The influence of location on environmental impact assessment: examples from South Africa

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I dedicate this to my parents, without whom the completion of this dissertation would not have been possible.

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With the completion of this dissertation, I feel compelled to bring glory and honour to my Heavenly Father, who created me with the necessary talents and perseverance to finish this project.

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Declaration

I, Liesl de Swardt 22817522 have read the information above and understand it. I know what plagiarism is and am aware of the consequences of committing plagiarism. I further declare:

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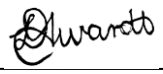
SIGNATURE:  DATE: 2018/05/10

Abstract

Ideally, environmental impact assessments (EIAs) should be completed at low costs and within acceptable time frames; this is known as efficiency which is an important aspect of effectiveness. In this study, one aspect of efficiency, namely time and, more specifically, the influence of location on the completion time of South African EIAs, was investigated. To determine the extent to which location influences the completion time of EIAs, data were gathered throughout South Africa and included temporal and location data of scoping and environmental impact assessment (S&EIA) reports and basic assessment reports of various EIA regimes (1996 – 2017). Data gathering involved telephonically contacting 36 environmental assessment practitioners (EAPs) (four per province) to gather data on location and information on critical phases in the EIA process via a systematic data template. Data templates were sent to 15 EAPs and 10 were completed and returned, which comprised of 55 EIA cases (some EAPs provided more data than required). The possible journeys that role players generally undertake were categorised into four groups: Firstly, the EAP travelling to the site, secondly, the EAP travelling to the competent authority, thirdly, the applicant travelling to the site and lastly, the competent authority travelling to the site. Data analysis firstly consisted of preparing the data by means of Google Maps and computer software to obtain the various travelling routes, distances (km) and duration (min) of the above-mentioned journeys. Secondly, Pearson's product moment correlation was conducted to test the relationships between distances and EIA completion time, duration of phases, duration of phases and completion time of the EIA process under different regulatory regimes and phases and completion time of the EIA process in different provinces.

The correlation analysis was performed on a total of 49 relationships of which 36 were positive and 13 were inverse relationships. The positive relationships suggest greater distances result in longer EIAs and were mostly found in the travel distances from competent authority to site and duration phases. The inverse relationships suggest greater distances between role players and result in quicker handling of the EIA. This was mostly found between the travel distance of EAP to site or EAP to competent authority and duration of phases. Most of the relationships existed in the duration of the phases.

These results implicate that location and more specifically distance have a smaller influence on completion time than expected.

Key terms:

Environmental impact assessment (EIA), completion time, efficiency, effectiveness, location, role players, regression analysis, location, Pearson's product moment correlation, correlation coefficient

Opsomming

Die ideaal is om omgewingsinvloedbepalings (OIB's) teen lae kostes en binne aanvaarbare tydperke te voltooi; dit staan as doeltreffendheid bekend wat 'n belangrike aspek van effektiwiteit is. In hierdie studie is daar ondersoek ingestel na 'n enkele aspek van doeltreffendheid, naamlik tyd en, meer spesifiek, die mate waartoe ligging 'n invloed op die afhandelingstydperk van Suid-Afrikaanse OIB's het. Om te bepaal of ligging wel 'n rol in die afhandelingstydperk van OIB's speel, is ligging- en tyddata van omvangs- en omgewingsinvloedbepaling (O&OIB) verslae asook basiese assessering (BA) verslae regoor Suid-Afrika van verskeie OIB regulasies (1997–2017) ingesamel. Data-invordering het behels dat 36 omgewingsinvloedpraktisyns (OIP's) telefonies gekontak is (vier per provinsie) en in 'n sistematiese data templaat liggingsdata en inligting oor kritieke fases in die OIB-proses verskaf het. Die data templaat is aan 15 OIP's gestuur, en 10 is ingevul en terug ontvang. Vanuit die 10 data template wat ontvang is, was daar 'n totaal van 55 OIB steekproewe (sommige OIP's het meer data verskaf as wat aangevra is). Die algemene reistogte wat die rolspelers moontlik aflê, is in vier groepe verdeel: Eerstens, die OIP wat na die terrein reis, tweedens, die OIP wat na die bevoegde owerheid reis, derdens, die aansoeker wat na die terrein reis en laastens, die bevoegde owerheid wat na die terrein reis. Die data-analise het eerstens uit die voorbereiding van data bestaan, wat met behulp van *Google Maps* en rekenaar programmering ingevorder is, om die verskillende roetes, afstande (km) en tydsduur (minute) van die voorafgenoemde reistogte te verkry. Tweedens is Pearson se produk oomblik korrelasie gebruik om die verhoudings tussen afstande (km) en OIB-afhandelingstydperke, afhandelingstydperke van OIB-fases, afhandelingstydperke van die OIB en fases onder die verskillende OIB-regulasies en afhandelingstydperke van die OIB en fases in die verskillende provinsies te toets.

Die analise is uitgevoer op 'n totaal van 49 verhoudings, waarvan 36 positiewe en 13 omgekeerde verhoudings was. Die positiewe verhoudings dui daarop dat groter afstande lei tot langer OIB's en is meestal in die reisafstand van bevoegde owerheid tot die terrein en duur van fases gevind. Die omgekeerde verhoudings dui daarop dat groter afstande tussen rolspelers lei tot vinniger hantering van die OIB's. Dit is meestal gevind tussen die reisafstand van die OIP na die terrein of die OIP na bevoegde owerheid en duur van fases. Die meeste van die verhoudings bestaan in die duur van die fases.

Hierdie resultate impliseer dat ligging en meer spesifieke afstand 'n kleiner invloed op voltooiingstyd het as wat verwag was.

Sleutelterme:

Omgewingsinvloedbepaling (OIB), afhandelingstydperk, doeltreffendheid, effektiwiteit, ligging, rolspelers, regressie analise, Pearson se produk oomblik korrelasie, korrelasie koëffisiënt

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Abbreviations

BA	Basic assessment
BAR	Basic assessment report
CA	Competent authority
CT	Completion time
DBAR	Draft basic assessment report
DEA	Department of Environmental Affairs
DEIR	Draft environmental impact report
DSR	Draft scoping report
EA	Environmental assessment
EAu	Environmental authorisation
EAP	Environmental assessment practitioner
ECC	Environmental consultancy company
ECA	Environment Conservation Act
EIA	Environmental impact assessment
EIR	Environmental impact report
FBAR	Final basic assessment report
FEIR	Final environmental impact report
FSR	Final scoping report
I&AP	Interested and affected party
IA	Impact assessment
NEMA	National Environmental Management Act
PP	Public participation
PPP	Public participation process
S&EIA	Scoping and environmental impact assessment
S&EIR	Scoping and environmental impact report
SEA	Strategic environmental assessment

VB	Visual Basic
ZAR	South African Rand

Analysis codes and abbreviations

Applicant–site	Distance from applicant to site
B-AA	BA application submit to application accept
Application–DBAR	BA application accept to DBAR
DBAR–FBAR	DBAR submission to FBAR submission
FBAR–EAu	FBAR submission to EAu granted
CA–site	Distance from CA to site
EAP–CA	Distance from EAP to CA
EAP–site	Distance from EAP to site
Application–DSR	S&EIA application accept to DSR submission
DEIR–FEIR	DEIR submission to FEIR submission
FEIR–EAu	FEIR submission to EAu granted
FSR–DEIR	FSR submission to DEIR submission
DSR–FSR	DSR submission to FSR submission

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Chapter 1. Introduction and problem statement

In this chapter, a brief description of the background of environmental impact assessment (EIA), both internationally and in a South African context, is given. Furthermore, the research aims, and objectives are mentioned. Lastly, a brief description of the structure of this dissertation is provided.

1.1. Background

EIA is a decision-making tool used at the earliest possible stage of planning to identify and assess the possible effects of a proposed development on the environment. It aims to avoid negative impacts and implement mitigation measures (Glasson *et al.*, 2012, 2003; Wood, 2003; Sadler, 1996). However, not only does this tool focus on negative environmental impacts, but it also examines alternative sites and identifies positive environmental impacts to be enhanced (Geneletti, 2002). The first formal EIA was conducted in 1969 as a result of the National Environmental Policy Act in the United States of America, with the aim of protecting the environment in federal development projects (Shakil & Ananya, 2015; Morgan, 2012; Cashmore *et al.*, 2004). In 1972, the United Nations Conference in Stockholm, as well as subsequent conferences, encouraged the formalising of EIA and consequently the practice of EIA spread across the rest of the world, with only two countries not having EIA legislation in place by 2011 (Morgan, 2012). Currently, all developed countries have well-established environmental laws in place, whereas some developing countries have a lack of legislation (Kolhoff *et al*., 2016; Arts *et al*., 2012; Morgan, 2012; Kidd & Retief, 2009; Ogola, 2007).

The main purpose of EIA is to provide decision makers with sufficient information to make an informed decision in light of sustainability. In order to achieve the purpose for which it was designed, it is important that EIA should take all relevant environmental aspects into account (Fraser *et al.*, 2003; Pineschi, 2001; Abu-Zeid & Bayoumi, 1999). Anifowose *et al.,* (2014) provides a good example of where relevant information was involved in an EIA process: By means of a geographic information system, it was found that damage to oil pipelines in Nigeria was linked to location. Subsequently, the location of oil pipelines was taken into account during the implementation of EIAs, which led to improved EIAs and eased this aspect of decision making (Anifowose *et al.*, 2014). The opposite can also happen where there is a shortage of information or irrelevant information is used in the EIA, for example, a case in Nepal, where EIAs of landfills contained inadequate information and did not take an alternative site into account. Although it was claimed that the consultants were incompetent, it was still a matter of a lack of information that ought to have appeared in the EIA (Dangi *et al*., 2015). Therefore, relevant and correct information (amongst other aspects) plays a role in EIA effectiveness.

Sadler (2004) describes effectiveness as whether the EIA process achieves its purpose. Jay *et al.,* (2007) and Pölönen *et al*., (2011) agree and describe it as whether the instrument works. Sadler (1996) developed a framework for evaluating EIA effectiveness and it has been used to measure different impact assessments, including EIA (Kolhoff *et al*., 2013). Different authors added to this framework (Bond *et al.*, 2013; Baker & McLelland, 2003; Ahmad & Wood, 2002). One aspect of this framework includes 'executional' or 'transactional' effectiveness, which refers to the time taken to complete an EIA and its associated costs (Phylip-Jones & Fischer, 2013; Arts *et al*., 2012; Lyhne, 2011).

1.2. South African background

EIA has been a compulsory legal process in South Africa since 1997, with the first regulations promulgated in terms of Sections 21, 22 and 26 of the Environment Conservation Act 73 of 1989. Hereafter the regulations underwent four rounds of changes – in 2006 when new regulations were promulgated under the National Environmental Management Act of 1998 and again in 2010, 2014 and 2017, respectively, where it was further refined (South Africa, 2017; 2014; 2010; Kruger, 2012; Kidd & Retief, 2009). Because of these changes, it is important to explore the South African EIA system.

Anecdotal evidence suggests that developers want to start developments as soon as possible. Therefore, consultants are pressed to carry out EIAs in an acceptable and often short time frame in spite of regular delays occurring in the process. Under this pressure, some aspects of EIA might be neglected. Retief and Chabalala (2009) found that 14% of the total cost of an EIA is spent on travelling and 39% on site investigation, which is the most expensive component of the EIA. Furthermore, although the contribution of the public benefits the EIA process, it has been found that it is easier, faster and more profitable for developers to exclude public participation because of time constraints (O'Faircheallaigh, 2010; Enserink & Monnikhof, 2003; Stoll-Kleemann & O'Riordan, 2002; Shepherd & Bowler, 1997). In underdeveloped areas in South Africa, where the needs of people often oppose the ecological sensitivity of the surrounding area, it becomes difficult to choose the 'no-developing' option in an EIA and the development continues in the best possible location with the best possible mitigation measures (Diab *et al*., 1999). Davidson (2011) states that the location of the site on which a proposed development is set to take place is one of the most common reasons for an EIA not being approved, including biodiversity and ecological issues of the site. This demonstrates how the location of the project affects decisions regarding the development.

In South Africa, the effectiveness of EIA has been researched for some time, for example by Wood (1999), who evaluated the South African EIA system against a list of criteria. Research on various ways in which to evaluate EIA effectiveness in South Africa has also been

published, especially on the evaluation of environmental impact report quality, by using an adjusted version of the review package of Lee and Colley (1992) (Sandham *et al*., 2013b; Sandham & Pretorius, 2008; Sandham *et al*., 2008a; Sandham *et al*., 2008b; Lee & Colley, 1992). Further research on EIA quality includes the comparison of 2006- and 1997-EIR quality, the quality of environmental management frameworks and that of biodiversity impact assessment (Hallatt *et al*., 2015; Marais *et al*., 2015; Sandham *et al*., 2013a; Sandham *et al*., 2010). Thus, there are many ways to evaluate the effectiveness of EIA which links to the aims and objectives of this study.

1.3. Research aims and objectives

Research has been conducted on various aspects of effectiveness, but not much has been published on transactional effectiveness. The aim of this study was to investigate the ways in which location differences influence the duration and critical time frames of the EIA process. The following objectives were set:

1. To investigate the influence of location on EIA by reviewing published literature.
2. To obtain a sample of EIA cases from which temporal and location data could be extracted.
3. To analyse temporal and location data using appropriate statistical and other analytical tools in order to establish the extent to which location influences the completion time of the EIA process.

1.4. Structure of the dissertation

This dissertation is divided into five chapters that can be linked to the objectives of this study: The introductory chapter is followed by **Chapter 2**, which contains the literature study and addresses the first objective. **Chapter 3** deals with the methods used to achieve the second and third objectives, including the methods used to obtain data from the various environmental consultancy companies, followed by the methods used to prepare the data and, finally, the methods for analysing the prepared data. This is followed by **Chapter 4** addressing objective 3, which deals with the results obtained from the analysis, illustrating the influence of location on EIA, accompanied by a discussion of the results. The last chapter of this dissertation, **Chapter 5**, contains the conclusion and recommendations for further research. Supporting data are provided in the appendices.

Having introduced the study, the dissertation now proceeds to a review of relevant literature in the next chapter.

Chapter 2. Literature study

With the aim of understanding the relationship between environmental impact assessment (EIA) and location, this chapter comprises two parts. The first part is a review of international literature and entails the developments of EIA up to date, the general structure of EIA and its effectiveness, followed by evaluation aspects of EIA, including location as part of effectiveness. The second part of this chapter has the same structure as that of the first part but is a review in a South African context, describing South Africa's EIA development, the current EIA structure and effectiveness as well as evaluation aspects, including location as part of effectiveness.

2.1. Origin and development

The first formal EIA has its roots in the National Environmental Policy Act of 1969 in the United States of America (USA) (Shakil & Ananya, 2015; Morgan, 2012; Cashmore *et al.*, 2004). The influence of this act, which formed the foundation of the EIA system in the USA, caused the expansion of the process in various forms outside of the USA. It initially spread to other developed countries such as Australia, France, the Netherlands, New Zealand and West Germany, as well as developing countries such as Colombia and Thailand (Wood, 2003; Barker & Wood, 1999). The United Kingdom carried out *ad hoc* EIAs, primarily for oil and gas development. Further development of EIA included the introduction of uniform requirements for all European Union member states in 1985, which required a formal EIA system to be in place in 1988.

The nature of EIA – whether mandatory or voluntary, regarding the level of public participation and the type of activities that require an EIA – varies globally. Since EIA is seen as a valuable tool in making a project environmentally feasible and sociably acceptable, it forms a central part of environmental legislation around the world (Kabir & Momtaz, 2013; Morgan, 2012; Glasson *et al*., 2012). The concept of sustainable development has also contributed to the development of EIA so that decision makers could become aware of the impacts that developments may have on the environment (Glasson *et al*., 2012; Craik, 2008). EIA has also contributed to the concept of sustainable development, especially by including social impact assessment. For EIA to contribute effectively to sustainable development, it should contribute to poverty alleviation, employment creation and improved economic development (Weaver, 2003).

The United Nations Conference in Stockholm in 1972 and subsequent conferences formalised EIA and after the Rio Earth Summit in 1992 (Principle 17, Rio Declaration), EIA significantly expanded, with more than 140 countries having some form of environmental regulation or

legislation in 2011 (Nduonofit *et al*., 2015; Summit, 1992). By 2016, all developed countries had environmental laws in place, but since the EIA process in developing countries had a late start and spread at a slow pace, most developing countries are still in the process of adoption (Kolhoff *et al.*, 2016; Ogola, 2007; Arts *et al.*, 2012; Morgan, 2012; Wood, 2003; Lee, 2000). EIA is not the same in all countries, but there is nonetheless a common structure on how it is carried out worldwide. Components of the general structure of EIA are discussed in the next section.

2.2. General structure of environmental impact assessment

The basic components usually found in EIA include screening, scoping, analysis and significance of impacts, consideration of alternatives, mitigation, public involvement, reporting, final decision and, finally, follow-up and monitoring. These components can be seen as different phases in EIA and usually follow a sequence unique to every country. These phases are usually time bound and any delay in one of the phases result in a delay in the overall completion time. Figure 2-1 illustrates the main steps and the general chronological order of EIA.

Screening can be defined as the phase that determines whether an EIA is needed. An EIA is required only if the proposed activity will have significant environmental impacts. Significant impacts are determined by a type of classification based on forecasts and, therefore, it cannot be said that the activity will have definite significant impacts on the environment. Screening is determined by the EIA regulations of a country and each country may have a different set of regulations for whether EIA is required (Phillips, 2011; Pinho *et al.*, 2010; Wood, 2003; International Finance Corporation (IFC), 2003). Scoping aims to identify the most important alternatives and impacts and includes a plan of action for the final report. Consultants have a tendency to provide long, costly and time-consuming studies and scoping helps to address this issue. It helps to focus the EIA process on issues that might have significant environmental impacts. Therefore, this phase also improves the effectiveness of the EIA process (Phillips, 2011; Koornneef *et al*., 2008; IFC, 2003).

Impact analysis and reporting take place only after scoping has been completed and require the compilation of a detailed report that includes the following information: description of the proposed site and the necessity of the activity, description of the affected area, identification of alternatives, a thorough investigation into the environmental consequences and significant impacts of the activity including mitigation measures, description of impacts of alternatives on the activity and mitigation measures (Phillips, 2011; IFC, 2003).

Public participation (PP) intends to take public comments into account during decision making. The public may sometimes have more knowledge on an area because of the time spent living

there, amongst other reasons. Therefore, their inputs promote the quality, completeness and effectiveness of EIA. The PP process consists of many different stages and each country's process may differ with regards to, for example, publishing notifications, conducting PP meetings and circulating some of the reports for comments (Phillips, 2011; ShanShan, 2008; Doelle & Sinclair, 2006; Andre *et al*., 2006; Hartley & Wood, 2005; Glasson *et al.*, 2005; Canter & Atkinson 2011.

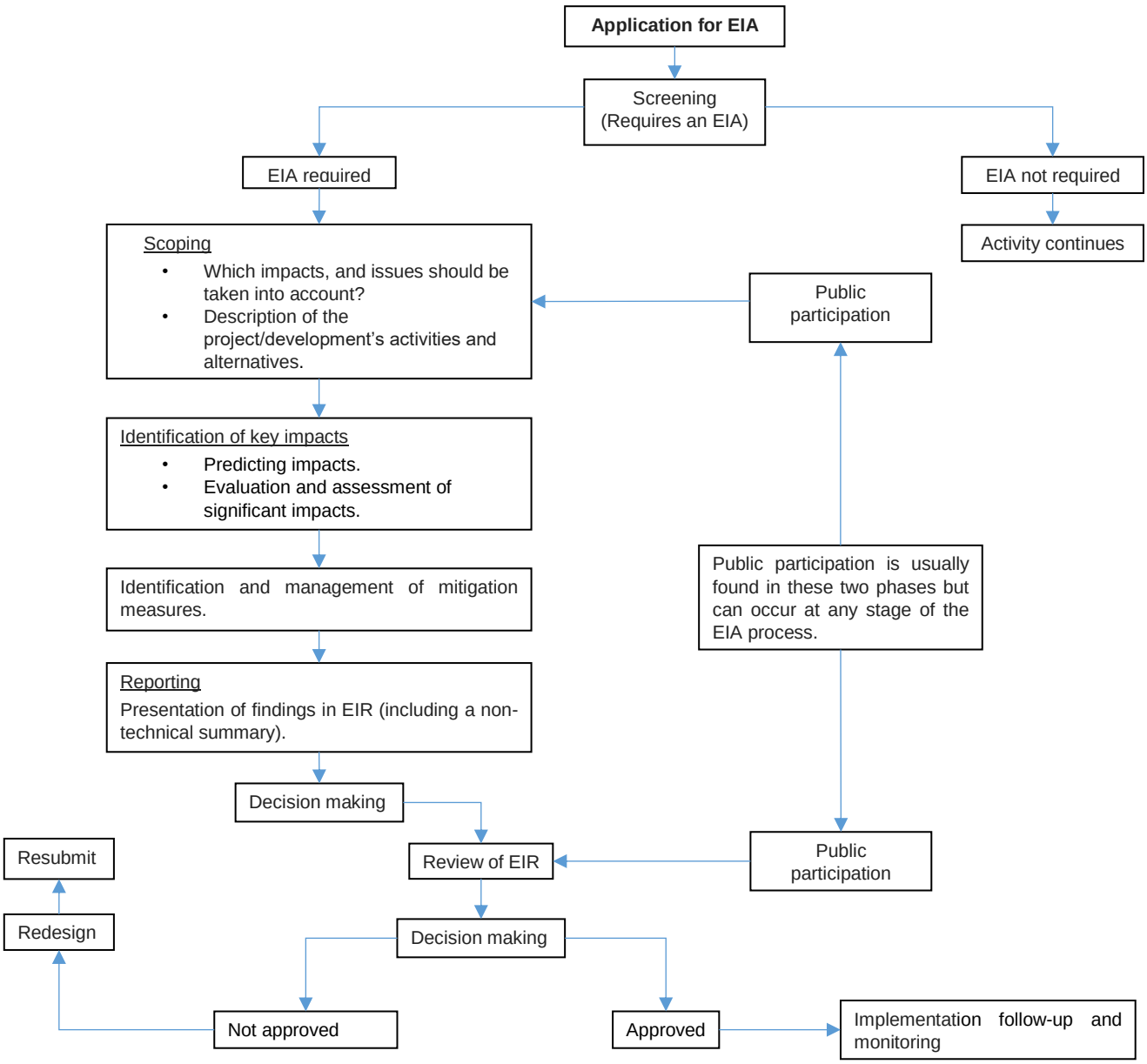

Figure 2-1: General environmental impact assessment (EIA) structure (adapted from Ogola, 2007, and Glasson *et al.,* 2012); EIR: environmental impact report

The final decision on the proposed project lies with the relevant authorities and the decision may not be taken before the environmental impact report (EIR) is formally completed and

finalised. The final decision will be influenced by the quality of the information submitted (Craik, 2008).

Follow-up involves the monitoring and evaluation of the development's impacts after the project has been approved and the construction phase has started. It also relates to the operation and decommissioning phase of the development. This stage is essential for determining whether the EIA had correctly foreseen the significant impacts and therefore to provide feedback and serve as a learning experience. It prevents the EIA from being carried out as a *pro forma* exercise (International Association for Impact Assessment, 2007; Morrison-Saunders and Arts 2004). Furthermore, Arts *et al.,* 2012 states that EIA follow-up comprises four elements which is (1) monitoring: compares standards, predictions and expectations prior to the project's commencement. It deals with post monitoring which relates to compliance to guidelines that has been set out. (2) Evaluation: takes into account the findings of the project in relation to standards, pre-project predictions and expectations. (3) Management: responding to the issues which may arise from the monitoring and evaluation process. (4) Communication: informing interested and affected parties about the results from the project (Phoolcharoen, 2007).

These EIA phases are prevalent worldwide, with only minor differences in the order and time limits, depending on the country's legislation. It is important that the implementation of these phases contributes to the effectiveness of the EIA process so that sustainability is promoted, regardless of the process followed. Therefore, the next section focuses on the effectiveness of EIA.

2.3. Effectiveness of environmental impact assessment

EIA is one of the six established forms of impact assessment (IA) along with strategic environmental assessment (SEA), policy assessment, social impact assessment, health impact assessment and sustainability assessment (Pope *et al*., 2013). This study is limited to EIA, but since effectiveness has been researched in all six of the above-mentioned forms of IA, research pertaining to IA will be used to contextualise EIA effectiveness as needed. The effectiveness of environmental assessment (EA) can be grouped in three interrelated parts: firstly, how well it is done and what it is achieving (this can be regarded as performance), secondly, the purpose and definition of EA and, lastly, EA system and report quality (Retief, 2010).

According to the Oxford English Dictionary (2016a), effectiveness is defined as '[t]he degree to which something is successful in producing a desired result [or] success'. This definition fits Retief's (2010) question on how well EA is being done and what is it achieving. In general, the meaning of effectiveness depends largely on the individual's perception. Without definite

objectives and norms, individuals' ideas of effectiveness may differ. This means that an individual's idea of effectiveness improves with the number of EIAs carried out by the individual but may also be affected by their interest, power, responsibilities, roles and experience (Hansen & Wood, 2016; Arts *et al*., 2012). For example, by comparing an environmental assessment practitioner's idea of EIA effectiveness with a developer's idea, the former may feel that EIA is effective, while developers may consider it a stumbling block that keeps them from beginning with the development (Aregbeshola *et al.*, 2011). Therefore, to prevent such discrepancies or to reach consensus, EIA effectiveness has been defined by a number of researchers, which is expounded in the paragraphs below.

Effectiveness is the ability to determine the extent to which EIA reaches its goal (Shakil & Ananya, 2015). Similarly, EIA effectiveness is not just the checking of the desired results, but also determining to what extent EIA makes a difference in terms of sustainability, which is best answered by looking at the purpose of EIA, namely restoration of the environment and maintaining its quality (Jay *et al*., 2007). There is consensus about three main themes that form the base of EIA effectiveness: how well it works, whether it works as it was originally intended and whether it achieves the purpose for which it was designed (Shakil & Ananya, 2015; Arts *et al*., 2012; Pölönen *et al*., 2011; Retief, 2010; Heinma & Põder, 2010 Sadler, 1996). These three themes are similar to those of EA effectiveness, except for the third concept that can be added to EIA effectiveness. Furthermore, Cashmore *et al*. (2010) reports that the main focus of EIA effectiveness should rather be on the complex dynamics of politics and power. The general aspects according to which EIA effectiveness can be measured include whether it promotes environmental awareness, leads to sustainable development and contributes to environmental values by the decision makers (Runhaar *et al*., 2013; Arts *et al*., 2012; Runhaar & Driessen, 2007). EIA effectiveness, therefore, refers to the incorporation of environmental considerations into decision making and, in the long term, contributing to sustainability. To determine the latter, the extent to which EIA achieves its objectives must be investigated. Sadler (1996) has accordingly set out a framework that consists of three EIA effectiveness aspects:

- Procedural effectiveness refers to whether the EIA meets established standards and principles.
- Substantive effectiveness points to the achievement of desired goals.
- Transactive effectiveness refers to whether the outcomes are achieved with the least cost in the minimum time frame (Shakil & Ananya, 2015; Bond *et al.,* 2013; Baker & McLelland, 2003; Sadler, 1996). Transactive effectiveness further refers to efficiency and it has been argued that time is one of the most important aspects of EIA efficiency (Cashmore, 2004; Pope *et al.,* 2013; Middle & Middle, 2010).

Baker and McLelland (2003) add a fourth concept to the above framework, which is normative effectiveness, which indicates the extent to which normative goals (a combination of social and individual norms as expounded by Bond *et al*., (2013)) are reached. The effectiveness of the EIA process therefore depends on a number of components.

In the past there was a strong focus on procedural effectiveness of EIA (i.e. the first point in Sadler's framework, dealing with the extent to which the EIA process conforms to established forms thereof), but the current focus is moved to include the evaluation of EIA by using more substantive criteria (i.e. the second point in Sadler's framework, to see whether EIA delivers results) that are searched for, including sustainable development (Shakil & Ananya, 2015; Van Doren *et al*., 2013; Arts *et al*., 2012; Jay *et al*., 2007; Cashmore *et al*., 2004; Lawrence, 1997). Research regarding transactive effectiveness, which involves the efficiency of EIA, has received limited attention. Retief and Chabalala (2009) conducted a study in a developing country, which showed the results of direct compliance costs in relation to overall EIA cost. However, this study was limited to time as a component of effectiveness, focusing on one aspect, namely completion time of the EIA. The four components of EIA effectiveness are related to the first two interrelated parts of EA effectiveness, i.e. how well it is done and what it is achieving (this can be regarded as performance) and, secondly, the purpose and definition of EA. This is illustrated in figure 2-1. The last interrelated part of EA effectiveness, i.e. system and report quality are discussed in the next section.

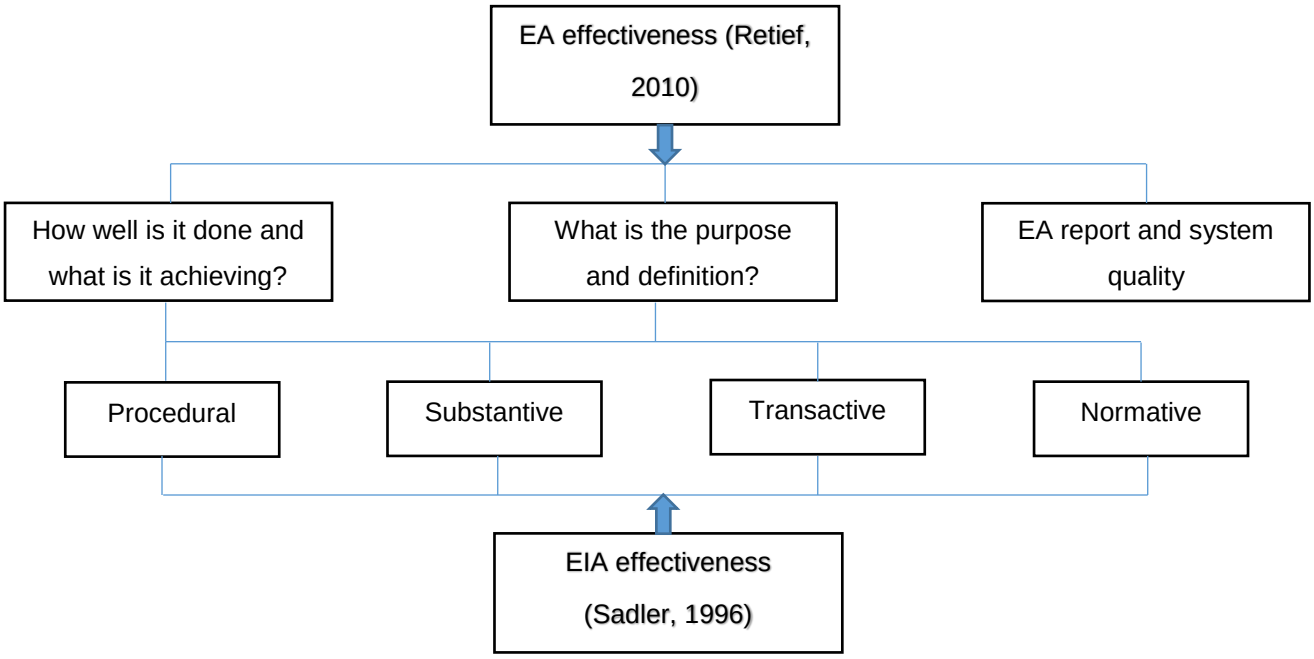

Figure 2-2: The relation of EIA effectiveness to EA effectiveness (adapted from Retief, 2010; and Sadler, 1996); EA: environmental assessment; EIA: environmental impact assessment

2.3.1. Quality

When looking at the quality of EIA, focus is placed on various aspects, including the quality of the EIA system, EIRs and some stages of EIA, such as public participation (PP).

The Oxford English Dictionary (2016c) defines quality as '[t]he standard of something as measured against other things of a similar kind [or] the degree of excellence of something'. Thus, quality may be considered as the standard of a particular object, service, product or process, i.e. whether it is durable, worthwhile or better than anything else. The important question is how to determine whether something is of good quality, which can be complex, because each individual has a different idea of quality. By comparing an individual who has conducted or evaluated a single EIA to an individual who has carried out and evaluated numerous EIAs, it becomes apparent that the idea of quality depends on the experience of an individual (Emmelin, 2006).

Several methods have been utilised to evaluate the quality of an EIA system; criteria and principles to evaluate the system have been developed by Gibson (1992), Sadler (1996) and Wood (1999, 2003). The criteria developed by Wood (1999, derived from the stages of EIA, have been utilised for reviewing EIA systems in a number of countries, including eight European Union countries' EIA performance evaluated by Barker and Wood (1999). These evaluations showed that the 'satisfactory' achievement had increased from 50% to 71% between 1990–1991 and 1994–1996. Pölönen *et al*., (2011) evaluated the Finnish EIA system and Wood and Coppell (1999) evaluated that in Hong Kong. These authors found that the overall systems were of high quality. Ahmad and Wood (2002) evaluated EIA systems of Egypt, Turkey and Tunisia and it was noted that the Egyptian EIA system was more advanced than that of Turkey or Tunisia. It was also the only system of the three that allowed for an appeal to be lodged after the decision had been made. Ramjeawon and Beedassy (2004) aimed at identifying the strengths and weaknesses of the Mauritian EIA system and one of the main weaknesses was the absence of EIA follow-up and monitoring. The quality of EIRs produced by a particular system has also been evaluated.

Worldwide, many studies have been conducted in connection with EIA quality and most have focused on the quality of EIRs, because their evaluation is part of any functioning EIA system. This improves the likelihood that the information provided to the authority is reliable and sufficient for decision making. It also promotes public confidence in the EIA process (Sandham *et al.*, 2013a; Sandham & Pretorius, 2008; Bonde & Cherp, 2000; Lee & George, 2000; Curran *et al*., 1998; Sadler, 1996; Asplund & Hilding-Rydevik, 1996. Several evaluation frameworks have been compiled for the evaluation of EIRs (Lee *et al.*, 1999; Lawrence, 1997; Glasson & Therivel, 1997), with the Lee and Colley evaluation package being the best known.

The quality of information found in EIRs is critical, because this information plays a major role in the effectiveness of EIAs and therefore might have an impact on the decisions of proposed projects. Since a high-quality EIR improves the likelihood of good decisions being made by the competent authority (CA). Whereas, low-quality, inadequate or irrelevant information contained in an EIR improves the likelihood of negative consequences, including legal actions and economic loss (Chang *et al*., 2013). Low-quality EIRs are the result of unqualified/inexperienced EA consultants, insufficient time and finances to obtain the relevant information, inadequate guidelines for the EIA that must be undertaken and decision-making authorities that do not promote continual improvements (Canelas *et al.,* 2005; Bankwatch, 2003; Morrison-Saunders *et al*., 2001; Simpson, 2001; Barker & Wood, 1999; Asian Development Bank, 1997).

An EIR contains a significant amount of information which is prescribed in Appendix 3 of Regulation No. 982 specifically for South Africa. Some of the information may include: (a) introduction which includes the legal mandate, details of the environmental assessment practitioner (EAP) and details of the specialists. (b) Activity description which may include the location of the activity, describing the layout and describing the services needed. (c) Legislative and policy: describing the legislation and policy context. (d) Need and desirability describing the need and desirability for the proposed development. (e) Description of the environmental issues dealing with consideration of alternatives and summary of the specialist studies. (f) Impacts and risks dealing with the impact analysis during construction, operation and decommissioning phase. (g) Lastly a summary of the recommendation of the specialist studies and EAP. Therefore, EIRs contain location information, which play a role in the EIA and, as such, the quality of EIRs. Location as part of EIA will be discussed next.

2.3.2. Location of environmental impact assessment role players

The Lee and Colley review package makes provision for location information in review areas 1, 3 and 4. Review area 1 deals with the description and location of the proposed site as well as a site plan, which is usually in the form of a map. Review area 3 deals with alternative site locations, and review area 4 deals with the communication of results including the layout plan (Kamijo & Huang, 2016; Sandham *et al.,* 2013a; Lee *et al.,* 1999). Therefore, these are indicators of the importance of location.

Location also features less explicitly in various other areas of the process which includes: firstly, the letters handed out to adjacent land owners and public meetings as part of the public participation process (PPP). Secondly, the significant impact matrix, which includes the extent to which the proposed project has an impact on the environment before and after mitigation

has been implemented. These impacts can be specific to the site, local, regional, national or international area.

The Oxford English Dictionary (2016b) defines location as a particular place or position, for example, 'the property is set in a convenient location'. There are different ways of conceptualising location in environmental research and researchers have focused on different impact assessments in using location. Collotta *et al.,* (2016) performed an environmental assessment in Canada to identify a preferred co-location solution between two alternative sites for an algal cultivation pond. Wanderer and Herle (2015) used a web-based spatial decision support system to identify preferable locations for solar power plants based on user preferences; the locations that were identified served as scenario development for integrated EIAs that followed. In Nigeria, a study was conducted on the large number of damaged oil pipelines and one of the objectives was to identify points on pipeline river crossings that were prone to oil spillage. Relevant network and pipeline shapefiles were subsequently mapped to identify all the river-crossing locations in Nigeria and the data showed that most of these locations were situated in southern Nigeria, where most of the damaged oil pipelines were located (Anifowose *et al*., 2014).

Various tools are utilised for mapping and analysing location data when conducting an EIA, including geographic information systems (GIS) (Del Campo, 2008; 2012; González *et al*., 2011; Vanderhaegen & Muro, 2005; Patil *et al*., 2002). In its simplest form, GIS in EIA is used in mapping site location, locating vegetation and various sensitive areas in the site area and presenting the development's layout in a map. Complex processes in GIS for EIAs include zone of theoretical visibility and suitability analysis (finding the most suitable location) for developments. As an example, Sánchez-Lozano *et al*. (2013) utilised GIS to obtain the best possible location for photovoltaic solar power plants in southeast Spain. GIS has the ability to increase the speed of processing information, integrate various information sources and provide a systematic analysis for the processes used, which transfers the results into a graphic format for visual and comparative investigation (Sizo *et al*., 2016; Del Campo, 2012; González *et al*., 2011; Vanderhaegen & Muro, 2005). It has been shown that EIA is a time-consuming and costly process (Pope *et al*., 2013; Morrison-Saunders & Retief, 2012; Retief & Chabalala, 2009; Oosterhuis, 2006; Meyer, 1995; Cashmore *et al*., 2004; Gilpin, 2000; Weaver 2003). It is therefore important to investigate the causes of delays in the process.

As seen in the above-mentioned research, it is clear that location influences the cost of EIA, for instance where the proposed sites are located in an unsuitable area for the proposed activity and proposed projects that received negative authorisation because of unsuitable sites. Furthermore, location also influences completion time, especially in projects with

unsuitable site location that have received a negative authorisation. The result is that the applicant has to reapply for the same activity at another proposed site, which results in time wasted to complete the EIA. Therefore, location has been shown to be a significant factor in various research and operational contexts.

2.4. Origin and development of South African environmental impact assessment

Since the 1970s, EIAs were conducted voluntarily as part of integrated environmental management in South Africa. EIA regulations were only promulgated in 1997 (Articles 21, 22 and 26 of the Environment Conservation Act 73 of 1989 [ECA]; South Africa, 1989), becoming obligatory thereafter. The ECA was the first legislation for EIAs in the country and continuous assessment occurred as certain issues arose, including too much focus having been placed on the environmental assessment phase, the absence of monitoring after a decision has been made and time limits. The Government therefore developed a programme to revise and adjust EIA regulations in terms of the National Environmental Management Act 107 of 1998 (NEMA) (South Africa, 1998); these revisions were promulgated in the 2006 EIA regulations (Sandham *et al*., 2013b; South Africa, 2006). Subsequently, assessments were conducted both by the government and independent researchers to determine whether these revisions improved the quality of EIA, including work done by Sandham *et al*. (2013a). The findings showed that despite the improved 2006 EIA regulations, there was a slight decrease in overall EIR quality. EIA regulations were subsequently refined three times more, in 2010, 2014 and 2017 (South Africa, 2010, 2014, 2017; Kruger, 2012; Kidd & Retief, 2009). Figures 2-3 and 2-4 illustrate the time frames and steps of the BA and S&EIA of the fifth regime in South Africa.

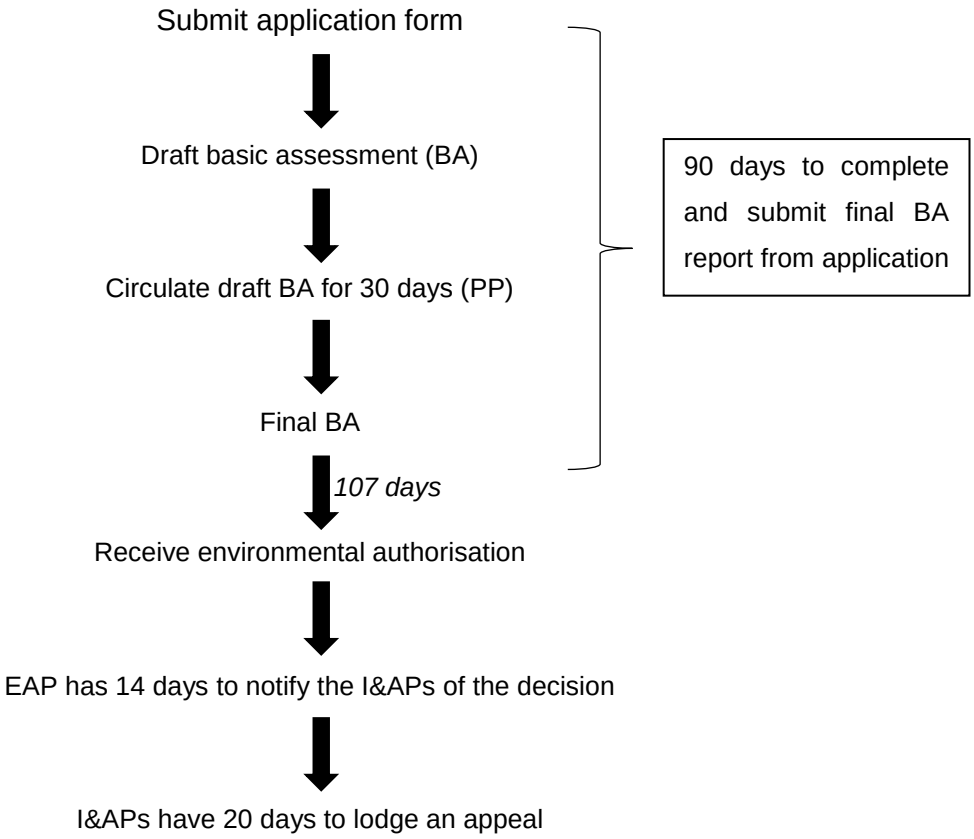

Figure 2-3: Basic environmental impact assessment process of the fifth regime in South Africa; EAP: environmental assessment practitioner; I&APs: interested and affected parties; PP: public participation

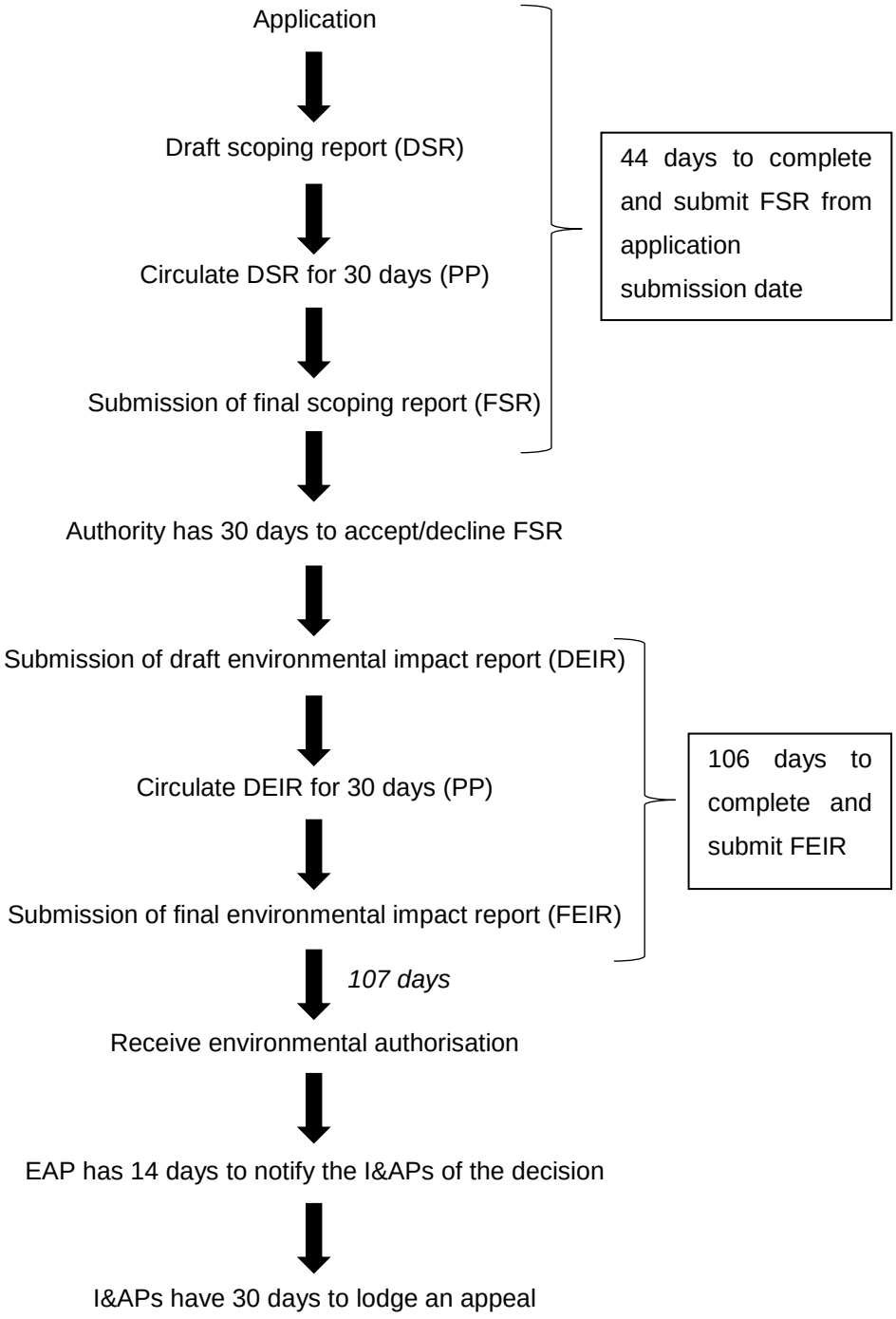

Figure 2-4: Scoping and environmental impact assessment process of the fifth regime in South Africa. EAP: environmental assessment practitioner; I&APs: interested and affected parties; PP: public participation

Therefore, there have been five EIA regimes up to date in South Africa and in the next section the time frames of these regimes will be discussed. The purpose of this is to show how the time frames have changed over time.

2.4.1. Regime 1 (ECA 1997–2006):

The first EIA regime, namely the ECA (Act 73 of 1989) made provision for environmental policy to guide decision making. Voluntary EIAs had been carried out since the 1970's, until 1997 when EIA regulations in terms of ECA were promulgated, outlining procedures to be followed in conducting, reviewing and appealing against records of decisions. The 1997 EIA regulations required a plan of study for scoping, scoping report and an EIA report. The time limits provided by the 1997 regulations were the 30-day notification period in a local newspaper of the proposed development (Part 3, regulation 16(b)); authorisation can be withdrawn after a 30-day written notice from the competent authority to the applicant was given (Part 5, regulation 22(4)). Part 5, Regulation 23 4(b) states: "A limited development area shall not be declared unless the competent authority has permitted not fewer than 60 days for the submission to the Director-General of the provincial administration concerned, of comment on the proposed declaration". Lastly the Regulations regarding activities identified under section 21(1) provides in 11(1) a 30-day appeal period after the records of decisions have been issued (Kidd & Retief, 2009; Glazewski, 2005; Wood, 2003).

2.4.2. Regime 2 (NEMA 2006–2010):

Hereafter, the second EIA regime replacing ECA, NEMA, made provision for EIA regulations in terms of section 24(5) and took effect in 2006 (GN. No. R. 385, R. 386 and R. 387 in Government Gazette No. 28753 of 21 April 2006). In this regulation, time frames were introduced for decision-making processes, for example, 14 days for acknowledging receipt of documents, 10 days to notify the applicant of a decision on an application, 45 days for review of minor reports i.e. basic assessments and 60–105 days for review of complex reports i.e. scoping and environmental impact assessment (S&EIA) (Kidd & Retief, 2009). Therefore, the major change in this regime was the provision for two types of assessments i.e. basic assessments which is a shorter process and S&EIAs which is a longer process. Interested and affected parties (I&APs) were invited to give comments within 30 days from the date the notice of the proposed development was published in the local newspaper. The environmental assessment practitioner (EAP) was not bound to time limits.

2.4.3. Regime 3 (NEMA 2010–2014):

The new NEMA regulations took effect in 2010 (Department of Environmental Affairs, 2010). This regulation added an additional listing notice focussing on activities planned for sensitive areas. However, the basic assessment process and S&EIA did not change. Amendments with regards to time frames included an extensive public participation process (PPP) which excluded the period between 15 December and 2 January from deadlines for decisions and lodging appeals. Previously there were no consequences for the environmental authority not meeting the deadlines, whereas in the 2010 regulations a decision had to be reached after a

prescribed extension on the regulatory time frames. Environmental management frameworks (EMF) are recognised as an environmental instrument, hence the EMF regulations that also took effect in 2010 (DEA, 2010). The EAP was still not bound to time limits.

2.4.4. Regime 4 (NEMA 2014–2017):

Hereafter, NEMA was amended and took effect on 4 December 2014. According to the Department of Environmental Affairs (2014), there was a need to amend the 2010 EIA regulations to align with the environmental authorisation (EAu) as specified in NEMA amendments (Sections 24(l) and 24(k)). The Infrastructure Development Bill 23 of 2014 (South Africa, 2014) requires that EIA time frames be regulated, and the ministers agreed to a single environmental system under NEMA, where the Department of Mineral Resources had become a competent authority (CA) in terms of NEMA. The EIA regulations must consequently be timed to ensure that it is in line with the processes of the Mineral and Petroleum Resources Development Act of 2002 (South Africa, 2002).

As seen in the previous regimes, the EAP was not bound to time limits, but since 2014 all steps in the EIA process have time limits. In this regulation the basic assessment and S&EIA are still evident. Time frame amendments include the exclusion of the PPP and decision-making from 15 December to 5 January, 30 days for the interested and affected parties (I&APs) to comment on the draft report and respond to advertisements, the CA must issue a decision within 107 days for the basic assessment (BA) and scoping and environmental impact assessment (S&EIA), notification of decision by the CA must be made within 5 days after a decision was reached, applicants must notify all I&APs in writing 14 days after the decision was received. The BA is now not allowed to take more than 197–247 days (50 days exemption may be applied for) and the scoping and environmental impact report not more than 300–350 days (50 days exemption may be applied for). Furthermore, an application for EAu (where applicable) may only be submitted after an application for any right or permit, as required by the Mineral and Petroleum Resources Development Act, has been adopted and where Section 24(l) of NEMA is applicable (South Africa, 2014).

2.4.5. Regime 5 (NEMA 2017–Present):

The most recent amendments to NEMA were published on 7 April 2017. These amendments give further effect to the implementation of *One Environmental System*, which is the agreement made in the 2014 amendments between the Ministers of Mineral Resources, Environmental Affairs and Water Affairs and Sanitation on an integrated environmental management system for mining (Fischer, 2015). The 2017 amendments attempt to better transition i.e. all environmental aspects regulated under NEMA, to the *One Environmental System.* Other changes to the regulations include that the minister may request additional

information to the application. Such additional information usually submitted with the EIR includes environmental management programmes and closing plans, amongst others. Now a financial provision may be requested along with the closure plan. After EAu has been granted, the time frame for the project to commence was previously 5 years but has now been changed to 10 years. Other changes were made to the listing notices, which affected Listing Notice 3[1] the most. Furthermore, the process of the basic assessments and S&EIA did not change.

Therefore, it is clear how the time frames have improved over time, from having minimal timeframes to having time frames on each phase in the EIA process. In 2006 the Department of environmental affairs initiated a study to assess the effectiveness and efficiency of EIA. Findings were presented at the 10 years of EIA conference in Somerset West in November 2008. The report concluded that effectiveness of EIA was marginal and made several recommendations of which the time frames were one. Additionally, one of the strategies being used to focus on the effectiveness and efficiency is environmental impact assessment and management strategy (EIAMS). The EIAMS is a participatory process to compile a strategy and to provide overall context for integrated environmental management (IEM) in South Africa within the context of sustainable development. In the next section effectiveness of the South African EIA will be discussed.

2.5. Effectiveness of South African environmental impact assessment

In South Africa, the concept of sustainability is strongly emphasised and provision is made for EIA to serve as a tool for implementing environmental law (NEMA Section 24; South Africa, 1998) and supporting sustainable development. Research has been done on SEA effectiveness: Retief (2007a) investigated the quality and effectiveness of a landmark SEA case study. The results showed an average achievement on quality and a mixed achievement on effectiveness. Another study by Retief (2006) evaluated the quality input and effectiveness output. Furthermore, research has been done on six SEA case studies, measured against four key performance areas and nine key performance indicators. Results showed a strong degree of ineffectiveness in all six SEA case studies and there was average and good achievement on input quality and output performance, respectively (Retief, 2007b).

With regards to EIA, little research has been done on effectiveness. Wood (1999) evaluated the EIA system as promulgated under ECA and the results showed that it only met seven of the 14 criteria. Retief *et al*., (2011) investigated screening effectiveness in EIA under the 1997

[1] Listing notice 3 sets out activities concerning geographical areas, and requires a basic assessment process where an activity falls within a geographically sensitive area, such as a development within a protected area.

and 2006 EIA regulations. The results showed that fewer EIA applications were submitted under the 2006 NEMA regulations than under the 1997 ECA regulations. Morrison-Saunders and Retief (2012) tested the objectives of EIA against the principles of sustainability. It was established that South Africa possesses a well-outlined sustainability EIA mandate, but despite this the effectiveness of EIA in practice is inadequate. Morrison-Saunders and Retief (2012) further stated that, during effective implementation, attention should be given to practice rather than the refinement of the mandate. These authors adapted the evaluation criteria used by Bond *et al*., (2012) as part of their effectiveness framework for sustainability assessment, adding normative effectiveness, pluralism and knowledge and learning. Procedural, substantive, transactive and normative effectiveness have been discussed (above in Section 2.2). Pluralism refers to the extent to which the general public's concern is accommodated into and satisfied by the sustainability assessment process. Knowledge and learning are explained as the extent to which the sustainability assessment process facilitates instrumental and conceptual learning (Morrison-Saunders & Retief, 2012).

Research conducted on the quality of EIRs in particular as part of effectiveness is expounded in the next section.

2.5.1. Report quality

Since EIRs play a critical role in a well-functioning EIA system, it is important to evaluate their quality. The quality of EIRs in South Africa has been researched for some time by mostly using the Lee and Colley evaluation package, adapted to fit a South African context. Research on EIR quality has been conducted by Sandham *et al*., (2013b), Sandham and Pretorius (2008), Sandham *et al*., (2008a), Sandham *et al*., (2008b) and results showed that EIR quality was generally stronger in descriptive (maps) and communication (good maps also contribute to better presentation and communication) divisions but weaker in the technical sections, including environmental impacts, mitigation and alternatives. Sandham *et al*., (2013a) investigated the quality of EIRs done for biological control agents. The results showed that the quality of the reports was poor. Further research on EIA report quality includes the comparison between 2006 and 1997 EIR quality and it was found that despite the changes of regulations, the report quality decreased somewhat from 1997 to 2006 (Sandham *et al*., 2013a).

Not only was the focus placed on EIR quality but also on the quality of various impact assessment reports. Hildebrandt and Sandham (2014) evaluated the quality of social impact assessment reports and determined whether the quality had improved since the introduction of the 2006 EIA regulations. The results showed that the quality of these reports was weak, but a slight improvement occurred since the introduction of the 2014 regulations. Looking at the review areas, it seems that review areas 1 and 4 performed well, but review area 3

(alternatives) performed poorly. Marais *et al.,* (2015) evaluated seven environmental management frameworks in terms of report and procedural quality and showed an overall satisfactory achievement. Hallatt *et al*., (2015) reviewed the quality of biodiversity impact assessment reports and the results showed an overall satisfactory achievement. Review areas 1 and 5 performed well, consisting of the proposed site description and the site plan including maps, indicating that the spatial location performed well in this area. Nonetheless, a number of shortcomings were found, such as the consideration of alternatives, PP and monitoring programmes. Therefore, location plays an important part in EIRs, but it is also clear that there is an absence of knowledge on how it affects the EIA with regards to delays and decision making.

2.5.2. Cost and time as part of location

Regulatory compliance costs South African businesses ZAR 796 billion p.a. which hinders national development targets (Retief & Chabalala, 2009; Strategic Business Partnership, 2005; Crookes & De Wit, 2002; Home, 2000). Research regarding efficiency (cost and time) a transactive effectiveness concern of EIA has received little attention. Retief and Chabalala (2009) investigated the direct cost of EIA in relation to the overall cost in the Free State, North-West and Northern Cape provinces and explained that not much research has been done because of three main problems: (1) defining what is meant by 'cost', which creates problems in consistency in the analysis, (2) the fact that there is no database from which cost data can be extracted and (3) data on cost is not always readily available. Results showed that the direct costs in these provinces were low compared to international practice, but the overall costs were in line with international EIA systems.

> *Government is concerned about any delay, costs and associated impacts on economic growth and development. This is why we need to improve efficiency and effectiveness without compromising basic environmental rights and quality (Department of Environmental Affairs and Tourism (DEAT) 2006).*

Macleod (2006b) stated that one of the former Presidents, Thabo Mbeki, attacked green laws recently, saying: "they were causing development delays that had contributed to a quite considerable slowing down of economic activity". Patel, (2009) states that despite the advantages of EIA, it has been persistent with controversy revolving mainly around delays in the process.

> *We cannot forever be held hostage by butterfly eggs that have been laid, because environmentalists would care about those things that are important for the preservation of the environment, while we sit around and wait for them to conclude the environmental studies. (Macleod 2006a).*

Retief *et al.,* (2011) mentions that screening is one of the methods that can be used to minimise the number of projects received by the competent authorities which might improve efficiency. These authors further state that screening can be carried out by combining various methods i.e. EMFs (indicating location sensitivity) or a checklist, but often locality as a key determinant of impact is not considered i.e. the same activity at deferent sites presents different levels of significance. Diab *et al*. (1999) investigated the 'no-development' option as an alternative in the EIA for a power line to an ecotourism development in Kwa-Zulu Natal. The study explained the difficulty of considering the no-development option in an underdeveloped area. Basic human needs need to be met especially in underdeveloped areas and therefore some of these projects are authorised and developed in the best possible location. Time delays were evident in the South African EIA system and EIA costs and various other aspects may have triggered these delays.

2.6. Chapter summary

The first formal EIA has its origins in the National Environmental Policy Act of 1969 in the United States of America (USA). Hereafter, it has spread to various countries with almost all having some form of EIA regulations in place. This includes South Africa which has five EIA regimes up to date. As seen in the international and South African context, there are different ways in which to address research on EIA effectiveness. Mainly consisting of efficiency and report and system quality as part of effectiveness with efficiency receiving little attention, which is an transactive (cost and time) EIA issue. The present study linked to this issue and focused on whether location of different role players contributed to the time delays that the EIA process faces. This chapter reviewed the literature addressing the first objective which was too investigate the influence of location on EIA by reviewing published literature. It was found that there is a lack of research in EIA efficiency, more specifically location, and the next chapter describes methods that attempted to address this gap.

Chapter 3. Methodology and analysis

Each role player in the environmental impact assessment (EIA) process is under pressure especially the environmental assessment practitioner (EAP) to deliver high-quality EIAs in an acceptable time frame. Therefore, this chapter aims to answer Objectives 2 and 3 (Section 1.3), which were to obtain a sample of EIA cases from which temporal and location data could be extracted and to analyse these data using appropriate statistical and other analytical tools. This chapter comprises two main sections: The first section, pertaining to the second objective, describes the methods used and the nature of the EIA cases obtained. The second section, pertaining to the third objective, describes the techniques used to analyse the temporal and location data.

3.1. Data acquisition

There are a variety of sources for obtaining data and for most research topics researchers have the option to use mixed methods to gather sufficient data to analyse theories and hypotheses (Brown *et al.*, 2017; Teddlie & Yu, 2007; Tashakkori & Teddlie, 2010. Specific methods of data collection are used in empirical research, where research through the collection of data aims to answer a particular research question – in this case the extent to which location has an influence on the total completion time of the EIA process.

The methods of data collection that can be considered during research are questionnaires and surveys, interviews, focus groups, observations, ethnographies, oral history, case studies, documents and records. Each source of data serves its own purpose as shown in Table 3-1 (Tashakkori & Teddlie, 2010).

Table 3-1: Description of data collection sources (adapted from Tashakkori & Teddlie (2010), Brancato *et al*., (2006), Beiske (2002), Nagle & Williams (2013))

Technique	Description
Questionnaires and surveys	• Responses can be analysed with quantitative methods • Results are generally easier to analyse than qualitative results • Pre- and post-tests can be compared and analysed
Interviews	• Can be conducted in person or telephonically • Can be formal, semi-structured or informal • Should contain open-ended questions • Yield qualitative data
Focus groups	• Facilitated group interview with people that have something in common • Captures combined perspectives and opinions • Responses are often coded into categories • Open group discussion
Observations	• Study of the dynamics of a situation, frequency counts of target or other behaviours • Good source for providing additional information to a group

	• Can produce qualitative data (e.g. narrative data) and quantitative data (e.g. frequency counts, mean length of interactions and instructional time)
Ethnographies, oral history, case studies	• Involves studying a single phenomenon • Examines people in their natural settings • Uses a combination of techniques such as observation, interviews and surveys • Ethnography is a more holistic approach to evaluation • Researcher can become a confounding variable
Documents and records	• Consists of examining existing data in the form of databases, meeting minutes, reports, attendance logs, financial records, newsletters, etc. • Can be an inexpensive way to gather information, but may be an incomplete data source

Choosing the ideal method depends on the type of research being conducted. Moreover, this depends on whether the research topic lends itself to quantitative or qualitative methods. Quantitative research methods take the form of numerical data collection and, in most cases, statistical analysis methods are required to analyse the data. Common methods are experimental in the form of measured results from before and/or after practices, surveys in the form of asking questions and historical data collection to identify patterns or trends from the data. Qualitative research methods involve data collected in the form of observations, interviews and documentary evidence (Ritchie, 2002; Bertelli & Mira, 1995). It is used in cases for research exploration and theory development. Common qualitative methods include case studies and the application of research in practice (Johnson & Turner, 2003).

Since EIA consists mainly of hard copies of reports submitted to the competent authority (CA) and documents received from the CA, the source of data collection for this study was documents and records. However, obtaining the documents and records directly from the EAPs to extract the data oneself was time-consuming and a mixed-methods approach, using a data template to obtain information from the EAPs' documents and records, was subsequently used. This approach appeared to be efficient and more accurate than capturing the data oneself, since EAPs are familiar with their archives. The data template consisted of a table that had to be completed. In the next section the data template is discussed.

3.1.1. Data template design

The data template allowed for capture of location and temporal data that had been submitted by the EAPs. More specifically this data consisted of the location of key role players, the site and the dates of receipt or submission of specific documentation. Furthermore, data was captured from the moment the application for environmental authorisation (EAu) was submitted until EAu was granted. Some EIA regimes request for certain phases to start before the application form is submitted; this made it difficult to obtain the exact starting date of the EIA and, therefore, anything that happened before the application form was submitted was not included in the data template. Each basic assessment report (BAR) or scoping and

environmental assessment report (S&EIR) is referred to as an EIA case. The themes included in the data template are provided in Table 3-2 (the complete data template appears in Appendix A).

Table 3-2: Information contained in the data template used in this study; BA: basic assessment; DEIR: draft environmental impact report; DSR: draft scoping report; EAu: environmental authorisation; EAP: environmental assessment practitioner; EIA: environmental impact assessment; FEIR: final environmental impact report; FSR: final scoping report; S&EIA: scoping and environmental impact assessment

Background	Location data	Temporal data
Project title	Location of EAP	Date of application submission and acceptance
Type of project	Location of relevant authority	Date of DSR and FSR submission and FSR acceptance
Is it classified as BA or S&EIA?	Location of applicant	Date of DEIR and FEIR submission and FEIR received
Under which EIA regime was the EIA carried out?	Location of site	Date of EAu granted

The design of the data template required in-depth investigation of the different phases and time frames of the basic assessment (BA) and scoping and environmental impact assessment (S&EIA), while keeping the main objective of this study in mind. This allowed for designing the data template in such a way that the necessary data would be collected. Since the basic assessments have no formal scoping phase the draft basic assessment report (DBAR) and final basic assessment report (FBAR) is displayed in the draft environmental impact assessment report (DEIR) and final environmental impact assessment report (FEIR) sections. Tables 3-3 and 3-4 show the abbreviations of the titles used in Table 3-4 and a list of 10 EIA cases collected via the template, respectively (All the EIA cases captured appears in Appendix A). The data are displayed according to the Province off the EAP as it was received.

Table 3-3: Abbreviations for data collected via the questionnaire

Abbreviation	Description
No	Number of project
Title	Project title
Type	Type of project
EIA	Basic assessment or scoping and environmental impact assessment (EIA)
Regime	Under which regulations?
Application submit	Date on which application form was submitted
Application accept	Date on which application form was accepted
DSR submit	Date on which draft scoping report (DSR) was submitted (if applicable)
FSR submit	Date on which final scoping report (FSR) was submitted (if applicable)
FSR received	Date on which FSR received by the relevant department
FSR accept	Date of letter received for acceptance of FSR
DEIR submit	Submission date of draft environmental impact report (DEIR) or basic assessment report (BAR)
FEIR submit	Submission date of final environmental impact report (FEIR) or final basic assessment report (FBAR)

Abbreviation	Description
FEIR received	Date on which FEIR or FBAR was received by the relevant department
EAu	Date of environmental authorisation (EAu) granted
EAP	Location of EAP
Applicant	Location of applicant
CA	Location of competent authority (CA)
Town	Nearest town to site
Site	Location of the site in the form of coordinates

Table 3-4: Data template

No	Title	Type	EIA	Regime	Application submit	Application accept	DSR submit	FSR submit	FSR received	FSR accept	DEIR submit	FEIR submit	FEIR received	EAu	EAP	Applicant	CA	Town	Site	
1	Hanover Housing Development	Housing development	BAR	2010	21 January 2014	24 January 2014	n/a	n/a	n/a	n/a	31 March 2014	05 June 2014	05 June 2014	20 August 2014	Potchefstroom, NW	Emthanjeni Local Municipality	Kimberley	Hanover	31º04'30.55"S	24º26'54.62"E
2	Britstown Housing Development	Housing development	BAR	2010	21 January 2014	25 January 2014	n/a	n/a	n/a	n/a	31 March 2014	05 June 2014	05 June 2014	12 August 2014	Potchefstroom, NW	Emthanjeni Local Municipality	Kimberley	Britstown	30º34'4.34"S	23º30'00.34"E
3	De Aar 1000 Housing Development	Housing development	BAR	2010	21 January 2014	26 January 2014	n/a	n/a	n/a	n/a	31 March 2014	05 June 2014	05 June 2014	25 September 2014	Potchefstroom, NW	Emthanjeni Local Municipality	Kimberley	De Aar	30º38'24.03"S	24º00'36.06"E
5	BCMM Haven Hills Cemetery Extension	Cemetery extension	BAR	2014	17 March 2016	21 April 2016	n/a	n/a	n/a	n/a	17 March 2016	13 May 2016	13 May 2016	15 August 2016	East London, EC	East London	East London	East London (Haven Hills)	33°00'26.34" S	27°51'25.08"E
6	Rocket Stores EIA	Mixed-use development	S&EIR	2014	14 March 2014	03 April 2014	20 June 2014	25 August 2014	02 September 2014	10 October 2014	06 February 2015	19 March 2015	31 March 2015	04 April 2015	East London, EC	East London	East London	East London	33°52'06.00" S	27°08'04.11"E
7	Ncambedlana Sewers BA	Pipeline	BAR	2015	10 February 2016	25 February 2016	n/a	n/a	n/a	n/a	02 March 2016	15 June 2016	05 July 2016	09 August 2016	East London, EC	East London	Mthatha	Mthatha	31°34'03.86'S	28°49'00.44"E
8	Retrofitting of the Existing Electrostatic Precipitators with Fabric Filters Plant and Upgrading of Dust Handling Plant at Kriel Power Station	Air quality	BAR	2014	16 June 2016	27 June 2016	n/a	n/a	n/a	n/a	07 June 2016	27 July 2016	02 August 2016	17 October 2016	Nelspruit, MP	Emalahleni (Kriel)	Emalahleni	Kriel	26°15'04.98" S	29°10'47.73"E
9	Eskom Vessel-Mokalaka 12 kV Powerline and Mokalaka Substation	Eskom powerline project	BAR	2010	11 February 2014	25 February 2014	n/a	n/a	n/a	n/a	29 May 2014	18 August 2014	02 September 2014	02 December 2014	Nelspruit, MP	Mahikeng	North-West	Madibeng	25°50'20.79" S	23°31'20.80"E
9	Construction of 30 MLD Reservoir Bulk Water and Sewer Pipelines on Portion 1 of the farm Leeuwdam 1216 JS	Housing development	BAR	2014	09 October 2015	16 October 2015	n/a	n/a	n/a	n/a	09 October 2015	11 November 2015	19 November 2015	30 March 2016	Nelspruit. MP	Emalahleni	Emalahleni	Emalahleni	25°48'11.20" S	29°10'05.24"E
10	Establishment of mixed-use township and infrastructure on Portion 1 of farm Altydmooi 379--LT at Ga-Sekgopo, Greater Letaba Municipality, Limpopo	Township establishment	S&EIR	2010	24 March 2014	26 March 2014	02 March 2015	02 April 2015	02 April 2015	13 April 2015	01 May 2015	30 June 2015	30 June 2015	11 September 2015	Tzaneen, LP	Modjadjiskloof	Polokwane	Modjadjiskloof	23°36'24.42" S	30°01'00.90"E

3.1.2. Study area and participants

This section outlines how the study area and participants were selected. The sampling area and the participants are described. To understand the influence of location on the EIA process, research needed to be conducted across the country to include the effects of location on the EIA process across a larger sampling area and to allow for enough information sources. Therefore, various environmental assessment practitioners (EAPs) were contacted in each province. This also allowed for different types of EIA projects sampled. This method is referred to as stratified random sampling (Pickard, 2012; Teddlie & Yu, 2007), which was the initial approach to the topic.

A minimum of four EAPs were contacted telephonically in each province: In total 36 EAPs throughout the country were contacted and requested to complete the data template. The intention was to acquire 30–70 cases, which allowed each EAP to supply a minimum of one data sample. This approach, however, was unsuccessful due to poor participation from the randomly selected EAPs. Therefore, whatever feedback was obtained had to be used, which is known as stratified availability sampling, where EAPs of different provinces were selected according to their agreement to participate in the study. Of the 36 EAPs contacted, only 15 agreed to participate in the research. Therefore, the base requirement was for the EAP to supply information of at least one BA and three S&EIAs, because it is known that more BAs are generally conducted as opposed to full S&EIAs. The data template was sent to these 15 EAPs via email and communication for the data acquisition was then conducted by means of email and telephonic conversations until the data collection was complete.

Of the 15 EAPs who initially agreed to participate, only 12 responded and in the end 10 EAPs completed the data template. The two EAPs that initially agreed to participate from the Northern and Western Cape provinces had changed their decision and declined to participate any further. This decision resulted in a lack of cases from both provinces. The data collected for analysis were therefore a distribution of EIAs from the remaining seven provinces. A total of 55 EIA cases were collected, of which 36 were BAs and 19 were S&EIAs. This means that 65.5% of the cases were BAs and 34.5% of the cases were S&EIAs, in comparison to the anticipated 25% BAs and 75% S&EIAs. The cases collected were conducted in terms of the 2010 and 2014 National Environmental Management Act No. 107 of 1998 (NEMA) regulations. EAPs from the Western and Northern Cape did not complete the data template, but the EAPs located in the North-West had some sites that were located in the Western Cape. Therefore, the location of the EAPs should not be confused with the location of other role players. Table 3-5 illustrates the amount of data received by each EAP per province.

Table 3-5: Basic assessments (BAs) and scoping and environmental impact assessments (S&EIAs) collected from the EAPs in different provinces

	BAs	S&EIAs
Eastern Cape	4	4
Mpumalanga	5	0
Limpopo	3	1
Free State	2	2
KwaZulu-Natal	9	2
North-West	12	9
Gauteng	1	1
Western Cape	0	0
Northern Cape	0	0
Total	**36**	**19**

Figure 3-1 illustrates the locations of the EAPs who agreed to participate. The EAPs' location stayed the same, but one EAP might have EIA projects in various provinces. Therefore, the distribution of EAPs and EIA cases should not be confused.

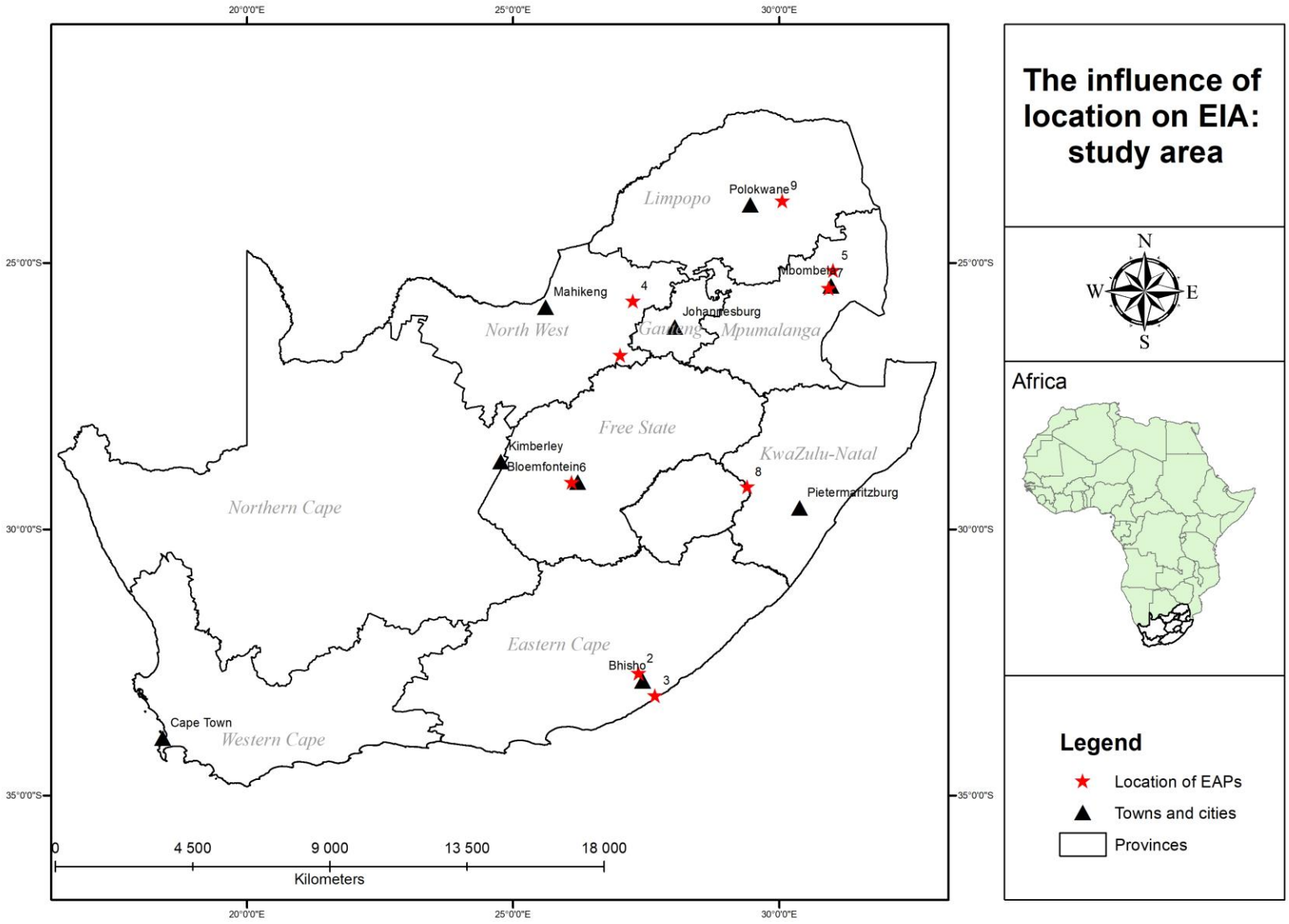

Figure 3-1: Map indicating locations of environmental assessment practitioner (EAPs)

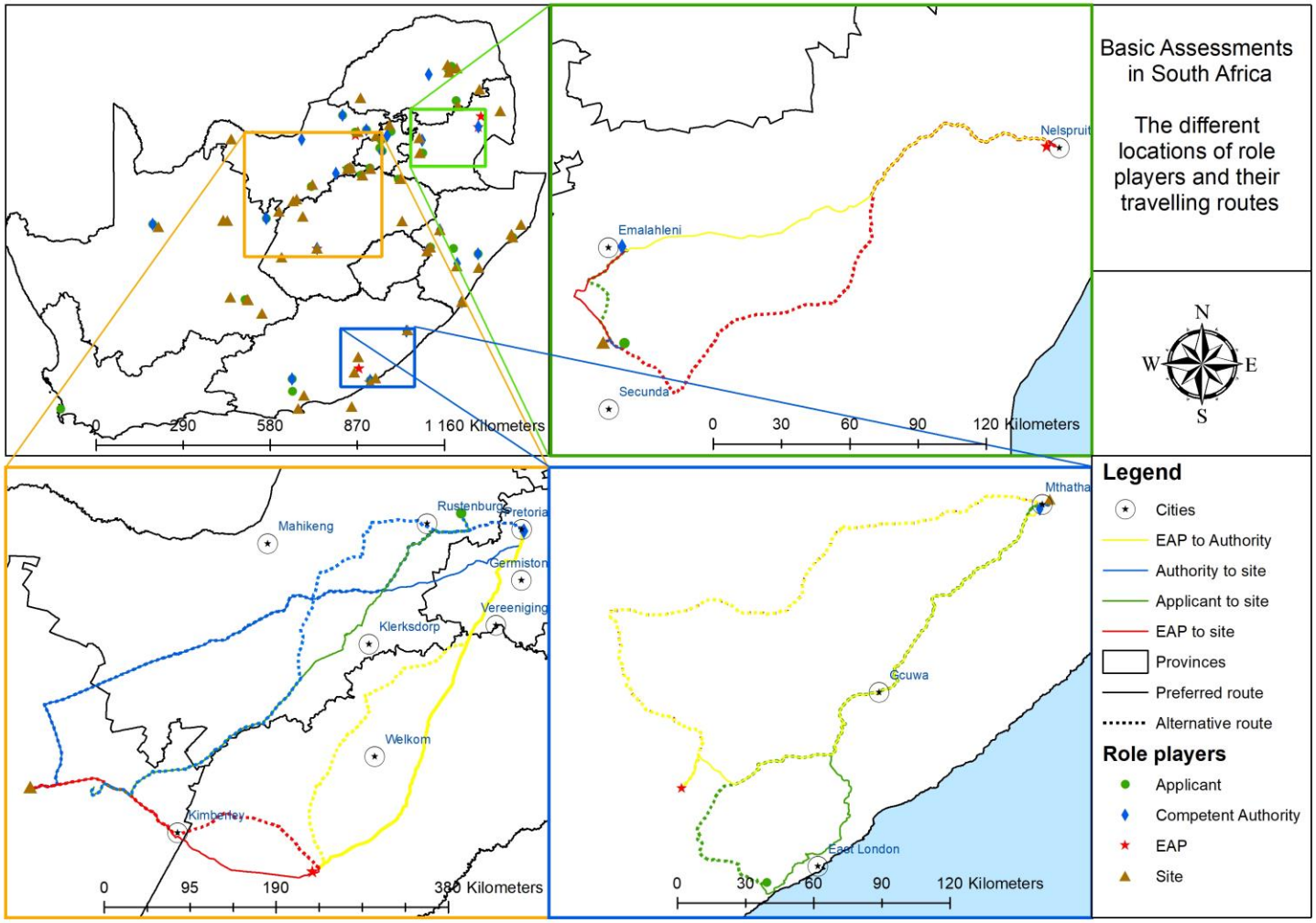

Figure 3-2: Map indicating locations and travel routs of the role players for basic assessments (BAs); EAP: environmental assessment practitioner

Some EAPs provided BAs only and some were able to provide up to 12 EIA cases. Figure 3-3 illustrates the location of role players of all the S&EIA cases.

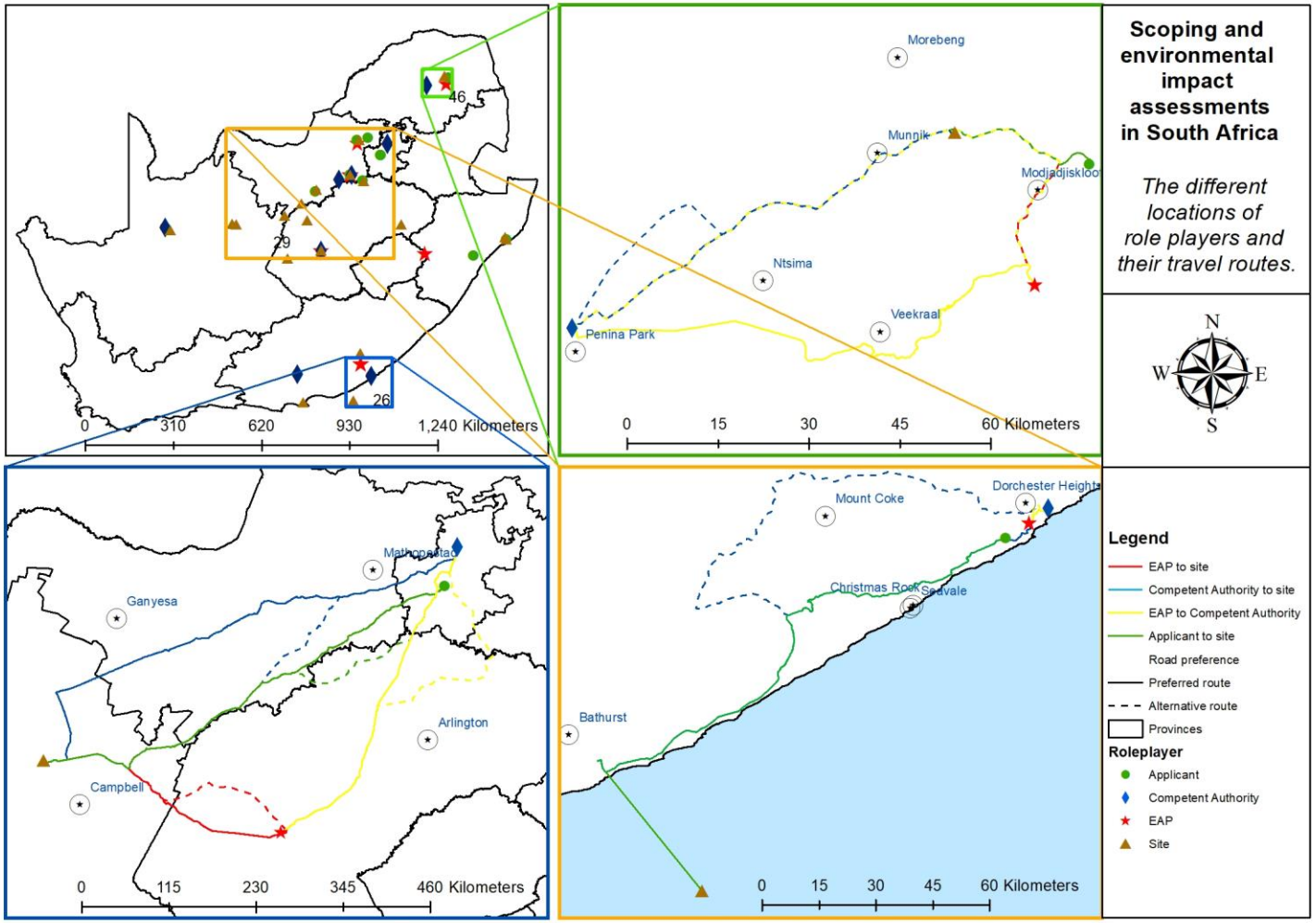

Figure 3-3: Map indicating locations and travel routes of the role players for scoping and environmental impact assessments; EAP: environmental assessment practitioner

3.1.3. Limitations

The difficulties experienced during data collection included the lack of data from EAPs in the Western and Northern Cape provinces. This resulted in the sampling area not being fully distributed throughout the country. In addition, not all EAPs that participated met the requirements of providing three S&EIAs and one BA.

Altogether, 62 data sets were obtained, of which seven cases were omitted due to incomplete locations of role players. After omitting these cases, six data samples were missing dates in the EIA process. These six were EIAs developed under the 2014 NEMA regulations and all of them were pending final authorisation from their respective competent authorities. To mitigate the absence of data, the missing dates were estimated according to the 2014 NEMA regulations, which states that the environmental authority has 107 days to authorise the final EIA submission. This resulted in 19 S&EIA and 36 BA cases for analysis. Public participation was another limitation which is discussed in section 3.1.4 below.

3.1.4. Exclusion of public participation

Public participation (PP) is one phase of EIA and it has been mandatory in South Africa since 1997 (Glucker *et al*., 2013; Kidd & Retief, 2009; South Africa, 1997, 2006, 2010, 2014). Andre *et al.,* (2006) defines PP in the context of environmental assessment as 'the involvement of individuals and groups that are positively or negatively affected by a proposed intervention (e.g., a project, a programme, a plan, a policy) subject to a decision-making process or are interested in it'. Here, the extent to which PP should be carried out is not mentioned. In contrast, PP is defined in EIA by Mwalyosi and Huges (1998) as a process that enables individuals or organisations affected by a proposed project to significantly influence decision making. Arnstein (1969) agrees with this concept and defined it as citizen power. According to NEMA the purpose of PP is to provide all interested and affected parties (I&APs) with the opportunity to comment on the proposed project. Therefore, PP plays an important role in EIA.

While the importance of PP has never diminished since 1997 there have been some changes to the prescribed minimum requirements. The public participation process (PPP) of EIAs have a generic set of requirements. These requirements were obligatory in all the regimes with some changes to time frames and other aspects that were included or excluded. PP in the first EIA regime (1997) in South Africa required intensive PP with a 30-day time frame for raising comments on the notice published in the local newspaper. Other forms of PP included notification of the immediate neighbours adjacent to the proposed site and including it in the EIR, erecting notification boards near the proposed site. The PP of the second EIA regime (2006), had the

same requirements as the first regime but, conducting some of the PP before submission of application forms and a 30-day commenting period on reports. The third EIA regime (2010) had a similar public participation process (PPP), which included a separate PP guideline document stating that PP must commence after the application form has been submitted. The commenting period was changed to 40 days and all the reports had to be circulated for comments. The period between 15 December and 2 January was added to the exclusion of PPP. In the fourth regime (2014), the commenting period was changed back to 30 days and only the draft reports had to be circulated for comments and the time period for exclusion of PPP was changed to 15 December–5 January. The PP must also commence before application is submitted, including notification of surrounding landowners, erecting notification boards on site and placing newspaper advertisements in the local newspaper (Environment Conservation Act No. 73 of 1989 and NEMA; South Africa 2006, 2010, 2014). NEMA was amended once more in April 2017; this is currently the fifth EIA regime in South Africa. The fifth EIA regime appeared when this study was almost complete and therefore, no data is available under this regime. Nothing has changed with respect to time frames of the PPP in this new regulation. Therefore, PP will still be conducted in the same manner as in the fourth EIA regime. Since most of the PP should commence before the application form is submitted and the circulation of the reports falls within the EIA phases, it was decided that the PP can be excluded from the data template.

3.2. Data preparation

The process followed to prepare the data for analysis is described in two sections in which the first covers the methods used to make the collected case data usable and the second deals with the process followed to refine the data.

3.2.1. Adding time and distance to environmental impact assessment cases

To be able to use the collected case data, it was necessary to determine the travelling distance between role players in kilometres and the travelling time in minutes. Table 3-6 illustrates which role players travel to each other often.

Table 3-6: Role players' travel routes and abbreviations

Role player		Destination	Abbreviation
Environmental assessment practitioner (EAP)	→	Site	EAP–site
Competent authority (CA)	→	Site	CA–site
EAP	→	CA	EAP–CA
Applicant	→	Site	Applicant–site

For the sake of completeness, three routes for each role player were determined from Google Maps. This resulted in a total of 24 routes for each EIA case and 1320 routes for the 55 EIA cases. Determining each route manually from Google Maps would not have been time efficient and therefore a Visual Basic hyperlink converter was developed to automatically use the location data of the EIA cases and create a web link. The code subsequently used the web link reference to formulate web hyperlinks to automatically launch the Google Maps browser. For example, a web link was created for the location of the EAP and the location of the site. When the hyperlink was opened it showed the travelling distances and travelling times for the possible routes. Travelling distance in kilometres is factored in to the travelling time in minutes. This means if the travelling distance from EAP to site was 619 km, Google Maps showed that the travelling time for the 619 km would be 5 h and 42 min. Figure 3-4 illustrates the hyperlink converter code used.

```
Sub ConvertToHyperlinks()
   Dim Rng As Range
   Dim WorkRng As Range
   On Error Resume Next
   xTitleId = "KutoolsforExcel"
   Set WorkRng = Application.Selection
   Set WorkRng = Application.InputBox("Range", xTitleId, WorkRng.Address, Type:=8)
   For Each Rng In WorkRng
   Application.ActiveSheet.Hyperlinks.Add Rng, Rng.Value
Next
End Sub
```

Figure 3-4: Visual Basic hyperlink converter code for each role player

To make this process more efficient and launch all the hyperlinks simultaneously, a separate Visual Basic code was used. This allowed for more efficient extraction of the travelling distance and time of each role player (Figure 3-5).

```
Sub OpenHyperLinks()
   Dim xHyperlink As Hyperlink
   Dim WorkRng As Range
   On Error Resume Next
   xTitleId = "KutoolsforExcel"
   Set WorkRng = Application.Selection
   Set WorkRng = Application.InputBox("Range", xTitleId, WorkRng.Address, Type:=8)
   For Each xHyperlink In WorkRng.Hyperlinks
      xHyperlink.Follow
   Next
End Sub
```

Figure 3-5: Visual Basic code to open all hyperlinks simultaneously

An illustration of the complete dataset and abbreviations used is provided in Table 3-7.

Table 3-7: Complete dataset and abbreviations for a single environmental impact assessment case; TD: travel distance; TT: travel time; ES: EAP to site; CS: competent authority to site; EC: EAP to competent authority; AS: applicant to site

Route	TD Route 1	TD Route 2	TD Route 3	TT Route 1	TT Route 2	TT Route 3
EAP–site	TD-EAP–site 1	TD-EAP–site 2	TD-EAP–site 3	TT-EAP–site 1	TT-EAP–site 2	TT-EAP–site 3
CA–site	TD-CA–site 1	TD-CA–site 2	TD-CA–site 3	TT-CA–site 1	TT-CA–site 2	TT CA–site 3
EAP–CA	TD-EAP–CA 1	TD-EAP–CA 2	TD-EAP–CA 3	TT-EAP–CA 1	TT-EAP–CA 2	TT-EAP–CA 3
Applicant–site	TD-Applicant–site 1	TD-Applicant–site 2	TD-Applicant–site 3	TT-Applicant–site 1	TT-Applicant–site 2	TT-Applicant–site 3

At this stage, the data for the EIA cases were complete, but to be able to achieve Objective 3, the data needed to be refined into EIA phases. Therefore, all these routes were used for the analysis, but the results were so close that it was only necessary to continue with an average travelling distance route which is expounded in the next section. The extraction of the EIA phases is also explained, and it is illustrated how the data were prepared for analyses.

3.2.2. Data refinement

After determining the travelling distance and time (as illustrated in Table 3-7) for all 55 cases, they had to be matched to the phases of the EIA in order to investigate the extent to which location has an influence. Table 3-8 shows the description of the EIA-phase variables along with their abbreviations.

Table 3-8: Duration of phases and abbreviations for basic assessments (BAs) and scoping and environmental impact assessments (S&EIAs)

Phase	Description	BA codes	S&EIA codes
Completion time	Total days to complete the environmental impact assessment (EIA), i.e. from application date to environmental authorisation (EAu) date.	CT	CT
Application acceptance to draft basic assessment report (DBAR) or draft scoping report (DSR) submission for BA/S&EIA	Number of days from the application acceptance to the submission date of the DBAR/DSR.	Application–DBAR	Application–DSR
DSR submission to final scoping report (FSR) submission for S&EIA	Number of days from the submission date of the DSR to the submission date of the FSR.	-	DSR–FSR
FSR submission to draft environmental impact report (DEIR) submission for S&EIA	Number of days from the submission date of the FSR to the submission date of the DEIR.	-	FSR–DEIR

Phase	Description	BA codes	S&EIA codes
DEIR submission to final environmental impact report (FEIR) submission for BA	Number of days from the submission date of the DBAR/DEIR to the submission date of the FBAR/FEIR.	DBAR–FBAR	DEIR–FEIR
FEIR submission to EAu for BA	Number of days from the submission date of the FBAR/FEIR to the day EAu was granted.	FBAR–EAu	FEIR–EAu
Regulations	EIAs were divided according to the regulations they were conducted under.	2010 2014	2010 2014
Provincial	EIAs were divided according to the province the environmental assessment practitioner was located in.	Name of province	Name of province

The duration of these phases is another dependent temporal data variable whereas travelling time is independent although it is dependent on travelling distance. This forms the premise of this study which is that duration/completion time (duration of the individual phases and the process) for EIA is dependent on location of the role players which is measured as travelling distance between them. Therefore, after calculating the durations as described in Table 3-4, the data were expanded into a crammed table. Figure 3-6 (a) and (b) illustrates all the data prepared for analyses.

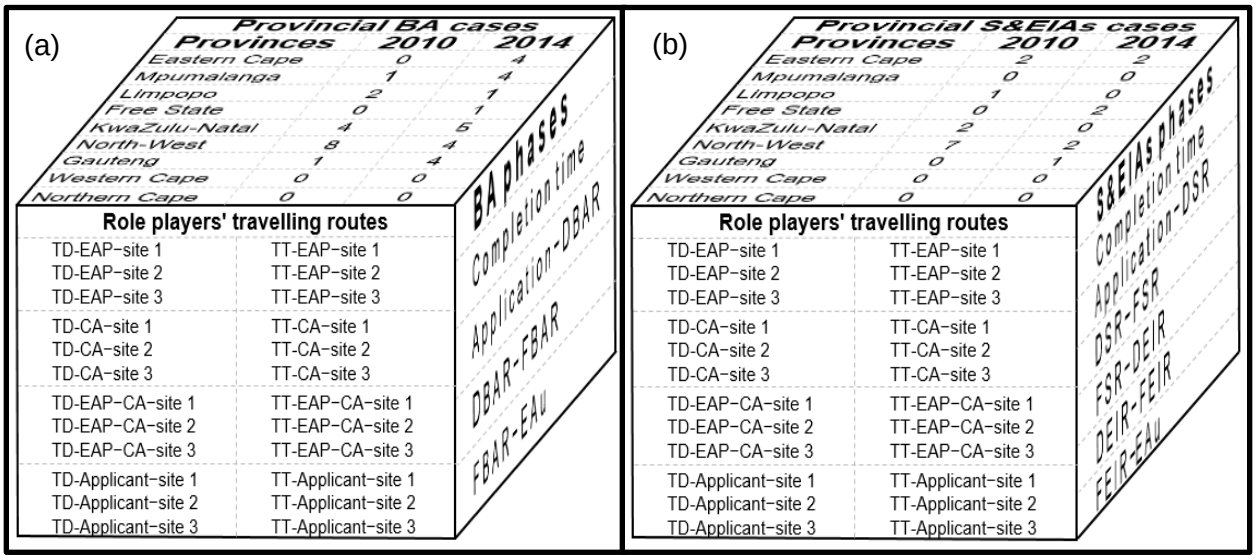

Figure 3-6: (a) Variables for basic assessment analysis and (b) Variables for scoping and environmental impact assessment analysis (refer to Table 3-6–3-8 for definitions of abbreviations). TD: travel distance; TT: travel time; BA: basic assessments; S&EIA: scoping and environmental impact assessments

In order to contextualise the rest of the data refinement it is necessary to understand how Pearson's correlation analysis was used in this study, which is expounded in the next section.

3.2.3. Understanding Pearson's correlation as part of data refinement

The Pearson product-moment correlation (Pearson's correlation) is the most common measure of correlation used in statistics. It identifies the existence of a linear relationship between two variables (Connelly, 2012). However, correlation does not imply causation (Veličkovič, 2015; Connelly, 2012). Correlation can be categorised by considering the changes to one variable as the other variable increases. In this study it is expected that as travelling distance increase completion time will increase as well. For example, a positive correlation suggests that as one variable increases, the other variable has a tendency to increase accordingly. A negative correlation suggests that as one variable increases the other variable has a tendency to decrease. No correlation (r = 0) suggests that as one variable increases the other variable does not tend to increase or decrease (Wall Emerson, 2015).

The principle of Pearson's correlation analysis is to determine the correlation coefficient (r) between two variables. This measures the strength of linear relationships between paired data (Sharma, 2005). The strength of the tendency is measured by the correlation coefficient (r) which can vary from -1 ≥ r ≤ 1. The closer r is to -1, the stronger the inversely proportional relationship that exists between the variables (as one variable increase the other variable decreases) and the closer r is to 1, the stronger the directly proportional relationship is (as one variable increases the other variable increases as well) (Agresti & Kateri, 2011). By using Evans' (1996) guide, the strength of the correlation is described in Table 3-9 for the absolute value of r.

Table 3-9: Strength of correlation according to Evans (1996)

r-value	Relationship strength
0.00–0.19 / -0.00–-0.19	Very weak
0.20–0.39 / -20.00–-0.39	Weak
0.40–0.59 / -0.40–-0.59	Moderate
0.60–0.79 / -0.60–-0.79	Strong
0.80–1.0 / -0.80–-1.0	Very strong

To understand whether the correlated results are a true representation of the datasets, it is important to explore the coefficient of determination (denoted by r^2). In short, this is used to determine the certainty of making predictions from a graph (Crawford, 2006). It represents the percentage of data that is closest to the line of best fit.

Pearson's correlation was used to describe and understand the strength of relationships between the variables. It was applied to calculate the correlation between the travelling distance/time and EIA completion time. After completing the correlations, it was found that the three routes for both travelling distance and time gave similar outcomes. Only the r-values of the travelling distance

between the different role players are illustrated in Table 3-10, since the r-values for travelling times had similar results.

Table 3-10: Correlation coefficients for travelling routes in relation to each other i.e. (a) alternative routes for the travelling distance of EAP to site, (b) alternative routes for the travelling distance of applicant to site (c) alternative travelling distance for competent authority to site and (d) alternative travelling distance for EAP to competent authority of all 36 basic assessment cases; TD: travelling distance; (For ease of reference Table 3-6–3-8 shows the definitions of abbreviations).

(a)

Distance	***TD-EAP–site 1***	***TD-EAP–site 2***	***TD-EAP–site 3***
TD-EAP–site 1			
TD-EAP–site 2	0.99		
TD-EAP–site 3	0.98	0.99	

(b)

Distance	***TD-Applicant–site 1***	***TD-Applicant–site 2***	***TD-Applicant–site 3***
TD-Applicant–site 1			
TD-Applicant–site 2	1.00		
TD-Applicant–site 3	1.00	1.00	

(c)

Distance	***TD-CA–site 1***	***TD-CA–site 2***	***TD-CA–site 3***
TD-CA–site 1			
TD-CA–site 2	1.00		
TD-CA–site 3	1.00	1.00	

(d)

Distance	***TD-EAP–CA 1***	***TD-EAP–CA 2***	***TD-EAP–CA 3***
TD-EAP–CA 1			
TD-EAP–CA 2	1.00		
TD-EAP–CA 3	0.99	1.00	

The first correlation coefficients highlighted shows a very strong relationship (r = 0.99) between the first travelling distance route of EAP to site and the second travelling distance route of EAP to site. Furthermore, for the same role players a very strong relationship (r = 0.98) is seen between the first travelling distance route and the second travelling distance route. Lastly a very strong relationship (r = 0.99) between the second travelling distance route and the third travelling distance route. This shows that the correlations between all three routes are very close. Therefore, it was decided that the averages of the three travelling distance of routes and the three travelling time of routes could be used for analyses.

After running the analyses again, the average travelling distance and time of routes yielded similar outcomes. Table 3-11 (a) and (b), show the r-values for the correlation between travelling distance as well as time and completion time of the BA process.

Table 3-11: (a) Correlations between travel distance of role players and completion time and (b) those between travel time and completion time of all 36 basic assessment cases (refer to Table 3-6–3-8 for definitions of abbreviations)

(a)	
Travel distance	**Completion time**
TD-ES	0,08
TD-AS	-0,30
TD-CS	-0,07
TD-EC	0,34

(b)	
Travel time	**Completion time**
TT-ES	0,08
TT-AS	-0,30
TT-CS	-0,04
TT-EC	0,34

Consequently, it was decided to continue the calculations with the average travelling distance of the three routes only, because it yielded similar results and any form of reduction assisted in simplification of the study. Therefore, travel distance was correlated with completion time of the EIA process and phases. In order to maintain accuracy it was decided that only the provinces with 10 and more EIA datasets will be included in the analysis. After this had been done, Figure 3-6 was simplified considerably as shown in Figure 3-7.

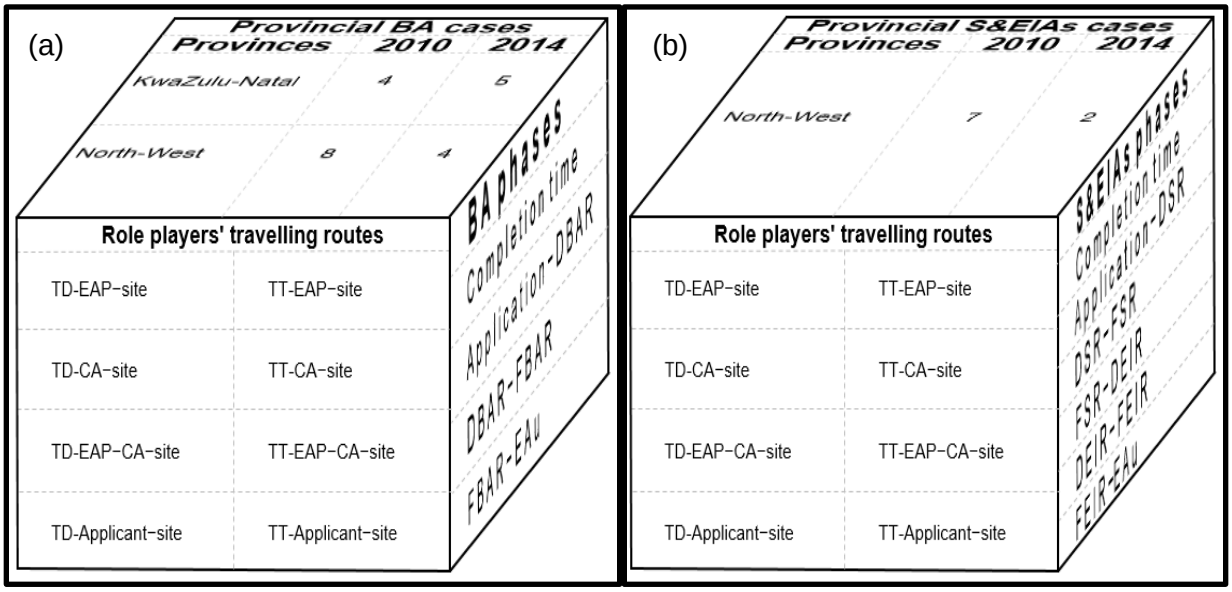

Figure 3-7: (a) Final variables for basic assessment analysis and (b) final variables for scoping and environmental impact assessment analysis (refer to Table 3-6–3-8 for definitions of abbreviations) TD: travelling distance; TT: travelling time; BA: basic assessment; S&EIA: scoping and environmental impact assessment

In comparison with Figure 3-6, the final data for analysis were reduced and refined.

3.3. Chapter summary

This chapter addressed Objective 2 which was to capture a sample of EIA cases from which temporal and location data could be extracted. This was done by sending out a data template to EAPs for completion. In total 55 EIA cases were captured throughout South Africa and to be able to use the data, travel distances and travel times of all the role players were added. This had to be matched to the temporal data from all the phases of the EIA. The data were further refined and simplified by using Pearson's correlation analysis to demonstrate that only the average travel distance variables are needed for analysis. In the next chapter, the results of Pearson's correlation are illustrated in tabular form and the possible relationships between TD and the completion time of EIAs and its phases are demonstrated and discussed.

Chapter 4. Results and discussion

This chapter presents the results obtained from the correlation analyses. It addresses Objective 3 which is to analyse temporal and location data using Pearson's correlation analysis to establish the extent to which location influences the completion time of the environmental impact assessment (EIA) process.

The results are described in four main sections:

1. Results of the correlation between travelling distance and completion time[2] both for the basic assessments and the scoping and environmental impact assessments (S&EIAs).
2. Results obtained from the correlation between travelling distance and the duration[3] of phases for both basic assessments and S&EIAs.
3. Results obtained from the correlation between travelling distance and completion time of the EIA process and duration of phases under the different regulatory regimes.
4. Results from the correlation between travelling distance and completion time of the EIA process and duration of phases for the various provinces for both basic assessments and S&EIAs.

The majority of the correlations were between -0.4 and 0.4, which can be regarded as weak and very weak, respectively, (Evans, 1996). Therefore, the discussion deals only with stronger correlations exceeding 0.4 i.e. moderate and better, except for the first analysis done for travelling distance of the role players versus total completion time for all the EIA cases. Furthermore, the full timelines of EIAs were collected but in certain phases of the EIA process there was no distance factor and these phases were therefore excluded for example the phase from application form submission to application form acceptance. This phase is an administrative procedure. This chapter ends with a conclusion of the results and a full set of all the analysis appears in Appendix B.

[2] Completion time refers to the number of days taken to complete a basic assessment report or a scoping and environmental impact assessment report.
[3] Duration refers to the number of days taken to complete a certain phase in the basic assessment or scoping and environmental impact assessment process.

4.1. Influence of travelling distance on completion time

This correlation describes the strength of the relationship between travelling distance of the various role players and the total completion time of basic assessments and S&EIAs. As seen in the results below, the relationships were weak for most of the correlation analyses.

Table 4-1 shows that the travelling distance for all the role players correlated weakly with the completion time for both basic assessments and S&EIAs.

Table 4-1: Correlation between travelling distance and completion time of basic assessments (BAs) and scoping and environmental impact assessments (S&EIAs); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)	
Distance	**Duration of BAs**	**Duration of S&EIAs**
EAP–site	-0.22	0.08
Applicant–site	-0.12	-0.30
Competent authority–site	0.15	-0.07
EAP–competent authority	-0.01	0.34
	N = 36	N = 19

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

The weak correlations varied, with values of r = -0.30–0.34. This does not support the premise of this study that greater distances would correlate positively with longer completion times.

Because the expected results were not achieved, i.e. to find a relationship between travelling distance and completion time of both basic assessments and S&EIAs, it was necessary to extend the analysis for other permutations, which are described in the followings sections.

4.2. Influence of travelling distance on duration of assessment phases

This analysis investigated the relationship between travelling distance of the role players and the duration of the EIA phases. For ease of reference, Table 4-2 is presented again with the relevant abbreviations for the basic assessment and S&EIA phases that were dealt with in Chapter 3.

Table 4-2: Duration of phases and abbreviations for basic assessments (BAs) and scoping and environmental impact assessments (S&EIAs)

Phase	Description	BA codes	S&EIA codes
Completion time	Total days to complete the environmental impact assessment (EIA), i.e. from application date to environmental authorisation (EAu) date.	CT	CT
Application acceptance to draft basic assessment report (DBAR) or draft scoping report (DSR) submission for BA/S&EIA	Number of days from the application acceptance to the submission date of the DBAR/DSR.	Application–DBAR	Application–DSR
DSR submission to final scoping report (FSR) submission for S&EIA	Number of days from the submission date of the DSR to the submission date of the FSR.		DSR–FSR
FSR submission to draft environmental impact report (DEIR) submission for S&EIA	Number of days from the submission date of the FSR to the submission date of the DEIR.		FSR–DEIR
DEIR submission to final environmental impact report (FEIR) submission for BA	Number of days from the submission date of the DBAR/DEIR to the submission date of the FBAR/FEIR.	DBAR–FBAR	DEIR–FEIR
FEIR submission to EAu for BA	Number of days from the submission date of the FBAR/FEIR to the day EAu was granted.	FBAR–EAu	FEIR–EAu
Regulations	EIAs were divided according to the regulations they were conducted under.	2010 2014	2010 2014
Provincial	EIAs were divided according to the province the environmental assessment practitioner was located in.	Name of province	Name of province

Only weak relationships were found between the travelling distance of the role players and the completion time of EIAs. Therefore, the EIAs were divided according to the duration of the phases to establish whether a relationship exists in one of the phases. Table 4-3 shows a number of strong relationships in the analysis of travelling distance versus duration of S&EIA phases and are as follows: Firstly, there was a moderate inverse relationship ($r = -0.41$) between the travelling distance of the applicant to site and the phase of final scoping report (FSR) submission to draft environmental impact report (DEIR) submission. This suggests that the further away the applicant was from the site, the quicker this phase was completed. Anecdotal evidence shows that some applicants that are far away from the site appoint a project management team close to the site, which helps the process run more smoothly. Another possibility is the fact that the applicant gives high priority to projects which are very far in order to reduce travelling to the site. This might possibly be the reason for the faster completion time of this phase.

Table 4-3: Correlations between travelling distance and duration of phases of scoping and environmental impact assessments (S&EIAs) (Table 4-2 contains the definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)		
Distance	**FSR–DEIR**	**DEIR–FEIR**	**FEIR–EAu**
EAP–site			
Applicant–site	-0.41		0.60
Competent authority–site			0.55
EAP–competent authority		0.41	
	N = 36		

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

Secondly, a moderate positive relationship (r = 0.41) was found between the travelling distance of the environmental assessment practitioner (EAP) to the competent authority and the duration of the phase of DEIR submission to final environmental impact report (FEIR) submission. This suggests that the further away the EAP was from the competent authority, the longer this phase took. EAPs have two choices with regards to submitting the reports: either by making use of courier services, which normally takes two to three days to be delivered, or by submitting the reports themselves, which depends on their schedule. This phase might take longer depending on which method of submission is used. Furthermore, if reports are significantly amended, a letter stating the amendments made should be submitted to the competent authority. These letters are separate from the EIA reports. Therefore, when great distances are involved, scheduling for this additional information to be submitted can possibly extend the duration of the phase.

Thirdly, there was a moderate positive relationship (r = 0.55) between travelling distance of the competent authority to site and the duration of the phase of FEIR submission to environmental authorisation. Some competent authorities require an additional site visit with the EAP. This site visit needs to be scheduled to fit both the competent authority's and the EAP's schedule and when a site is a great distance away, scheduling can play a role in extending the completion time of this phase.

Lastly, a strong positive relationship (r = 0.60) existed between the travelling distance of the applicant to site and duration of the phase of FEIR submission to EAu. This confirms the premise that the further away the applicant was from the site, the longer the phase of FEIR submission to environmental authorisation lasted. This could be explained by the fact that in this phase various aspects need to be finalised, for example, the final layout of the proposed site. This could result

in the applicant having to visit the site again in order to confirm the changes. If the final report is adjusted and changed too often, it could result in an extension of this phase.

4.3. Influence of travelling distance on duration of phases under different regulatory regimes

Table 4-4 shows the analysis of travelling distance versus duration of the phases and total completion time under the different regulatory regimes for basic assessments. A number of strong relationships were found under the 2010 regulations: Firstly, there was a strong inverse relationship (r = -0.68) between the travelling distance of the EAP to site and the phase from application acceptance to the submission of the draft basic assessment report (DBAR). This suggests that the further away the EAP was from the site, the faster this phase was completed, most likely to consolidate the work to avoid additional site visits. This influenced the overall completion time with a moderate inverse relationship of r = -0.55.

Table 4-4: Basic assessment 2010 and 2014 regulations, travelling distance versus duration of phases and total completion time (Tables 4.2 contains the definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)			
	2010 regulations			**2014 regulations**
Distance	**Application–DBA**	**DBA–FBA**	**Completion time**	**Application–DBA**
EAP–site	-0.68		-0.55	
Applicant–site		0.70		
Competent authority–site				0.75
EAP–competent authority	-0.41			0.73
	N = 16			N = 20

Legend

Very weak	0.00–0.19	Weak	0.20–0.39	Moderate	0.40–0.59	Strong	0.60–0.79	Very strong	0.80–1.0
	-0.00–-0.19		-0.20–-0.39		-0.40–-0.59		-0.60–-0.79		-0.80–-1.00

Secondly, a moderate inverse relationship of r = -0.41 existed between the distance of EAP to the competent authority and the phase of application acceptance to DBAR submission. This agrees with the first previous relationship found. This might be due to the fact that the EAP wanted to speed up the work because of the great distances and, therefore, instead of submitting the reports on the exact time frames, the EAP tried to submit more than one document in one trip, meaning that if the EAP should submit the DBAR along with the application, only one visit is necessary instead of two separate visits to the competent authority.

Thirdly, a strong positive relationship (r = 0.70) was found between the travelling distance of the applicant to site and the phase of DBAR submission to final basic assessment report (FBAR) submission. This supports the premise of the study in that the further away the applicant was from the site, the longer certain EIA phases or overall completion time took. This can be linked to the results in Table 4-3, where additional site visits needed to be conducted due to amendments made to the final reports.

Fourth, under the 2014 regulations, a strong positive relationship (r = 0.75) existed between travelling distance of the competent authority to site and the phase from application acceptance to DBAR submission. Figure 4-1 depicts this relationship. In Figure 4-1, zero values can be seen for the phase of application acceptance to DBAR submission. However, in this data set, some phase values had a long duration over a great distance (labelled on the figure) and these outliers resulted in a strong positive relationship in comparison to the other inverse relationships in this phase.

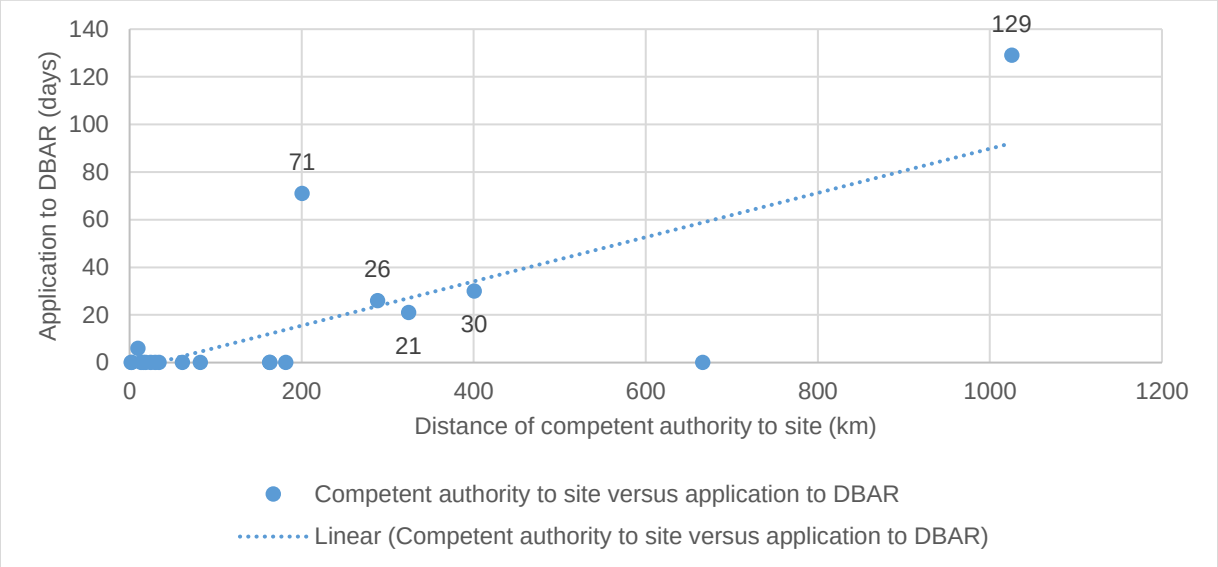

Figure 4-1: Relationship between traveling distance of the competent authority to site and the duration of the phase of application acceptance to draft basic assessment report (DBAR) submission under the 2014 regulations

Lastly under the 2014 regulations, there was a strong positive relationship with a value of 0.73 between the travelling distance of the EAP to the CA and application acceptance to DBAR submission. This could possibly be explained by additional information that needed to be submitted along with the DBAR, possibly resulting in additional trips (courier or manual submission) to the CA.

Table 4-5 illustrates the most pertinent results of the analysis of the travelling distances of the various role players versus the duration of phases and total completion time under the different regulatory regimes for S&EIA. A number of moderate and strong inverse and positive relationships were found under the 2010 EIA regulations for S&EIA and are as follows: A moderate inverse relationship (r = -0.48) existed between the travelling distance of the competent authority to site and the phase from application acceptance to draft scoping report (DSR) submission, suggesting that the further away the competent authority was from the site, the faster the handling of the S&EIA in this phase was.

Table 4-5: Scoping and environmental impact assessment (S&EIA) under 2010 regulations: travelling distance versus duration of phases and total completion time (Table 4.2 contains the definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)				
	S&EIA 2010 regulations				
Distance	**Application–DSR**	**FSR–DEIR**	**DEIR–FEIR**	**FEIR–EAu**	**Completion time**
EAP–site					
Applicant–site		-0.53	-0.58	0.60	-0.43
Competent authority–site	-0.48			0.44	
EAP–competent authority		0.67	0.54		0.44
	N = 12				

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

A moderate inverse relationship (r = -0.53) was found between travelling distance of applicant to site and the phase from FSR submission to DEIR submission. The phase from DEIR submission to FEIR submission also had a moderate inverse relationship (r = -0.58). This agrees with the results in Table 4-3, suggesting that the further away the applicant was from the site, the quicker this phase was completed, most likely because additional site visits were avoided since the proposed site was so far away.

A strong positive relationship (r = 0.67) between the travelling distance of the EAP to the competent authority can also be seen in Table 4-5. Moderate positive relationships were found in the next two phases, firstly for the phase of DEIR submission to FEIR submission (r = 0.54) and secondly for the overall completion time (r = 0.44). This can be explained by the scheduling of additional trips to submit new information to the competent authority.

A positive relationship (r = 0.60) was found for the phase of FEIR submission to environmental authorisation, which agrees with the results in Table 4-3, suggesting that the amendments to the final reports resulted in additional site visits. Overall, a moderate inverse relationship was found for the total duration under the 2010 regulations with a value of r = -0.43. This suggest that the further away the quicker the EIA is handled due to role players prioritising projects that is further away.

A positive relationship (r = 0.44) was found for the phase from FEIR submission to environmental authorisation. This was also seen in the results in Table 4-3 and supports the general premise of the study in that the further away the role player was from the site, the longer the EIA phase lasted.

Table 4-6 shows the analysis of the travelling distance of the role players versus the duration of phases and completion time for the S&EIAs under the 2014 EIA regulations. Firstly, inverse relationships were found between the travelling distance of the EAP to site and (1) application acceptance to DSR submission (r = -0.47) and (2) FSR submission to DEIR submission (r = -0.50). This agrees with the results in Table 4-4 in that the EAP wanted to complete the work during one site visit because of the greater distance. However, positive relationships were found between the distance from EAP to site and the phases of (1) DSR submission to FSR submission (r = 0.78), (2) FEIR submission to environmental authorisation (r = 0.52) and (3) overall completion time (r = 0.46). This can be explained by the fact that the inverse relationship (travelling distance of EAP to site and application acceptance to DSR submission) of the duration of phases were handled more quickly due to the great distance, but the positive relationships (FSR submission to DEIR submission, DSR submission to FSR submission and FEIR submission to environmental authorisation) of the duration of phases and the overall completion time had been extended due to additional site visits.

Table 4-6: Scoping and environmental impact assessment (S&EIA) under 2014 regulations: travelling distance versus duration of phases and total completion time (Tables 4.2 contains the definitions of abbreviations); EAP: environmental assessment practitioner

Pearson's correlation coefficients (r)						
2014 regulations						
Distance	**Application–DSR**	**DSR–FSR**	**FSR–DEIR**	**DEIR–FEIR**	**FEIR–EAu**	**Completion time**
EAP–site	-0.47	0.78	-0.50		0,52	0.46
Applicant–site						
Competent authority–site				0.49		
EAP–competent authority		0.57			0.51	0.42
	N = 7					

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

A moderate positive relationship (r = 0.49) existed between the travelling distance of competent authority to site and the phase of DEIR submission to FEIR submission. This was also seen in the results in Tables 4-3 and for the phase DBAR submission to FBAR submission in Table 4-5, which suggests that scheduling became an issue with greater distances. Moderate positive relationships were further found between the travelling distance of EAP to competent authority and the phases of (1) DSR submission to FSR submission (r = 0.57), (2) DEIR submission to FEIR submission (r = 0.51) and (3) overall completion time (r = 0.42). Results in Tables 4-5 has the same tendency, suggesting that scheduling became an issue when new information had to be submitted to the competent authority.

4.4. Influence of travelling distance on duration of phases and completion time in different provinces

The EIAs (basic assessments and S&EIAs) were grouped according to the provinces in which the EAPs were situated. In this analysis, the sample size of EIA cases was small and it was decided to only discuss the analysis for provinces with more than 10 EIA cases and this only included the North-West province. Therefore, KwaZulu-Natal was included in the discussion although it had nine EIA cases. Stronger relationships existed in this section due to the smaller sampling size.

Table 4-7 shows three moderate to strong relationships: Firstly, a moderate positive relationship (r = 0.53) existed between the travelling distance of the competent authority to site and the phase

of application acceptance to DBAR submission. This is also shown in Table 4-4 and Figure 4-1. In Figure 4-2 a few outliers can be seen which influenced the outcome of this relationship

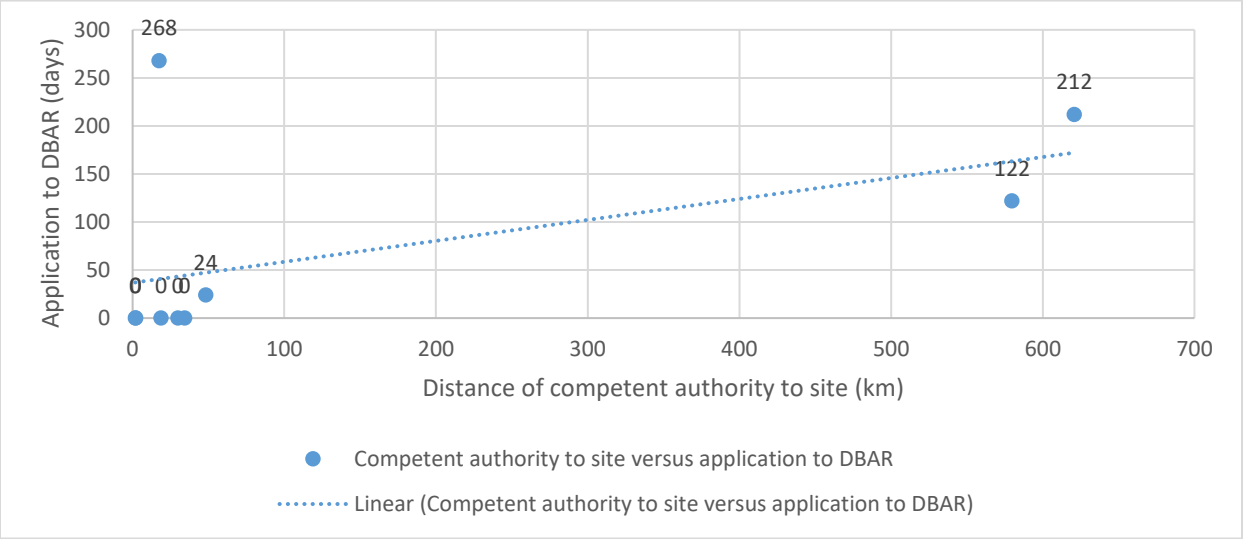

Figure 4-2: Relationship between traveling distance of the competent authority to site and the duration of the phase of application acceptance to draft basic assessment report (DBAR) submission in KwaZulu-Natal

Secondly, this resulted in an overall moderate positive relationship (r = 0.57) for the total completion time of the basic assessment process in KwaZulu-Natal. This suggests that scheduling became an issue when greater distances were involved. Lastly, a strong positive relationship was found between the travelling distance of the applicant to site and the phase of DBAR submission to FBAR submission (r = 0.65). This tendency appears in Tables 4-3, 4-4 and 4-5 and can be associated with scheduling issues due to greater distances.

Table 4-7: Basic assessments in Kwa-Zulu Natal province (Table 4.2 contains definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)		
Distance	**Application–DBAR**	**DBAR–FBAR**	**Completion time**
EAP–site			
Applicant–site		0.65	
Competent authority–site	0.53		0.57
EAP–competent authority			
	N = 9		

Legend

Very weak	0.00–0.19	Weak	0.20–0.39	Moderate	0.40–0.59	Strong	0.60–0.79	Very strong	0.80–1.0
	-0.00–-0.19		-0.20–-0.39		-0.40–-0.59		-0.60–-0.79		-0.80–-1.00

Table 4-8 shows the results of the analysis of the travelling distance of role players versus the duration of phases and completion time of basic assessments conducted in the North-West province. A number of moderate to strong inverse and positive relationships were found: Firstly, a very strong positive relationship existed between the travelling distance of the EAP to site and the phase of DBAR submission to FBAR submission (r = 0.65). This can be linked to the previous tables in that scheduling for site visits when greater distances are involved becomes difficult.

Table 4-8: Basic assessments in North-West province (refer to Table 4-2 for definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)		
Distance	**Application–DBAR**	**DBAR–FBAR**	**Completion time**
EAP–site		0.65	
Applicant–site		0.42	
Competent authority–site	-0.43	0.49	
EAP–competent authority	-0.61		-0.47
	N = 12		

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

Secondly, a moderate positive relationship (r = 0.42) existed between travelling distance of applicant to site and the phase of DBAR submission to FBAR submission. This can be linked to scheduling issues due to greater distances.

Thirdly, travelling distance of competent authority to site had (1) a moderate inverse relationship to the phase from application acceptance to DBAR submission (r = -0.43) and (2) a moderate positive relationship to the phase from DBAR submission to FBAR submission (r = 0.49). This can also be associated with scheduling issues.

Lastly, an inverse relationship (r = -0.61) existed between the travelling distance of EAP to competent authority and the phase of application acceptance to DBAR submission. Since the time frames were mostly led by the EAPs, they had the freedom to manage the EIA process according to their situation. If the competent authority is a great distance away from the EAP, minimising travelling makes sense. This possibly resulted in the above-mentioned inverse relationship and those in Tables 4-3, 4-4, 4-5 and 4-6. This resulted in an overall moderate inverse relationship between the travelling distance of EAP to competent authority and the total completion time (r = -0.47) for basic assessments in North-West.

The results in Table 4-9 for S&EIAs for the relationship between the duration of phases and total EIA completion time in North-West show a number of moderate to strong positive and inverse relationships: Firstly, travelling distance of EAP to site had (1) a very strong positive relationship (r = 0.83) to the phase of application acceptance to DSR submission and (2) a moderate positive relationship (r = 0.40) to the phase of DSR submission to FSR submission. This supports the premise of the study in that greater distances resulted in extended EIA completion time. However, a moderate negative relationship was found between travelling distance of EAP to site and the phase of FSR submission to DEIR submission (r = -0.51). This can be explained by the fact that in this phase the EAP wanted to consolidate the work to avoid additional site visits. Overall, this resulted in a strong positive relationship (r = 0.68) between travelling distance of EAP to site and the overall completion time of the S&EIAs in North-West.

Secondly, the travelling distance of applicant to site had (1) a very strong relationship with the phase of application acceptance to DSR submission (r = 0.95), (2) a moderate positive relationship for the phase of DSR submission to FSR submission (r = 0.52) and (3) a moderate inverse relationship (r = -0.62) with the phase of FSR submission to DEIR submission, possibly due to scheduling in order to avoid additional site visits. This resulted in an overall very strong positive relationship between travelling distance of applicant to site and the total completion time (r = 0.80).

Thirdly, the travelling distance of the competent authority to site had (1) a very strong positive relationship (r = 0.89) with the phase of application acceptance to DSR submission, (2) a strong positive relationship (r = 0.72) with the phase of DSR submission to FSR submission, (3) a strong positive relationship (r = 0.78) with the phase of FEIR submission to environmental authorisation. This resulted in an overall very strong positive relationship between the total completion time and travelling distance of the competent authority to site (r = 0.85). This tendency was also seen in the results in Table 4-3, 4-4, 4-5, 4-6 and 4-7, suggesting that scheduling becomes difficult for additional site visits when greater distances were involved.

Table 4-9: Scoping and environmental assessments (S&EIAs) in North-West province (Table 4.2 contains definitions of abbreviations); EAP: environmental assessment practitioner

	Pearson's correlation coefficients (r)					
Distance	**Application–DSR**	**DSR–FSR**	**FSR–DEIR**	**DEIR–FEIR**	**FEIR–EAu**	**Completion time**
EAP–site	0.83	0.40	-0.51			0.68
Applicant–site	0.95	0.52	-0.62			0.80
Competent authority–site	0.89	0.72			0.78	0.85
EAP–competent authority	0.47	0.97	0.44	0.58		0.72
	N = 9					

Legend

Very weak	Weak	Moderate	Strong	Very strong
0.00–0.19	0.20–0.39	0.40–0.59	0.60–0.79	0.80–1.0
-0.00–-0.19	-0.20–-0.39	-0.40–-0.59	-0.60–-0.79	-0.80–-1.00

Lastly, the travelling distance of EAP to competent authority had a few relationships:

- a moderate positive relationship to the phase of application acceptance to DSR submission (r = 0.47),
- a very strong positive relationship to the phase of DSR submission to FSR submission (r = 0.97),
- a moderate positive relationship to the phase of FSR submission to DEIR submission (r = 0.44), and
- a moderate positive relationship to the phase of DEIR submission to FEIR submission (r = 0.58).

This resulted in a very strong positive relationship between the total completion time and travelling distance of EAP to competent authority (r = 0.72), which corresponds to the results in the previous tables, suggesting that greater distances may result in difficulties in scheduling trips to the competent authority.

From the above results it is apparent that there exist two main themes: Firstly, the positive relationships which were the expected results and suggests the further the role players are from each other the longer the EIA takes. Secondly, the inverse relationships which relates to the EAPs and applicants deciding to give high priority to projects in order to avoid scheduling delays later in the process. This is seen on various levels in the EIA process. Furthermore, the positive relationships found agree with the following authors, stating that EIA is a timely and costly process

(Pope *et al.,* 2013; Morrison-Saunders & Retief, 2012; Retief & Chabalala, 2009; Oosterhuis, 2006; Cashmore, 2004; Gilpin, 2000; Weaver 2003). Department of Environmental Affairs and Tourism (DEAT) 2006 also mentions that efficiency and effectiveness should be improved to address costliness and time delays in the process. Patel, 2009 agrees with this and states that EIA has its advantages, but delays in the process are evident and Retief *et al.,* 2011 mentions that screening is one tool that can be used to reduce the number of projects submitted to the department in order to improve efficiency. A conclusion of the results follows in the next section.

4.5. Chapter conclusion

In total, 39 positive relationships were found, which support the premise of the study, namely that the greater the distance between role players was, the more the EIA completion time was extended. Nonetheless, a total of 13 inverse relationships between travelling distance and completion time were found, which did not support the premise of the study. These inverse relationships can be explained by the fact that the role players consolidated their work in order to minimise travelling due to greater distances. Therefore, the specific role player (mostly the EAP) sped up the EIA process. Therefore, the objective of this study which was to investigate the influence of location on EIAs has been achieved by investigating the extent of the influence of role players' travelling distances on EIA completion time. However, the influence was less pronounced than expected. Hence, other factors influencing duration have to be examined. These factors are highlighted in the next chapter.

Chapter 5. Conclusion

In the literature review, the first objective of this study was addressed. It was established that environmental impact assessment (EIA) effectiveness can be divided into three main themes, namely how well the process works, whether it works as it was originally intended to and whether it achieves the purpose for which it was designed. These themes were further divided into four categories, namely procedural, substantive, normative and transactive effectiveness. For this study, the latter refers to efficiency whether the EIA is completed with the lowest cost in the minimal time frame without compromising its quality. Time is regarded as one of the most important aspects of effectiveness. Another important factor is the location of various aspects in the EIA, i.e. site alternatives, finding the best location for a proposed project and mapping site location. This formed the basis of the study – combining time with a distance factor – and this informed the main premise of the study, i.e. greater distances between EIA role players result in EIAs with longer completion times.

To investigate the main premise of the study, a total of 55 EIA cases were collected via a data template, addressing the second objective, 36 of which were basic assessment cases and the remaining 19 were scoping and environmental impact assessment (S&EIA) cases. These cases were kept separate throughout the study, since they consisted of different phases. Four main role players were identified in this study, namely the environmental assessment practitioner (EAP), applicant, competent authority and the site, which were categorised by the role players who travelled most to each other, namely EAP to site, applicant to site, competent authority to site and EAP to competent authority. Travelling distances for these four groups were obtained. Subsequently, the EIAs were divided into four main groups for correlation analysis namely travelling distance versus completion time, travelling distance versus duration of EIA phases, travelling distance versus the duration of phases and total completion time under the different EIA regulatory regimes (2010 and 2014) and travelling distance versus the duration of phases and total completion time in the different provinces of the EIAs.

Pearson's product-moment correlation was used for statistical analyses, which addressed the third objective, to identify relationships between travelling distance and duration of phases and total completion time of the four main groups. These analyses showed a total of 13 inverse relationships, which did not support the main premise of the study. These inverse relationships were mostly found between the EAP's travelling distance and the duration of various phases and completion time. This suggests that the longer the distance is, the faster the EIA completion time

is. This can be explained by the fact that the EAP/applicant wanted to speed up the EIA process by eliminating additional trips or site visits due to long distances. A total of 36 positive relationships were found, which supports the main premise of the study in that the greater the travelling distance is, the longer the EIA completion time is. This can be supported by the fact that when additional information needs to be submitted, amendments to the projects need to be made or additional site visits need to be conducted; scheduling therefore becomes an issue over greater distances. Overall, it was found that distance played a role in the completion time of the EIA cases. However, the influence was not as significant as expected. The strict time frames of the EIA process do not allow distance to greatly impact on completion time. Therefore, other factors influencing duration need to be explored, such as the influence of cost on duration.

Reference list

Abu-Zeid, K. & Bayoumi, M.N. 1999. A decision support system for environmental impact assessment of irrigation projects. *Irrigation under conditions of water scarcity. vol 1D. 17th ICID international congress on irrigation and drainage, Granada, Spain, 13-17 September 1999.,* 269-280.

Agresti, A. & Kateri, M., 2011. Categorical data analysis. *In International encyclopaedia of statistical science*, Springer Berlin Heidelberg, 206-208.

Ahmad, B. & Wood, C. 2002. A comparative evaluation of the EIA systems in Egypt, Turkey and Tunisia. *Environmental impact assessment review*, 22(3):213-234.

Andre, P., Enserink, B., Connor, D. & Croal, P. 2006. *Public participation international best practice Principles–Special publication series 4, international association for impact assessment: Fargo.*

Anifowose, B., Lawler, D., Van der Horst, D. & Chapman, L. 2014. Evaluating interdiction of oil pipelines at river crossings using environmental impact assessments. *Area*, 46(1):4-17.

Aregbeshola, M., Mearns, K. & Donaldson, R. 2011. Interested and affected parties (I&APs) and consultants' viewpoints on the public participation process of the Gautrain environmental impact assessment (EIA). *Journal of public administration,* (4):1274.

Arnstein, S.R. 1969. A ladder of citizen participation. *Journal of the American Institute of Planners,* 35(4):216-224.

Arts, J., Runhaar, H.A.C., Fischer, T.B., Jha-Thakur, U., Van Laerhoven, F., Driessen, P.P.J. & Onyango, V. 2012. The effectiveness of EIA as an instrument for environmental governance: reflecting on 25 years of EIA practice in the Netherlands and the UK. *Journal of environmental assessment policy and management*, 14(4): 1250025.

Asian Development Bank. 1997. EIA for developing countries. https://www.adb.org/sites/default/files/publication/29779/eia-developing-countries-asia.pdf Date of access: 18 November 2016.

Asplund, E. & Hilding-Rydevik, T. 1996. SEA: integration with municipal comprehensive land-use planning in Sweden. *In Therivel, R. & Partidário, M.R., eds*. The practice of strategic environmental assessment. London: Earthscan. 130-140.

Baker, D.C. & McLelland, J.N. 2003. Evaluating the effectiveness of British Columbia's environmental assessment process for first nations' participation in mining development. *Environmental impact assessment review*, 23(5):581-603.

Bankwatch. 2003. Quality analysis of the EIA for the Sakhalin II Phase 2 Project. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKEwir1eHDk7DQAhWsJMAKHeLLAzUQFggsMAM&url=http%3A%2F%2Fbankwatch.org%2Fdocuments%2FSakhalin_HIA_quality_analysis_devic2003.pdf&usg=AFQjCNGVQESrow4FflblPZuTHnnk_G2Pig&sig2=bB8ueha4veLHAtX2YH9q5Q&bvm=bv.139138859,d.ZGg Date of access: 17 November 2016.

Barker, A. & Wood, C. 1999. An evaluation of EIA system performance in eight EU countries. *Environmental impact assessment review*, 19(4):387-404.

Beiske, B. 2002, Research methods. Uses and limitations of questionnaires, interviews, and case studies, Munich, GRIN Verlag, http://www.grin.com/en/e-book/15458/research-methods-uses-and-limitations-of-questionnaires-interviews-and

Bertelli, J.A. & Mira, J.C. 1995. The grasping test: a simple behavioural method for objective quantitative assessment of peripheral nerve regeneration in the rat. *Journal of neuroscience methods*, 58(1-2):151-155.

Bond, A., Morrison-Saunders, A. & Howitt, R. 2013. Framework for comparing and evaluating sustainability assessment practice. Didcot: Routledge, Taylor and Francis Group.

Bond, A., Morrison-Saunders, A. & Pope, J. 2012. Sustainability assessment: the state of the art. *Impact assessment and project appraisal*, 30(1):53-62.

Bonde, J. & Cherp, A. 2000. Quality review package for strategic environmental assessments of land-use plans. *Impact assessment and project appraisal*, 18(2):99-110.

Brancato, G., Macchia, S., Murgia, M., Signore, M., Simeoni, G., Blanke, K., Körner, T., Nimmergut, A., Lima, P. & Paulino, R. 2006. Handbook of recommended practices for questionnaire development and testing in the European statistical system. European Commission Grant Agreement 200410300002. Luxembourg: Eurostat.

Brown, G., Strickland-Munro, J., Kobryn, H. & Moore, S.A. 2017. Mixed methods participatory GIS: an evaluation of the validity of qualitative and quantitative mapping methods. *Applied geography*, (79):153-166.

Canelas, L., Almansa, P., Merchan, M. & Cifuentes, P. 2005. Quality of environmental impact statements in Portugal and Spain. *Environmental impact assessment review*, 25(3):217-225.

Canter, L.W. & Atkinson, S.F. 2011. Multiple uses of indicators and indices in cumulative effects assessment and management. *Environmental impact assessment review,* 31(5):491-501.

Cashmore, M., Gwilliam, R., Morgan, R., Cobb, D. & Bond, A. 2004. The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory. *Impact assessment and project appraisal*, 22(4):295-310.

Cashmore, M., Richardson, T., Hilding-Ryedvik, T. & Emmelin, L. 2010. Evaluating the effectiveness of impact assessment instruments: theorising the nature and implications of their political constitution. *Environmental impact assessment review*, 30(6):371-379.

Chang, T., Nielsen, E., Auberle, W. & Solop, F.I. 2013. A quantitative method to analyse the quality of EIA information in wind energy development and avian/bat assessments. *Environmental impact assessment review*, (38):142-150.

Collotta, M., Champagne, P., Mabee, W., Tomasoni, G., Alberti, M., Busi, L. & Leite, G.B. 2016. Environmental assessment of co-location alternatives for a microalgae cultivation plant: a case study in the city of Kingston (Canada). *Energy procedia*, (95):29-36.

Connelly, L.M. 2012. Correlations. Medsurg nursing: official journal of the Academy of Medical-Surgical Nurses. 21(3):171-172.

Craik, N. 2008. The international law of environmental impact assessment: process, substance and integration. Cambridge, UK: Cambridge University Press.

Crawford, S.L. 2006. Correlation and regression. *Circulation*, 114(19):2083-2088.

Crookes, D. & De Wit, M. 2002. Environmental economic valuation and its application in environmental assessment: an evaluation of the *status quo* with reference to South Africa. *Impact assessment and project appraisal*, 20(2):127-134.

Curran, J.M., Wood, C. & Hilton, M. 1998. Environmental appraisal of UK development plans: current practice and future directions. *Environment and planning B: urban analytics and city science*, 25(3):411-433.

Dangi, M.B., Fernandez, D., Bom, U.B., Belbase, S. & Kaphle, R. 2015. Evaluation of environmental impact assessment report preparation and public participation in landfill projects in Nepal. *Habitat international*, 4672-81.

Davidson, J. 2011. The contribution of EIA to decision making: a critical analysis of EIA refusals in South Africa. Potchefstroom: NWU. (Mini-dissertation – Master of Environmental Management).

Del Campo, A.G. 2008. Incorporating spatial data and GIS to improve SEA of land use plans: opportunities and limitations: case studies in the Republic of Ireland. Dublin: Dublin Institute of Technology. (Thesis – PhD).

Del Campo, A.G. 2012. GIS in environmental assessment: a review of current issues and future needs. *Journal of environmental assessment policy and management*, 14(1):1250007.

Department of Environmental Affairs. 2010. Amendments to the Environmental Impact assessment regulations and listing notices. Government Gazette 33306, GN No. R. 543. 30 July 2010. Government printer: Pretoria.

Department of Environmental Affairs. 2014. Amendments to the Environmental Impact Assessment Regulations and listing notices. Government Gazette 38282, GN No. R. 982. 4 December 2014. Government printer: Pretoria.

Department of Environmental Affairs and Tourism. 2006. Environmental protection: quicker, simpler, better new EIA regulations for South Africa. http://www.environment.gov.za/NewsMedia/MedStat/2006Apfl9/19042006.htm Date of access: 10 November 2017.

Diab, R.D., Ellery, W.N., Tooley, J., McKenzie, A. & Barnes, K. 1999. The no development option versus the development option in an underdeveloped area. *Impact assessment and project appraisal*, 17(3):243-250.

Doelle, M. & Sinclair, A.J. 2006. Time for a new approach to public participation in EA: Promoting cooperation and consensus for sustainability. Environmental impact assessment review, 26(2):185-205.

Emmelin, L. 2006. Effective environmental assessment Tools–critical reflections on concepts and practice.

Enserink, B. & Monnikhof, R.A.H. 2003. Information management for public participation in co-design processes: evaluation of a Dutch example. *Journal of environmental planning and management*, 46(3):315-344.

Evans, J.D. 1996. Straightforward statistics for the behavioural sciences. Brooks/Cole.

Fischer, D. 2015. One environmental system. Presented at the annual IAIA conference. 10 August 2015. http://www.elasa.co.za/uploads/1/1/8/2/11823994/d.fischer.pdf Date of access: 9 November 2017.

Fraser, J.L., Thompson, G.G. & Moro, D. 2003. Adequacy of terrestrial fauna surveys for the preparation of environmental impact assessments in the mining industry of western australia. *Ecological management & restoration,* 4(3):187-192.

Geneletti, D. 2002. Ecological evaluation for environmental impact assessment. Koninklijk Nederlands Aardrijkskundig Genootschap.

Gibson, R.B. 1992. Environmental assessment design: lessons from the Canadian experience. *Environmental & resource economics*, 2(6):12-24.

Gilpin, A. 2000. Environmental economics: A critical overview. Wiley New York.

Glasson, J. & Therivel, R. 1997. EIA-learning from experience: Changes in the quality of environmental impact statements for UK planning projects. *Journal of environmental planning & management,* 40(4):451. SocINDEX with Full Text, EBSCO*host*, viewed 17 November 2016.

Glasson, J., Therivel, R. & Chadwick, A. 2005. Introduction to environmental impact assessment. [electronic resource]. London: Routledge, 2005; 3rd ed.

Glasson, J., Therivel, R. & Chadwick, A. 2012. Introduction to environmental impact assessment. Milton Park, Abingdon, Oxon; New York: Routledge, c2012; 4th ed.

Glazewski. J. 2005. Environmental law in South Africa, Durban: LexisNexis Butterworths, 3-24.

Glucker, A.N., Driessen, P.P., Kolhoff, A. and Runhaar, H.A., 2013. Public participation in environmental impact assessment: why, who and how? *Environmental Impact Assessment Review*, (43):104-111.

González, A., Gilmer, A., Foley, R., Sweeney, J. & Fry, J. 2011. Applying geographic information systems to support strategic environmental assessment: opportunities and limitations in the context of Irish land-use plans. *Environmental impact assessment review*, 31(3):368-381.

Hallatt, T.W., Retief, F.P. & Sandham, L.A. 2015. The quality of biodiversity inputs to EIA in areas with high biodiversity value – experience from the Cape Floristic Region, South Africa. *Journal of environmental assessment policy and management*, 17(3):1550025.

Hansen, E. & Wood, G. 2016. Understanding EIA scoping in practice: a pragmatist interpretation of effectiveness. *Environmental impact assessment review*, (58):1-11.

Hartley, N. & Wood, C. 2005. Public participation in environmental impact assessment—implementing the aarhus convention. *Environmental impact assessment review,* 25(4):319-340.

Heinma, K. & Põder, T. 2010. Effectiveness of environmental impact assessment system in Estonia. *Environmental impact assessment review*, 30(4):272-277.

Hildebrandt, L. & Sandham, L.A. 2014. Social impact assessment: the lesser sibling in the South African EIA process? *Environmental impact assessment review*, (48):20-26.

Home, I. 2000. A South African developers guide to environmental impact assessment. Johannesburg: Environmental Impact Management Services.

International Association for Impact Assessment. 2007. EIA follow-up International best practice principles. Special publication series no 6. http://www.iaia.org/uploads/pdf/SP6_1.pdf Date of access: 12 July 2016.

International finance corporation. 2003. The social and environmental impact assessment report. http://www.ifc.org/wps/wcm/connect/296ae980488551f5aa0cfa6a6515bb18/ESIA.pdf?MOD=AJPERES Date of access: 17 N0vember 2016.

Jay, S., Jones, C., Slinn, P. & Wood, C. 2007. Environmental impact assessment: retrospect and prospect. *Environmental impact assessment review*, 27(4):287-300.

Johnson, B. & Turner, L.A. 2003. Data collection strategies in mixed methods research. (*In* Tashakkori, A. & Teddlie, T., *eds*. Handbook of mixed methods in social and behavioral research. Thousand Oaks, CA: SAGE. p. 297-319).

Kabir, S.M.Z. & Momtaz, S. 2013. Fifteen years of environmental impact assessment system in Bangladesh: Current practice, challenges and future directions. *Journal of environmental assessment policy and management,* (4):1.

Kamijo, T. & Huang, G. 2016. Improving the quality of environmental impacts assessment reports: Effectiveness of alternatives analysis and public involvement in JICA supported projects. *Impact assessment & project appraisal,* 34(2):143-151.

Kidd, M. & Retief, F.P. 2009. Environmental assessment. (*In* Strydom H.A. & King N.D., *eds*. Fuggle and Rabie's environmental management in South Africa. 2nd ed. Cape Town: Juta, 971-1047.

Kolhoff, A.J., Driessen, P.P.J. & Runhaar, H.A.C. 2013. An analysis framework for characterizing and explaining development of EIA legislation in developing countries—illustrated for Georgia, Ghana and Yemen. *Environmental impact assessment review*, (38):1-15.

Kolhoff, A.J., Runhaar, H.A.C., Gugushvili, T., Sonderegger, G., Van der Leest, B. & Driessen, P.P.J. 2016. The influence of actor capacities on EIA system performance in low and middle-income countries—cases from Georgia and Ghana. *Environmental impact assessment review*, (57):167-177.

Koornneef, J., Faaij, A. & Turkenburg, W. 2008. The screening and scoping of environmental impact assessment and strategic environmental assessment of carbon capture and storage in the netherlands. *Environmental impact assessment review,* 28(6):392-414.

Kruger, R. 2012. A critical analysis of the quality of EIA reports for filling stations in South Africa. Potchefstroom: NWU. (Mini-dissertation: Masters in Environmental Management).

Lawrence, D.P. 1997. Quality and effectiveness of environmental impact assessments: lessons and insights from ten assessments in Canada. *Project appraisal*, 12(4):219-232.

Lee, N. 2000. Reviewing the quality of environmental assessments. (*In* Lee, N. & George, C., *eds*. Environmental assessment in developing and transitional countries. Chichester: Wiley & Sons, 137-148.

Lee, N. & Colley, R. 1992. Reviewing the quality of environmental statements. Occasional paper no. 24. 2nd ed. Manchester: EIA Centre, University of Manchester.

Lee, N. & George, C., eds. 2000. Environmental assessment in developing and transitional countries: principles, methods and practice. Chichester: John Wiley & Sons

Lee, N., Colley, R., Bonde, J. & Simpson, J. 1999. Reviewing the quality of environmental statements and environmental appraisals. Occasional paper No 55. Manchester: EIA Centre, Department of Planning and Landscape, University of Manchester.

Lyhne, I. 2011. Between policy-making and planning: SEA and strategic decision-making in the Danish energy sector. *Journal of environmental assessment policy and management*, 13(3):319-341.

Macleod, F., 2006a. Ministries aim to trash green laws. Mail and Guardian [online], 20 March. Available from: http://www.mg.co.za/articlePage.aspx?articleid=267189&area=/ insight/insight_national Date of accessed 13 November 2017.

Macleod, F., 2006b. Mbeki joins assault on green laws. Mail and Guardian [online], 7 August. Available from: http://www.mg.co.za/articlePage.aspx?articleid=280008&area=/ insight_national Date of accessed 13 November 2017.

Marais, M., Retief, F.P., Sandham, L.A. & Cilliers, D.P. 2015. Environmental management frameworks: Results and inferences of report quality performance in south africa. *South african geographical journal,* 97(1):83-99.

Meyer, S.M. 1995. The economic impact of environmental regulation. *Journal of environmental law & practice,* 3(2):4-15.

Middle, G. & Middle, I. 2010. The inefficiency of environmental impact assessment: Reality or myth? *Impact assessment & project appraisal,* 28(2):159-168.

Morgan, R.K. 2012. Environmental impact assessment: the state of the art. *Impact assessment and project appraisal*, 30(1):5-14.

Morrison-Saunders, A. & Arts, J. 2004. (eds.) Assessing Impact: Handbook of EIA and SEA Follow-up, Earthscan James & James, London.

Morrison-Saunders, A. & Retief, F. 2012. Walking the sustainability assessment talk—progressing the practice of environmental impact assessment (EIA). *Environmental impact assessment review*, (36):34-41.

Morrison-Saunders, A., Annandale, D. & Cappelluti, J. 2001. Practitioner perspectives on what influences EIA quality. *Impact assessment and project appraisal*, 19(4):321-325.

Mwalyosi, R. & Huges, R. 1998. Environmental impact assessment and stakeholder involvement: International institute for environment and development. *Environment planning issues,* (11).

Nagle, B. & Williams, N. 2013. Methodology brief: introduction to focus groups. Lawrence: KS: Center for assessment, planning and accountability, University of Kansas.

Nduonofit, L.E., Nkpah, Y.A. & Ekpenyong, O.A. 2015. Limitations and drawbacks of nigeria's environmental protection law (1980 - 2010). *International journal of innovative environmental studies research,* 3(1):14-20.

O'Faircheallaigh, C. 2010. Public participation and environmental impact assessment: purposes, implications, and lessons for public policy making. *Environmental impact assessment review*, 30(1):19-27.

Ogola, P.F.A., 2007. Environmental impact assessment general procedures. *Short Course II on Surface Exploration for Geothermal Resources, organized by UNUGTP and KenGen, at Lake Naivasha, Kenya*, 2-17.

Oosterhuis, F. 2006. Costs and benefits of the EIA directive. https://pdfs.semanticscholar.org/1363/673edc414a88df6456866f69f9aa96b03a02.pdf Date of access: 9 November 2017.

Oxford English Dictionary. 2016a. Effectiveness. https://en.oxforddictionaries.com/definition/effectiveness Date of access: 27 Jun. 2016.

Oxford English Dictionary. 2016b. Location. https://en.oxforddictionaries.com/definition/location Date of access: 27 Jun. 2016.

Oxford English Dictionary. 2016c. Quality. https://en.oxforddictionaries.com/definition/quality Date of access: 27 Jun. 2016.

Patel, Z. 2009. Environmental justice in South Africa: Tools and trade-offs. *Social dynamics,* 35(1):94-110.

Patil, A.A., Annachhatre, A.P. & Tripathi, N.K. 2002. Comparison of conventional and geo-spatial EIA: a shrimp farming case study. *Environmental impact assessment review*, 22(4):361-375.

Phillips, J. 2011. The conceptual development of a geocybernetic relationship between sustainable development and environmental impact assessment. *Applied geography,* 31(3):969-979.

Phoolcharoen, S. 2007. EIA follow-up. http://projekter.aau.dk/projekter/files/12657750/siam_final_10_semester_thesis.pdf Date of access: 8 November 2017

Phylip-Jones, J. & Fischer, T.B. 2013. EIA for wind farms in the United Kingdom and Germany. *Journal of environmental assessment policy and management*, 15(2): 1340008 .

Pickard, A. 2012. Research methods in information. Facet publishing.

Pineschi, L. 2001. Chapter 15: The duty of prior environmental impact assessment of antarctic activities under the madrid protocol and its implementation in the italian legal system. *Environmental contamination in antarctica,* 363-380.

Pinho, P., McCallum, S. & Cruz, S.S. 2010. A critical appraisal of EIA screening practice in EU member states. *Impact assessment and project appraisal,* 28(2):91-107.

Pölönen, I., Hokkanen, P. & Jalava, K. 2011. The effectiveness of the Finnish EIA system—what works, what doesn't, and what could be improved? *Environmental impact assessment review*, 31(2):120-128.

Pope, J., Bond, A., Morrison-Saunders, A. & Retief, F. 2013. Advancing the theory and practice of impact assessment: setting the research agenda. *Environmental impact assessment review*, (41):1-9.

Ramjeawon, T. & Beedassy, R. 2004. Evaluation of the EIA system on the Island of Mauritius and development of an environmental monitoring plan framework. *Environmental impact assessment review*, 24(5):537-549.

Retief, F. 2006. The quality and effectiveness of Strategic Environmental Assessment (SEA) as a decision-aiding tool for national park expansion—the greater Addo Elephant National Park case study. *Koedoe*, 49(2):103-122.

Retief, F. 2007a. A performance evaluation of strategic environmental assessment (SEA) processes within the South African context. *Environmental impact assessment review*, 27(1):84-100.

Retief, F. 2007b. Effectiveness of strategic environmental assessment (SEA) in South Africa. *Journal of environmental assessment policy and management*, 9(1):83-101.

Retief, F. 2010. The evolution of environmental assessment debates: critical perspectives from South Africa. *Journal of environmental assessment policy and management*, 12(4):375-397.

Retief, F. & Chabalala, B. 2009. The cost of environmental impact assessment (EIA) in South Africa. *Journal of environmental assessment policy and management*, 11(1):51-68.

Retief, F., Welman, C.N.J. & Sandham, L. 2011. Performance of environmental impact assessment (EIA) screening in south africa : A comparative analysis between the 1997 and 2006 EIA regimes. *South african geographical journal / suid-afrikaanse geografiese tydskrif,* (2):154.

Ritchie, J. & Spencer, L. 2002. Qualitative data analysis for applied policy research. *The qualitative researcher's companion,* 573(2002):305-329.

Runhaar, H. & Driessen, P.P.J. 2007. What makes strategic environmental assessment successful environmental assessment? The role of context in the contribution of SEA to decision-making. *Impact assessment and project appraisal*, 25(1):2-14.

Runhaar, H., Van Laerhoven, F., Driessen, P. & Arts, J. 2013. Environmental assessment in The Netherlands: effectively governing environmental protection? A discourse analysis. *Environmental impact assessment review*, (39):13-25.

Sadler, B. 1996. Environmental assessment in a changing world: evaluating practice to improve performance. International study of the effectiveness of environmental assessment: final report. Ottawa: Minister of Supply and Services Canada.

Sadler, B. 2004. On evaluating the success of EIA and SEA. (*In* Morrison-Saunders, A. & Arts, J., *eds.* Assessing impact: handbook of EIA and SEA follow-up. London: Earthscan. p. 248-285.

Sánchez-Lozano, J.M., Teruel-Solano, J., Soto-Elvira, P.L. & García-Cascales, M.S. 2013. Geographical Information Systems (GIS) and Multi-Criteria Decision Making (MCDM) methods for the evaluation of solar farms locations: case study in south-eastern Spain. *Renewable and sustainable energy reviews*, (24):544-556.

Sandham, L.A. & Pretorius, H.M. 2008. A review of EIA report quality in the North-West province of South Africa. *Environmental impact assessment review*, 28(4-5):229-240.

Sandham, L.A., Van Der Vyver, F. & Retief, F.P. 2013a. The performance of environmental impact assessment in the explosives manufacturing industry in South Africa. *Journal of environmental assessment policy and management*, 15(3):1350013.

Sandham, L.A., Carroll, T.H. & Retief, F.P. 2010. The contribution of Environmental Impact Assessment (EIA) to decision making for biological pest control in South Africa – the case of *Lantana camara*. *Biological control*, 55(2):141-149.

Sandham, L.A., Hoffmann, A.R. & Retief, F.P. 2008a. Reflections on the quality of mining EIA reports in South Africa. *Journal of the Southern African Institute of Mining and Metallurgy*, 108(11):701-706.

Sandham, L.A., Moloto, M.J. & Retief, F.P. 2008b. The quality of environmental impact reports for projects with the potential of affecting wetlands in South Africa. *Water SA*, 34(2):155-162.

Sandham, L.A., Van Heerden, A.J., Jones, C.E., Retief, F.P. & Morrison-Saunders, A.N. 2013b. Does enhanced regulation improve EIA report quality? Lessons from South Africa. *Environmental impact assessment review*, (38):155-162.

Shakil, S.H. & Ananya, T.H. 2015. Effectiveness of environmental impact assessment (EIA): Bangladesh perspective. *Bangladesh e-journal of sociology*, 12(1):115-125.

ShanShan, Y. 2008. Public participation in the chinese environmental impact assessment (EIA) system: The Chinese environmental impact assessment (EIA) system includes projects EIAs and plan EIAs which are legally required in china. *Journal of environmental assessment policy and management,* 10(1):91-113.

Sharma, A.K. 2005. Text book of correlations and regression. New Delhi: Discovery Publishing House.

Shepherd, A. & Bowler, C. 1997. Beyond the requirements: improving public participation in EIA. *Journal of environmental planning and management*, 40(6):725-738.

Simpson, J. 2001. Developing a review package to assess the quality of EA reports of Local Authority structure and local plans in the UK. *Environmental impact assessment review*, 21(1):83-95.

Sizo, A., Noble, B.F. & Bell, S. 2016. Strategic environmental assessment framework for landscape-based, temporal analysis of wetland change in urban environments. *Environmental management*, 57(3):696-710.

South Africa. 1989. Environment Conservation Act (ECA), Act no. 73 of 1989, Government Printer, Pretoria.

South Africa. 1997. Regulations regarding activities identified under Section 21(1) of the Environment Conservation Act, 1989 (73 van 1989). (Notice R 1183). *Government Gazette*, 8261, 5 September.

South Africa. 1998. National Environmental Management Act, 1998 (Act no.107 of 1998). Environmental assessment regulations. Government Printer, Pretoria.

South Africa. 2002. The Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002, Government Printer, Pretoria.

South Africa. 2006. National Environmental Management Act, 1998 (Act no.107 of 1998). Environmental assessment regulations. *Government Gazette*, 385. Government Printer, Pretoria.

South Africa. 2010. National Environmental Management Act, 1998 (Act no.107 of 1998). Environmental assessment regulations. (Notice R 543). *Government Gazette*, 33306, 18 June.

South Africa. 2014. Environmental impact assessment regulations. (Notice R 982). *Government Gazette*, 38282, 4 December.

South Africa. 2017. National Environmental Management Act 1998 (Act no. 107 of 1998). Environmental assessment regulations. (Notice R 326). *Government Gazette*, 40772, 7 April.

Stoll-Kleemann, S. & O'Riordan, T. 2002. From participation to partnership in biodiversity protection: experience from Germany and South Africa. *Society & natural resources*, 15(2):161-177.

Strategic Business Partnership. 2005. Main report: counting the cost of red tape for business in South Africa. Johannesburg: Strategic Business Partnership.

Summit Earth. 1992. Agenda 21. *The united nations programme for action from Rio.*

Tashakkori, A. & Teddlie, C. 2010. Sage handbook of mixed methods in social & behavioural research. Sage.

Teddlie, C. & Yu, F. 2007. Mixed methods sampling a typology with examples. *Journal of mixed methods research,* 1(1):77-100.

Van Doren, D., Driessen, P.P.J., Schijf, B. & Runhaar, H.A.C. 2013. Evaluating the substantive effectiveness of SEA: towards a better understanding. *Environmental impact assessment review*, (38):120-130.

Vanderhaegen, M. & Muro, E. 2005. Contribution of a European spatial data infrastructure to the effectiveness of EIA and SEA studies. *Environmental impact assessment review*, 25(2):123-142.

Veličkovič, V.M. 2015. What everyone should know about statistical correlation. *American scientist*, 103(1):26.

Wall Emerson, R. 2015. Causation and Pearson's correlation coefficient. *Journal of visual impairment & blindness*, 109(3):242-244.

Wanderer, T. & Herle, S. 2015. Creating a spatial multi-criteria decision support system for energy related integrated environmental impact assessment. *Environmental impact assessment review*, (52)2-8.

Weaver, A. 2003. EIA and sustainable development: Key concepts and tools. *Environmental impact assessment in Southern Africa,* 1-7.

Wood, C. 1999. Pastiche or postiche? Environmental impact assessment in South Africa. *South African geographical journal*, 81(1):52-59.

Wood, C. 2003. Environmental impact assessment: a comparative review. London: Pearson Education.

Wood, C. & Coppell, L. 1999. An evaluation of the Hong Kong environmental impact assessment system. *Impact assessment and project appraisal*, 17(1):21-31. Worley, B. 2016. Sub random methods for multidimensional nonuniform sampling. *Journal of magnetic resonance*, (269):128-137.

Appendix A: Data template

Data template

No.	Name of EIA	Type of Project	BAR or S&EIR	Province	Regulation	Application submission	Application acceptance	Draft Scoping Submission	Final scoping report submission	Scoping report received by department	Scoping acceptance received	Draft EIR/BAR Submission	Final EIR/BAR submission	Department received final BAR/EIR	Authorisation on Final EIR/BAR	Location of EAP	Location of Applicant	Location of Competent Authority	Nearest Town to Site	Coordinates of the site	
1	Hanover Housing Development	Housing Development	BAR	North West	2010	21 January 2014	24 January 2014	N/A	N/A	N/A	N/A	31 March 2014	05 June 2014	06 June 2014	20 August 2014	Potchefstroom	Emalangeni Local Municipality	Kimberley	Hanover	31 04'30,55"S	24 26'54,62"E
2	Brits town Housing Development	Housing Development	BAR	North West	2010	22 January 2014	25 January 2014	N/A	N/A	N/A	N/A	01 April 2014	05 June 2014	06 June 2014	12 August 2014	Potchefstroom	Emalangeni Local Municipality	Kimberley	Brits town	30 34'54,34"S	23 30'00.34"E
3	De Aar 1000 Housing Development	Housing Development	BAR	North West	2010	23 January 2014	26 January 2014	N/A	N/A	N/A	N/A	02 April 2014	05 June 2014	06 June 2014	25 September 2014	Potchefstroom	Emalangeni Local Municipality	Kimberley	De Aar	30 38'24,03"S	24 00'35,06"E
4	De Aar 1400 Housing Development	Housing Development	BAR	North West	2010	24 January 2014	03 February 2014	N/A	N/A	N/A	N/A	03 April 2014	05 June 2014	06 June 2014	08 July 2014	Potchefstroom	Emalangeni Local Municipality	Kimberley	De Aar	30 39'39,55"S	24 01'55,60"E
5	Ferdies Petrol station	Filling Station and Centre	BAR	North West	2010	17 April 2014	24 April 2014	N/A	N/A	N/A	N/A	21 November 2014	21 January 2015	22 January 2015	18 June 2015	Potchefstroom	Potchefstroom	Potchefstroom	Potchefstroom	26 42'26"S	27 07'3,3"E
6	Dreamland Piggery	Expansion of piggery	BAR	North West	2010	15 April 2014	22 April 2014	N/A	N/A	N/A	N/A	14 November 2014	21 January 2015	22 January 2015	17 April 2015	Potchefstroom	Vanderbijl Park	Johannesburg	Vanderbijl Park	26.72583˚	27.70054˚
7	NWU Sport grounds	Sport grounds development	BAR	North West	2010	21 July 2014	29 July 2014	N/A	N/A	N/A	N/A	24 September 2014	06 November 2014	07 November 2014	19 December 2014	Potchefstroom	Potchefstroom	Potchefstroom / Mafikeng	Potchefstroom	26 41'27"S	27 04'37"E
8	MALU Matlabane Piggery	Expansion of piggery	BAR	North West	2014	14 April 2015	21 April 2015	N/A	N/A	N/A	N/A	17 May 2015	30 June 2015	01 July 2015	22 September 2015	Potchefstroom	Kimberley	Mafikeng	Bloemhof	27 41'44"S	25 22'47"E

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9	Thabazimbi Pipeline	Potable Pipeline	BAR	North West	2014	27 January 2016	05 February 2016	N/A	N/A	N/A	N/A	26 February 2016	22 April 2016	23 April 2016	20 May 2016	Potchefstroom	Rustenburg	Polokwane	Thabazimbi	24 36'5,9"S	27 24'16,7"E
10	Proposed Township Wolmaransstad	Township Establishment	S&EIR	North West	2014	15 October 2015	20 October 2015	23 October 2015	23 November 2015	24 November 2015	02 December 2015	20 January 2016	17 March 2016	22 March 2016	18 May 2016	Potchefstroom	Makwassie Wolmaransstad	Potchefstroom	Wolmaransstad	27 12'06.9"S	25 58'02.3"E
11	VKB Storage facilities, Villiers, Free State	Storage units	BAR	North West	2010	17 June 2015	29 June 2015	N/A	N/A	N/A	N/A	17 July 2015	15 September 2015	28 September 2015	04 February 2016	Potchefstroom	Villiers, Free State	Bloemfontein, Free State	Villiers	27°02'01.83"S	28°36'38.27"E
12	Ngwathe Township Establishment	Township Establishment	S&EIR	North West	2010	15 June 2013	14 July 2013	24 July 2013	23 September 2013	12 November 2013	13 December 2013	21 January 2014	24 March 2014	07 April 2014	14 June 2014	Potchefstroom	Parys, Free State	Bloemfontein, Free State	Parys	26°55'38.35"S	27°28'00.69"E
13	Thomas River Wind Energy Facility	Renewable Energy	S&EIR	Eastern Cape	2010	10 November 2010	25 November 2010	02 December 2010	02 February 2011	18 February 2011	23 March 2011	15 July 2011	14 September 2011	28 September 2011	09 July 2012	East London	Port Elizabeth	Pretoria	Stutterheim	32 22'08.97"S;	27 20'30.39"E
14	Kidds Beach Retirement Village	Development	BAR	Eastern Cape	2014	05 February 2016	01 March 2016	N/A	N/A	N/A	N/A	29 February 2016	07 April 2016	08 April 2016	08 August 2016	Gulu, Eastern Cape	East London, Eastern Cape	East London, Eastern Cape	Kidds Beach	33° 8'35.88"S	27°41'38.15"E
15	Richards Bay Wind Farm	Wind Farm	S&EIR	Eastern Cape	2010	01 May 2011	01 June 2011	15 June 2011	01 July 2011	11 July 2011	01 August 2011	01 February 2012	01 April 2012	02 April 2012	01 June 2012	East London	Durban	Pretoria	Empangeni	28°41'46.48"S	31°55'58.92"E
16	Proposed Upgrade of the Debe Water Supply Scheme in Nkonb\kobe Local Municipality, Eastern Cape	Potable water pipeline upgrade	BAR	Eastern Cape	2014	21 October 2015	27 October 2015	N/A	N/A	N/A	N/A	04 March 2016	07 March 2016	15 April 2016	29 July 2016	East London	East London	Pretoria (National DEA)	Dambisa	32 50'26.8"S	27 14'13.0"E
17	BCMM Haven Hills Cemetery Extension	Cemetery Extension	BAR	Eastern Cape	2014	17 March 2016	21 April 2016	N/A	N/A	N/A	N/A	17 March 2016	13 May 2016	14 May 2016	15 August 2016	East London	East London	East London	East London (Haven Hills)	33 0'26,34"S	27 51'25,08"E

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18	Basic Assessment Report for the proposed expansion of the existing dangerous goods storage infrastructure for the Rhovan mine	Mining	BAR	Gauteng	2014	27 February 2015	24 March 2015	N/A	N/A	N/A	N/A	03 June 2015	08 July 2015	06 November 2015	06 June 2016	Tshwane, Gauteng	Brits, North West	DMR, Klerksdorp	Berseba	25 36'10.1"S	27 39'47.5"E
19	Scoping and EIA Report for the proposed construction of dangerous goods storage infrastructure exceeding 500 cubic metres for the Rhovan mine	Mining	S&EIR	Gauteng	2014	28 February 2015	24 March 2015	20 May 2015	08 July 2015	09 July 2015	28 September 2015	13 November 2015	18 January 2016	19 January 2016	07 June 2016	Tshwane, Gauteng	Brits, North West	DMR, Klerksdorp	Berseba	26 36'10.1"S	28 39'47.5"E
20	Environmental Impact Assessment (EIA) for the Hammanskraal Residential Property Development.	Mix land-Use	BAR	Gauteng	2010	21 April 2010	15 June 2010	N/A	N/A	N/A	N/A	11 October 2010	10 December 2010	13 December 2010	25 November 2011	Tshwane, Gauteng	Tshwane, Gauteng	GDARD	Tshwane	25 24'43.0"S	28 16'07.5"E
21	Construction of lodge	Lodge construction protected area	BAR	Mpumalanga	2010	28 February 2014	10 March 2014	N/A	N/A	N/A	N/A	12 August 2014	20 November 2014	21 January 2015	24 February 2015	White River	Johannesburg	Nelspruit	Skukuza	24 59'41.2"S	31 35'47.2"E
22	Construction of Airstrip	Construction of airstrip protected area	BAR	Mpumalanga	2014	18 August 2016	24 August 2016	N/A	N/A	N/A	N/A	18 August 2016	27 September 2016	28 September 2016	13 January 2017	White River	Holland	Nelspruit	Hoedspruit	24 23'14.4"S	31 02'48.2"E
23	Construction of Radio Tower	Construction of radio tower in protected area	BAR	North West	2014	18 June 2016	28 June 2016	N/A	N/A	N/A	N/A	18 June 2016	08 August 2016	15 August 2016	29 September 2016	White River	Brits	Rustenburg	Magaliesberg	25 44'59.6"S	27 51'60.0"E
24	Expansion of private lodge	development of infrastructure within 32m of watercourse	BAR	Mpumalanga	2014	10 March 2016	11 March 2016	N/A	N/A	N/A	N/A	10 March 2016	26 April 2016	29 April 2016	30 May 2016	White River	Cape Town	Nelspruit	Hoedspruit	24 23'14.4"S	31 02'48.2"E

No.	Name of EIA	Type of Project	BAR or S&EIR	Province	Regulation	Application submission	Application acceptance	Draft Scoping Submission	Final scoping report submission	Scoping report received by department	Scoping acceptance received	Draft EIR/BAR Submission	Final EIR/BAR submission	Department received final BAR/EIR	Authorisation on Final EIR/BAR	Location of EAP	Location of Applicant	Location of Competent Authority	Nearest Town to Site	Coordinates of the site	
25	Amajingqi Macadamia Farm	Agriculture	S&EIR	Eastern Cape	2014	11 November 2015	02 March 2016	03 March 2016	06 May 2016	15 June 2016	16 June 2016	12 September 2016	02 October 2016	12 October 2016	27 January 2017	East London	East London	East London	East London	38 17'53,71"S	28 39'15,4"E
26	Rocket Stores EIA	Mixed-Use Development	S&EIR	Eastern Cape	2014	14 March 2014	03 April 2014	20 June 2014	25 August 2014	02 September 2014	10 October 2014	06 February 2015	19 March 2015	31 March 2015	04 April 2015	East London	East London	East London	East London	33 52'6"S	27 8'4,11"E
27	Ncambedlana Sewers Basic Assessment	Pipeline	BAR	Eastern Cape	2014	10 February 2016	25 February 2016	N/A	N/A	N/A	N/A	02 March 2016	15 June 2016	05 July 2016	09 August 2016	East London	East London	Mthatha	Mthatha	31 34'3,86"S	28 49'0,44"E
28	Metsimatala - 132 kV power line	Power line development	BAR	Free State	2014	25 August 2016	30 August 2016	N/A	N/A	N/A	N/A	25 August 2016	31 October 2016	01 November 2016	15 February 2017	Bloemfontein	Johannesburg	DEA	Postmasburg	28°07'56.06''S	23°06'12.85''E
29	Metsimatala - 150 MW CSP (Parabolic Trough) facility	Renewable Energy	S&EIR	Free State	2014	31 March 2016	05 April 2016	31 March 2016	20 May 2016	21 May 2016	13 June 2016	02 August 2016	30 September 2016	01 October 2016	15 January 2017	Bloemfontein	Johannesburg	DEA	Postmasburg	28°16'23.74776"S	23°17'11.00848"E
30	Carpediem 500 ha vineyard	Agriculture	S&EIR	Free State	2014	24 April 2015	18 May 2016	24 April 2015	14 December 2015	15 December 2015	06 January 2016	06 January 2016	09 February 2016	10 February 2016	24 May 2016	Bloemfontein	Upington	NCENC	Upington	28°28'41.17"S	21° 20' 28.29"E
31	Retrofitting of the Existing Electrostatic Precipitators with Fabric Filters Plant and Upgrading of Dust Handling Plant at Kriel Power Station	Air Quality	BAR	Mpumalanga	2014	16 June 2016	27 June 2016	N/A	N/A	N/A	N/A	07 June 2016	27 July 2016	02 August 2016	17 October 2016	Nelspruit	Emalahleni (Kriel)	Emalahleni (Kriel)	Emalahleni (Kriel)	26 15'4,979"S	29 10'47,725"E
32	Construction of 30 MLD Reservoir Bulk Water and Sewer Pipelines on portion1 of the farm Leeuwdam 1216 JS	Housing Development	BAR	Mpumalanga	2014	09 October 2015	16 October 2015	N/A	N/A	N/A	N/A	09 October 2015	11 November 2015	19 November 2015	30 March 2016	Nelspruit	Emalahleni	Emalahleni	Emalahleni	25 48'11,2"E	29 10'5,24"E

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33	Eskom Vessel-Mokalaka 12kV Powerline and Mokalaka Substation	Eskom Powerline Project	BAR	North west	2010	11 February 2014	25 February 2014	N/A	N/A	N/A	N/A	29 May 2014	18 August 2014	02 September 2014	02 December 2014	Nelspruit	North West	North West	Madibeng	25 50'20,79"S	23 31'20,8"E
34	Proposed Upgrade of Road L1524 situated near the Town of Ladysmith,KZN	Road Upgrade	BAR	KwaZulu-Natal	2014	15 March 2016	23 March 2016	N/A	N/A	N/A	N/A	15 March 2016	14 April 2016	15 April 2016	17 May 2016	Durban	PMB	Ladysmith	Ladysmith	28 33'36.3"S	29 46'50.7"E
35	Proposed Upgrade of Road P187 situated near the Town of Ladysmith.KZN	Road Upgrade	BAR	KwaZulu-Natal	2014	23 March 2016	05 April 2016	N/A	N/A	N/A	N/A	23 March 2016	10 May 2016	11 May 2016	18 May 2016	Durban	PMB	Ladysmith	Ladysmith	29 33'36.3"S	30 46'50.7"E
36	Proposed Upgrade Road P254-1 situated near the Town of Port Sheptsone, KZN	Road Upgrade	BAR	KwaZulu-Natal	2014	04 July 2016	20 July 2016	N/A	N/A	N/A	N/A	04 July 2016	26 September 2016	27 September 2016	11 January 2017	Durban	PMB	Port Shepstone	Port Shepstone	30 43'37.1"S	30 26'34.1"E
37	A583 Causeway, eThekweni Metro Municipality	Watercourse Crossing Establishment	BAR	KwaZulu-Natal	2014	12 May 2016	24 May 2016	N/A	N/A	N/A	N/A	12 May 2016	20 July 2016	21 July 2016	23 September 2016	Durban	Durban	Durban	Durban	29 51'40.8"S	31 01'14.5"E
38	Proposed Richards Bay Port Expansion Project	Port Expansion	S&EIR	KwaZulu-Natal	2010	12 December 2013	20 December 2013	25 March 2014	01 June 2014	02 June 2014	15 July 2014	16 July 2015	01 September 2015	02 September 2015	01 November 2015	Durban	Richards Bay	Pretoria	Richards Bay	28 46'57.0"S	32 03'21.4"E
39	Proposed New Malabar Housing Development	Housing Development	S&EIR	KwaZulu-Natal	2010	01 June 2012	01 July 2012	02 July 2012	12 October 2012	13 October 2012	01 November 2012	01 April 2013	01 June 2013	20 August 2013	01 November 2013	Durban	Port Elizabeth	Port Elizabeth	Malabar	33 55'17.8"S	25 32'10.8"E
40	Upgrading of the Valencia storm water management system, within the town of Addo.	Upgrading of Storm water Management Systems	BAR	KwaZulu-Natal	2010	05 June 2013	21 June 2013	N/A	N/A	N/A	N/A	15 July 2013	01 September 2013	02 September 2013	01 December 2013	Durban	Sunday River Valley Municipality	Port Elizabeth	Addo, Valencia	33 31'35.9"S	25 42'42.9"E
41	Proposed construction of Kwabhoboza interchange	Road Upgrade	BAR	KwaZulu-Natal	2010	12 September 2012	28 November 2012	N/A	N/A	N/A	N/A	28 June 2013	07 October 2013	22 October 2013	08 January 2014	Durban	Scotsville	Pretoria	Mtubatuba	28 24'19.7"S	32 12'54.5"E

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42	Proposed upgrade of the D1652 road .	Road Upgrade	BAR	KwaZulu-Natal	2014	27 November 2015	30 November 2015	N/A	N/A	N/A	N/A	30 September 2015	12 December 2015	13 December 2015	16 April 2016	Durban	PMB	Durban	Inanda	29 41'46.6"S	30 56'51.2"E
43	Proposed Darvill Wastewater treatment works upgrade, Msunduzi Local Municipality (KZ26), uMgungundlovu District Municipality (DC22), KwaZulu-Natal.	Wastewater treatment works	BAR	KwaZulu-Natal	2010	10 June 2013	13 June 2013	N/A	N/A	N/A	N/A	13 October 2013	19 November 2013	21 November 2013	14 February 2014	Durban	PMB	Pretoria	Pietermaritzburg	29 36'02.6"S	30 23'00.4"E
44	Proposed construction of the Station road bridge and Associated infrastructure, Pietermaritzburg , Umsunduzi	Pedestrian Bridge	BAR	KwaZulu-Natal	2010	15 June 2012	16 June 2012	N/A	N/A	N/A	N/A	11 March 2013	26 March 2013	10 April 2013	26 August 2013	Durban	PMB	PMB	Edendale	29 38'49.1"S	30 17'46.1"E
45	Establishment of new citrus orchards on the Remainder of Portion 6 of the farm Wildebeesthoek 389-KT near Burgersfort, Greater Tubatse Municipality, Limpopo	Agriculture	BAR	Limpopo	2014	26 April 2016	09 May 2016	N/A	N/A	N/A	N/A	26 April 2016	15 June 2016	16 June 2016	29 August 2016	Durban	Burgersfort	Polokwane	Burgersfort	24 51'8,26"S	30 19'45,73"E
46	Proposed establishment of a mixed-use township and associated infrastructure on Portion 1 of the farm Altydmooi 379--LT at Ga-Sekgopo, Greater Letaba Municipality, Limpopo	Township establishment	S&EIR	Limpopo	2010	24 March 2014	26 March 2014	02 March 2015	02 April 2015	03 April 2015	13 April 2015	01 May 2015	30 June 2015	01 July 2015	11 September 2015	Tzaneen	Modjadji Kloof	Polokwane	Modjadji Kloof	23 36'24,42"S	30 1'0,9"E

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47	Proposed construction or upgrading of low-level bridges at Lenyenye, Khwekhwe, Rikhotso and Mawa Block 12, within Greater Tzaneen Municipality	Infrastructure development	BAR	Limpopo	2010	13 August 2014	20 October 2014	N/A	N/A	N/A	N/A	03 March 2015	07 April 2015	08 April 2015	29 April 2015	Tzaneen	Tzaneen	Polokwane	Tzaneen	23 58'27.0"S	30 16'05.3"E
48	Proposed establishment of a shopping centre and associated infrastructure on Portion 25 of the farm Deer Park 459-LT at Ga-Kubjana Village, Greater Tzaneen Municipality	Commercial development	BAR	Limpopo	2010	13 December 2013	09 January 2014	N/A	N/A	N/A	N/A	08 August 2014	06 March 2015	07 March 2015	29 April 2015	Tzaneen	Centurion (Tshwane)	Polokwane	Tzaneen	23 42'59,47"S	30 17'21,43"E
49	Proposed Delta PV Energy facility, near Bloemhof North west	Renewable Energy	S&EIR	North west	2010	26 March 2014	09 April 2014	20 May 2014	04 July 2014	18 August 2014	06 October 2014	08 October 2014	27 November 2014	26 January 2015	20 April 2015	Potchefstroom	Sandton	Pretoria	Bloemhof	27 38'15.60''S	25 29'35.11''E
50	Proposed PV Beta	Renewable Energy	S&EIR	North west	2010	27 March 2014	10 April 2014	21 May 2014	05 July 2014	19 August 2014	07 October 2014	09 October 2014	28 November 2014	27 January 2015	21 April 2015	Potchefstroom	Sandton	Pretoria	Hertzogville	28 9'54.92''S	25 40'14.28''E
51	Kappa	Renewable Energy	S&EIR	North west	2010	28 March 2014	11 April 2014	22 May 2014	06 July 2014	20 August 2014	08 October 2014	10 October 2014	29 November 2014	28 January 2015	22 April 2015	Potchefstroom	Sandton	Pretoria	Christiana	28 0'51.25''S	24 57'17.42''E
52	Alpha	Renewable Energy	S&EIR	North west	2010	29 March 2014	12 April 2014	23 May 2014	07 July 2014	21 August 2014	09 October 2014	11 October 2014	30 November 2014	29 January 2015	23 April 2015	Potchefstroom	Sandton	Pretoria	Danielskuil	28 17'28.30''S	23 24'49.55''E
53	Oryx	Renewable Energy	S&EIR	North west	2010	30 March 2014	13 April 2014	24 May 2014	08 July 2014	22 August 2014	10 October 2014	12 October 2014	01 December 2014	30 January 2015	24 April 2015	Potchefstroom	Sandton	Pretoria	Koffiefontein, FS	29 23'2.68''S	25 2'23.80''E

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54	Serurubele	Renewable Energy	S&EIR	North west	2010	31 March 2014	14 April 2014	25 May 2014	09 July 2014	23 August 2014	11 October 2014	13 October 2014	02 December 2014	31 January 2015	25 April 2015	Potchefstroom	Sandton	Pretoria	Bloemfontein	29 05'16.5"S	26 11'03.9"E
55	Ikageng township establishment, Potvh	Township development	S&EIR	North west	2014	02 April 2015	13 May 2015	02 April 2015	12 May 2015	13 May 2015	10 June 2015	02 July 2015	03 August 2015	05 August 2015	14 October 2015	Potchefstroom	Potchefstroom	NWDREA	Potchefstroom	26 43' 43.10"S	27 01' 21.93"E

Appendix B: Correlation matrices

Relationships between travelling distance and completion time for both basic assessments and scoping and environmental impact assessments

BA-r values					
	Completion time	***TD-EAP–site***	***TD-Applicant–site***	***TD-CA–site***	***TD-EAP–CA***
Completion time	1				
TD-EAP–site	-0,22	1			
TD-Applicant–site	-0,12	-0,07	1		
TD-CA–site	0,15	0,19	-0,01	1	
TD-EAP–CA	-0,01	0,55	-0,18	0,71	1
	N = 36				

S&EIA-r values					
	Completion time	***TD-EAP–site***	***TD-Applicant–-site***	***TD-CA–site***	***TD-EAP–CA***
Completion time	1				
TD-EAP–site	0,08	1			
TD-Applicant–site	-0,30	0,16	1		
TD-CA–site	-0,07	0,11	0,68	1	
TD-EAP–CA	0,34	0,62	-0,06	0,44	1
	N = 19				

Relationships between travelling distance and duration of phases for basic assessments

R-values for basic assessments								
	Application-DBAR	***DBAR-FBAR***	***FBAR-EAu***	***Completion time***	***TD-EAP-site***	***TD-Applicant-site***	***TD-CA-site***	***TD-EAP-CA***
Application-DBAR	1							
DBAR-FBAR	0,29	1						
FBAR-EAu	0,21	-0,17	1					
Completion time	0,82	0,38	0,64	1				
TD-EAP-site	-0,20	0,05	-0,17	-0,22	1			
TD-Applicant-site	-0,15	-0,05	-0,01	-0,12	-0,07	1		
TD-CA-site	0,19	-0,03	0,08	0,15	0,19	-0,01	1	
TD-EAP-CA	0,05	-0,10	-0,04	-0,01	0,55	-0,18	0,71	1
	N = 36							

Relationships between travelling distance and duration of phases for scoping and environmental impact assessments

R-values for scoping and environmental impact assessments										
	Application-DSR	*DSR-FSR*	*FSR-DEIR*	*DEIR-FEIR*	*FEIR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DSR	1									
DSR-FSR	-0,29	1								
FSR-DEIR	0,03	-0,22	1							
DEIR-FEIR	0,22	-0,41	0,00	1						
FEIR-EAu	-0,21	0,20	-0,31	0,20	1					
Completion time	0,23	0,51	0,50	-0,14	0,12	1				
TD-EAP-site	-0,25	0,23	-0,04	0,17	0,12	0,08	1			
TD-Applicant-site	-0,21	0,00	-0,41	0,08	0,60	-0,30	0,16	1		
TD-CA-site	-0,20	-0,17	0,01	0,33	0,55	-0,07	0,11	0,68	1	
TD-EAP-CA	-0,19	0,10	0,26	0,41	0,25	0,34	0,62	-0,06	0,44	1
	N = 19									

Relationships between travelling distance and completion time and duration of phases under the 2010 basic assessment regime

R-values under the 2010 regime								
	Application-DBAR	*DBAR-FBAR*	*FBAR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DBAR	1							
DBAR-FBAR	0,24	1						
FBAR-EAu	0,18	-0,15	1					
Completion time	0,77	0,40	0,65	1				
TD-EAP-site	-0,68	-0,09	-0,18	-0,55	1			
TD-Applicant-site	0,23	0,70	-0,09	0,34	0,03	1		
TD-CA-site	-0,13	0,12	-0,13	-0,07	0,30	0,26	1	
TD-EAP-CA	-0,41	-0,09	-0,16	-0,33	0,68	-0,02	0,63	1
	N = 16							

Relationships between travelling distance and completion time and duration of phases under the 2014 basic assessment regime

R-values under the 2014 regime								
	Application-DBAR	*DBAR-FBAR*	*FBAR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DBAR	1							
DBAR-FBAR	-0,40	1						
FBAR-EAu	0,52	-0,27	1					
Completion time	0,67	-0,07	0,94	1				
TD-EAP-site	-0,18	0,20	-0,29	-0,28	1			
TD-Applicant-site	-0,12	-0,06	0,00	-0,08	-0,09	1		
TD-CA-site	0,75	-0,26	0,22	0,35	0,07	-0,01	1	
TD-EAP-CA	0,73	-0,23	0,08	0,24	0,39	-0,24	0,79	1
	N = 20							

Relationships between travelling distance and completion time and duration of phases under the 2010 scoping and environmental impact assessment regime

R-values under 2010 regime										
	Application-DSR	*DSR-FSR*	*FSR-DEIR*	*DEIR-FEIR*	*FEIR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DSR	1									
DSR-FSR	-0,57	1								
FSR-DEIR	-0,11	-0,26	1							
DEIR-FEIR	0,11	-0,22	-0,03	1						
FEIR-EAu	-0,39	0,43	-0,34	-0,10	1					
Completion time	0,32	-0,26	0,69	0,01	0,08	1				
TD-EAP-site	-0,35	-0,10	0,21	0,20	-0,11	-0,18	1			
TD-Applicant-site	-0,36	0,29	-0,53	-0,58	0,60	-0,43	0,00	1		
TD-CA-site	-0,48	-0,06	0,26	-0,28	0,44	0,17	-0,13	0,48	1	
TD-EAP-CA	-0,33	-0,26	0,67	0,54	0,04	0,44	0,51	-0,43	0,29	1
	N = 12									

Relationships between travelling distance and completion time and duration of phases under the 2014 scoping and environmental impact assessment regime

R-values under the 2014 regime										
	Application-DSR	*DSR-FSR*	*FSR-DEIR*	*DEIR-FEIR*	*FEIR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DSR	1									
DSR-FSR	-0,20	1								
FSR-DEIR	0,91	-0,25	1							
DEIR-FEIR	0,31	-0,48	0,16	1						
FEIR-EAu	-0,34	0,20	-0,12	0,15	1					
Completion time	0,39	0,75	0,41	-0,20	0,30	1				
TD-EAP-site	-0,47	0,78	-0,50	-0,02	0,52	0,46	1			
TD-Applicant-site	-0,31	-0,18	-0,16	0,25	0,38	-0,26	0,32	1		
TD-CA-site	-0,24	-0,31	-0,13	0,49	0,39	-0,32	0,27	0,96	1	
TD-EAP-CA	-0,21	0,57	-0,32	0,27	0,51	0,42	0,88	0,45	0,44	1
	N = 7									

Relationships between travelling distances and completion time and duration of phases for basic assessments in KwaZulu-Natal

	Application-DBAR	*DBAR-FBAR*	*FBAR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DBAR	1							
DBAR-FBAR	0,01	1						
FBAR-EAu	0,54	-0,19	1					
Completion time	0,93	0,27	0,64	1				
TD-EAP-site	-0,16	0,06	-0,15	-0,13	1			
TD-Applicant-site	-0,07	0,65	-0,33	0,10	-0,11	1		
TD-CA-site	0,53	0,38	0,08	0,57	-0,13	0,18	1	
TD-EAP-CA	0,22	0,26	-0,11	0,24	0,71	-0,01	0,59	1
	N = 9							

Relationships between travelling distances and completion time and duration of phases for basic assessments in North-West

	Application-DBAR	*DBAR-FBAR*	*FBAR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DBAR	1							
DBAR-FBAR	0,41	1						
FBAR-EAu	0,47	0,31	1					
Completion time	0,92	0,52	0,76	1				
TD-EAP-site	-0,31	0,65	-0,13	-0,19	1			
TD-Applicant-site	-0,08	0,42	0,04	0,03	0,51	1		
TD-CA-site	-0,43	0,49	0,10	-0,19	0,68	0,58	1	
TD-EAP-CA	-0,61	0,36	-0,25	-0,47	0,76	0,43	0,69	1
	N = 12							

Relationships between travelling distances and completion time and duration of phases for basic scoping and environmental impact assessments in North-West

	Application-DSR	*DSR-FSR*	*FSR-DEIR*	*DEIR-FEIR*	*FEIR-EAu*	*Completion time*	*TD-EAP-site*	*TD-Applicant-site*	*TD-CA-site*	*TD-EAP-CA*
Application-DSR	1									
DSR-FSR	0,65	1								
FSR-DEIR	-0,53	0,20	1							
DEIR-FEIR	0,09	0,43	0,70	1						
FEIR-EAu	0,92	0,58	-0,55	-0,01	1					
Completion time	0,90	0,86	-0,24	0,23	0,92	1				
TD-EAP-site	0,83	0,40	-0,51	0,11	0,76	0,68	1			
TD-Applicant-site	0,95	0,52	-0,62	-0,02	0,86	0,80	0,94	1		
TD-CA-site	0,89	0,72	-0,27	0,31	0,78	0,85	0,92	0,92	1	
TD-EAP-CA	0,47	0,97	0,44	0,58	0,39	0,72	0,24	0,32	0,59	1
	N = 9									