the presence of strategic environmental planning and guidelines for climate change

and GHGs. They said that strategic planning for GHGs emissions is essential, in parallel with guidelines for climate change incorporation into EIA process,

- The participants mentioned different challenges for climate consideration in the EIA process such as; uncertainty of climate change prediction, lack of guidelines, insufficient time and financial provisions.
- In addition to interviews with key informant EAPs to support the research report findings, a discussion point has been posted on the IAIAsa linkedin group to allow more EAPs to participate in supporting the research report findings. See appendix 4 for the posted discussion and responses. The important points that have been mentioned by EAPs on the IAIAsa linkedin group were;
- There were examples of climate change consideration into EIA (outside of Gauteng province) in South Africa such as; Durban Port Expansion for berths 203-205 and the Eskom Nuclear-1,
- Climate change should be considered at the strategic-level using tools such as EMFs and SEAs, where climate change modelling can be undertaken more effectively that conducting climate change modelling at the project-level EIA, and
- Issues that hinder climate change consideration into EIA process such as non-availability of local data and high cost of using the available data in climate change modelling.

## 4.4. Summary

EIA regulations in NEMA and related legislation in NEM: AQA do not explicitly specify or contain any climate change mitigation or adaptation measures, while implied consideration of climate change can be found in some places in the reviewed legislation. On the other hand, according to the collected sample of EIAs in Gauteng, key informant interview results and IAIAsa linkedin discussion, climate change has not been considered in the EIA practice. The results that were found have shown that due to unclear incorporation of climate change in the EIA legal regime, EIA practice did not incorporate climate change. This outcome has been supported by key informant EAPs in the interviews and IAIAsa linkedin group discussion.

# Chapter 5.0 Discussion

This section of the research report includes a discussion of the outcomes of reviewing the EIA legal regime and practice, in conjunction with the results of key informant interviews and IAIAsa linkedin discussion. This chapter also supported and informed by the literature review. It also ends up with conclusion and recommendations.

## 5.1. Climate change and EIA legal regime

South Africa has considered climate change as an environmental issue, which affects South African sustainable development. This was clear in the National Climate Change Response Policy for South Africa. As indicated in the results climate change is only implied in the EIA legislation, even though it is adequately considered at the policy level.

### 5.1.1. Direct consideration of climate change

Legally climate change has not been stated explicitly and/or directly in the 2010 EIA regulations in NEMA, or in the other reviewed legislation in conjunction with the EIA. There are no steps and/or guidelines in the 2010 EIA regulations, which require and guide climate change incorporation into EIA process. The expected results of this situation is the lack of climate change incorporation into EIA practice. This is what has been found in the case studies of EIA practice in Gauteng province. Despite the emphasis of the White Paper on the incorporation of climate change mitigation and adaptation into sectors, departments, planning and decision-making process, the results from the legal side showed no explicit consideration of climate change in the EIA process within EIA regulations and other related reviewed legislation. As climate change has been recognized in South African National Climate Change Response Policy, and efforts to mitigate and adapt to climate change have been represented and worked on, why are there no direct legal requirements for climate change incorporation into EIA process at the project-level, where climate change mitigation and adaptation measures can be identified? The possible answers to this question are discussed below;

#### 5.1.1.1 Timing of the EIA legal reform process

Despite the South African agreements with the international efforts and protocols such as the UNFCCC in 1997 and Kyoto protocol in 2002 as mentioned in NEM: AQA, and the commencement of the National Climate Change Response Policy in 2004, South Africa was relatively late in starting to address climate change and work on the possible measures for climate change mitigation and adaptation with a vision for effective climate change policy. Climate change was firstly looked at in 2004, but it was seriously addressed in 2010 and 2011, when the Green and the White Papers were published respectively. The National Climate Change Response Policy for South Africa commenced in 2011, while the latest EIA regulations amendment was published in 2010. The White Paper showed significant South African policy towards climate change, but because it was recently published after the 2010 EIA regulations amendment, the time for policy translation into legislation was short to for instance incorporate climate change into the EIA legal regime. It is concluded that South Africa was quite late in developing effective response strategy to climate change, and EIA legal regime predates the Response Policy, therefore, EIA regulations do not include climate change. The figure 4 illustrates the timeline development for EIA regulations, international climate change policy, and national climate change policy in South Africa.

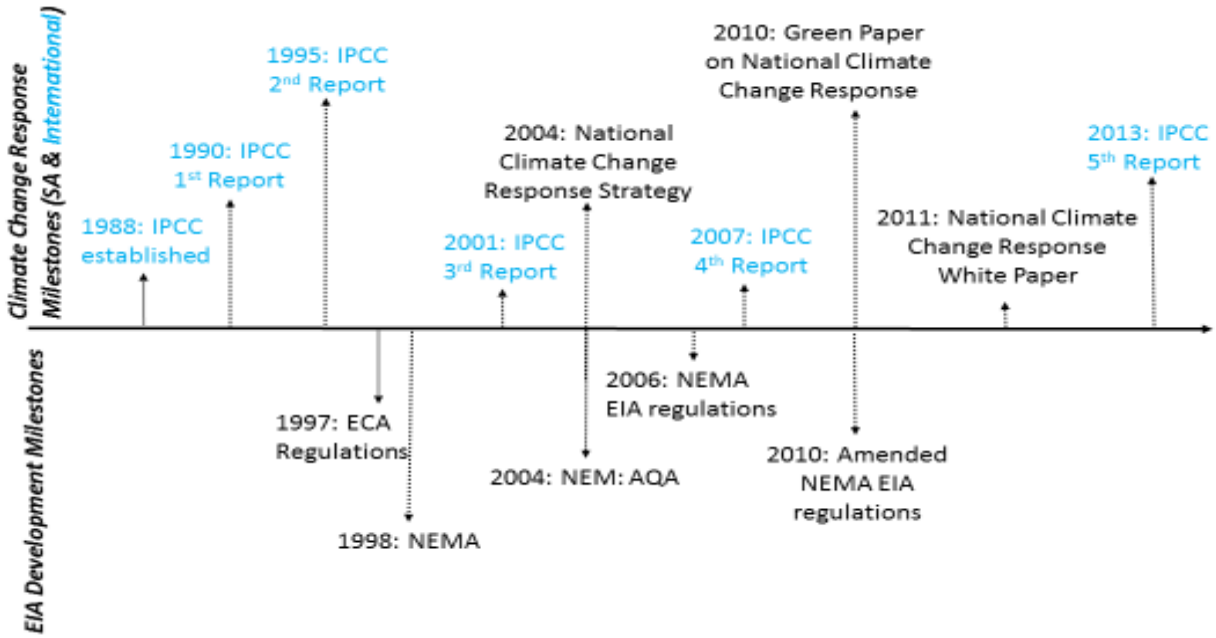


***Figure 4: Timeline development for EIA regulations and National Climate Change Policy***

#### 5.1.1.2. Obstacles for policy translation into act

It was highlighted that climate change policy potentially affected by issues housed within the DEA and other relevant departments, such as the lack of cooperation between departments in terms climate change management, the lack of climate change understanding and information, the lack of human capacity and financial resources, the lack of climate change consideration into political and administrative decision-making affect climate change policy implementation in South Africa (DEA, 2011b; Faling, et al., 2012; GDARD, 2009). According to these issues, climate change policy management, implementation and specially translation into legislation in terms of climate change and EIA legal regime, become complicated processes. Therefore, it is recommended to support climate change awareness within government departments, which are responsible for climate change and environmental authorisation. It is also suggested that economic and political barriers should be resolved, through conducting studies which look at how climate change can be incorporated into economic and political decision-making.

### 5.1.2. Implied consideration of climate change

Direct climate change incorporation into EIA process in the EIA regulations was not there, but implied climate change consideration into EIA legal regime has been found in NEMA, 2010 EIA regulations and NEMA: AQA.

#### 5.1.2.1. linkage between sustainable development and EIA

NEMA has mentioned the EIA process as an environmental management instrument, which is implemented in order to achieve the objectives of IEM. The role of IEM objectives is about sustainable development in South Africa. This was obvious from the linkage between sustainable development and IEM objectives definitions in NEMA. The link between EIA process and IEM objectives, and the link between IEM objectives and sustainable development implies that, EIA contributes to sustainable development in South Africa. According to the National Climate Change Policy for South Africa, climate change is an issue that adversely affects sustainable development in South Africa. It also stated that South Africa is highly affected by climate change due to its economic system, which heavily relies on mineral resources such as burning coal, its sensitive environmental condition such as scarcity of water, and the low adaptive

capacity of poor communities to tolerate climate change consequences. Therefore, climate change consideration into EIA is implied in NEMA. This result has been supported by Gilder, et al. (2011), who mention that climate change incorporation into EIA process is required by NEMA, based on the adverse consequences of climate change on South African sustainable development, and the role of EIA which contributes to sustainable development as implied in NEMA. Figure 5 illustrates the relationship between EIA, IEM objectives, sustainable development and climate change.

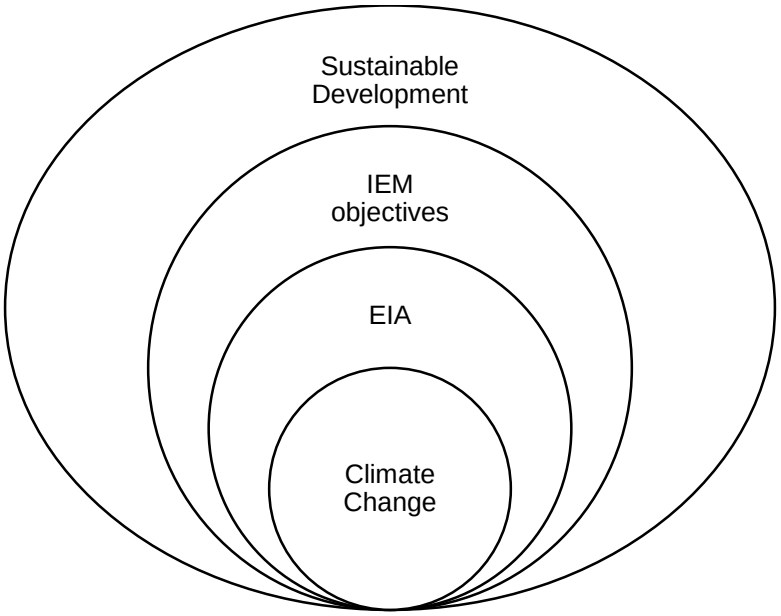


***Figure 5: The relationship between EIA, IEM objectives, sustainable development and climate change***

Implied climate change consideration in the EIA regulations and NEMA was also mentioned and supported by two interviewed EAPs. They mentioned the role of EIA as an environmental management tool, stated in NEMA is to achieve IEM objectives and sustainable development in South Africa. They looked at climate change as an issue, which threatens South African sustainable development. Thereby, climate change should be addressed in the EIA process, based on legal and imperative requirement to support sustainable development. This view was exactly the same in the legal review results, in which climate change is seen as an environmental issue that should be in an EIA. In support of this outcome, one EAP said that there are no specification or determination of specialist studies that have to be taken during EIA practice in the EIA regulations. This opinion was based on the role of EIA to address every environmental issue, which can be caused by an activity. Climate change is a

potential impact of different activities as a result of GHG emissions. Therefore, it should be considered in the EIA practice. In terms of climate change incorporation into EIA legal regime, one EAP has suggested the establishment of a list of activities, which should require climate change consideration in the EIA process in the EIA regulations. It was assumed that this list of activities will direct and ease climate change consideration into EIA practice for EAPs and responsible authorities.

Additionally, examples for climate change consideration into EIA practice for coastal developments have been mentioned on the IAIAsa linkedin group discussion such as Richards Bay Port Expansion, The Eskom Nuclear-1 and Durban Port Expansion for berths 203-205. Interestingly, the latter project was refused by the DEA of Durban because the EIA did not include climate change risks such as sea-level rise and coastal storm surges (Paton, 2014). This supports the implied consideration of climate change in the Environmental Law.

#### 5.1.2.2. 2010 EIA regulations

Climate change consideration into EIA process was not explicitly mentioned in 2010 EIA regulations, but it was implied in two places. It was firstly implied in the consideration of cumulative impacts in the EIA process. One of the impacts that should be identified during EIA process is the cumulative impacts of an activity combined with current and potential impacts of present and future activities. The definition of cumulative impacts in the 2010 EIA regulations indicates climate change consideration. It has been defined as 'the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area' (*NEMA 1998, EIA regulations (R.543) 2010, p.10*). Cumulative impacts have also been defined in the same way by IFC as the resulted effects from a project added to existing and anticipated impacts of current and future development activities such as climate change (IFC, 2013). Climate change consideration through cumulative impact assessment in the EIA process may face number of difficulties due to complexity of climate change modelling, availability of climate change data (Agrawala, et al., 2012; (Yi & Hacking, 2012; The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003). In addition to this, it has been stated that cumulative impact assessment in the EIA practice in South Africa is not effective (Brownlie, et al., 2012). This situation of ineffective cumulative impact assessment and

complexity of climate change modelling may hinder effective climate change incorporation into EIA practice.

Climate change consideration into EIA process was also implied in the Listing Notice 2 of 2010 EIA regulations. The Listing Notice 2 includes the activities that require conducting EIA process in terms of section 24(2) and 24D of NEMA, (Government Notice R545). Activities No.1, 4, 5 and 17 implied incorporation of climate change into EIA practice. They mentioned the construction of electricity generation infrastructure, construction of oil, gas and petroleum refining, extraction and processing infrastructure, and construction of facilities associated with release of emissions. All of them emit GHGs at different stages of construction and operation, and they contribute to climate change. Activity No.17 indicated vegetation disturbance and removal, which affects $CO_2$ balance in the atmosphere and release GHGs particularly by clearing and burning vegetation.

Additionally, it was mentioned that climate change was incorporated into EIA regulations in the 2008 NEMA amendment (Government Notice, R658), in which climate change was required to be considered in the EIA process, if an activity may contribute to climate change prior to granting the environmental authorization (Gilder, et al., 2011). Interestingly, this requirement was not included in the 2010 EIA regulations when it was published. This leads to the following question, why climate change was removed from the final EIA regulations of 2010? A possible answer is that climate change was not wanted to be part of decision-making process for environmental authorization, because it may affect project implementation and economic development due to climate change risks. EIA is an informative tool which provides decision-makers with the appropriate information about the potential consequences of a proposed activity. The effectiveness of EIA at the decision-making phase is limited due to economic dominance in decision-making (Brownlie, et al., 2012). A further reason may be the lack of capacity within the relevant government departments to deal with climate change within the limits of EIA.

#### 5.1.2.3. NEM: AQA

NEM: AQA and its National Framework for 2013 have linked the EIA process to AEL application. EIA role in this linkage is to identify and assess the atmospheric emissions that might result from an activity, through air quality impact assessment. This forms part of the AEL application process. According to the definition of the atmospheric

emissions in NEM: AQA, GHGs are part of the atmospheric emissions which must be considered during EIA process as part of AEL application. Therefore, climate change consideration was implied in the EIA process, which is linked to AEL process in NEM: AQA.

Climate change was mentioned in NEM: AQA, its 2013 National Framework, 2009 NAAQS, the list of activities which result in atmospheric emissions (2010) and (2013) of NEM: AQA as well as the declaration draft of GHGs as priority air pollutants (2014) under NEM: AQA. It was found that within the first five acts, GHGs specifically $CO_2$, $CH_4$ and $N_2O$ were mentioned without emission standards. In 2014, a declaration for GHG emissions standard was commenced for public comment. According to this declaration, a developer is required to submit pollution prevention plans, if the activity which will be conducted emits 0.1 Megatonnes of GHGs. The activities types that must include pollution prevention plans in this case are determined in the declaration, such as electricity and heat production activities. What is noticed in this declaration is that the emission standard of the major GHGs for pollution prevention plan submission is the same, regardless of different types of GHGs.

In fact, the declaration mentioned to submit pollution prevention plan if GHG emissions reach 0.1 Megatonnes, but it did not limit GHG emissions, because it does not require the developer to decrease GHG emissions, if they exceed the mentioned limit in the declaration. It just requires a pollution prevention plan. In the Canadian Environmental Protection Act, emission standard for $CO_2$ from coal-fired power plants for electricity generation was set, which is 420 t/GWh. The Canadian Act stated that 'A responsible person for a new or an old unit must not, on average, emit with an intensity of more than 420 tonnes $CO_2$ emissions from the combustion of fossil fuels in the unit for each GWh of electricity produced by the unit during a calendar year' (*Canadian Environmental Protection Act, 1999, p 1, 3. (1)*). In this Act, the emissions of just $CO_2$ is limited from electricity generation by combustion fossil fuels, while in the mentioned declaration a pollution prevention plan is required, when all mentioned GHG emissions in the declaration reach certain emission rate. This does not imply limiting the GHG emissions.

## 5.2. Climate change and EIA practice

The results of reviewing 21 EIA cases have elaborated no consideration of climate change mitigation and adaptation into EIA practice. This outcome might be expected

as a result of unclear incorporation of climate change in the 2010 EIA regulations of NEMA. The 21 EIA applications have been searched taken into account direct and implied consideration of climate change. They were also analyzed to determine the type of the EIA, and the size depending on the specialist studies number. The assumption was that some activities can contribute to climate change through GHG emissions such as construction of power plants and wastewater works. It was also assumed that bigger projects with more significant impacts, lead to conduct more specialist studies. This leads to a possibility of climate change consideration in the EIAs. Despite the relevance between EIA project type and climate change, the reviewed cases did not show consideration of climate change. Most of the reviewed EIAs have shown significant number of specialist studies, but they did not include the consideration of GHG emissions mitigation and climate change adaptation.

In fact, the two words (climate change) were not even mentioned in the reviewed EIAs as a direct climate change consideration. As a result, climate change mitigation, adaptation, baseline adaptation measures that have been searched were not considered in the EIAs. Interestingly, two EIAs for waste license application have considered GHG emissions. They mentioned that wastewater works contribute to emissions such as GHGs and their projects are no exception. That means GHGs will be emitted, but measures for GHG emission reduction and climate change adaptation were not mentioned. Additionally, vegetation removal and clearance have been considered in the research process as an indirect climate change consideration, with relation to climate change. It was found that all of the reviewed EIAs except one mentioned vegetation removals for site construction and another associated activities. One of the mitigation measures were used is re-vegetation of the cleared sites. The purpose was mentioned for re-vegetation is to prevent erosion, surface and groundwater runoff deterioration. Two of the 21 EIAs that mentioned vegetation clearance have considered prevention of burning removed vegetation. This could imply consideration of climate change, because burning cleared vegetation contributes to GHG emissions. The rest of the EIAs did not mention what will be done to the cleared vegetation. It was also noticed that few of the reviewed EIAs have considered $CO_2$ emissions from vehicles (with mitigation measures such as maintenance and service) during construction phase of the projects not from the activity itself. This is also another climate change implied consideration, but what about $CO_2$ emission from the activity which were not considered. The reviewed EIAs showed inadequate assessment of significance of impacts, based on the example of considering $CO_2$ emissions from vehicles and ignoring $CO_2$ emissions from the project. $CO_2$ emissions from vehicles

during project construction and operation could lead to minimal impacts, in comparison with $CO_2$ emissions from the project itself.

Using Gauteng province as a case study for EIA practice in South Africa has explicitly demonstrated inadequate climate change incorporation into EIA practice. This result is supported by the results of reviewed 2010 EIA regulations, NEMA and interviewed EAPs. The interview outcomes with EAPs have come out with almost the same results of the legal review and EIA case studies. All the interviewed EAPs have not considered climate change in the EIAs, which they have undertaken or participated in South Africa. One EAP has considered climate change in the EIA process internationally following the IFC standards. The interviewed EAPs said that due to lack of clear climate change incorporation into EIA regulations of NEMA, and absence of guidelines for climate change consideration into EIA process, they did not consider climate change in their EIAs locally. This outcome supports the research results of reviewing EIA legal regime and practice.

An important question can be asked here, if climate change incorporation into EIA legislation and practice still needs to be made explicitly, why are IFC standards not used in terms of climate change consideration into EIA in South Africa?. The possible answer could be that there is a lack of interest to consider climate change at the project-level, from both responsible authorities and environmental agencies. In support of this answer, it was mentioned that lack of government incentives to address climate change, lack of political and agency interests to address climate change hinder climate change incorporation into EIA (IAIA, 2013). In South Africa the situation may be the same, there is a lack of climate change planning within some South African municipalities, and climate change consideration into political and administrative decision-making was not accomplished (Faling, et al., 2012). There is also a concern that EIA process under the current legal and practice regimes is problematic. This is elaborated in the next point.

## 5.3. Is EIA the appropriate tool to consider climate change?

The question here, if climate change is considered in the EIA legal regime in South Africa, is it the correct tool? And will EIA process be effective in considering climate change under the current situation? Various studies have addressed the effectiveness of EIA process in accomplishing its objectives under different regimes of environmental legislation. It has been outlined that despite strong EIA regulations in the legislation,

EIA practice does not meet the criteria mentioned in the legislation due to lack of skills amongst EIA professionals (Morrison-Saunders & Retief, 2012). Furthermore, (Brownlie, et al., 2012) evaluated EIA regime in terms of achieving sustainable development in South Africa and concluded that;

- Government departments give priority to economic development on the expense of natural capital for socio-economic development.
- The current environmental impact management procedures and operations failing to achieve integrated decision making and co-operative governance,
- Current EIA process fails to interrogate and provide focused information on important sustainability issues.
- EIA process does not effectively take into account cumulative or additive impacts of projects, because there are no legal requirements for strategic impact assessment in South Africa,
- Mitigation hierarchy is not fully implemented in all EIA processes, the majority of the EIAs do not go further than minimizing the potential adverse effects,
- There is a lack of environmental thresholds (limits) recognition in the EIA practice, which are related to achieving sustainability,
- There are excessive requirements for conducting EIA processes with a lack of prioritization according to the environment and the potential impacts of a development,
- The EIA process has been implemented as a tick box approach following the legal requirements of EIA regulations, providing decision-makers with insufficient information, which do not assist in achieving sustainable development,
- There is a lack of compliance with the required conditions prior decision being taken, there is also a lack of monitoring and enforcement about the accomplishment of the agreed conditions,
- There is an inadequate capacity and insufficient staff of environmental authorities as well as fragmented departments in terms of climate change responsibility, and
- Public accountability and liability, and evaluation of environmental performance are not met because of difficulties of accessing information about environmental authorization and application from environmental departments.

According to the assessment above, the EIA process generally is problematic even if climate change is incorporated, it may not be effective. Adding climate change to the

EIA regime in South Africa under the current situation may also hinder EIA process. Add to this situation of EIA, climate change complexity, modelling and prediction. From the international perspective about climate change and EIA, many challenges which have been outlined in the international experience might apply to the EIA regime in South Africa under the current situation. For example, lack of expertise and appropriate EIA tools to address climate change, lack of government policy and incentives to address climate change, lack of standard protocols and guidance for EAPs, and lack of scientific prediction and evaluation of GHGs in the EIAs (IAIA, 2013; Yi & Hacking, 2012). Additionally, there are number of issues which may contribute to ineffective climate change incorporation into EIA regime, such as conflicting situation between environmental stresses and development needs within the government spheres, lack of understanding climate change impacts within local municipalities, failure to incorporate climate change consideration into political decision-making, lack of information availability on climate change in South Africa, and insufficient human and financial resources (Faling, et al., 2012; GDARD, 2009).

Furthermore, number of potential challenges for climate change incorporation into EIA regime in South Africa have been raised by some EAPs and members of IAIAsa linkedin group. The mentioned possible challenges were;

- Issue of time for EIA preparation and approval. It was said that adding climate change impacts to EIA will require more time for preparation due to difficulty of climate change impacts prediction. It will also require more time for EIA application approval by competent authority due to lack of capacity in the responsible authorities in dealing with climate change. This was expected to affected the applicant because of time loss, which could also cause economic loss for the applicant,
- Issue of cost of assessment. It was expected that climate change incorporation into EIA process will require more money, in order to prepare the EIA document because of high cost of climate change studies and modelling,
- Issue of non-availability of local data about climate change, and high cost of data interpretation within project budget, and
- The lack of EAP capacity to address climate change in the preparation of EIA document, and lack of staff capacity in the competent authorities to evaluate the assessment.

Despite the challenges and issues that face EIA, EIA can partially play a significant role in considering climate change at the project-level, where GHGs can be mitigated

and projects can be adapted to climate change impacts. It is suggested that climate change should be incorporated into EIA process according to project type, which may contribute to climate change, and specific locations where climate change may cause significant impacts. It is also recommended to use EIA in conjunction with broader tools such SEA in terms of climate change consideration.

## 5.4. Climate change, EIA and SEA

IA tools mainly EIA and SEA are being looked at for their importance in considering climate change. SEA has been believed to significantly collaborate in addressing climate change issue (Posas, 2011; OECD, 2008; Larsen & Kørnøv, 2009). In parallel with SEA role in considering climate change, it has been outlined that climate change should be considered using both SEA and EIA (Byer, et al., 2012). It was mentioned that SEA is a critical tool for climate change adaptation integration into policy-making, in terms of setting adaptation objectives and vulnerability assessment, while EIA is more effective for climate change mitigation, through identifying mitigation measures during scoping stage. In South Africa, SEA is mentioned in NEMA without regulations. The concept of SEA is implied in the EMF, its purpose is to compile information and maps specifying the attributes of the environment in particular geographical areas (SADC, 2012). EMF is legislated in NEMA, it has been defined as 'a study of the biophysical and socio-cultural systems of a geographically defined area to reveal where specific land use may best be practiced and to offer performance standards for maintaining appropriate use of such land' (EIA Regulations *(R. 547) of 2010, NEMA, p. 190*).

In support of SEA role, one interviewed EAPs said that EIA can partially address climate change in combination with another environmental tools such as SEA and EMF. This view was also supported by two members of IAIAsa linkedin group discussion, who considered the role of SEA and EMF in supporting EIA in terms of climate change consideration. It was mentioned that climate change planning and modelling have to be made at the strategic- level as part of SEA or EMF. The benefit from addressing climate change at the strategic-level is that consideration of climate change impacts and GHG emissions across all components of every area or part of a country. It also assists in climate change modelling, in which predictions for climate change impacts can be set for the whole country. One EAP said that climate change has to be firstly considered at the strategic-level, not just in the plans or programs, but beyond that targets or measures for GHG emissions have to be established, which can

be implemented in the EIA practice. The view was that strategic environmental planning for climate change leads to consider all environmental and developmental components. Then it assists in establishing achievable targets for GHG emissions, which can be made and then considered in the EIA process.

## Conclusion and Recommendations

Climate change has been considered in the National Climate Change Response White Paper as an issue, which threatens sustainable development in South Africa. Measures for climate change mitigation and adaptation have been presented, in order to decrease GHG emissions and protect proposed project developments from climate change effects. This research looked at climate change mitigation and adaptation measures incorporation into EIA regime in South Africa, based on international focus on the role of EIA at the project-level in addressing climate change. For the purpose of this research which was to describe climate change incorporation into both EIA legal and practice regime in South Africa, NEMA, 2010 EIA regulations, NEM: AQA, 21 case studies of EIA practice from Gauteng province between 2010 and 2013 were collected and reviewed, and interviews with EAPs and IAIAsa linkedin discussion were conducted. The research findings showed that climate change was not explicitly stated in the 2010 EIA regulations, while it was implied in NEMA, List Notice 2 of 2010 EIA regulations and NEM: AQA. NEMA has focused on sustainable development in South Africa, based on the role of environmental management tools such as EIA to accomplish IEM objectives. This has implied the legal requirement to consider climate change in the EIA process, especially in the South African situation which is highly affected by climate change as stated in the White Paper. EIA regulations of 2010 have also included implied climate change consideration in the EIA practice. Implied consideration of climate change were found in the consideration of cumulative impacts in the EIA practice, and in the listing activities No, 1, 4, 5 & 17. Climate change is a cumulative impact, which results from different activities across temporal and spatial scales, so cumulative impact consideration in the EIA regulations implies consideration of climate change in the EIA practice. The mentioned activities in the Listing Notice 2 in the 2010 EIA regulations have indicated implied climate change incorporation into EIA process. They require EIA for certain type of projects, which can emit GHGs during different constructional and operational phases such as electricity power generation stations. The last place in which climate change has been implied was in the linkage between AEL and EIA in NEM: AQA. In this linkage EIA purpose is to include an assessment of air quality including atmospheric emissions such as GHGs. This has implied legal requirement to incorporate climate change into EIA practice.

The second part of the research results showed inadequate climate change consideration in the EIA practice in Gauteng province. The reviewed 21 EIA cases were searched for climate change mitigation, adaptation and baseline adaptation, which were not addressed. This is a consequent result of explicit absence of climate

change incorporation into EIA regulations. The findings from EAPs interviews and IAIAsa linkedin discussion have supported the legal and practice review results, which illustrated lack of climate change incorporation into EIA practice in South Africa. Despite the partial role that EIA can play to address climate change, in conjunction with strategic tools such as SEA as mentioned by EAPs, a concern has been raised about the effectiveness of EIA to consider climate change, especially under the current situation of EIA regime in South Africa, and the complexity of climate change. This research report is in line with the other studies in the same field of study. The findings of this study are similar to the points that have been raised in the other studies, that looked at climate change incorporation into EIA internationally as illustrated in sub-section (2.6.6) in the literature review. For instance, lack of explicit legislation that require climate change incorporation into EIA process is an issue in the South African context and globally.

Based on this conclusion, it is firstly recommended that climate change considerations be incorporated in EIA regulations in the next amendment of the regulations. This can be done through:

- Identifying whether climate change is a concern, during the scoping stage of an EIA,
- Adding a list of activities to the current listed activities in the 2010 EIA regulations, which require climate change consideration in the EIA practice. These would depend on the activities contribution to climate change (GHG emission), and/or climate change impacts on an activity in specific environments such as coastal areas, and
- Developing guidelines for climate change consideration into EIA process.

It is very important here to find out the best and most effective legal framework for climate change integration into EIA regime, in order to enhance the benefits of climate change consideration into EIA practice, and avoid potential issues of preparing the EIA and EIA approval by competent authorities. This would require a simultaneous programme of capacity building in relevant government departments (competent authorities), and amongst EAPs.

Secondly, it is recommended that climate change data should be readily available, and climate change modelling technology should be accessible at lower cost.

Thirdly, enhance the role of SEA and EMF for climate change consideration in combination with EIA.

Fourthly, increase climate change awareness and staff capacity within the government departments that are responsible for environmental authorization, and effective integration of climate change consideration in decision-making process. This would require a mainstreaming of climate change issue within and across government departments, because it is not only an environmental issue.

Finally, support the role of associations such as IAIAsa and EAPSA in encouraging climate change consideration into IA tools such as EIA, through different activities, programs and courses which lead to increase EAP's capability to consider climate change in the EIAs. Responsible departments for the EIA within the government are also required to support EAPs to ease climate change consideration.

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# Appendix 1

## Table analysis of the EIA cases

| No | Project type | Project date | No. of specialist studies (project size) | Source of the project consultancy/ EAP | Consideration of climate change mitigation | Consideration of climate change adaptation | Consideration of climate change baseline adaptation |
|---|---|---|---|---|---|---|---|
| 1 | Waste license application | March 2012 | 6 | Envirolution consulting | Not considered | Not considered | Not considered |
| 2 | Waste license application | March 2012 | 3 | Envirolution consulting | Not considered | Not considered | Not considered |
| 3 | Petroleum construction | October 2013 | 6 | Golder associates | Not considered | Not considered | Not considered |
| 4 | Waste license application | September 2013 | 5 | Golder associates | Not considered | Not considered | Not considered |
| 5 | Power line and substation construction | April 2012 | 6 | Savannah Environmental | Not considered | Not considered | Not considered |
| 6 | Power line and substation construction | April 2010 | 6 | Savannah Environmental | Not considered | Not considered | Not considered |
| 7 | Residential Development | August 2013 | 5 | Newtown Landscape architects | Not considered | Not considered | Not considered |
| 8 | Waste license application | September 2011 | 8 | Newtown landscape architect | Not considered | Not considered | Not considered |
| 9 | Residential Development | March 2010 | 6 | Golder associates | Not considered | Not considered | Not considered |
| 10 | Waste license application | October 2013 | 12 | Golder associates | Not considered | Not considered | Not considered |
| 11 | Smelter construction | February 2013 | 9 | Golder associates | Not considered | Not considered | Not considered |
| 12 | Residential Development | November 2010 | 8 | Tholoane Sustainable Development & Environmental consultants | Not considered | Not considered | Not considered |
| 13 | Power line construction | October 2011 | 8 | Envirolution consulting | Not considered | Not considered | Not considered |

| No | Project type | Project date | No. of specialist studies (project size) | Source of the project consultancy/ EAP | Consideration of climate change mitigation | Consideration of climate change adaptation | Consideration of climate change baseline adaptation |
|---|---|---|---|---|---|---|---|
| 14 | Power line Construction | March 2013 | 7 | NEMAI consulting | Not considered | Not considered | Not considered |
| 15 | Residential Development | February 2010 | 8 | Newtown Landscape architect | Not considered | Not considered | Not considered |
| 16 | Waste license application | March 2012 | 5 | Envirokey Management Services cc | Not considered | Not considered | Not considered |
| 17 | Furnace construction | January 2011 | 5 | Terra-pacis Environmental | Not considered | Not considered | Not considered |
| 18 | Pipeline and waste rock dump construction | December 2013 | 13 | Shangoni management services | Not considered | Not considered | Not considered |
| 19 | Residential development | December 2013 | 8 | Strategic environmental Focus (Pty) Ltd | Not considered | Not considered | Not considered |
| 20 | Commercial development | January 2013 | 3 | Strategic environmental Focus (Pty) Ltd | Not considered | Not considered | Not considered |
| 21 | Tailing backfill plant and pipeline construction | November 2013 | 4 | GCS water and environmental consultants | Not considered | Not considered | Not considered |

## Appendix 2

### EIA project titles

1. Environmental impact assessment and waste license application for the proposed expansion of Sebokeng waste water treatment works.
2. Environmental impact assessment and waste license application for the proposed upgrade of Rietspruit waste water treatment works.
3. Environmental impact assessment (EIA) for the proposed VSAD reatile bulk petroleum products storage and distribution facility in Heidelberg, Lesedi local municipality.
4. Draft environmental impact assessment for the licensing of various NEMWA waste management activities at Impala platinum refinery, Springs.
5. Environmental impact assessment process, draft environmental impact report, proposed Tshwane strengthening project phase1: Apollo-Verwoerdburg loop-in transmission power lines and substation extension.
6. Environmental impact assessment process, draft environmental impact report, proposed Tshwane strengthening project phase 1: Kwagga-Phoebus transmission power lines and Kwagga substation expansion and new Phoebus substation.
7. Draft environmental impact assessment report, Diepsloot Estate residential development, city of Joburg.
8. Environmental impact report for the proposed expansion of Luipaardsvlei landfill site Mogale city.
9. Draft environmental impact assessment for the proposed development portions 2 and 21 of the farm Nietgedacht 535 JQ. Gaut 002/09-10/N0586.
10. Draft environmental impact report: Establishment of transformer oil regeneration and waste treatment facility in Wadeville.
11. Environmental assessment report and EMP for Scaw South Africa (Pty) limited: Eclipse east site.
12. Draft environmental impact assessment report for a mixed-use development for the proposed Avianto estate mixed-use development on various portions of the farm Driefontein 179 IQ and portion 172 of Rietvallei 180 IQ Mogale city local municipality, Gauteng province.
13. Environmental impact assessment for the proposed Taunus Diepkloof 40 KM 132KV overhead line and two 132 KV substations.
14. Final environmental impact assessment report for the proposed establishment of the Abderson 400KV substation in the Flora Park, Gauteng.

15. Environmental report for the proposed Princess Plot 229 temporary relocation area, Princess Ext 3.
16. Environmental impact assessment for the waste management license application and EIA for the proposed Olifantsfontein general landfill site (portion 41 and a portion of portion 179 of the farm Olifantsfontein 410 JR in Glen Austin A,H,).
17. Environmental impact assessment report for the M14 furnace project at Samancor manganese (Pty) LTD (Metalloys), Samancor Meyerton works.
18. Final environmental impact assessment report for pipeline and waste rock dump construction of Vergenoeg mining company.
19. Draft environmental impact assessment report for the proposed Huddle township development.
20. Final environmental impact assessment report for the proposed Lanseria commercial crossing.
21. Gold One tailing backfill plant and pipeline environmental impact assessment and environmental management programme.

# Appendix 3

## Interview protocol

### Introduction

Abdulhakim Aljareo, postgraduate student at The University of The Witwatersrand. I am working on MSc research about climate change consideration into Environmental Impact Assessment (EIA) in South Africa under the supervision of Dr. Ingrid Watson.

Internationally, EIA has been considered as a useful tool to consider climate change at the project level with relation to Strategic Environmental Assessment (SEA) at the strategic level. From the international literature, guidelines, suggestions for legislation amendments and methods for incorporating climate change consideration into EIA practice have been developed such as climate change mitigation and adaptation, in order to incorporate climate change into EIA legally and practically.

According to the international interest of climate change consideration into EIA, we are aiming to describe how climate change is incorporated into EIA in SA. Therefore, the main question of the study is, how is climate change incorporated into EIAs in SA? In order to answer this question, two sub-questions were set out which are how is climate change incorporated into the EIA regime in SA and how climate change is addressed in the EIA practice in SA. Through these objectives, we are looking for describing the consideration of climate change in the legislation particularly EIA regulations in the National Environmental Management Act (NEMA), and the link between EIA and atmospheric Emission License (AEL) in the National Environmental Management, Air Quality Act (NEMAQA). We are also looking for describing the practice of climate change consideration into EIA.

The other important part of the study is to interview Environmental Assessment Practitioners (EAPs) and discuss climate change consideration into EIA in SA with them. That can assist us in adding an important knowledge of EAPs about EIA and climate change to our research which based on experience and practice of EIA. We will also discuss our findings with EAPs and look for their views, opinions, how they see climate change should be dealt with using EIA and what are their recommendations.

**The interview questions;**

1. Is EIA an appropriate tool to consider climate change, if yes how, if not why and what can be used to consider it?

2. We found that climate change is not legislated in the EIA regulations in NEMA, why it is not, and what can be done to introduce it to the legislations?
3. Do you think climate change can be addressed using just EIA, or it should be considered using another instruments in addition to EIA?
4. Have you considered climate change in the EIAs in which you have participated whether locally or internationally?
5. From your experience, what issues can face climate change incorporation into EIA regulations and practice in SA?

# Appendix 4

## Ethics Clearance Approval

Research Office

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

| | |
|---|---|
| **CLEARANCE CERTIFICATE** | **PROTOCOL NUMBER H14/03/09** |
| **PROJECT TITLE** | How is climate change incorporated into Environmental Impact Assessment (EIAs) in South Africa? |
| **INVESTIGATOR(S)** | Mr A Aljareo |
| **SCHOOL/DEPARTMENT** | Animal, Plant & Environmental Sciences |
| **DATE CONSIDERED** | 28 March 2014 |
| **DECISION OF THE COMMITTEE** | Approved Unconditionally |
| **EXPIRY DATE** | 28/04/2016 |

**DATE** 29/04/2014 **CHAIRPERSON** pp. E.M. Takawira
(Professor T Milani)

cc: Supervisor : I Watson

**DECLARATION OF INVESTIGATOR(S)**

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10003, 10th Floor, Senate House, University.

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

**Signature** **Date** 05/05/2014

**PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES**