Incorporation of biodiversity conservation into the Environmental Impact Assessments and Compliance Processes in KwaZulu-Natal

By

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PREFACE

The research contained in this thesis was completed by the candidate while based in the Discipline of Environmental Science, School of Agricultural, Earth and Environmental Sciences of the College of Agriculture, Engineering and Science, University of KwaZulu-Natal, Pietermaritzburg, South Africa. The research was financially supported by the National Research Foundation of South Africa.

The contents of this work have not been submitted in any form to another university and, except where the work of others is acknowledged in the text, the results reported are due to investigations by the candidate.

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DECLARATION: PLAGIARISM

I, **Nomaswazi Kubheka**, declare that:

(i) the research reported in this dissertation, except where otherwise indicated or acknowledged, is my original work;

(ii) this dissertation has not been submitted in full or in part for any degree or examination to any other university;

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ABSTRACT

Biodiversity Authorities (BAs) are faced with a great challenge to safeguard biodiversity of conservation significance. As a developing country, the focus in South Africa has been placed on major infrastructure development which involves a lot of construction activities that pose significant risks to biodiversity conservation, ecosystems and the environment holistically. Biodiversity conservation at a provincial level has increasingly become aligned with environmental legislation, as a result of concerns over high biodiversity loss rate. A significant amount of critical biodiversity (over 50 %) lies outside of protected areas in KwaZulu-Natal (KZN), and is subjected to a variety of developments and transformation (Ezemvelo 2009a). This study focuses on development applications proposed throughout KZN located outside of protected areas. Limited emphasis has been placed on the extent to which biodiversity recommendations are incorporated in the Environmental Impact Assessment (EIA) process, it remains unclear whether biodiversity recommendations are mainstreamed during decision making in EIAs. The level of incorporation of biodiversity recommendations into Environmental Authorisations (EAs) was assessed at three levels (yes, partial and no), with a special focus on the types of developments being considered and the nature of recommendations provided by the BA (Chapter 2). Full incorporation of biodiversity recommendations was significantly higher than partial or no incorporation of biodiversity recommendations. However, a further assessment indicated that standard mitigations were highly considered, instead of specific biodiversity issues raised. Compliance monitoring or follow-up to EIAs was evaluated through a case study analysis to assess the implementation of biodiversity related conditions of EAs on development sites (Chapter 3). Evidently, the stipulation of biodiversity recommendations on EA conditions did not guarantee compliance, as case studies had minimum to no compliance. The results have illustrated the role of biodiversity information at different stages of EIAs and compliance, this knowledge has informed the current challenges and potential solutions to improve land use planning and the overall EIA process. Further investigations could assess in detail, the role of all stakeholders in the EIA process and how they influence the decision making procedure.

ACKNOWLEDMENTS

This dissertation is dedicated to my late parents D.Z. and D.Z.N Kubheka.

~Khathide, Masobode, Wena owasobodela indlubu nekhasi ~

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ACRONYMS AND ABBREVIATIONS

BA	Biodiversity Authority
BPA	Biodiversity Priority Area
CA	Competent Authority
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAEARD	Department of Agriculture, Environmental Affairs and Rural Development
DEA-SA	Department of Environmental Affairs-South Africa
DEAT	Department of Environmental Affairs and Tourism
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DMR	Department of Mineral Resources
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
HGM	Hydro-Geomorphic units
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management

IUCN	International Union for Conservation of Nature
MOU	Memorandum of Understanding
NECER	National Environmental Compliance and Enforcement Report
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
PES	Present Ecological State
SA	South Africa
SAIEA	Southern African Institute for Environmental Assessment
SANBI	South African National Biodiversity Institute
SCP	Systematic Conservation Planning
SPLUMA	Spatial Planning and Land Use Management Act
SPSS	Statistical Package for Social Scientists
TSCP	Terrestrial Systematic Conservation Plan
TOR	Terms of Reference
UNCED	United Nations Conference on the Environment and Development

UNITS OF MEASUREMENT

% Percentage

mm Millimetres

m Metre

ha Hectare

CHAPTER 1: INTRODUCTION

1.1 Biodiversity conservation status

Biodiversity can be defined as the variety of life, that occurs globally or in a particular habitat, it encompasses variety in functionality traits and species interactions with each other and their ecosystems or habitats (Mooney 2002, Hooper 2005, Mace *et al*. 2012). In essence, biodiversity forms part of the natural capital that humans depend on (Galli *et al*. 2014). However, the rapid use pressure on natural resources and ecosystems has led to a decline of biodiversity globally (Weinzettel *et al*. 2013). Understanding the breakdown of ecosystems due to biodiversity loss has received considerable interests over the past years (Brooks *et al*. 2006, Cardinale *et al.* 2012). Theory and experimental work clearly indicates that humans are increasingly dominating ecosystems (Vitousek *et al*. 1997, Cardinale *et al.* 2012), leading to impacts at a global and landscape level (Cardinale *et al. 2012,* Hooper *et al.* 2012*).* Such domination is taking place by over-exploitation of both marine and terrestrial resources, which results in the clearing of natural habitats (Chapman *et al.* 2016). The impact on ecosystems occurs through the alteration and the reduction of ecosystem functioning (Grime *et al*. 1997, Naeem *et al*. 1994).

South Africa (SA) is considered to be one of the richest countries in biodiversity due to its numerous biomes and their associated environmental conditions (Bowker 2000, Turpie 2003). An example of such wealthy biodiversity lies in areas such as the three biodiversity hotspots including the Cape Floristic Region, Succulent Karoo and the Maputaland-Pondoland-Albany hotspots, which possess a great level of endemism and species richness (Myers 1990, Turpie 2003, Forest *et al.* 2017). The coastal environment of SA also contributes to the rich biodiversity, placing SA as the third most biodiverse country in the world (Martinez 2007, Goble *et al*. 2014). Biodiversity in SA faces a threat due to the great rate of land transformation, amongst other causes of biodiversity loss (Reyers 2004, Pereira *et al.* 2013, Jewitt *et al*. 2015b: pages 2-7), these include:

- Loss and degradation of natural habitat, in terrestrial, freshwater and marine environments;
- land and habitat fragmentation;
- alteration of water flow, especially in the freshwater environment (such as construction of dams and abstraction of water);
- over-harvesting of marine resources;

- poaching;
- invasive alien species, in terrestrial, freshwater and marine environments;
- pollution (freshwater, coastal, air and land);
- climate change.

(CBD 2014, Ezemvelo 2009a, Barlow and Peres 2008)

Over time, the formulation of environmental policies has shifted towards facilitating biodiversity based conservation planning (Wilson and Piper 2008). This is essential as land uses competing with biodiversity conservation include agriculture, mining, housing, industrial development and so forth, which are considered as priorities globally (Wessels *et al*. 2003, O'Connor and Kuyler 2009, Gagné *et al*. 2015). The economic growth focus in SA is on major infrastructure development, especially since it is a developing country, which involves a lot of construction activities that pose significant risks to biodiversity conservation, ecosystems, and the environment holistically (Moja and Mnguni 2014, PICCSA 2014). Environmental Impact Assessments (EIAs) enable the potential impacts of development to be carefully considered before authorisation, as discussed in section 1.3 (Day 2015). EIAs also make provision for mitigations which are applied to reduce the possible negative impacts on the environment during and after land transformation (Wilson and Piper 2008).

Biodiversity conservation at provincial level is increasingly being recognised as a key component of environmental legislation, due to the high rate of biodiversity loss (Butchart *et al.* 2010, Gomar 2014). A significant amount of critical biodiversity (over half) lies outside of protected areas in KwaZulu-Natal (KZN), and is subject to a variety of developments and transformation (Ezemvelo 2014b). Traditionally, conservation was achieved through the establishment of protected areas (Roux *et al*. 2015, Veloz *et al*. 2015). Over time mitigation measures, such as buffering areas of conservation significance from degradation, have been introduced (Macfarlane *et al*. 2015, Roux *et al*. 2015). The role of conservation agencies (government, parastatal and private) became essential in assisting with conservation and the safeguarding of biodiversity in KZN (DEAT 2002, Wood *et al.* 2015). Conservation agencies not only aid biodiversity conservation through their institutional services but they also enable protection of the environment through science-driven conservation research (Ezemvelo 2009a, Roux *et al*. 2015).

1.2 Environmental Legislation

The need for the conservation of biodiversity was recognised decades ago through the United Nations Conference on the Environment and Development (UNCED) international convention

(McGraw 2002, Swanson 1999). About 160 nations endorsed the Convention on Biological Diversity (CBD) which rendered it a globally binding treaty (McGraw 2002). The principles of the CBD require one to have a clear understanding of what the current biodiversity issues are (Bragdon 1996, Swanson 2013). Secondly, it stipulates actions to be implemented in achieving the objectives of the Convention (Swanson 2013, Dunn *et al*. 2014). Regardless of this, quantifying global achievements of this convention remains difficult, international challenges have led to the current approach and agreement, known as the framework convention (Cock *et al*. 2010, Swanson 2013). This framework includes the identification of specific issues, negotiations and logical solutions aimed at filling the current gaps and challenges faced by the CBD (Balmford *et al*. 2005). It is evident that the international biodiversity conventions and treaties do influence the environmental legislative framework of SA (Figure 1.1).

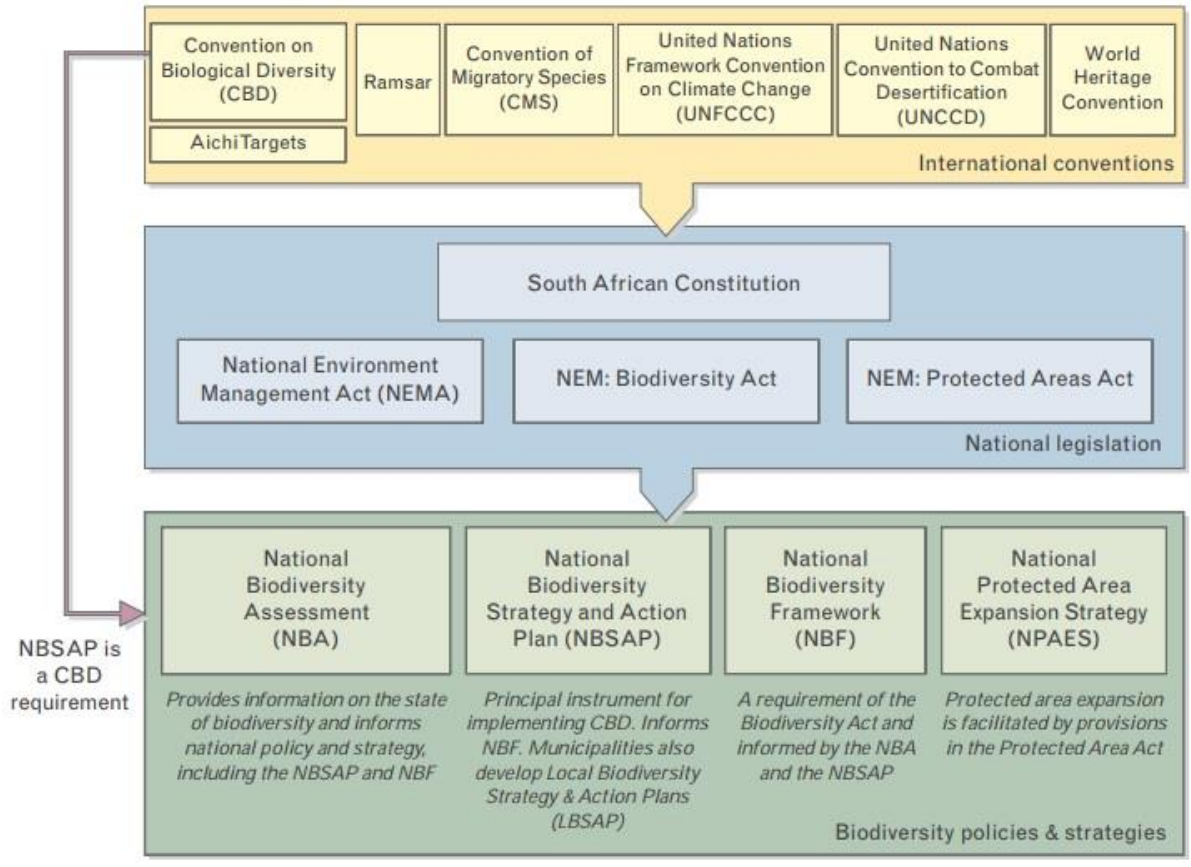


Figure 1.1: The Relationship among international conventions, national legislation and biodiversity policies and strategies in South Africa (SANBI 2014)

Prior to fulfilling international agreements and obligations, McNeely *et al*. (1990) expresses that it is fundamental for nations to also adhere to their environmental legislation. This type of

practice is likely to occur at local and community levels (Balmford *et al*. 2005), which is where the positive impact of biodiversity policies and sustainable practices should ideally be taking place (McNeely *et al*. 1990). Meeting international targets could be applied through good use of local conservation activities (McNeely *et al*. 1990), this is largely possible if biodiversity plans and information are available to decision makers and implemented timeously in development applications (Brownlie *et al*. 2009).

The approach to environmental management in SA is a result of the evolution of various legislation and policies that have occurred over time (Fuggle and Rabbie 2009, Day 2015). The National Environmental Management Act (NEMA) No. 107 of 1997 was put into effect to enforce the Environmental Management Policy. NEMA originates from an influence of public management with the intention to achieve co-operative governance nationally (DEAT 2004, SAIEA 2003, Fuggle and Rabbie 2009). This is the basis for its core principles which are governed by the organs of state (Day 2015). NEMA also supports the practice of integrated decision making, in order to achieve sustainable development, similar to the international context of environmental management approach (DEAT 2004, Rossouw and Wiseman2004). The principles of NEMA were formulated based on Section 24 of the Constitution, which speaks to the human's rights to a safe or healthy environment (RSA 1996). The NEMA has been amended several times to date in order to provide clarity and ensure its relevant efficient use (SAIEA 2003).

The KZN province was initially governed by the Nature Conservation Ordinance, Ordinance 15 of 1974 (this was prior to 1994). The protection of species and regulation for hunting was enforced through this ordinance (Ezemvelo 2009a). Post 1995, due to legal reformations and amendments, the KZN Nature Conservation Management Act No. 9 of 1997 and KZN Nature Conservation Management Act No. 5 of 1999 came into effect. In support of these acts, the KZN Conservation Board was mandated to deal with activities pertaining to protected areas, indigenous animals and plants (Todes *et al*. 2005). The mandate of the Board was further streamlined as the authority responsible for the management of the provincial biodiversity (Ezemvelo 2009a). This occurred through the provision of comments on land-use change applications, which have the potential to negatively impact the biodiversity of KZN. In deliverance of this mandate, Ezemvelo KwaZulu-Natal Wildlife's (EKZNW) organisation provides official comments outlining recommendations on land use change applications (Ezemvelo 2009a).

EKZNW undertakes detailed review of all development applications through the EIA process, within Integrated Environmental Management (IEM) system. The EIA process allows for decision making that is informed and defensible, thus enabling the EKZNW Planning Committee to be an advisory body especially from a biodiversity conservation perspective (Ezemvelo 2009a). This is in accordance with the principles of the National Environmental Management Act (NEMA) 107 of 1998; ensuring that the ecological integrity of the receiving environments is not compromised nor lost (SAIEA 2003). The final decision on whether or not to authorise the proposed development, lies with the Department of Economic Development, Tourism and Environmental Affairs (DEDTEA), or any other relevant Competent Authority (CA) for that specific application (DEAT 2004).

1.3 The Environmental Impact Assessment and Compliance Process

According to the 2010 NEMA Regulations, the EIA is defined as a systematic process of identifying, assessing and reporting environmental impacts associated with an activity (SAIEA 2003). The purpose of the EIA process is for the provision of information on the environmental consequences, for the activities to be considered and to obtain an Environmental Authorisation (EA) at the end of the process (DEAT 2004, Rossouw and Wiseman2004). The EIA process enables the engagement of various stakeholders, and allows the informed and defensible decision making by Competent Authorities (CAs) (DEAT 2004, SAIEA 2003, Fuggle and Rabbie 2009). Initially in SA (in the 1970's), the EIA process was non-mandatory as participants conducted EIAs voluntarily, based on the notion of IEM and promoting environmental awareness (Sandham *et al*. 2013). The approach to environmental management in SA is a result of the evolution of various legislation and policies that have occurred over time (Day 2015). The National Environmental Management Act (NEMA) No. 107 of 1997 was put into effect to enforce the Environmental Management Policy. Prior to NEMA coming into effect the Environmental Conservation Act (ECA) No. 3 of 1989 was in place (Kidd 2008, CBD 2014). In September 1997, the EIA process became mandatory under the EIA Regulations of the Environmental Conservation Act (Kidd 2008). It became mandatory as conflict was arising with decision making that concerns conservation and development (Sandham *et al*. 2013). Furthermore, the EIA process was acknowledged as a tool that could be flexible, project specific, and practical to implement (Retief *et al.* 2011).

EIAs undergo a review, which is a critical function that aids in the assessment of information from assessments such as biodiversity, environmental, social and heritage (SAIEA 2003). There are different stages of reviewing which have their specific objectives (Table 2.1). The

stages range from early conceptual and proposal stages, to assessments of information, stakeholder engagement, decision making, and implementation of conditions, should the application be authorised (DEAT 2004, Wood *et al*. 2015). Within these different stages in the EIA process, there are different roles and responsibilities as outlined below:

- Project applicants or developers: applicants who appoint independent Environmental Assessment Practitioners (EAP's) to conduct the EIA process on their behalf,
- EAP's: independent consultants who have expertise to conduct EIAs under NEMA Regulations,
- ECO's: Environmental Control Officers oversee and audit the implementation of conditions stipulated in the EA, once the development is authorised.
- Competent authorities: Department Personnel and Reviewing Authorities that review the EIAs and Interested and Affected Parties (I and AP's): range from individuals, private entities to community members or civil society

  The stakeholders engage throughout the EIA process, from the proposal of the application to the decision making stage.
- IAP's: Interested and Affected Parties which include members of society, official stakeholders, communities and other individuals who may be interested or affected by the proposed development.

(DEAT 2002, DEAT 2004, Wood *et al*. 2015).

Once the EIA process has been concluded an authorisation is obtained which contains a set of conditions that must be complied to (DEAT 2002, Wood *et al*. 2015. This introduces the another aspect of this research that placed emphasis on compliance monitoring of biodiversity related conditions. Compliance monitoring can be defined as a follow up to the EIA process as it makes provision for the evaluation of whether conditions stipulated in EAs are complied with or not (DEAT 2004, Jennings 2011). The need for compliance monitoring has become more apparent due to development projects failing to comply with conditions pertaining to sustainable construction practices (Wessels et al. 2015, Arts and Faith-Ell 2012). Compliance takes place during and after construction, and, in some cases, during the operational phase, this depends on the type of development being assessed (Du Plessis 2002, Nel and Wessels 2010).

In principle, compliance monitoring is part of the environmental management discipline, and it is conducted for all authorised applications or developments. However, it has been established that, in some cases, compliance monitoring is only prompted by complaints raised about a development (Carter-Brown 2017). In relation to the EIA process, the role of compliance is to ensure that conditions stipulated in authorisations are adhered to and implemented (DEAT 2004, Jennings 2011). However, Alers (2016) highlights that limited emphasis is placed on the follow-up compliance and enforcement aspects in the South African context, a. Lack of compliance means that biodiversity related conditions may be stipulated in EAs, however, if there is no compliance there is also no implementation, therefore, biodiversity remains at risk (Alers 2016).

1.4 Land use planning and decision making challenges

This study is focused on land use change or development applications in KZN, with the aim to establish how much biodiversity is, in reality, taken into consideration during the EIA and compliance process. Conservation Planning has been defined as a means of locating, protecting and maintaining areas of conservation significance, and also ensuring the persistence of biodiversity (Margules & Pressey 2000, Pressey *et al*. 2007). Lindenmayer and Hunter (2010) describe Systematic Conservation Planning (SCP) as being a multidisciplinary science as it considers a variety of methodologies from other fields such as geography, spatial ecology and computer sciences. The method of systematic conservation planning emerged in the 1970's and its purpose has changed over time (Veloz *et al*. 2015). Initially the SCP in conservation agencies such as EKZNW was used only when it was necessary and for specific landscapes (protected areas). However, over time it became a tool for land use planning implementation (Ezemvelo 20014b, Nel *et al*. 2011).

Systematic Conservation Planning contributes to the prioritisation of conservation actions through the consideration of irreplaceability and threat statuses as primary guides for the formulation of conservation planning maps (Carroll *et al*. 2004, Veloz *et al*. 2015). It should be noted, however, that, as the natural environment is dynamic, an update of data that informs these maps is required regularly (Pressey 2004, Pressey *et al*. 2007). Tracking change through mapping land cover has been critical as some the largest cause of biodiversity loss is due to land cover changes and habitat loss, especially with the rapid rate of natural landscape transformation occurring in the province (Figure 1.2) (CBD 2010, Jewitt *et al.* 2015b, Blackmore 2016).

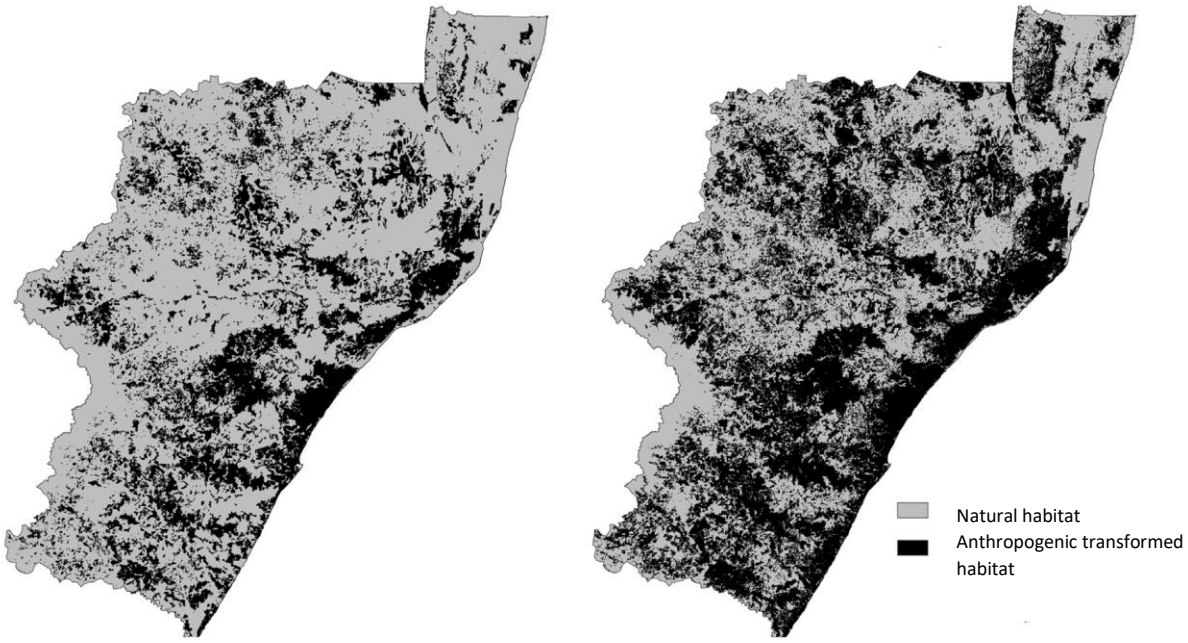


Figure 1.2: Land transformation in KwaZulu-Natal between 1994 and 2011 (grey areas represent natural habitats while the black areas have been transformed by human activities) (Jewitt *et al.* 2015b)

It is evident that mapping systematic land cover change and habitat loss can assist in monitoring changes in the landscape at provincial level, consequently, aiding in the tracking of national targets and international obligations (Jewitt *et al.* 2015b). Therefore, SCP is considered as one of the most influential tools for identifying priority areas, thereby ensuring long term persistence of sites with great biodiversity value (Kukkala and Moilanen 2013, Veloz *et al*. 2015). SCP could influence the EIA process through stakeholders that participate in the EIA process being informed about plans produced through SCP, thus enabling Integrated Environmental Management (IEM) that could forge a balance between development and sustaining the environment (DEDTEA 2017).

A common challenge in land use planning is conflict of recommendations and roles of different stakeholders discussed in section 1.3. Applications for land use changes require applicants to appoint independent consultants and specialists to carry out the applications and assessments (Wood *et al*. 2015, Carter-Brown 2017). Challenges tend to occur in practice whereby consultants not only have to consider biodiversity input from specialists, but still have to take into consideration other aspects such as economic, social and geotechnical factors (Kareiva and Marvier 2012). The attempt to achieve a balance between safeguarding biodiversity and feasibility with other aspects (economic and social) is a challenge when it comes to

consolidating different inputs and plans for the same application or site (Carter-Brown 2017). This is evident when a final layout for an application is formulated, but still cannot take into consideration all the different recommendations from various stakeholders (Kareiva and Marvier 2012).

There are a number of biodiversity information challenges within the EIA process, which are not only problematic at a national level, but also at a provincial level (Myers 1990, Rands *et al*. 2010, Wale and Yalew 2010, Manuel *et al*. 2016). Brownlie *et al*. (2009) outlined the specific challenges in the South African context, which were deemed as weaknesses in the initial stages of the EIA process (discussed further in Chapter 3). The challenges mainly pertain to provisioning, interpretation, understanding, and implementation of biodiversity information (SAIEA 2006, Sandham *et al*. 2013). Furthermore, in some cases authorities experience difficulties in making sound and defensible decisions in the authorisation process, despite the biodiversity information and impact reports being sufficient and made available to them as decision makers, (SAIEA 2006, Brownie *et al*. 2009). The reasons for poor decision making include inexperience with reviewing environmental reports, lack of understanding sustainability concepts, and lack of compliance monitoring of biodiversity issues, among others (Brownie *et al*. 2009).

After years of conducting the EIA process, the gap between the expected outcome and practical implementation remains evident (Sandham *et al*. 2013, Zhakata *et al*. 2016). Numerous factors leading to the underperformances of the EIA process have been outlined to include: lack of resources and capacity constraints in relevant departments and organisations, lack of political support, insufficient consideration of biodiversity features in the decision making process and severe lack of compliance or follow-up to the authorised developments (Alers 2016, Brownie *et al*. 2009, Zhakata et al. 2016).

1.5 Study Aim, Objectives and Outline

The aim of the study is to analyse the effectiveness of biodiversity recommendations in safeguarding biodiversity from land use change or development in KZN, through the EIA process. sis. Furthermore, my work should assist in identifying the level of compliance to biodiversity related conditions placed on a development, and ways for improving compliance, integrated environmental management, and overall land use planning. Development is regulated through the EIA application process (Ezemvelo 2014b), the process is not without its shortcomings; hence, a careful evaluation of the EIA process is required. One of the

shortcomings is the limited emphasis that has been placed on the extent to which biodiversity recommendations are incorporated in the EIA process and decision making (Brownlie *et al*. 2009, Blackmore 2016). It remains unclear as to what extent biodiversity recommendations are considered in the EIA process in order to safeguard fauna, flora, wetlands and ecosystems of conservation significance in KZN.

This study assessed the level at which biodiversity conservation recommendations, provided by a biodiversity conservation authority, EKZNW, were incorporated into Environmental Authorisations (EAs). In addition, this study also assessed compliance to biodiversity recommendations that are stipulated as conditions once EAs are granted. This was done using specific case studies, as compliance is an integral part of environmental management and land use planning (Jennings 2011, NECER 2015). especially since EIA follow up processes are often neglected once EAs have been issued (Mhango 2005, Nel and Wessels 2010).

The main objectives of this study were:

1. To assess the level of incorporation of biodiversity recommendations into the EAs for land use change applications.

2. To identify the challenges or limitations to the application of biodiversity conservation recommendations.

3. To assess the implementation of conditions of EAs (compliance) on the ground or site level, through the use of case studies.

Key questions to address these objectives were:

i. To what extent are biodiversity recommendations incorporated into the EAs of various land use change applications?
ii. What biodiversity features or attributes influence the level of incorporation? Thus influencing the likelihood of those features or attributes being considered in EA's?
iii. Do development types or competing needs influence the level of incorporation of EKZNW's recommendations? Thus leading to specific development types having specific trends on the level of incorporation?
iv. What leads to biodiversity recommendations being excluded in the EAs? Thus leading to specific biodiversity recommendations being considered challenging or limiting to incorporate and implement?

v. What leads to compliance or non-compliance of biodiversity related conditions on site, can the use of case studies indicate the implementation levels of biodiversity related conditions?

This study is structured around two data chapters, where these questions will be addressed. Data chapter 1 focused on assessing incorporation of biodiversity recommendations into the EIA and decision making process. Factors that could potentially influence the incorporation or lack thereof were evaluated. The findings will be indicative of land use planning and EIA decision making drivers at a provincial scale (development applications in KZN).

Data chapter 2 assessed compliance (EIA follow-up) to biodiversity recommendations at a case study level. The outcome of data chapter 1 will inform the inclusion of biodiversity recommendations into EAs at a provincial level. Data chapter 2 will go further, with the assessment of whether those biodiversity recommendations are compiled to or implemented on site. The case study analysis will be site specific and include direct input from stakeholders involved in the cases.

CHAPTER 2: AN ASSESSMENT OF THE INCORPORATION BIODIVERSITY RECOMMENDATIONS INTO ENVIRONMENTAL AUTHORISATIONS FOR DEVELOPMENT IN KWAZULU-NATAL, SOUTH AFRICA

Abstract

Biodiversity conservation at provincial level is increasingly becoming aligned with environmental legislation, as a result of concerns over high biodiversity loss rate. A significant amount of critical biodiversity (over half) lies outside of protected areas in KwaZulu-Natal (KZN), making it subjected to a variety of developments and transformation. Development is regulated through the Environmental Impact Assessment (EIA) process and we aimed to assess the extent to which recommendations from the Biodiversity Authority (BA) were incorporated into Environmental Authorisations (EAs) for development applications authorised between January 2010 and June 2015. Full incorporation of biodiversity recommendations was significantly higher than partial or no incorporation. However, a further assessment indicated that standard mitigations tend to a generic recommendation, instead of specific biodiversity issues being raised relevant to that application. The types of developments also influenced the level of incorporation and consideration of biodiversity recommendations. Majority of linear developments (roads, bridges, pipelines) had standard mitigations in the Environmental Management Programmes, that were easy to incorporate as conditions to EAs, while developments with larger footprints and impacts (residential, commercial, industrial) had specific biodiversity recommendations that were seldom or not fully reflected in the resulting EAs. By assessing whether biodiversity recommendations are mainstreamed into the EIA process, gaps and shortcomings such as capacity constraints and lack of biodiversity consideration in EIAs were determined. This assisted in informing the overall improvement of land use planning through better understanding of types of development, and how they influence decision making in the EIA process.

2.1 Introduction

Environmental management is considered complex, as it takes into consideration various disciplines, approaches and scales (Fuggle and Rabie 2009). Literature indicates the intention for environmental management to be a multidisciplinary practice where various disciplines such as conservation, socio-economic aspects and science are integrated (Barrow 2005, Fuggle and Rabie 2009). From a scale perspective, environmental management is shifting away from assessing areas of impacts as isolated or local, but rather considering cumulative impacts at a regional or national level (Ryding 1994, Morrison-Saunders *et al.* 2013). The approach has also evolved with the aim to have an environmental management system that is not imposed (top down), rather, to have a consultative approach which considers indigenous knowledge and the people's needs (Barrow 1999, Barrow 2005, Barrow 2006). The issue of scale greatly affects biodiversity conservation as biodiversity elements and ecosystems are interconnected (Dabrowski *et al.* 2015, Macfarlane et al. 2015). The complexities of environmental management enable it to be flexible for application, but also render it challenging to implement (Barrow 2006, Fuggle and Rabie 2009), as it is dynamic and occurs in various scales which makes it difficult to regulate or manage (Roux *et al.* 2015).

Land use planning has contributed significantly to biodiversity conservation through habitat management (Butchart *et al.* 2006, Carroll *et al*. 2004), however, its use to achieve biodiversity conservation has its own challenges. One of the challenges is poor quality of data, and limited access to data by implementing practitioners and authorities (Beniston *et al.* 2012). The poor quality and lack of access to data hinders the level at which planners, officials and practitioners incorporate biodiversity elements into decision-making processes (Meredith 1996, Theobald 2000). Another challenge is that the use of biodiversity conservation tools has limitations for practitioners in various disciplines, examples include difficulty with use of the latest computer models and interpretation of maps that assist in safeguarding biodiversity (Knight *et al.* 2006). The data and knowledge pertaining to mechanisms that can aid conservation implementation are mainly underused at the different levels of decision-making (Rands *et al.* 2010) meaning that regardless of availability of conservation information to decision makers, it remains insufficiently used.

Biodiversity information pertaining to the status, planning and safeguarding of biodiversity features of conservation significance is not articulated in environmental management processes such as the Environmental Impact Assessments (EIAs) (DEAT 2004, SAIEA 2003). In order to overcome this gap, Knight *et al.* (2006) highlights that there is a need for better

communication between scientists and practitioners, which will ensure that the knowledge gained from biological or conservation research is applied into practice (Sutherland *et al.* 2004). Biodiversity information should be clearly defined and incorporated into policies and plans to improve the implementation of biodiversity conservation on site (Duerkson *et al.* 1997, Pressey *et al.* 2007). Compliance, which is considered as a follow-up mechanism to the EIA process, is also imperative to the safeguarding of biodiversity, and assessing whether biodiversity related information is actually implemented on development sites (DEAT 2004, Jennings 2011, Pereira *et al*. 2013).

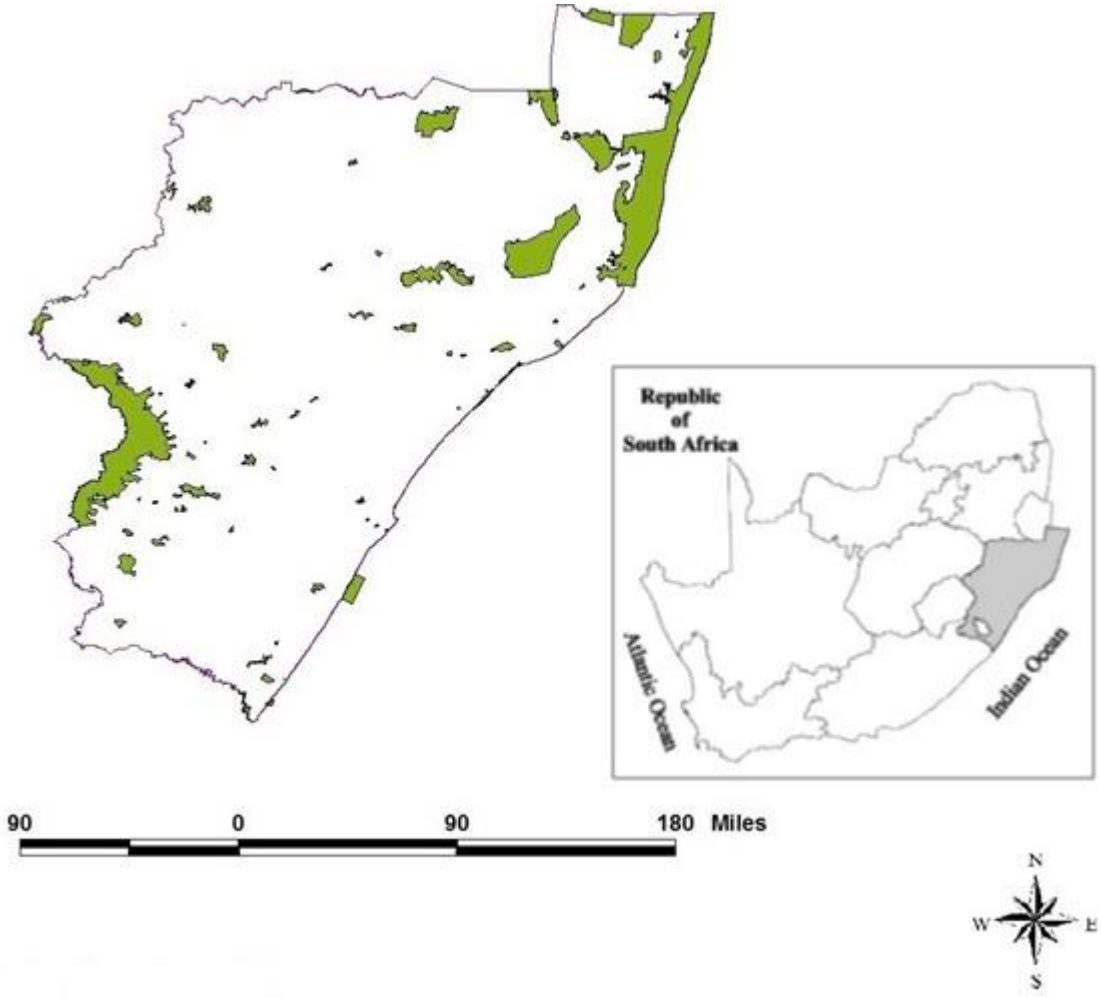
Biodiversity recommendations provided to Competent Authorities (department personnel and reviewing authorities that review and assess the EIAs) are aligned with the mitigation hierarchy (De Witt 2015). The hierarchy for mitigation is as follows: (1) Avoidance: the recommendation is that potential negative impacts on biodiversity are completely avoided by the use of alternative sites with no critical biodiversity (2) Minimisation: it is suggested that construction and operational activities are reduced to minimise or eliminate potential negative impacts on biodiversity (3) Restoration or Rehabilitation: at this stage, if negative impacts could not be avoided or minimised, the impacted areas should be restored or rehabilitated, post the construction phase (4) Offsets: the biodiversity offset programmes are the last resort for compensation on a different site, normally with similar biodiversity features to that site that is subjected to long-term impacts that could not be avoided (Ezemvelo 2013, Blackmore 2015, DeWitt 2015, Midgley 2015). As best practice, developers and environmental practitioners are required to follow the mitigation hierarchy approach with all applications (Midgley 2015).

Limited studies have been undertaken to assess the influence of specific biodiversity recommendations into the EIA process and decision making on whether to grant applications or not. Due to the limited or absence of such an assessment particularly in the KZN province, this study aims to establish the overall trends in the incorporation biodiversity recommendations into EAs. The distribution of comments was analysed according to the three levels of incorporation of biodiversity recommendations into EAs based on the EKZNW assessment criteria (see Appendix 1). It comprised of (1) yes: indicating full incorporation of biodiversity recommendations, (2) no: indicating no incorporation of biodiversity recommendations, and, (3) partial: indicating incorporation of some biodiversity recommendations. The study assessed possible trends and gaps or challenges influencing the biodiversity incorporation levels.

2.2 Methods

Study Area

The study is based on the province of KZN which is located on the east coast of SA (Figure 2.1). The landscape of KZN is considered complex due its physical and biological biodiversity ranging from mountainous escarpments to coastal environments (Fairbanks and Benn 2000). KZN is also home to the well renowned protected areas and World Heritage Sites including iSimangaliso Wetland Park and the uKhahlamba Drakensberg Park (Jewitt *et al*. 2015a). The vegetation coverage of the province is mainly grasslands, bush thickets, savannas, forest and wetlands (Fairbanks and Benn 2000). Furthermore, the province's landscape is characterised significantly by agricultural activities including crop farming (commercial and subsistence), such as sugar cane, orchards and timber (Jewitt *et al.* 2015a). The climate is mainly influenced by the Indian Ocean with the warm Agulhas current thus creating a coastal region with high temperatures and humidity with a tropical climate (Jewitt *et al*. 2015a). KZN (Figure 2.1) is considered as the wettest province in South Africa with a mean annual precipitation of 837mm (Schulze *et al*. 2006). The study focuses particularly on areas that fall outside of the Protected Areas. This is due to EKZNW's IEM Planning division's mandate to comment and provide biodiversity recommendations on all applications that fall outside of Protected Areas.



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745 **Figure 2.1: Protected areas in the province of KwaZulu-Natal (shaded as green) within**
746 **South Africa (Ezemvelo 2016, Fairbanks and Benn 2000)**

747 For the purpose of meeting the objectives of this study, data including EIA reports, EAs and
748 EKZNW official comment letters were required. Data collected was based on EKZNW's
749 official comments upon the review of EIA applications, the comments made comprised of
750 biodiversity recommendations, and the key assessment was how much of those
751 recommendations were reflected on the EAs. The first stage of this study followed a
752 quantitative method whereby numerical data based on the yes, no and partial categories was
753 collected to establish the overall distribution of biodiversity recommendations. Muijs (2010)
754 states that quantitative research enables the use of scientific mathematically based techniques
755 which are used to collect and analyse data. Through the use of statistical analysis and
756 techniques, sampled applications' data could be investigated (Venkatesh *et al.* 2013).

757 The second stage followed the qualitative research method, which comprised of reviewing
758 content influencing the numerical data. Qualitative data are rigorous in collecting information

759 that is rich in detail and are often based on real world observations (Marshall and Rossman
760 2014). Post the establishment of the distribution of biodiversity recommendations
761 incorporation to EAs according to incorporation levels, the factors possibly influencing the
762 level of incorporation were then evaluated. This method is deemed flexible by Robson (2002)
763 as it is distinguished by thorough data collection procedures that require the accessing of
764 various information sources, to ensure sufficient representation of the complexity of a specific
765 research area. Understanding what type of factors influence the level of incorporation enabled
766 the comparison of data to identify opportunities and gaps that influence the level of biodiversity
767 recommendations incorporated.

768 *Data Collection and Analysis*

769 Data was extracted from the EKZNW's Land Use Change Application Register (accessed
770 August 2015), inserted into Excel for categorisation, cleaning and then transferred to Statistical
771 Package for Social Scientists (SPSS version 24) software. Ethical approval was granted by the
772 UKZN Humanities and Social Sciences Ethics Committee (Protocol reference Number:
773 HSS/0312/017M). Furthermore, written approval was received from EKZNW to utilise all
774 information and resources available and required for research (Appendix1). The data extracted
775 from the Application Register in preparation for the SPSS software went through various stages
776 of evaluation and analysis (Figure 2.2).

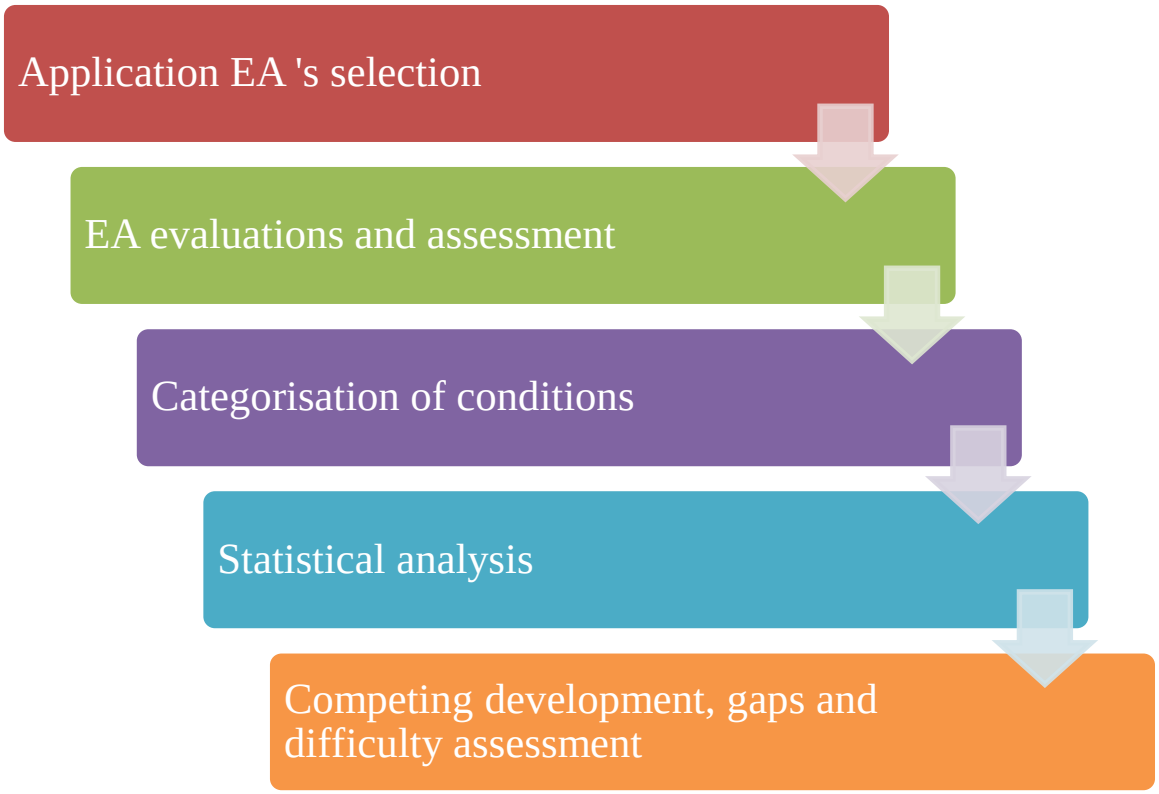

Figure 2.2: Data query methodology steps applied to collect and analyse data

EAs were selected, an EA is an official document issued by the relevant governmental department (in this study, DEDTEA). It outlines the conditions that an applicant is required to adhere to with regards to the authorised application activities. According to the NEMA Regulations, EA conditions are required to be specific, applicable and tailored to the activities of the application (EIAMS, 2011). EKZNW receives a significant number of applications for land use changes across the province. The EKZNW's Land Use Change Application Register was queried using the following conditions (Table 2.1).

Table 2.1: Data query conditions specified on the EKZNW's Land Use Change Application Register to obtain the data sample

Process of Applications sampled	All: Scoping, Basic Assessment Reports and EIAs
Categories of development sampled	All: Residential, Industrial, Commercial, Energy, Dams
Period of Applications sampled	January 2010-June 2015

Seven hundred and forty four development applications were obtained from the database query, which made up the sample for this study.

The different types of land use change applications comprise of various categories (Table 2.2). This can enable an understanding of what types of developments are associated with certain decisions.

Table 2.2: Application Categories and the types of development within them

Application Category	**Development types within categories**	**Total (n)**
Agriculture	Breaking Virgin land, Cultivation, Broiler Houses, Livestock Farming and Crop Change	39
Airport Development	Rural Airstrip	1
Alternative Energy	Photovoltaic, Hydroelectric, Biogas Generation and Biomass	7
Coastal Defence	Dune stabilisation	1
Commercial Facilities	Office Park, Business Park, Shopping Centre and Facilities, Petrol Station and Private Sector Service	58
Dams	Commercial and Private	6
Harbour Development	Lengthening and widening Harbour Port	1
Industrial	Light and Heavy Industry, Fuel Storage, Waste Facilities and Chemical Storage	54
Linear Development	Road, Bridge, Pipeline, Power line, Causeway, Sewer line and Interchange	319
Mining Activities	Heavy Minerals, Quarry, Coal and Sand mining	9
Mixed Use	Combination of residential and commercial components	4
Municipal Facilities and Services	Schools, Bulk Water Supply, Substation, Landfill, Reservoir, School and Cemetery	60
Recreational	Sports Centre, Beach Promenade, Raceway,	5
Rehabilitation or Restoration	Wetlands and Contaminated land	6
Residential	Low, Middle, Upper, Upgrades and Estates	123
Subdivision	Farm Portions	2

Tourism	Hotel, Cottages, Resorts, Guesthouse, Ranch and Reserve	9
Towers	Telecommunications and Cell phone	35
Unlawful	Unlicensed activities, Closures and Rectifications	5
Total		**744**

Source: Compiled by author from data provided by the EKZNW Land Use Change Application Register

In order to evaluate and assess EAs, the following information was recorded-

1. Project reference and name
2. EA Reviewer name and date
3. Biodiversity issue (EKZNW's recommendation) - Summarised
4. Condition Number for the specific condition stipulated in the EA
5. EA Condition (summarised) as captured and stipulated by the assessing officer in the EA
6. Evaluation Outcome: Mitigated (yes), Partially Mitigated, and Not Mitigated (No)
7. Status of Application: Filed or appealed

A portion of authorisations out of the 744 applications were already evaluated and captured by respective EKZNW staff members. However, some applications still required processing and evaluation. EAs that were not captured were evaluated (see Appendix 2: evaluation form template) by assessing the EA against the EKZNW's official comments, and the outcomes were recorded according to the format highlighted above. The evaluation outcomes, which indicated the level of incorporation (yes, no and partial), were recorded together with their descriptions of what comprised of the comments, that implies the type of issues raised.

The evaluation outcome of the authorisations were categorised as follows:

1. Yes (Mitigated): All of EKZNW's recommendations have been incorporated into the EAs, therefore, potential negative biodiversity impacts have been mitigated.
2. Partial: Some of EKZNW's recommendations have been incorporated into the EAs, therefore, potential negative biodiversity impacts have been partially mitigated and there remains some concerns.

3. No (Not Mitigated): None of EKZNW's recommendations have not been incorporated into the EAs, therefore, potential negative biodiversity impacts have not been mitigated, and there are concerns.

The conditions of authorisations were then categorised according to what specific attributes were incorporated. This categorisation was based on attributes that the BA uses during the application review process (Ezemvelo 2014a). This enabled a feasible checklist to be produced on Excel for the 744 applications, consequently proportions or distributions could be drawn from this preliminary assessment. Two broad categories: (1) Biodiversity or Environmental issues (such as wetlands, fauna and flora) and (2) Standard or Procedural issues (such as Environmental Management Programmes, standard mitigations and screenouts) were formed at this stage (full descriptions: Appendix 3). The Critical Biodiversity Areas (CBAs) which were previously termed as Biodiversity Priority Areas (BPAs) were also taken into consideration in this research, as they are considered as having critical biodiversity according to EKZNW's Terrestrial Systematic Conservation Plan (Ezemvelo 2014b).

The chi-square test

The chi square test in the SPSS software was chosen as the data collected consisted of variables that were categorical or nominal (Fienberg 1979). It compared the frequencies of different categorisations against the expected frequencies to determine whether they were significantly different. Null hypothesis: All categories of the level of incorporation biodiversity recommendations are distributed evenly. An assumption was made that the yes, no and partial categories would be equal. All statistics were performed in SPSS (version 24).

Competing development assessment

The distribution of development categories was recorded according to the level of incorporation within the yes, no and partial categories, thus getting an indication of which types of developments incorporated biodiversity fully, partially, or none at all, between the years 2010-2015. Land uses or developments that were evaluated tend to be competing land uses against biodiversity conservation, understanding which developments compete with biodiversity conservation could aid in the understanding of the current biodiversity decline. Land is significantly regulated in South Africa (SA), especially in urban areas (Kihato and Berrisford 2006). The recently introduced legislation: Spatial Planning and Land Use Management Act (SPLUMA) seeks to provide a framework that includes all settlements through linking spatial planning with zoning schemes (Joscelyne 2015, Nel 2016). As land use

changes or transformations are some of the major drivers of biodiversity loss, it was essential to analyse the trends of incorporation according to development types, which may also pose as competing needs to biodiversity conservation (Barlow and Peres 2008).

Gap Assessment

The gap assessment was the evaluation of factors inhibiting the incorporation of biodiversity recommendations into the EAs, through a quantitative approach. This assessment was possible by assessing the no category, which comprises of development applications that were authorised with completely no incorporation of biodiversity recommendations. The limitations in biodiversity recommendations incorporation also took into consideration other factors, such as capacity constraints of the BA, which lead to the authorisation of applications with no input form the BA. The assessment yielded information that would address the gap of knowledge that exists, that is, what limits biodiversity recommendations from influencing the final EA conditions. There were specific issues outlined by literature (Brownlie *et al.* 2009) that lead to the lack of incorporation of biodiversity recommendations, including: (1) Conflict of input from specialists and stakeholders, (2) biodiversity information challenges, (3) capacity constraints, and, (4) poor decision making.

Difficulty Upholding Biodiversity Recommendations Assessment

In order to assess difficulty that leads to not all recommendations of the biodiversity being included, the partial incorporation category was assessed. Factors leading to partial incorporation were according to a scale (Table 2.3), taking into consideration what kind of comments make it easy or difficult for decision makers and applicants or developers to incorporate and implement biodiversity recommendations. The scale rating focused on particularly why specific parts of comments were upheld while others were excluded.

Table 2.3: Scale rating of the difficulty applicants or developers deal with in incorporating or implementing biodiversity recommendations into their development projects.

Scale	Rating	Description
1	Easy	Comments included recommendations that had no major biodiversity concerns and supported the existing EMPr of the application.

2	Moderate	Comments recommended the implementation of specific standard mitigations, simple mitigations may be included in the EMPr but some are emphasised as they are site or biodiversity feature specific. These recommendations normally promote best practice which indirectly benefits biodiversity and the environment in general.
3	Challenging	Comments recommended specific measures to safeguard sensitive areas, this includes allocation of buffers, reduction of development footprints and rehabilitation of affected areas. Applicants or developers may find these recommendations challenging as they cost them time, money and a possibility of reduced development area.
4	Very Difficult	Comments recommended in these cases are normally due to presence of biodiversity features of conservation significance. These include the avoidance of disturbing habitats, possibly seeking alternative sites or development layout and as the last resort offsets. It might be required that additional biodiversity specialist studies be conducted that have Terms of Reference informed by the BA. Such recommendations are very difficult for applications or developers to adhere to.

2.3 Results

2.3.1 Comment distribution and level of incorporation

A total of 720 Environmental Authorisation (EA) outcomes were analysed in terms of the overall level of incorporation, that implies how much the Biodiversity Authority's (EKZNW) comments were considered in the EAs. There was a significantly higher proportion of full incorporation (yes: 70%, n=557)) than partial (10%, n=71) or no (13%, n=92), incorporation (Chi-square = 628.975, df = 2, $P < 0.01$). *Level incorporation within the biodiversity issues recommendations*

A total of 219 comments with biodiversity issues were analysed in terms of the overall level of incorporation of biodiversity comments, that implies. yes, partial, or no. There was a significantly higher proportion of full incorporation (yes: 73%, n=161) than partial (15%, n=32) or no (12%, n=26), incorporation (Chi-square = 159.370, df = 2, $P < 0.01$).

Level of incorporation within the standards issues recommendations

A total of 531 comments with standard issues were analysed in terms of the overall level of incorporation of biodiversity comments, that implies yes, partial or no. There was a significantly higher proportion of full incorporation (yes: 90%, n=478) than partial (7%, n=39) or no (3%, n=14), incorporation (Chi-square = 764.339, df = 2, $P < 0.01$).

2.3.2 Distribution of incorporation levels within development categories or land use change activities

The leading application type was linear developments, and these include: roads, bridges, pipelines, power lines, sewer lines and causeways (Figure 2.3). The high count of full incorporation (yes) indicated is linked to linear developments being associated with easy to incorporate comments from BAs, such as supporting the generic Environmental Management Programme (EMPr) and recommendations of standard mitigations.

A high number of applications under the residential category was also anticipated, as the population is increasing, more land is subjected to transformation into housing, not only through private owners, but also through large government housing projects. Partial incorporation was also evident in the residential category, whereby considering the large development footprint size, biodiversity is likely to be overlooked in certain portions of the development footprint. Commercial, industrial and municipal developments followed closely, as developments within these categories provide employment and service provision, in a

number of applications they have taken precedence over biodiversity conservation. No incorporation of biodiversity recommendations is evident in the mining, residential and municipal facilities, this suggests that potential biodiversity features on those sites were subjected to long term- permanent degradation through activities that subject land to heavy transformation and pollution.

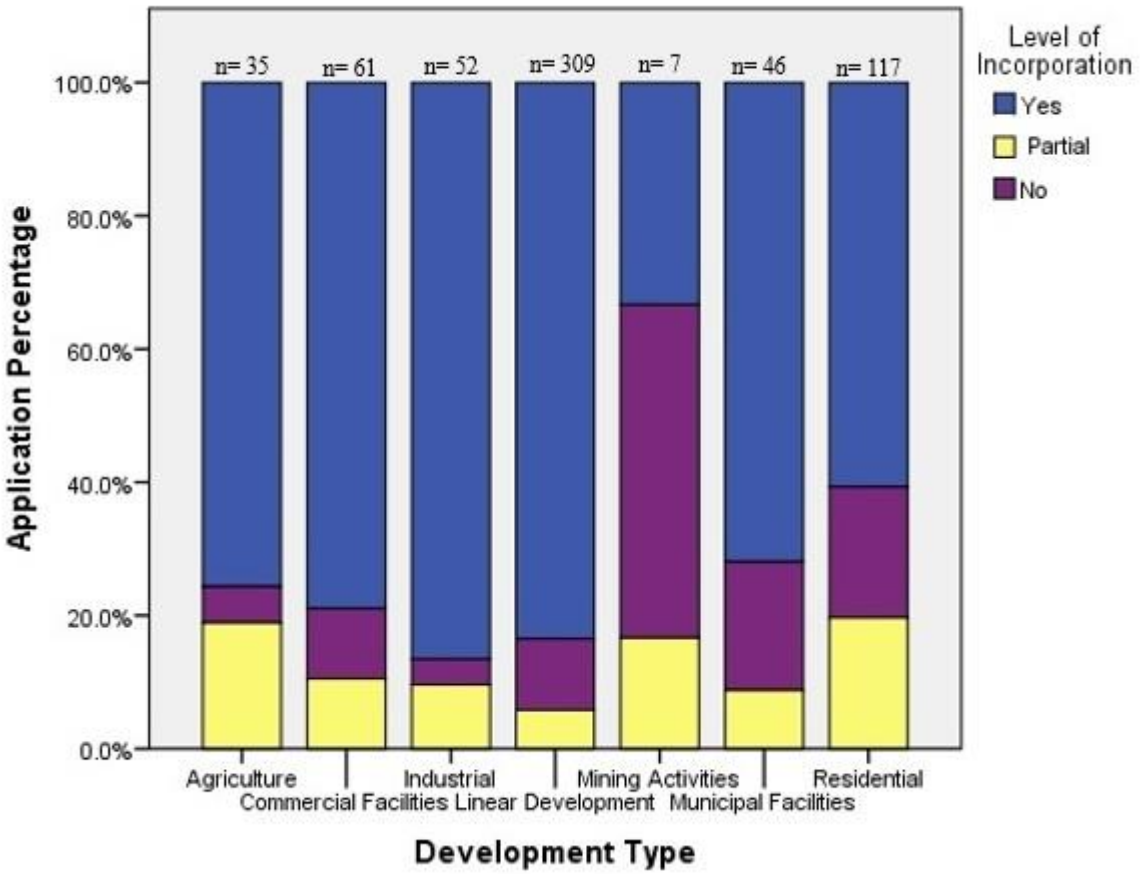

Figure 2.3: Overall distribution across development categories or land use changes for all levels of biodiversity incorporation.

2.3.3 Distribution of incorporation levels within Critical Biodiversity Areas (CBAs)

A total of 122 comments within CBAs were analysed in terms of the overall level of incorporation of biodiversity comments: yes, partial and no. There was a significantly higher proportion of full incorporation (yes: 79%, n=94) than partial (8%, n=10) or no (13%, n=16), incorporation (Chi-square = 764.339, df = 2, $P < 0.00$).

2.3.4 Gap or Challenges Assessment (No Incorporation)

In order to assess gaps (shortcomings) that lead to recommendations of the biodiversity not being included, the no incorporation category was assessed. Numerous factors that lead to a lack incorporation of biodiversity recommendations are outlined (Figure 2.4). These were identified as gaps from the official comments.

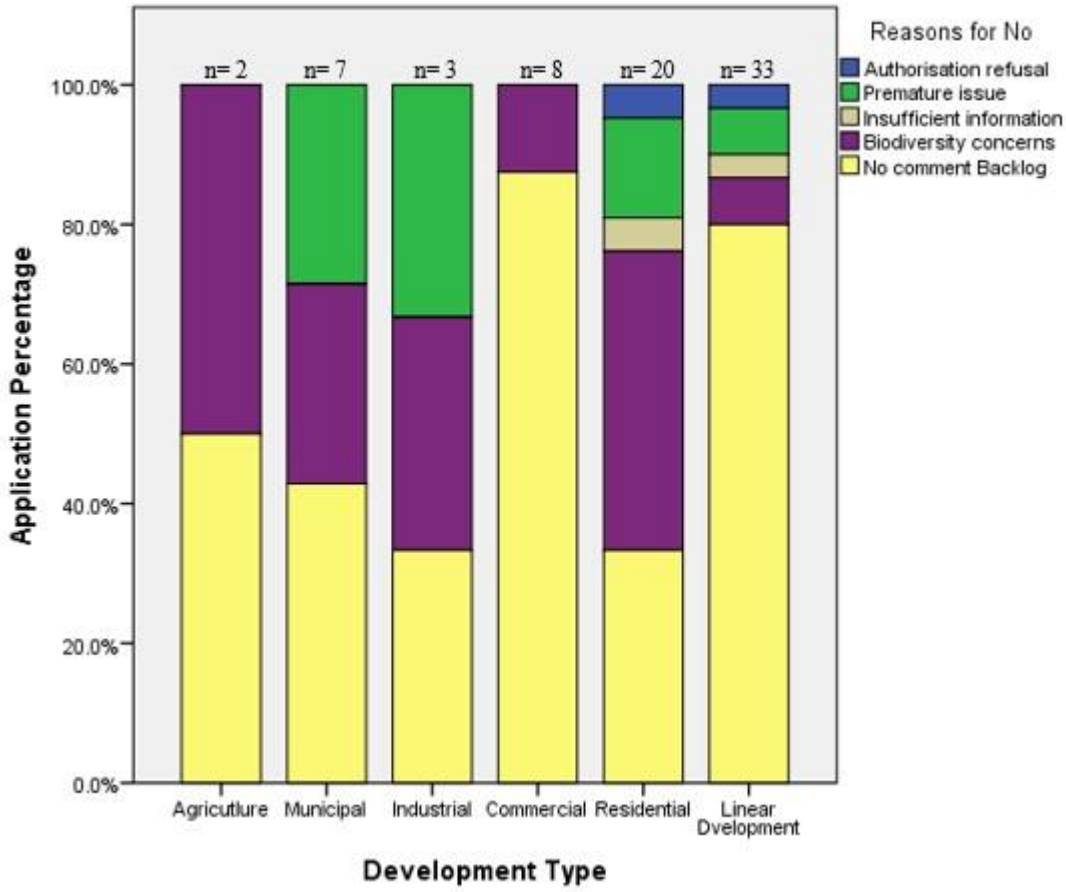

Figure 2.4: Categories for applications with no biodiversity recommendations incorporation, and identification of gaps or factors leading to complete non-incorporation of biodiversity recommendations.

Majority of applications had no incorporation due to backlog, and reasons include cases where the BA was unable to provide comment due to capacity constraints. The backlog comments acknowledge receipt of the EIA application, and state that the EKZNW IEM Section has capacity constraints that may lead to delayed responses. As a result, the majority of these applications end up being authorised without any input from the BA.

The biodiversity concerns category indicated applications which had biodiversity issues but still got authorised, this suggested that regardless of EKZNW outlining biodiversity issues and not supporting the applications, authorisation was still granted by the Competent Authority (CA). This was observed for all development categories, with residential development being the highest, possibly due to the high demand of housing the property market and agriculture due to commercial farming. Applications that had insufficient information were observed for the linear and residential development, these were due to the BA's technical reasons such as the database not being updated, hard drive failure, and loss of information.

Premature issuing of decision by the Competent Authorities (CAs, Department) was also a factor in the lack of incorporation across urban land uses (residential, linear, municipal and industrial), in such cases applications were authorised while the BA was still awaiting the final version of the reports or requested studies, maps and layouts. The lowest percentage in the no category was due to authorisation refusals (significant biodiversity impacts or other procedural issues leading to the refusal, objection or withdrawal of the authorisation application.) in the residential and linear development categories. Such a low percentage for applications sampled over 4-5 years, in a biodiversity rich province, is of concern. However, it is important to note that some objections to development due to environmental impacts do get taken into consideration and lead to authorisation refusal, evidently on the residential and linear developments.

2.4.5 Level of difficulty for applicants or developers to uphold and implement biodiversity recommendations (Partial Incorporation)

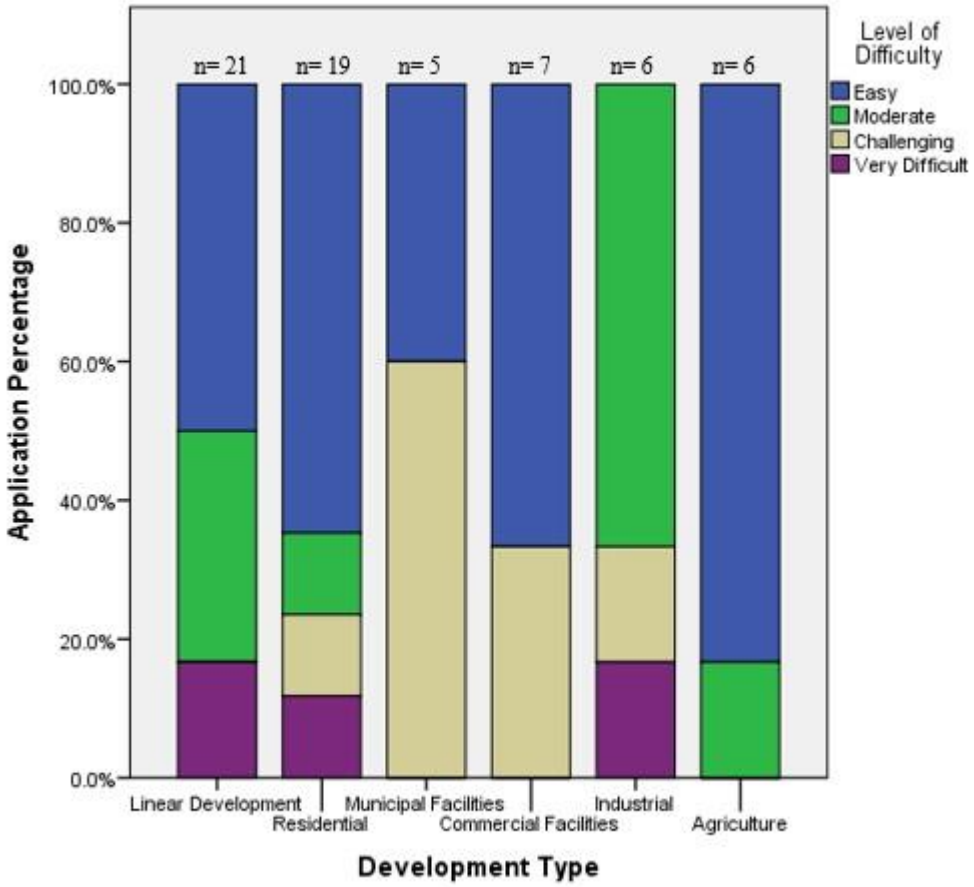

Figure 2.5 Categories for applications with partial biodiversity recommendations incorporation, and the level of difficulty for applicants or developers to uphold and implement biodiversity recommendations.

It is evident that majority of developments were able to uphold specific recommendations that were easy to implement, such as comments that supported the existing Environmental Management Programme (EMPr) that forms part of EIA reports. This was high in activities of linear development which include common infrastructure including roads and bridges (Figure 2.5). Standard mitigations comments (considered moderate in difficulty) were reasonably upheld across the different categories as they consist of basic best practice, except for municipal and commercial facilities. For the challenging and very difficult categories it was evident that developments with large footprints (residential, commercial, agriculture and municipal) seldom uphold biodiversity specific recommendations, as they did not always avoid biodiversity sensitive features. This is where the concern lies with partial incorporation of comments.

2.4 Discussion

Association between the level of incorporation of biodiversity recommendations and specific attributes was established, and this contributed to the understanding of how specific recommendations or attributes may influence the level of incorporation. The significantly higher incidences of standard concerns being considered over biodiversity issues was evident. This is viewed as problematic by Brownlie *et al.* (2009) as this can be an indication of heavy reliance on EMPs or standard mitigations to "fix all ills" while development applications require site-specific mitigations. Lack of understanding of biodiversity information was identified, as conditions of EAs excluded biodiversity issues (Brownlie et al. 2009, Blackmore 2016), and incorporated readily consolidated EMP's. Other various biodiversity information challenges have been outlined including, insufficient information being provided due to lack of data and access to relevant biodiversity information (Knight *et al*. 2006). The EIA process contributes to the regulation of land use and the Environmental Affairs department is considered as a lead CA that is the ultimate decision maker (Fuggle and Rabie 2009, Veloz *et al.* 2015). However, in most cases they play a facilitative role, and coordinate input from various authorities with separate mandates, which fuels the fragmentation of the environmental management structure in SA (Barrow 2005, Barrow 2006). The different disciplines within environmental management are not always cohesive, and often end up clashing. This is evident in the EIA process, which requires input co-ordination from different organs of state, with various mandates, for common resources (Barrow 2006, Day 2015).

Majority of biodiversity issues in the biodiversity recommendations were based on water bodies such as wetlands and rivers. This is concerning as wetlands are considered to be the most threatened ecosystem type in SA (CBD 2010, CBD 2014), and they are critical features as they provide various ecosystem services such as the improvement of water quality (Kotze *et al*. 2007, Cowden *et al.* 2014). Vegetation concerns also had a high occurrence in the biodiversity recommendations, this was expected as KZN has been subjected to severe transformation from species rich vegetation (mesic grasslands, forests and savannas) to transformed areas (Jewitt *et al.* 2015b). Connectivity in landscapes is an issue seldomly considered when authorisations are granted (Brownlie *et al*. 2009, Sutherland *et al*. 2010), in cases of biodiversity features such rivers, degradation through water pollution does not only occur on one site, there are downstream impacts that affect other ecosystems that are not part of the development footprint (Dabrowski *et al*. 2015, Elosegi and Sabater 2013). It then becomes a challenge to monitor impacts on specific development sites while also taking into

consideration cumulative impacts that are not visible to the naked eye, such as reduced water quality (Dabrowski *et al*. 2015). By understanding which types of comments are likely to be considered in EIAs, interventions and solutions required to improve the incorporation of biodiversity information can be formed.

Evidently, developments linked with social and economic needs such roads and pipelines (service provision), commercial and industrial development (employment provision) are prioritised over biodiversity conservation (Cavaye 2006, Reitzes 2009, Luthuli and Houghton 2015). As a result, biodiversity conservation ends up competing with a range of development activities and needs (Wessels *et al*. 2003). It is a challenge to reverse this dynamic, as these developments are in high demand, especially in the underdeveloped rural areas of KZN that only started receiving infrastructure in the past two decades (Luthuli and Houghton 2015, Tissington 2012). Moja and Mnguni (2014) highlighted that EIA Regulations sometimes do not get implemented accordingly and development activities get authorised on inappropriate sites. In some cases, this is due to pressure on government to meet election promises (regarding programmes such as Reconstruction and Development Programme housing, water supply and roads for transportation), which results in developments not adhering to EIA Regulations (Moja and Mnguni 2014). Being informed about what kind of developments are likely to take precedence over biodiversity conservation, can be used to formulate solutions that integrate those developments with conservation practices, thus rendering that development sustainable. Furthermore, different approaches should be used on different developments as some pose a greater risk to biodiversity than others (Blackmore 2016).

Incorporation of biodiversity recommendations was significantly higher on development applications located in CBAs. Biodiversity incorporation is imperative in areas of significant biodiversity as these sites are irreplaceable, and there are no alternatives sites with similar biodiversity features (Ezemvelo 2014b). Information depicting critical biodiversity areas in KZN is readily available to decision makers, and this could be one of the reasons why biodiversity was highly incorporated (Pressey 2004, Pressey *et al*. 2007). Furthermore, the BAs engage more on developments that are proposed within these critical areas, which leads to improved communication with other stakeholders (Longmore 2017). CBAs comprise of conservation features required to meet conservation targets, and the study has ascertained that there was significant incorporation of biodiversity recommendations for applications within CBAs between 2010-2015. Rands *et al.* (2010), Blackmore (2015) emphasised the importance of safeguarding biodiversity through ensuring that: (1) biodiversity is managed as a public good

through understanding the concept of sustainability (benefits of biodiversity are both for present and future generations) (2) biodiversity is integrated into public and private decision making through stakeholder engagement (government and civil society), and (3) create enabling conditions for incorporating biodiversity conservation into policy implementation, through development of plans that are driven by restoration of ecosystems and conservation of biodiversity. This yields biodiversity conservation planning systems that are proactive rather than reactive (Karr 1990), through consideration of biodiversity as part of initial land use planning as opposed to it being considered at mitigation or final phases of decision making (Veloz *et al.* 2015).

Considering high backlog as well as capacity constraints faced by the BA (EKZNW), it would be expected that the Department would have a high refusal rate in order to avoid any unknown risk to biodiversity. This would be in line with the precautionary principle, which is defined as an approach that is meant to avoid and prevent negative environmental impacts (Dickson and Cooney 2005). This is more so in cases where there is a significant level of uncertainty pertaining to potential biodiversity impacts (Paterson *et al*. 2008, Blackmore 2016); however, this was not the case with the study. It can be deduced that, as a consequence of delayed or no input from EKZNW, biodiversity features (where they exist) could not be protected adequately. Non-Government Organisations, such as Endangered Wildlife Trust (EWT) and Duzi UMngeni Conservation Trust (DUCT), are important in scenarios such as these, as they also provide comments as Interested and Affected Parties (IAPs) to the Department of Environment, which contributes to safeguarding threatened habitats and ecosystems of conservation significance. The authorisation of developments objected to, by EKZNW is of concern as this is in conflict with the conditions stipulated in the Provincial Gazette of KZN pertaining to protection of biodiversity. It is stated that, before making a decision in respect of any such application: "*(iii) take into account any comments made by Ezemvelo KZN Wildlife in terms of this subsection; and (iv) take into account any biodiversity targets, bioregional plans and biodiversity management plans approved by the MEC in terms of section 4(1)(f) and (g).*" (Ezemvelo 2009a, KZN Provincial Gazette 2015)

Another challenge that hinders the incorporation of biodiversity recommendations is the insufficient information provided in EIA reports. The authorisation of developments without relevant biodiversity information was greatly emphasised by Brownlie *et al.* (2005) in terms of how it limits the effectiveness of land use planning (Veloz *et al.* 2015). This is also in not in keeping with safeguarding of the public trust (biodiversity) which is meant to be a legal

foundation enforced through NEMA to ensure that natural resources are conserved (Sax 1970, Blackmore 2015). To overcome these challenges, one of the key factors is the understanding and utilisation of biodiversity information during the planning phases of the EIA up to the implementation phases (Brownlie *et al.* 2005). Some of this information is readily available in bioregional and municipal plans, and it can also be requested from the BA (Ezemvelo 2009a). An example would be the Durban Metropolitan Open Space System (DMOSS) plan that takes into consideration areas of high biodiversity value linked together in a viable network of open spaces (Roberts *et al.* 2016, Boon *et al.* 2016). The DMOSS allows the conservation of threatened ecosystems, including wetlands and habitats that currently face significant threats from development (Boon *et al.* 2016).

The difficulty assessment depicted that, in the majority of cases, the easier recommendations are highly likely to be upheld or implemented compared to difficult and challenging biodiversity specific recommendations. Partial incorporation could be considered better than no incorporation at all. However, it is still risky if issues of higher biodiversity concern are excluded, while less significant issues are picked up. Buffers protecting sensitive biodiversity features (wetlands, rivers, fauna or flora) should be considered critical compared to standard recommendations that are likely to be part of the general EMP (Macfarlane *et al*. 2015, Manuel *et al.* 2016). Improving of EMP's by ensuring that they are site specific and take into consideration sensitive biodiversity could lead to an overall improved level of biodiversity conservation along with sustainable development (Barrow 2006).

A major challenge within environmental management is due to the decision making structures that are fragmented and the disjointed departments that have separate mandates regarding same developments or activities gives rise to conflict in the decision making process (Barrow 2005, Barrow 2006). This has been evident with this study where the various authorities such as EKZNW, Department of Water Affairs and Department of Agriculture have conflicting inputs as organs of state due to their overlapping mandates. This gives rise to incompatible conditions in the authorisations which are challenging to implement and even more difficult to follow-up or monitor.

The EIA process has proven to be a sufficient tool in environmental management however there are gaps or shortcomings when it comes to the aspect of safeguarding biodiversity regardless of the immaculate environmental legislation that exists. Protected area establishment has been one of the main interventions for conserving biodiversity (Roux *et al*. 2015).

However, establishing protected areas has proven not to be enough to meet national and provincial biodiversity targets, hence the need for support from the EIA process (Goodman 2003, Brownlie 2005, Wale and Yalew 2010). The enhancement of conservation through appropriate land use planning appears promising (Nelleman and Corcoran 2010, Ezemvelo 2014b), as it has been a major contributing factor to efforts of biodiversity conservation in KwaZulu-Natal (KZN), and South Africa (SA) as a whole (Butchart *et al.* 2006). Possible solutions and recommendations will be discussed in Chapter 4 in conjunction with case study analysis (Chapter 3) outcomes that were site specific, in contrast with this chapter that considered overall development applications in KZN.

CHAPTER 3: COMPLIANCE MONITORING FOR BIODIVERSITY RELATED CONDITIONS IN ENVIRONMENTAL AUTHORISATIONS IN KWAZULU-NATAL, SOUTH AFRICA (CASE STUDY ANALYSIS)

Abstract

Prioritisation of biodiversity recommendations is critical in the compliance monitoring phase to ensure persistence of significant biodiversity within developments that are regulated by Environmental Impact Assessments (EIAs). Compliance monitoring or follow-up to EIAs faces a great challenge, as the implementation stage of the EIA process may be neglected. Compliance, specifically to biodiversity conditions, becomes a more difficult task as the inclusion of biodiversity related conditions in Environmental Authorisation (EA) may be limited. A case study of development applications with different levels of biodiversity incorporation enabled the assessment of compliance to biodiversity related conditions. It was evident that the stipulation of biodiversity recommendations on EA conditions did not warrant that they would be complied with. The degree of compliance also varied, as some conditions were partially complied with, and others were considered as pending since no action had taken place to implement them. The insight provided by stakeholders active in the EIA and compliance processes highlighted existing challenges within the process, such as lack of communication among stakeholders, neglect of biodiversity information at early stages of applications and insufficient capacity and resources within departments and organisations. Awareness of these issues, and the evident shortcomings identified by the case study analysis, enabled the identification of possible solutions, including transparency and clear communication amongst stakeholders, raising of environmental or biodiversity awareness, early integration of biodiversity assessments into development applications, and the importance of political support in safeguarding biodiversity of conservation significance. Significant implementation effort will be required to improve compliance monitoring to overall EA conditions, and those that are biodiversity related; this study has illustrated the main gaps and challenges prohibiting successful implementation of EIAs.

3.1 Introduction

The Environmental Impact Assessment (EIA) process has become a critical tool in the field of environmental management and land use planning in the development sector (Ehrlic and Ross 2015). Glasson (2005) outlines the EIA process as follows: screening, scoping, evaluation of impacts, mitigation, review, decision-making and post decision compliance monitoring. Compliance monitoring refers to the process that makes provision for the evaluation of whether the conditions stipulated in EAs are complied with (DEAT 2004, Jennings 2011) However, limited emphasis has been placed on the follow-up (compliance) to EIAs (Alers 2016). Compliance monitoring could be identified by scale, whereby monitoring could be project specific (micro scale) or overall monitoring of how effective the EIA process is (macro scale) (Morrison-Saunders *et al.* 2007). The main principles of compliance monitoring include the evaluation of EIA outcomes, transparent provision of feedback to stakeholders, supply of resources to enable compliance monitoring, and allocation of responsibility to regulators and applicants or developers to participate in compliance monitoring (Marshall and Morrison-Saunders 2005, Morrison-Saunders *et al.* 2007). There is a limitation of internationally applicable guidelines to conduct compliance due to different impact-receiving environments in different countries (Connelly 2011). Therefore, it is essential for compliance practices to advance towards being project specific, while considering cumulative impacts and align with stakeholder's requirements (Morrison-Saunders *et al.* 2007, Connelly 2011, Arts and Faith-Ell 2012).

Various approaches and techniques that can lead to successful compliance monitoring in a global context include (Morrison-Saunders *et al.* 2003 pages: 47-49,Morrison-Saunders *et al.* 2014): (1) Pragmatic approach: a practical approach that makes use of readily available resources and procedures to follow up on the EIAs; (2) Permits and contracts: specific stipulations and conditions set by the decision maker, that legally binds the applicant; (3) Scientific monitoring: scientific monitoring is utilised on environmental components in order to predict and assess direct and cumulative impacts posed by development on ecosystems; (4) Simple rigorous techniques: in cases where there are time and resource constraints for compliance monitoring, simple methods such as engagement with local communities to obtain knowledge pertaining to impacts ; and, (5) Flexibility and adaptive management: environmental objectives are set; however, the manner in which the applicant meets them is not specified, thus allowing flexibility and adaptation with unique projects (Ramjeawona and Beedassy 2004, Morrison-Saunders and Arts 2004, Connelly 2011, Alers 2016).

Compliance monitoring, as an independent environmental verification process, is undertaken by compliance monitors and auditors from the respective Competent Authorities (CAs) (Ross 2004, Morrison-Saunders *et al*. 2014). Another role considered crucial post the authorisation process is that of the Environmental Control Officer (ECO) (Morrison-Saunders *et al*. 2014). Once the EA is granted by the Competent Authority (CA, in the context of this research: Department of Economic Development, Tourism and Environmental Affairs: DEDTEA) an ECO is required (SAIEA 2003, DEAT 2004). It is the responsibility of the applicant or developer to appoint an independent ECO with the relevant experience and expertise (Alers 2016). The role of the ECO is to monitor and report on compliance to conditions outlined on the EA, which includes, among other things construction impact mitigations, control programmes and rehabilitation plans (Wessels *et al*. 2015).

EIA follow-ups are supposed to occur throughout the life of the development (from construction to closure) (Marshall *et al.* 2005). However, emphasis is normally placed on the biophysical impacts of the construction phase, especially in South Africa (SA); currently that is where ECO's are mostly active (Marshall *et al.* 2005, PICCSA 2014). According to the South African National Environmental Management Act (NEMA) 107 of 1998, the sustainability principles referring to duty of care and compliance monitoring not only consider the physical environment, but also social and cultural components (DEA-SA 2015, Wessels *et al*. 2015). Compliance monitoring also contributes to the improvement of project management and provision of feedback on the effectiveness of the EIA process (Morrison-Saunders *et al.* 2003, Morrison-Saunders *et al.* 2007). The need for compliance monitoring emerged due to development projects failing to comply with conditions pertaining to sustainable construction practices (Wessels *et al.* 2015, Arts and Faith-Ell 2012). This made it mandatory to have follow-up mechanisms, such as compliance to conditions of authorisations, for construction and operation phases of development (Du Plessis 2002, Nel and Wessels 2010).

The study evaluates compliance to biodiversity related conditions that form part of EAs in the context of SA NEMA implementation in KwaZulu-Natal Province. Three case studies of developments application with the different levels of biodiversity incorporation (yes, partial and no, see Chapter 2) were assessed. The specific conditions being evaluated were those provided by the Biodiversity Authority (BA) Ezemvelo KwaZulu-Natal Wildlife (EKZNW) to the CA, Department of Economic Development, Tourism and Environmental Affairs (DEDTEA). Stakeholders active in the EIA and compliance process also provided input with regards to factors influencing decision making in development applications.

3.2 Study Area and Case Study Site Description

The three case studies assessed within the KZN province were Southdown Farm-Nottingham Road (an agricultural development), N2 or R56 Interchange near Kokstad (a linear infrastructure development), and Mbila Anthracite Underground Mine near Nongoma (a mining development) (Figure 3.1). Further details regarding the specific sites are discussed below.

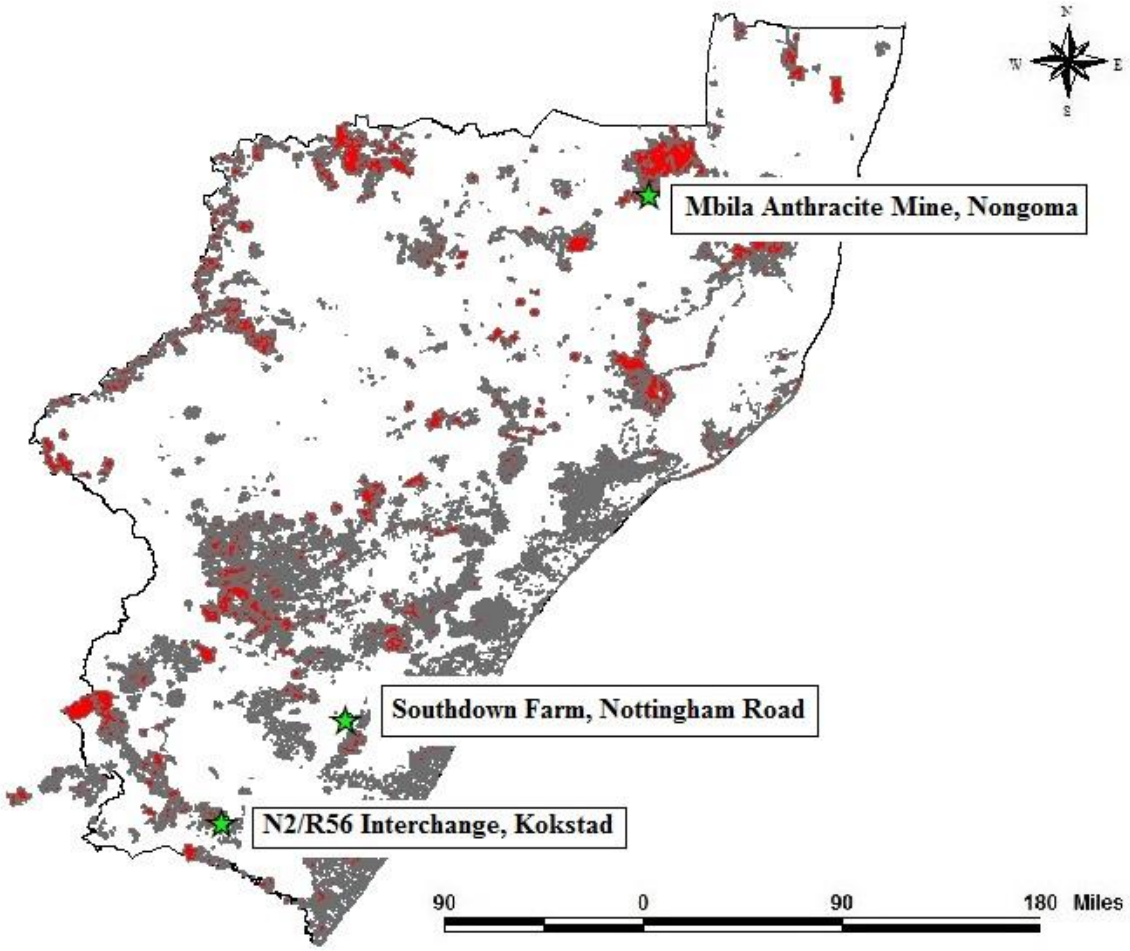

Figure 3.1: Spatial distribution of the three case study sites within the KZN province, depicting Irreplaceable Critical Biodiversity Areas-shaded in red and transformed areas-shaded in grey (Ezemvelo 2016).

3.2.1 Case Study 1 site: Southdown Farm Rem of Portion 1 of the Farm Warsash No. 1966, Southdown, Nottingham Road

Southdown Farm is located in Nottingham Road in the KZN Midlands, uMngeni Municipality of uMgungundlovu District. It is situated approximately at 29° 26′ 22.15″S and 29° 59′ 12.48″E

(Figure 3.2). The farm is recognised for its great agricultural potential and good biodiversity value (Carter-Brown 2014).

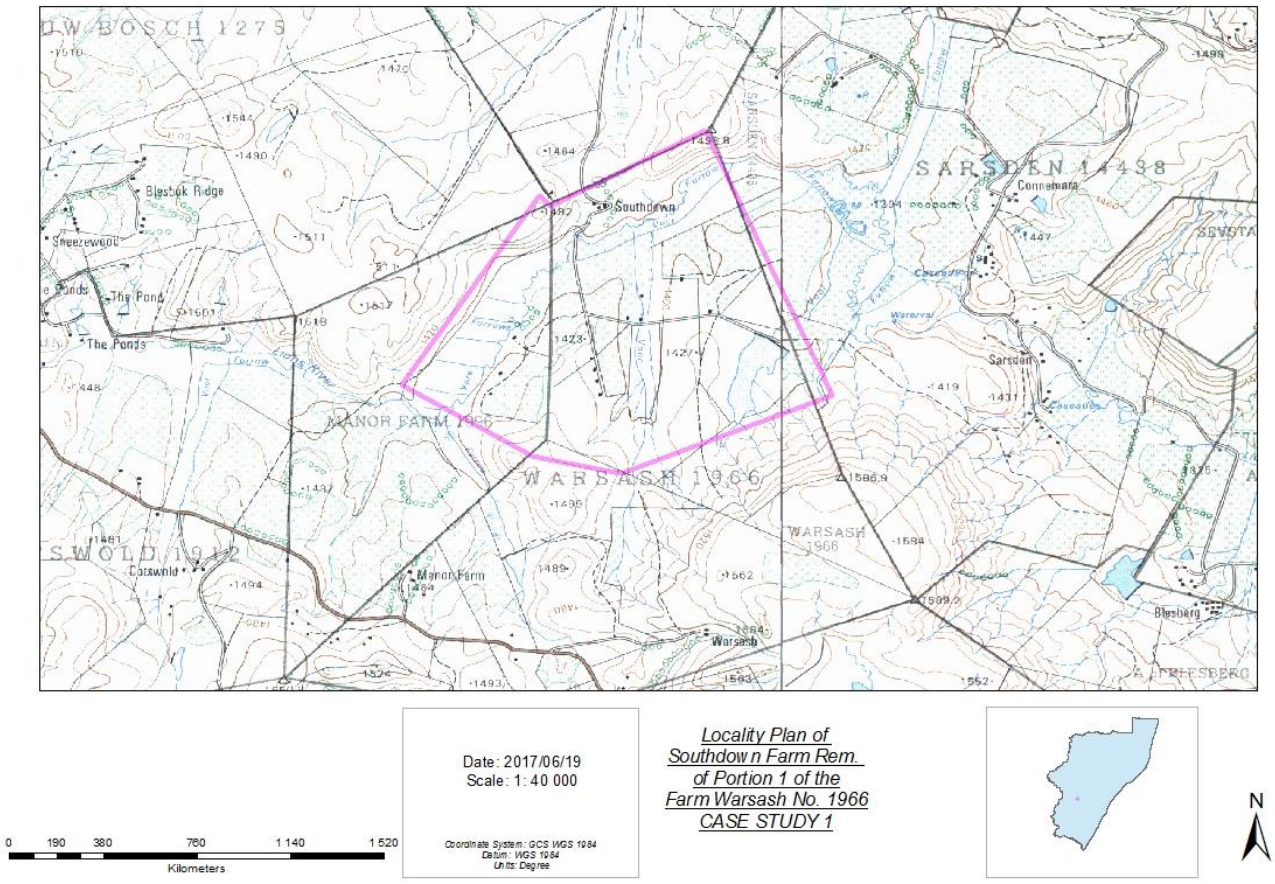

Figure 3.2: Locality Map of the Southdown Farm.

Project Description:

The application proposed to renovate the Southdown Farm into a dairy enterprise. Proposed activities included the transformation of virgin grassland into maize production lands and rye grass pastures, construction of small bridges to enable pivot irrigation to traverse wetland areas, and fixing the leak in the eastern, small dam. And the storage of waste in two effluent lagoons (Figure 3.3) (Carter-Brown 2014).

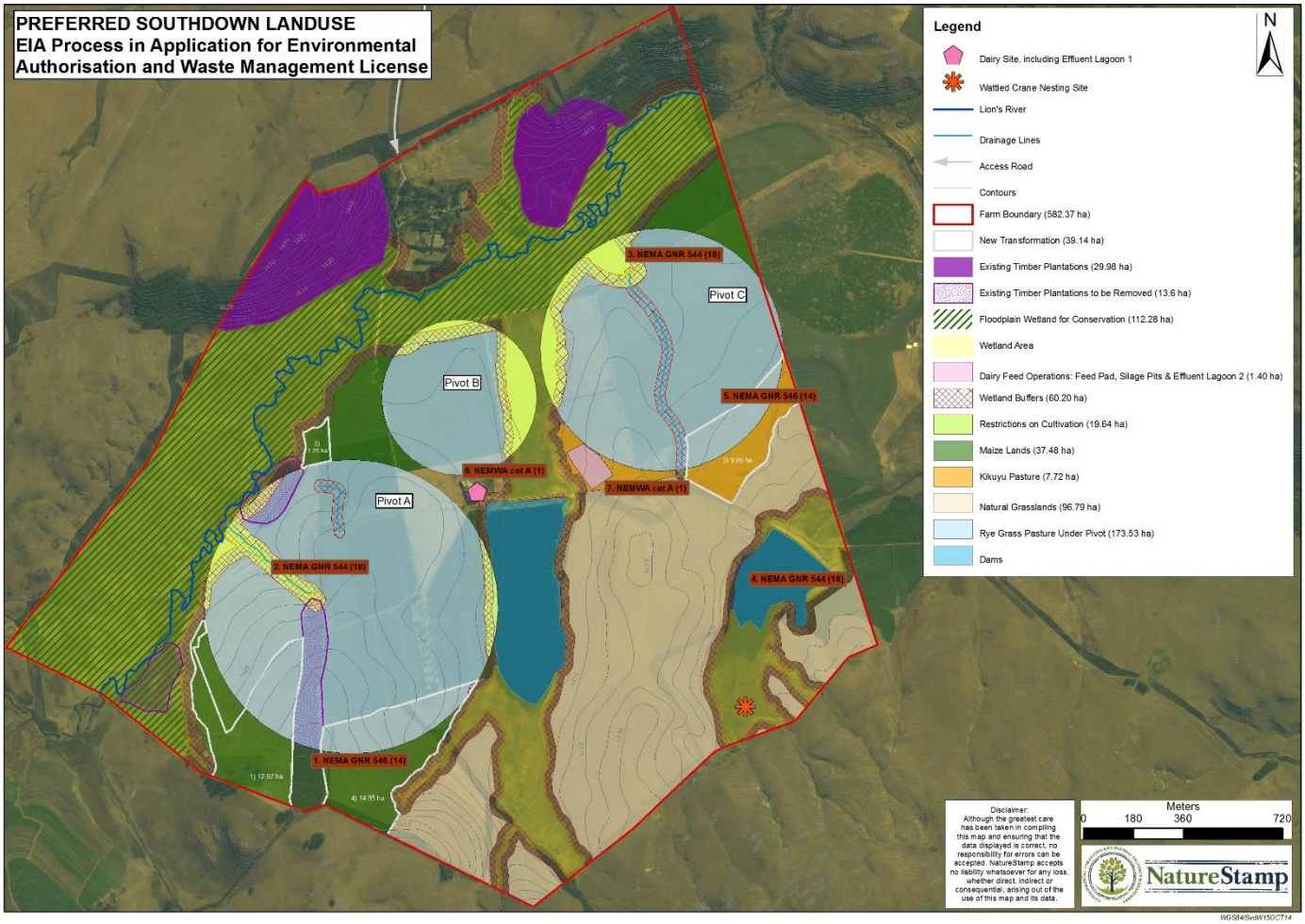

Figure 3.3: The proposed land use for the dairy and associated activities (Carter-Brown 2014).

Biophysical characteristics and biodiversity value:

According to the Terrestrial Systematic Conservation Plan (TSCP), Southdown Farm falls within the Critical Biodiversity Area (CBA, previously termed as Biodiversity Priority Area: BPA) (Escott et al. 2012). It has an irreplaceability value of <0.8 and≤ 1.0, given that it supports various important biodiversity features including wetlands, fauna and flora species of conservation significance (Ezemvelo 2014b). Southdown Farm falls within the grassland biome, the specific vegetation type is the Drakensberg Foothill Moist Grassland (conservation status: vulnerable) (Mucina & Rutherford 2006, IUCN 2006, IUCN 2016). This type of vegetation consists of significant endemic flora species. In terms of fauna, there are two endangered species which are Wattled Crane (*Bugeranus carunculatus*) and Oribi (*Ourebia ourebi*), both of which have been identified and confirmed to be present on site; the Wattled

Crane utilise wetlands and the headwaters of dams as nest sites (McCann & Benn 2006, Carter-Brown 2014, IUCN 2016).

The Lion's river that runs through the Southdown Farm is classified as a NFEPA (National Freshwater Ecosystem Priority Areas) river (Driver *et al*. 2005, Nel *et al*. 2011, SANBI 2011). NFEPA's are not only required to meet national biodiversity goals for freshwater ecosystems, they also enable use of water in a sustainable manner (Nel *et al*. 2011). Furthermore, the NFEPA project is considered as a response to significant anthropogenic threats to the SA's rivers, wetlands and estuaries (Driver *et al*. 2005, Macfarlane *et al*. 2015). The presence of both the NFEPA wetlands and river at Southdown farm further necessitated the need for comprehensive assessments, as these contributed to the conservation significance of the site.

3.2.2 Case Study 2: Construction of the N2 orR56 Interchange on National Route 2 Section 21

The proposed road upgrade is located in the intersection of the N2 and R56 on National Route 2 Section 21 (N2-21). It is on the south east of the town of Kokstad, situated approximately at 30° 30′ 53″S and 29° 45′ 27″E (Figure 3.4). Initially the N2 was constructed under provincial administration (in the 1970's) and then it was incorporated into the National Road System.

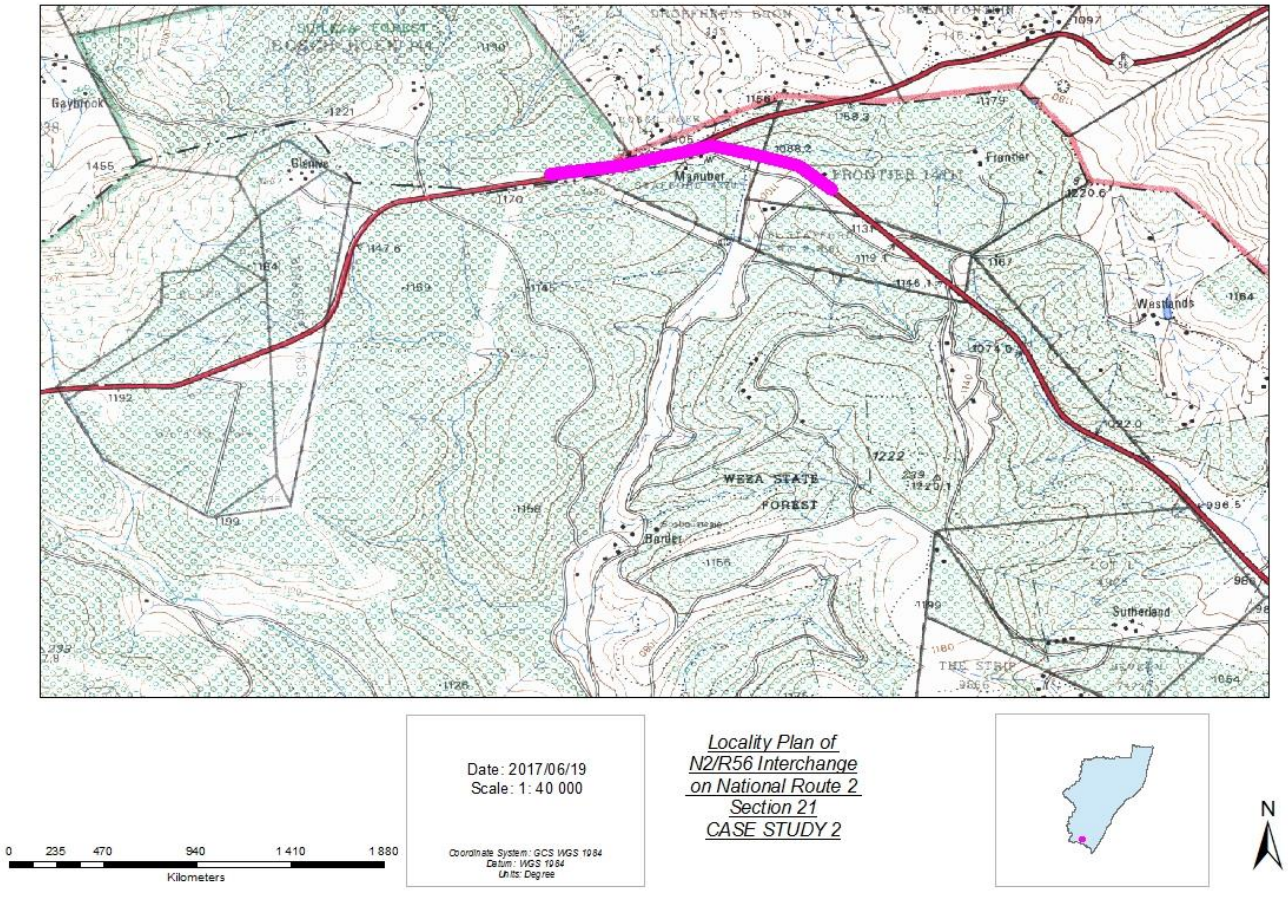

Figure 3.4: Locality map of the N2 or R56 Interchange.

Project Description:

The application proposed to upgrade the existing N2 and R56 on National Route Section 21. The upgrade activities include the construction or upgrade of bridges, bulk storm water outlet structures and associated infrastructure (Batho 2012). The new alignment of the N2, R56 required lengthening of the major existing box culvert and new ramps (Batho 2012).

Biophysical characteristics and biodiversity value:

The proposed activities fall within the CBA (BPA1) according to the Terrestrial Systematic Conservation Plan (TSCP) (Escott et al. 2012). The site is identified in modelling to support the Midlands Mistbelt Grassland (conservation status: critically endangered) (Mucina & Rutherford 2006, IUCN 2006). However, the vegetation on site is severely degraded, and the land cover alongside the N2 is predominantly timber plantations (Batho 2012). There is a watercourse within 32m of the proposed activities, which triggers the NEMA Regulations, hence, the requirement for a Basic Assessment Process (DEAT 2004). There is a channelled bottom valley wetland area (Figure 3.5), with hygrophilous grassland, adjacent to the N2, which is a biodiversity concern (Carter-Brown 2012). The wetland health assessment indicates that the Present Ecological State (PES) of the N2 or R56 wetland category is C, meaning the wetland has been moderately modified in terms of ecosystem processes and loss of habitat, however, the natural habitats are still intact (Carter-Brown 2012).

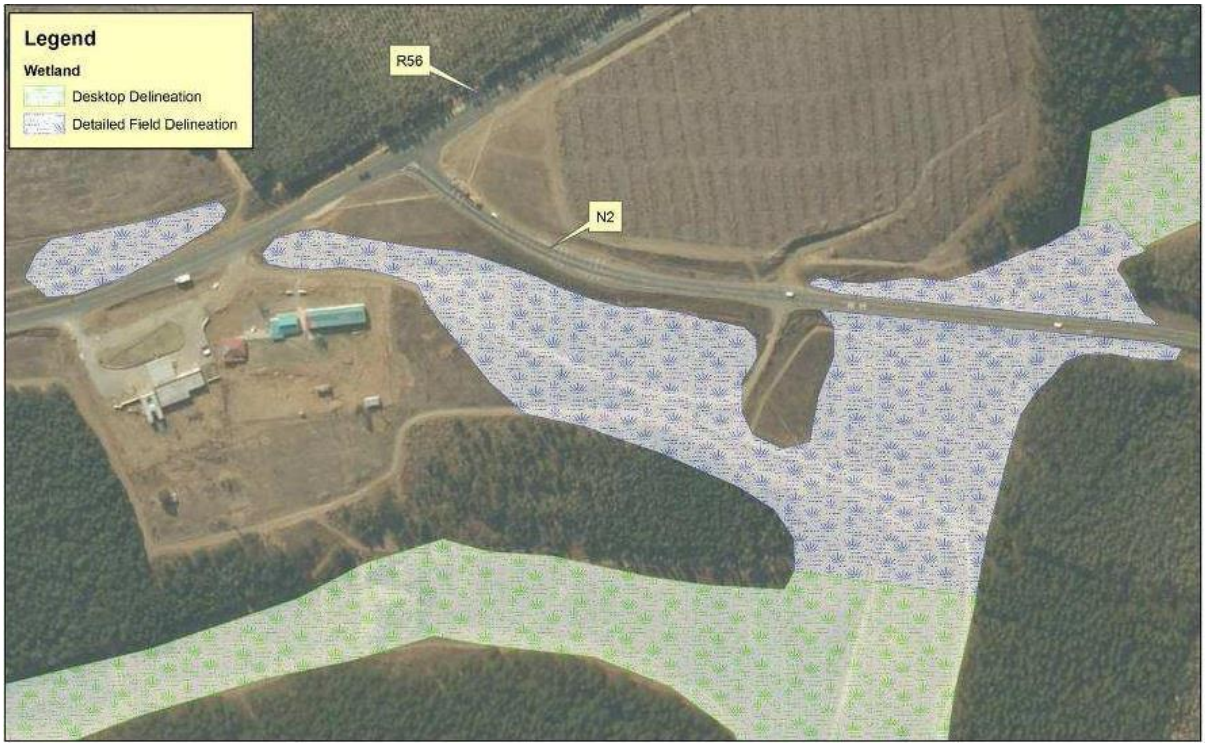

Figure 3.5: A detailed wetland delineation in and around the N2 or R56 site (Carter-Brown 2012).

There are also protected plant species (Table 3.1) that were identified in and around the site by a botanist during a site inspection (SANBI 2009, Burring 2012).

Table 3.1: Protected Indigenous Plant Species under the KwaZulu-Natal Ordinance 15 of 1974, Schedule 12

Botanical name	Common name
Bulbine asphodeloides	Spreading Bulbine
Hypoxis nemerocallidea	Star-flower
Ledebouria floribunda	Large Ledebouria
Scadoxus puniceus	Blood Lily
Zantedeschia aethiopica	White arum Lily
Zantedeschia albomaculata	Arrow-leaved Arum

3.2.3 Case Study 3 site: Underground Mine G-Block Portion 9 of the Farm Reserve Number 12, east of the town Nongoma

The proposed site for the underground mine is located about 8km north east of the town of Nongoma, within the Mandlakazi tribal authority, Zululand District Municipality. It is situated approximately 27° 52′ 35.17″S and 31° 43′ 50.72″E (Figure 3.6a) (van de Wouw 2014). The

location of the proposed project area is considered as rural, as it has a few homesteads present (van de Wouw 2014).

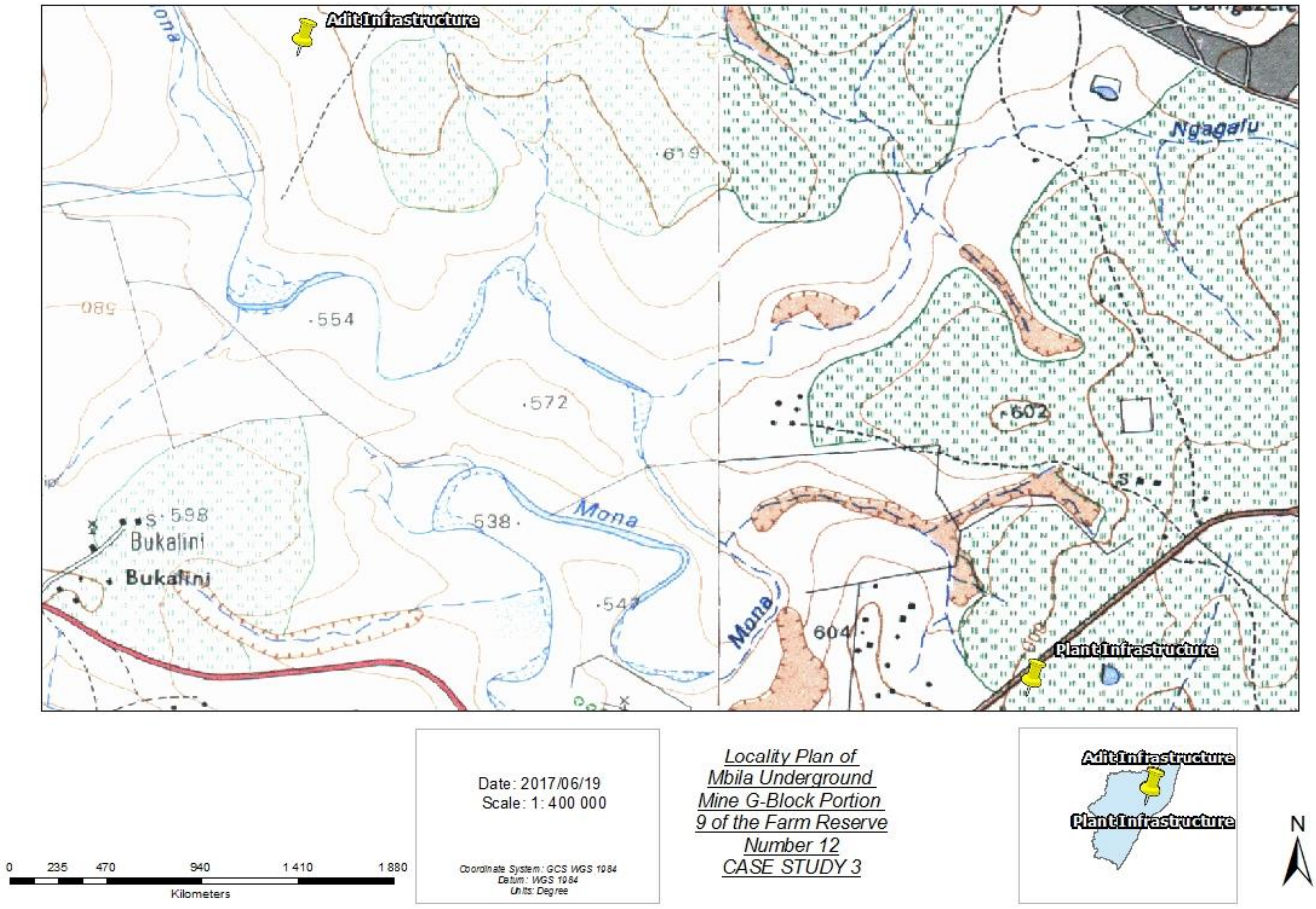

Figure 3.6a: Locality plan of the Mbila underground mine

Project Description:

The application proposed to mine coal underground, construction of infrastructure, including a coal handling and processing plant, haul road, discard pump and surface audit (Figure 3.6b) (van de Wouw 2014). The bord and pillar method will be used to perform the underground mining, and proposed plant will treat about 20 000 tonnes of coal per month (van de Wouw 2014).

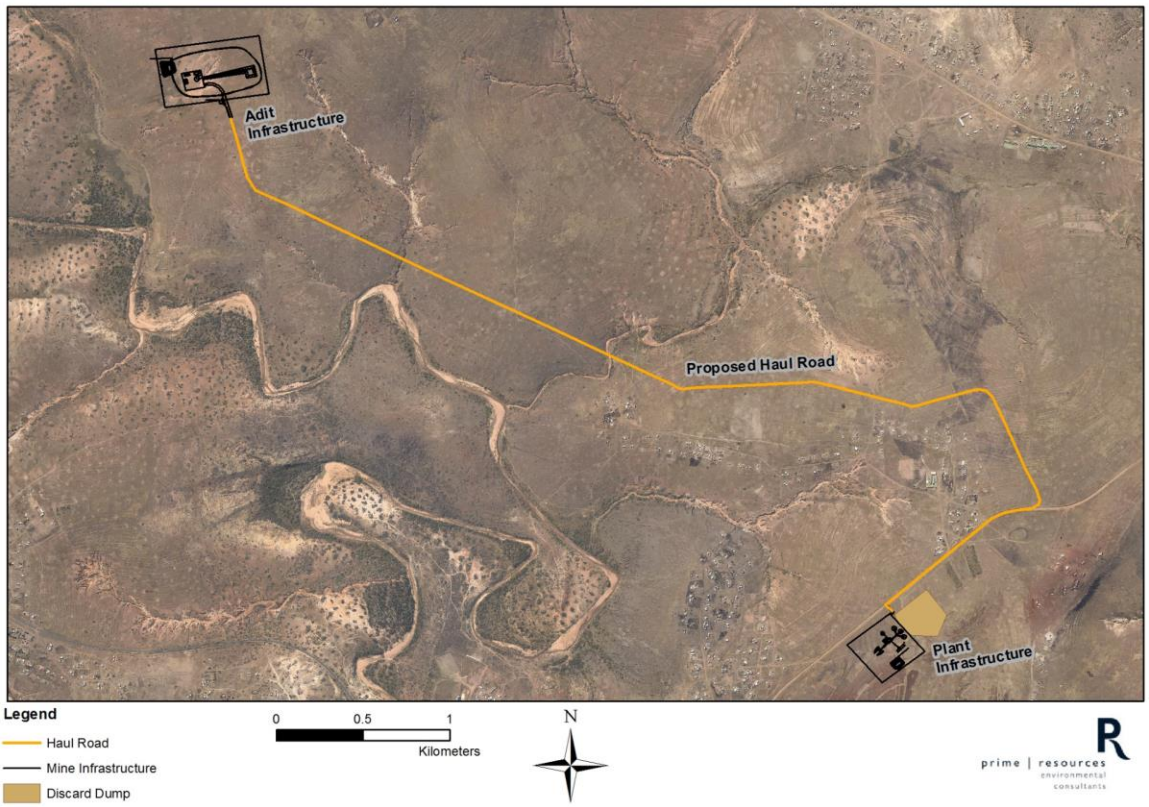

Figure 3.6b Location of the plant, adit and associated infrastructure of the Mbila underground mine (van de Wouw 2014)

Biophysical characteristics and biodiversity value:

According to the TSCP, the proposed site falls in proximity to CBA (BPA1) areas, which indicates potential high biodiversity in terms of irreplaceability measures (Escott *et al*. 2012). However, extensive anthropogenic activities such as agriculture have contributed to the transformation of the vegetation composition (Phillips 2014a). The proposed study area falls within the savannah biome, composed mainly of grassy ground layer with an upper layer of woody plants (Mucina and Rutherford 2006). The vegetation type on the proposed G-Block underground mine is the Northern Zululand Sourveld in the Savanna biome (conservation status: vulnerable) (Mucina & Rutherford 2006, IUCN 2006). Plant species were identified by Phillips (2014a) as conservation significant, provincially protected, and indigenous species on the different areas of the proposed site (Table 3.2).

Table 3.2: Plant species recorded on various areas of the study site

Dominant indigenous species at the time of the survey:	Grasses : *Heteropogon contortus* *Cymbopogona excavates* *Themeda triandra* *Eragrostis plana* *Panicum sp.*
Plants of conservation concern confirmed to occur:	*Hypoxis hemerocallidea* (Declining) *Boophone disticha* (Declining)
Provincially protected plants confirmed to occur:	*Boophone disticha*

Drainage lines were also identified on site as eroded wetlands, together with a limited number indigenous plant species (Phillips 2014a, SEF 2014). The wetlands were categorised as Hydro-geomorphic units (HGM) that included valley bottom wetlands with a channel, valley bottom wetlands without a channel, and hillslope seepage wetlands feeding or non-feeding a watercourse. In addition, these wetlands were identified in the NFEPA (discussed in Chapter 2) which further makes the drainage lines and wetlands of this proposed area of conservation significance (Figure 3.7) (Phillips 2014a, Nel *et al.* 2011).

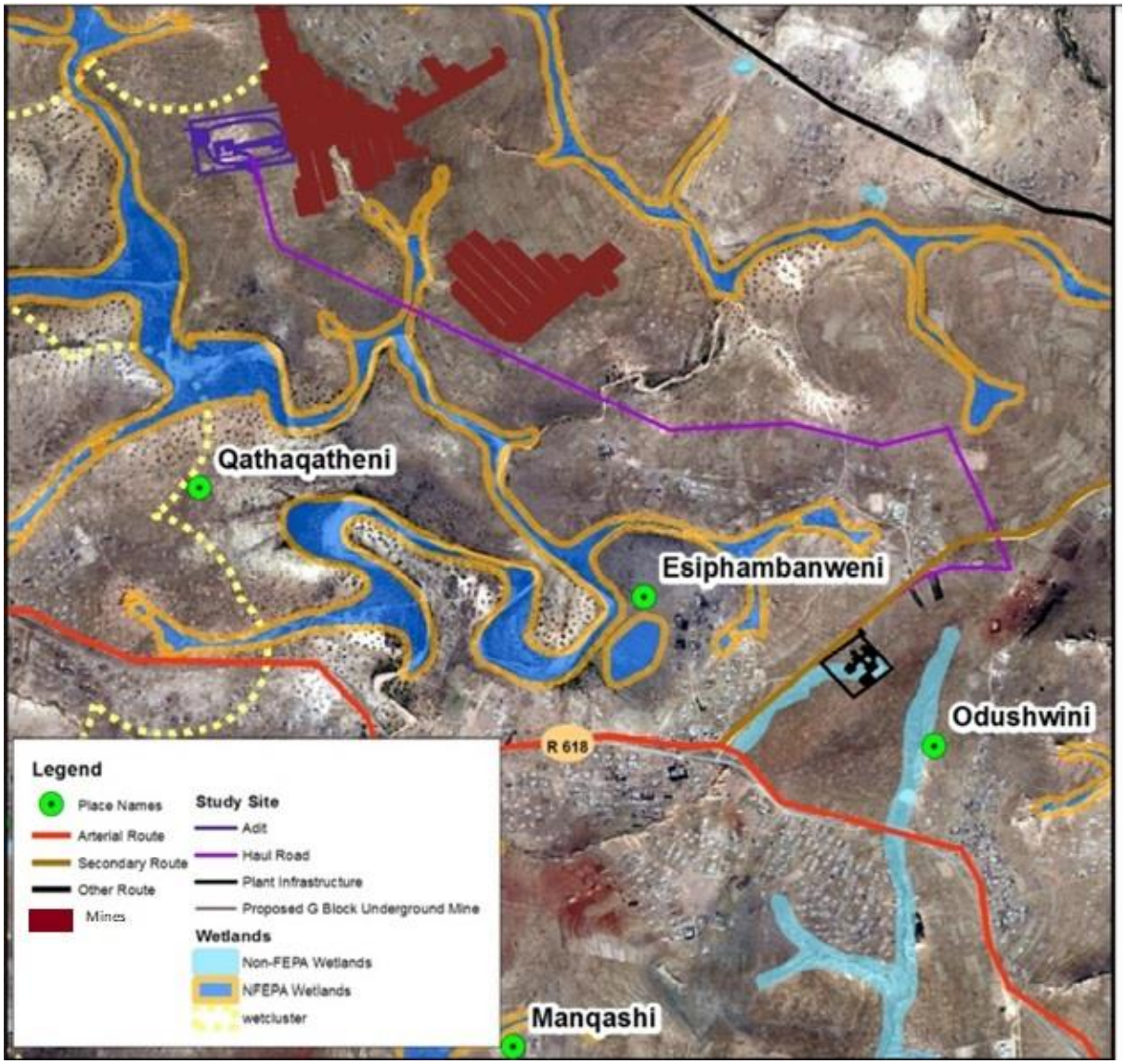

Figure 3.7: NFEPA wetlands associated with the proposed G-Block underground mine (Nel *et al*. 2011)

3.3 Methodology

A case study approach was adopted to enable the identification of patterns and underlying factors across different cases (Eisenhardt 1989, Malterud 2001, Eisenhardt and Graebner 2007). The study was also qualitative and comparative in nature, as three different decision making outcomes, based on the NEMA legislation and stakeholder engagement, were assessed (Malterud 2001). In line with the ethical requirements of the study, approval was granted by the UKZN Humanities and Social Sciences Ethics Committee to conduct research (Protocol reference Number: HSS/0312/017M). Permission was also obtained from EKZNW to utilise data resources and interview staff (Appendix 1).

To provide context for the selected case studies, collection, review, assessment and evaluation of various documentation (soft and hard copies) was required (Bowen 2009). Sources of data for case studies included, *inter alia*: EIA Reports, NEMA legislation documents, official comment letters from the BA, EAs from the CAs, and compliance audits or reports from the respective Environmental Assessment Practitioners (EAP). Questions asked during the unstructured discussions to obtain information from stakeholders have been specified below. The selection and analysis of case studies went through various steps, in order to assess the level and impact of compliance monitoring (Figure 3.8).

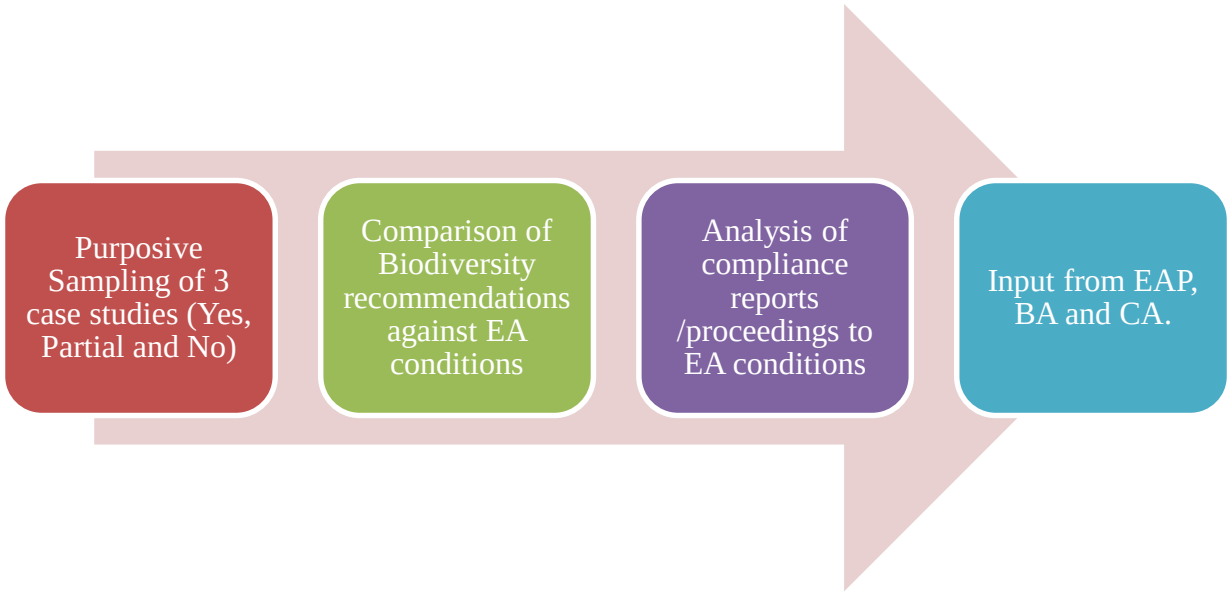

Figure 3.8: Case Study Analysis steps after Eisenhardt and Graebner (2007)

Purposive sampling was used to select case studies in this research. This, therefore, allowed a deliberate choice of case studies to obtain specific information, which enabled the researcher to decide which aspect to focus on, in alignment with the study objectives (Bernard 2011, Tongco 2007).

Three applications, falling under the yes, no, and partial categories (Chapter 2), were required:

- Yes (Mitigated): All of Ezemvelo KwaZulu-Natal Wildlife's (EKZNW's) recommendations have been incorporated into the EAs; therefore, potential negative biodiversity impacts have been mitigated.
- Partial (Partially Mitigated): Some of EKZNW's recommendations have been incorporated into the EAs; therefore, potential negative biodiversity impacts have been partially mitigated, and there remain some concerns.
- No (Not Mitigated): None of EKZNW's recommendations have not been incorporated into the EAs; therefore, potential negative biodiversity impacts have not been mitigated, and there are concerns.

The case study selection was informed by: (1) the EKZNW staff (BA), in terms of identifying applications which had significant biodiversity issues, and sufficient interaction with various stakeholders; and, (2) the outcome of Chapter 2 which highlighted that wetlands and vegetation biodiversity issues have a high occurrence in EIA applications (sampled from the year 2010-2015) so those attributes were considered in case studies.

In order to compare the incorporation of specific recommendations, EAs were evaluated. EA conditions regarding biodiversity issues encompassed a variety of recommendations and agreements between the BA and the applicant. Officially, this part of the process is conducted by the BA, through the evaluation and capturing by the respective EKZNW staff members (evaluation form template, see Appendix 2). Recommendations by the BA can also support specific recommendations from various studies, such as wetland and vegetation assessment reports. Once it was established that biodiversity related conditions were stipulated in the EA, at this stage compliance to those conditions was assessed. This required access to compliance or audit reports, input from the Environmental Assessment Practitioners (EAPs), and Environmental Control Officers (ECOs) involved in these projects (case studies).

Lastly, input from an Environmental Assessment Practitioner, BA and CA was obtained. This was intended for case specific, and more generally, understanding of the decision making and compliance process. Input from various stakeholders was essential in order to understand which

factors lead to compliance, as well as the lack thereof, from their perspective. This is in line with the assessment of gaps or shortcomings in the EIA process due to lack of stakeholder interaction, analysed and discussed in Chapter 2. The following questions were asked in an unstructured discussion with stakeholders:

1. From your experience, which factors leads to compliance of biodiversity related conditions and recommendations?

2. From your experience, which factors lead to the lack of compliance of biodiversity related conditions and recommendations?

3. How can the compliance to biodiversity recommendations and implementation be improved on the ground or site?

The selected case studies followed the EIA process in accordance with the National Environmental Management Act (NEMA) 107 of 1998 (discussed in Chapter 1, section 1.2). The application reports were intended to provide a detailed description of the proposed development or land use change (SAIEA 2003, DEAT 2004, Day 2015). Secondly, to describe the potential impacts across the triple bottom line (Environmental, Social and Economic), and to provide specialist studies where appropriate (EIAMS 2011, Day 2015). Lastly, the reports presented the Environmental Management Programme (EMPr), outlining how the potential impacts will be mitigated and managed (Ezemvelo 2014a, Wood *et al*. 2015). The assessment focused on biodiversity issues being carried out from recommendations to authorisations, and, lastly, being implemented on site. All information pertaining to the case studies (especially compliance monitoring or audits) is up to the date of when the data collection took place (up to March 2017). Possibly, new occurrences or developments may have taken place post data collection of this study; therefore, conditions of the EAs that were not complied with at the time of the case study analysis could now possibly be complied with.

3.4 Case Study Analysis and Findings

3.4.1 Case Study 1: Full Incorporation of biodiversity recommendations into an EA

Project name: Dairy and Associated Activities on Southdown Farm Rem of Portion 1 of the Farm Warsash No. 1966, Southdown, Nottingham Road.

For full recommendations and EA conditions, see Appendix 4.

Table 3.3: Evaluation of the biodiversity recommendations against the EA conditions, indicating how the biodiversity recommendations have been fully incorporated. Date of Authorisation: 21 July 2015

Summary of biodiversity recommendations (summarised)	Condition No.	EA Condition (summarised)	Issue incorporated (Yes, No and Partial)
1. Formal security and management for conservation of 96.8 ha grassland ridge and the 112.28 ha floodplain wetland	5.4.9.1	Formal security and management for conservation of 96.8 ha grassland ridge and the 112.28 ha floodplain wetland	Yes
2. Entering a legal contract with EKZNW Biodiversity Stewardship Programme, within 18 months.	5.4.9.2	Pursuing a legal contract with EKZNW Biodiversity Stewardship Programme, within 18 months	Yes
3. Conservation areas must be endorsed onto the Title Deeds of Portion 1 of the farm Warsash No. 1966, within 12 months of the Stewardship agreement being finalised	5.4.9.3	Once the agreement is reached the conservation areas must be endorsed onto the Title Deeds of Portion 1 of the farm Warsash No. 1966, within 12 months of the Stewardship agreement being finalised	Yes

Biodiversity recommendations reflected in the EA as conditions (Table 3.3) included wetland, grassland, conservation areas and biodiversity stewardship issues. Specific amounts of area (wetland and grassland in hectares) to be conserved were stated, as well as the specific time frames to commence the legal biodiversity stewardship programme. In addition, once the stewardship agreement was finalised, conservation areas were expected to be finalised on the Title Deed to secure the conservation of those areas.

Implementation of conditions (compliance monitoring and reporting)

The case study findings indicate that a full compliance audit was not performed by the CA, nor an appointed ECO (Table 3.4). Rather, the compliance process was initiated due to the reporting of unlawful cultivation on grassland that was meant to be conserved as stated by the EA. Furthermore, no follow up has occurred regarding the other biodiversity concerns, such as wetlands and the Biodiversity Stewardship Programme.

Table 3.4: Compliance monitoring of fully incorporated biodiversity related EA conditions

Audit Aspect (as per the EA and EMPr)	**Audit Observation**	**Compliance or Non-Compliance**	**Corrective Action**
Formal security and management of grassland and wetland for conservation	Grassland: a portion of the grassland was unlawfully cultivated Wetland: To be rehabilitated	Grassland: Partial Compliance Wetland: Compliance Pending	Land owner directed by Department to provide Compliance Notice and Grassland Rehabilitation and Management Plan. EKZNW requested grassland and vegetation rehabilitation plans for review and comment
Legal contract with EKZNW Biodiversity	Legal process has not been initiated	Compliance Pending	No action taken

Stewardship Programme, within 18 months	To date, negotiations between EKZNW and landowner have not taken place		
Conservation areas must be endorsed onto the Title Deeds within 12 months of the Stewardship agreement being finalised	Subject to the legal process being initiated	Compliance Pending: Subject to the legal contract being put in place	No action taken

Compliance for this case study was initiated through the reporting, to the CA, of grassland being unlawfully cultivated. This prompted the other aspects to be assessed, the formal security of grassland was partially complied to, as some of the grassland was fenced off. Rehabilitation plans for the damaged areas were put in place, which indicated the intention to comply. Compliance to conditions pertaining to the stewardship programme and conservation could not be ascertained, as no formal discussions took place, and no legal process had been initiated to date of the case study analysis. Therefore, compliance was recorded as pending, as it was subject to a legal process commencement.

3.4.2 Case Study 2: Partial Incorporation of biodiversity recommendations into an EA

Project name: Construction of the N2or R56 Interchange on National Route 2 Section 21

For full recommendations and EA conditions, see Appendix 4.

Table 3.5: Evaluation of the biodiversity recommendations against the EA conditions, indicating how the biodiversity recommendations have been partially incorporated. Date of Authorisation: 28 March 2013

Summary of biodiversity recommendations (summarised)	Condition No.	EA Condition (summarised)	Issue incorporated (Yes, No and Partial)
1. Support recommendations in Wetland Report in DBAR	31.+2a	• Wetland rehabilitation plan after construction • Findings of specialist studies conducted and mitigation measures	Partial
2. Support offsets as in DBAR	12.	• EMPr must be adhered to	Partial
3. Require offset report and Memorandum Of Understanding (MOU) prior to EA	-	Not incorporated in Authorisation	No
4. Active management of wetlands by applicant during operational phase, in line with rehabilitation and management plan	-	Not incorporated in Authorisation	No
5. NEMA ACT 107 of 1998	3e	EMPr for all phases must be adhered to	Yes

Biodiversity recommendations for this case study were mainly wetland rehabilitation and an offset report. The findings indicated that the recommendations of the wetland report were not fully captured as the mitigation and corrective measures for wetland rehabilitation were not fully integrated. The recommendation to produce an offset report and a MOU prior to the EA being issued were not incorporated; these were required to determine the residual impact of the proposed infilling and the required size of the offset. Active management of the wetland by applicant once the operation has commenced was not incorporated into the EA, the aim of this recommendation was to ensure that wetlands are managed for conservation objectives. Other aspects of the issues of concern were catered for by the EMPr, and were, therefore, recorded as being incorporated.

Implementation of conditions (compliance monitoring and reporting)

In the partial incorporation case study, the findings indicated that compliance monitoring was conducted by both the CA and the ECO. The environmental compliance inspection was first conducted (20th August 2013) by the Department of Environmental Affairs, and no emphasis was placed on the conditions outlined by EKZNW. Several inspections were conducted by the ECO, and the most recent one was utilised for this assessment (04th March 2015). The biodiversity conditions compliance analysed were based only on those partial recommendations that were carried into the EA (Table 3.6) (DEA-SA 2013, Edgson 2015).

Table 3.6: Compliance monitoring of partially incorporated biodiversity related EA conditions

Audit Aspect (as per the EA and EMPr)	**Audit Observation**	**Compliance or Non-Compliance**	**Corrective Action**
Wetland rehabilitation after construction	Not contractor's responsibility	Non-Compliance	None, a wetland rehabilitation plan has still not been compiled at this time
EMPr for all phases must be adhered to (support offsets as in DBAR)	Offsets not mentioned in audit reports	-	-

EMPr for all phases must be adhered to (NEMA ACT 107 of 1998)	EMPr adhered to and implemented but not in all environmental or biodiversity aspects (wetland)	Partial Compliance	Monetary fines levied, rectification (of spillages and soil erosion) directions given to constructor, rehabilitation suggested for damaged areas

The compliance audits indicated that no wetland rehabilitation plan was compiled as a condition of the EA, therefore, there was no compliance or corrective actions taken at the time of the case study analysis. Offsets were partially incorporated into the EA conditions. However, from the compliance audits it was evident that they were not taken into consideration at all; consequently, compliance could not be assessed. The EMPr also had partial compliance, as the findings of the compliance audit depict that not all EMPr aspects were adhered to or implemented. Examples include environmental issues that were evident on audit reports such as hazardous material spillages, and non-revegetation of earthworks that makes the site prone to erosion. According to the audits, monetary fines were levied for such actions, and rehabilitation instructions were given for damaged and contaminated areas.

3.4.3 Case Study 3: No Incorporation of biodiversity recommendations into an EA

Project name: Proposed Anthracite Underground Mining, Mbila-G-Block

For full recommendations and EA conditions, see Appendix 4.

Table 3.7: Evaluation of the biodiversity recommendations against the EA conditions, indicating how the biodiversity recommendations have not been incorporated at all. Date of Authorisation: 14 September 2014

Summary of biodiversity recommendations (summarised)	Condition No.	EA Condition (summarised)	Issue incorporated (Yes, No and Partial)
1.Biodiversity concerns still remain - request alternative route for the haulage road given floral significance of the proposed site	-	-	No
2.Alternative location for the proposed coal handling and processing plant is investigated	-	-	No
3. Meeting be arranged to discuss layouts and potential way forward	-	-	No

Regardless of the biodiversity recommendations provided, none were incorporated, including a proposed meeting by the BA to discuss the project layouts and a potential way forward. The application was granted an EA on the 14th September 2014. Since the focus of the study is mainly on biodiversity issues, and none were included, compliance monitoring for biodiversity features could not be assessed.

3.4.4 Input from various stakeholders (Environmental Assessment Practitioner, Biodiversity Authority and Competent Authority) regarding the incorporation of biodiversity recommendations and compliance monitoring

The process of considering biodiversity recommendations into EA conditions, and assessing compliance, on those conditions involves various stakeholders (discussed in detail on Chapter 2 section 2.4.2). Through unstructured discussions, input and perceptions of these stakeholders regarding the incorporation of biodiversity in EIAs and compliance were obtained based on their experience (Table 3.8).

Table 3.8: Responses from stakeholders in an unstructured discussion regarding the incorporation of biodiversity related conditions into compliance

Questions / **Responses**	**Environmental Assessment Practitioner (EAP or Consultant)**	**Principal Conservation Planner (Biodiversity Authority)**	**Compliance Officer (Department or Competent Authority)**
Which factors leads to compliance of biodiversity related conditions and recommendations?	Good communication between the EAP and applicants regarding: conditions, mitigations recommended in Environmental Management Programmes. An appointment of Environmental Control Officer to oversee the implementation of those conditions and mitigations.	The incorporation of biodiversity from early stages of the application through the use of biodiversity assessments, plans and guidelines at the disposal of EAP's or ready to be provided by the BAs Taking into consideration recommendations provided by the BAs not only for inclusion in the EAs but also for implementation and compliance.	Communication and collaboration between the BAs and CAs in the monitoring or enforcing of biodiversity related conditions. Applicants that are committed to adhere to conditions pertaining to the safeguarding of biodiversity of conservation significance. Thorough implementation of mitigation measures to ensure development impacts are reduced.
Which factors lead to the lack of compliance of biodiversity	Lack of communication between EAP's and the applicant leading to authorisation of conditions the applicant is not willing to uphold,	The prioritisation of various developments over biodiversity conservation. The neglect of data resources available such as	Department mainly focusing on brown issues (waste or pollution) while green issues (biodiversity related) require Department to

related conditions and recommendations?	especially biodiversity mitigation measures that could require extra time and money from the applicant.	biodiversity plans to guide EAP's and developers. Capacity constraints faced by authorities which lead to uninformed decisions during the EIA process.	constantly engage the BA. Due to capacity constraints of both authorities this is not always possible thus limiting the compliance of biodiversity issues. Lack of environmental awareness and education with land owners and developers.
How can the compliance to biodiversity recommendations and implementation be improved on the ground or site?	Transparency, independence and integrity of EAP's. Good communication during the early phases of the development between EAP's and applicants. EAP's should clarify biodiversity issues and possible mitigations from the initial application stages to the applicant.	Improved incorporation of biodiversity information and recommendations. Improved relationships between authorities to ensure that EAP's and applicants adhere to conditions stipulated EAs, especially those aimed at safeguarding biodiversity.	By capacitating authorities that can be active in the follow up compliance phase of the EIA process. Combating illegal or uninformed developments by raising public environmental or biodiversity awareness. Encouraging applicant commitment to appointing ECO's during the planning phases to ensure that conditions stipulated in the EA will be implemented accordingly.

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As the discussion was unstructured, more insight was given by the stakeholders regarding biodiversity and compliance within the decision making process. An Environmental Assessment Practitioner (EAP) who has experience within the EIA process expressed the importance of communication during the EIA application process:

"*Excellent communication between the appointed EAP and the developer (applicant) is critical at all stages of the EIA process, especially in cases where there are biodiversity or environmental issues that have to be dealt with, not only at the assessment phase but also during compliance monitoring*" (Environmental Assessment Practitioner 1).

This view is echoed by the results depicting that EA conditions do sometimes influence which environmental or biodiversity issues are emphasised. Clear communication ensures that the applicant's expectations are well understood, and are in line with the conditions of the authorisation.

Engagement with a BA representative indicated that there are some challenges that lead to a lack of incorporation and compliance to conditions, especially those pertaining to biodiversity issues. Such challenges include that biodiversity is not viewed as a priority when compared against other land uses such as agriculture, mining and industrial expansion:

"*Many farmers are expanding the size of their operations to achieve economies of scale and become more profitable and this has concomitant impacts to biodiversity. Expansion of existing operations generally results in the transformation of more land, often areas that were safeguarded for conservation in prior applications*" (Biodiversity Authority 1).

Another challenge highlighted in the BA responses, was that the EIA as a process can be highly effective at site level, but ineffective regarding the identification of cumulative impacts to biodiversity or environment (Connelly 2011). Incorporation and safeguarding of biodiversity is not only site-specific, but it should ensure biodiversity connectivity and persistence (Brownlie *et al*. 2009). Relying solely on EIAs to ensure that the province is developed sustainably, while continuous biodiversity connectivity loss is evident, is counterproductive (Morrison-Saunders *et al*. 2014).

Evidently, compliance allows monitoring of applications that have been authorised on site (Nair 2017). There are various factors that lead to full compliance and the lack thereof including: (1) the thorough incorporation of biodiversity recommendations as conditions in EAs. (2) the consideration, or lack thereof, of biodiversity issues being captured into EAs, and

being stipulated as conditions of EAs. (3) the lack of commitment from applicants to appoint an ECO that will oversee the implementation of EA conditions. (4) the lack of follow-ups by the CAs to assess whether conditions stipulated are being implemented (Environmental Assessment Practitioner 1, Biodiversity Authority 1, Competent Authority 1).

There are different responses to compliance enforcement from different applicants, developers and landowners (Competent Authority 1, 2007). Some are environmental or biodiversity conscious, and are more than willing to comply with biodiversity related EA conditions, other applicants are more concerned with production, development and not conservation, regardless of their sites being considered sensitive (Biodiversity Authority 1, 2007, Utembe 2015). There are developers that are not aware of the legal EIA process. In some cases, compliance officers dealt with, it was apparent that the developers were not aware of the EIA process application required and that their sites triggered any listed activities within the NEMA (Competent Authority 1, 2007). The importance of environmental awareness was emphasised to ensure better compliance:

"*Environmental education and awareness is critical through workshops and NGO initiated programmes. The EIA and compliance monitoring process and the penalties involved for unlawful activities, needs to be understood by more developers and farmers*" (Competent Authority 1).

3.5 Discussion

The outcome of the case study analysis should be considered as indicative for some development applications in the EIA and compliance processes, rather than conclusive for all development applications in KZN. This assessment aimed at indicating the level of compliance at site or ground level, which can be considered as a crucial component that ensures implementation of the NEMA in the EIA process (Ross 2004, Machaka *et al.* 2016). The study ascertained that the incorporation of biodiversity recommendations into EAs as conditions does give biodiversity issues a platform to be monitored for compliance. However, it does not warrant that those conditions will be complied to, in contradiction with the NEMA (Act No. 107 of 1998) which states conditions in the authorisation that must be adhered to (DEAT 2004). A review by Betey and Godfred (2013) supports this, depicting that four African countries (including SA) showed that, in most cases, compliance monitoring was often neglected unless there were complaints raised about a site or a disaster occurred. This was depicted in this study, as compliance was only prompted after illegal grassland transformation was reported (Carter-Brown 2017). To improve such cases, the appointment of an Environmental Control Officer (ECO) would ensure implementation of conditions (Alers 2016). Follow-up by the CAs to ensure the appointment of the ECO, and the monitoring of compliance of the site, could also encourage applicants to adhere to EA conditions (Marshall *et al.* 2005, Morrison-Saunders *et al.* 2014). The BAs could also be more proactive, work jointly with CAs and engage with applicants on the way forward regarding safeguarding biodiversity of conservation significance, such as grasslands and wetlands in KZN (Nair 2017).

In principle, compliance monitoring is part of the EIA process, and should be conducted for all authorised applications or developments (DEAT 2002, DEAT 2004). The role of compliance is to ensure that conditions stipulated in authorisations are adhered to and implemented. Nonetheless, from SA's perspective, it is concerning that limited emphasis is placed on the compliance and enforcement aspects post the EIA process (Alers 2016). As a developing country, the focus in SA is on major infrastructure development (PICCSA 2014). This challenge is not unique to SA, as studies conducted throughout Africa indicate that compliance monitoring lacks in the EIA process (Machaka *et al*. 2016, Mhango 2005). This further perpetuates the misconception that EIA's are performed merely to obtain certificates (authorisations) (Ehrlic and Ross 2015). In Malawi, 93.75% of EIA reports had the outcome of less than 50% compliance (Mhango 2005). This was largely due to conditions stipulated in EAs not being implemented or being poorly adhered to (Mhango 2005, Machaka *et al*. 2016). Lack

of compliance means that biodiversity related conditions may be stipulated in EAs, but if there is no compliance and they are not implemented on site, biodiversity remains at risk (Alers 2016).

The study demonstrated good compliance monitoring for standard issues that normally form part of the general EMP and corrective measures were taken if compliance was lacking in those standard recommendations. Conditions audited efficiently included spillages, non-revegetation and soil erosion, monetary fines were charged for non-compliance and rehabilitation was recommended. This affirms a challenge identified by Brownlie *et al*. (2009) that, at times, EMP's are considered as a "one size fits all solution", and, hence, all standard EMP issues were covered. In contrast, biodiversity issues that are unique to the site were poorly integrated into the EA, to a point where they are not reflected during compliance monitoring (Longmore 2017). Neglect of biodiversity issues at planning, assessment, decision-making, and compliance monitoring phases of development applications could contribute to biodiversity conditions being excluded (SAIEA 2006, Brownlie *et al*. 2009). To improve such cases, it would be helpful if CAs that consolidate EA conditions have a background and knowledge of biodiversity sensitive features on relevant sites (Pereira *et al.* 2013). This would enable them to fully understand the recommendations made by the BAs, and, be able to further incorporate biodiversity into EAs efficiently (Pereira *et al.* 2013).

This study portrayed various challenges stakeholders face during the EIA and compliance process, which included lack of communication, lack of biodiversity prioritisation, and limited environmental awareness (Carter-Brown 2017, Longmore 2017, Nair 2017). Capacity and resource constraints for managing and implementing EA conditions were also key inhibitors, not only for BAs, but CAs as well; evidently this is not a new problem in the KZN province (, Retief 2010). Duthie (2001) reviewed the provincial EIA administrative capacity in SA, and the ability of the 9 provinces to fulfil their legal mandates in the EIA process. KZN was identified as one of the provinces that had severe staff shortages, and had less qualified staff members with diplomas, while all the other eight provinces had between 60 - 100% of staff possessing postgraduate qualifications (Duthie 2001). The reduction of EIA commenting time frames to facilitate Economic Development also contributes to the existing capacity problems (DEADTEA 2017). Competent and commenting authorities echoed this concern, as reduction of time frames increases pressure to deliver in terms of reviewing and commenting at much shorter deadlines (DEDTEA 2017). It becomes a significant challenge to comment on all development applications and meet the deadlines, (Longmore 2017). To improve the capacity

of various provinces, Duthie (2001) suggests that government agencies collaborate with inspectorate functions in creating a central database system. This would allow various stakeholders to access EAs for applications and their conditions, thus making compliance monitoring or auditing transparent to all stakeholders (Duthie 2001, Van Wyk 2015, Pienaar *et al*. 2015).

Other external forces that hinder compliance monitoring functions from being fully effective is the influence of political pressures that are economic development driven (Moja and Mnguni 2014). As a result, the public's confidence in EIA's has significantly reduced (Duthie 2001). Political support is crucial, especially at provincial levels, to ensure the success of EIAs (Longmore 2017). The regulation and final decision making of EIA applications should not be placed in departments or agencies that are mainly economic development driven; rather, this should be placed with those departments or agencies dealing with resource use and conservation as their main mandate (Duthie 2001, Longmore 2017). In an economic driven developing country, a price tag should be attached to biodiversity value, and financial incentives and market based solutions are required to safeguard critical biodiversity (Makina and Luthuli 2014, Longmore, 2017).

The outcomes of this case study analysis reflects a significant challenge regarding compliance to biodiversity conservation related issues. It cannot be concluded whether authorisation holders do not comply due to lack of understanding biodiversity issues, financial or time constraints, ignorance, or choosing not to comply (Utembe 2015). Input from various stakeholders gave context to the different perspectives within the EIA and compliance process. The insight provided by these stakeholders has informed the potential EIA and compliance improvement recommendations mechanism provided in the conclusions of this study (Chapter 4).

CHAPTER 4: CONCLUSION, KEY FINDINGS AND RECOMMENDATIONS

4.1 Introduction

The aim of this research was to analyse the effectiveness of biodiversity recommendations in safeguarding biodiversity from land use change or development in KZN, through the EIA process. This chapter summarises the findings of this research and how they address the aim and objectives established in chapter one of this study. In addition, the conclusion, recommendations and limitations of the study are also presented.

4.2 Main objectives of the study and findings

4.2.1 Assessing the level of biodiversity recommendations being incorporated into the Environmental Authorisations for land use change applications in Kwazulu-Natal (KZN)

This study has ascertained that decision making in EAs comprises of three levels (Yes, No and Partial) of incorporation of biodiversity recommendations into authorisation conditions. Scrutiny of the results indicated that mainly standard issues are highly considered, while significant site specific biodiversity concerns (such as wetland and indigenous vegetation buffers) tend to have less incorporation. A conceptual framework was developed by Slootweg and Kolhoff (2003) to ensure biodiversity consideration at screening and scoping phases of the Environmental Impact Assessment (EIA). Guidelines were formulated through consultation with the Ecology and Biodiversity specialists, and members of the International Association for Impact Assessment (IAIA) (Slootweg and Kolhoff 2001). Thus, producing a framework that is aligned with the Convention on Biological Diversity (CBD) guidelines. The framework took into consideration various aspects of biodiversity, including its composition, structure and the anthropogenic impacts imposed on biodiversity, particularly development in this study (Slootweg and Kolhoff 2003). This enabled a formulation of generic guidelines that can inform Strategic Environmental Assessments (SEAs), and other environmental legislation applicable to various countries (CBD 2001, CBD 2002, Slootweg and Kolhoff 2003).

4.2.2 Identifying the challenges limiting the incorporation of biodiversity related recommendations

A number of challenges that led to the exclusion of biodiversity information in the EIA process were identified, including the importance of biodiversity not being emphasised enough in reports (Brownie *et al*. 2009). Another major challenge identified was the inability of the Biodiversity Authority (BA) to provide recommendations due to severe capacity constraints, resulting in authorisations of applications without input from the BA (Duthie 2001). In some

cases, even with biodiversity recommendations being provided, there was premature issuing of EAs, and, in other cases, while BAs await further information they have requested, applications get authorised. Capacity and resource issues are not unique to South Africa's EIA system, they are evident in other African countries such as Zimbabwe and Malawi (Mhango 2005). International interventions to combat capacity and stakeholder interaction include the strict requirement of high quality EIA and specialist reports, prepared by experienced and reputable consultants (Gomar 2014, Swanson 2013). Furthermore, the timely submission of these reports to ensure there is enough time and capacity for stakeholders to review and comment on reports (Connelly 2011).

4.2.3 Assessing the implementation of conditions stipulated in the EAs (compliance monitoring) on the ground, through the use of case studies

The case study analysis ascertained that compliance monitoring and enforcement of biodiversity recommendations is a significant challenge in KZN. Stipulation of biodiversity recommendations in the EA does not affirm that these will be adhered to, or complied with. This further reiterates that compliance is lacking in development applications, as not enough emphasis is placed on following up on applications post the granting of the authorisation (Alers 2016). The main objective for compliance monitoring is to assess adherence by developers to EA conditions and site specific Environmental Management Programmes (EMPr). Compliance monitoring should also provide a platform for recommendations on how to improve development practices on-site, thus enabling sustainable development (Morrison-Saunders *et al.* 2003). Development types such as mining, linear and agricultural developments, evidently have challenges when it comes to complying with biodiversity related conditions. Compliance monitoring practices could be improved not only to focus on construction impacts (which is common in urban developments) but also take into consideration operational impacts that are continuous and cumulative (Ndlovu 2015).

Applicants tend to strive to get the EA as a pass, but do not fully take cognisance of conditions that are meant to safeguard biodiversity. To improve compliance in developments, it is suggested that wording on EA conditions be precise and unambiguous, this could avoid opportunity for applicants to negotiate out of complying due to unclear conditions (Brownlie *et al.* 2009). The continuous information sharing regarding EIA follow-ups in national and international networks is crucial to gain valuable lessons from EIA practises from other nations (Marshall *et al*. 2005). This is possible through action plans such as the well-known Agenda 21, that was part of the outcomes of the Convention on Biological Diversity (CBD), and is

undertaken internationally by the United Nations in efforts to addressing human impact on the environment and achieve sustainable development (McGraw 2002, Swanson 2013).

What can be taken away from the study is to improve the understanding of the role of biodiversity conservation imperatives within the EIA process. The main objectives of biodiversity management need to be emphasised in order to be implemented (Slootweg *et al.* 2006). Biodiversity conservation at a global context, as defined by the CBD, is to ensure the ability of the earth to sustain current and future generations (Barrow 2006). This could be possible through the safeguarding of conservation significant habitats, setting targets for biodiversity at international and local scales, prioritising biodiversity that is irreplaceable, and promoting restoration and rehabilitation of previously impacted areas (Vitousek *et al*. 1997, Ezemvelo 2009a, Cardinale *et al.* 2012, Veloz *et al*. 2015). Different approaches could be developed for various types of development, as some developments have greater impacts on biodiversity and receiving environments, compared to others (Blackmore 2016). The South African NEMA legislation is thorough and good on paper, as it carries a framework informed by the CBD; however, without stringent enforcement, its effectiveness pertaining to biodiversity protection is limited (Ndlovu 2015, Alers 2016). The EIA process itself has the potential to achieve sustainable development, but the challenges come about with the implementation, capacity, resources, political pressures and lack of prioritisation of biodiversity conservation (Duthie 2001, Moja and Mnguni 2014, Longmore 2017). This study has identified a mechanism with recommendations that could be applied as potential solutions and a way forward (section 4.3).

4.3 Recommendations

Based on the outcome of the research, four key recommendations have been identified (Figure 4.1) this includes various stakeholders and is aimed at improving Integrated Environmental Management (specifically the role of EIAs) and overall Land Use Planning in the province of KZN.

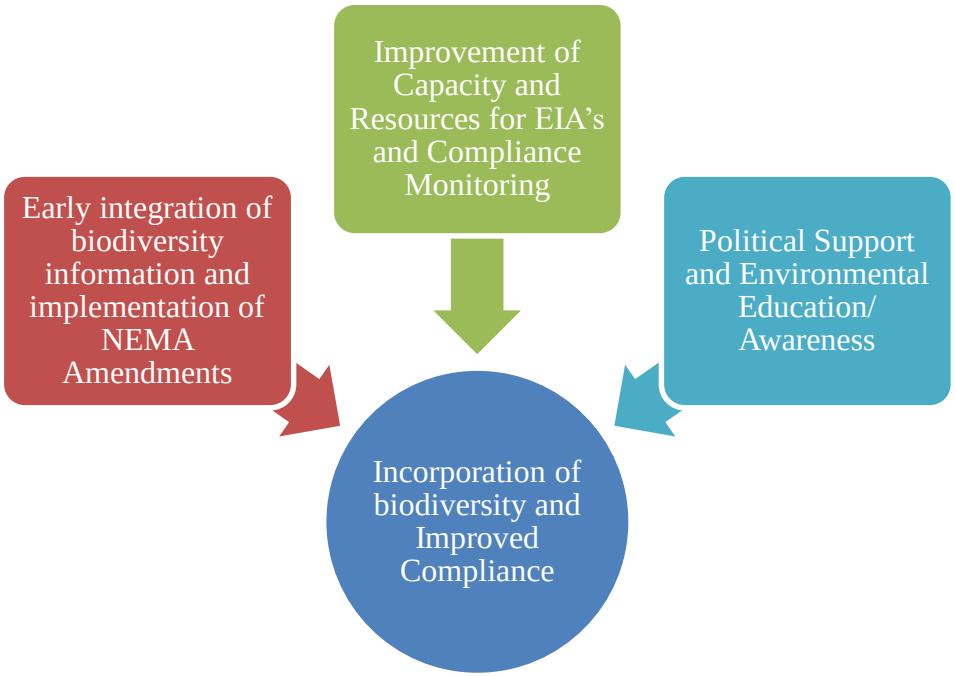

Figure 4.1: Potential EIA and Compliance improvement mechanism

4.3.1 Early integration of biodiversity information into EIAs and implementation of NEMA amendments

The careful consideration of biodiversity before the EIA process commences is key to improving its incorporation into development applications, and to the implementation of the National Environmental Management Act (NEMA) amendments aimed at improving EIAs as a whole (Brownlie *et al.* 2009, Slootweg and Kolhoff 2003). Such early integration could also prevent delays later on in the application process, where specialist input is required, and more studies may have to be conducted, thus extending the EIA process (Brooks *et al.* 2006, Brownlie 2005, Butchart *et al.* 2010). The application of Terms of Reference (TOR) provided by the BA to consultants is essential, as they serve as guidelines to conduct efficient studies and produce quality reports. Such TOR could stipulate the scope of work to be conducted in specialist studies to fulfil the BA information requirements (Ezemvelo 2014b, Longmore 2017). The use of TOR can be better entrenched in the overall EIA process by informing bioregional and spatial plans, and they could also form part of minimum requirements for EIA applications in areas known or modelled to have significant biodiversity to deal with (Dickson and Cooney 2005, Ezemvelo 2009a)

Currently, amendment of NEMA is underway, such as the inclusion of Strategic Environmental Assessments (SEAs). Use of SEAs is aimed at facilitating smarter and faster processing of applications, thus reducing and streamlining requirements of EIAs located in non-sensitive

areas (DEDTEA 2017). This is expected to have a positive impact, as SEA is a proactive and holistic tool that is not site based, but considers large geographical areas and their overall development suitability or risks. Therefore, if there are severe biodiversity concerns on a specific site, the applicant can be informed before investing financially in assessments for a site that is not suitable for development, or that may require major mitigation investments. SEAs endorsing the inclusion of biodiversity have proven to be effective at an international context, through encouraging governments, states, organisations, and other stakeholders to integrate biodiversity in national systems for impact assessment (Slootweg and Kolhoff 2001, Slootweg *et al.* 2006). Another NEMA amendment aimed at improving the EIA or Compliance process, is the requirement of applicants or developers to provide proof of availability of funds for rehabilitation, remediation, and management of sites prior to obtaining authorisations (DEDTEA 2017). Such a requirement will avoid compliance issues, where, currently, applicants may agree to rehabilitate and mitigate development impacts, while they are not financially able or willing to do so.

4.3.2 Improvement of capacity and resources for the EIAs and Compliance Monitoring

Capacity provision is an essential solution, not only for BAs, but also for Competent Authorities (CAs). It is recommended that capacity should be secured from suitably qualified and competent people, and who view the world not only from a biodiversity perspective, but also include broader environmental management and development more holistically (Duthie 2001). Provision of qualified staff to Departments and Municipalities will increase the quality of the reviewing and commenting procedures, resulting in the EIA process being more thorough and rapid. Another solution, apart from increasing staff members, is that existing staff could be better trained to review EIA reports more competently (Brownlie *et al*. 2009). Provision of resources could improve interaction and communication within stakeholders (Duthie 2001). These include resources such as vehicles which are important for conducting frequent site visits at early stages of the EIA process. The interaction of stakeholders before the EA is granted ensures that all concerns could be considered before an application is authorised (Aloni *et al*. 2015, Longmore 2017) More emphasis needs to be placed on the follow-up (compliance), as this is where the implementation of mitigation measures to safeguard the environment and biodiversity should take place (DEAT 2004, Jennings 2011). Applicants that do not comply to conditions of the EAs should be subjected to severe penalties (Hulett and Diab 2002). Monetary fines have been administered in the past; however, they are

not as effective because some applicants are able to pay fines for not obeying the rules (Carter-Brown 2017).

4.3.3 Political Support and Environmental Education or Awareness

Political support and investments are required to make a significant contribution to programmes such as protected area expansion and conservation areas of high biodiversity (Ezemvelo 2014b, Roux *et al*. 2015). Provision of incentives is recommended to applicants that take the initiative to consider and incorporate biodiversity conservation on their sites (Longmore 2017). Placing monetary value on biodiversity could encourage conservation and sustainable development, whereby land owners participating in conservation understand the benefits of the diverse ecosystems, and more importantly, how they could profit from it (Cowden *et al.* 2014). It is essential to improve the knowledge and understanding of applicants or landowners regarding ecosystem goods and services (such as purification of water, habitat for aquatic life, and flood attenuation) provided by biodiversity features on their properties, especially wetlands. (Cowden *et al.* 2014, Nair 2017).

Environmental education and awareness would be key strategies to inform potential developers and members of the public, especially those that are likely to be applicants, such as rural farmers, private property owners, and large scale developers. Workshops and information sharing sessions can be conducted among stakeholders to improve working relationships between CAs, BAs, and other stakeholders active in the EIA process (Nair 2017). Evidently from the study, a number of illegal activities that compliance officers deal with are due to uninformed land owners, especially in KZN (Nair 2017). Therefore, environmental workshops regarding the EIA process through private or governmental agencies are crucial to enable information sharing, and to reduce illegal developments or land use changes. Access to information such as permits could be improved by the Department of Mineral Resources (DMR) to improve follow-up and compliance processes; as, in the case of study, it was difficult to access authorisations on mining applications.

Biodiversity loss is a major concern at international and national levels (Butchart *et al.* 2010, Gomar 2014). This study has established that conservation measures and environmental legislation are in place to safeguard biodiversity, and ensure sustainable development. However, regardless of the environmental legislation being in place, its implementation and compliance is lacking, specifically in certain developments more than others (Reitzes 2009, Luthuli and Houghton 2015). Linear developments tend to have generic EA conditions which

could end up being a copy and paste exercise for consultants and CAs (Ndlovu 2015). However, larger developments such as residential, agriculture, industrial and commercial with larger footprints require more experience with EIA reviewing. With this pattern decision of outcomes in various types of developments identified, emphasis should be placed on ensuring that developments with large footprints encompass mitigations that are site specific and that consider biodiversity information. Compliance monitoring should also be frequent and stringent, especially in development sites with sensitive biodiversity. Furthermore, compliance monitoring should not only be conducted by CAs; the BA could play a supporting role in terms of ensuring that biodiversity mitigations have adequate implementation (Nair 2017).

4.4 Limitations of the study and future research

1. Conflict of interest: EA evaluations assessed for level incorporation were left to the individual's discretion (EKZNW IEM staff), possibly a development planner could be stringent or lenient in terms of concluding the level of biodiversity incorporation in the evaluation process. It was assumed that the IEM staff was objective while evaluating incorporation. Furthermore, an assumption was made that EKZNW's biodiversity recommendations to DEDTEA are valid and contribute to the efforts of meeting the provincial targets and safeguarding biodiversity.

2. Possible human error: Evaluations being conducted by staff members could have led to possible human errors or inaccuracies in terms of accurate data capture into the Application Register Database.

3. Access to mining EAs or permits: Authorisations or permits for mining activities from the Department of Mineral Resources (DMR) are not readily available, or provided efficiently, as the authorisations are from DEDTEA. Therefore, it is highly likely that more mining applications were authorised without coming to the attention of the BA, since the DMR does not fastidiously circulate authorisations to all stakeholders, such as the DEDTEA.

4. Establishing duration of applications: Time frames for EIA reports circulation and comment periods have changed from 2010 to 2015, due to the NEMA amendments. The reduction of time frames may be a source of inconsistence on the applications sampled for this study from January 2010-June 2015. Furthermore, there are cases where Biodiversity and CAs agree mutually on extending comment periods for specific applications, which alters the duration of the application process.

5. Number of case studies and applicant approval: There was a limitation of case studies due to time and resource constraints, and the evaluation of more case studies across KZN would have required more time and financial resources. Site visits were also a challenge to conduct, as majority applicants or developers approached were not comfortable with giving development site access. Furthermore, not many applicants were willing to provide detailed information about the compliance status of their project developments.

Future research could investigate how all stakeholders, including applicants, influence the EIA decision making process directly. This could be done through detailed questionnaires and interviews that would enable the understanding of the stakeholder interaction, and where challenged, solutions and potential opportunities for improvement could be incorporated. Larger numbers of case studies could be utilised in future studies to enable better understanding of the development compliance status in the province of KZN. There could also be development of strategic plans that ensure mandatory inclusion of biodiversity information into EIAs from the beginning of the EIA process, specifically for areas known or modelled to be Critical Biodiversity Areas. This could be beneficial, not only to BAs, but also to applicants in terms of having a proactive approach regarding the biodiversity value of their sites, instead of being prompted by EIAs to conduct specialist studies and consider biodiversity attributes at a later stage of the application.

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APPENDIX 1: PERMISSION TO CONDUCT RESEARCH FROM EZEMVELO KZN WILDLIFE

EZEMVELO KZN WILDLIFE
Conservation, Partnerships & Ecotourism

TO WHOM IT MAY CONCERN

For and behalf of Ezemvelo KZN Wildlife,

Ms Nomaswazi Thandeka Kubheka (SN 210508030) registered for a Masters Degree in Environmental Science in the School of Agricultural, Earth and Environmental Sciences, under the supervision of Professor Mathieu Rouget, for the dissertation/thesis entitled 'Incorporation of biodiversity conservation into the Environmental Impact Assessments and Compliance Processes' is hereby given permission to access Ezemvelo KZN Wildlife's records pertaining to the documentation, assessment, review, comment, decision on any environmental impact assessment or land transformation application received by this organisation.

Further, permission is hereby granted to the above named student to interview, seek assistance or clarity from, or engage with any relevant staff member of Ezemvelo KZN Wildlife in the furtherance of her research towards compiling the above mentioned dissertation/thesis.

Yours sincerely,

Andrew Blackmore
Manager Integrated Environmental Management and Protected Area Planning
Ezemvelo KZN Wildlife
23 May 2017

APPENDIX 2: ENVIRONMENTAL AUTHORISATION MITIGATION OF BIODIVERSITY IMPACTS EVALUATION REPORT

Project reference:	
Project Name:	
EA Date:	
EA Reviewer:	

Evaluation Summary (✓)		
Mitigated	**Partially**	**Not Mitigated**
		✓

Filed		**Appealed**	

Biodiversity issue (Ezemvelo's recommendation) Summarised	**Condition No.**	**EA Condition (summarised)**	**Issue mitigated (Yes, No or Partial)**

Reason for Evaluation Summary

Criteria for Evaluation Summary:

Mitigated: All critical recommendations taken into account.

Partially: Not all recommendations taken into account, but alternative mitigation provided for.

Not Mitigated: 1 or more critical issues not taken into account

APPENDIX 3: TYPES OF COMMENTS AND ATTRIBUTES FOR THE CATEGORISATION OF CONDITIONS

Biodiversity or Environmental issues	
Attributes within comments or types of comments	Description
FEPA Wetlands, Rivers and drainage lines	Freshwater Ecosystem Priority Areas project, these strategic spatial priorities are obtained through systematic biodiversity planning. They are based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries.
Non FEPA Wetlands, Rivers and drainage lines	Rivers, wetlands and estuaries that are not included in the FEPA project, however are remain critical and protected by the NEMA legislation.
Fauna (Red data listed or endemic)	Conservation significant fauna species and populations, some are red data listed due to their threat status which may be vulnerable, threatened or endangered.
Flora, vegetation and habitats	Conservation significant flora species and vegetation, some are red data listed due to their threat status which may be vulnerable, threatened or endangered.
Offset negotiations	Applications with negotiations pertaining to on the ground compensation for negative impacts on biodiversity that remain after mitigation measures have been taken into account.
Standard or Procedural issues	
Attributes within comments or types of comments	Description
EMPr	Environmental Management Programme (Previously known as EMP – Environmental Management Plan) as per Chapter 3 of the National Environmental Management Act 107 of 1998.

Standard Mitigations	Comments with specific standard mitigations for specific types of development or land use change considered as best practice in order to minimise negative impacts on the receiving environment.
Screenouts and No concerns	Comments stating that the biodiversity authority has reviewed the application and no significant biodiversity impacts are anticipated.
Backlog comment	Comments not submitted due to backlog or capacity constraints of the biodiversity authority.
Application refusal, objection and withdrawal	Significant biodiversity impacts or other procedural issues leading to the refusal, objection or withdrawal of the authorisation application.
Insufficient information	Database not updated, drive failure and loss of information regarding applications.

(Ezemvelo 2013, Ezemvelo 2014a, Ezemvelo 2014b, SANBI, 2011)

APPENDIX 4: FULL BIODIVERSITY RECOMMENDATIONS AND ENVIRONMENTAL AUTHORISATION CONDITIONS

Case Study 1

Recommendations provided by the Biodiversity Authority (EKZNW):

1.The 96.8 ha grassland ridge and the 112.28 ha floodplain wetland of the Lion's River on Portion 1 of the farm Warsash No. 1966, must be formally secured and managed for conservation.

2. The applicant or landowner must, within 18 months of the environmental approval, have entered into a legal contract with Ezemvelo's KZN Biodiversity Stewardship Unit.

3. Conservation areas must be endorsed onto the Title Deeds of Portion 1 of the farm Warsash No. 1966, within 12 months of the Stewardship agreement being finalised. Any costs incurred in the securing of conservation areas and endorsement of title deeds is to be borne by the applicant.

(Longmore 2015)

Conditions as stipulated in the EA:

5.4.9 In accordance with the requirement on Ezemvelo KZN Wildlife (EKZNW, letter dated 16 January 2015):

5.4.9.1The 98.56 ha natural grassland ridge and the 112.28 ha floodplain wetland of the Lion's River on Portion 1 of the farm Warsash No. 1966 must be formally secured and managed for conservation.

5.9.1.2 The Authorisation holder must, within 18 months of the Environmental Authorisation, initiate engagement with EKZNW with the purpose of pursuing a legal contract with the EKZNW Biodiversity Stewardship Programme.

5.9.1.3 Once the agreement is reached the conservation areas must be endorsed onto the Title Deeds of Portion 1 of the farm Warsash No. 1966, within 12 months of the Stewardship agreement being finalised.

The comparison between EKZNW's comments and DEDTEA's EA conditions indicates that all of the Biodiversity Authority's recommendations were fully incorporated into the EA (Table

3.3). Therefore, making the applicant or landowner legally bound to implement EA conditions. With the assumption that these conditions will be implemented, biodiversity was expected to be safeguarded.

Case Study 2

Recommendations provided by the Biodiversity Authority (EKZNW):

1. EKZNW supports all the recommendations in the Wetland Delineation and Functional Assessment report in the application.

2. Furthermore with regards to the loss of the 1.93ha of wetland habitat mentioned in the Wetland Report as a result of the proposed development, EKZNW supports the recommendation of the implementation of offsets (as in the Wetland Report). In this regard, EKZNW recommends that an Offset Report as well as a Memorandum of Understanding (MOU) must be compiled in accordance with guidelines in the Draft Norms and Standards for Offsets document. This is to determine the residual impact of the proposed infilling, and the required size of offset. It is strongly urged that the applicant negotiate a MOU with EKZNW, prior to Environmental Authorisation should this be granted.

3. In addition to the above, with reference to the remaining wetland habitat (approximately 62.07ha), EKZNW recommends that the proposed development of the N2-R56 be in full compliance with the mitigations suggested in the Wetland Report, during the construction phase. Furthermore, the active management of these wetlands by the applicant is strongly recommended during the operational phase; in line with a comprehensive Rehabilitation and Management plan. The objective of which would be to manage these areas for conservation objectives.

4. EKZNW trusts that all the appropriate measures to safeguard the ecological integrity of the receiving environment will be implemented in accordance with the sustainable development principles of the National Environmental Management Act 107 of 1998 (Pillay 2012).

Conditions as stipulated in the EA:

3: The holder of the authorisation is responsible for ensuring compliance with the conditions contained in this EA. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.

12: The Environmental Management Programme (EMPr) submitted as part of the EA is hereby approved. This EMPr must be implanted and adhered to.

31: A wetland rehabilitation plan must be implemented after the construction activities.

This case study is a representation of biodiversity being partially considered (Table 3.5). The conditions pertaining to wetland rehabilitation and EMP were incorporated to a certain extent but not completely. The requirement of a Memorandum of Understanding (MOU) regarding a wetland offset report and the recommendation that wetlands should be managed actively by the applicant was not included in the EA conditions.

Case Study 3

Recommendations provided by the Biodiversity Authority (EKZNW):

1. Alternative routes for the proposed haulage road are investigated in order to reduce potential negative impacts on the receiving vegetation and floral species of conservation significance. It is EKZNW's preference that the haulage road follows existing servitudes or transformed areas, and remains outside of the sensitive areas.

2. An alternative location for the proposed coal handling and processing plant is investigated in order to safeguard the ecological integrity of Hydro-geomorphological Unit 44 as highlighted in the Wetland Baseline and Impact Assessment.

3. In addition to the above, EKZNW requests that a meeting be arranged by the applicant with EKZNW in order to discuss the points highlighted above to finalise the proposed application

(Pillay 2014).

Conditions as stipulated in the EA:

For this case study, the comparison of biodiversity recommendations and the final EA conditions indicate that none of the conditions or recommendations provided by EKZNW were incorporated (Table 3.7). Biodiversity issues pertaining to this underground mine included the proposed route for the haulage road, which consisted of floral species of conservation significance. The location of the coal handling and processing plant was found to be problematic due to drainage lines or wetlands in the vicinity. It was suggested that an alternative location be investigated as the vegetation, drainage lines and watercourses were considered sensitive and important ecological linkages.