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ABBREVIATIONS AND ACRONYMS

DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism (the national government department responsible for environmental matters)
DEDEA	Department of Economic Development and Environmental Affairs (the provincial government department in the Eastern Cape responsible for implementing the EIA regulations)
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
ECA	Environment Conservation Act, Act 73 of 1989
ECO	Environmental Control Officer
EMP	Environmental Management Plan
EMS	Environmental Management System
ERA	Ecological Risk Assessment
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
NEMA	National Environmental Management Act, number 107 of 1998
STW	Sewage Treatment Works
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency
WSS	Water Supply Scheme

Chapter 1: Research problem

1.1 Introduction

One of the cornerstones of sustainable development is sound environmental management (UNEP 2002). However, balancing the needs of current generations without compromising the environment for future generations is far from simple. A number of environmental decision-making instruments have been developed in an attempt to ensure that development is sustainable. One of the most popular of these is environmental impact assessment or EIA. As the name suggests, EIA involves identifying and assessing the environmental impacts of a development project and its alternatives. To date it is estimated that more than 100 countries, South Africa included, make use of an environmental assessment procedure such as EIA to facilitate sustainable development (Sadler 1996).

This widespread use of EIA highlights its popularity as an environmental management tool, but it also raises the question of whether the process deserves this popularity. Is EIA an effective means of achieving sustainable development? The answer to this question lies largely in determining what effect EIA has had on the planning, implementation, operation and possibly decommissioning of a project. The efficacy of the EIA process can only be assessed through the follow-up of projects subjected to an EIA (Ortolano & Shepherd 1995).

Unfortunately however, the EIA process often ends at the consent decision stage and seldom proceeds through to the project implementation and operation stages (Tomlinson & Atkinson 1987a; Sadler 1988; Culhane 1993; Petts & Eduljee 1994; Glasson 1999; Arts *et al* 2001; Hulett & Diab 2002; Morrison-Saunders & Arts 2004).

This lack of emphasis on the post-decision – or follow-up stages – of EIA is problematic for several reasons. EIA is essentially a predictive process that attempts to identify and assess the potential environmental impacts of a proposed development before a consent decision is made (UNEP 2002). If there is no follow-up to the pre-decision EIA phase, then there is no means of telling if the environmental consequences of a project are as anticipated or even within acceptable limits (Marshall *et al* 2005). In effect there is no learning from experience and the chance to advance the knowledge base for future EIAs is lost (McCallum 1987; Bisset & Tomlinson 1988; Duinker 1989; Dipper *et al* 1998; Arts *et al* 2001).

Additionally, the lack of EIA follow-up means that the opportunity to monitor and control a project during its implementation is lost (US EPA 1992; Arts & Nooteboom 1999; Dasgupta *et al* 2000). Most environmental impacts arising from a project occur during the implementation and operational stages and follow-up is essential in ensuring that these impacts are kept within acceptable limits. Impacts that were not anticipated by the environmental impact assessment studies may also occur and follow-up offers the chance to identify and manage these unexpected impacts (Morrison-Saunders 1996; Arts & Nooteboom 1999).

In light of the above, ending the EIA process at the EIA consent decision stage can be considered somewhat short-sighted. Yet comprehensive, national follow-up processes seem to be the exception rather than the rule (Sadler 1996; Dipper *et al* 1998; George 2000c). South Africa is a case in point, with no national EIA follow-up processes currently in place (Wood C 1999; Duthie 2001; Hulett & Diab 2002; Weaver 2003). How this lack of follow-up, particularly in South Africa, could be addressed through the means of a pilot follow-up process, is the subject of this thesis.

1.2 Rationale and aims

The overall rationale for undertaking this study was – as argued above – that EIA follow-up is an essential, but neglected part of the EIA process. This study attempted to address this lack of follow-up in South Africa by implementing a regional follow-up process. The aim of this follow-up process was two-fold.

1.2.1 Establishing a compliance and effects EIA follow-up process

Firstly, the study aimed to determine the post consent decision status of implemented EIA-approved projects by following-up on them. Very little work has been done on this in South Africa despite recommendations to do so (Weaver 2003). This follow-up formed the first phase of this study and focused on determining the degree of compliance with the EIA consent conditions and the overall impact of the projects on the environment.

This phase of the research also involved designing a follow-up process as there were no suitable ones in the literature that met the needs of this study. This lack of a standardized follow-up process appears to be a problem internationally (Bailey & Hobbs 1990). Some useful proposals for follow-up frameworks have been made by Harrington and Canter (1998), Wilson (1998) and Baker (2004) although none of them seem to have gained wide-spread international usage. In the absence of an internationally (or even nationally) accepted follow-up process, the approach taken for this study was to examine the processes of EIA, examples of EIA follow-up practice and the process of environmental risk assessment in order to come up with an integrated, tailor-made EIA follow-up process for this research. This follow-up process needed to be simple, practical and allow for the risk screening of new EIA applications. A review of EIA, EIA follow-up and environmental risk assessment is thus provided in the rest of this chapter and a follow-up process incorporating elements from all three is proposed.

1.2.2 Developing a risk screening process

The second aim of the study was to determine a means of identifying new EIA applications that could present a risk of defaulting on the consent conditions and/or having a high overall impact on the environment. These high risk applications could then be screened out and targeted for follow-up at an early stage of the EIA application process. The development of this risk screening process formed the second phase of this study.

There are a number of advantages in being able to screen out potentially risky projects. Firstly, screening allows follow-up to be directed to those projects most likely to be in need of it; which allows scare resources to be channelled most effectively (Sadler 1996). Screening may also provide a higher degree of environmental protection as the implementation of potentially problematic projects can be monitored and controlled by the environmental authority. Finally, being able to estimate which EIA applications are most likely to present a compliance and/or negative effects risk at a stage before an EIA consent decision is made allows concerns regarding compliance and impact to be addressed early on and before a final decision on the acceptability of the project is made.

1.3 Context and scope of the study

As discussed in Section 1.2, the focus of this study is on follow-up and risk screening. The following section provides a background and context for the study, with particular emphasis on the processes of EIA, EIA follow-up and risk assessment. The relevance of each of these processes is examined, with an emphasis on the situation in South Africa, and special reference to the Eastern Cape Province. A framework is then proposed within which all three processes can be integrated to form a coherent, linked whole that can be used in EIA practice and that provides a structure for this study.

1.3.1 Environmental Impact Assessment

1.3.1.1 The EIA process

Environmental impact assessment can be defined as a planning or decision-making tool that allows the various impacts of a proposed project and its alternatives to be assessed prior to a consent decision being taken (Ortolano & Shepherd 1995). The concept of EIA has been around for decades, but its use only really burgeoned after the United States made EIAs mandatory for federal agency projects in terms of their seminal National Environmental Policy Act of 1969 (Ortolano & Shepherd 1995). Since then, EIA has become increasingly used by many countries to promote good environmental decision-making and to encourage environmental sustainability (Sadler 1996). Increasingly, non-governmental organizations such as development banks and aid agencies are also requiring that EIAs be undertaken for projects that they fund. This has had the result that even in countries where EIA is not a legislative requirement, it is often carried out to satisfy the requirements of funding agencies (Ortolano & Shepherd 1995). The use of the EIA process as a sustainability tool has also been emphasized by the inclusion of EIA processes in many of the principles of the World Summits on Sustainable Development in Rio de Janeiro in 1992 and in Johannesburg in 2002 (Fuller 2005).

This wide-spread use of EIA speaks for its popularity and international applicability. And despite some country-specific adaptations, there is a welcome uniformity in the way in which the EIA process is applied around the world. A summary of the generic EIA process as described by Weaver (2003) and UNEP (2002) is provided below.

Screening

The EIA process usually begins with screening. Screening involves determining if environmental assessment is necessary, and if so, at what level and depth (UNEP 2002). For example, a minor project in a transformed environment would require less in the way of assessment than a large development in a pristine area. Screening plays an important role in the efficiency of the EIA process by ensuring that proposals that need environmental assessment are captured while proposals that are likely to have minimal environmental effects are not subjected to excessive analysis (UNEP 2002). Screening may be guided by legislation (such as when lists of activities requiring EIA have been published in terms of an Act) or it may be discretionary, with each development proposal being evaluated on a case-by-case basis. Whichever approach is taken, it is important that screening is fair and undertaken as early in the development process as possible (UNEP 2002).

Scoping

Once the level of assessment that is needed has been determined by screening, the scoping process is used to determine what issues and alternatives should be investigated during the actual impact assessment (UNEP 2002). Stakeholder consultation often plays a vital role at this point in helping to highlight issues of importance (UNEP 2002). By identifying environmentally (and socially) important issues, scoping can help to guide the impact assessment process and focus resources where needed. It is important that scoping is carried out for each proposed project as issues of environmental importance vary from country to country and from project to project.

Impact assessment

The impact assessment stage identifies, evaluates and predicts the likely environmental impacts of the project, both positive and negative, in terms of their nature, magnitude, likelihood, duration and significance (UNEP 2002). What is identified as an environmental impact will depend on the results of the scoping stage as well as what is deemed to be encompassed by the term “environment”. For example, some countries will use the term environment to refer solely to bio-physical elements such as water and air, while others adopt a broader definition of environment and include socio-economic and cultural issues (Rabie 1999; UNEP 2002).

Mitigation

Mitigation involves investigating and detailing measures that can be used to avoid, reduce or compensate for negative impacts and enhance positive ones (UNEP 2002). Mitigation should involve detailing how impacts will be managed, for both expected and unexpected impacts (UNEP 2002).

Reporting

After investigating and evaluating the various impacts, alternatives and mitigation measures for the proposed project, a report is compiled to convey the findings of the impact assessment (Weaver 2003). This report may be variously known as an Environmental Impact Statement (EIS), Environmental Impact Report (EIR) or Environmental Statement (ES). The term EIR is preferred for this study. All reports need to be clear, objective and helpful in assisting role-players to understand the project and its potential impacts (DEAT 2004c).

Review

After receiving an environmental report, the decision-makers will review it to determine if the EIA is sufficient, both procedurally and substantively, to base an informed decision on (UNEP 2002). While review is primarily undertaken by the decision-making authority, the report may also be reviewed by the public and/or independent specialists (Weaver 2003).

Decision-making

At this stage a decision is made as to whether the project should be allowed to proceed or not; if changes are required or under what conditions approval may be given (UNEP 2002). The conditions of consent that are set often form the framework for later management (Weaver 2003). The end product of decision-making is usually some form of permit, authorization or Record of Decision (RoD).

Implementation and follow-up

This is the phase in which the proposed project is set in motion (provided, of course, the project was approved) and the various conditions of authorization, mitigation measures and management tools such as Environmental Management Plans (EMPs) are implemented where necessary (Weaver 2003). This step also involves checking that the project is proceeding within the bounds of its consent decision, that the impacts are being managed as desired and that the information on the performance of the project is fed back into the EIA process. Despite its vital importance, this step is often neglected, particularly with regards to follow-up (UNEP 2002).

A visual representation of the generic EIA process is provided in Figure 1-1.

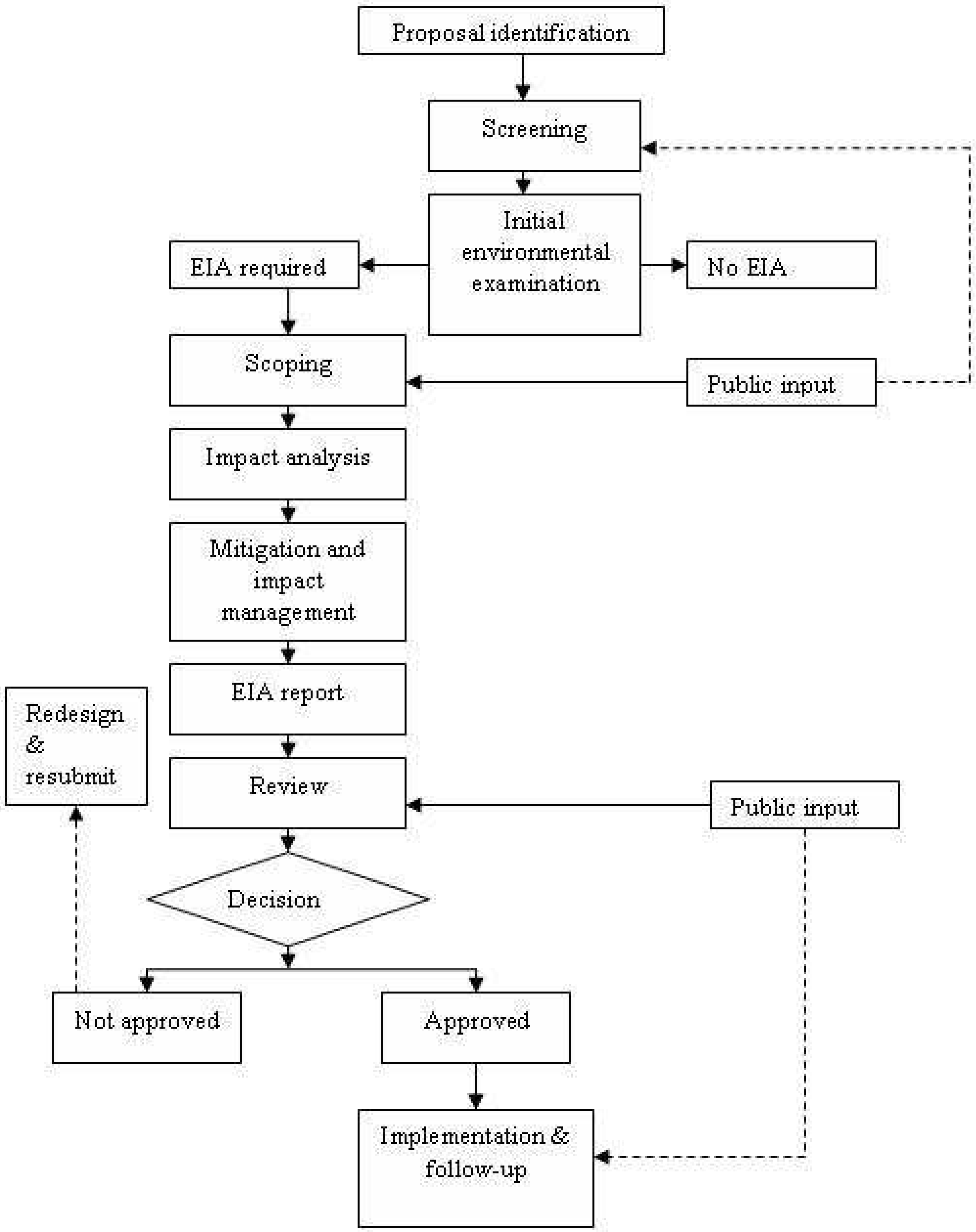


Figure 1-1. The generic EIA process (after UNEP 2002).
Dashed lines indicate potential iterations.

1.3.1.2 The EIA process as implemented in South Africa

In South Africa, EIA practice became mandatory in 1997 with the promulgation of the EIA regulations under the Environment Conservation Act 73 of 1989 (RSA 1989; RSA 1997). Prior to this, some voluntary EIAs were conducted under the Integrated Environmental Management (IEM) framework (Weaver 2003). The IEM procedure never became mandatory, but its principles of holism, consultation and integration remain important concepts for environmental policy in South Africa today (Hamann *et al* 2000).

The EIA process in South Africa (as set out in the 1997 EIA regulations (RSA 1997)) conformed fairly well to the generic EIA process (Figure 1-2). There were however a few unique adaptations and these are highlighted below.

Screening

Screening in South Africa is guided both by legislation and by the discretion of the regulatory authorities. A list of activities that require environmental assessment has been published as part of the EIA regulations (RSA 1997) which acts as a primary screening process. However, screening can also be discretionary to some extent (Wood C 1999) in that the provincial authorities can determine the depth of the assessment required. Pre-application meetings between the regulatory authorities, the project proponents and/or their environmental consultants to discuss issues also sometimes takes place (DEAT 2002a) and can act as screening sessions.

Scoping

The South African EIA guidelines define scoping as “the process of identifying the significant issues, alternatives and decision points which should be addressed by a particular EIR, and may include a preliminary assessment of potential impacts” (DEAT 1998:7). As with the generic EIA process, public participation forms an important part of the scoping process (DEAT 2002b). Although this conception of scoping is in line with the generic EIA process, it is at this step of the South African EIA process that a key difference from the generic process is evident in practice. For the 1997 EIA regulations allowed for a project to be approved, turned down or subjected to further studies (EIA proper) at the scoping stage (RSA 1997). This provision for a consent decision to be taken at the scoping stage is an unusual practice and had the result that most applications stopped after scoping and were never subjected to a full EIA (Duthie 2001;

Weaver 2003). The scoping process instead functioned as a “mini-EIA”, with proponents and consultants combining the steps of scoping and impact assessment in the hopes of obtaining a consent decision as quickly as possible.

Impact assessment and mitigation

As explained above, this step of the South African EIA process is often combined with that of scoping. However, in the case where applications were subjected to the traditional route of scoping and then EIA, then impact assessment and mitigation involves an assessment of the issues identified during the scoping stage (RSA 1997; UNEP 2002). This assessment includes consideration of impact avoidance, minimization and mitigation measures.

Reporting

During this stage the results of the scoping and/or EIA are recorded, along with any public comments. Although the contents of the various reports required are outlined in the 1997 EIA regulations (RSA 1997) and the subsequent guideline document (DEAT 1998), the quality of reporting is still often poor (Wood C 1999; DEAT 2004c; Kruger & Chapman 2005).

Review

During the review process, the relevant authority determines, *inter alia*, whether there is sufficient information on which to base a sound decision (Fuggle & Rabie 1999) and whether the necessary legal and procedural requirements have been met (DEAT 1998). Review may also include specialist and public review of the environmental reports (DEAT 1998).

Decision

After review, and provided that further information is not required, the relevant authority may make one of two decisions, namely to authorize the project (with or without conditions) or to deny authorization (RSA 1997, section 9(1)). A Record of Decision is then issued stating the nature and location of the activity, contact details of the applicant and environmental consultant, validity period of the authorization, conditions of authorization (if applicable), key factors for the decision and means of appeal (DEAT 1998).

Implementation

This stage involves the implementation and management of the project and is one of the most neglected steps in the EIA process in South Africa (Wood, C 1999; Weaver 2003). Neither the 1997 EIA regulations (RSA 1997) nor the related guidelines (DEAT 1998) make any mention regarding the implementation of the approved project, so guidance is somewhat lacking. Authorities may attempt to guide implementation through means of the conditions of authorization and/or by requiring the proponent to submit an environmental management plan (EMP). However, as little EIA follow-up appears to have been done, the effectiveness of these conditions of authorization and the EMPs is largely unknown. It is here that this study hopes to make a valuable contribution.

From the above it is clear that the South African EIA process is in general agreement with the generic EIA framework, although it does have its own unique features. In particular the fact that a consent decision can be made at the scoping stage and the lack of a specified follow-up process should be noted. Although both of these issues have been addressed in the 2006 EIA regulations, their effectiveness must still be realized.

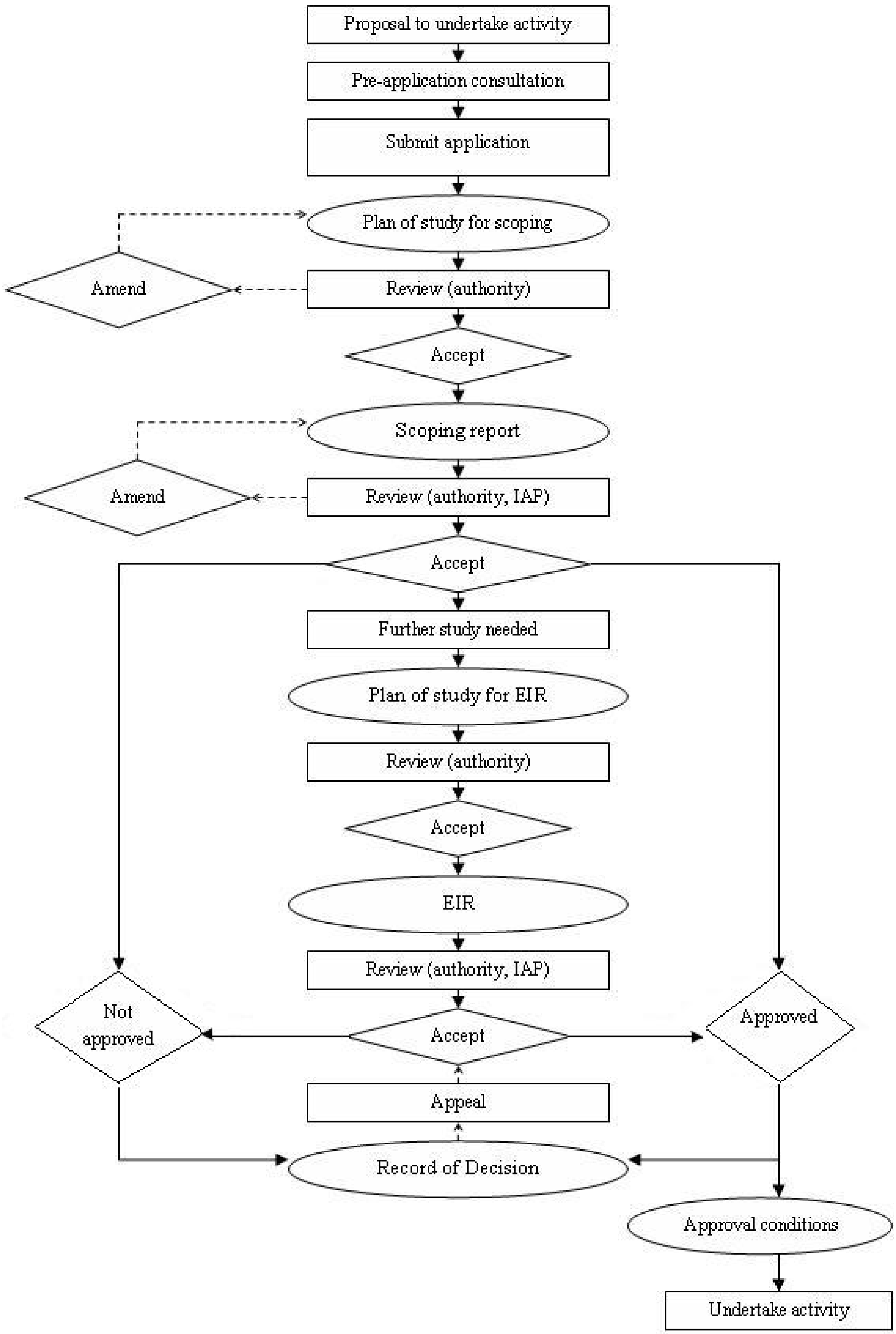


Figure 1-2. The 1997 EIA application procedure in South Africa (adapted from DEAT 1998)

1.3.1.3 Legislative context for EIA in South Africa

There are many Acts in South Africa that have some bearing on environmental management and only the ones that have direct relevance for the study will be discussed here. The intent of this section is not a comprehensive review of the relevant legislation, which is rather available in works such as those by Fuggle and Rabie (1999); Rossouw and Wiseman (2004); Barnard *et al* (2005); Glazewski (2005) and van der Linde (2006).

The Constitution of South Africa, Act 108 of 1996

The overarching piece of legislation that affects all others in South Africa is the Constitution (RSA 1996). Two issues are of prime relevance for environmental management in the Constitution and therefore for this study.

The first of these is the enshrinement of the right of all persons to an environment that is not harmful to their health as a basic human right. Section 24 of the Constitution (RSA 1996) reads:

"Everyone has the right –

- *(a) to an environment that is not harmful to their health or well-being; and*
- *(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –*
  - *i. prevent pollution and ecological degradation;*
  - *ii. promote conservation; and*
  - *iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".*

In other words, all persons in South Africa are entitled to have the environment protected and managed in such a way that it does not impact detrimentally on their – or future generations' – health and well-being. While this basic right may be more concerned with human well-being than actual environmental health, the two are related and this section places a duty on not only the Government of South Africa, but also on each and every person in South Africa, to manage the environment appropriately. This section of the Constitution has also led to the enactment of several key pieces of environmental legislation such as the National Environmental Management Act 107 of 1998 (hereinafter referred to as NEMA) and its related Acts.

The second issue of importance relating to environmental management and the Constitution is the provision for the administration of environmental matters. Environmental management is a concurrent responsibility of provincial and national government (RSA 1996, Schedule 4) although local government is also expected to promote a safe and healthy environment within its financial and administrative capabilities (RSA 1996, Section 152). Co-operation between these three spheres of government is therefore important (Hamann *et al* 2000) and this co-operative governance has important implications with regards to enforcement of environmental violations in that the various spheres of government are strongly discouraged from taking each other to court.

The Environment Conservation Act 73 of 1989 (ECA)

Despite much of ECA already having been repealed by NEMA (RSA 1998, Section 50), ECA remains important for the purpose of this study for two reasons. Firstly, and most importantly, it is the primary Act that guided the 1997 EIA process upon which this study is based and secondly it provides an essential backdrop to the evolution of the EIA process in South Africa with regards to the new 2006 EIA regulations.

ECA essentially provided the legislative framework on which the South African EIA process could be based. This was accomplished by making provision for the identification of activities that could have significant detrimental effects on the environment (RSA 1989, Section 21); requiring that such activities be assessed for their environmental impact and authorized before they could commence (RSA 1989, Section 22) and by allowing the promulgation of regulations regarding environmental impact reports (RSA 1989, Section 26).

Although ECA provided for an EIA process; it was not until 1997 – with the gazetting of the EIA regulations (RSA 1997) – that effect was given to this provision.

EIA regulations published in terms of the ECA of 1989

On the 5th of November 1997, listed activities (i.e. those that were deemed to have potentially significant detrimental impacts on the environment) as well as the regulations governing the preparation, submission and assessment of the environmental impact assessments were published in Government Gazette No.18261, Notices R.1182 and No. R. 1183. Fairly minor amendments to these regulations were published on 17 October 1997 (GN R.1355); 27 March 1998 (GN R.448) and 10 May 2002 (GN R. 670 and No. R. 672).

As the listed activities published in these regulations have an important bearing on this study in that they represent the list of activities that were subject to an EIA and subsequently to EIA follow-up, they have been attached as Appendix 1.

National Environmental Management Act 107 of 1998

The National Environmental Management Act (NEMA) gives effect to the constitutional right of the citizens of South Africa to have the environment protected and also provides for co-operative governance and the control of activities that may have a detrimental impact on the environment (RSA 1998). It is the intention of NEMA and its similar environmental management Acts to provide an overarching framework for sustainable environmental management within South Africa (RSA 1998, preamble to the Act).

NEMA has a strong focus on sustainable development and sets out a number of principles that all organs of state undertaking activities that might significantly effect the environment must adhere to (RSA 1998, Section 2). These include placing people and their needs at the forefront of environmental management; ensuring that development is economically, socially and environmentally sustainable and ensuring that sustainable development considers all relevant factors.

EIA regulations published in terms of the NEMA of 1998

New EIA regulations in terms of Section 24(5) of NEMA were gazetted on the 21st of April 2006 (RSA 2006) and implemented on 3 July 2006. These regulations are based largely on the previous ones, with key changes being as follows:

- Applications follow either a basic assessment route (for smaller projects) or a traditional scoping-EIA route (for more complex projects).

- The roles and responsibilities for the various role-players have been refined. For example time-frames for processing applications have been introduced and the concept of independence regarding environmental consultants has been clarified.
- A threshold approach has been taken in respect of some of the listed activities.
- Provision has been made for enforcement and more post-authorization management mechanisms such as transfers and withdrawals of authorizations.

Implications of the change in EIA regulations for this study

The follow-up work undertaken for this research was carried out while the 1997 EIA regulations were in effect and follow-up was therefore focused on listed activities identified in terms of the 1997 regulations. The change in the regulations (from those under ECA to those under NEMA) has meant that some of the activities listed in terms of the old EIA regulations are no longer applicable and a number of new activities have been added under the new EIA regulations. The overall implication of this change in legislation for this study is not expected to be great and indeed there are some positive benefits, namely:

- The under-lying principles of follow-up remain the same for both the old and the new regulations as the basic intention of the EIA process has not changed. The principles of the follow-up process presented here are equally valid for both sets of regulations.
- Many of the previous listed activities have been included in the list of activities for the new regulations (RSA 1997 and RSA 2006) and the information gathered during this study's follow-up exercise will still be valid for these same listed activities. New activities can easily be included in the follow-up process by using the same methods as used for this study. The information gathered for this study is therefore still relevant for - and can be readily applied in terms of - the new EIA regulations.
- The adoption of new regulations provides a unique opportunity to see if the follow-up process used in this study is flexible enough to cope with change in the legislation.

- Finally, and perhaps most importantly, the current study based on the 1997 regulations has provided invaluable base-line information for future comparative studies with the new EIA regulations.

1.3.2 EIA follow-up

The previous section provided an overview of the EIA process, both in general and in South Africa. The following section examines what takes place after the EIA process has reached the consent decision stage.

1.3.2.1 Defining EIA follow-up

Standardized terminology regarding EIA follow-up is somewhat lacking (Culhane 1993) despite attempts (Tomlinson & Atkinson 1987a) to provide clarity. EIA follow-up obviously involves activities that follow after the EIA consent decision, but there are a number of terms that can be used to describe these activities. These include:

- "*ex post* evaluation" which has been used by Arts *et al* (2001) to refer to evaluations that take place after a principal EIA consent decision; and also confusingly, by Sadler (1996) and UNEP (2002) to refer to a policy level (as opposed to project level) evaluation of a system.
- "*post hoc* assessment" which Serafin *et al* (1992) use to refer to policy level evaluations.
- "Auditing", which is often used to refer to post EIA decision activities particularly those that provide an objective comparison of observations to preset standards (Arts & Nooteboom 1999; Sampson & Visser 2004). However, the term may also be used to refer to the review process of the EIR (Canter 1985; Tomlinson & Atkinson 1987a) and more commonly to the verification of predicted environmental impacts with actual ones (Bisset 1980; Bird & Therival 1996).
- "Post auditing" (Culhane 1993; Dipper *et al* 1998) or "post development auditing" (Wood G 1999) may also be used to refer to the verification of predicted environmental impacts with actual ones.

Given the above confusing, and sometimes contradictory, terminology, there is a clear need for a single, commonly accepted term to refer to activities that take place after an

EIA consent decision has been granted. The term that seems to be gaining the most support in this regard is that of EIA follow-up (Arts & Nooteboom 1999; Morrison-Saunders *et al* 2003) and this is the term that has been preferred for this study.

EIA follow-up (or just follow-up) is generally regarded as consisting of the activities of monitoring, evaluation, management and communication (Arts *et al* 2001). Monitoring refers to the collection and recording of environmental data over a period of time for a specific purpose (Arts *et al* 2001), for example the gathering of information on the compliance status of an approved EIA project. Monitoring may in some cases include some form of evaluation of the data gathered (Petts & Eduljee 1994); or evaluation may occur separately (Duinker 1989), as is the case here.

The follow-up element of evaluation generally involves interpreting and assigning meaning to the gathered information. NEMA (RSA 1998, Section 1) defines evaluation as "the process of ascertaining the relative importance or significance of information, in the light of people's values, preferences and judgments, in order to make a decision". Evaluation thus inevitably involves some form of value judgement (Arts *et al* 2001), as information only has meaning in terms of what the users of the data judge to be important. If certain benchmarks, standards or expected performance are valued, then a project might be evaluated in terms of how well it meets these expected standards.

Management involves taking a decision and formulating and implementing responses to the various matters arising out of the monitoring and evaluation activities (Arts *et al* 2001).

Finally, communication refers to disseminating the information gained from the EIA follow-up process to the various stakeholders and the general public (Arts *et al* 2001).

Types of follow-up

There are a number of types of follow-up that can take place. However, the two most commonly identified types are compliance (verifying if the strategy/project is performing as required) and effects follow-up (measuring the impact of a project on the environment) (Canter 1985; Tomlinson & Atkinson 1987a; Sadler 1988, 1996; Arts & Nooteboom 1999; George 2000c). These two types as well as some additional ones are briefly defined below. The original terms as proposed by the respective authors (such as audits or monitoring) have been retained as far as possible in this section.

a) Compliance monitoring

Compliance monitoring has also been termed surveillance follow-up (McCallum 1987) and implementation auditing (Canter 1985; Arts & Nooteboom 1999). Generally, the aim of compliance monitoring is to check that set requirements are being met (US EPA 1992). These requirements may include compliance with consent conditions; the installation of approved pollution-reducing equipment or the implementation of specified environmental management practices. Compliance monitoring would thus check if the holder of the environmental authorization is complying with the conditions of EIA approval; if the required types of equipment have been installed and are operating correctly and that the project is being implemented and managed as agreed upon or approved by the regulatory authority.

Compliance monitoring may also sometimes include cause-effects surveillance (Petts & Eduljee 1994) which aims to link a negative change in environmental quality to a source such as a particular project.

The type of compliance monitoring used for this study focuses on checking compliance with the conditions of EIA approval for projects.

b) Effects monitoring

Two main types of effects monitoring can be distinguished:

- Impact prediction audits – which generally seek to compare the predicted environmental impacts (made in the EIA) with the actual impacts that have occurred on site (Canter 1985) – may also be known as post audits (Bird & Therival 1996; Dipper *et al* 1998). This is the type of audit that appears to be most often reported on in the literature (see for example Bisset 1980; Canter 1985; Bisset & Tomlinson 1988; Bird & Therival 1996; Dipper *et al* 1998; Wood G 1999). They may also be known as predictive techniques audits (Tomlinson & Atkinson 1987a) if the emphasis is on assessing the accuracy of the techniques used to predict the impacts.

- Project impact audits on the other hand also look at impacts, but only describe actual impacts rather than comparing predicted and actual ones (Tomlinson & Atkinson 1987a). Their purpose is to determine environmental changes that have occurred due to the project (Tomlinson & Atkinson 1987a). This is the type of effects monitoring that was used in this study.

c) Other types of monitoring

- Base-line monitoring aims to establish a record of conditions that exist before the project is implemented (Arts *et al* 2001).
- Area-wide monitoring involves the monitoring of a large area that may include many individual EIA projects and is most often used for the assessment of cumulative impacts or for strategic environmental assessments (Arts *et al* 2001).
- Policy implementation monitoring involves a review of strategies based on their effects (Arts & Nooteboom 1999). This is closely related to the EIA procedure audit which is an assessment of the effectiveness of the EIA process as a whole and can therefore be seen as a macro or policy level audit (Tomlinson & Atkinson 1987a).
- A decision point audit is used to assess the value of EIR as a decision-making tool (Tomlinson & Atkinson 1987a). In other words, it assesses how effective the EIA was at helping decision-makers come to an informed decision.
- The draft EIS audit refers to the procedure of evaluating an EIR to determine if it contains the necessary information to make an informed decision on the application (Canter 1985). This procedure is usually termed “review” in most countries, and Tomlinson and Atkinson (1987a) prefer to define it as such.
- A performance audit as described by Canter (1985) and Tomlinson and Atkinson (1987a) is an audit that is usually undertaken by a firm to determine whether the necessary measures are in place to deal with major environmental incidents (Tomlinson & Atkinson 1987a). It is also

more commonly known as an environmental audit or an environmental management audit (Petts & Eduljee 1994).

1.3.2.2 Motivation for EIA follow-up

The comparative tabular assessment of the EIA status of developing and transitional countries provided by George (2000a) indicates that over half of the 44 countries listed have some form of follow-up requirement, either mandatory or voluntary. For some it might be a provision more on paper than in practice, but it is nevertheless an indication of the growing realization of the importance of EIA follow-up that so many low and middle income countries have made an attempt to institute the process. In some countries (e.g. the Netherlands, Canada and Australia) follow-up is already a legislative requirement (Morrison-Saunders *et al* 2003) and it is increasingly being required by funding and development agencies such as the World Bank (World Bank 1996). Clearly follow-up has something of value to add to the EIA process.

Adding value via control

One of the obvious ways in which follow-up can add value is in being able to regulate the impacts that an EIA approved project has on the environment (Arts & Nooteboom 1999). It is only by following-up that the actual – and sometimes, unexpected - impacts of a project can be identified and corrected where necessary (Culhane 1993; Arts *et al* 2001; Arts & Morrison-Saunders 2004). Follow-up also offers the opportunity to assess the effectiveness of the mitigation measures and to make changes to them if they are not functioning as desired. In this way the impact of the project on the environment can be controlled to some extent. Similarly, the degree of compliance with environmental requirements – such as consent conditions – can be monitored and managed via follow-up.

Follow-up is not just about controlling negative impacts however; it can also offer an opportunity to ensure that the positive benefits of a project are maximized (UNEP 2002). The proponent in particular can reap benefits from implementing a follow-up process and from being able to prove compliance (Marshall 2005). By being able to prove that the project is performing in accordance with required standards proponents can improve their firm's public environmental image (US EPA 1992). This can be of considerable importance if a firm operates within a competitive global market that places high value on environmental conformance (Konar & Cohen 2001). A good compliance track record can also help a proponent with future applications for environmental authorization (Marshall 2005). Follow-up for the purposes of controlling impacts can also be an important bargaining tool for proponents that want to undertake a potentially environmentally damaging project and are facing serious public objections. The promise of instituting a solid follow-up process can sometimes reassure a community that their concerns regarding the on-going management of the project will be adequately addressed and controlled (Marshall 2005). Of course it is then absolutely critical that such promises are kept.

Finally, undertaking follow-up with a focus on controlling a project can also yield a long term benefit of reduced costs and liabilities for proponents, communities and regulators. Proponents can for example save on environmental clean-up costs and penalties by making use of “greener” technologies and adhering to their permit conditions (US EPA 1992); communities can benefit via reduced health risks from more environmentally sound operations and the regulators can benefit in terms of reduced compliance and enforcement costs (Dasgupta *et al* 2000).

Adding value via knowledge accumulation

For Bisset and Tomlinson (1988) and Duinker (1989), the advancement of scientific knowledge and reduction of uncertainty are key motivating factors for undertaking follow-up. Duinker (1989) notes that monitoring can be used to detect project effects, test impact forecasts and prediction models, improve the knowledge base for future EIAs, provide evidence for paying or not paying compensation, provide early warnings of undesirable change, reduce uncertainties in forecasting models and establish baseline information. In addition, follow-up can help to improve the predictive capability of EIA in that inaccurate predictions and predictive techniques that do not function as well as expected can be noted and improved (Dipper *et al* 1998). It can also help to establish cause-effect relationships and determine what mitigation and/or construction methods were the most successful (Arts *et al* 2001). Finally, follow-up can provide learning opportunities with regards to cumulative effects and ecosystem functioning and can identify areas where training might be needed (McCallum 1987).

While the gathering of such information can be immensely valuable, it is of little use if it is not actually disseminated and integrated back into the EIA process. This is why the communication/feedback and management functions of follow-up are so important. Information needs to be shared. Quite how this should be done is still a matter for debate although Petts and Eduljee (1994) suggest the establishment of a regional or national database for recording follow-up results. This could have considerable merit and would be a profitable future research area.

Adding value via acceptance and legitimization of a project

Follow-up can add considerable value by improving the credibility of the environmental management process (McCallum 1987). As the US EPA (1992) observes, compliance is more effective if proponents see the environmental regulatory system as credible and strong. Follow-up helps to establish such an enforcement presence and can encourage faith in the strength of the environmental requirements. Consistent follow-up also helps to ensure fairness between those firms that comply voluntarily and those that take chances which is important as firms are more likely to comply if they think they will be treated fairly (US EPA 1992).

Another important benefit of follow-up is the opportunity it presents in terms of providing and getting feedback from the public (Arts *et al* 2001). Not only can follow-up provide an ideal opportunity to involve the community, but it can also benefit from their unique inputs. No decision occurs within a social vacuum and having an involved public on the ground has many benefits, including the fact that local communities can provide “on the spot” feedback and ensure that results of the follow-up process are locally meaningful (Hunsberger *et al* 2004). Involving the public and acknowledging that their skills and perceptions are valued can do much towards increasing their acceptance of the EIA procedure as a worthwhile and legitimate process.

Adding value by catering for the integration of information

Follow-up can also offer a benefit in terms of helping to improve co-operative governance by promoting information sharing (Arts & Nooteboom 1999) and inter-agency co-operation (McCallum 1987). This is particularly relevant where an activity, such as mining, may be administered by more than one competent authority. A well-designed follow-up process can help to ensure that information is shared between the role-players and that duplication is minimized. This is of particular relevance in South Africa where the NEMA supports co-operative, participatory governance.

As a final point it is important to note that EIA follow-up can offer benefits at the project, plan and policy levels (Morrison-Saunders & Arts 2004; Marshall *et al* 2005). Most of the benefits discussed above apply to the project level as this is the focus for this study. However, many of the above benefits, in particular learning from experience, are equally applicable to plan and policy levels. For as Morrison-Saunders and Arts (2004) and Sadler (1996) note, it is not until the actual results of the environmental assessment process are known (via follow-up), that the true effectiveness of the EIA concept as a whole can be determined.

1.3.2.3 EIA follow-up in practice

While the benefits and need for follow-up are well documented, the actual means of implementing a follow-up process is not. It seems that the concept is well supported in theory, but that actual, practical implementation is a challenge. Morrison-Saunders *et al* (2003) for example, note that many countries may have EIA follow-up requirements but that few projects are actually followed-up. There are obvious practical challenges that need to be overcome, such as a lack of resources and institutional problems (Tonn & Peretz 1999) but Morrison-Saunders *et al* (2003:46) also perceptively note that one of the main problems is a “fear of opening Pandora’s Box”. Follow-up can be a grey area, particularly if there are no supporting legislative prescripts and guidelines. Often the authority is reluctant to follow-up in case action is needed or in case the follow-up reveals unacceptable practices which may result in unpleasant choices or reflect badly on the authority. Take for example the case of a large industry that is releasing effluent that doesn’t comply with standards. It is highly unlikely that the industry will be shut down – even if there is blatant non-compliance – as this could result in the loss of hundreds of jobs. Good litigation solutions are difficult in these cases (Culhane 1993) and in most instances the firm will simply be ordered to institute some form of mitigation measure. In South Africa the situation is further complicated by the principles of co-operative governance which actively discourage one sphere of government (such as the environmental authority) from taking another government body (such as a municipality with an illegal waste site) to court. These and other challenges have somewhat hampered the development of follow-up processes as is reflected in the mostly theoretical (rather than practical) literature on the subject of EIA follow-up.

1.3.2.4 Follow-up practice internationally

The lack of a standardized follow-up framework and the uniqueness of each country's situation has led to a wide variety of follow-up studies being reported on in the literature. For instance, there are examples from Ghana (Afoom 2004), Canada (McCallum 1987; Hunsberger *et al* 2004; Noble 2004), the Netherlands (Arts & Meijer 2004; Nijsten & Arts 2004), Western Australia (Bailey & Hobbs 1990), Hong Kong (Sanvicens & Baldwin 1996), Mauritius (Ramjeawon & Beedassy 2004); Brazil (Gallardo & Sánchez 2004) and the United Kingdom (Marshall 2002). Follow-up for specific purposes such as the verification of the accuracy of EIR predictions (Bird & Therival 1996; Wood, G 1999); suggestions for frameworks for follow-up (Harrington & Canter 1998; Wilson 1998; Baker 2004) and general discussions of follow-up (Bisset 1980; Canter 1985; McCallum 1987; Culhane 1993; Dipper *et al* 1998; Sadler 1998; Arts & Nooteboom 1999; Arts *et al* 2001; Morrison-Saunders *et al* 2001; Morrison-Saunders *et al* 2003; Morrison-Saunders & Arts 2004) are also available.

Given the wide variety of follow-up practices, the lack of a single commonly practiced approach and the uniqueness of each follow-up context, it is difficult – and unwise – to simply cut and paste EIA follow-up processes from one country to another. A more practical course of action would be to examine some of the general factors that influence follow-up and to select the elements which seem to be the most appropriate to the situation at hand. Morrison-Saunders *et al* (2003) and Morrison-Saunders and Arts (2004) have made notable attempts to consolidate some of the main lessons learned from follow-up practice around the world. These provide a useful starting point for any follow-up programme and are briefly discussed below.

Who should be involved in follow-up?

There are usually three main role-players in the follow-up process, namely the proponent, the regulatory authority and the community or interested and affected parties (IAPs) (Morrison-Saunders *et al* 2003). For follow-up to be successful, the roles and responsibilities of each party need to be clearly identified and specified (McCallum 1987; US EPA 1992). Co-ordination between the various role-players – especially if these groups include several government agencies that administer different aspects of the same activity – is also vital for successful follow-up (Harrington & Canter 1998).

Any of the three parties may be responsible for driving the follow-up process. Proponents may for example decide to initiate a follow-up process in order to prove compliance to the regulatory authorities. They may also initiate follow-up if they've had considerable pressure from IAPs to comply, in which case follow-up is driven by both the proponent and to a lesser extent, the community. In some cases, the regulatory authority may appoint a non-governmental organization or outside party to conduct follow-up on their behalf, as is the case in Taiwan (Leu *et al* 1996). Whichever approach is ultimately chosen, the determining factor for success is the clear assignment of roles and responsibilities.

Also important is the commitment of the various role-players to the follow-up process. In a situation where, for example, the political will isn't there to enforce, then follow-up is unlikely to be successful (US EPA 1992). The easiest way of obtaining commitment is usually to make each party clearly aware of the value that follow-up can add to the project. For a regulatory authority this value might be in the form of being able to ensure that environmental standards are being maintained, for a community it might be assurance that their issues are being addressed as promised and for the proponent it might be the chance to prove compliance and establish a good environmental track record (Marshall 2005).

Regulatory and institutional arrangements for follow-up

Morrison-Saunders *et al* (2003) have identified three common approaches to follow-up.

(a) Where there is a legal requirement for follow-up to take place, a traditional "command and control" type of approach may be taken. The regulatory authority is usually the main driver in these cases and follow-up tends to focus on issues of compliance and enforcement (Morrison-Saunders *et al* 2003). If a command and control approach is desired but there are no specific legal provisions for follow-up, then there are several other ways in which approved projects can be controlled. In Western Australia (Dik & Morrison-Saunders 2002) and Ghana (Afoom 2004) for example, follow-up is made mandatory by requiring it as one of the legally binding conditions of the EIA authorization. Follow-up may also be tied to existing permits issued by other regulatory agencies or written into agreements with proponents (Arts & Nooteboom 1999). While the command and control approach has its merits, legislation on its own is not always enough to ensure that follow-up takes place (Morrison-Saunders *et al* 2003). In the Netherlands for example, follow-up is required by law, but seldom carried out (Arts & Meijer 2004). A more effective approach suggest Morrison-Saunders *et al* (2003), could be to combine a legislative framework with self-regulation and public pressure. This leads to the second approach that can be taken to follow-up, that of self-regulation.

(b) As the name suggests, the self-regulation approach to follow-up relies largely on the proponent to regulate his or her own activities. This can relieve the regulatory authority of much of the burden of monitoring the implementation of projects, especially if the self-regulatory approach chosen by the applicant requires regular independent auditing. These independent audits help to ensure standardized and honest reporting. One of the most popular self-regulation tools is the implementation of environmental management systems (EMSs) such as ISO 14000. A number of authors support the use of self-regulatory tools such as EMPs and EMSs (McCallum 1987; Marshall 2002; George 2000c) although in order to be successful, the capacity (technical and financial) and commitment on the part of the proponent to implement and manage them must also obviously be there.

(c) Finally, there is the follow-up approach that involves Interested and Affected Parties (IAPs) as a key driving force, either as watchdogs to ensure that the process is properly implemented or as a part of the project management team. The involvement of IAPs in follow-up tends to be particularly successful in cases where the project has a high environmental profile and there is considerable public pressure to get things done correctly (McCallum 1987). This public pressure can be a very useful means of prompting follow-up in the absence of legal requirements (US EPA 1992), although Arts and Nooteboom (1999) caution that agreements with communities may not always be met if the costs are perceived to be too high by the proponent.

Each of the above approaches to follow-up has its advantages and disadvantages. The overall context in which follow-up is to take place will in all likelihood dictate the most suitable approach. What is best for one country, or project, may not be so for another and different elements of the above approaches may need to be combined in different ways to suit differing needs. They should certainly not be regarded as mutually exclusive. Morrison-Saunders *et al* (2003) for example suggest that a legislative approach coupled with self-regulation and public pressure might be the best way forward.

Methods and techniques used in follow-up

Pragmatism

Practicality in follow-up has been valued by, *inter alia*, Wilson (1998); Nijsten and Arts (2004) and van Velzen *et al* (2004). Although there have been calls for EIA and follow-up to be carried out in a scientific and rigorous manner (Beanlands & Duinker 1984; Bisset & Tomlinson 1988; Duinker 1989; Culhane 1993), this is not always possible or practical (Wilson 1998). Scientifically rigorous follow-up – especially when focused on assessing the accuracy of impact predictions – has its own set of challenges (Bisset 1980; Canter 1985; Bisset & Tomlinson 1988; Dipper *et al* 1998). There is a growing trend to focus on practical means of achieving follow-up goals.

Nijsten and Arts (2004) for example report on what they term a “quick scan” approach to the follow-up of road projects in the Netherlands. They note that not all projects will require follow-up and that not all issues will need to be addressed in the follow-up process. They therefore made use of existing monitoring information, simple field observations and a workshop process to perform a quick follow-up on some major road projects with the aims of determining which issues were important (i.e. a scoping type of process) and whether there were any major environmental problems that needed immediate correction or further follow-up. They conclude that such a quick scan approach can be a cost-effective and practical means of undertaking follow-up and of highlighting projects where more in-depth follow-up may be needed.

Wilson (1998) provides a further example of practically orientated follow-up. He proposes that follow-up start with determining the actual impacts of a project rather than by first looking at what was predicted and then trying to determine the accuracy of these prediction hypotheses. He also supports the use of simple, practical techniques such as site visits, interviews with experts or IAPs and simple field measurements.

Adaptive management

A further key to successful follow-up is flexibility and the ability to adapt management responses to changing conditions (Holling 1978; Bailey 1997; Marshall 2002; Morrison-Saunders *et* al 2003). Few projects are implemented exactly according to plan and there are likely to be unexpected impacts, impact mitigation measures that don't work as anticipated and changes in project plans that all need to be catered for somehow. Follow-up and project management mechanisms need to be able to respond to these changes, making a flexible approach vital. Flexible management appears to be preferred by both proponents and regulators (Dik and Morrison-Saunders 2002).

Resources and capacity for follow-up

The amount and type of resources and capacity available will obviously affect the type of EIA follow-up process that can be carried out. For example a country with limited resources might make use of a simple, pragmatic approach, rely more on self-regulation to reduce the burden on the authority, focus on major issues and conduct low-frequency inspections with existing data. A country with adequate resources could afford to have a more comprehensive, scientifically rigorous approach, with high-frequency monitoring, more stake-holder involvement and more frequent reports (Morrison-Saunders *et al* 2003).

One of the key resource issues – apart from the ever present one of budget – is that of personnel, or what Morrison-Saunders *et al* (2003) term "professional practice". The need for knowledgeable, committed and long-term staff with good interpersonal skills has been noted by a number of authors (McCallum 1987; Tonn & Peretz 1999; Branis & Christopolous 2005). This observation applies not only to regulatory authority staff, but also to proponents, communities and environmental consultants. As McCallum (1987) points out, poor work by consultants can lead to poor quality EIRs which in turn can make for inadequate follow-up suggestions and practice. Unfortunately, as Friend (2004) has noted, instances of exceptional environmental good practice are usually due to individual committed staff members rather than being a reflection of the industry in general. Bailey (1997) agrees that some EIA processes are reliant on key individuals to drive policy. This need for dedicated individuals has obvious implications for the success of any follow-up programme.

Related to this issue of human resources, is the question of which persons or parties are tasked to carry out the follow-up. Generally, follow-up can be conducted by personnel from the regulatory agency, the proponent's organization or an independent party. Sanvicens and Baldwin (1996) found that the most successful follow-up processes made use of independent and experienced environmental teams that maintained high profiles and credible relations with the public.

Another important resource issue is that of integration with other institutions involved in the same activity. For example, a major infrastructure project such as a dam might require the involvement of various regulatory agencies such as those dealing with water, dam safety, environmental issues and resettlement. By integrating and aligning the various requirements of these agencies and departments, time and money can be saved, duplication can be avoided and resources can be pooled. Harrington and Canter (1998) identify integration as an important step in planning a successful follow-up process.

Technological resources also play a role in the follow-up practice adopted by a country. Hong Kong for example makes use of a web-based information system to monitor, keep track and disseminate information on enforcement and monitoring (Au & Hui 2004). In Western Australia, Bailey and Hobbs (1990) made use of a database for recording and managing audits conducted, while the use of Geographical Information Systems in EIA practice is also growing (Antunes & Camara 1992; Eedy 1995; João & Fonseca 1996; Şahin & Kurum 2002). However, a lack of high-tech resources does not mean that follow-up is not possible or somehow less useful. There are many simple, practical methods that can be used to accomplish the same aims. What is important is matching the level of technology used to the capacity of the country; that is, appropriate technology should be used. Follow-up need not be high-tech or complicated to be successful (Morrison-Saunders *et al* 2003).

Finally, community resources can also play a major role in how follow-up is conducted. Public pressure (US EPA 1992), community watchdogs (Ross 2004) and indigenous knowledge (Hunsberger *et al* 2004) can greatly assist in follow-up, but only if the community is willing and capacitated, expectations are clarified and channels of communication are established and kept open.

Type of project being followed-up

Whether a project is large or small in nature also has an influence on follow-up (Morrison-Saunders *et al* 2003). For example, major projects that require considerable amounts of investment, long-term commitments and occupy large spatial areas, usually also have a greater potential for generating significantly adverse environmental impacts. In such cases, resources are usually available for follow-up and there is a greater likelihood of intense public scrutiny. Consequently, these major projects are more likely to be subjected to comprehensive follow-up processes. Smaller projects on the other hand may not have the resources, or pressure from the public, to implement in-depth follow-up procedures. Follow-up therefore tends to be focused on larger projects. And if it is carried out for more minor developments, it is likely to be limited to simple methods and to focus mainly on checking compliance (Morrison-Saunders *et al* 2003).

This "large project bias" is also evident in follow-up studies reported on in the literature (see for example Bisset 1980; Tomlinson & Atkinson 1987b; Bird & Therival 1996; Wood, G 1999; Slinger *et al* 2005). There is no doubt that follow-up of these major projects is useful; however, it would be unwise to ignore the smaller developments. While many of them may not justify a comprehensive follow-up process it must be borne in mind that small projects are also capable of having significant detrimental impacts on the environment and that the cumulative effect of many small projects can be significant (DEAT 2004a). In addition, to promote fairness, it can be argued that *all* projects must comply, not just big ones. The lessons learned from following-up small projects – as opposed to just large ones - may be just as valuable to improving the EIA and follow-up process, particularly when smaller projects form the bulk of EIA project applications as is the case of the current study. There is thus good reason to include minor projects in follow-up. Some form of screening and prioritization is however essential to ensure that the follow-up process will add sufficient value (Arts & Meijer 2004) and that resources are allocated to projects most in need of follow-up (US EPA 1992; Arts & Nooteboom 1999; George 2000c).

From the above it can be seen that there is no one formula for how follow-up should be carried out. There are indeed many roads that lead to Rome and the desired end result of the follow-up process is what is important rather than how it is achieved. However, it is still important to ensure that the "how" of follow-up suits each country's unique needs (Marshall *et al* 2005).

1.3.2.5 Follow-up practice in South Africa

Provision was made in ECA (the Act under which the 1997 regulations were promulgated) for the national Minister of the Department of Environmental Affairs and Tourism to make regulations concerning "the procedure to be followed in the course of and after the performance of the activity in question or the alternative activities in order to substantiate the estimation of the environmental impact report and to provide for preventative or additional actions if deemed necessary or desirable" (RSA 1989, section 26(c)). There was thus a legal provision for follow-up. However no regulations were ever published in this respect and neither the 1997 EIA regulations nor the guideline document published by the DEAT (1998) make mention of follow-up. This is a peculiar discrepancy as the Integrated Management procedure drawn up by the Council for the Environment in 1992 included monitoring and auditing as an integral part of the implementation phase of a project (Wood C 1999).

This lack of legislated regulations for follow-up and enforcement, financial constraints and a lack of capacity could be some of the reasons why little follow-up has taken place (Wood C 1999; Duthie 2001; Hulett & Diab 2002; Craigie 2005). In the Eastern Cape Province where this study takes place, no EIA follow-up takes place on a regular, sustained basis and this work is the first such attempt in that region.

Elsewhere in the country, particularly in the more capacitated provinces such as Gauteng, some instances of follow-up may occur (Weaver 2003; Craigie 2005), but these are often isolated incidents and in reaction to urgent need or citizen complaints. This lack of a comprehensive follow-up programme is not entirely surprising, given the relatively young status of legislated EIA requirements (1997) and a lack of guidance, experience and capacity (Duthie 2001). EIA follow-up in general only tends to assume prominence once a country has established a stable EIA system. For example, in the United States, EIAs for federal projects were made compulsory in 1970 but follow-up only came to prominence some 10 years later with the advent of regulations requiring some form of project monitoring (Bisset 1980). Sadler (1996) has also observed stages in the evolution of EIA processes and believes that EIA globally has moved from the early application of the concept in the 1970s through two stages of increasing integration and sophistication and that it is now entering a fourth stage of focusing on strategic, sustainability and international issues. This evolution of EIA procedures to cope with changing social expectations is necessary to ensure the continued survival of EIA (McCallum 1987).

This point of EIA follow-up only assuming prominence once the initial EIA system is well established is reflected to some extent in the evolution of the South African EIA legislation. ECA makes only a brief provision for regulations relating to monitoring (RSA 1989, Section 26(c)) while NEMA devotes a chapter to compliance and enforcement (RSA 1998, Chapter 7) and lays the preliminary groundwork for monitoring procedures to become established by requiring that all authorizations must make provision for management and monitoring of the project throughout its life cycle (RSA 1998, Section 24E). An amendment to NEMA in 2003 further improves the follow-up situation by allowing for the designation of environmental management inspectors (EMIs) with wide ranging compliance and enforcement powers (RSA 1998, sections 31A-Q; Craigie 2005).

Thus although it appears that South Africa is well aware of the need for environmental follow-up activities, the necessary provisions are only now being put into place. The focus at this stage also seems to be on general compliance and enforcement actions rather than on EIA follow-up. This, while valuable, does seem to neglect the rich opportunities for learning and adaptive management that a broad follow-up process could provide.

Given the above and the lack of a formal follow-up process it is perhaps not surprising that there is also a significant lack of literature on establishing follow-up processes in South Africa. In a notable exception Hulett and Diab (2002) have outlined four models of EIA follow-up that have been used in South Africa and these will be examined for their potential use in this study.

The first follow-up model identified by Hulett and Diab (2002) is the legally based approach where legislation is used to ensure that monitoring takes place (Hulett & Diab 2002). This is akin to the traditional “command and control” approach with an emphasis on compliance and enforcement. South Africa has taken the first few steps along this path by requiring that environmental authorizations contain conditions relating to monitoring (NEMA Section 24E(a) and Regulation 38(1)(d)(ii) of the 2006 EIA regulations) and by providing for compliance and enforcement options in NEMA (Chapter 7). Hulett and Diab indicate that the legislative approach does not seem to be much favoured among the people they interviewed. They do note however, that most of the interviewees were environmental consultants and as such were probably not in favour of more legislation.

Hulett and Diab (2002) instead favour the use of a second model which makes use of statutory or voluntary agreements between the proponent and the affected community. Slinger *et al* (2005) provide an example of a successful partnership type approach that facilitated the monitoring and management of a large dam project in the Great Brak estuary in South Africa. This partnership approach also seems to have found considerable favour with the current South African dispensation; witness the provision in the NEMA (RSA 1998, Chapter 8) for the formation of Environmental Management Cooperation Agreements (EMCAs) between the various role-players for a project.

While the partnership approach may be a popular option for follow-up, one of the requirements for it to work effectively is that the community must have the necessary financial means, knowledge and skills to be able to understand and monitor the project. In parts of the developed world where the community is strongly capacitated on environmental issues the partnership approach has proved valuable (Hunsberger *et al* 2004; Ross 2004). Friend (2004) however cautions against expecting developing countries and countries in transition to be able to effectively police “first world” polluters. While he acknowledges the valuable role that communities can play, he also notes the lack of environmental capacity amongst many developing countries and their subsequent incapacity to act as public watchdogs. He argues instead for the strengthening of government enforcement to deal with immediate problems.

The partnership approach also has limited utility for this study in that the focus at this stage is on gathering information rather than on promoting participation in the process. Having to involve all the communities relevant to the large number of relatively low-key projects followed up on would be exceptionally time-consuming and unlikely to add much value. The partnership approach to follow-up could however become a valuable management option at a later stage once the follow-up procedure has become well established.

The third approach to follow-up identified by Hulett and Diab (2002) is that of self-regulation, which requires the implementation of environmental management plans (EMPs) or environmental management systems such as ISO 14001. Again, this could prove to be an exceptionally valuable management tool, but is not relevant for the information gathering phase of this study.

The fourth approach is one where incentives (such as positive publicity) and disincentives (such as financial penalties) are applied in a “carrot and stick” fashion. While Hulett and Diab (2002) do not see much merit in this approach, the US EPA (1992) advocates its use, as do Dasgupta *et al* (1999) and Friesen (2002). Among the advantages of this type of approach are flexibility and the wide variety of “carrots” and “sticks” that can be used. Even in cases where legislated incentives and disincentives are lacking, some creative penalties and rewards (such as good and negative publicity) can still be applied. Consistency is however important (US EPA 1992).

1.3.2.6 Implementing a follow-up process

The above discussion of EIA follow-up theory and practice around the world and in South Africa provides a wealth of theoretical solutions to the implementation of follow-up. The problem when implementing a follow-up process is however often a practical one. The theory and benefits might be well-documented and clear, but the question often remains: how does one actually put it into practice?

Providing an answer to that question is one of the aims of this thesis. As a starting point – and a useful summary of the discussion above – some of the key elements that seem to make for successful follow-up, and that are desired for use in this study, are highlighted and set out below. These provide useful pointers for the follow-up process being proposed in this thesis.

Follow-up should:

- be pragmatic and simple, but based on scientific principles wherever practical and possible;
- allow for flexible and adaptive management;
- initially be driven by the regulatory authority (i.e. the legislative approach), but acknowledge that there is room for the partnership and self-regulation models once the basics of the follow-up and the credibility of the enforcing agency have been established;
- cater for the South African EIA situation and the ultimate goals of the study – to establish a follow-up process and to pro-actively predict applications that could present a compliance or impact risk.

In addition to the above, the follow-up process must be able to offer early and effective screening of projects that should be subjected to follow-up. Follow-up can be expensive and projects that would most benefit from follow-up need to be identified and prioritized (Sadler 1996). How and why this should take place is the subject of the following section.

1.3.3 Risk screening and assessment

1.3.3.1 Screening for follow-up

Screening is usually intended to act as a preliminary decision-making process. When applied in terms of the EIA procedure, screening is used to determine whether assessment is necessary and if so, at what level (DEAT 2002a). It has the same function in terms of follow-up except that it is now used to identify EIA projects that should be subject to follow-up, preferably well before a consent decision is made (Baker 2004).

Screening is especially necessary in cases where resources are limited and need to be allocated to where they will be able to make the most difference (US EPA 1992; Arts & Nooteboom 1999; George 2000c). However, even where resources may be available, not every project subject to an EIA requires follow-up. As Arts and Meijer (2004) note, follow-up was made mandatory in the Netherlands under the assumption that if a project required an EIA, then it was obviously anticipated to have potentially significant effects on the environment and would therefore benefit from follow-up. In practice however, it was found that not all projects required follow-up (Arts & Meijer 2004). Some have acceptable or minimal impacts and follow-up might do little to add value in these cases. Arts and Meijer (2004) thus advocate that screening coupled with discretionary follow-up be implemented instead of mandatory follow-up for all projects.

If this is the case, then how can projects that would benefit from follow-up be screened out? The literature offers very little guidance in this respect. DEAT (2002a) provides a very brief review of screening methods that can be used to determine if a project should be subject to EIA. These methods include consultation with the regulatory authority, preliminary evaluations, decision-maker's discretion, decision support systems and checklist based approaches. In terms of screening methods applied to follow-up, it appears that so far only the checklist type approach has been reported on (Afoom 2004; Arts & Meijer 2004; Baker 2004).

Screening checklists

Screening checklists usually consist of a list of questions that help to determine if a project should be subject to follow-up or not. They commonly involve asking questions such as the following (which are a compilation of some of those suggested by Afoom (2004); Baker (2004) and Arts & Meijer (2004)): is there a legal requirement for follow-up? Is the area to be affected by the project environmentally sensitive? Are the mitigation measures that have been suggested based on new and/or unproven technology? Is there a significant risk associated with failure of the proposed mitigation measures? Does the proponent have experience in implementing the type of project being proposed? etc. An affirmative answer to one or more of these questions usually indicates a need for follow-up.

While these questions can be very helpful in determining if follow-up is needed or not, they do have their drawbacks. Firstly, many of them suggest that follow-up should be triggered if there is uncertainty about the outcome of the project (such as uncertainty about mitigation measures, the experience of the proponent, the technology to be used, the impact prediction techniques being used and so forth). This is a good idea, but is only really practical if the EIRs are high quality documents and clearly indicate where the areas of uncertainty are. If however, the EIRs are poor quality and full of uncertainty themselves (as is sometimes the case – Beanlands & Duinker 1984; Dipper *et al* 1988; Kruger & Chapman 2005) then follow-up will be more dependent on the quality of the EIRs than the actual projects and may well be triggered for virtually every project. This would defeat the aim of the screening process.

Secondly, answering a list of questions as above can be a rather cumbersome and subjective process, dependent as it is on the judgment of the reviewer. The regulatory authority in South Africa is already over-burdened (Duthie 2001) and a simpler process that requires only the minimum project details may be better received. The issue of subjectivity also deserves some consideration. For example, how much uncertainty about the effectiveness of a proposed mitigation measures constitutes "reasonable uncertainty"? Should even a limited amount of uncertainty trigger follow-up? DEAT (2002a) notes this as one of the shortcomings of list-based approaches and suggests that thresholds of some kind are needed. Subjectivity has another aspect to it in terms of how much discretion decision-makers have in answering the checklist questions. For example, some proponents may object if they are regarded as having limited experience and being "penalised" by it by having to undergo follow-up. A more objective process that is based on actual past performance of similar projects may be a better solution.

Given the above, and the lack of information on alternative screening options; the use of risk assessment is examined and proposed as a potentially useful screening tool.

Risk assessment as a screening tool

The use of risk assessment for follow-up screening makes intuitive sense. Risk assessment is primarily a decision-making tool that can help to assess possible adverse outcomes (Petts 1999b), which is exactly what the screening process hopes to achieve in terms of identifying projects that could present a default and/or negative environmental impact risk. Risk assessment in principle fits well with the second aim of this study.

It also has some additional advantages which make it an option worth considering for use in this study.

- Risk assessment has a clear and useful linkage with EIA (Andrews 1988; Eduljee 1999; Petts 1999b) which makes integration of the two fairly straightforward.
- Risk assessment allows best use of monitoring results according to Suter II (1998). Suter II views the collection of data on environmental status and trends as important, but not nearly as useful as feeding that data into a risk assessment model to help decision-makers.
- Risk assessment is a well-established and accepted approach. It is possibly more objective than the screening checklist approach and may be easier to use in that a simple Excel spreadsheet – as proposed in this study – can be set up to calculate potential risk.
- The risk assessment approach as proposed for this study is in line with the environmental management principle of "polluter pays" in that past defaulters are more likely to be targeted for follow-up as the screening tool is based on past performance. This type of approach (targeting based on past compliance history) has been supported by several enforcement studies (US EPA 1992; Friesen 2003).

Risk assessment clearly has the potential to be a useful aid to follow-up, but what exactly is it, and how can it be put into action? This is the topic of the next section.

1.3.3.2 Risk assessment

Risk assessment is a loosely applied term and can cover a whole spectrum of activities (Petts 1999b). Indeed in the environmental field it has been used, *inter alia*, to assess pollution risks to water supply (Foster & McDonald 2000); to manage water resources (Jooste & Claassen 2001); to assess the risks to ecosystems from introduced fauna and flora (Simberloff & Alexander 1998); and to prioritize action areas for the US EPA (Fiorino 1990). Quint (1998) discusses a number of examples of how environmental risk assessment can be applied in business. Ecological risk assessment, which focuses primarily on assessing risks to ecosystems, is also extensively used throughout the world (DEAT 2002c), including South Africa (Claassen *et al* 2001) and a comprehensive set of guidelines has been developed by the US EPA (1998).

Given this diversity of application, it is inevitable that there is some lack of clarity around the definition of the term. There is currently "no single, internationally agreed definition of risk assessment" (Eduljee 1999:375) and it is not the intention of this thesis to propose one. The most useful definition for this study is provided by the common language use of "risk" and "assessment" as provided by the on-line Compact Oxford English Dictionary (2007). Risk is defined as "the possibility that something unpleasant will happen", and assess is defined as "to evaluate or estimate". Risk assessment can thus be considered to be a process that evaluates the likelihood of an adverse effect occurring and may include a judgement about the acceptability of that effect. In the case of this study risk assessment would then encompass determining the likelihood of an EIA application resulting in high levels of compliance default and/or negative environmental impact during implementation. It also includes making a decision as to whether follow-up should be required for these potentially risky applications or not.

1.3.3.3 The risk assessment process

It has been commented on by several authors (CRARM 1997; Power & McCarty 2002) that there is no internationally standard environmental risk assessment process. Some countries such as Australia, New Zealand and the Netherlands have their own specific risk assessment frameworks that are applied to a wide range of activities (Power & McCarty 1998) while others make use of the more specialised ecological risk assessment process of the US EPA (US EPA 1998), or adaptations thereof (Claassen *et al* 2001). Risk assessments may also be used by development and funding agencies such as the World Bank (World Bank 1997) and the Development Bank of South Africa (Heydenreich & Barlow-Weilbach 2004).

Given this diversity of applications, a "lowest common denominator" approach is needed. Eduljee (1999) provides such an approach by identifying four stages that are common to most risk assessments. These are discussed below. A brief outline of how each stage relates to this study is also provided.

Step 1: Hazard identification

As the term suggests, hazard identification involves identifying hazards, that is substances or activities which could cause harm. In this step each project component is usually assessed for potential hazards and a conceptual model is built up that identifies possible sources of hazard, potential ways in which the hazard could develop and the ultimate possible effects or impacts. This step is also concerned with identifying which hazards are likely to be the most important or useful to include in the assessment. This is important as resources are usually limited and studies need to be focused in order to produce the desired results.

In the case of this study, default with the conditions of authorization and a high overall negative impact on the environment have been identified as potential hazards.

Step 2: Hazard assessment

The second step of the risk assessment process, that of hazard assessment involves refining and further developing the conceptual model of what is being affected, what the effects are and how the effects are occurring.

In order to assess the hazards for this study, information had to be gathered on the actual degree of default and impact among authorized EIA projects. In other words, field work to determine what had happened in terms of default and impact was necessary.

Step 3: Risk estimation

Risk estimation involves estimating the magnitude and probability of a hazard occurring. In other words it involves determining how likely it is that a hazard will occur (for example, the likelihood of a fuel spill occurring) and how severe the effects of that event are likely to be (for example, contamination of a water resource from the fuel spill).

During this step, the information gathered during the previous stage is evaluated to determine where the problem areas in terms of default and impact are and what the effect of such default and impact is.

Step 4: Risk evaluation

Finally, risk evaluation integrates all the stages and is used to give an indication of the acceptability (or otherwise) of the risk.

This is the step in this study where screening for default and impact risk is undertaken by means of a risk screening tool. This stage also involves making a decision as to whether follow-up should be triggered or not based on an estimate of a project's likelihood of default or negative impact on the environment.

The way in which this study proposes to use risk assessment adheres to the concept of risk assessment in the broadest sense of the word. It is however acknowledged that risk assessment also often includes quantifying the likelihood of the potential for harm occurring as well the significance of the consequences (DEAT 2002c). This was not attempted for this study as the type of data gathered on compliance and impact was not suited to such analytical procedures. As the focus of the risk assessment for this study is on screening, the term risk screening is henceforth preferred, particularly when referring to the screening process.

1.3.4 Integrating EIA, EIA follow-up and risk screening

The linkage between EIA and EIA follow-up is evident. What might not be so clear is how risk assessment can relate to both of them and how they can all be integrated into a complementary and useful whole. That is the subject of this section.

1.3.4.1 EIA and risk assessment

There are strong similarities between risk assessment and EIA (Suter II 1998; Eduljee 1999; Petts 1999b). Both are concerned with prediction; can be used to reduce uncertainty; assist with decision-making and provide a means to assess the potential outcomes of alternatives (Suter II 1993). A more in-depth perspective on their similarities and differences is provided by Andrews (1988) as summarized in Table 1-1.

Table 1-1. A comparison of the differences between EIA and risk assessment (based on Andrews 1988).

Differences in substance		
	EIA	**Risk Assessment**
Target actions	Applied mostly to public projects (in the USA) Usually legally required	Applied to public and private projects Usually not legally required
Alternatives	Can be selective	Not always considered.
Effects	Usually focus on ecosystems	Usually focus on human health
Prediction	Fairly crude and simplistic	More statistically sophisticated
Uncertainty	Often not explicitly dealt with	May be explicitly dealt with
Subjective information	Acknowledged	Discounted
Differences in process		
Purpose	Statutory requirement	Expert management technique
Administration	Generally open process	Usually closed, expert process

EIA and risk assessment also have commonalities in process. As Petts (1999b) and Eduljee (1999) indicate, the identification of hazards in the risk assessment process can be equated to baseline and scoping studies which focus on identifying issues. Risk estimation can be considered as equivalent to impact prediction while risk evaluation is similar to impact evaluation. There is thus considerable scope for integrating the two processes (Andrews 1988; Ortolano & Shepherd 1995; DEAT 2002c). Kwiatkowski (1998) and Eduljee (1999) both provide examples of instances where this has been done.

The particular benefit of integrating the two processes is that the strengths of each approach can complement the other. As Andrews (1988) observes, EIA and risk assessment have evolved from different backgrounds and therefore provide a slightly different emphasis on the environmental management process. Risk assessment tends to draw from a few discrete professional communities such as toxicologists, engineers and biostatisticians (Andrews 1988) and has historically been seen as an objective, scientific process capable of dealing with uncertainty. EIA on the other hand has evolved from a more socially driven, inter-disciplinary background (Andrews 1988) and while good at incorporating public input has sometimes been criticized (Beanlands & Duinker 1984) for a lack of scientific rigour. Integrating the two could allow for a process that is both politically and scientifically acceptable. Risk assessment could gain some socio-economic relevance from the EIA process, while EIA could benefit from the more scientific and defendable decision-making process offered by risk assessment.

1.3.4.2 EIA follow-up and risk assessment

As noted in section 1.3.3.1 above, risk assessment can fit well into EIA follow-up as a risk screening tool to identify default and impact risks. However, there is also some indication that risk assessment and follow-up share additional common ground.

Follow-up is sometimes regarded as the ideal link between project planning and implementation (Bailey 1997; Arts & Morrison-Saunders 2004) as it provides a transition between planning and doing. Eduljee (1999) has made the same comment about risk assessment. As he puts it, risk assessment has "…the potential to establish a seamless link from project conception/design through to operation/implementation and beyond; [which helps to provide] continuity between the planning process and the regulatory control of facility/project operations" (Eduljee 1999:374). Follow-up and risk assessment are therefore both useful linkage processes, particularly in that they provide feedback that can help deal with risks (Arts & Morrison-Saunders 2004).

Some of the examples of risk assessment used in the literature also indicate the potential for integration between follow-up and risk assessment, particularly in terms of the use of risk assessment as a follow-up screening tool. The Development Bank of South Africa (DBSA) for example makes use of environmental risk assessment to screen applications for funding in terms of their likelihood of default, negative environmental impact and being able to meet environmental requirements (Heydendreich & Barlow-Weilbach 2004). Quint (1998) provides some examples of how risk assessment is used to determine when firms are not environmentally compliant in terms of emissions and when clean-up needs to be triggered. Fiorino (1990) suggests that risk assessment could be ideally combined with environmental planning to help prioritize and allocate resources as was done in the US EPA. Finally Eduljee (1999) notes that risk assessment could play a valuable role in monitoring and follow-up by helping to prioritize emissions, processes, issues or sites that may have higher risk profiles. These high-risks can then be focused on during the follow-up procedure. Thus although no one has yet utilised risk assessment within EIA follow-up, the potential of it as a tool to prioritize risks is there.

1.3.4.3 A proposed framework for the integration of EIA, EIA follow-up and risk screening

Based on their commonalities and respective strengths, an integration of all three processes (EIA, EIA follow-up and risk assessment) could provide a very powerful assessment tool to assess compliance default and environmental risk. Such an integrated framework is proposed in Figure 1-3.

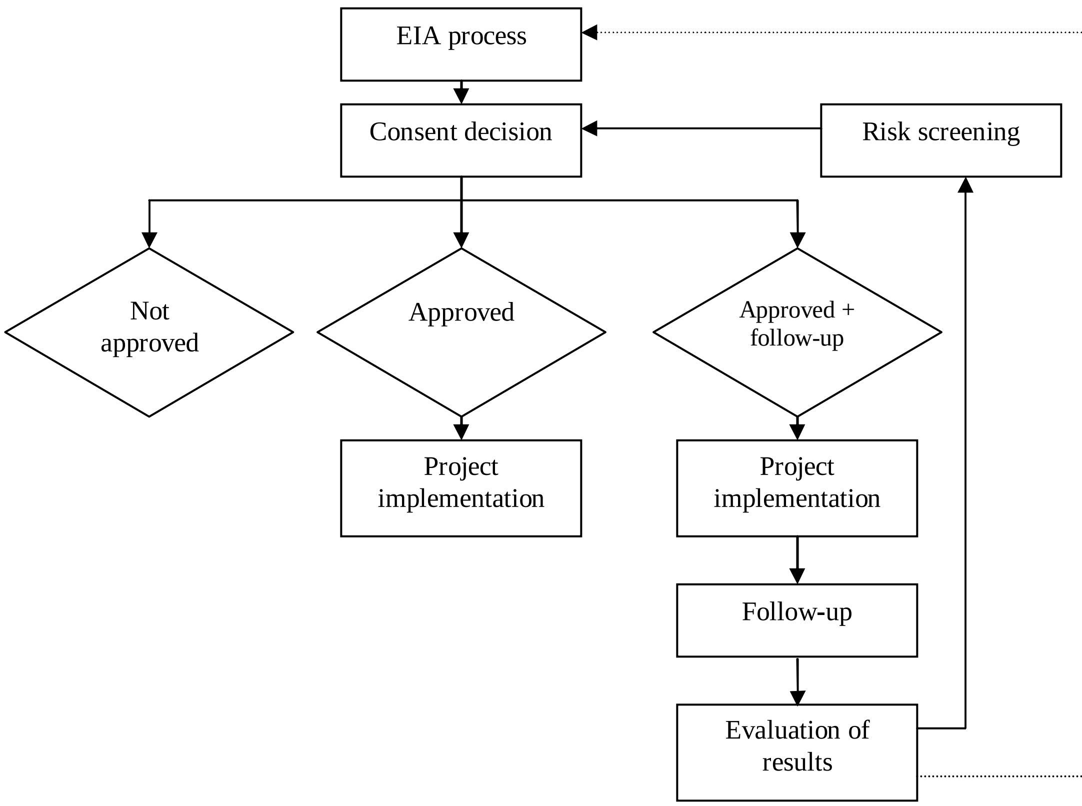


Figure 1-3. The integration of EIA, EIA follow-up and risk screening as proposed for this study. *Dashed lines indicate potential iterations.*

Figure 1-3 shows the goal of integration, but how can it be achieved in practice? From the above discussion, it is clear that there are notable similarities – even overlap – among EIA, EIA follow-up and environmental risk assessment. The main steps of each and the commonalities among them are summarized in Table 1-2.

Table 1-2. A comparison of processes.

EIA[1]	**EIA Follow-up**[2]	**Risk Assessment**[3]	**Approach taken for this thesis**
Project definition		Hazard identification	Planning for follow-up
Scoping	Monitoring	Hazard assessment	Monitoring
Impact prediction	Evaluation	Risk estimation	Evaluation
Impact evaluation/ EIR		Risk evaluation	Risk screening
Decision	Management	(Risk management)	Management of follow-up (Communication)
EIR	Communication		

<u>Notes</u>:
1. EIA = generic environmental impact assessment
2. EIA Follow-up = EIA follow-up as described by Arts et al (2001)
3. Risk assessment = Eduljee's (1999) generic risk assessment framework
Brackets enclose options that are not explicitly part of the process, but may be included or are seen as peripheral to the main process

These steps provide an ideal practical framework process and one which will be utilised for this thesis (Table 1-3). The first phase of this study – that of follow-up – will involve the steps of planning for follow-up (step 1); monitoring or gathering of follow-up data (step 2) and evaluation of the data gathered (step 3). The second phase of this study – that of risk screening – will involve the development of a risk screening tool (step 4). Step 5 – that of management – flows from the outcomes of the previous steps and will be dealt with as part of the conclusions and recommendations of this study.

Table 1-3. The research framework.

Step	Activity	Research phase
Step 1	Planning for follow-up	Phase 1 – follow-up
Step 2	Monitoring/ collection of follow-up data	
Step 3	Evaluation of follow-up results	
Step 4	Risk screening	Phase 2 – risk screening
Step 5	Management recommendations for follow-up	

It should be noted that although these steps and phases are presented in a linear fashion, the process is ultimately cyclical, with the results of the follow-up phase feeding into the development of a risk screening tool, risk screening and follow-up feeding into management and lessons learned during management of the process being fed back into the follow-up process.

Chapter 2: Methodology

2.1 The underlying paradigm of the research

In the previous chapter (section 1.3.2.6), it was proposed that the methodological approach for this study be pragmatic and simple, yet based on sound scientific principles. This section examines the relative merits of a scientific versus a more pragmatic paradigm and motivates why a more practical approach was chosen.

It is important to define the paradigmatic approach taken for a study as paradigms guide not only the methodology of a study, but also significantly influence the results and value of such a study (Serafin *et al* 1992).

Within the environmental management field, two paradigmatic perspectives are readily apparent. The terminology for these two approaches may differ, Lawrence (1993) for example couches the distinction in terms of quantitative versus qualitative, but the underlying principles are the same. The first approach, which will here be termed the rational-scientific perspective, is concerned with taking an objective and scientifically defensible approach to environmental management. The second approach, here referred to as the pragmatic perspective, is more concerned with practicalities and dealing with subjective real-world situations. That is not to say that these are the only two possible paradigms available, but they are the most relevant for this study.

The first of these approaches is supported by authors such as Beanlands and Duinker (1984) and Culhane (1993) who argue strongly in favour of a rational and scientific approach to EIA. These authors view the EIA process as being too embedded within a socio-political context with the scientific accountability of EIA studies suffering as a result. There have been arguments too, that a lack of scientific precision makes follow-up work – and in particular the verification of impact predictions – more difficult as imprecise and vague predictions are difficult to verify and audit (Bisset 1980; Canter 1985; McCallum 1987; Tomlinson & Atkinson 1987b). A more scientific approach to follow-up could provide a means to reduce uncertainty, assess and improve the prediction power of EIA and thereby advance scientific knowledge (Duinker 1984; Bisset & Tomlinson 1988).

Scientific studies can also be more defensible in court (Duinker 1989), provide an objective view (Culhane 1993) and allow precise thresholds for action to be identified (Duinker 1989).

Given the above advantages, the case for adopting a scientific approach to follow-up seems strong. The rational-scientific approach does however, have some limitations. It is these limitations – as outlined below – that make an alternative, and more pragmatic approach, more suitable for this study.

One of the first challenges faced by scientifically precise studies is their requirement for considerable investments of finance, time, equipment and personnel resources (Bisset, 1980; Culhane, 1993). Such resources are often not available, especially for projects that are focused on providing basic services such as housing, roads or sanitation. These types of basic infrastructure provision projects make up a large proportion of the study sample and the lack of financial resources for rigorous follow-up work is therefore an important consideration.

A related, and equally important consideration is the fact that most proponents are businessmen or government agencies rather than scientists. They are therefore more likely to be amenable to EIA processes – including follow-up – that make practical business (and thus economic) sense rather than scientific sense (Noble 2004). Expensive proposals for follow-up are therefore not likely to be well received especially if they appear to be implemented to satisfy scientific curiosity only. A practical approach is far more likely to be accepted, particularly if it is cost-effective and can add value to the project.

The second limitation that can face rational-scientific paradigms relates to objectivity and the assumption that data produced via the scientific method is relatively free from bias. This objectivity is often touted as one of the strongest reasons for adopting a scientific approach. Paradoxically however, this objectivity is also a strong motivation for *not* using an objective, scientific method. As Holling (1978), Ortlano and Shepherd (1995), Holdway (1997) and van Leeuwen (1997) point out, scientists are not only products of society, with inevitable societal biases in even supposedly “objective” work; but it is also society’s environmental values that provide relevance and context for the EIA process.

The aim of the EIA process should be to provide a practical decision-making tool, not a scientific research one and the EIA process therefore needs to operate within the real world context of social, economic, political and environmental concerns (Ortolano & Shepherd, 1995). Environmental practitioner views appear to support this stance, that is that science is only one element in the decision-making process, with socio-economic and political concerns being equally important (Morrison-Saunders *et al* 2001a).

The third argument against scientific studies, is that, even if they are desirable, they are often not practical (Wilson, 1998). Some of the practical methodological challenges faced by scientific follow-up studies include lack of baseline data and suitable control sites, unforeseen changes to projects after consent decisions that can render impact predictions obsolete and difficulty in obtaining data that is suitable for rigorous statistical analyses (Bisset 1980, Bisset & Tomlinson 1987, Bird & Therival 1996, Noble 2004). These are challenges that are equally relevant for this study. Limited project budgets and tight time frames mean that baseline data is very seldom available which makes pre and post project implementation comparisons very difficult, if not impossible. The often poor quality of environmental reports in South Africa (DEAT 2004c; Kruger & Chapman 2005) means that the environmental information presented is often vague and not suitable for hypothesis testing. This inability to make use of properly designed testable hypothesis may be a disadvantage for scientific studies, but can actually be of benefit if a more pragmatic paradigm is adopted. For testable scientific hypotheses may lack utility and result in only easily quantifiable impacts being studied (Bailey 1997). If a more pragmatic perspective is adopted, then the scope of a study can often be expanded as the tolerance for qualitative and less precise data is higher.

The use of scientifically less precise data may also increase the practical utility of the study in that practical data is often better understood by managers, decision-makers and the general public. As Lawrence (1993) notes, the use of jargon and scientific terms may exclude many of the public from giving input. This can be a particular problem in less developed countries – such as South Africa – where large sectors of the population may have limited environmental education (Friend 2004).

It is in light of the above that a more pragmatic and qualitative approach has been adopted for this study. That is not to say that the scientific method is without merit, and certainly sound research principles such as standardization so as to facilitate comparisons between projects over space and time (Bailey & Hobbs 1990) should be adhered to. However, practicality provided a more useful research paradigm. This decision to utilize a more practical paradigm rather than pursue scientific certainty is not without precedent in the literature. A growing number of authors in the environmental management field (Lawrence 1993; van Leeuwen 1997; Dipper *et al* 1998; Arts & Nooteboom 1999; Morrison-Saunders & Bailey 1999; Tonn & Peretz 1999; McCarty & Power 2000; Noble 2004) have supported the use of a practical rather than scientific approach.

2.2 Specification of terms

Terminology in the environmental impact assessment field is not standardized which can lead to confusion about the meanings attached to certain terms (Tomlinson & Atkinson 1987a). This section thus provides an alphabetical definition of terms as used in this study that have not already been defined elsewhere.

Activities refers to the activities listed in terms of the 1997 EIA regulations as potentially having a significantly detrimental effect on the environment and therefore requiring authorization. The complete list of activities (as set out in the EIA regulations) is specified in Appendix 1. For convenience sake a condensed list of activities – and the abbreviations used for them in this thesis – are specified here.

- "**APPA**" is the abbreviation used for Air Pollution Prevention Act and refers to activities listed in the second schedule of that Act. APPA projects in terms of this thesis are thus those that have potential impacts on air quality and require an APPA permit.
- "**Dams**" is used to refer to activities that result in impediments to a water-course and includes the construction or upgrading of dams, bridges, weirs and river crossings.
- "**Electricity**" refers to projects involving the construction of infrastructure for the generation or transmission of electricity such as power-lines and sub-stations.
- "**Hazmat**" is used to refer to activities involving the storage, handling, treatment, processing and transportation of hazardous materials. In the case of this thesis all hazmat projects involved the storage of fuel or bitumen.

- "**Land Use type 1**" refers to projects that involve the change of land use from agriculture or undetermined to any other land use.
- "**Land Use type 2**" is used to denote projects that involve the change of land use from public open space or land used for conservation purposes to any other land use.
- "**Reservoirs**" means the construction or upgrading of water storage facilities that are used for public bulk water supply.
- "**Resorts**" refers to the construction or upgrading of any facility which is "frequented by people for holiday, sport, recreation, health or similar purpose" (DEAT 1998:12).
- "**Roads**" refers to activities involving the construction or upgrading of a road.
- "**STW**" is used as an abbreviation for Sewage Treatment Works and refers to projects that involve the construction or upgrading of sewage treatment plants.
- "**Telecom**" is the abbreviation used for projects involving the construction or upgrading of masts used for communication purposes. It includes cell phone towers and radio frequency transmission towers.
- "**Waste**" refers to projects that involve the development or upgrading of solid waste disposal sites.
- "**WSS**" means projects involving the construction or upgrading of Water Supply Schemes.

Applicant refers to the person or entity that applied for authorization in terms of the EIA regulations. The term **proponent** has also been used in this context and the two can be regarded as interchangeable for this study.

Applicant type refers to the type of proponent undertaking the projects that were followed-up on for this study. For convenience sake, the following abbreviations have been used for this thesis:

- "**co fuel**" refers to fuel companies that applied for the storage of hazardous substances (being fuel in this case). These include Engen, BP, Shell, Total, Caltex and Sasol.
- "**co telecom**" is used to refer to telecommunication companies, that is, Vodacom, MTN, Cell-C and Telkom.

- "**co other**" is a category used for a mix of companies that as individual applicants submitted too few applications to justify categories on their own. This grouping includes individual private companies of town and regional planners, small businesses and a water services provider.
- "**DM CHDM**" – refers to the Chris Hani District Municipality
- "**engineer**" is used to refer to cases where an engineering firm applied for authorization on behalf of a client.
- "**Eskom**" is the name of the South African parastatal that generates and distributes electricity in the country.
- "**Pvt ind.**" – used for individual persons that applied in their personal capacity.
- "**SANRAL**" – South African National Roads Agency Limited (a statutory body that deals with matters relating to South Africa's national road network).

Compliance, in line with the definition of the US EPA, was taken to mean "the full implementation of environmental requirements" (US EPA 1992:1-2). For this study, the environmental requirements were the conditions of the environmental authorization. **Default** was thus regarded as non-compliance with the conditions of environmental authorization.

Consent decision refers to the written decision made by the regulatory environmental authorities in terms of Section 22 of the Environment Conservation Act (RSA 1989) allowing a project to proceed. The consent decision may also be referred to as an **environmental authorization** or **positive Record of Decision**. In addition to formally authorizing a development, the consent decision usually sets out a list of conditions under which consent is granted. These conditions have been termed **consent conditions** or **conditions of authorization**.

Consultant refers to the environmental consultant employed by the applicant to undertake the necessary environmental impact assessment studies as required in terms of the EIA legislation. Most have been referred to by their firm's name, but the following abbreviations have also been used:

- "**engineer**" is used to denote cases where the engineering firm appointed by the applicant to undertake engineering work on the project also provided the environmental information required.

- "**exempt**" is used for cases when the applicant requested – and was granted – exemption from having to appoint an environmental consultant. The environmental information was then provided by the applicant.

There has been considerable debate in the literature regarding the definition of the term **environment** and what it should or shouldn't include (Fuggle & Rabie 1999). This study made use of the definition of environment as provided by the ECA, being the Act that provided for the EIA process. In terms of this definition, the environment is taken to mean "the aggregate of surrounding objects, conditions and influences that influence the life and habits of man or any other organism or collection of organisms" (RSA 1989, section 1(x)). This definition can be interpreted fairly broadly and a recent series of court cases in South Africa (Field 2006; Grundlingh 2006) have tested the notion of whether socio-economic factors need to be taken into account when considering applications submitted in terms of the EIA regulations. There were conflicting rulings on this (Field 2006; Grundlingh 2006) and although Field (2006) seems to disagree, there does appear to be an international trend towards including socio-economic factors in EIA and EIA follow-up (Morrison-Saunders & Arts 2005). This has obvious implications for the scope of work for follow-up and the use of SEA and SEA follow-up as a means of dealing with these broader issues may become more appropriate in future. At present however, economic issues such as economic efficiency and legal issues such as liability are not usually a focus for follow-up (Arts & Meijer 2004). In terms of this study, the focus was mostly on traditionally bio-physical and waste management issues although socio-economic concerns were taken into account where feasible.

Environmental Control Officer (ECO) refers to the person appointed (usually by the proponent) to oversee the implementation of environmental requirements for a particular project. ECOs are usually appointed for large developments that require daily environmental monitoring.

An **Environmental Management Plan** (EMP) is a document that "outline[s] the mitigation, monitoring, and institutional measures to be taken during project implementation and operation to avoid or control adverse environmental impacts, and the actions needed to implement these measures" (World Bank 1999:1). EMPs are thus practical documents that attempt to ensure that the impacts and mitigation measures identified during the EIA process are managed and implemented respectively during project implementation. EMPs are usually project-specific, which distinguishes them from EMSs.

Environmental Management Systems (EMSs) tend to be broader in scope than EMPs and provide a broad overall environmental management tool that governs the overall operations of a proponent (Marshall 2002).

The field-work in terms of the data collection that was undertaken for this study is here being referred to as **monitoring** to distinguish it as a distinct step in the follow-up process. Monitoring involved the undertaking of a site visit to a project subject to follow-up in order to determine the degree of compliance with the conditions of authorization and the overall environmental impact of the project. Monitoring was thus a once-off event and did not involve setting up sampling stations or undertaking in-depth investigations.

Overall environmental impact was taken to mean the overall effect that the project was judged to have had on the environment. This effect was rated on a 1 to 5 scale, with 1 representing low overall impact, 2 low-medium impact, 3 medium impact, 4 medium-high impact and 5 high overall impact.

Parastatal refers to a type of applicant. A parastatal is an organization which operates in the private sector (and for profit) but has the state as its sole shareholder. It thus has elements of both private and state applicants. Parastatal applicants for this study included Eskom (South Africa's electricity provider) and Telkom (one of South Africa's telecommunications providers).

Predicted-actual matches refers to the match between predicted default and/or impact scores (that is, scores predicted by the risk screening tool developed during this research) and the actual scores given by the person(s) undertaking follow-up for default and/or impact.

Processes and Tools. EIA is sometimes distinguished from environmental assessment (EA) in that it tends to have a narrower focus on managing project-specific environmental impacts whereas environmental assessment is often considered to have a broader policy or programme focus that concentrates more on ensuring sustainability (Sadler 1996). Petts (1999a) frames this distinction in terms of EIA being used as either a decision-making tool or as a process for making decisions. In general, a tool is regarded as a specialist input into the decision-making process whereas a process subsumes the tool into the overall system in an iterative manner. This distinction between tools and processes has been loosely retained for this study. The word "tool" (as in risk screening tool) is used to refer to a more specialized input into an overall process or system. In the case of this study, a risk screening tool arises from and feeds back into, the overall EIA follow-up process.

Project refers to an activity (such as the construction of a road or a change in land use) that was subject to the South African EIA regulations (RSA 1997) and that was subsequently assessed and granted a consent decision from the regulatory authority in terms of those regulations. A list of the projects followed-up on for this study is provided in Appendix 3.

Project life cycle refers to the cycle of construction, operation and decommissioning that a project progresses through. For the purpose of this study, the following four life cycle stages were defined and used:

- "**construction**", which refers to projects that are still being built
- "**construction/operation**", which refers to projects that have both construction and operational elements to them. These projects are those which are partly operational but are also still under construction such as a housing development which is being built in phases and will thus have some houses which are occupied and some which are still under construction.
- "**operational**", which means projects for which construction is complete and project operations have commenced; and
- "**decommissioned**", which refers to projects that have ceased operation.

In Chapter 3, reference is made to **Test 1** and **Test 2**; **Predicted 1** and **Predicted 2** and **Actual 1** and **Actual 2**. These terms all refer to the testing of the accuracy of the risk screening tool. The accuracy of the risk screening tool was determined by comparing a set of predicted impact and default scores (that is, scores predicted to occur by the risk screening tool), with actual scores (that is, scores obtained during a verification site visit). Two test sets of data were used for this purpose. **Test 1** is a set of 41 projects that were implemented after the follow-up work for this thesis took place while **Test 2** is a set of 13 projects that were implemented before any follow-up took place. **Predicted 1** thus refers to the impact and default scores predicted using the Test 1 data set in the risk screening tool while **Predicted 2** refers to the predicted impact and default scores for the Test 2 data set. Similarly, **Actual 1** refers to the actual impacted and default scores for Test 1 and **Actual 2** to the actual scores for Test 2. Further clarity is provided in Section 2.4.3.

2.3 The follow-up phase of the research

The remainder of this chapter follows the 5-step framework that was introduced in the previous chapter (Table 1.3). Follow-up is thus dealt with in terms of planning (step 1), data collection or monitoring (step 2), data analysis (step 3), risk screening (step 4) and management (step 5).

The follow-up phase – which is dealt with in this section (2.3) – will cover steps 1 to 3, that is, planning for follow-up, the collection of data and the analysis of results. The outcomes of this phase are then used to develop a risk screening tool (step 4) which is described in the next section (2.4) of this chapter.

Management is a culmination of planning, monitoring, data analysis and risk screening and is thus covered in a separate chapter.

It should be noted that while the framework for follow-up is presented in a series of five steps, the process is not strictly linear as there is considerable iteration between the steps.

2.3.1 Planning for the follow-up process

The first step of the follow-up process for this research involved planning the study and clearly outlining the scope and objectives of the research. The planning step can include defining the scope of issues to be addressed; determining the roles and responsibilities of the various role-players; selecting the methodologies to be used (Baker 2004); setting management goals (Claassen *et al* 2001) and drawing up a clear assessment or design plan (US EPA 1998; Baker 2004). These outcomes are addressed below.

2.3.1.1 Aspects of environmental importance focused on during the follow-up process

Logistically, follow-up cannot cover every conceivable issue that might be of environmental importance. Follow-up therefore needs to be focused on those environmental aspects that will add the most value to the follow-up process and those which are feasible to measure (Arts & Meijer 2004). This focusing of the follow-up process is particularly important for countries in transition – like South Africa – where newly created agencies with few staff and ill-defined areas of competency require the focusing of resources in order for an appreciable difference to be made (George 2000c).

The aspects of environmental importance that this study focused on were firstly, the degree of compliance with the conditions of authorization and secondly, the overall environmental impact of a development project.

Compliance follow-up involves checking whether specified environmental requirements – usually those required by the EIA consent decision – have been met (US EPA 1992). In the case of this study, this was done by determining if the conditions of authorization of a project were complied with or not. In South Africa, the majority of EIA authorizations are issued subject to conditions. These consent conditions usually regulate how a project must be constructed and managed. Their aim is to decrease and mitigate any potential impact on the environment. Thus for example, a road construction project may have conditions set that dictate what storm-water control measures must be put into place to prevent erosion. Compliance monitoring would then involve checking that the required erosion protection measures had indeed been provided.

The second follow-up focus area was the effect or impact that the EIA approved project had actually had on the environment. In many cases (for example Bisset 1980; Canter 1985; Bisset & Tomlinson 1988; Bird & Therival 1996; Dipper *et al* 1998; Wood G 1999) this type of effects monitoring is done by attempting to determine if the predictions made in the environmental impact assessment actually transpired in practice. However, on the whole, studies that have attempted to verify impact predictions made in EIRs have not yielded promising results. Dipper *et al* (1998) report that 43% of the predictions made for eight UK projects could not be audited due to a lack of data and unsuitable information; while Bisset (1984) (in Dipper *et al* 1998) found 88% could not be audited. Bird & Therival (1996) fared somewhat better with only 18% of impact predictions that were not able to be audited, although their study focused on quantifiable, physio-chemical predictions only. Morrison-Saunders *et al* (2004) report impact prediction verification success rates of between 12% and 56% and Dipper *et al* (1998) a range of 12% to 85% (the latter being for a project that looked at quantifiable predictions only).

Studies that have attempted to verify the accuracy of the predictions made in EIRs have not fared much better. Morrison-Saunders *et al* (2004:156) in their observation on the accuracy of impact predictions make the comment that "results to date have been variable, but generally not impressive". They found results that ranged between 30% and 80% accuracy.

This poor performance is generally attributed to poor quality information in the EIRs, impact predictions that were not designed to be verified, lack of baseline information and vague or imprecise impact predictions (Bisset 1980; Duinker 1984; Canter 1985; McCallum 1987; Tomlinson & Atkinson 1987b; Dipper *et al* 1998).

Given the generally poor performance of impact verification studies, the fact that predictive accuracy does not usually give a good indication of how well the project is performing in practice (Morrison-Saunders & Bailey 1999; Morrison-Saunders *et al* 2004) and the often poor quality of South African environmental impact reports (DEAT 2004c; Kruger & Chapman 2005), this study did not focus on impact verification. Instead, the focus was on determining the overall impact that the project had had on the environment. This measure of overall environmental impact was judged to be a more useful measure of a project's environmental performance than a measure of how accurate the EIR was at predicting impacts. It also provided a single estimate of overall environmental impact for a project which was simpler and more practical to measure than trying to verify numerous impact predictions for a single project.

Both compliance and effects monitoring were identified as important issues to focus follow-up on for this study for the following reasons.

Compliance monitoring is usually undertaken in order to ensure that the environmental requirements specified for a project are being implemented (US EPA 1992). The assumption is that these requirements have been set with the intent of reducing environmental impact and that ensuring compliance will help to ensure environmental protection. And while this may indeed often be the case, compliance monitoring on its own is not a sufficient indicator of the true environmental performance of a project (Morrison-Saunders *et al* 2004). For "[i]t is assumed that implementing proposed mitigation measures as planned actually protects the environment, but this may not be the case … through cumulative or synergistic effects, it is possible that the receiving environment is adversely impacted, but this may not be examined during a compliance audit" (Morrison-Saunders *et al* 2004:157). Additionally, most compliance audit results are based on the assumption that each consent condition has equal weighting whereas in reality some may be more important for environmental management purposes than others. For example, non-compliance with a condition prohibiting removal of sand from a sensitive floodplain may have more environmental importance than non-compliance with one stipulating that a site camp must be kept free of litter. These differences in weighting are not reflected in the scoring of compliance which can make it difficult to accurately determine the seriousness of overall default (Morrison-Saunders *et al* 2004). A high level of compliance therefore cannot be assumed to mean a high level of environmental protection (Morrison-Saunders *et al* 2004). This makes it essential to include an indication of overall environmental performance in the compliance monitoring programme. In other words, the overall effect that the project has had on the environment needs to be indicated.

This does not however mean that compliance monitoring is not particularly useful. Compliance monitoring and enforcement programmes have other, vitally important roles to play. These include helping to strengthen the credibility of the environmental requirements (such as the EIA process) by showing that the regulatory authority takes compliance seriously and helping to protect environmental quality and public health by checking for compliance with environmental and health standards (US EPA 1992).

Monitoring compliance can also provide valuable information on the actual degree of default that is occurring and can reveal areas where enforcement or modification of the consent conditions may be necessary. Van Velzen *et al* (2004), for example, found that some conditions relating to the distance that fuel had to be stored from watercourses were totally impractical in practice and that these conditions needed to be modified in order to allow the contactors to carry out their work effectively. Without this sort of compliance follow-up, this type of project management is not possible.

Thus both compliance and effects monitoring are important and both were therefore included in this study. While these were the two aspects of most importance for this study, other follow-up processes may have other key focus areas, depending on the stake-holders involved (Arts & Meijer 2004). For example, a more community driven follow-up process may focus on aspects that are of importance to that community.

2.3.1.2 The spatial extent of follow-up

The spatial extent of the study area for this research is as indicated in Figure 2-1 below. The study area is situated within the Eastern Cape Province of South Africa. In this Province, applications for provincial EIA authorization are submitted to the environmental authority (the Department of Economic Development and Environmental Affairs or DEDEA) via one of five regional offices, depending on the location of the development project. This study focuses on the EIA applications submitted to one of these regional offices. This regulatory authority office, which is based in Queenstown, covered the district municipal areas of Ukhahlamba and Chris Hani (Figure 2-1). Ukhahlamba in turn is comprised of four municipal areas (Elundini, Gariep, Maletswai and Senqu) and Chris Hani of eight (Emalahleni, Inkwanca, Intsika Yethu, Inxuba Yethemba, Lukhanji, Ngcobo, Sakhisizwe and Tsolwana). The region encompasses parts of the former Transkei homeland as well as parts of what was “white” South Africa under the apartheid era.

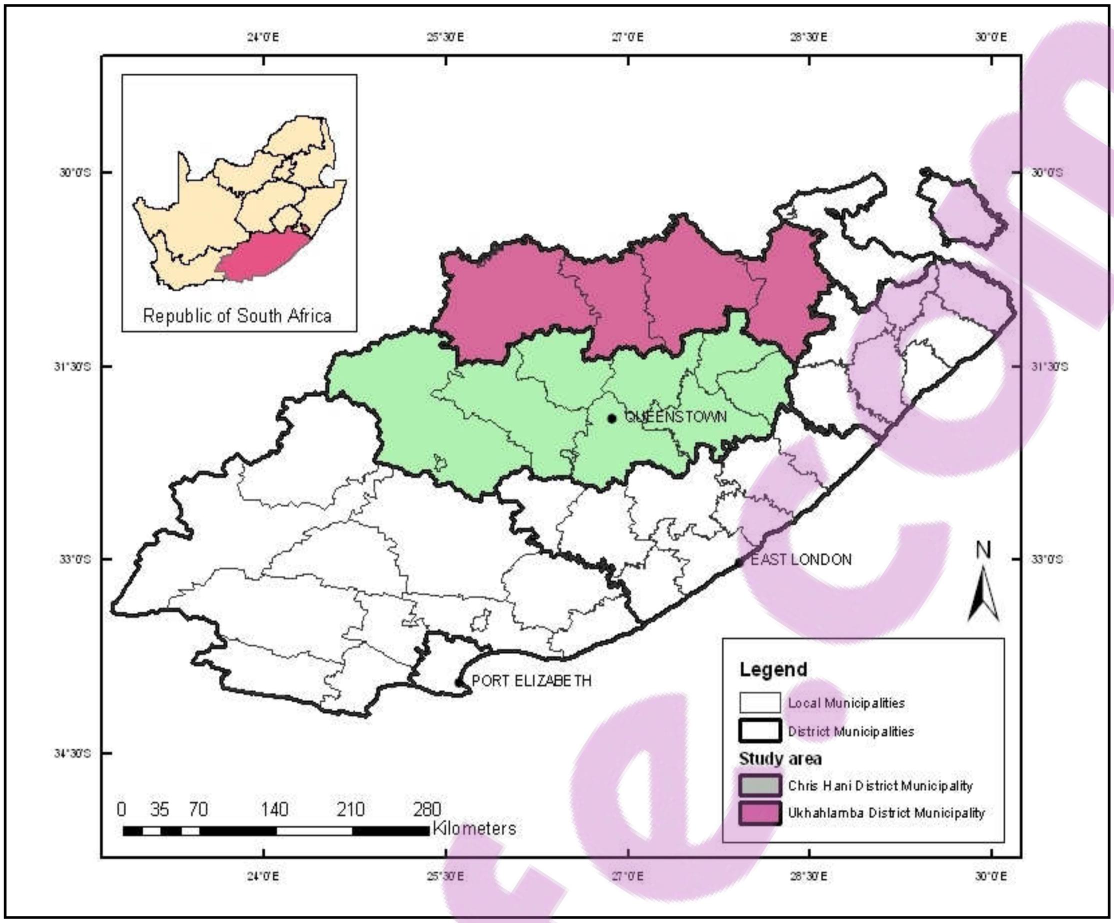


Figure 2-1. The study area.

Follow-up needs to be delimited not only in terms of general study area, but also in terms of spatial limits of follow-up for individual projects. For example, will the follow-up investigation be limited to the local project area or will regional impacts of the project (if relevant) also be taken into account? This will to some extent be dependent on the objectives of the follow-up programme. A “state of environment” type of follow-up process would probably want to examine effects on a regional scale whereas most EIA follow-up processes – like this one – will probably concentrate on local effects.

With regards to determining the spatial extent of follow-up for individual projects, monitoring was limited to the immediate project area. Limiting the study in this way was useful when it was uncertain if extraneous variables had influenced default. For example, if there was litter present on site but there was a community living nearby that could also have contributed to the waste problem, then only litter on the immediate project site or that which was obviously related to the project was taken into account when determining if a waste management default had occurred. Figure 2-2 illustrates this further.

Figure 2-2. A low-income housing development being constructed in the Tsolwana municipal area of the study area[1].

Impact estimation was also confined to the local project area for this study. This was the most practical approach and most of the projects did not have impacts that extended much beyond a local range in any case.

For large, ill-defined projects, such as water supply schemes, follow-up was focused on a few pre-selected points (such as where pipelines cross water-courses) where it was felt that follow-up would add the most value.

2.3.1.3 The most effective time to undertake follow-up

Different issues and different projects may require different frequencies of follow-up (Arts & Meijer 2004), which makes the issue of timing – or when to undertake follow-up – important.

[1] While the dust evident in the background towards the left hand side of the photo could have been generated by construction activities for the housing development, it may also be as a result of traffic on the nearby gravel road. Similarly the litter evident in the foreground could be as a result of the project or from the adjacent existing township.

The way in which default and impact were measured for this project (that is, during a single site visit) presents a realistic but snapshot view of conditions at that particular point in time. Defaults and impacts are however not static and can vary somewhat according to the stage of the project (construction, operation or decommissioning).

The appearance of a project and the opportunities to detect default in particular can differ according to project stage and type. Large-scale road projects for example usually give an impression of high impact during the construction stage due to the bulk earthworks and the opportunities to detect construction defaults and impacts are greater. However, after completion and rehabilitation a rather different and lower-impact picture is presented. Waste disposal sites on the other hand tend to have fewer construction defaults but more management ones and look very different just after construction and after some months of being in operation (see for example Figures 2-3 and 2-4).

While the stage that the project was in at the time of follow-up was recorded, no deliberate attempt was made by this study to select projects for follow-up based on the stage that they were likely to be in. This is because the authority had little means of knowing what stage a project was in prior to undertaking the follow-up site visit. Follow-up would also have been more difficult to carry out if it had to be tied to the construction schedule of many individual projects. However, given the large sample size for this study, most project stages were covered automatically without having to specifically target follow-up to take place during a specific stage.

Figure 2-3. Landfill site in the Elundini area just after construction.

Figure 2-4. The same landfill site a year later. Note the lack of covering of the waste, the presence of goats on site and the partial removal of the tree screen.

As the timing of follow-up is important, the regulatory authority needs to determine how often follow-up should take place for a specific project. Ideally there needs to be a balance between undertaking a few, snapshot type visits and more expensive but frequent follow-up. Due to the number of projects that needed to be followed-up, this study focused mainly on the former approach, that is undertaking follow-up only once or at most twice for each project. This enabled a lot of general information on a wide range of EIA projects to be gathered as opposed to more detailed, but limited information on fewer projects.

A final point regarding the timing of follow-up relates to when follow-up should take place within the environmental management process as a whole. Obviously, as its name suggests, follow-up usually takes place after an EIA consent decision. However, planning for follow-up needs to occur well before that decision takes place (Baker 2004) and should continue through project implementation, evaluation, management and reporting. In the case of individual projects, the need for follow-up should be determined when the need for EIA is determined and a draft follow-up proposal should be submitted with the EIR as this allows the opportunity for review and fine-tuning (Baker 2004). The EIA study will then be able to inform the design of the follow-up process and a final follow-up process could be tied to the consent decision. Identifying projects that require follow-up prior to a consent decision is one of the objectives of this study and relies on the development of a screening process.

2.3.1.4 The role-players involved in the follow-up process

The clear assignment of roles and responsibilities has been identified as key to successful follow-up (McCallum 1987; US EPA 1992; Marshall *et al* 2005; Morrison-Saunders *et al* 2004; Ahammed & Nixon 2006). There are generally three main role-players involved in the follow-up process: the applicant, the regulatory authority, and interested and affected parties (Morrison-Saunders *et al* 2003).

Applicant

There appears to be a general assumption in the literature – in line with the "polluter pays" principle – that the proponent should fund follow-up or at least be responsible for funding the mitigation measures that are needed (George 2000c; Marshall *et al* 2005).

Opinions are divided as to whether this funding responsibility should include undertaking follow-up as well (Morrison-Saunders *et al* 2004), or simply funding the follow-up process but having it conducted by an independent body to ensure unbiased results (Sanvicens & Baldwin 1996). The most prevalent view seems to be that the proponent should fund the mitigatory and remediation measures required by the environmental authority, but that follow-up itself should be the responsibility of the regulatory authority (US EPA 1992; Afoom 2004). This is a view shared by this study.

This viewpoint – that the applicant should be responsible for follow-up costs while the regulatory authority must ensure that follow-up takes place – is also largely supported by the legislation in South Africa. NEMA clearly states that “the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment” (RSA 1998, Section 2(4)(p)). While there was no specific assignment of responsibility for follow-up in either ECA or the 1997 EIA regulations, the guideline document for the EIA regulations does note that the applicant must “be responsible for all costs incurred in complying with the regulations” (DEAT 1998:14) while the relevant authority “is responsible to ensure that the applicant/consultant complies with the requirements of the regulations” (DEAT 1998:15).

Although the proponent is supposed to be responsible for payment and implementation of mitigation and other project management measures, this is sometimes a considerable challenge. In many cases, the proponent is a government agency such as a local municipality with severely limited funding and a considerable lack of environmental capacity. In such cases there is often barely funding available for conducting an EIA, let alone follow-up. There is also very seldom money available for remediation measures once the project has been commissioned and is in operation. This is particularly the case with projects that have been built with grant funding but have to be maintained with municipal funding. This lack of resources, coupled with the fact that most of these projects are to meet social needs such as housing or water supply, can make it extremely difficult to hold a proponent responsible for poor environmental performance. Thus although there is a legal expectation that proponents must pay for mitigation measures, this is not always viable and creates a challenge for the regulatory authority.

Requests for corrective action need to be reasonable and fair (Arts & Meijer 2004) but fairness can be a problem if only certain projects – such as those funded by wealthy developers who are assumed to have the necessary financial resources – are subject to corrective action.

The regulatory authority

The final responsibility for undertaking follow-up in South Africa is the generally accepted mandate of the regulatory authority (Hulett & Diab 2002). Although the proponent may be required to appoint an ECO or to submit regular audit reports, the final compliance and enforcement actions usually rest with the regulatory authority as they have the legal mandate to enforce.

The regulatory authority in the case of this study (DEDEA) was thus responsible for driving and conducting the follow-up process for this study. As such, inspection and travel costs were borne by them. In the case of large projects, where third parties were already undertaking independent environmental audits, the authority still conducted independent verification inspections. The proponent remained responsible for rectifying environmental damage caused by their development and for costs relating to this rectification. They were also responsible for funding and appointing independent third parties to conduct audits and to implement management plans where required to do so by the authority.

Interested and affected parties

The involvement of the community in follow-up bears some discussion. Particularly for large projects, where there is a lot of public sensitivity, the incorporation of the community as an active part of the follow-up process can be very successful (Hulett & Diab 2002; Hunsberger *et al* 2004; Marshall 2005; Slinger *et al* 2005). The importance of public pressure and scrutiny in ensuring compliance should also not be underestimated (US EPA 1992; Dasgupta *et al* 2000). The community can play a valuable role in not only monitoring a project's performance, but also the regulatory authority's performance. However, given the large number of small, disparate and widely dispersed projects that were followed-up on for this study and the general lack of community capacity (Hulett & Diab 2002; Friend 2004), this was not an area emphasized by this study. In addition, for smaller projects, the public often loses interest after the project is implemented and just accepts it "as is" (Arts & Nooteboom 1999). Public involvement takes time and commitment from all parties and is probably best suited to large projects where it can really add value. Thus for this study, communities were not much involved, unless specific issues were identified that required their input or they reported a major non-compliance that required urgent follow-up. There are however considerable opportunities to involve IAPs in follow-up and this is suggested as a fruitful avenue for future research.

In an ideal situation, all three parties would be involved in co-operative follow-up whereby the proponent would implement the necessary mitigation measures and management plans, the regulatory authority would check that these measures and plans are being correctly carried out and the community would be involved (Marshall *et al* 2005).

2.3.2 Collection of follow-up data

2.3.2.1 Selecting projects for follow-up

The 146 projects selected for follow-up during the follow-up phase of this research were drawn from the population of approved EIA applications submitted to the Queenstown regional office of DEDEA between 2000 and 2004. Apart from projects that had to be screened out for practical reasons (such as those that the authority was aware had not taken place or that fell outside the redefined regional boundaries), the whole data set of approved EIA applications to the regional office over that 5 year time span was available for follow-up. This data set is therefore likely to yield a representative set of activities for the region, with the possible exception of three activity types (reservoirs, change in land use from public open space to other and resorts) where only one project of each activity type was available to be followed-up on. Activity types that have not been subject to follow-up include coastal activities (the study area does not have a coastline) and some of the less common, complex activities such as the construction of nuclear power stations. It is likely that the results of this study may be cautiously extrapolated to the rest of the Eastern Cape Province where similar activities have been implemented.

Access to the projects selected for follow-up (including the impact assessment reports and the environmental authorizations) was readily available as part of the researcher's normal employment and permission to undertake the research was obtained from the necessary managers.

Of the initial 146 projects selected for follow-up, 29 could not be monitored due either to the projects not having started or to access difficulties (impassable roads or unsafe areas); leaving a total of 117 projects that had complete follow-up results.

Activity types subject to follow-up

As no deliberate selection of applications was done and the full complement of applications received between 2000 and 2004 (a full 5 year period) was included in the sample, it can be assumed that the sample was representative of applications received by the regulatory authority (DEDEA). The types of activities monitored are thus a reflection of the types of EIA applications received by DEDEA.

As indicated in Figure 2-5, the majority (18%) of applications were for land use change type 1. Most of these were for the establishment of low-income townships. Basic infrastructure projects such as water supply schemes (WSS) (15%) and roads (13%) accounted for another substantial proportion of projects monitored. Hazardous substance (primarily petrol, diesel and paraffin) storage applications (hazmat) (12% of all projects followed-up) were also common.

The least common applications were those for resorts, land use change type 2 and the construction of reservoirs (only one application received for each of these activities). Few resort applications were submitted while reservoirs were usually included as part of water supply projects and therefore seldom submitted as an application on their own. Land use change type 2, which involves the change in land use from nature conservation or zoned open space to any other land use, is also not a common application as not much of the land in the study area is zoned for nature conservation or open space purposes.

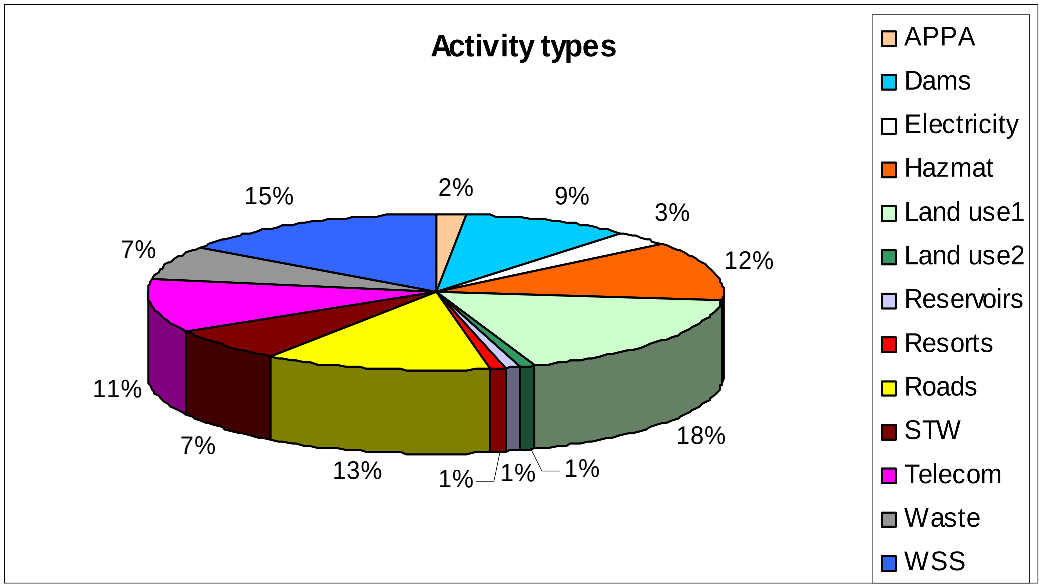


Figure 2-5. The proportion of different activity types followed-up on.

Types of applicants subject to follow-up

The majority (68%) of applicants for the projects followed-up on were government institutions (Figure 2-6), whether at a local, district, provincial or national level. Private sector proponents made up a further 27% while 5% of projects had parastatal organizations as proponents.

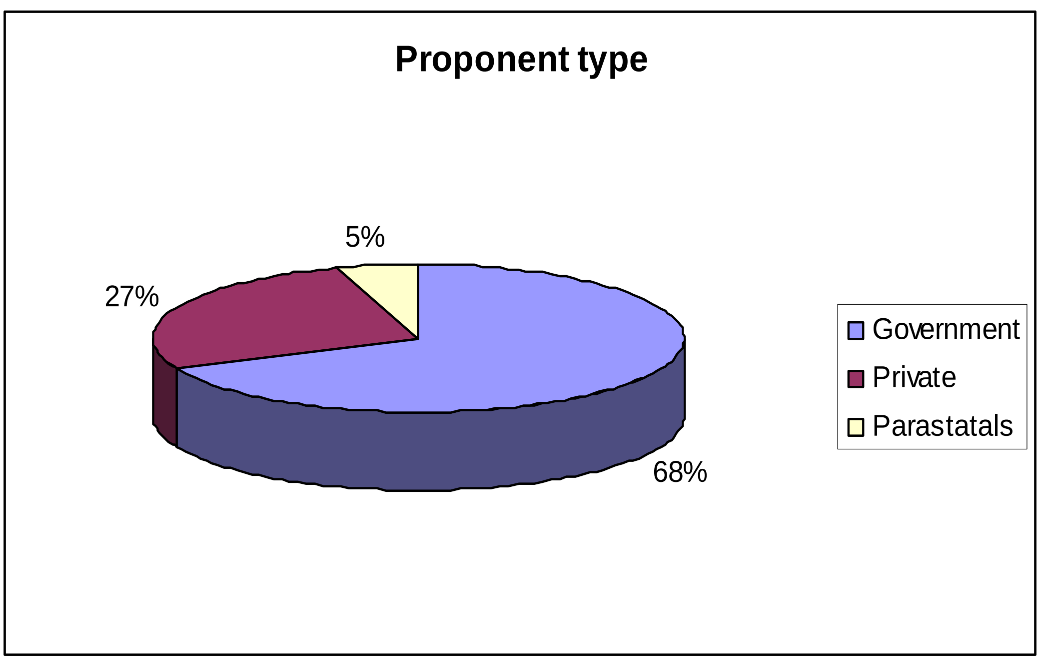


Figure 2-6. The type and proportion of proponents for the projects followed-up on.

2.3.2.2 Data collection methods utilized by the study

Tools available

Baker (2004) lists audits, site visits, permit conditions, Environmental Management Systems, interviews, cameras, State of Environment monitoring schemes, multi-stakeholder advisory committees and the review of documents as some of the tools that can be used to collect follow-up information. To these Wilson (1998) adds comparing the affected site with similar sites, interrogating environmental data-bases, expert interviews, self-monitoring by project operator, general observations, photo interpretation and sampling. Citizen complaints and area monitoring (e.g. remote sensing) can also be used (US EPA 1992). Given this wealth of available tools it can be difficult to know which one to select. Baker (2004:52) makes the reassuring comment that "there is no evidence to suggest that any one of these tools is more effective than the others". The main criteria should therefore be ease of use and suitability for the specific follow-up process concerned.

This study chose to make use of site visits, self-designed monitoring checklists and occasional informal interviews with staff on site to gather data. Photographs were used to document occurrences of impact and default, while expert judgment and comparison with other similar projects was used to help score overall impact. Little use was made of proponent audit reports as most of the projects were not at a sufficient scale to justify the expense of making the applicant undertake accredited audits or even appoint an environmental control officer. However, there may be a case for shifting some of the monitoring burden onto the proponent and as a minimum requiring a "post construction" report with photographs and descriptions of the various mitigation measures that were put into place. This requirement for a post construction audit report is an approach that has been used with some success by the National Energy Board in Canada (Farrand *et al* 2004) and bears consideration for future follow-up work.

The tools used in the collection of follow-up data for this study are discussed below.

Forms

To facilitate the collection of data, a short monitoring form (Appendix 2) – based on recommendations made in the literature (US EPA 1992) – was designed for on-site completion so that the follow-up process would be as uniform as possible at each project. Provision was made on this form for the recording of general project details; the number of consent conditions complied with; the overall environmental impact rating of the project; actions taken on site and recommendations made. This form was then attached to the environmental authorization (which contained the consent conditions) issued for each project.

Site visits

Site visits provided the primary data collection tool. Each project selected for follow-up was visited by one or more staff members from the regulatory authority. During the visit, observations were made as to overall impact of the project on the environment and the site was checked for compliance with the conditions of authorization. The results were recorded on the previously developed monitoring form. These visits were wherever possible carried out as part of a two or three person team in order to reduce bias where judgment calls had to be made; to allow the training of new colleagues and to ensure a more consistent approach to follow-up.

Most of the site visits were undertaken unannounced and without the proponent being present. This had the following advantages:

Firstly, the site could be seen “as is” without any special clean-up being conducted because the proponent knew the authority was coming (US EPA 1992). This can give a more accurate picture of actual conditions on site. If the proponent has had time to clean up or hide certain defaults then a true reflection of compliance will not be gained when the authority visits the site.

Secondly, unannounced site visits allow the authority more flexibility in terms of site visit planning as visits did not have be scheduled with the proponents. Site inspections can be unpredictable in terms of how long each visit takes, so not having to plan to meet on-site at certain times allowed for more efficient monitoring. It can also be difficult to persuade proponents to come back onto site for a simple “compliance check” meeting especially if they are not resident close to the site.

Finally, unaccompanied site visits often mean that the surrounding communities are more comfortable talking to the authority about problems they may have experienced with the project. With the proponent present – especially if the proponent happens to be an influential local political figure – concerns may not be so readily voiced.

Unaccompanied and unannounced site visits do have however have a major drawback, and that is the potential lack of personnel present on site to answer questions, to undertake immediate remedial action and to exchange information (US EPA 1992).

Site visits are often most time-cost effective if several projects in the same area can be visited in the same time period. This was the approach taken for this study and the projects selected for follow-up were thus sorted according to the municipal area that they were in. Municipal areas were then targeted in turn for follow-up and all projects in that particular municipal area were followed-up on. In cases where there were only a few projects in an area then the follow-up often took place within the space of a day, but more usually a month was allocated to each municipal area and several trips were taken within that time period.

Photos

Photographs can provide a very useful monitoring tool and were extensively utilized in this study. It is important to ensure that the date and time are correctly set on the camera, that photographs show context and that a record of photographs taken be kept, especially if several sites in a similar area were visited on the same day. Date and time need to be correctly set in case there are queries later regarding when the photograph was taken. This can be particularly important for enforcement cases if the applicant is arguing that the photograph was taken either before the project started (that is the environmental damage was pre-existing) or well afterwards. For the same reason it is important to ensure that the photograph(s) clearly show the subject of the photograph in context. For example, an erosion gully should be photographed in relation to the road or culvert structure that is causing the erosion and if possible some of the background scenery should also be included. This helps to prove that the erosion is actually occurring on the identified site and can also help the proponent locate the damage in order to get it repaired. It is often a good idea to take several sequential photographs so that the subject is shown in its general context and close up (US EPA 2002). For large projects that require regular and long-term monitoring, it can be useful to establish fixed points from which photographs are taken in order to facilitate comparison. Often this will be the responsibility of the proponent rather than the regulatory authority. Figure 2-7 shows structures that are used to take fixed point photographs from for a large green-fields industrial development.

Figure 2-7.The fixed points (yellow structures) from which photographs are taken on a regular basis for monitoring the development of a large timber industry in the Elundini municipal area.

Another issue that needs to be considered, especially if the follow-up process will be focused on enforcement and needs to provide conclusive proof of violations is the capturing and safekeeping of records, particularly photographs. As digital photos can be so easily altered, photos should be written to non-rewritable CD as soon as possible after the field visit (US EPA 2002). As a further precaution, a note can be made on-site of all photographs taken and their subject so that this list can be cross-referenced to the photographs on the CD. This may be important if they are to be used as evidence in a court of law at a later stage. Regardless of whether they are likely to be used as evidence or not, it is still a good idea to download and correctly file them as soon as possible.

Interviews/meetings

Interviews as a data collection tool were utilized to a limited extent by this study. These interviews were generally more along the lines of informal discussions with people encountered on site. They functioned primarily as a means of introducing the regulatory authority and to check if certain conditions of authorization had been implemented or to request remediation measures if necessary and feasible. It is wise to record who was spoken to on-site and what actions (if any) were agreed upon (US EPA 1992, 2002). Provision was made for this on the monitoring form.

2.3.2.3 Challenges in assessing default and impact

The challenges associated with monitoring projects and in verifying impact predictions in particular have been well documented in the literature (Bisset 1980; Duinker 1984; Canter 1985; McCallum 1987; Tomlinson & Atkinson 1987b; Dipper *et al* 1998). A brief discussion of some of these challenges – and proposed solutions – as they relate to this research follows.

a) Uncertainty and limited information

One of the greatest challenges faced during the undertaking of this study was uncertainty as to how best to go about monitoring and uncertainty as to what to do if a default was detected. The lack of standardized follow-up frameworks (Marshall *et al* 2005) and the uniqueness of each follow-up situation can mean that regulatory authorities are uncertain as to how best to proceed with follow-up processes. Not knowing what actions to take if a default is detected is another problem. Little practical guidance is provided to the South African regulatory authority as to what enforcement options are available and few of the provincial departments have dedicated environmental lawyers to advise them. Sanctions such as withdrawing consents are difficult to implement (Arts & Nooteboom 1999) especially in South Africa (Friend 2004).

Additionally, uncertainty regarding causality (whether a particular development actually caused the environmental impact that needs to be sanctioned or not) can lead to reluctance by the authority to take action. This uncertainty about causality is often compounded by a lack of baseline data that makes comparing the environment before and after the project difficult. This lack of baseline data is a common complaint in impact prediction verification studies (Bisset 1980; Canter 1985; Bisset & Tomlinson 1988; Dipper *et al* 1998).

Uncertainty is however an intrinsic part of EIA practice (de Jongh 1988) and waiting to undertake follow-up until scientific certainty is obtained is impractical. There is also a strong case for simply making a start and being willing to adapt the follow-up procedure as necessary. This was an approach successfully taken by the follow-up process for a large dam project in South Africa (Slinger *et al* 2005) and is also the approach adopted here. Thus it was accepted for this study that information (such as baseline data) was limited and that the research needed to work with the information that was available.

b) Deficiencies in the EIRs

The poor quality of the some of the EIRs received in South Africa has already been noted (DEAT 2004c; Kruger & Chapman 2005). Impact predictions in particular are a weak area and the capacity of the proponents to manage the project as required is seldom mentioned and never quantified. These inadequacies coupled with a lack of clear guidance both for and from the regulatory authority can mean that follow-up becomes something that is ignored in the hope that it will go away.

Another deficiency in the EIRs that was picked up during this study was the lack of good quality maps. A map that gives the general project locality may be sufficient for review purposes but may be totally inadequate to find the site when it needs to be visited for follow-up purposes. This was particularly a problem for some of the more remote sites.

The long-term solution would be to find ways to improve the quality of EIRs such as ensuring that environmental practitioners are certified by a professional body and that the authorities take a firm stance on not accepting sub-standard EIRs. For the purposes of this study however, existing EIRs had to be used as these provided the background against which environmental authorizations were issued for the projects that were then subject to follow-up.

c) Consent conditions not designed for monitoring

One of the greatest challenges relating to monitoring is that neither consent conditions nor impact predictions are usually made with ease of follow-up in mind. Predictions and conditions can be vague, confusing, imprecise or require comparison to non-existent baseline data. These can all lead to problems in trying to verify predictions and compliance (Beanlands & Duinker 1984; Canter 1985; Tomlinson & Atkinson 1987b; Dipper *et al* 1998; Wilson 1998).

One of the solutions that has been proposed to this challenge of not always being able to monitor consent conditions or impact predictions is that follow-up should be focused only on issues that can be readily monitored (Arts & Meijer 2004). While pragmatic, this would also obviously limit the utility and scope of the follow-up process and cannot be recommended as a long-term solution.

An alternative solution could be to monitor compliance with broad overall environmental objectives rather than to monitor compliance with individual consent conditions. In other words, follow-up would focus on ensuring that the project is generally within the bounds of the consent decision rather than on how many consent conditions were complied with. This approach has been supported by Bailey (1997) and seems to be preferred by both proponents and authorities (Dik & Morrison-Saunders 2002). It does however have two major drawbacks in that it assumes at least a basic level of environmental management capacity on the part of the proponent to understand what is environmentally "acceptable" and to manage to that standard; and is more difficult to enforce in court. The acceptability of this approach would thus obviously depend on the type of project (hazardous projects would for example require strict compliance) and the goals of the follow-up process.

Finally, there is also a case – especially where follow-up has to be carried out with existing consent decision conditions – for simply trying to monitor as well as possible under the circumstances. As Bailey and Hobbs (1999:165) so aptly put it, "better qualitative and useful than quantitative and wrong". It helps in this case to focus on the intention and outcome of the consent condition rather than the actual condition itself. This is the approach taken for this study.

d) Causality

The concept of causality has considerable relevance for this study, especially with regards to determining whether a particular impact or default could reasonably be attributed to a particular project or not. Determining causality with absolute certainty is difficult, and is further complicated by the potential for cumulative effects if there are several similar projects in the same area. The approach taken by this study to determining causality is derived from that of Suter II (1998) who notes that there are generally two approaches which can be taken to trying to establish causality in real-world (as opposed to controlled, laboratory) settings. The first is to try to eliminate potential causes, which is extremely difficult in real-world settings were there are many uncontrolled, confounding variables (Suter II 1998). The second is to make use of criteria (such as how strongly the cause and effect seem to be related, whether there is more than one piece of evidence that suggests a link, whether the cause and effect relationship is plausible and so forth) against which evidence of causality can be evaluated. Criteria such as these were regarded as a more practical approach for this study as they provide a useful framework on which to base expert judgments regarding the likely association between a project and its effect.

e) Unexpected impact

Follow-up sometimes reveals unexpected impacts related to a project. Unexpected impacts are ones which were not anticipated or dealt with in the EIR. They may be positive (as illustrated in Figure 2-8), or negative; but because they are unexpected there are unlikely to be mitigation measures in place to deal with them. The follow-up process therefore needs to be adaptive enough to cope with this. This need for flexible and adaptive management has been raised by a number of authors (Holling 1978; Bailey 1997; Marshall 2002; Morrison-Saunders *et al* 2003).

Figure 2-8. Unexpected positive impact[2].

2.3.3 The use of expert judgment in the collection of data

Expert judgment was used during the collection of data to assess the overall impact of the project on the environment and whether an impact could be reasonably linked to a specific project or not. Suter II (1993) has noted that if improperly used, expert opinions can lead to poor quality data being collected. He argues that ecological systems are already "fuzzy" in nature and that the use of subjective techniques such as expert judgment can lead to more imprecision and reduced scientific credibility. Data collection that is based on the professional opinion of a single expert team can also make data "one-dimensional" (that is, representative of only one point of view), difficult to validate and dependent on the skill of the researchers (Serafin *et al* 1992).

The use of expert judgment in the environmental field is however, still an important tool and forms the basis of several environmental evaluation methods. The Delphi technique as well as the Environmental Evaluation System both make use of expert opinions

[2] These *Kniphofia* species have flourished as a result of being used to help filter the overflow effluent from a small sewage disposal facility from a resort in the Senqu municipal area. The sewage disposal facility is overloaded but this appears to have been to the benefit of the local flora!

(Fuggle 1999) as do the Soil Conservation Service Guidelines and the Fischer and Davis Method (DEAT 2002c). DEAT (2002c:2) further note that value judgments “reflect the reality of EIA practice”. Despite their flaws, expert judgment methods can provide a useful and effective method for follow-up, especially where practicality is more important than scientific certainty (Holdway 1997; Wilson 1998; George 2000b; Nijsten & Arts 2004). It is also useful when used as a preliminary screening approach as it is simple, straightforward, unobtrusive and only requires moderate resources. Furthermore it provides a good first step to identify problem areas or areas that require further in-depth study (Serafin *et al* 1992). As such, it fits well with the methodology of this study.

Suter II’s (1993) point about expert judgment potentially leading to poor quality data is however acknowledged and potential data quality problems relating to the use of professional judgment such as judgment bias were countered through the use of a multi-person team to score impact to reduce bias; the presence of the author for all follow-up visits to ensure internal consistency and the use of standardized monitoring forms and procedures to improve consistency across projects.

2.3.3.1 The collection of default data

Compliance default for this study was determined by undertaking a site visit and then assessing whether each of the consent conditions for a particular project had been complied with in practice or not. This is one of the primary means of determining default (US EPA 1992), although other methods such as self-reporting by the proponent are also possible. Site visits were preferred as they are practical, commonly used (US EPA 1992), more objective than self reports by the proponent and offer the opportunity to pick up on any other environmental problems on site.

Although assessing compliance by checking if each consent condition for a project was implemented or not appears simple in theory, in practice it is not always easy (US EPA 1992). Default is seldom a clear-cut case of either compliance or non-compliance. There are problematic cases, for example, where compliance with a consent condition might be only partial; where no information is available to determine compliance or instances where an environmental requirement has been met, but not in the specified manner. These cases need to be catered for when assessing default or valuable information can be lost and the degree of default over or under-estimated. It is thus not sufficient to simply make provision for recording either compliance or non-compliance with a consent condition. Instead, provision also has to be made for recording instances of partial compliance with a consent condition, recording conditions that are no longer applicable and recording instances where there is insufficient information to conclusively determine compliance. Based on the work of Bailey and Hobbs (1990) who made use of similar compliance categories, the following five categories were provided for assessing default for this study.

- Yes, consent condition complied with.
  This was used where there was a clear case of full compliance with a condition of authorization. It was also used for cases where an environmental requirement was fully met, but where the means of doing so was not exactly as stipulated in the authorization. For example, the authorization might have required that concrete be mixed on trays to prevent contamination of the soil; however compliance can also be taken to occur if the concrete was not mixed on trays, but rather mixed on an existing concrete surface. Trays were not used, but no contamination of the soil took place, so it would be reasonable to assume that the spirit of the condition was adhered to and that compliance thus took place. The key criteria here are that the alternative means of achieving the environmental requirement must not result in environmental harm and must not be too dissimilar to the original requirement.
- No, condition not complied with.
  This scoring category was used for instances where there was a clear case of non-compliance such as the non-provision of toilet facilities at a construction camp site.
- Partial compliance.
  A scoring of partial compliance was given when only part of a condition was complied with, or where compliance was limited. For example, a consent condition might have required that certain erosion protection measures be provided and that these measures be properly maintained. Partial compliance would occur if the measures were provided but not maintained, or if only some of the specified erosion control measures were implemented.
- No information or unable to determine compliance with any certainty.

This scoring category was necessary to record cases where default could not be readily established, such as where underground fuel storage tanks had to comply with a certain design standard or land had to be rezoned to a specific zoning. During a brief site visit, the regulatory authority would have little means of independently verifying compliance with these conditions.

- Not applicable.
  Projects sometimes change during implementation (Bird & Therivel 1996), making some conditions of authorization no longer valid. In these cases a default scoring of not applicable was necessary.

Thus, when determining default with a condition of authorization on site, compliance was qualitatively recorded as "yes" (full compliance with a consent condition), "no" (no compliance), "partial" (partial compliance with a consent condition), "?" (no information) or "n/a" (not applicable).

2.3.3.2 The collection of overall impact data

Assessing the overall impact of a project on the environment was slightly more difficult than assessing default as there are no clear criteria (such as consent conditions) against which to measure it. As a starting point, an assumption was made that impact could be estimated in terms of the overall apparent effect that the project had had on the baseline (pre-project) environment. This estimation was done by means of expert judgment while on site.

While arguably somewhat subjective, the use of expert judgment has also been widely utilized in methods (such as the Delphi technique) used to determine impacts and impact significance during the impact assessment phase of EIA (DEAT 2002c; Thompson 1990). The literature is lacking on methods that could be used for the follow-up phase of EIA, but it is likely that many of the above impact assessment techniques would be useful as the follow-up phase is also concerned with assessing impact (albeit post-project rather than pre-project).

In order to ensure consistency, clear and objective assessment criteria are necessary (DEAT 2002c) and the ones used for this study are presented in Table 2-1 below.

These criteria are not intended to be prescriptive, but serve as guidelines to aid the assessment of overall impact only. Impact was rated on a qualitative ordinal scale of low, low-medium, medium, medium-high and high. A project was thus assessed as having a low overall impact; a low-medium overall impact; a medium impact; a medium-high impact or a high overall impact. No provision was made for a category of "no impact" as it was assumed that a project would have some effect on the environment, however minor. The criteria which were used to determine which impact rating should be given to a project is given in Table 2-1 below.

Table 2-1. The criteria used to help assess overall impact.

Impact rating	**Indications for assigning this rating**
Low	Minimal to no changes in ecological functioning, no community complaints, well within the acceptable bounds of the consent decision.
Low-medium	Minor changes in ecological and/or community functioning. Project within acceptable bounds of consent decision, some minor corrective actions may be needed.
Medium	Some changes in ecological functioning, several moderate impacts noted, some community complaints or disruption. Project can be considered mostly within bounds of the consent decision but has some aspects that require corrective action. Possible cumulative impact risk.
Medium-high	Moderate changes in ecological and/or community functioning. A number of aspects that require corrective action, generally a higher impact than envisaged by the consent decision. Cumulative impact risk.
High	Considerable and/or wide-spread changes in ecological functioning. Many and wide-ranging impacts or alternatively a few, serious impacts. Disruption to communities and/or cultural aspects. Considerable community complaints. Project not within acceptable bounds of the consent decision, considerable corrective action required.

Five categories were chosen to represent the range of possible overall impact as this represented a good balance between having too many categories into which impact could be classified (which would be cumbersome to score and difficult to analyse) and having only a few categories that would not allow much distinction to be drawn between the various projects in terms of impact. This is in line with the suggestion of Neuman (1997) that between four to eight categories be used for this Likert-type scaling. Having fewer categories can mean that the scaling is too crude and valuable data is lost; while too many categories tend to be confusing and do not add much value (Neuman 1997).

2.3.3.3 Capture of collected data

The data collected during follow-up was entered into an electronic spreadsheet (Microsoft Excel) prior to analysis. This spreadsheet made provision for the following information to be entered:

a) Project details (Departmental reference number, activity type, locality of the project, applicant and the environmental consultant undertaking the EIA)

b) Overall environmental impact of the project. During data collection, projects were scored as having a low, low-medium, medium, medium-high or high impact on the environment. To facilitate data analysis, these qualitative impact categories were assigned numerical codes. Thus projects scoring “low” on overall impact were coded in the spreadsheet as 1; projects scoring “low-medium” received a code of 2; “medium” a code of 3; “medium-high” a code of 4 and “high” impact projects a code of 5.

c) The number of consent conditions for each project that were: fully complied with; not complied with; partly complied with; unable to be determined and not applicable. The percentage default was also calculated by determining the percentage of conditions that were not complied with out of the number of conditions that could be monitored.

2.3.4 Analysis of the follow-up data

Data needs to be interpreted in order to be useful (Baker 2004); but what is meaningful or useful in one context may not be so in another. This makes data analysis largely project- and objective-specific and helps to explain the lack of standardized follow-up data analysis procedures.

A simple, pragmatic and non-parametric data analysis approach was chosen for this study for the following reasons:

- The data collected is of a semi-quantitative and qualitative nature, making the use of parametric data analysis methods inappropriate.

- The end users of the data (mostly the regulatory authority and particularly managers within that organization) are not technically inclined and require readily understandable answers about the state of approved EIA projects. A data analysis approach that provides practical, simple and easily understood results is therefore preferred to one that is more scientific.
- Simple and highly visual (graphic) analysis techniques – such as box-and-whisker plots and graphs – allow for comparison between widely disparate projects. A box-and-whisker plot can for example, allow the comparison of a range of default scores for all telecommunication projects to be visually compared with the range of default scores for all land use change projects.

Analysis and evaluation of data was done using Microsoft Excel and Statistica. Excel was utilised to perform basic mathematical tasks such as the calculation of averages and totals and to produce most of the graphs. The risk screening tool (to be discussed in Section 2.4) was also created in Excel. Statistica was utilized to produce box-and-whisker plots, frequency histograms and to perform Wilcoxon matched-pairs tests on the risk screening test data.

2.3.4.1 Analysis of data relating to default

The focus of this section is on exploring what types of default were encountered, when, where and why. The types of default experienced give an indication of when problems with compliance are likely to be experienced during project implementation and can also indicate conditions that proponents struggled to comply with. Being able to identify instances of default allows for more efficient management of these problem areas.

Overall distribution of default

A simple, visual approach was chosen to examine the overall distribution of default scores.

Box-and-whisker plots are a simple means of providing a visual summary of the distribution of data and for comparing data sets (Siegel 1994). A box-and-whisker plot was therefore used to determine what the median score for default was, what the highest and lowest default scores recorded were and where most of the default scores tended to be concentrated in terms of the inter-quartile range.

The distribution of default scores was also examined by means of a frequency histogram which was overlaid with a normal distribution curve to determine whether the distribution of default scores was normal or not.

Types of default

Tabular summaries were made of the types of default encountered per development project type. As the consent conditions varied according to how they were worded, they were not the best means of listing defaults. Instead, defaults were grouped according to what the condition dealt with. For example, all defaults relating to the prevention of erosion by providing for storm-water control were grouped together regardless of whether the condition required the provision of energy dissipaters or just that storm-water be managed. Defaults were then ranked as to how many times they had been noted during the follow-up process. For example, if the lack of erosion protection measures had been noted for 20 of the projects followed-up on while the non-provision of toilets was only noted for 5 projects, then default on erosion protection was ranked as occurring more frequently than the non-provision of toilets.

A similar table was then constructed for compliances as these give a useful “flip side” perspective to default. Sometimes it is just as important to find out what was complied with as to determine what wasn’t.

2.3.4.2 Analysis of data relating to impact

Overall distribution of impact

As with default (section 2.3.4.1 above), a box-and-whisker plot and a frequency histogram were used to describe the distribution of impact scores. A pie chart was also used to determine the proportion of projects that scored in each impact category (that is, low, low-medium, medium, medium-high and high).

2.3.4.3 Analysis of data relating to a combination of default and impact

The relationship between impact and default

Given that the conditions of authorization (by which default is measured) are set with the intention of reducing impact, it is anticipated that there should be a relationship between impact and default. However, it has also been argued (section 2.3.1.1) that increased compliance does not necessarily result in increased environmental protection. No empirical evidence to support or refute either position could be found in the literature and it was judged important to explore the degree of association between impact and default. Correlations offer one useful means of doing so, by allowing the strength and direction (positive or negative) of a relationship between two variables to be described (Witte & Witte 1997). A correlation does not imply causality (for example that default caused impact), but does indicate if a general increase in one variable is related to a corresponding increase (positive relationship) or decrease (negative relationship) in the other (Sheskin 2004). Spearman's correlation was selected as the most appropriate correlation to use as it allows the use of rank-ordered data (Sheskin 2004).

Average impact and default trends over time

The average trend of impact and default over time was determined by taking the average score for impact and the average score for default for all projects followed-up on for each year covered by the sampled population and plotting these on a line graph. This graph provides an indication of whether the average rates of impact and default increased or decreased over time. It also indicates if the follow-up activities, which began in 2004, could have had an influence on the compliance and impact rates of more recent applications.

Identifying occurrences of high default and impact

As both default and impact need to be managed and screened for, a data analysis approach was required that would allow both to be combined in order to identify, summarize and prioritize occurrences of risk (such as applications that are likely to be both high impact and high default). This approach needed to be simple and to immediately highlight problem applications in terms of default and impact for the regulatory authority staff. It also needed to allow the comparison of different projects in terms of their performance with regards to impact and default.

A simple quadrant graph was thus designed for use in this study with impact scores plotted on the x-axis and default scores on the y-axis. The origin of the x-axis (impact) was set at 3 (medium impact which was the mid-point on the 1-5 scale) and the origin of the y-axis (default) at 50% default (which was the mid-point on the 0-100% default scale). Any impact score of 3 and above was considered “high” and any score below this was considered “low”. Similarly for default, any score of 50% or more was considered “high” and less than 50% was considered “low”. This had the effect of producing a graph with four default-impact risk classes. These were:

- High default-high impact; that is, projects that showed both a high degree of impact as well as a high degree of default (high risk projects);
- High default-low impact; projects that scored high on default but were relatively low impact (default risk projects);
- Low default-high impact; projects that complied fairly well but which has a high impact on the environment (impact risk projects), and
- Low default-low impact; projects that complied well and had little environmental impact (low risk projects).

This can be represented graphically as follows (Figure 2-9):

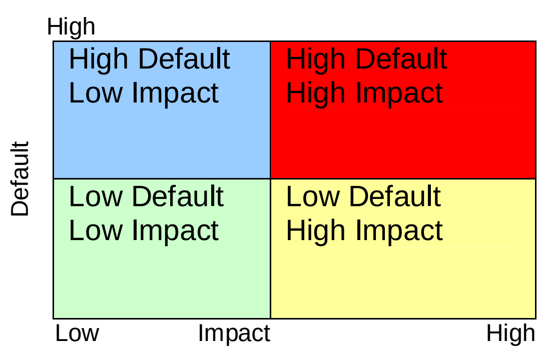


Figure 2-9 . The four default-impact risk classes.

The above classification of projects into one of four classes allows for the quick identification of impact and/or default problems; provides a clear, easy-to-understand visual picture of impact and default and allows impact and default to be easily differentiated for different management options where needed.

Using the above four impact-default risk categories, the overall distribution of projects into these four categories was described using a pie chart.

Impact and default in terms of the different components of an EIA application

The above sections have discussed how default and impact can be examined at a broad scale and for the whole population of projects. Analysis at a more project-specific level is however also necessary. In particular, occurrences of high default and/or impact need to be identified so that similar projects presenting a default and/or impact risk can be screened out.

The challenge with this project-specific analysis is how to identify occurrences of risk for each of the 117 projects followed-up on and to translate these risk occurrences into a screening tool that can be used on new (and unique) EIA applications. Examining each of the 117 projects in detail would yield vast amounts of data that would be cumbersome to work with. Some sort of summary is thus necessary.

The approach taken to address the above challenge was to analyse the follow-up data according to four basic components or chunks of information that make up a typical EIA application. Thus, rather than examining the data project by project, analysis of each of the following components took place:

- the type of activity (such as a dam or a resort)
- the locality of the project (in terms of municipal area)
- the proponent; and
- the environmental consultant undertaking the EIA.

The reason for selecting these components for analysis was that this component information was a) most likely to be readily available at the time at which screening was required and b) most likely to have an influence on impact and/or default. Information on the engineering and contracting firms employed to implement the projects would also have been useful, but was seldom available at the start of the EIA process when the risk screening was carried out.

The reason for grouping the project applications into these components is that these components form a common denominator between applications. Applications are usually unique, which makes it extremely difficult to estimate the likelihood of default and impact based on how similar projects have performed in the past (as there are no identical projects on which to base this estimate). All applications however consist of some combination of applicant, activity type, locality and consultant. Thus by finding the average default and impact risks for each of these four components (applicant, activity, locality and consultant), the default and impact risks of new applications can be estimated based on the combination of components of the new application.

Analysing the default and impact risks for each of these four components was done as follows (using activity type as an example). First of all the follow-up results were sorted according to the activity type. In this case, 13 activity types (such as water supply schemes, telecommunication towers, waste disposal sites) were identified. Next the average score for default and the average score for impact for each of the 13 activity types was calculated. Thus, for example, all projects involving the construction of telecommunication towers were extracted from the follow-up database and the scores that each such project had obtained for default and for impact were added and averaged. This then gave the average amount of default and impact that could be expected from that particular activity type. These average default and impact scores were displayed in a scatterplot format using the four risk categories described earlier in this section; that is impact risk (high impact-low default); default risk (low impact-high default); impact plus default risk (high impact-high default) and low risk (low impact-low default). The end result was thus a graph that highlighted which activity types tended to be problematic and which didn't. The same process was repeated for locality (12 municipal areas), proponent type (22 types, based on the organization they belonged to) and environmental consultant (21 firms).

This approach allowed problematic activities, localities, proponents and environmental consultants to be identified, which made the screening of new projects easier.

The results of the above (that is, the calculation of the average scores of default and impact and the identification of occurrences of default and/or impact) were then used to create a risk screening tool that could be used to determine the likely risk of default and impact of a new application (based on how similar projects had performed in the past). This is discussed in the following section.

2.4 The risk screening phase of the research

The objective of this phase of follow-up was the development of a risk screening tool into which the details (the proponent, activity type, location and environmental consultant) of a new EIA application could be entered in order to obtain an estimate of the likely level of default and impact that could be expected for that particular project.

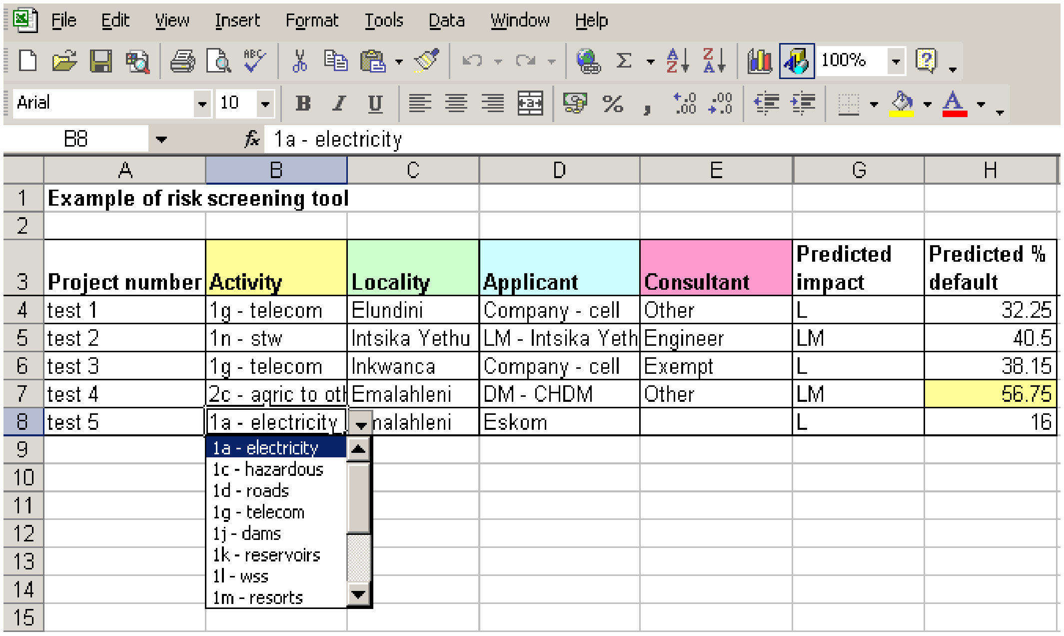
2.4.1 The development of a risk screening tool

The screening tool was based on the assumption that past performance of approved projects can be used to help predict future performance of similar projects. Changes do of course happen over time, but past performance is a useful place to start (George 2000c) and has been used by, amongst others, the US EPA (1992) and Friesen (2003) to target projects which require follow-up.

The challenge however lies in finding a means of using past performance to predict future performance. The key question for this research was how the possible future impact and default risk of projects could be estimated from past default and impact scores, especially given that each application is unique. There may be similarities between projects (they may for example be for the same activity or in the same locality), but there will also be differences (such as different applicants or consultants).

The approach taken to addressing the above challenge was, as discussed in the previous section, to split each application into core components of: activity type, proponent, locality and environmental consultant and to calculate average default and impact scores for sub-components (such as the 13 different activity types under the component of activity and the 12 municipal areas under the component of locality) within each of those components. These average scores were then used in an Excel worksheet (see appendix 4 for the full worksheet and Figure 2-10 for an illustrative example) where a column was provided for each project component (applicant, activity type, locality and consultant). In each of these columns, a drop-down list was provided for the user to select the desired sub-component (such as the municipal area under locality or the type of activity under activity). As soon as the sub-component was selected Excel would return the relevant average default and impact scores for that sub-component (this was done by using the “if-then” logic function). These scores were then added together to yield an overall impact risk and default risk rating.

As an example take a new application for the construction of a cell phone tower by a cellular company in the Elundini municipal area. The user would thus select “telecommunications tower” in the activity type column (which would return the average default and impact scores for telecommunication towers). “Company - cell” would be selected from applicant type (which would return the scores for cell phone companies) and “Elundini” from locality type (which would return average scores for that particular area). Similarly consultant would be selected and all of the returned average scores could then be added and averaged to give an overall risk rating for both default and impact. These final average likelihood scores for impact and default can either be expressed qualitatively (i.e. as low, low-medium, medium, medium-high or high) or quantitatively (on the 1 to 5 scoring scale for impact and as a percentage for default).



	A	B	C	D	E	G	H
1	**Example of risk screening tool**						
2							
3	**Project number**	**Activity**	**Locality**	**Applicant**	**Consultant**	**Predicted impact**	**Predicted % default**
4	test 1	1g - telecom	Elundini	Company - cell	Other	L	32.25
5	test 2	1n - stw	Intsika Yethu	LM - Intsika Yeth	Engineer	LM	40.5
6	test 3	1g - telecom	Inkwanca	Company - cell	Exempt	L	38.15
7	test 4	2c - agric to otl	Emalahleni	DM - CHDM	Other	LM	56.75
8	test 5	1a - electricity	nalahleni	Eskom		L	16

Figure 2-10. An example of the risk screening tool[3].

Note that in the case of applicant and environmental consultant, provision was made for an "other" sub-component to cater for new applicants or consultants that might submit an application during this study. The risk screening tool can also be updated on a regular basis to cater for these new applicants and consultants.

2.4.2 Using the risk screening tool to identify projects requiring follow-up

It was decided that follow-up actions would be triggered on any project scoring above 40% for default and above 2.5 for impact in the risk screening process. The screening tool was thus designed so that either default levels of more than 40% or impact ratings of more than 2.5 would trigger follow-up for an application. However, a composite score (default plus impact) is also possible so that projects can be ranked overall in terms of follow-up priority. In other words, projects that were predicted as likely to be both default and impact risks can be prioritized over projects that were only a default risk.

[3] In this example, project number "test 4" (with a predicted default score of 56.75% and a likely impact of low-medium (LM)) should be targeted for follow-up for default and impact, while project "test 2" (with an impact risk of LM) may present an impact risk.

It is noted that the above thresholds are fairly arbitrary and may require revision in the future should it be found that either too many or too few projects are being selected as needing follow-up. However, these thresholds do provide an important starting point and were selected as being the most likely to catch high impact (that is, projects likely to score 3 and above on the impact rating scale) and/or high default applications (applications with 50% or higher levels of default) as well as some of the potential borderline cases (those applications that may be close to 50% default or 3 on impact). The use of thresholds is also in line with risk assessment frameworks such as those of Australia, New Zealand and Hong Kong which make use of *a priori* criteria to determine when action to mitigate risks is necessary or not (Sanvicens & Baldwin 1996; Power & McCarty 1998).

2.4.3 The accuracy of the risk screening tool

The risk screening tool needed to be tested to determine if it accurately predicted impact and default risks. Testing was done by comparing the predicted impact and default scores for a sample of projects to the actual default and impact scores for that same set of projects. Two sets of data were therefore required for testing, that is a set of "predicted" data and a set of "actual" data. The predicted data was obtained by running the test sample of projects through the risk screening tool while the actual data set was obtained by undertaking follow-up (as per the methodology used for follow-up phase of this research) on that same sample of projects.

However, in order to avoid any possible bias from seeing what the screening tool predicted and then going out into the field and scoring the project using expert opinion, the actual data set was collected before undertaking the risk screening process to get the predicted data set.

Another measure that was put in place to ensure that the testing of the risk screening tool was as accurate as possible was to control for the effect that follow-up could have had on the risk screening process. Follow-up can encourage compliance by applicants which means that projects implemented after follow-up started are likely to have lower rates of default. This would have the effect of the risk screening tool (based on pre follow-up results) tending to over-predict default for the projects which are now being implemented after follow-up started occurring. The risk screening tool was therefore tested using two samples (an “after follow-up sample” and a “before follow-up” sample).

The first test sample consisted of forty-one (41) projects that were implemented after the risk screening tool has been designed. In other words, these test projects were not followed-up as part of the follow-up phase of this research that was used to feed into the development of the risk screening tool. Thus none of the projects used to design the risk screening tool were also used in the step of testing. The second test sample consisted of thirteen (13) projects that were implemented in 1999, well before any sort of follow-up took place.

The predicted and actual scores (for both of the above samples) were then compared to determine how well the actual scores matched the predicted ones. Or in other words, how accurate the risk screening tool was at predicting impact and default. This was done through the use of firstly, box-and-whisker plots; and secondly, Wilcoxon matched-pairs tests.

Box-and-whisker plots were used to provide a visual comparison of the match between the predicted and actual impact and default scores. Box-and-whisker plots were chosen as they provide a useful exploratory aid by allowing the underlying data structure to be seen (Sheskin 2004). They can thus provide a good first overview of whether the predicted and actual scores had similar distributions or not. They are also useful for comparing several different sets of data at once as they provide a summary of critical information (Siegel 1994).

While box-and-whisker plots are useful for giving a visual indication of whether there is a difference in the distribution of the predicted and actual scores, it is also useful to know whether this difference is significant or not. Given the non-parametric nature of the data, a Wilcoxon matched-pairs test was therefore used to determine if there was a significant difference between the two. A chi-squared test would also have been appropriate if the data is re-organised into the five measurement categories of low, low-medium, medium, medium-high and high. However, one of the requirements for a chi-square test is that the expected frequencies should be greater than 5 (Witte & Witte 1997; Sheskin 2004). This requirement was not met for a number of the expected categories for both default and impact and the chi-squared test was therefore not used.

Chapter 3: Results and interpretation

This chapter addresses the results of the follow-up and risk screening phases of the research, in particular the outcomes of the data evaluation and risk screening steps.

An important influence on the results of the follow-up phase is the life cycle stage that projects were in when they were subject to follow-up and this is considered below.

3.1 The influence of the project life cycle

The life cycle stage that a project is in when followed-up was found to have a considerable influence on the results of the follow-up process as is reflected in Table 3-1. There was only one project followed-up that was in the decommissioned stage, so the results from this project life cycle stage need to be interpreted with caution.

Table 3-1. Project stages and their relation to the average amount of impact and default recorded.

Life cycle stage	**No. of projects monitored in this life cycle stage**	**Average impact for projects in this life cycle stage**	**Average % default for this life cycle stage**	**% conditions monitorable in this life cycle stage**
Construction	18	3	62	70
Construction/Operational	6	3	69	64
Operational	92	1	45	62
Decommissioned	1	2	75	54

Default and impact are both generally greater for projects during life cycle stages that have construction elements to them (Table 3-1). An average impact score of 3 (medium impact) was found for projects in the construction and construction/operational stages while projects in the operational stage had an average impact score of 1 (low impact). Similarly with default, construction related project stages show an average default rate in the 60% - 70% range while operational projects have an average default rate of 45%.

This discrepancy in default and impact scores between the construction and operational stages has several probable explanations. Firstly, environmental disturbance is usually at its maximum during construction due to the concentration of people and activity on site. This is also the project stage when high-impact activities such as bulk earthworks and large-scale concrete batching take place, which will tend to result in higher impact ratings being given to the project during follow-up. Compare for example, Figures 3-1 and 3-2 which are of the same road during the construction stage and just after construction. The first figure (Figure 3-1), taken during the construction stage gives the impression of having a higher environmental impact than the following figure (Figure 3-2) where some clean up and rehabilitation has taken place. This impression of high impact during construction is also reflected in the higher impact ratings for projects in this life cycle stage (Table 3-1).

During the operational stage on the other hand, many of the people (such as contractors) involved in the construction of the project will have moved off site and the mitigation and rehabilitation measures (if applicable) will have had a chance to become established (Figure 3-3). The project will thus tend to score much lower on default and impact. For construction/operational projects however, it is likely that rehabilitation has not yet taken place (and will only be implemented once construction is complete), which could explain the higher default and impact ratings for these projects.

Figure 3-1. Road and bridge in the Elundini area during the construction stage.

Figure 3-2. The same road and bridge after completion of the bulk earthworks but before all rehabilitation had been carried out.

Figure 3-3. A recently surfaced road in the Elundini municipal area[4].

Secondly, it is also common for the construction stage to be regulated by a greater number of consent conditions as there are generally more activities happening on site (such as the setting up and management of construction camps, earthworks, concrete batching, sanitation provision and waste management) that need to be controlled. There are thus a greater number of conditions relating to construction that could be defaulted on, which in turn increases the likelihood that default will be recorded.

Thirdly, as stated previously (section 2.3.1.3), this study did not target follow-up according to a project's life cycle. Thus large, high-impact projects which tend to be constructed slowly – such as major road construction projects – were more likely to be caught for follow-up during their construction stage. Smaller, low impact projects on the other hand tend to be constructed relatively quickly and were therefore more likely to be

[4] The applicant had been required to ensure that adequate erosion protection measures were put into place and had experimented with the planting of miniature berms of Kikuyu grass (*Pennisetum clandestinum*), rather than laying the more traditional stone-pitching. These berms have been highlighted in the photo above and were proving very effective.

caught in their operational stage. Thus the incidences of impacts and defaults recorded for the construction stage are more likely to be from large, high-impact projects.

Decommissioned projects show a surprisingly high level of default and impact. However, as there was only one project followed-up on in this stage, the results may be a function of that particular project and not a true indication of expected levels of default and impact for all decommissioned projects. In the case of this particular project (a temporary asphalt plant – project number 109), few of the conditions in the authorization relating to site clean-up and rehabilitation had been complied with. This resulted in a high default scoring and also resulted in a low-medium impact rating as spills had not been cleaned up and erosion had developed due to a lack of erosion control measures.

It may however be that once a project is complete and decommissioned that proponents have little incentive to adhere to conditions relating to rehabilitation or decommissioning. They may view a good working relationship with the environmental authorities as no longer necessary and may also see clean-up or rehabilitation as an unnecessary expense.

3.2 Results from the follow-up phase of the research

3.2.1 Default

3.2.1.1 The overall distribution of default scores

Default on the conditions of authorization for individual projects ranged from no default (0%) to 100% default with a median score of 50%, or half compliance (Figure 3-4). Most of the projects scored in the inter-quartile range of between 25% and 78% default.

The combined overall average degree of default is 49%, indicating that on average, almost half the consent conditions will not be complied with. Although reports on compliance studies seldom quantify the degree of default (Morrison-Saunders & Bailey 1999), indications are that other studies have found generally higher rates of compliance compared to the 51% overall average compliance rate found for this study. Bailey *et al* (1992) found compliance rates of 63%. It may be that default in South Africa is generally higher, but it may also be that the above authors reported mostly on projects that were high-profile and thus under close environmental supervision. The results will also depend on how compliance is measured and what consent conditions were set.

Whatever the reason, a default rate of 49% is still cause for concern. The question that must be raised is why default levels are generally so high. Answers at this point are conjecture, but default may be due to a lack of environmental awareness, proponents not seeing environmental issues as important or consent conditions that are difficult to implement or require extra (unavailable) resources. However, perhaps the most plausible reason is that the EIA process is seen as simply another government requirement that must be got out of the way as soon as possible and is simply a means to achieve a positive consent decision. What should happen after the decision is largely ignored. This view of the EIA process as a hoop that must be jumped through to obtain a consent decision appears to be a world-wide problem (Bisset 1980; Tomlinson & Atkinson 1987a; Sadler 1988; Culhane 1993; Dipper *et al* 1998). The lack of a consistent follow-up process is perhaps also to blame as default then often goes unnoticed and uncorrected so little learning from experience takes place.

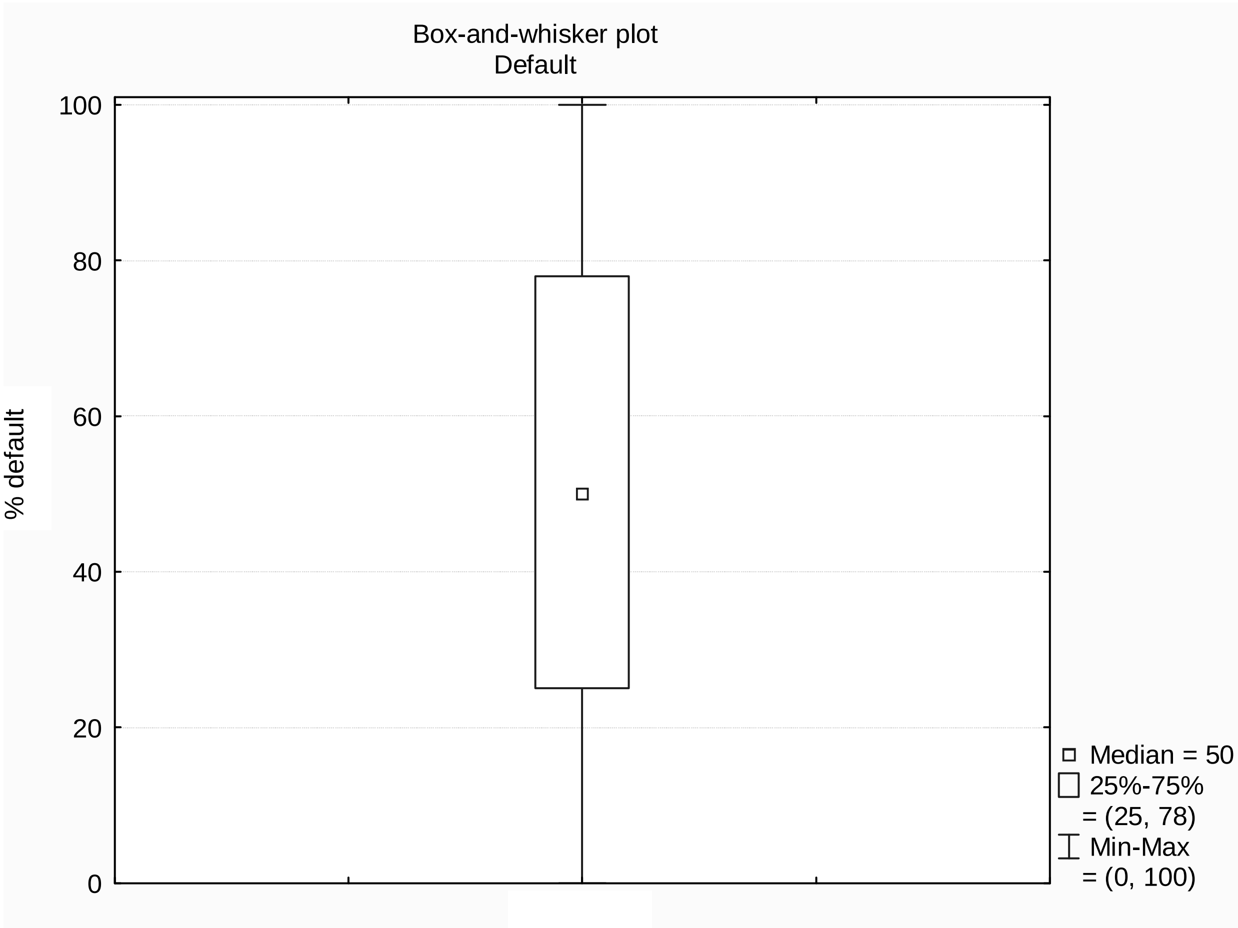


Figure 3-4. Box-and-whisker plot showing the overall distribution of default scores.

Despite the normal looking distribution portrayed by the box-and-whisker plot in Figure 3-4, the actual distribution of default scores is not normal (Figure 3-5). Instead there are two major peaks, or clusters of default scores. The first is at 0% default, with 24 of the projects followed-up on showing complete compliance. The other peak is between 90 and 100% or full default, with 18 projects falling into this category.

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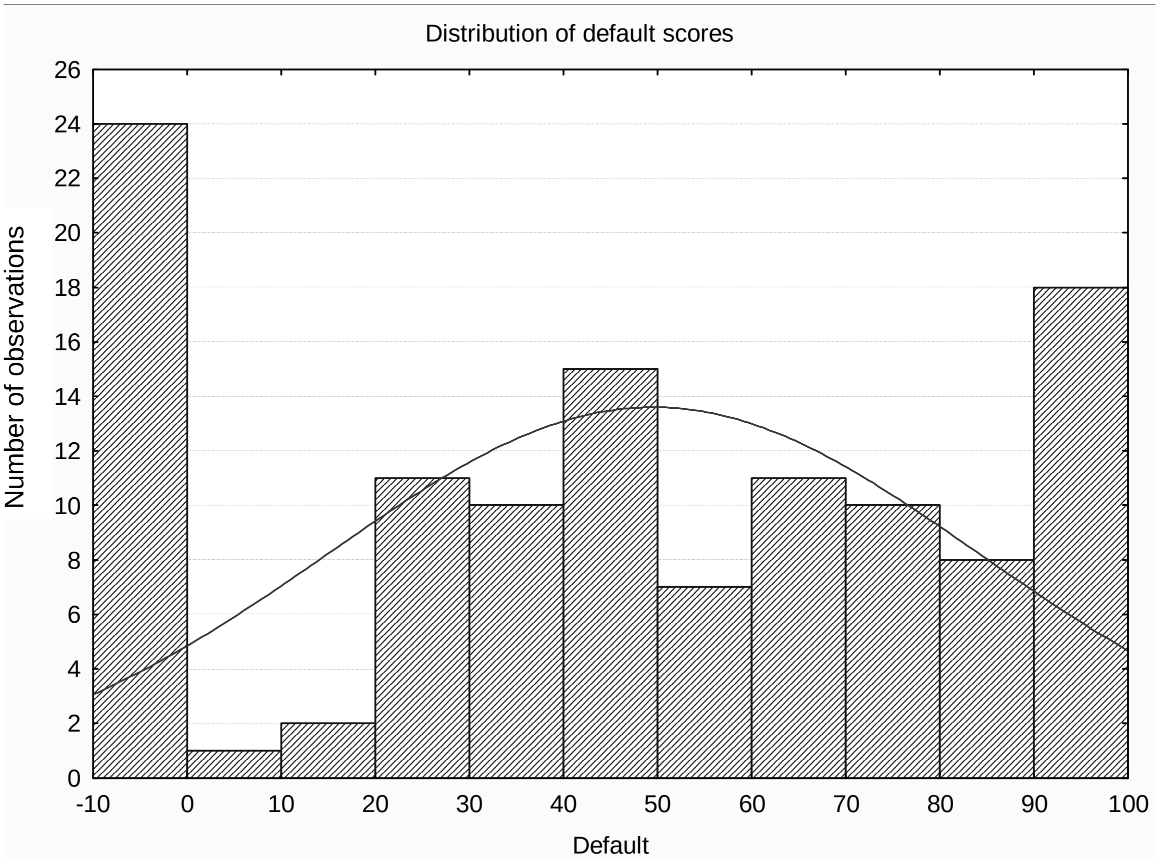

Figure 3-5. The distribution of default scores (%) with a normal distribution curve superimposed[5].

In order to understand this distribution, it is helpful to examine which types of projects and applicants make up the two default distribution peaks (that is, zero default and full default). It is acknowledged that there are other factors (such as the type of contactor engaged on the project or whether an ECO was present or not), that may also have an effect on the default scores. However, activity type and applicant type were selected as being the most likely and readily available means of being able to offer a preliminary insight into why some projects exhibit full default and others zero default.

Proponent type

More than half the zero default projects are submitted by private proponents (Figure 3-6), while all of the full default projects had government (whether local, district or provincial) as the applicant (Figure 3-7). It is suspected that private proponents tend to

[5] Note that the –10 on the x axis does not indicate negative scores in this particular instance, but is due to the way that the programme (Statistica) arranges its data. In this instance, the category –10 to 0 includes all of the projects which scored 0% default.

adhere more closely to consent conditions due to the greater impact that negative publicity could have on their earnings (Konar & Cohen 2001). Additionally, applicants (such as telecommunication and fuel companies) that have to apply in future for similar activities have a vested interest in building up a good compliance track record with the regulatory authorities. Failure to comply with the environmental requirements on one project could potentially jeopardize applications that they will submit for similar projects in the future (Marshall 2005), so these applicants may make a concerted effort to comply with the necessary requirements.

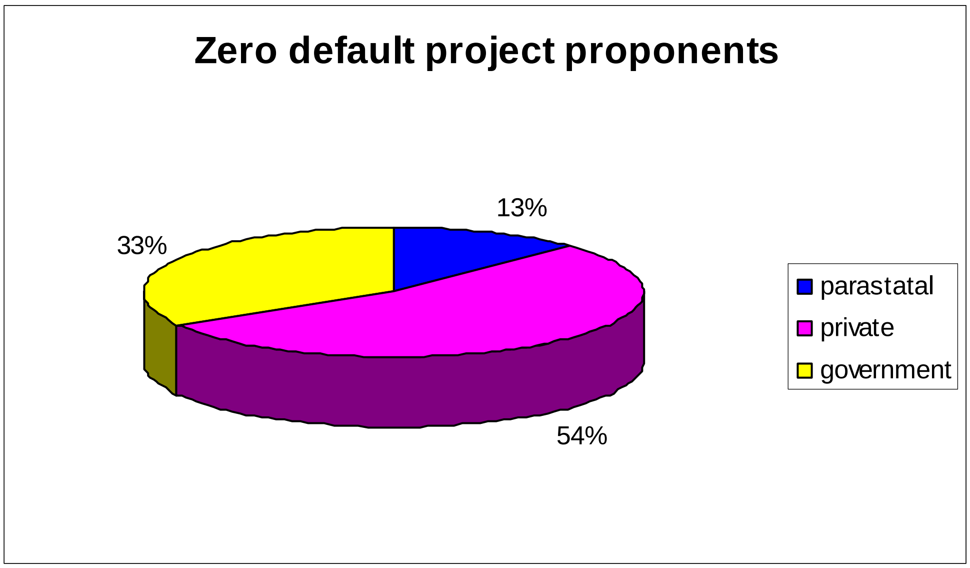

Figure 3-6. Proportion of proponent types that had zero default projects.

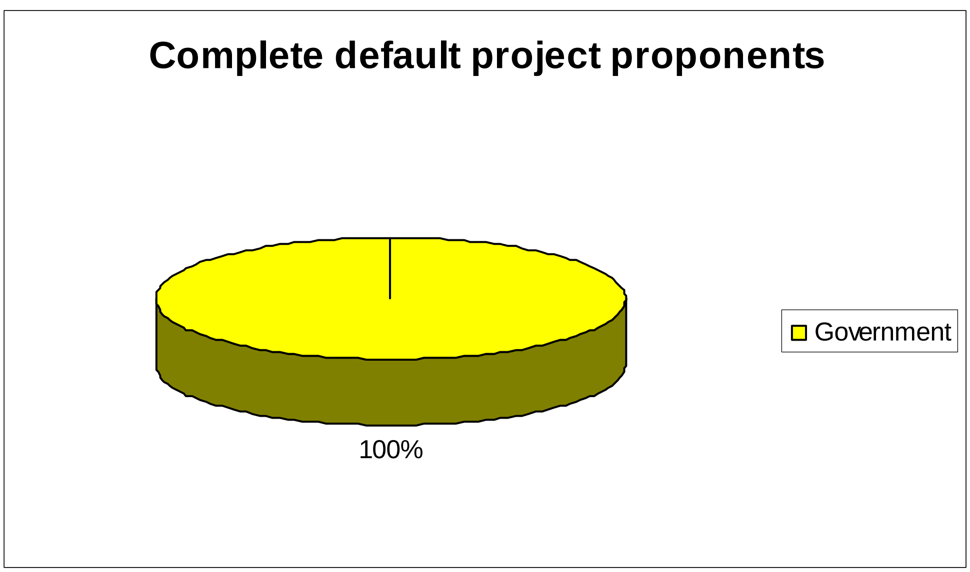

Figure 3-7. Proportion of proponent types that had full default projects.

Government on the other hand is not as susceptible to market forces as private applicants and indeed is often under pressure to get projects implemented regardless of environmental cost. A recent article in the Business Report for example, indicates that the majority of South Africans place job creation and economic growth over environmental protection (Khanyile 2007) and there have been comments such as those by Lindiwe Sisulu, the former Minister of Housing that “housing delivery will no longer be held hostage by butterfly eggs” (Macleod 2006, no page number). It may also be that private proponents feel more responsibility when it comes to complying with legislation, especially as they are clearly defined entities (such as companies or private individuals) to which accountability for managing a project can be assigned. Government on the other hand tends to a have a far more amorphous structure with few clear lines of accountability in practice. Government is also protected from prosecution to a large extent by the concept of co-operative governance (RSA 1996, Chapter 3). This co-operative governance principle makes enforcement of environmental non-compliance very difficult.

Activity type

While the type of applicant has an influence on the amount of default, the type of activity was also found to be an important factor and indeed, the two (proponent and activity) are often closely related, with certain types of applicant undertaking specific types of activities. Hazardous substance storage and telecommunication projects for example are almost always undertaken by private sector fuel and telecommunication companies respectively. Accordingly, these two activity types are among the zero default projects (Figure 3-8), along with electricity supply projects, water supply schemes, dams and some land use changes. Similarly, with the full default projects; roads, land use changes and water supply scheme are almost always implemented by government proponents (Figure 3-9).

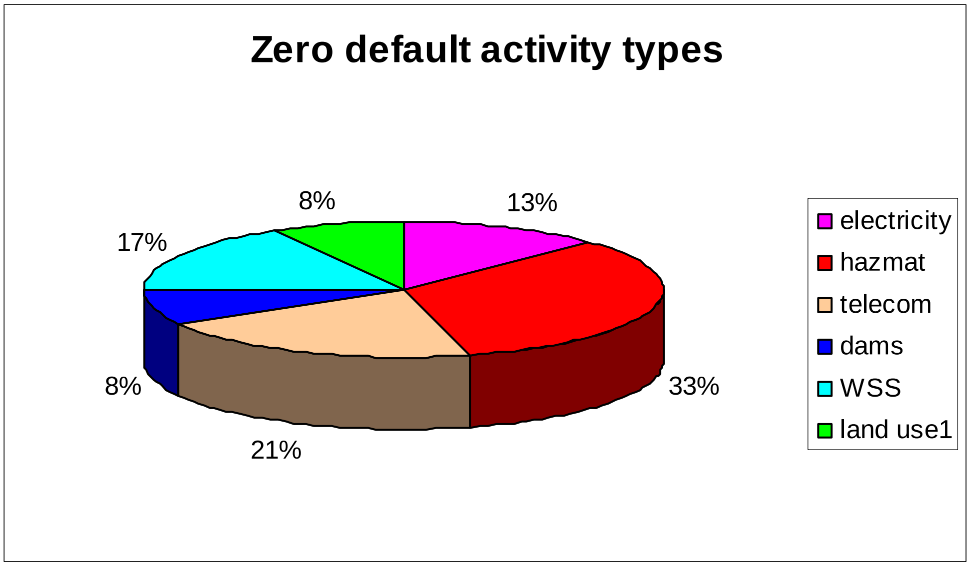

Figure 3-8. Proportion of activity types among zero default projects.

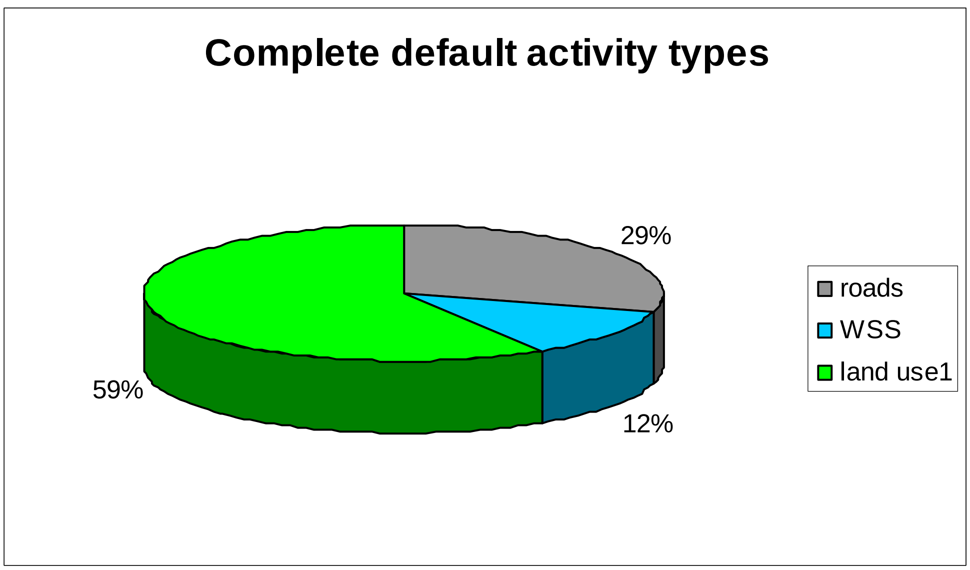

Figure 3-9. Proportion of activity types among full default projects.

Note that there are two activity types, namely land use change type 1 and water supply schemes (WSS) that show instances of full default as well as instance of zero default. For the land use changes, the full default projects included 8 for low-income townships (projects 2, 20, 35, 36, 44, 54, 68 and 80), 1 for a taxi rank (project 75) and 1 for a community fish abattoir (project 92). The zero default projects were for a cemetery and for the upgrading of a traditional leader's "great place" (projects 105 and 32 respectively). It is postulated that the key difference between these two sets of projects (that is, zero and full default) is dependent on whether there are clear lines of environmental accountability for the project or not. In other words, for the cemetery where the municipality was clearly and directly responsible for management and for the great place where the land was directly managed by the traditional leader, there was compliance with environmental requirements. However, for all of the full default land use change type 1 projects, responsibility is far more diffuse. For although a municipality may own the land on which the activity takes place, there are also members of the public who use the land on a daily basis and who can also contribute towards non-compliance with environmental requirements. The reason for the water supply scheme projects to show instances of full default as well as zero default is not as clear. All had government applicants and there are no other immediate distinguishing differences between them except for locality, with the two full default projects being implemented in Inxuba Yethemba and Senqu and the zero default ones both being implemented in Intsika Yethu. It is possible that there are different levels of environmental awareness amongst the municipal structures for these different areas and that the municipal officials in Intsika Yethu have a better understanding of their environmental responsibilities.

To return to the overall distribution of default scores (Figure 3-5); an additional interesting feature (apart from the two peaks of zero and complete default as discussed above), is the relative lack of projects scoring between 1% and 20% default (only 3 projects, Figure 3-5). It appears that projects are largely either in full compliance, or exhibit more than 20% default. The reasons for this are unclear, but it may be that some proponents take the consent conditions seriously and make a concerted effort to comply fully with all environmental requirements, while other proponents exhibit varying degrees of commitment with complying. Those that have made an obvious effort to comply might inadvertently be scored a bit more leniently by the authority during the follow-up process, to the extent that some minor defaults are overlooked and the project is scored as "fully compliant". More than one or two immediately apparent defaults may however lead the authority to be more stringent and more inclined to score the project as showing some default.

3.2.1.2 The consent conditions most often defaulted on

The consent conditions that are most often defaulted on are those related to erosion prevention and correction, and the management of general waste on site (Table 3-2). This finding is in line with that of van Velzen *et al* (2004) who, in a follow-up study of projects in Calgary, Canada, also noted the following as common defaults: erosion (measures were implemented but not maintained), lack of adherence to contractual obligations and poor waste management.

With regards to erosion, default may in some cases be due to an ignorance of ecological processes (that is, what causes erosion), but it is suspected that it is largely due to insufficient budget having been allocated to providing for erosion protection structures and their maintenance.

A lack of financial resources may also be the main contributing factor to defaults on consent conditions that require items that may not have been budgeted for such as the provision of wet weather cells for landfill sites (projects 5, 8) or re-vegetating an area (defaults for projects 4, 14, 53, 91,106); as well as conditions that could be considered as “frills” or ancillary to the main project. Project 108 for example had a recommendation – which was not implemented – that trees be planted near the standpipes for a water supply scheme so as to provide shade and to take advantage of the run-off from the taps.

One of the default areas that could be greatly improved with minimal cost to the applicant is that of waste management. See for example Figure 3-10 which is for the construction of a fuel station complex in the Lukhanji municipal area. In this case, and most others, it would cost the contractor very little to provide bins for litter and ensure that waste is properly managed. Non-compliances are thus usually due to poor management rather than financial constraints.

Figure 3-10. Poor waste management during the construction of a fuel station complex in the Lukhanji municipal area.

Lack of management – rather than financial resources – seems to be a factor in many other defaults as well. It appears that conditions of authorization that require little budget but entail some effort or make life a little more difficult (especially for contractors on site) are often defaulted on. For example many access routes might be created if the existing one doesn't suit the contractor (such as for project 88 and project 112 – depicted in Figure 3-20), water may be abstracted from any convenient point rather than ones specified in the authorization, no effort might be made to pick up litter (as for project 81 illustrated in Figure 3-10 above), concrete might be mixed on the soil rather than on a tray (projects 13; 40; 48 and 91) and so forth.

Further conditions that are often defaulted on are those requiring the applicant to submit documents such as operational plans, design details and EMPs once the authorization has been issued. Documents that were not submitted include: operational plans for landfill sites (projects 5, 62 and 63) and sewage treatment works (project 46); layout plans for a resort (project 89); emergency response plans for sewage treatment works (projects 28, 46 and 61) and design details for river crossings (projects 74 and 106). It appears that the focus of many applicants is simply to get an authorization and once this has been done, business with the regulatory authority is seen as having been largely concluded. Similar observations have been made by Culhane (1993) and Dipper *et al* (1998).

The way that consent conditions are worded also appears to be an important factor in determining the default that will be experienced. Conditions that are "strong recommendations" as opposed to compulsory are seldom implemented. For example, project 108 which was for a water supply scheme had a recommendation that trees be planted near the standpipes to take advantage of spilled water and to provide shade. This recommendation was not complied with.

Although not specifically examined for this study, it is also likely that applicants and the authority may interpret conditions differently. The authority may for example, set a requirement for "adequate erosion protection measures to be provided" for a road project, expecting stone-pitched side drains, energy dissipaters and re-vegetation of disturbed slopes. The applicant on the other hand may regard the simple provision of one or two earth drains as "adequate" to prevent erosion.

3.2.1.3 The consent conditions most often complied with

In trying to understand default it is also helpful to look at what *was* complied with as well as what wasn't. Conditions that are typically complied with are:

- Conditions that are reinforced by other laws. Hazardous substance storage tanks for example must comply with various industry standards such as SABS 089-3:1999 (South African Bureau of Standards 1999). These standards may inadvertently provide environmental protection by requiring that underground hazardous substance storage tanks are constructed in a manner that minimizes the chance of leaks and so forth.
- Conditions that don't create extra work – such as making use of a convenient existing access route and not creating a new one – are often complied with.
- Conditions that relate to unusual, sensitive or potentially risky items such as the avoidance of rare plants or a wetland, or not building within a flood-line are often

complied with, particularly if the regulatory authority has indicated that these are important issues prior to issuing the authorization. Projects 30 and 27 are cases in point. Project 30 was for a road upgrade and required the protection of a wetland area while project 27 for a river crossing required the protection of a specific plant species. In both cases, these sensitive items were highlighted and discussed with the applicants prior to issuing the authorization and in both cases, the applicant made an effort to comply with conditions relating to the protection of these sensitive items.

- Conditions relating to waste management are also often complied with. This was also one of the conditions most frequently defaulted on (Table 3-2) and a note is needed on the apparently contradictory nature of those conditions that were both complied with and defaulted on. This contradiction is caused by the number and frequency of consent conditions set regarding a particular issue. In the case of waste management almost every consent decision will have at least one condition related to waste management as such management is relevant to almost all projects. Because so many consent decisions will have conditions relating to waste management, the chances of picking up both compliances and defaults for this issue are greater than for conditions less frequently set.

  This raises an important related issue, that for both Tables 3-2 and 3-3, a default or a compliance can only be recorded if there was a condition in the authorization relating to that specific item. The lack of a default or compliance for an activity type does not automatically mean that a project did not comply. Instead it might be that there was no condition in the authorization that related to that particular aspect. For example, telecommunication towers do not usually impact on watercourses, so there is seldom a condition in the authorization that specifies that such areas must be protected.

- Finally, some compliance may be co-incidental in that it would occur whether the condition of consent was set or not. For example, a condition stating that no new borrow pits are to be created will automatically be complied with if the contractor has no need for borrow material in the first place. (Note: these apparently redundant conditions are often put into the authorization as a precautionary measure to cater for unexpected changes to the project during implementation – such as the engineer discovering that minor amounts of borrow material are necessary after all).

Table 3-2. Most commonly encountered defaults per activity type.

No. times default occur-ed	Default	Activity type affected												
		Electricity	Roads	Hazmat	Telecom	Dam	Reservoir	WSS	Resorts	STW	Land use1	Land use2	Waste	APPA
26	Adequate erosion protection measures not provided		X			X		X	X	X	X		X	X
26	Erosion not monitored or corrected		X		X						X		X	X
19	Waste not removed from site		X			X		X		X	X		X	X
16	Watercourses not protected from disturbance		X			X			X	X	X		X	
13	No management or design plans submitted		X	X					X	X			X	
12	Topsoil not stockpiled		X								X			
11	No re-vegetation/rehabilitation		X			X	X	X	X		X		X	X
7	Storm-water not properly managed				X								X	X
5	Concrete mixed on soil				X	X		X			X			
5	No audit conducted		X			X		X			X			
5	Waste not covered or being burned in trenches												X	
4	Excessive vegetation removal		X								X			
4	No dust suppression		X								X			
4	Visual impact mitigation not done/no trees planted		X					X		X				
4	No environmental education provided					X		X			X			
3	Inadequate sanitation facilities provided		X								X	X		
2	Creation of unnecessary access routes		X			X								
3	No wet weather cell provided												X	
2	Exotic vegetation not removed										X			
2	Many open trenches												X	
1	Game fence not erected										X			
1	Water being wasted							X						
1	No back-up pump provided									X				
1	No budget provision made for maintenance												X	
1	No bird flappers attached to power-line													
1	No community forum established												X	

Note: STW = sewage treatment works; WSS = water supply scheme

Table 3-3. Most commonly encountered compliances per activity type.

No. times condition complied with	Compliance	Activity type affected												
		Electricity	Roads	Hazmat	Telecom	Dam	Reservoirs	WSS	Resorts	STW	Land use1	Land use2	Waste	APPA
21	Waste removed from site		√	√	√	√		√						
20	Disturbance and pollution to river minimized		√	√		√				√		√	√	
16	Vegetation removal limited	√	√		√	√		√		√	√		√	√
13	Working areas/access routes restricted		√		√	√		√						
11	Sensitive areas (flood-lines, wetlands etc) avoided		√	√		√		√	√	√	√			
10	Rehabilitation, re-vegetation and landscaping		√	√	√									
8	Erosion protection measures provided	√	√		√	√		√		√	√			
5	No borrow pits opened			√	√	√								
5	Gates hung properly so as not to scrape ground				√		√							
4	Disturbed areas used instead of pristine ones		√					√		√	√			
4	Access routes left un-graded				√									
4	Site fenced												√	
3	Spillage emergency plans in place			√										
3	Required buffer zones left between site and town												√	
2	Topsoil properly stockpiled		√			√								
2	Lights angled so as to reduce light pollution				√					√				
1	Existing services not damaged							√						

Note: STW = sewage treatment works; WSS = water supply scheme

3.2.1.4 Activity types with the most default

The activity types that had the widest variety of default were roads and land use changes (Table 3-2) while telecommunications towers and hazardous substance storage experienced the least. This is probably due to two, inter-related variables. Firstly, the conditions set in the consent decision will obviously limit the type of defaults that can be experienced as a default can only occur if there was a condition that was supposed to be complied with in the first place. Secondly, the conditions set in turn relate to the type of activity itself. Activities such as roads often have a wide range of conditions set as they need to cover issues such as construction camp management, waste management, road alignment, dust suppression, borrowing of material, topsoil handling and so on. Telecommunication and hazardous substance storage activities on the other hand tend to be more defined in scope and usually have a more limited range of consent conditions that reflect this. This could be why telecommunication and hazardous substance storage projects show a more limited range of default.

3.2.1.5 The relationship between the number of consent conditions set and the percentage default recorded

There was no significant correlation between the number of conditions set and the percentage of default that occurred ($r = 0.14$). This would seem to suggest that the number of conditions that are set in an authorization have little to do with how well they are complied with. It could be postulated that setting too few conditions could result in a lack of guidance for the proponent, but that setting too many could result in an information overload and not all the conditions being read. This, however, does not seem to be the case and there are probably other factors that mediate compliance. Judging by the drop in default due to follow-up (Figure 3-16 in section 3.2.3.2) it is suspected that one of the most important default mediating factors is active and visible follow-up by the regulatory authority.

The number of conditions set over time has shown limited variation (Table 3-4) which is in contrast to the findings of Branis and Christopoulus (2005) who, in their study of EIA approvals in the Czech Republic, found that the average number of consent conditions, including those set for monitoring, increased considerably between 1993 and 2000. They do not provide an explanation for this, but the slight variations encountered in this study are probably attributable to both the type of applications received as well as the experience of the regulatory authority. Certain types of projects (such as road upgrades) are usually assigned more consent conditions than others (such as fuel tank replacements) as they are more complex in nature, are not guided by other regulatory standards (such as the SABS and SANS standards for hazardous substance storage) and have more aspects that need to be covered in the authorization (hazardous substance storage tanks for example do not need conditions regulating the placing and management of a construction camp). Thus, if a lot of road upgrade projects were received during a year, then the number of conditions set during that year will be higher. The number of conditions set may also change with the experience of the regulatory authority staff. Informal observation has shown that conditions tend to increase as officials become more experienced and better understand the aspects of a project that need conditions; this then tapers off slightly as further experience shows which conditions are practicable and enforceable and which are not. Junior staff tend to set very few conditions. This is obviously a dynamic situation due to staff turnover. Dik and Morrison-Saunders (2002) make a similar observation with regards to the experience of the proponent. They note that less experienced project staff tend to refer to the conditions of approval more, but that this decreases as they gain more experience and become more familiar with the environmental management process.

Table 3-4. The average number of conditions of authorization set, the average percentage of conditions that could not be monitored, the average percentage default and the number of projects monitored.

Year	**Avg no. of conditions set**	**Avg % of conditions that could not be monitored**	**Avg % default**	**Number of projects monitored**
1999	13	33	56	13
2000	12	34	46	19
2001	10	35	51	26
2002	13	39	46	30
2003	15	35	56	35
2004	11	41	34	29
2005	9	50	29	19

Average percentage of consent conditions that could not be monitored

This study found that the number of conditions that were not able to be monitored for each project ranged between 4% and 100%; with an overall average of 37% of conditions not able to be monitored. This “not able to be monitored” figure of 37% is slightly higher than the 0-24% reported on by Morrison-Saunders and Bailey (1999) and the 35% noted by Bailey *et al* (1992).

Some of the possible reasons that certain conditions could not be monitored include:

- Conditions not usually being set with ease of monitoring them in mind. The focus of the person(s) setting the conditions is usually on trying to keep the impacts of the project within acceptable limits rather than on setting conditions that will be able to be monitored at a later date.
- Some conditions, such as the requirement that an environmental education programme be implemented, could not be verified simply through means of a site visit. Such conditions could only be monitored if a person responsible for the project could be tracked down to verify if the condition had been complied with or not. In some cases this was not possible, especially if there were no contact details or if the responsible person had moved on to another job.
- There were also certain conditions that could not be monitored as they were not applicable to the current project stage. For example conditions relating to decommissioning are obviously not relevant if the project is still in the construction stage. Similarly, there were some conditions that were no longer applicable due to changes in the project such as for project 18. This project for a landfill site at Molteno originally included the upgrading of a small bridge structure over a stream to access the site. Due to budget constraints this stream crossing was never upgraded, so the conditions relating to it are not applicable.

3.2.2 Impact

Overall impact (Figure 3-11) shows a far more skewed distribution than that of the default scores (Figure 3-4), with most projects scoring low (1 on the impact scoring scale) or low-medium (2 on the impact scoring scale). The range of scores is between 1 and 5, with a median impact rating of 1 (low impact).

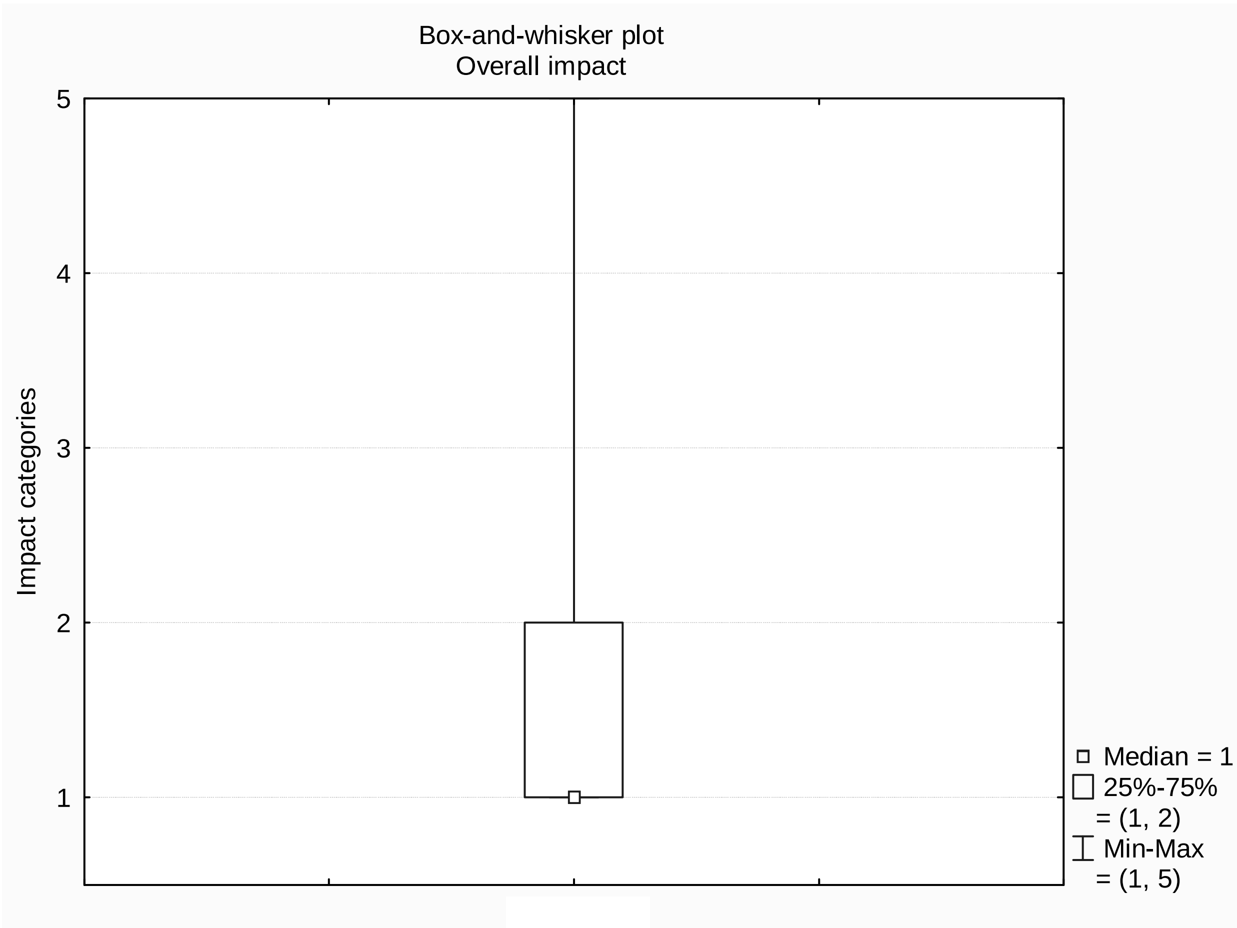

Figure 3-11. Box-and-whisker plot showing the distribution of scores for overall impact.

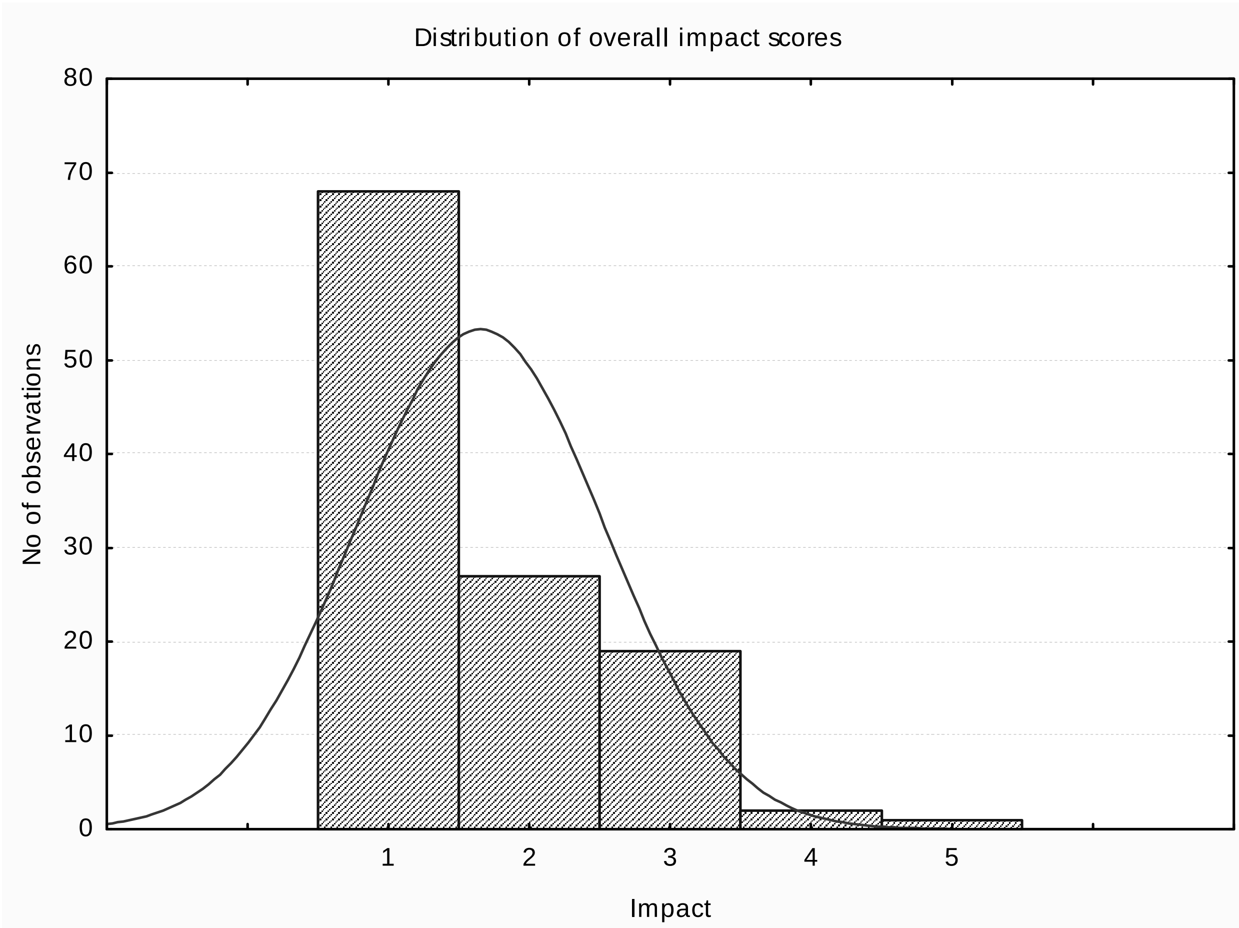

Figure 3-12. The distribution of overall impact scores superimposed with a normal distribution.

As can be seen from Figure 3-12, the distribution of overall impact scores is not normal, with a definite skew to category 1 (low impact). In other words, most projects received a score of low impact, with progressively fewer receiving scores of low-medium (category 2 in Figure 3-12), medium (category 3), medium-high (category 4) and high (category 5). Figure 3-13 provides an indication of the proportion of projects falling into each of the impact categories. As noted, most (58%) fall into the low impact category.

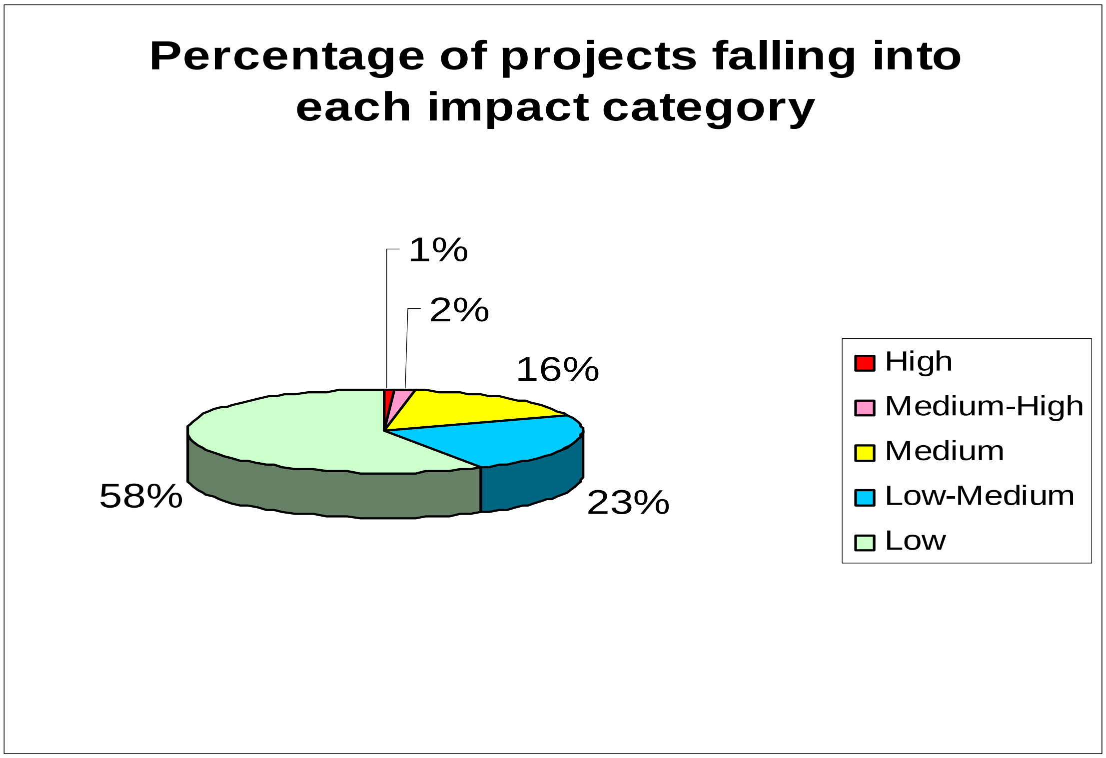

Figure 3-13. Percentage of all projects that scored from low to high on environmental impact.

The reason for this skewed distribution is not clear, but it may be that most projects simply did have a low impact on the environment, whether due to the activity inherently not presenting particularly high impacts; the relatively minor nature of the projects followed-up on; good management or successful mitigation measures. All of the activity types represented in this study (with the exception of reservoirs, which were represented by a single project) showed the potential to score low on impact (Figure 3-14) which suggests that perhaps it is not so much the activities themselves that create the impact, but rather the way in which they are implemented and managed.

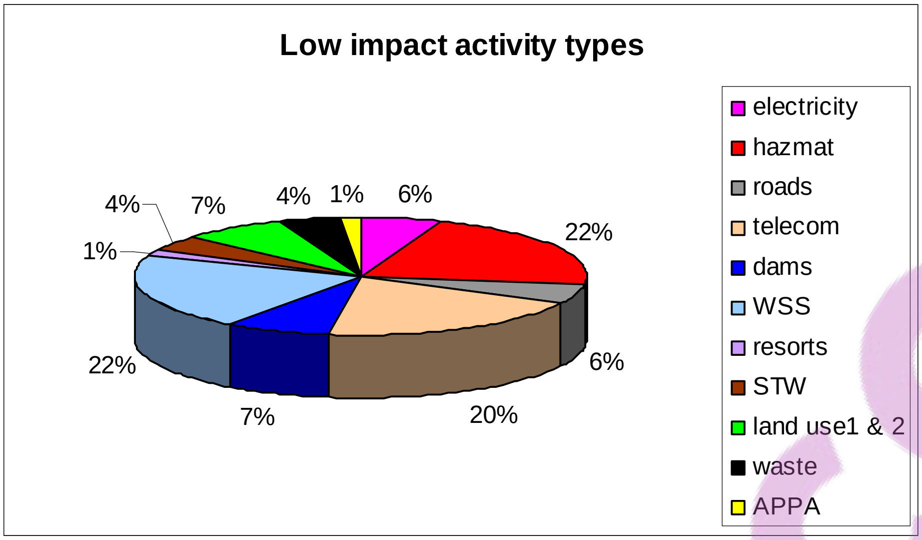

Figure 3-14. The proportion of activity types that scored low on impact.

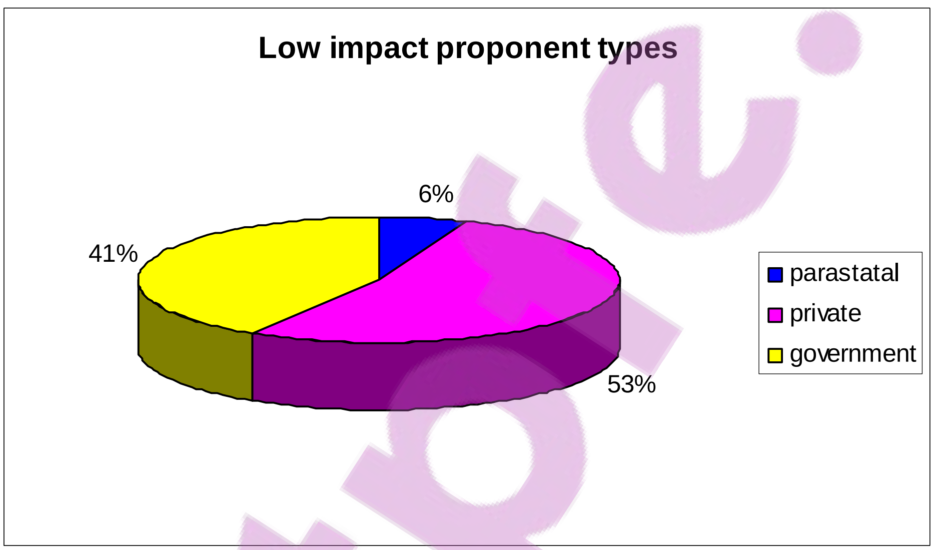

Figure 3-15. The proportion of applicant types that had low impact projects.

The majority of low impact projects (53%) have private companies as applicants (Figure 3-15). The only high impact project recorded was for a road upgrade by a local municipality in the Engcobo area. This is a similar pattern to the default scores in that lower impact projects tend to be implemented by private companies while the high impact project had a government proponent. The underlying reasons for this are likely to be the same as those for default (section 3.2.1.1). The fact that the applicant type has an influence on impact supports the suggestion made in the paragraph above that impact is likely to be mediated more by management than by nature of the activity itself.

In contrast to default however, the distribution of impact scores (Figure 3-12) lacks the second peak that the default score distribution shows at the high end of the measurement scale. That is, there are very few high impact projects while there are many high (100%) default projects. There are also a greater number of activity types that scored low impact (Figure 3-13) compared to the relatively few activity types that scored zero default (Figure 3-8).

The above suggests that there is some relationship between default and impact, particularly in that low default projects tend to have similar proponent and activity type characteristics to low impact projects, but that high default does not automatically equate to high impact. This relationship between default and impact is discussed in more detail in the following section (section 3.2.3).

3.2.3 Default and impact combined

3.2.3.1 The relationship between default and impact

A positive Spearman's correlation co-efficient of $r_s = 0.48$ (significant at $p < 0.05$) between the default and impact scores was obtained, indicating that there is a moderate, but statistically significant, relationship between impact and default and that an increase in one is generally related to an increase in the other. It would be logical to assume that increased default is related to increased impact rather than increased impact resulting in increased default, however this causal relationship has not been proven.

This check on the relationship between default and impact was undertaken because most authors (Canter 1985; Tomlinson & Atkinson 1987a; Sadler 1988, 1996; Arts & Nooteboom 1999; George 2000c) tend to distinguish between the two when discussing monitoring. There are no empirical studies to support or refute this position and the question that arises is whether impact and default are sufficiently related to one another that monitoring of both would amount to duplication of effort. The results of the above correlation suggest that impact and default are related to one another, but not strongly enough that they can act as substitutes for one another. It would thus be wise to monitor both of them.

3.2.3.2 Average default and impact trends over time

Average default and impact scores have varied somewhat over time (Figure 3-16). Both impact and default show a marked decrease towards the end of 2003 and the beginning of 2004 which is when follow-up started. Whether the drop in default – and to a lesser extent, impact – is due to follow-up or is merely co-incidental is not clear. Continued tracking of impact and default scores over time should provide an answer.

It has already been shown that default is not related to the number of conditions set nor apparently to the number of projects selected for follow-up each year (Table 3-4, Section 3.2.1.5). The most likely explanation at present for the drop in default and impact rates in 2004 and 2005 is that the follow-up process has had a positive effect on improving levels of compliance. This supports the point made at the beginning of this thesis that follow-up is an important means of reducing non-compliance with environmental consent condition requirements.

Assuming the follow-up process did indeed result in the decrease in default and impact, could it have worked so rapidly? Potentially, yes. Recent studies such as those by Shimshack and Ward (2005) and Decker and Pope (2005) have found that enforcement activities at one development have unexpectedly large spill-over effects at other plants, suggesting that firms watch each other and that compliance by one influences compliance by others. While some of the proponents for this study's projects may not be large competitive firms, word definitely gets around that the regulatory authority is checking up.

With regards to the less marked decrease in impact – as compared to the sharper drop in default (Figure 3-16) – it is likely that impact is less sensitive to follow-up interventions than default as it is an inherent function of the type of project being implemented and is mediated by factors such as the sensitivity of the receiving environment. Follow-up cannot influence factors such as environmental sensitivity. It can however, considerably influence the way a project is managed which explains why default – which is almost exclusively a function of management – is more amenable to follow-up management interventions than impact. However, improving compliance may help to reduce impact by ensuring that the necessary mitigation measures are put into place, which could explain the slight decrease in impact at the same point (i.e. end of 2003/beginning of 2004) as the sharp decrease in default . This is in line with the observation made earlier that there appears to be a relationship between default and impact but that this relationship is only moderate.

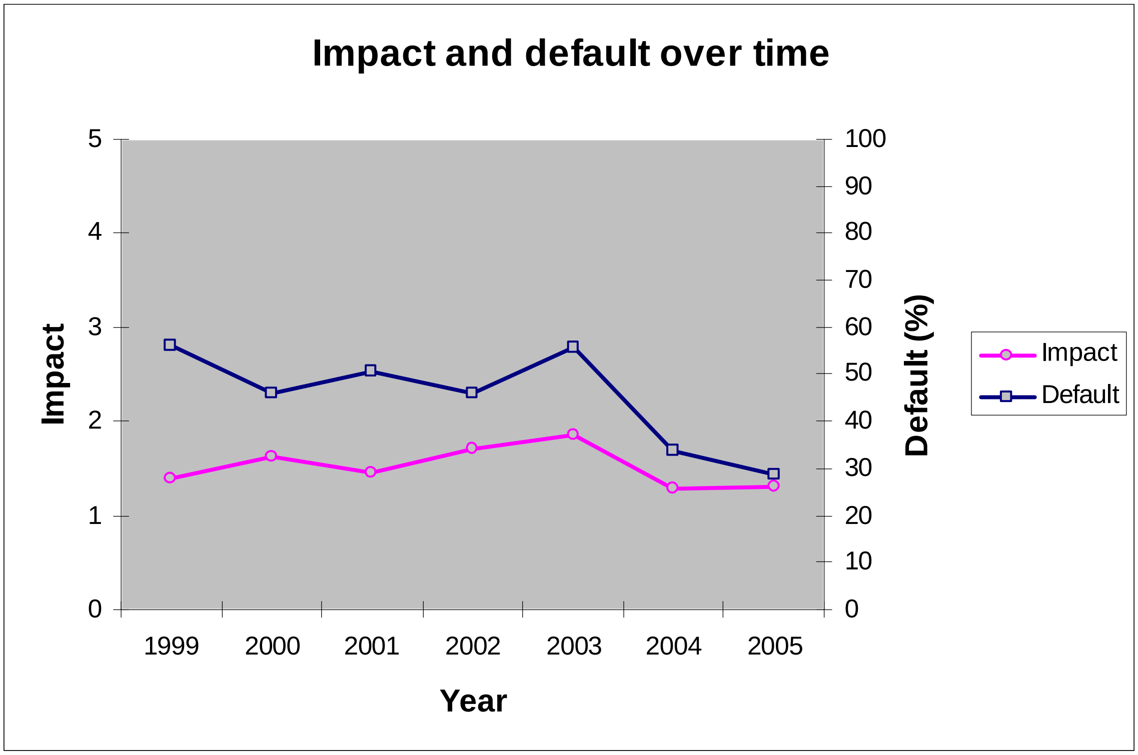

Figure 3-16. The average scores for default and impact over time[6].

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3.2.3.3 Identifying occurrences of high default and/or high impact

In section 2.3.4.3 (Figure 2-9), a means of combining default and impact scores into four categories (high default-high impact; high default-low impact; low default-high impact and low default-low impact) was introduced. This section provides the results of the combining of the default and impact scores for the complete data set of projects followed-up on (Figures 3-17 and 3-18) as well as for the individual project components of activity, locality, applicant and environmental consultant (Figures 3-21 to 3-24).

[6] The year refers to the year in which an application for authorization was received by the regulatory authority and not the year in which follow-up took place

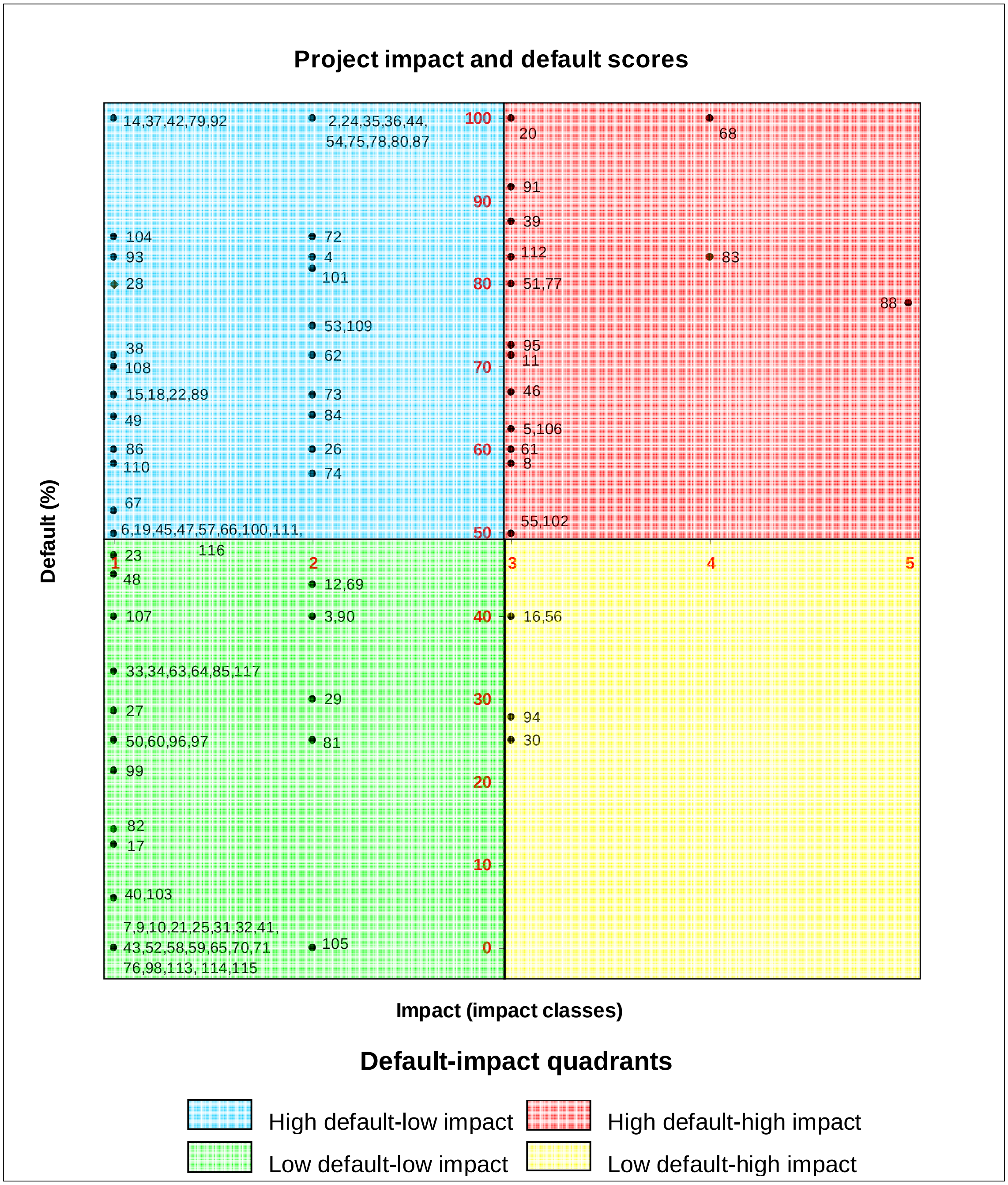

Figure 3-17. The distribution of combined default and impact scores into quadrants for all the projects followed-up on[7].

Figure 3-17 shows the default and impact score for each project followed-up on. The proportion (percentage) of projects falling into each quadrant of the above graph is depicted in Figure 3-18.

[7] The black numbers on the graph refer to the individual project numbers (as set out in Appendix 3).

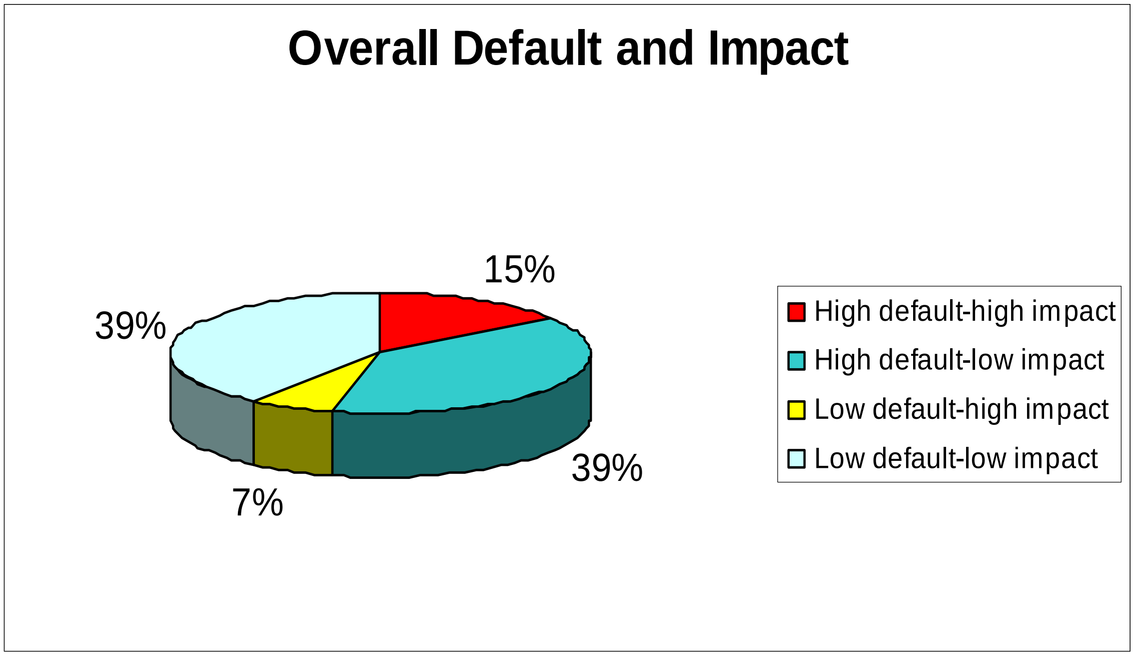

Figure 3-18. The percentage of projects overall falling into each of the four default-impact categories.

The general overall distribution of the projects in terms of the proportion falling into each of the four categories (that is high default-low impact; high default-high impact; low default-low impact and low default-high impact), can be unpacked in more project-specific detail. This is done by examining impact and default scores from the perspective of activity type, locality, applicant and environmental consultant.

High default-low impact

Thirty-nine percent of projects (Figure 3-18) fall into the high default-low impact quadrant of Figure 3-17 (that is projects with a default score of 50% or higher and projects with an impact rating of less than 3 [medium]). Thus, over a third of the projects followed-up on showed default levels of above 50% but low to low-medium levels of impact. Given that default and impact are moderately related (section 3.2.3.1), this would seem to suggest that, although fairly high, default does not necessarily result in negative impacts on the environment. This may be because many of the defaults recorded (such as littering, the non-submission of documents and the failure to plant trees for screening purposes) are unlikely to result in significant environmental impacts.

High default-high impact

Fifteen percent of projects fell into this quadrant (Figure 3-18). Most cluster around the medium level of impact while three projects scored more than this (Figure 3-17). The two projects scoring 4 on impact (towards the right hand side of the quadrant) are for a low-income township and a sewage treatment works upgrade, while the single project on the far right is for a road construction project. The township was high impact due to the large area disturbed and impacts on a nearby stream while the treatment works was given a high rating due to its total incapacity to handle the effluent being discharged into it. The road project that scored high on impact had resulted in serious erosion, a bridge collapse and subsequent impacts on the river. All three projects also had significant defaults and suffered from a general lack of environmental management.

Low default-high impact

Of the four high impact but low default projects, two are for major road upgrades (projects 30 and 56), while one is for a solid waste disposal site (project 94) and the remaining one for a township development (project 16). The road construction projects have high impact ratings due to the magnitude of the works taking place. Major road construction projects typically have major earthworks, blasting, river crossings, concrete batching plants and several construction camps. Both of these projects were however also low in default. This may be due to the fact that Environmental Control Officers and EMPs were required for both projects, which resulted in tight environmental management. It is also possible that the contractors and engineers engaged on the projects were well established and experienced firms that were familiar with environmental requirements.

Low default-low impact

Projects falling into this quadrant represent over a third (39%, Figure 3-18) of the projects followed-up on. These are largely the zero default and low impact projects identified and discussed in sections 3.2.1.1 and 3.2.2 (Figures 3-8 and 3-11).

Figures 3-19 and 3-20 provide pictorial examples of a low default-low impact project (29% default and an impact rating of low) and a higher impact and default project (83% default and an impact rating of 3) respectively.

Figure 3-19. Example of a low-impact and low-default project (reconstructed bridge) in the Senqu Municipal area[8].

Figure 3-20. Example of a high impact and default project (water supply scheme) in the Engcobo Municipal area[9].

[8] The required erosion protection measures have been provided, the bridge was correctly aligned perpendicular to the flow of the river, rubble from the old bridge was removed, the river banks were minimally disturbed and the construction camp area was cleaned up.

[9] Defaults include the creation of several access tracks, lack of erosion protection (note the recent erosion along the sides of the road towards the left of the picture) and inadequate waste disposal (note discarded pipes and litter).

The following sections examine the distribution of combined default and impact scores at a more project specific level. As explained in 2.3.4.3 of the previous chapter, each project was broken down into four core components of activity type, locality, applicant type and environmental consultant. These components and the distribution of default and impact within them are considered below.

Activity type

The scores for the activity types approximate a weak linear distribution (Figure 3-21) from the low default-low impact quadrant up to the high default-low impact one. This would seem to suggest a weak underlying relationship between default and impact, with activities that score lower on default also generally scoring lower on impact. The fact that none of the activities fell into the high impact quadrants is in all likelihood due to the distribution of impact scores being strongly skewed towards low impact (Figure 3-12). Thus when the impact scores for the graph in this section were averaged, the relatively few projects that did fall within the high impact quadrant were moderated by the large number of low impact scores. This distribution of scores also indicates that – for this sample of projects at least – the overall environmental impact is less of a problem than default.

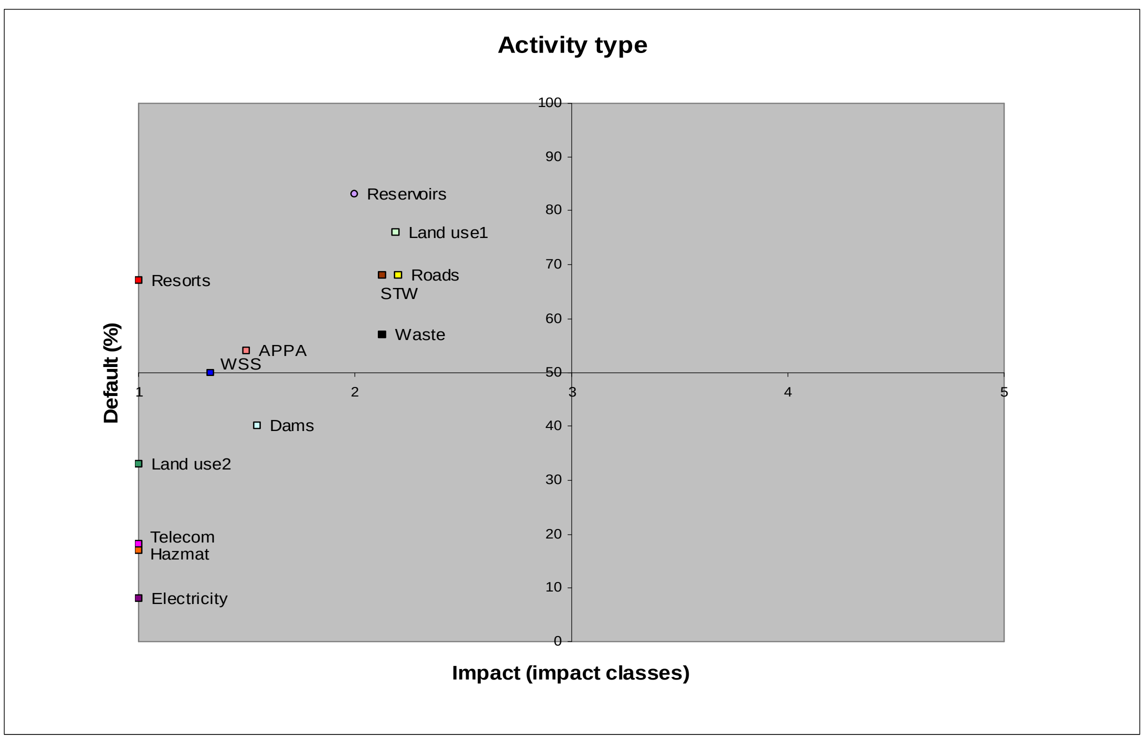

Figure 3-21. The distribution of default and impact scores for activity type.

Activities that fell into the high default-low impact quadrant include Air Pollution Prevention Act (APPA) permit applications; waste disposal sites; sewage treatment works; roads; land use changes from agriculture to other (mostly from commonage to residential for low-income townships); dams; resorts and reservoirs. These activities are thus likely to be default but not impact risks.

The activity type that had the highest score for default was reservoirs at 83%. This activity is however represented by a single project so may not present an accurate indication of generally expected levels of default. With regards to other high default activities, STW and waste disposal activities usually have a number of defaults relating to a lack of on-going management which makes them high default risks. Land use1 projects (especially those for low income townships) also show high levels of default. This may be the result of two factors. Firstly, low income houses are usually funded by grants or housing subsidies. These subsidies generally only cover the activities necessary to build the top structure of the house and do not extend to “niceties” such as erosion protection measures which are usually required in the consent conditions. Consent conditions which have not been budgeted for and cannot be covered by the grants will thus tend to be defaulted on. Secondly, housing developments are occupied by a large number of people, most of whom will not be aware of the consent decision or the consent conditions. They may thus inadvertently contribute to default (such as illegally dumping waste). This second factor may also apply to resorts in that while the resort owner may be aware of the consent conditions, the resort guests are unlikely to be.

Roads are high default activities and also scored the highest for impact (impact score of 2.2). Road construction is often an inherently high impact activity and also typically involves a number of activities that need to be covered by consent conditions such as earthworks, construction camp management, concrete batching, borrow pits and waste management. Because there are a lot of conditions set to control all of these activities, there is more opportunity for default of some sort to be detected.

Activities that fell into the low default-low impact quadrant include electricity, hazmat, telecom, land use2 and dams. Electricity had the lowest score for both default and impact (8% and 1 respectively). This could be due to the fact that electricity projects are all implemented by the parastatal organization Eskom, which is profit driven and thus subject to market and environmental conformance pressures. Eskom additionally has a dedicated in-house environmental section. Similar reasons are likely to be valid for telecommunication and hazmat activities. The low default and impact scores for land use2 are probably due to the fact that the area subject to the land use change was already considerably disturbed and the proposed change in land use contributed to an improvement in overall environmental conditions on site. The reason for dams to be low default may be that one of the foci of consent conditions for these activities is on protection of the river banks. Given that the applicant will usually also have a vested interest in ensuring that the river banks remain stable and the dam/bridge structure doesn't get eroded away, compliance with river bank protection conditions is likely to be high and likely to occur regardless of whether conditions were set or not.

At a more general level, there are two key differences between the activities in the high default-low impact and the low default-low impact quadrant. The first of these seems to have to do with the reasons that the projects were originally implemented. It appears that activities – such as telecommunication, hazardous substance storage and electricity projects – that are implemented with the primary aim of making an on-going profit tend to be lower default. It may be that these projects have a greater need to demonstrate a good environmental track record to enhance their competitiveness. Public perception of a firm's environmental performance can significantly influence its market value (Konar & Cohen 2001), so good environmental performance can be an economic advantage for a proponent. Those projects, such as resorts and townships that are developed with the intention of the developer making a once-off profit by selling off land show higher levels of default, possibly because the proponent has little need to establish an on-going good compliance track record with the authorities. Projects that are implemented in the public interest and not with profit-making in mind – such as reservoirs, roads and sewage treatment works – tend to have the highest rates of default. This may be due to there being no market incentive for the proponents to comply with the environmental legislation.

The second key difference between the two quadrants could have to do with legislation. Telecommunication, hazardous substance storage and electricity activities are all regulated by additional legislation, which, while not primarily environmental, may inadvertently provide environmental protection. Hazardous substance storage for example has to comply with the prescriptions of the South African National Standards (SANS) which require that tanks be designed to minimize the chance of leaks. A similar argument may apply to dams and water supply schemes that usually have to obtain approval from the Department of Water Affairs and Forestry, which takes water-related concerns into account.

Overall, default is more of an issue than impact for activity types. This has important implications for the management of the EIA process in South Africa as more attention needs to be paid to assessing and managing default risk; particularly in cases where applicants use promises of compliance as a motivation for their projects to be allowed to go ahead.

Locality

Scores for locality (Figure 3-22) generally cluster around 50% default and low-medium (2) impact. There are no high impact localities, indicating that default is likely to be more a problem than overall impact. It also suggests that – for this study area at least – the municipal areas are fairly equal in their sensitivity to overall environmental impact.

Localities that scored high on default include Gariep (highest at 73%), Tsolwana, Inkwanca, Senqu and Sakisizwe. Engcobo scored high on default as well as being the locality with the highest impact score of 2.67. The high scores for Engcobo can be explained by the occurrence of several particularly high default and impact projects in this locality (projects 83, 88 and 112). There are less clear-cut explanations for the high default scores for Inkwanca, Gariep and Tsolwana. However, these three areas lie adjacent to one another and are all arid, poor regions (CES 2004) with no major development nodes. Environmental capacity in these areas is limited and the focus is on the development of agricultural projects and basic infrastructure (Chris Hani District Municipality 2004). This predominance of infrastructural projects may explain the higher default scores as these types of basic services projects were found by this study to have high instances of default.

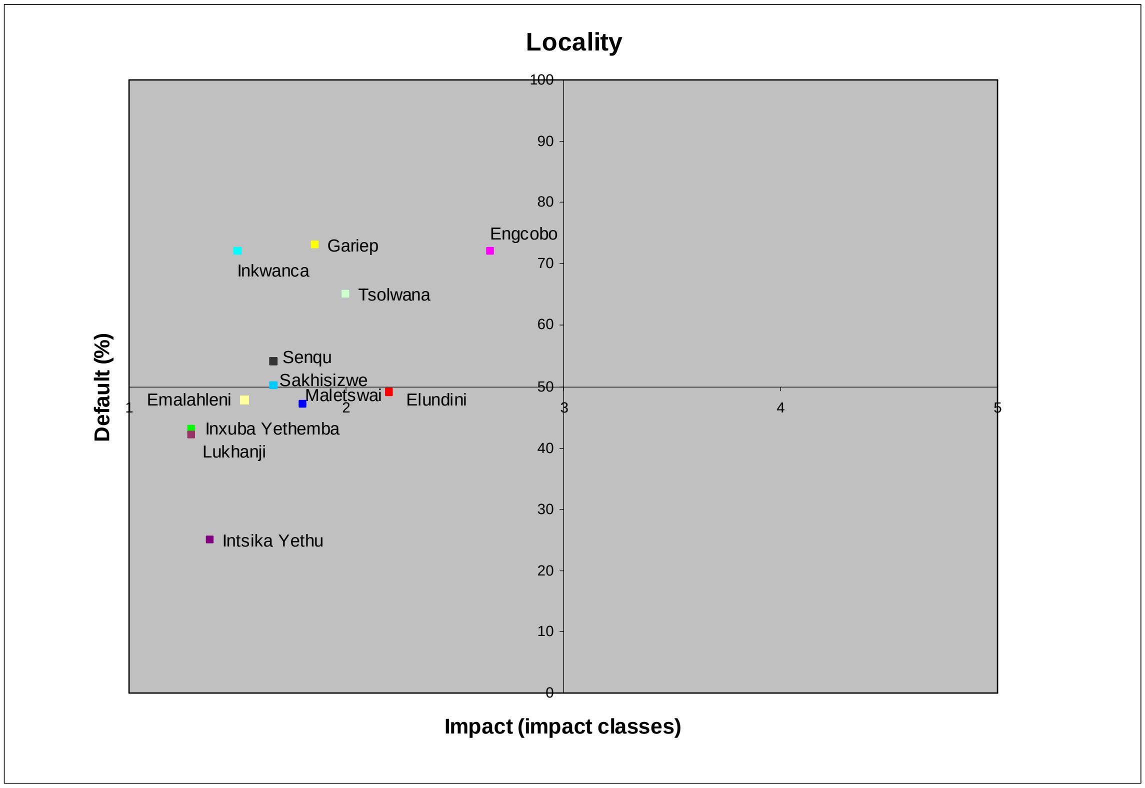

Figure 3-22. The distribution of default and impact scores for locality.

With regards to the low default-low impact quadrant, Intsika Yethu scored lowest on both default and impact (scores of 25% and 1 respectively). The reason for this area to be low impact and default is probably related to the type of proponent (mostly private companies) and the projects (largely hazardous substance storage and telecommunication activities) they implement in this area.

Lukhanji and Inxuba Yethemba are also low default localities. Lukhanji is the seat of the regulatory authority and the fact that the authority is close by may result in applicants being less willing to take chances on defaulting on consent conditions. Inxuba Yethemba contains two well established development nodes (Cradock and Middelburg – Eastern Cape) and applicants in this locality may be correspondingly better capacitated regarding environmental matters and more able to comply with conditions requiring financial outlay.

It is interesting to note that there does not appear to be a significant difference in default and/or impact risk between ex-homeland and former white South Africa areas.

Inkwanca, Gariep, Maletswai and Inxuba Yethemba are in the former white South Africa; Engcobo and Intsika Yethu represent the former Transkei homeland while the remaining municipalities are a mix of both ex-homeland and non-homeland areas. This would suggest that default and impact risk are mediated more by factors such as the type of activity being implemented than by locality and past political dispensations.

Applicant

The scores for applicants fall largely within the high default-low impact quadrant, especially for local municipalities (indicated by diamond shapes in Figure 3-23). There is however a smaller cluster of applicants in the lower left corner of the low default-low impact quadrant. These latter applicants – with the exception of Intsika Yethu and provincial government – are all private or parastatal companies. Some reasons for this distribution are offered below.

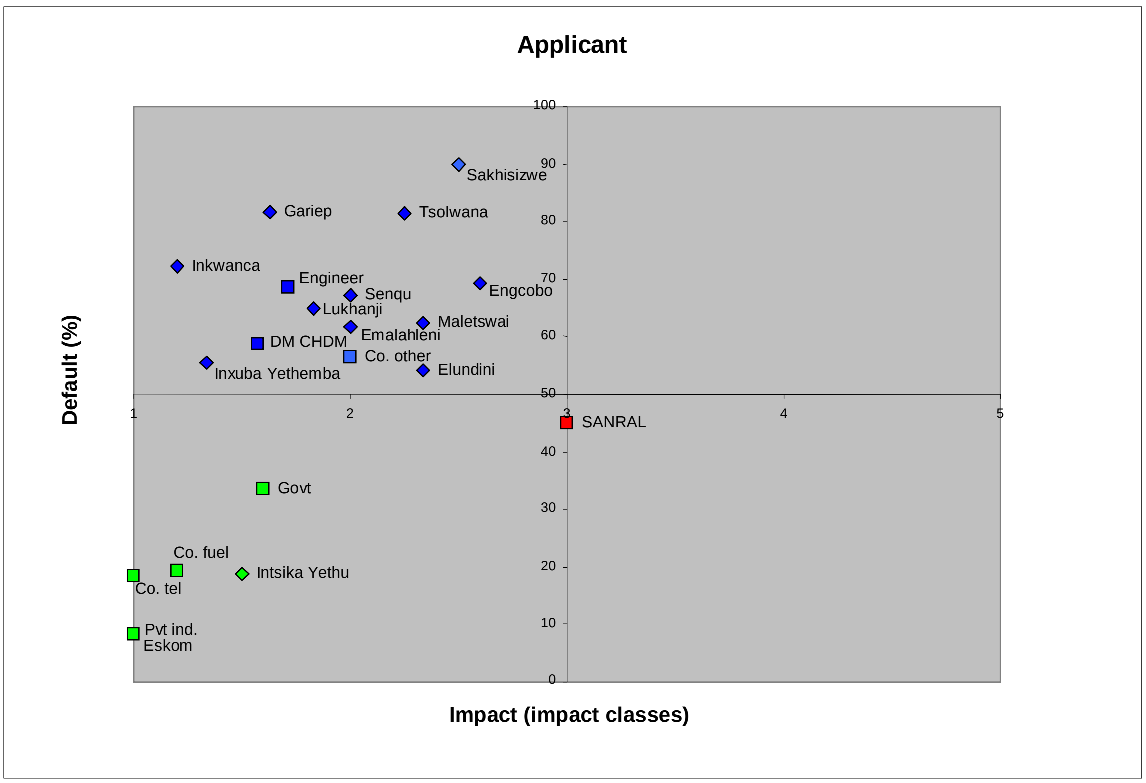

Figure 3-23. The distribution of default and impact scores for applicant[10].

In the high default-low impact quadrant, the applicant with the highest default rating is Sakhiszwe (90%) while the applicant with the highest impact rating is Engcobo (impact score of 2.6). The highest impact rating overall (at a score of 3) is from SANRAL (in the

[10] Diamond shapes indicate Local Municipal applicants.

low default-high impact quadrant). Sakisizwe's high default score is probably due to the fact that the applications submitted by this applicant were all for low-income housing developments which generally have high rates of default. Engcobo has a high impact rating due to two high impact projects that were implemented by that proponent. The high impact score for SANRAL (South African National Roads Agency Limited) is not surprising given that they administer the national roads in South Africa and that their projects inevitably involve major road construction or repair. Their low default score could be explained by two factors. Firstly, due to their size, the regulatory authority usually requires that these projects have EMPs in place and that environmental conformance to this EMP and to the authorization be checked by independent environmental control officers. Secondly, the engineers and contractors employed on these larger projects tend to be well established firms with the resources necessary to handle such work. Having been in the business for some time, these larger concerns generally tend to be more aware of environmental and other legal requirements and have the necessary resources to implement required environmental measures.

The only non local municipal applicants that fall into the high default-low impact quadrant, are DM CHDM (Chris Hani District Municipality), Engineer and Company – Other. DM CHDM is also a municipal applicant, albeit at a district rather than local level. They have an in-house environmental section, but implement larger municipal infrastructure projects such as regional water supply schemes and waste sites. These larger infrastructural projects generally score high on default which could explain the high default scores for this applicant. "Engineer" represents those applications that were handled by engineers on behalf of the applicants. It may be that this handling of the environmental authorization application process on behalf of an applicant leaves the proponent unaware of their environmental responsibilities. The high rates of default generally scored by these "engineer as applicant" projects tend to bear this out. "Company – other" is a mix of companies that also – like the engineers – tend to handle EIA applications on behalf of the applicant. These companies also generally implement basic infrastructure type projects such as low income townships.

With regards to the smaller cluster of scores in the low default-low impact quadrant, the applicants scoring lowest on default (8% each) were private individuals and Eskom. These two applicants also had the lowest overall impact scores (impact scores of 1) along with telecommunication companies. As previously noted, private and parastatal applicants generally score lower on default and impact.

The reason for Intsika Yethu's low score (just below 20% default) is probably a function of the types of projects it submitted applications for, one for a water supply scheme and one for a river crossing (dam). The other municipalities tended to submit more in the way of high default applications such as those for low income townships or waste sites.

Government, which is comprised of the provincial government departments for public works and roads, also shows a low impact and risk profile. This does not fit the previous profile of state applicants that generally have the highest default and impact risks. However, it may be that these provincial departments have more in the way of capacity and resources than local municipalities. Additionally, the types of projects undertaken by these provincial state applicants tend to be large road projects which result in the regulatory authority requiring that an EMP be implemented and regularly audited. Provincial government also shows a preference for appointing well-known and large engineering firms to manage their projects and these firms may be better capacitated regarding environmental matters.

Environmental consultant

Environmental consultants (Figure 3-24) were seen as having a possible influence on the impact and default status of a project as they advise the applicant, assess the potential impacts, make suggestions for mitigation measures and occasionally provide follow-up services. The results however seem to be heavily influenced by the type of projects that particular consultants deal with, or more accurately, the types of projects that consultants submitted to the Queenstown office for authorization. It is likely in many cases that they deal with other types of projects, and only their Queenstown office submissions are reflected here.

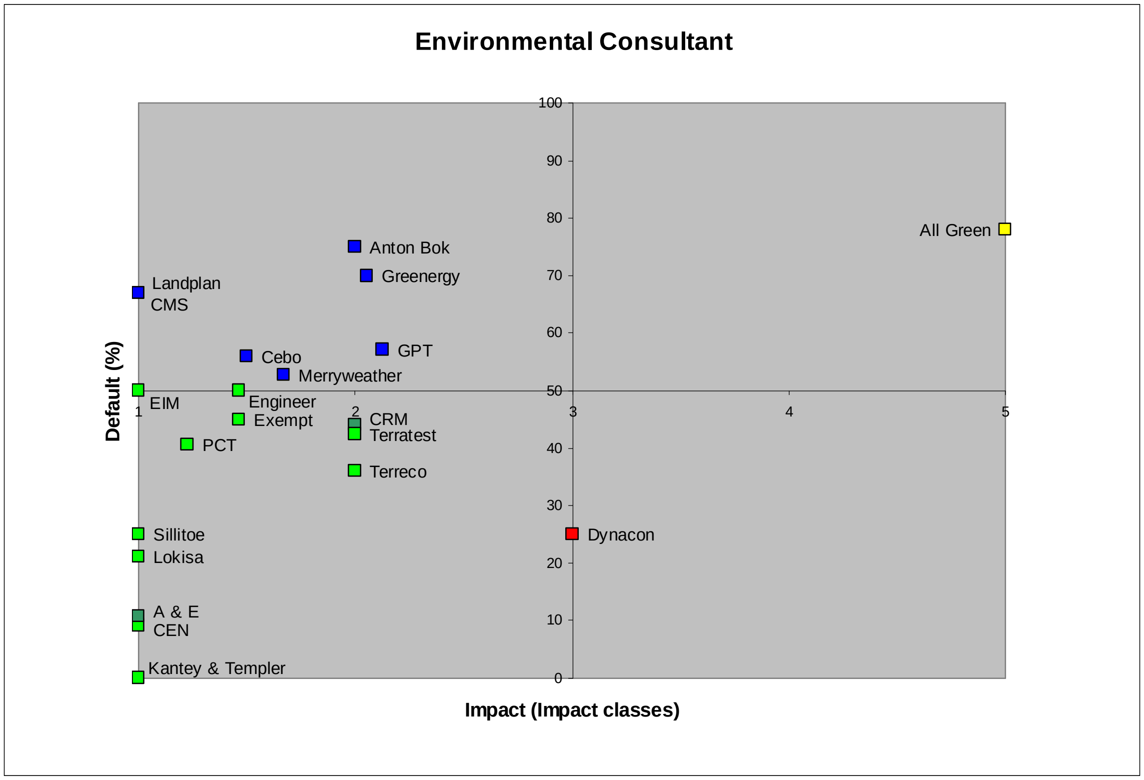

Figure 3-24. The distribution of default and impact scores for environmental consultant.

Activity type does seem to play a role in individual consultant's default and impact scores. A & E for example (Figure 3-24) only handle telecommunications projects which tend to score low on default and impact, giving that consultant an apparently low default and impact score. On the other hand, some of the more experienced consultants might show a higher default and/or impact score as they can deal with bigger and higher impact projects. In general, low scoring consultants are those who submitted mostly telecommunication projects (Lokisa, A & E, CEN) or hazardous substance storage ones (Sillitoe, K & T). As discussed earlier, telecommunication and hazardous substance storage activities tend to be low default and impact. Terreco, Terratest, CRM and PCT who also scored fairly low risk (in the 40's for default and around 2 for impact) tend to undertake a wide range of projects but are also all well-established firms with good project management skills. "Exempt" which is a category for projects for which applicants requested exemption from appointing an environmental consultant are usually only granted authorization if the authority sees the project as unlikely to pose a problem for which could account for their low default and impact ratings. Dynacon shows a high impact profile (impact score of 3) due to the fact that they handled a major road construction project which had some significant impacts. All Green – which had both the highest default and impact scores (78% and 5 respectively) – was involved in a high impact road project in the Engcobo area that resulted in considerable erosion, impacts on a river and disruption to the surrounding community.

Activity type, locality, applicant and environmental consultant combined

If the scores for applicants, activity types, environmental consultants and locality are considered in combination, it appears that projects that present the highest default and impact scores (i.e. scores that fall into the high default-low impact quadrants) are basic infrastructure projects implemented by local municipalities, such as low-income townships, roads and sewage treatment works. The least problematic are those implemented by private or statutory body applicants that have profit making as a primary objective such as cell phone towers and hazardous substance storage projects (i.e. scores falling mostly into the lower left hand corner of the low default-low impact quadrants). This can probably be attributed to greater capacity, a greater understanding of environmental issues, stricter regulation and increased liability in the private sector.

The private sector is also more likely to be influenced by market pressure (US EPA 1992; Dasgupta *et al* 1999; Konar & Cohen 2001) and the need to maintain a good environmental track record – both in terms of positive publicity and keeping on the right side of the regulatory authorities. It is also possible that these applicants have more money for follow-up. Some of these private and parastatal companies – such as Eskom – have in-house environmental staff; and may also have international environmental and other standards that they have to adhere to.

Public applicants on the other hand have little incentive to comply with environmental legislation as they are not subject to market pressure and are seldom taken to task by the regulatory authority due to the requirement for co-operative governance (US EPA 1992). In addition, most of the public sector applicants are implementing projects for the benefit of the community. The scale is therefore already very heavily weighted in favour of social concerns, and it would take environmental issues of extremely high magnitude to tip this balance. In addition, many of the local municipalities are currently struggling with issues of integrating former black townships into white areas, thus priorities are not always environmental (Friend 2004). There is also a capacity issue, with few municipal staff having environmental training. Environmental issues are often seen as low priority and delegated to someone who already performs other duties such as an environmental health officer.

Lack of budget provision for on-going maintenance is also often a problem in municipalities, particularly for basic infrastructure projects that might have been funded from a grant. For example, a grant might have enabled the licensing and construction of a waste disposal site, but such grant does not cover equipment such as compactors or on-going maintenance. This lack of capacity and budget for maintenance becomes apparent in projects that require on-going maintenance such as waste disposal sites and sewage treatment works. In this study, these projects usually presented high default and impact scores. The findings of Morrison-Saunders and Bailey (1999) seem to tentatively support the above. They note that out of their six follow-up case studies, the three that implemented adaptive environmental management were private companies, while the government institutions which made up the remaining case studies did not.

3.3 Results from the risk screening phase of the research

The development of the risk screening tool was covered in Section 2.4.1 of Chapter 2. The reader is referred to Appendix 4 which presents the Excel worksheet that was developed as the risk screening tool to determine the default and impact risk of a project.

3.3.1 Testing the accuracy of the risk screening tool

As discussed in section 2.4.3, the accuracy of the risk screening tool was tested with two sets of data, one set of 41 projects from 2005 and a second set of 13 projects from 1999. These two test data sets have been referred to as Test 1 and Test 2 respectively. The predicted results are those obtained from using the risk screening worksheet (Appendix 4) while the actual results were obtained during the follow-up process to the project sites.

Two procedures were used to examine the accuracy of the risk screening tool. The first was through means of box-and-whisker plots, which provide a visual indication of the match between the scores predicted and the actual scores; and the second was via significance testing using Wilcoxon matched pairs tests. The following section reports on the results from these testing processes.

3.3.1.1 Comparing predicted and actual default with box-and-whisker plots

Results from Test 1

The predicted-actual match between the scores for default (Figure 3-25) shows that the scores predicted by the risk screening tool vary between 20% and 66% default, with a median score of 35%; while the actual default scores vary far more widely (between 0 and 100%), with a median score of 33%. This more limited distribution of predicted scores compared to the actual scores is in all likelihood due to the effect of using averaged scores to design the risk screening tool. Averaging evens out extreme scores with the result that the risk screening tool predicts scores which do not range into the extremes of zero and full default. The actual default scores however were not subject to averaging and extremes of 0% default and 100% default are therefore evident.

For the Test 1 data set, the risk screening tool slightly over-estimates the degree of default that actually occurs. Most of the predicted scores (the box part of the box-and-whisker plot for “predicted” in Figure 3-25) are between 20% and 63% default, whereas most of the actual scores are between 0% and 57% (the box for “actual” in Figure 3-25). Some of the actual default scores are thus lower than was predicted by the risk screening tool.

Results from Test 2

As with Test 1, the actual default scores (Figure 3-25) show more variability (a range of between 0 and 100% default), especially with regards to the median scores, than for predicted default (a range of 23 to 67% default). Actual default scores are generally higher for this Test 2 data set than for the Test 1 (post-follow-up) data set. This, coupled with the fact that the risk screening tool slightly under-estimates the actual degree of default, lends support to the supposition that follow-up has had a positive effect on default (by promoting compliance) as these Test 2 results are from 1999 applications which were implemented before follow-up took place. In other words, the actual default scores for pre-follow-up projects tend to be generally higher than those for projects implemented after follow-up started and proponents became aware that their compliance was being assessed.

Whether the differences between the predicted and actual scores are significant or not is tested in the following section (section 3.3.1.3).

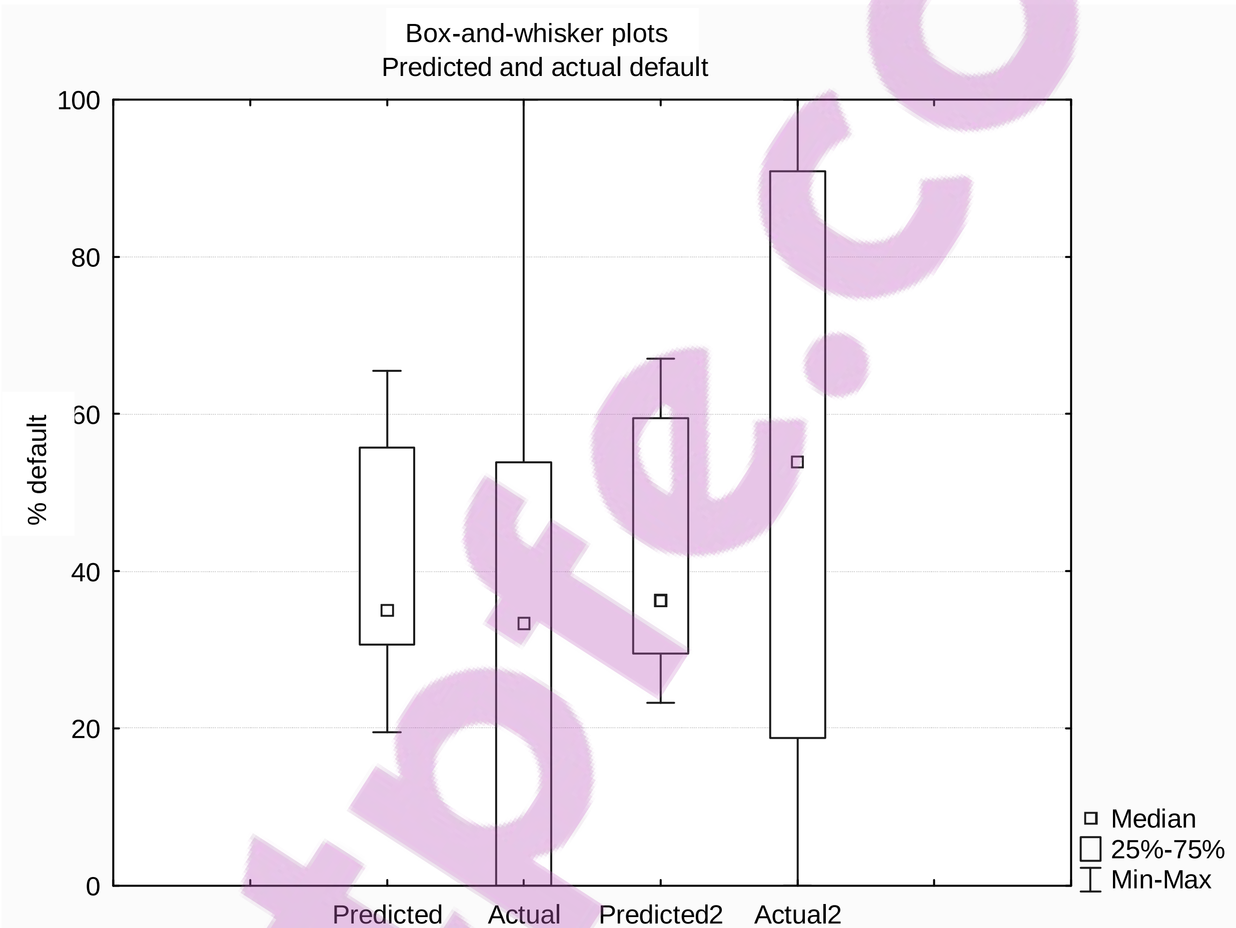

Figure 3-25. Box-and-whisker plots showing predicted and actual default ranges of scores for Tests 1 and 2[11]

3.3.1.2 Comparing predicted and actual impact with box-and-whisker plots

With regards to impact, the risk screening tool marginally over-estimates the degree of impact for both test samples (Figure 3-26). Again, this is probably due to the fact that the

[11] Predicted and Actual refer to Test 1 while Predicted2 and Actual2 refer to Test 2.

impact scores used to construct the risk screening tool were averaged scores. The averaging process results in a limited range of variability as extreme scores are evened out. The actual impact scores however were not subject to averaging and extreme scores are therefore possible. The reduced variability of the predicted scores compared to the actual scores ones is thus probably due to the use of averaged data in the risk screening tool.

In contrast to the findings for default, there does not seem to be a significant difference between the pre- and post-follow-up test samples, indicating that follow-up has not had much of an influence on impact scores. Significance testing is however necessary before final conclusions can be drawn and will be addressed in the following section.

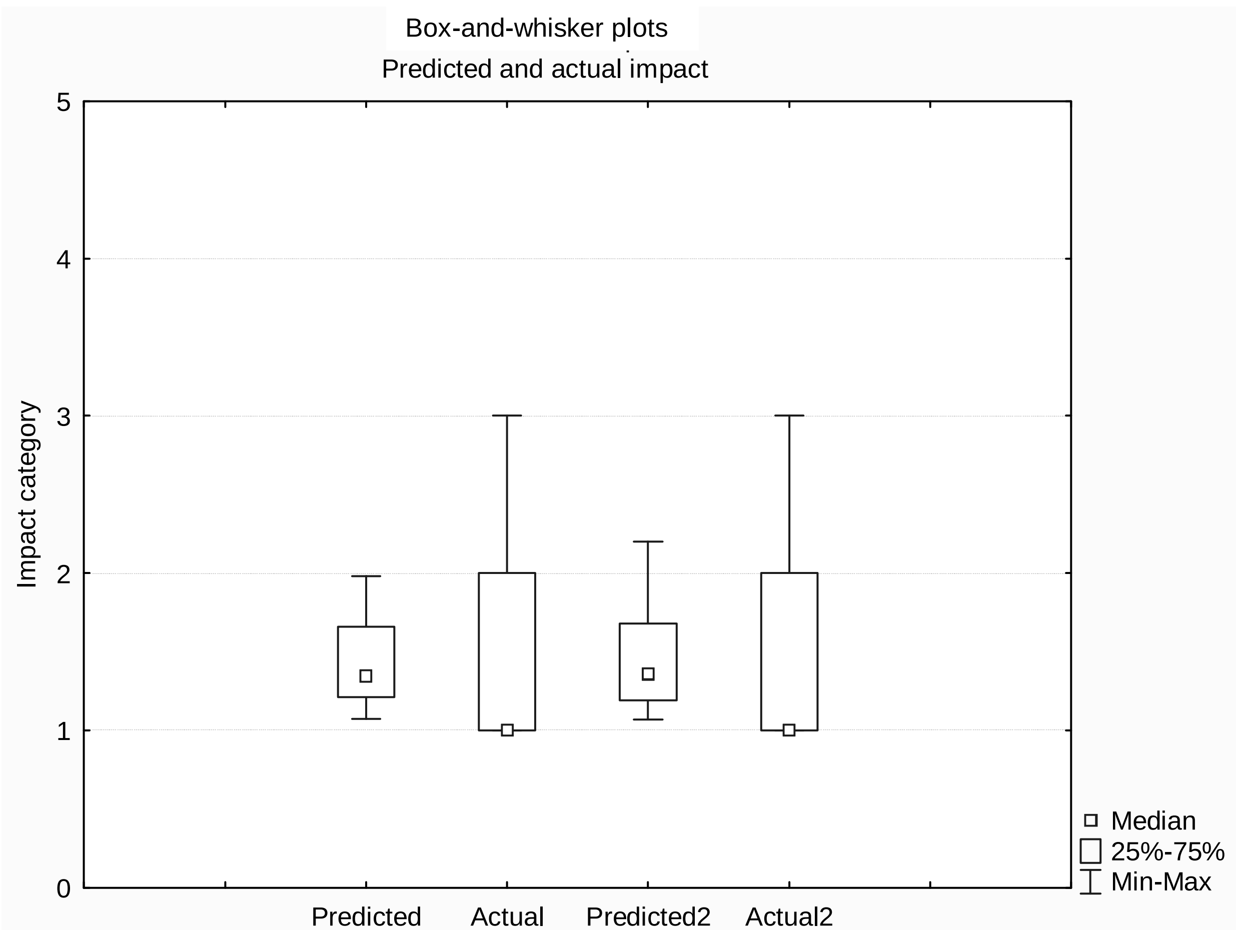

Figure 3-26. Box-and-whisker plots showing the range of scores of predicted and actual impact for tests 1 and 2[12].

[12] Predicted and Actual refer to Test 1 while Predicted2 and Actual2 refer to Test 2.

3.3.1.3 Testing the significance of predicted-actual matches with Wilcoxon matched-pairs tests

The null hypothesis for the Wilcoxon matched-pairs test states that the distribution of the predicted scores is equal to the distribution of the actual scores. In the case of this thesis, this implies that there is no significant difference between the scores predicted by the risk screening tool and the actual default and impact scores. In other words, the risk screening tool is performing well. A Wilcoxon test result of "no significant difference" between the predicted and actual scores is thus an indication of successful risk prediction.

A statistically significant result on the other hand would mean that the null hypothesis is rejected and that the predicted scores are significantly different to the actual scores. In other words, the risk screening tool is not accurately identifying default and impact risks.

Table 3-5 presents the results of the Wilcoxon matched-pairs tests between the predicted and actual results from Tests 1 and 2.

Table 3-5. The results of the Wilcoxon matched pairs test between the predicted and actual scores.

Variables	Results	Significance level
Test 1		
Predicted & actual default	T = 257, Z = 2.5 (n = 41)	Significant (p = 0.02)
Predicted & actual impact	T = 304, Z = 1.64 (n = 41)	Not significant (p = 0.10)
Test 2		
Predicted & actual default	T = 25, Z = 1.43 (n = 13)	Not significant (p = 0.15)
Predicted & actual impact	T = 33, Z = 0.87 (n = 13)	Not significant (p = 0.38)

As can be seen in Table 3-5, the null hypothesis is accepted for three out of the four test runs and is only rejected for Test 1 – default. The risk screening tool thus produces statistically significant matches of predicted and actual scores for impact and also for the 1999 default test, but not for Test 1 – default. In other words, the risk screening tool accurately identifies EIA projects that present an impact risk and also identifies projects from 1999 (i.e. pre follow-up) that present a default risk. Projects that were implemented post follow-up are however not accurately screened for default risk.

The most probable explanation for this relates to the effect that undertaking follow-up has had on rates of default. As discussed in Section 2.4.3; follow-up is expected to have resulted in a reduction in the rates of default. It is therefore likely that the risk screening tool (which is based on the results of projects that were implemented before follow-up started) now slightly over-predicts the amount of default expected as the rates of default on new projects will have been influenced by the carrying out of the follow-up process. In other words, the actual rates of default are lower than predicted due to the positive effect that conducting the follow-up process has had on reducing rates of default.

3.3.2 Overall effectiveness of the risk screening tool in screening out projects that require follow-up

As discussed in section 2.4.2, the screening threshold for default was set at 40%. At this threshold, the risk screening tool identified 22 out of the 54 test (Tests 1 and 2) projects as requiring follow-up for possible default problems. In actuality, 26 out of 54 projects achieved 40% default or higher, indicating that the screening tool slightly under-estimated the number of projects needing follow-up for default (Table 3-6). This is probably due to the fact that screening tool is based on averages, which gives a limited range of predicted default scores (between 20% and 60% for Test 1 and between 23% and 67% for Test 2). The actual scores however, ranged between 0 and 100% default which slightly increases the likelihood that a particular score will be above the screening threshold of 40%. In other words, the screening tool predicts default scores within a fairly limited range and projects that have actual scores outside of that range show up as false negatives (that is, not predicted but actual). This is evident in Table 3-6 where 8 projects were not predicted as needing follow-up, but in actuality did.

For impact, the threshold for follow-up was initially set at 2.5 (refer to section 2.3.2 of this thesis); in other words, any project predicted by the risk screening tool to present an impact risk of 2.5 or above would be targeted for follow-up. In practice however, there were no projects in the test data sets that were predicted to have an impact rating of this level, so the threshold was dropped to 1.5. At this latter threshold level, 21 of the projects in Tests 1 and 2 were selected by the risk screening tool as needing follow-up, with 17 actually needing it. In other words, the risk screening tool over-estimated the degree of impact that was actually experienced (Table 3-6). This concurs with the results of the box-and-whisker plots for impact (Figure 3-26). The predictions for the number of projects needing follow-up for impact was subject to some false positive (predicted but not actual) errors as can be seen in Table 3-6.

Table 3-6. The number of projects screened out for default and impact and the number of false positive and false negative results[13].

	Number of projects identified for follow-up	**Number actually needing follow-up**	**Predicted-Actual Matches**	**Predicted not actual**	**Not predicted but actual**
Default	22	26	18	4	8
Impact	21	17	13	8	4

Overall, the screening tool performs well, with statistically significant matches between predicted and actual results (for all except Test 1 for default; Table 3-5). While some false positive (that is projects that are predicted to require follow-up, but actually don't in practice) and false negative predictions (projects not predicted to require follow-up, but actually needing it in practice) occurred (Table 3-6), these are not statistically significant. With further use and minor recalibration of the screening tool, it is likely that these errors may be further reduced.

[13] The raw data is reflected in Appendix 5.

Chapter 4: Conclusions

It will be recalled that the two primary aims of this research were to obtain information regarding the default and impact status of implemented EIA projects and to determine if risk screening for default and impact was possible. This chapter draws conclusions regarding the achievement of these aims and the outcomes of this study.

In the interests of providing a logical summary, these conclusions have been structured according to the 5-step research framework that was presented in Chapter 1 (section 1.3.4.3, Table 1-3); that is: planning for follow-up; follow-up of projects (monitoring); evaluation of data gathered during follow-up; risk screening and management.

4.1 Conclusions relating to the planning of a follow-up process

A primary aim of follow-up is to gather information so that learning from experience is possible (Sadler 1988; Dipper *et al* 1998). It therefore makes sense to learn not only from the analysis phase of the study but from the planning phase of follow-up as well. Key conclusions relating to planning for follow-up have thus been drawn and are presented below.

4.1.1 Suitability of a simple and pragmatic approach to follow-up

In Chapter 2 it was argued that a simple and pragmatic approach to follow-up was likely to be of more value to this study than a rational-scientific one. This argument proved to be justified in that the pragmatic approach that was utilised adequately satisfied the aims of the study. Furthermore, the simple format of follow-up was readily understood by the regulatory authority staff and fitted easily into their day-to-day business. Should the need for a more scientific approach to follow-up arise at a later stage, then the solid foundation for follow-up that has already been established can easily be refined. Similar conclusions regarding the usefulness of a simple approach were made by Bailey and Hobbs (1990) and Morrison-Saunders *et al* (2003) who remark that follow-up does not have to be complicated to be successful.

4.1.2 Compliance and effects monitoring

At the beginning of this study compliance (default) and effects (overall environmental impact) were selected as the most useful parameters to focus follow-up on. As explained in section 2.3.1.1 both default and overall environmental impact were regarded as necessary to provide a realistic picture of the actual effects of implemented EIA projects.

It can be concluded that selecting compliance monitoring as one of the foci of follow-up was both useful and necessary. Default on the consent conditions was found to range widely from 0% to 100%, with an overall average of 49%. Non-compliance with almost half of the consent conditions for an “average” project indicates that default does indeed need to be monitored. Follow-up provided the regulatory authority with not only an opportunity to monitor for default, but also with an opportunity to manage and correct default. In addition, enforcing compliance gave the authority the chance to improve their image as an enforcement agency and thus encourage continued compliance. Judging by the drop in default after the implementation of a follow-up process (Figure 3-16), it can be concluded that compliance monitoring is useful and effective in this regard.

Effects monitoring was also found to be worthwhile. While most projects were found to have a low overall impact on the environment; assessing the overall impact of projects provided a useful, practical indication of the actual environmental effect of projects on the environment. It also indicated – for the study area at least – that default and impact are not as strongly linked as anticipated. High levels of default did not automatically equate to high levels of impact. This suggests that default on consent conditions does not always result in high impact and that monitoring and management of both default and impact is necessary.

4.1.3 Obtaining buy-in for follow-up

Obtaining buy-in or support for the follow-up process from the top management structures in the regulatory authority during the planning phases of the study was found to be vitally important. Buy-in was important in two aspects, firstly in terms of securing the necessary budget for follow-up and secondly in terms of helping to mitigate pressure on the EIA process from political agendas. There is a definite need for independence from political agendas (Tonn & Peretz 1999), particularly in the Eastern Cape where the provincial department that is responsible for environmental management is also responsible for economic development. This sharing of the same political head for environmental and economic affairs can sometimes lead to conflicts of interest, with environmental concerns often taking second place to economic development. This is compounded by political pressure from applicants to be exempted from the EIA process (Ortolano & Shepherd 1995). Implementing a follow-up process can help with this by providing political heads with practical information on the outcomes of the EIA process. This information can then be used to justify decisions and to provide motivation for authority requirements, such as the requirement for the appointment of an environmental control officer (ECO). This is however only possible if follow-up is supported by top management in the first place. To do this, managers may have to be convinced of the value and importance of follow-up first.

4.1.4 The need for clear roles and responsibilities

The need to clarify and enforce roles and responsibilities as early as possible in the follow-up process emerged as a key lesson for this study. Role-players that clearly understand their responsibilities in terms of environmental management are vital for the success of follow-up programmes (McCallum 1987; US EPA 1992; Marshall *et al* 2004).

Follow-up is sometimes not implemented due to uncertainties as to what to do if problems are detected (Dipper *et al* 1998; Arts & Nooteboom 1999; Arts & Morrison-Saunders 2004) and having clear roles and expectations laid out means that procedures are in place to allow for problems to be fixed quickly. As an example, take two road projects that were followed-up on for this study. The first (project number 78) was a minor gravel road upgrade project that involved ripping, reshaping, re-gravelling and re-compacting the road bed and installing drainage. The project did not have an EMP or an ECO and scored low-medium on impact and had a 100% default rate. The second project (project number 30) involved a major road upgrade from gravel to tar with route re-alignments and bridge structures. This project had an EMP which clearly stated roles and responsibilities and the project was audited regularly by an ECO. This project scored medium on impact but only had a default score of 25%. In both cases during follow-up, some erosion problems were detected. In the case of the project which had an ECO, there were clear channels for communicating with the engineers and contractors on site and the erosion problem was promptly addressed. In the smaller gravel road project however, there was no clear line of responsibility, with the result that the engineers, the contractor and the proponent all tried to shift responsibility onto each other. Despite promises for remedial action, the erosion on the gravel road project was never repaired. While this is but one case study and the non-compliance was undoubtedly also affected by the lack of resources to fix the problem, the principle remains that having clear responsibilities set out helps project management greatly. It will not automatically guarantee that the project will have a lower impact on the environment or even a better compliance rate, but chances of compliance and good management are better if lines of responsibility and accountability are clear.

This requirement for clear accountability was reinforced by the finding (section 3.2.1.1) that a key difference between zero and full default projects was the degree to which the applicant could be held – or felt – directly responsible for environmental management on the project. Finding ways to encourage a sense of responsibility would thus be key in managing default and impact.

The EIA regulations (both the 1997 and more recent 2006 ones) have made considerable efforts to clarify the roles and responsibilities of the various parties. These form a valuable basis upon which to build follow-up, but it was found that further clarification regarding the day-to-day management of projects is necessary. Ways in which this could be addressed are discussed in the following chapter on recommendations.

4.1.5 Site visit planning

Proper planning for site visits can greatly improve the efficiency of the follow-up process. The first few monitoring inspections undertaken for this study were found to be very time consuming and the amount of time required to locate and monitor projects had been under-estimated. Although seemingly obvious, checking directions to a project and planning the most efficient route between the sites to be visited is essential.

Pre-trip file review was also found to be vitally important. A preliminary review of the EIA project file allows potential problem areas to be flagged for inspection during the site visit; served as a reminder of particular conditions set and also disqualified some projects for follow-up immediately, such as when a selected project fell outside of redefined regional boundaries.

Projects that extended over a large spatial area (such as water supply schemes or linear developments) required the pre-selection of points to monitor rather than trying to cover the whole scheme or development. For water supply schemes for example, points where the pipeline crosses a river might be selected as target areas as this is often where most control measures are required, particularly in terms of erosion and handling of materials (such as concrete) close to water-courses. Following several hundred kilometres of pipeline is extremely time-consuming and not always possible. Having good quality maps and layout plans is essential in being able to pre-select (and later locate) areas that might require follow-up.

Finally, it can be concluded that unannounced site visits are easier to organize and fit into the authority's follow-up programme as they don't involve having to co-ordinate several role-players' schedules. They do however have some disadvantages as will be discussed in section 4.2.2 below.

4.2 Conclusions relating to monitoring projects

4.2.1 Expect the unexpected

The first conclusion that can be drawn regarding monitoring is that follow-up does not always go according to plan. Routes that were planned may no longer be navigable (Figure 4-1), the time taken to monitor a project may be far longer than expected; projects that were assumed to be non-problematic may not be and so on. A measure of flexibility in the follow-up process is thus essential to cope with unexpected developments and the pragmatic approach adopted worked well in this respect.

Figure 4-1. Expect the unexpected!

4.2.2 The tools used in the collection of follow-up data

Site visits

Most of the site visits for this study were undertaken unannounced and without the proponent being present. While this had advantages in terms of the authority not having to plan site visits in conjunction with other parties, it did mean that fewer conditions could be monitored in cases where determining default required verification from the proponent. Unaccompanied site visits also meant that the chance to jointly discuss project issues between the various role-players was lost. This study found that joint site visits where representatives of the proponent, authority, engineer, environmental control officer (if relevant) and contractor were all present offered an ideal learning opportunity for all parties. The regulatory authority for example could gain a better understanding of the project and construction methods; the engineers and proponent gained a better understanding of environmental issues and the ECO had an opportunity to raise any site management issues and report back on the usefulness of the EMP. The value of such site visits should not be dismissed, especially as training for more junior staff members.

In practice a balance of accompanied and unaccompanied site visits will probably be most useful, depending on the outcomes desired by the regulatory authority.

Involve several staff in follow-up visits

A further important conclusion related to site visits is the advisability of involving a number of staff in this aspect of follow-up work. Not only is there physical safety in numbers, but monitoring also provides an opportunity to impart skills to more junior staff, provides feedback on the actual consequences of consent decisions taken, assists in reducing potential bias in scoring default and impact and helps to ensure continuity in the follow-up process if staff leave. The regulatory authority suffers from a high staff turn-over rate (Duthie 2001) and follow-up is unlikely to be sustainable in the long-term if provision is not made for the continual training of new staff in follow-up.

Photographs

Photographs proved to be a very useful monitoring tool. In order to make most effective use of this tool, this study found that there was a need to ensure that the date and time were correctly set on the camera, that the photographs showed context and that a record of on-site photographs taken was kept, especially if several sites in a similar area were visited on the same day. Date and time needed to be correctly set in case there were queries later regarding when the photograph was taken. This can be particularly important for enforcement cases if the applicant argues that the photograph was taken either before the project started (that is the environmental damage was pre-existing) or well afterwards. For the same reason it is important to ensure that the photograph(s) clearly show the subject of the photograph in context. For example, an erosion gully should be photographed in relation to the road or culvert structure that is causing the erosion and if possible some of the background scenery should also be included. This helps to prove that the erosion is actually occurring on the identified site and can also help the proponent locate the damage in order to get it repaired. It is often a good idea to take several sequential photographs so that the subject is shown in its general context and close up (US EPA 2002). As digital photos can be so easily altered, photos also need to be written to non-rewritable CD as soon as possible after the field visit (US EPA 2002).

4.2.3 The influence of the project life cycle on monitoring

In the previous chapter it was noted that the life cycle stage of a project can influence the default and impact results obtained. Each project life cycle stage can offer certain opportunities and constraints for follow-up and some conclusions regarding these are highlighted below.

Construction stage

The construction stage offers an opportunity to correct potential problems early on. There is also a greater chance that people (such as the contractor and engineer) who can answer questions regarding compliance will be on site. This can be of importance if compliance with a condition (such as the requirement to conduct environmental staff training) cannot be determined simply by a site visit. Having people on site to verify compliance can thus increase the number of conditions that can be monitored and can therefore yield a more accurate overall picture of default. This is reflected in Table 3-1 which reflects that 70% of conditions could be monitored for projects during the construction stages as opposed to the 62% and 54% that could be monitored for the operational and decommissioned stages respectively.

Monitoring during the construction stage can however give a more negative view of the impact of the project due to the fact that mitigation and rehabilitation measures have not yet been fully established (as indicated in Figures 3-1 and 3-2). Projects that involve bulk earthworks in particular tend to have a high-impact appearance during construction.

A further disadvantage of monitoring during the construction stage is that the regulatory authority has to tie its follow-up programme to construction start dates which can make follow-up reactive (responding to a notification of construction start) rather than proactive and can make follow-up more difficult to plan.

Operational stage

The operational stage is a good time to gain an impression of the longer-term impact of the project on the environment. Follow-up during the operational stage also allows inspection of the effectiveness of mitigation measures, such as those for the road upgrade project in Figure 3-3.

Inspections during the operational stage also have the advantage that they can be timed to suit the authority, rather than tied to construction time-frames. The draw-back of following-up during this stage is that important construction-related defaults or impacts might be missed; or potentially avoidable construction damage is not prevented. This was the case for project 4 which involved the construction of a reservoir on a small hill in the Inxuba Yethemba municipal area. Despite being required to keep blasting to a minimum, the whole top of the hill was unnecessarily blasted flat, resulting in destruction to vegetation and a considerable visual impact.

Decommissioning stage

The decommissioning stage offers the opportunity to get residual impacts mitigated and gives a more accurate reflection of the actual impact that the project has had on the environment. Obtaining co-operation for the implementation of mitigation measures however can depend on why the project was decommissioned. Financial bankruptcy usually means that there is little hope of getting a proponent to repair any damages. Decommissioning for reasons of redundancy or relocation usually offers a better chance that rehabilitation will occur, although this study found that it was extremely difficult to get proponents back to site once they had left. The temporary asphalt plant for the road upgrade (project number 109) is a case in point. The applicant was requested to return to site to clean up some minor spillages and to repair some erosion damage, but did not do so. As such, follow-up during the decommissioned stage may not be the most effective time to get corrective actions implemented. Follow-up during this stage should be preceded by follow-up during the construction and/or operational stages.

4.2.4 The value of post-monitoring reports

Sending out post-monitoring or follow-up reports to the applicant is extremely valuable as these reports serve several important purposes.

Firstly, they provide an opportunity for the regulatory authority to instruct the proponent to implement required corrective measures. However, they also provide an opportunity to compliment the applicant on a job well done (if this was indeed the case). It is as important to indicate what is acceptable as to what is not. Knowing that the authority approves may encourage continued compliance.

Secondly, the follow-up reports alert the applicant to the fact that follow-up has taken place. If the project was followed-up while no-one was on site (for example a cell phone tower that once operational, only gets visited every few weeks by technical personnel), the applicant will not be aware that their environmental compliance was checked. Although not specifically assessed for this study, it is suspected that the drop in default after the commencement of follow-up is due to applicant's being aware that follow-up was being carried out.

4.3 Conclusions relating to default

4.3.1 Overall distribution of default scores

The EIA projects that were subject to follow-up showed a wide range of default (0% to 100% default) on consent conditions. This range of default scores suggests that there are likely to be a number of factors influencing default and that a range of default interventions may be required.

Most of these zero default projects are developments implemented by private companies driven by a need for on-going profit generation, so incentives to comply are likely to be economic in nature (such as fines for non-compliance, or negative publicity which can harm share prices). These zero default projects are unlikely to need much in the way of default management and following-up on all of them would not be a productive use of follow-up resources. While a few of these projects should still be subject to follow-up to check that they are indeed still complying, the focus should rather be on promoting a continuance of this level of compliance.

Full default projects on the other hand – which are generally those implemented by government proponents for basic infrastructure provision – require interventions to reduce default and different management strategies. It is on these full default projects that follow-up should be primarily focused as this is where default requires most in the way of management.

Zero and full default projects represent the extremes of the spectrum of default. The majority of projects (65% of those followed-up) had default scores somewhere between these two extremes and a range of management strategies will be required to deal with these. There were no clear indications as to which types of projects or applicants were likely to score relatively higher or lower on default in this range (unlike the zero and full default projects) so some kind of risk screening will need to be applied to ensure that the projects most in need of follow-up are identified. Suggestions for management measures are presented in the following chapter on recommendations.

A final important conclusion that can be drawn regarding the distribution of the default scores is that the results of this study may reflect a default situation that is unique to the Eastern Cape or even more specifically to the study area. For example, the high proportion of infrastructural projects received is probably a reflection of the growth and development focus of the current political dispensation as it attempts to redress the inequalities of South Africa's past. This strong focus on basic infrastructural projects may not be the case in the more developed areas of South Africa such as in Gauteng. It may be that this study reflects a distinctively Eastern Cape situation where the integration of two former homelands and the old South Africa presents unique challenges. In this sense it would be very useful to compare the distribution of default found in this study with research done in other parts of South Africa, and indeed the world.

4.3.2 Consent conditions and default

Default is not strongly influenced by the number of consent conditions set (section 3.2.1.5, Table 3-4), nor apparently – given the number of full default projects – by the fact that the conditions are legally binding. However, the way in which the conditions are worded does have an effect on default and particularly on how easy default is to monitor.

Conditions to be clear and precise

Consent conditions need to be precise, clearly worded and refer to a single item if they are to be easily monitored. It was found during monitoring that some of the conditions were very difficult to assess as they related to more than one requirement. For example several conditions required an applicant to implement and maintain erosion protection measures. In some cases the erosion protection measures were implemented but not maintained, which meant that part of the condition was complied with but part wasn't. If two consent conditions had been set – one requiring the implementation of erosion protection measures and a second one requiring the maintenance of such measures – then scoring default would have been easier and more accurate.

Goal-orientated conditions (that is, conditions that require the achievement of a particular goal such as providing litter bins on site) were found to be easier to monitor than process-orientated conditions (conditions that require the achievement of an overall environmental objective) as it is easier to determine when a goal rather than a process has been complied with. The authority thus preferred goal-orientated conditions which is in contrast to the findings of Dik and Morrison-Saunders (2002) who found a preference amongst both applicants and authorities for process-orientated conditions, particularly those that required the implementation of an EMP.

Conditions to be relevant and practical

A further important conclusion regarding consent conditions is that such conditions need to be relevant to the project at hand and to take the political, social and economic situation of the project into account. Projects that have little in the way of finance for example, will tend to show default on conditions that are considered "frills" or "nice to haves" (such as the planting of trees for screening purposes or for shade at standpipes) and items that have not been budgeted for such as the lining of a waste site or re-vegetation of an area. This indicates a need for the authorities and project proponents to work together more closely to determine what is and isn't reasonable up front.

Conditions also need to be technologically practical or default is more likely, particularly during the operational stages of the project. This is particularly relevant for infrastructural developments such as sewage treatment works and landfill sites. Although technologically advanced options (and the grant funding to initially implement them) may be readily available, if the system is not understood and skilled operators and an on-going maintenance budget are not available then the system is unlikely to continue to function optimally. This is illustrated in Figures 4.2 and 4.3 below.

Figure 4-2. A sewage treatment package plant constructed in 2002 that two years later no longer functioned optimally as indicated by the ponding of effluent on site.

Figure 4-3. The incinerator that was installed at a landfill site in the Maletswai area in 2003 and was not operational at the time of follow-up a year later (note missing chimney). Waste was instead being burned on site.

A final, important conclusion is that follow-up provides the ideal opportunity to determine which consent conditions actually work in practice, which in turn allows the regulatory authority to set more practical conditions in the EIA authorizations; and to determine the need for additional conditions in future.

4.4 Conclusions relating to impact

The distribution of impact scores showed the majority of projects (58%) scoring "low" on impact with progressively fewer scoring low-medium, medium, medium-high and only 1% scoring high (Figure 3.13). This distribution – with the majority of projects being low impact – is desirable on the one hand as it indicates that impacts on the environment are generally not great. It could be that the EIA process is successful in reducing impact levels to low or that good project management has resulted in low impact scores.

However, the predominance of low impact projects may also indicate that the wrong types of activities are getting caught by the EIA regulations and that too many inherently low impact projects are being subjected to an unnecessary EIA process.

It may also be that the distribution of impact scores is specific to the study area only and that scores are higher elsewhere in the country, making both of the above points inconclusive. Further research into this would thus be important.

Although the majority of projects scored low or low-medium on impact, there are still those (19%) that scored higher than low-medium and these will require attention and management. Follow-up and risk screening can provide the ideal opportunity for doing so.

4.5 Conclusions relating to a combination of default and impact

Combining default and impact to obtain four default-impact categories proved to be a useful data analysis tool. As indicated by the results of the correlation analysis (r_s = 0.48), there is a link between default and impact, but this link is not strong enough to indicate that default and impact can act as substitutes for one another. Monitoring, analysis and management of both of them is thus necessary.

Thirty nine percent of projects scored low on both default and impact (Figure 3-18), indicating that they are unlikely to need much in the way of follow-up in future. A further 39% present a default risk while 22% present an impact risk (Figure 3-18). These scores would seem to suggest that among all the EIA applications submitted, 39% will require follow-up measures to reduce default, 22% will require measure to reduce impact and 15% will require measures to correct both default and impact. In other words, around two-thirds of all applications would benefit from some kind of follow-up process and the focus should be largely on correcting default.

Default, and to a lesser extent, impact; was generally found to be greatest amongst government applications for basic infrastructure projects. This is cause for some concern given that so many EIA applications are from local or district municipalities (half of the projects in the follow-up sample were from government applicants). For, as a whole, state applicants in the form of local municipalities are often under-funded and under-capacitated institutions with priorities other than exemplary environmental management. It can also be difficult for the regulatory authority to take enforcement actions against these state proponents as legal action between organs of state is strongly discouraged in terms of co-operative governance (RSA 1996, Chapter 3). Added to this is the political pressure that can be exerted on the regulatory authority to exempt local municipal projects from undertaking an EIA process. The principal argument put forward for this exemption is that these are projects that benefit the community and that the EIA process is delaying service delivery (see for example Macleod 2006 and Ridl 2007 for press comment on the political accusations that EIA is delaying service delivery). However, based on the results of this research it can be argued that these service delivery type projects are precisely the ones that need more in the way of environmental control. Ultimately, a properly managed project will benefit the community more than one which results in environmental degradation.

This tension between service delivery and EIA requirements raises an interesting question as to whether it was the intention of the EIA regulations to catch so many basic infrastructure type projects. For of the activities listed as requiring EIA (Appendix 1) only seven appear to be primarily related to basic service infrastructure provision (i.e. roads, water transfer and abstraction schemes, reservoirs for public water supply, dams, sewage treatment works and waste disposal sites); a further three could be, depending on the exact nature of the application (for example land use changes for low-income housing) while the remaining fifteen are aimed more at private development or environmentally risky activities (such as the release of biological control agents). If infrastructural projects were meant to be caught, it was perhaps not quite to the extent they are currently. However, based on the results of this study, it can be argued that they are not being caught unfairly. Additionally, while the EIA process can delay the implementation of infrastructure, this is usually because it wasn't taken into account or the applicant had to go back and address basic environmental oversights (such as proposing a low-income housing development but not having the capacity to treat the sewage from such development). It could therefore be concluded that the EIA process – and follow-up in particular – is both necessary and useful.

High default and/or impact are however not the sole preserve of government driven basic infrastructure projects and follow-up needs to include these other projects as well. Indeed, even some of the low default and/or impact ones need to be followed-up on to ensure they continue to remain low default/impact and to ensure fairness and consistency on the part of the regulatory authority. For while compliance can be rewarded by a lower level of scrutiny from the regulatory authority, some scrutiny is still necessary. This research, while providing valuable pointers at possible problem occurrences of default/impact should be regarded as a useful starting point for further work.

4.6 Conclusions relating to the risk screening phase of the research

Overall, the screening tool performed well, with statistically significant matches between predicted and actual results for all except Test 1 for default (Table 3-5). A few false positive predictions (that is projects that are predicted to require follow-up, but actually don't in practice) and false negative predictions (projects not predicted to require follow-up, but actually needing it in practice) did result (Table 3-6), but these are not statistically significant and with further refinement of the screening tool these errors could be reduced even further. The risk screening tool is thus a useful means of identifying potentially high impact and/or default projects for the regulatory authority.

The tendency of the screening tool to slightly over-predict the amount of default likely to be experienced (section 3.3.1.1) supports the finding that follow-up has had a positive influence on reducing default. Despite this slight over-prediction, the risk screening tool is still useful and produces statistically significant predicted-actual score matches. This indicates that over-prediction is not occurring to a significantly detrimental degree and means that the screening tool is robust. It is however imperative that the screening tool be checked and recalibrated at reasonable intervals to ensure that it still performs optimally. It is likely that the influence of the follow-up process on default and impact levels will stabilise at some point and recalibration will then only be needed occasionally. It is however necessary to be aware of the effect of follow-up in reducing default scores when conducting similar studies and to ensure that the risk screening tool takes this into account.

It remains to be seen whether the thresholds at which a project is screened out as a risk are practical in the long term (that is, whether the number of projects screened out are too many or too few). These thresholds are however easily changed and can be modified as required as follow-up progresses. The long-term use of the screening tool is still being assessed, but thus far it has proved valuable and of considerable help in managing follow-up resources. The tool proved to be of particular use in assisting the authority to decide if projects in very remote locations should be subject to follow-up or not. Given the size of the study area, some projects were located a four to five hour (one way) drive away from the authority’s office. A full day out of the office to monitor a single project can only be justified if the project is really likely to need follow-up. Otherwise, time can be better spent following-up several projects that are not as remote. With continued use, further benefits of using the tool are likely to become apparent – as are points that require improvement. Only time will tell.

4.7 Conclusions regarding implementing a follow-up and risk screening process

In Chapter 1, it was put forward that follow-up allows the actual consequences of a project to be determined and also offers valuable opportunities to regulate projects and to learn from experience. This study found that follow-up was indeed useful in determining what the actual consequences of projects were – albeit at a broad level – and whether these consequences were within acceptable limits. Follow-up was also found to provide useful opportunities to correct default and to result in a drop in default rates over time. Overall it can be concluded that follow-up plays a vital and valuable role in project management.

With respect to meeting the aims of this research, it can be concluded that both aims were successfully achieved. The first aim of the study was to implement a follow-up process that would provide a picture of the state of default and overall environmental impact. This study has made a valuable contribution in this area. A follow-up process was successfully designed and implemented and compliance and effects follow-up was undertaken.

The second aim was to determine if an effective risk screening process could be developed that would allow EIA applications that presented a potential default and/or impact risk to be screened out at the application stage. A risk screening tool was developed and tested and was found to be successful in identifying projects that presented a default and/or impact risk.

Overall, it can be concluded that the implementation of a simple and pragmatic follow-up process can be of help in reducing default and to a lesser extent overall environmental impact. The follow-up process can be further enhanced through the implementation of a simple risk screening tool that can be used to identify EIA applications that present a high default and/or impact risk. Screening EIA applications that would most benefit from follow-up can assist the environmental regulatory authority in directing follow-up resources to where they will be of most benefit.

Chapter 5: Recommendations

This chapter draws on the results of this research and other studies reported on in the literature to provide recommendations for follow-up and risk screening. It is thus in a sense a culmination of the previous phases of the study (that is follow-up and risk screening) and builds on the conclusions drawn from these phases to form the fifth step of follow-up as identified in Chapter 1 of this thesis.

5.1 Planning for follow-up

The following key recommendations can be made with regards to planning for a follow-up process.

5.1.1 Retain a simple and pragmatic approach

The simple approach to follow-up adopted for this study worked well and proved to be very practical in terms of the limited resources available to the regulatory authority. It is therefore recommended that a pragmatic – as opposed to scientific – approach be utilised for follow-up work, at least during the establishment stages of follow-up. Follow-up can then be refined and/or expanded as circumstances dictate. Simple follow-up processes should also be easier to standardise between the various provincial authorities, which will greatly assist in the comparison of follow-up results.

5.1.2 Check both compliance and effects

This study found that compliance monitoring and effects monitoring measured different – and largely non-interchangeable – aspects of environmental performance (section 3.2.3.1) and that both were useful. It is thus recommended that monitoring and management of both should form part of a follow-up process.

Given the recent establishment of the Environmental Management Inspectorate in South Africa (Craigie 2005; DEAT undated), it would be useful to align compliance monitoring in particular with the prescribed inspection procedures of this unit to avoid unnecessary duplication of effort.

It is also recommended that effects monitoring be extended at some point in the future to provide a check on the accuracy of the effects (or impacts) predicted in the EIR. It is acknowledged that assessing the accuracy of individual impact predictions is challenging and often of limited value (Bisset 1980; Duinker 1984; Canter 1985; McCallum 1987; Tomlinson & Atkinson 1987b; Dipper *et al* 1998), but some check on the accuracy of the EIRs is required. One of the major challenges that is often encountered in trying to assess the accuracy of impact predictions is the disparity in the quality of predictions made in the EIRs (Bisset 1980; Duinker 1984; Canter 1985; McCallum 1987; Tomlinson & Atkinson 1987b; Dipper *et al* 1998). It is to be hoped that this challenge can be largely addressed by the new 2006 EIA regulations which set out minimum requirements for the assessment of impacts (DEAT 2006, section 32(k)) and should thus provide a minimum standard for impact reporting.

5.1.3 Obtain buy-in for the process

Obtaining buy-in is a vital step in planning a follow-up process. Obtaining support for the follow-up programme can be greatly facilitated by being able to demonstrate the value that follow-up can add to the EIA process as a whole. Ways in which follow-up can add value were discussed in section 1.3.2.2.

Obtaining support can also depend on addressing underlying fears regarding follow-up. For some the follow-up process can be seen as a threat to decision-making and as a criticism of decisions taken or failed management (Dipper *et al* 1998; Arts & Morrison-Saunders 2004). It may also reveal unacceptable changes and require actions that threaten the regulatory authority or applicant (Arts and Nooteboom 1999).

A key means of addressing underlying fears and demonstrating value could be to prepare a well thought out follow-up proposal. This proposal, detailing the planned follow-up process – together with the financial implications – can then be used to motivate for follow-up. This would then need to be coupled with willingness to simply “make a start” on follow-up and be prepared to learn and adapt the process as necessary.

Continued buy-in of follow-up would depend on the process being fair and demonstrating continued value-add to the EIA process as a whole.

5.1.4 Provide feedback on the follow-up process to top management structures

The top political and management structures in the regulatory authority are usually not involved in the day-to-day running of the EIA and follow-up processes and typically have functions in addition to environmental ones. However, it is these top managers – such as the Member of the Executive Council, or MEC – who are often the ones that have pressure put on them to approve developments. In order to reduce the effect of this pressure and other political agendas, it is recommended that these top managers be capacitated regarding the importance and results of follow-up. Knowing what the actual outcomes of the EIA process have been can lend support to management by providing them with factual information for decision-making. For example if a certain type of applicant is found to consistently default on consent conditions, then managers at least have sound reasons for either declining a new application from that applicant until compliance is achieved or for requiring additional control measures. Providing feedback can also assist in proving that the follow-up process is still adding value, which in turn can assist with continued support of the process.

5.1.5 Clarify roles and responsibilities

It was concluded in the previous chapter that there is a considerable need to clarify the roles and responsibilities of the various parties and in particular to make the applicant more aware of their environmental responsibilities.

Recommendations that could be made in this regard include:

- Continuing with the follow-up process and in particular with the joint accompanied site visits. Often the practical implications of various responsibilities only become apparent on site and all parties need to be aware of what is possible/practical or not. For example, the ECO may not always have the power to issue site instructions for non-compliances as this can result in conflicts with legal contract processes where site instructions can only be issued by representatives of the engineer. These issues can however usually be fairly easily resolved if all parties can discuss the issue and if clear (and non-conflicting) roles and responsibilities are laid out in the contract and environmental documentation.

- Clear roles also need to be specified in the project EMP. EMPs should stipulate who is responsible for monitoring what, when and how; what the procedures for addressing non-compliances are and what the penalties for non-compliance are.
- The environmental authorization also presents a useful opportunity to clarify responsibilities. It would however be important to ensure that all of the various documents (such as the consent decision, EMP and contract document) are in agreement with one another and that conflicting roles are not assigned.
- Public pressure can be a very useful tool for inducing applicants to fulfil their environmental responsibilities (US EPA 1992; Morrison-Saunders *et al* 2001) and to this end it is recommended that ways in which to involve the public in follow-up be explored.
- Ways of encouraging the applicant that signs the EIA application form to recognise their environmental responsibility are also needed. The application form presents an ideal opportunity to reinforce accountability at an early stage of the application process. Unfortunately however, the person that eventually signs the application form may not even have been involved in the EIA process. This is particularly the case with municipalities where the municipal manager – as the political head – signs the form, but is not otherwise involved in the day to day management of the project. Instead the EIA process is managed by the environmental consultants (as required by the regulations) and these consultants normally fill in the form and present it to the applicant for signature. For those applicants who have little understanding – or interest – in the EIA process, there may not be an understanding of what their environmental obligations actually are. Expecting good environmental management in these cases is then obviously unrealistic and the follow-up process would then ideally need to include an education component. Of course it can also be argued that the environmental consultants that manage the EIA process for the applicant also have a responsibility to educate their clients about their environmental responsibilities. This argument is likely to remain unresolved until clarity on who is expected to play what role is obtained. This

should be the task of the national environmental authority as discussed in the point below.

- While roles and responsibilities for the EIA process were set out in the EIA guideline document (DEAT 1998), they did not make specific provision for follow-up and this has only been partly rectified in the 2006 regulations. It is therefore recommended that the national environmental authority provides a new guideline document that clearly assigns roles and responsibilities in terms of the EIA process and follow-up in particular.

5.1.6 Involve a number of staff in follow-up

In order to ensure the long-term sustainability of the follow-up programme, several staff members should be involved in follow-up and training of new staff should be on-going. This helps to ensure continuity, is safer in the field, allows on-the-job training and helps to reduce bias when judging the degree of default and impact. The continual training of new staff does have time and cost implications, but these can be off-set by the benefit that follow-up has for environmental management overall. It would be far more costly for the regulatory authority to have to restart follow-up programmes due to them failing when staff leave than to invest time in on-going field training. Follow-up may also inadvertently provide a staff retention benefit as it broadens the scope for involvement in environmental management. For example, instead of focusing only on impact assessment and review, staff could have the option to also become involved in compliance and enforcement or monitoring.

5.1.7 Integrate follow-up data into existing EIA application processing systems

Follow-up needs to be integrated into existing EIA systems to ensure long-term sustainability. Ideally, follow-up needs to be planned for when EIA application processing and filing systems are being designed. In other words, provision needs to be made for the way in which the follow-up data will be recorded, tracked and stored; preferably in a way that is integrated with the EIA application processing system. Failure to do so can result in valuable information becoming lost, inaccessible or unnecessarily duplicated.

Again it is recommended that this takes place at a national environmental authority level to ensure a standardised system is implemented across the country.

5.2 Recommendations relating to monitoring

5.2.1 Standardise follow-up programmes and reports

There is a need for standardised follow-up procedures to be implemented across the country if follow-up results are to be meaningfully compared. Follow-up programmes also need to be in agreement as to what is followed-up and how. If one province for example decides to focus follow-up on default while another concentrates only on the accuracy of impact predictions, then comparison of the follow-up results between the two provinces becomes difficult. In particular, standardised formats for reporting on site visits are needed. This should apply not only to report formats within the regulatory authority, but also to outside parties that may independently audit projects – such as environmental control officers. In this respect it is recommended that the regulatory authority consider providing guidelines or templates for audit reports so that these third party reports will fit into the follow-up system as well. Given that both provincial and national government have an environmental mandate it is recommended that national government set the requirements for follow-up as the same system can then be fed down to all the provinces. Follow-up – if left as a provincial initiative – can still be highly useful, but standardisation and consistency are likely to remain as challenges if there is no overarching guidance for the nine provincial authorities.

5.2.2 Establish a national database

It is also recommended that a national database for follow-up results be established. These results could include – but are not limited to – default and impact scores, consent conditions most often defaulted on and enforcement actions taken. This would allow lessons learned from the follow-up process to be recorded and accessed by all provinces. Over time, this recording and use of follow-up results could help to standarise and improve the EIA process as a whole. It would also allow conclusions regarding the default and impact performance of projects around the country to be drawn. The establishment of a national database would also greatly assist government in fulfilling its mandate to report on environmental matters such as State of the Environment and similar reports.

5.2.3 Balance accompanied and unaccompanied site visits

The advantages and disadvantages of accompanied and unaccompanied site visits were discussed in section 2.3.2.2. It is recommended that the authority make use of a balance of accompanied and unaccompanied site visits. Accompanied ones are likely to be of most value for larger projects where more skills transfer is possible as there are more issues to be dealt with and learnt from. Major road construction projects are an ideal example as a joint visit with the regulatory authority, applicant, the engineer, the contractor, other interested and affected parties and/or the ECO can cover issues such as earthworks, borrow pits, river crossings, construction camps, bitumen plants and so forth. These large projects often take a number of months (or years) to construct, so there is also a greater time window in which to arrange for accompanied visits.

Unaccompanied visits on the other hand may be more useful for smaller projects such as telecommunication towers. Joint site visits in these cases do not always add value. These projects tend to have a fairly limited range of issues and also often make use of the same contractor, so the need for capacity building/skills transfer is not as critical. They are also usually constructed within a matter of weeks to months, making it more difficult to arrange a time for an accompanied site visit while the relevant personnel are still on site.

5.2.4 Collect follow-up data based on project life cycle stage

The life cycle stage that a project is in when monitored can influence the results of follow-up. The following recommendations can be made with regards to the collection of follow-up data in relation to the life cycle stage that a project is in.

- Large, complex projects would benefit from several follow-up visits and a follow-up strategy to cater for this should be finalised before the consent decision is issued. Visits should be more frequent during the construction stage as this is the stage when most impacts and defaults occur.

- Smaller, less complex projects can be followed-up less often, especially if the budget for follow-up is limited. The best time to monitor these projects is usually from halfway through construction to towards the end of construction so that any major problems can be corrected while there is still plant and personnel on site, but the project is far enough advanced to asses default and impact.

- A follow-up visit just before the end of the maintenance or retention period can be of great benefit. The retention period – which is usually for a year after completion of construction – is the period during which the contractor is liable to come back and repair any defects. Retention money is usually held aside for this purpose and is only paid out to the contractor at the end of the one year period. The benefit of following-up during this retention period is two-fold. Firstly, an accurate assessment of the effectiveness of mitigation measures is possible as these measures are likely to have been in place for six months to a year; and secondly, the retention money can often be used to correct any residual impacts or improperly functioning mitigation measures. After the retention monies have been released there is very little chance of getting a contractor back on site to fix problems.

  George (2000c) also supports the follow-up of a project in this stage, although for a different reason. He notes that a post-implementation visit is useful to determine if the proponent has been accurately reporting on operational impacts. This obviously applies to projects where the developer has been required to carry out some monitoring activities but is still a valuable point.

George (2000c) further suggests that follow-up should be timed so that key impacts can be seen and at times when corrective action can be taken. This timing might vary from project to project. The biggest challenge in following this advice is that follow-up is then tied to project construction time frames. An additional problem noted during this study is that although proponents are requested to alert the authority of project construction start and end dates, they seldom do so. This makes it difficult to determine what stage a project is actually in, especially as not all projects start as soon as they receive their consent decision.

Given the above, there is a case for taking the approach followed in this study and following-up according to the regulatory authority's schedule rather than project construction schedules. This allows greater freedom in planning follow-up and is probably sufficient if all that is wanted is a baseline or status quo for future follow-up work. However, to be really effective, it is better to time follow-up (for large or high default/impact projects at least) so that follow-up can take place when it can make the most difference. The recommended approach would be to make use of a screening tool to identify projects that require follow-up, time follow-up for most of these screened projects according to key project time frames and then undertake follow-up for more minor projects as and when convenient.

5.2.5 Send out follow-up reports

It is recommended that follow-up reports be sent out to applicants shortly after follow-up has been conducted. This does mean additional paperwork for the authority, but as noted in section 4.2.4, reports are an important means of alerting the applicant to the fact that the regulatory authority is checking up.

Both complimentary and corrective reports should be sent out. Complimenting an applicant on good compliance and/or management can encourage further compliance and also enhances the profile of the regulatory authority as a fair enforcement agency.

Projects that require corrective or remedial actions need to have follow-up reports that reflect this. These reports need to be specific on what actions must be taken, where, when and by whom. It is also recommended that photographs be included, a picture speaks volumes and can often convey points more easily than words.

Given the recent developments in enforcement legislation and the creation of the Environmental Management Inspectorate (EMI) or “Green Scorpions” as they are more popularly known; it would also be important to ensure that follow-up reports requiring corrective action follow the necessary procedures and formats set out in the legislation.

In some cases however, a simple report indicating that follow-up occurred may be sufficient and serious enforcement could be left to the specialised EMI units.

5.3 Recommendations relating to default management

5.3.1 Promote compliance

Managing default involves a balance of promoting compliance and deterring non-compliance. The purpose of this section is to discuss some of the factors that have been identified as influencing compliance (US EPA 1992) and to make recommendations for managing default based on these factors in relation to this study.

The US EPA (1992) identifies several factors that affect compliance. The most relevant for this study are: the deterrence value of a follow-up programme, how much it costs for the proponent to comply, whether there are practical technological options available to enable the proponent to comply, how credible the regulatory authority is as an enforcement agency and social factors. These are discussed below.

For a compliance programme to have a successful deterrence value, four factors have to be present (US EPA 1992). Firstly, there has to be a good chance that non-compliances will be detected; secondly that the response from the regulatory authority will be rapid and predictable; thirdly that this response will include sanctions of some sort and finally, that the regulated community believes that the previous three factors are present. In other words, creating the perception of a definite, swift and effective response is vitally important. Thus how enforcement is done is just as important as the fact that it is done. If enforcement is undertaken in a lax or non-consistent manner it is not likely to be effective. The recommendation would thus be that follow-up be continued as proponents are then aware that there is a good chance of default being detected, and that follow-up is expanded to include more in the way of enforcement. There are already excellent initiatives underway in terms of improving enforcement with the establishment of the Environmental Management Inspectorate which has legal backing in terms of NEMA. It would thus be of benefit to find ways in which the follow-up procedure as proposed here can be tied more closely to the Environmental Management Inspectorate initiative.

A lack of finance was identified earlier in this thesis (section 3.2.1.2) as an important reason for non-compliance. This may be due to limited project budgets or a lack of awareness (or willingness) to budget for environmental requirements. The recommendation in this case would be to ensure that applicants (and the contractors who will be undertaking the project) be made aware of and budget for environmental requirements. A very useful way of doing this is to ensure that the environmental requirements (whether consent conditions, an EMP or general environmental specifications) are written into tender documentation. The contractor then knows at the tender and cost proposal stage what environmental requirements must be costed for. Ensuring that on-going maintenance of projects such as waste sites and sewage treatment works is budgeted for is more difficult and creative solutions will need to be found.

Proponents may sometimes also default if they think compliance will be too expensive. The cost of complying must thus be reasonable and practical or default is more likely. It can also help to demonstrate to proponents and contractors that it is cheaper to budget for items such as drip trays upfront rather than having to pay for remediation (such as soil contaminated by oil because drip trays were not used) later. Joint follow-up site visits are useful vehicles for such demonstrations and it would be useful for the regulatory authority to plan for joint site visits as part of their follow-up programme.

It may also be necessary to apply financial penalties in cases where default is not due to a lack of finance but rather to disregard for the environmental requirements or to greed (US EPA 1992). In this case, a useful strategy can be to make the release of retention monies dependent on certain environmental requirements having been met. This will obviously only work for projects that are still within the retention stage and the authority will need to plan follow-up to ensure that monitoring takes place during this retention period so that default can be assessed.

Financial penalties, which are the most successful type of sanction (Shimshack & Ward 2005), are especially useful for private sector proponents who are more influenced by market related (and therefore economic) pressures. This study however found that these proponents were usually the ones that complied. Attention should rather be given to high default proponents. Unfortunately though financial penalties may not however be as successful for government owned or operated projects (George 2000c; US EPA 1992). As the US EPA (1992) points out, government usually has a central budget and is not a profit-making organisation. Financial penalties do not therefore directly impact on the government agency as a polluter. In addition, accountability for default can be difficult to enforce, especially if it is as a result of one department fulfilling its mandate (US EPA 1992). A further problem with government proponents is that they often cannot be sued or taken to court, which gives them little motivation to comply with environmental legislation (US EPA 1992). Although in South Africa the government may be taken to court by non-government organisations, legal action between two government departments is strongly discouraged by the Constitution (RSA 1996, Chapter 3). This can be a problem in cases where, for example, the local authority is polluting the environment, but cannot be taken to court by the regulatory environmental authority until all other options have been exhausted. It is recommended that other means of ensuring compliance be investigated with regards to the management of default amongst these government proponents. The use of public pressure may be one of the most useful options as will be discussed shortly.

Economic compliance issues are also often linked to technological ones. This may be the case where environmentally preferred technologies are expensive, unavailable or unreliable (US EPA 1992). As noted earlier (section 4.3.2) best practicable environmental options (with the emphasis on practical) often have to be sought. It may be better to opt for a low-tech option, which, although the quality of the output product (such as effluent) may not be as high, has a better chance of being kept operational in the long term.

Institutional credibility, particularly of the regulatory authority is another vitally important aspect of managing compliance. As noted above, deterrence is to a large extent dependent on the regulated community perceiving the regulatory authority as being swift and effective in their enforcement responses (US EPA 1992). Managing default would thus involve building the credibility of the regulatory authority as an effective enforcer and as an authority that takes the law seriously. This is a slow process and will depend on co-ordinated, regular, fair, effective and efficient follow-up and enforcement. Simply implementing a follow-up programme has however proved to be very valuable in starting to establish credibility and it is recommended that follow-up be continued for this reason and also implemented in other regions of the country. Institutional credibility is also being considerably helped by the establishment of the Environmental Management Inspectorate in South Africa (Mail & Guardian 2007a, b). Their well-publicised enforcement efforts are useful as a few, successful, high-profile enforcement cases can “spill-over” and encourage compliance in the rest of the regulated community (Shimshack & Ward 2005). Linking follow-up more closely to these enforcement actions could enhance compliance benefits for both programmes.

Social factors also play an important role in promoting compliance. Positive relationships between the regulatory authority and the regulated community can promote compliance (US EPA 1992) while default can occur due to a fear of change (such as mistrust of new, more environmentally acceptable technologies), ignorance of environmental issues and a lack of government and public support for environmental issues (US EPA 1992). One of the most important social factors is public pressure. Public pressure can not only encourage compliance with consent conditions (Dik & Morrison-Saunders 2002) but on-going public pressure and calls for the management of default can provide the regulatory authority with the ideal motivation for follow-up resources and budget (US EPA 1992). It would be recommended that the follow-up procedure be expanded to find ways in which to involve the public more openly in follow-up.

A final, and important, point regarding the promotion of compliance is the need to provide education especially in less environmentally capacitated areas as to why compliance is necessary (US EPA 1992). Follow-up provides an ideal opportunity in this regard, especially if joint accompanied site visits can be undertaken. It would also be helpful for environmental management issues to be included in existing mentoring and training programmes, especially for emerging contractors that may not have had the opportunity to be exposed to environmental issues previously.

5.3.2 Consent conditions and the management of default

As default is measured by adherence to the consent conditions set, then managing default inevitably involves managing the consent conditions.

Apart from their relevance for managing default, conditions of approval also influence environmental practices, highlight focus areas for environmental management and help to set standards for environmental auditing (Dik & Morrison-Saunders 2002). Consent conditions are therefore a valuable management tool for more than just compliance.

5.3.2.1 Number of conditions set

Although the number of consent conditions set was not found to have much effect on the degree of default recorded, it is recommended that a balance be found between setting many consent conditions that could become unwieldy to monitor and setting only a few that could result in not all important issues being covered. Conditions can serve to guide (Dik & Morrison-Saunders 2002) and educate proponents so setting too few conditions could thus potentially result in the proponent defaulting in unexpected areas by not having guidance for all relevant aspects of the project.

5.3.2.2 The degree to which approval conditions are legally binding

In South Africa, the conditions of approval are legally binding, as is the case in Western Australia (Morrison-Saunders *et al* 2003). While there are indications that having a legal requirement for follow-up (via the consent conditions or otherwise) is an important pre-requisite for follow-up (Culhane 1993; Sadler 1996; Morrison-Saunders *et al* 2003), this requirement on its own doesn't ensure that follow-up will take place (Arts & Meijer 2004). Similarly, with legally binding conditions, there may be factors other than the legal aspect that influence compliance rates. Morrison-Saunders and Bailey (1999) for example, found that conditions were sometimes implemented even if they weren't legally binding. Similarly, Dasgupta *et al* (2000) found that some Mexican firms showed good environmental compliance even when legal pressure was weak. The authors attribute these compliances to clear expectations of good environmental management (Morrison-Saunders & Bailey 1999) and extra-legal factors such as public and market pressure and credit availability (Dasgupta *et al* 2000). Branis and Christopoulus (2005) have also suggested that a legal framework is not as important as financial and personnel resources, while Dik and Morrison-Saunders (2002) found that there was little to no difference in the degree of implementation of conditions imposed by the environmental authority and conditions that the proponent committed to. Instead, public pressure and being seen as environmentally responsible was more important that legally binding conditions (Dik & Morrison-Saunders 2002). These latter authors also found that the Western Australian environmental authority viewed the fact that the conditions were legally binding as important but that the proponents seldom did, probably due to the fact that environmental authority seldom prosecutes.

The above suggests that although a legal backing for the EIA system is good, there are other factors that can be harnessed to help increase compliance with conditions of authorization. Public involvement and pressure appears to be one of the most important ones and is certainly worth exploring as a compliance management tool.

It would therefore be recommended that consent conditions in South Africa retain their legally binding status; but that this is backed up with additional means of promoting compliance.

5.3.2.3 Wording and type of approval conditions

Good conditions need to be clear, understandable, precise and balanced between stringency and feasibility (US EPA 1992). This is relevant to both the proponent as well as to the authority. The proponent needs to understand clearly what the authority is expecting and needs to be left in no doubt as to meaning or which conditions are mandatory and which are optional. The authority must also strive to ensure that conditions set are relevant, reasonable and feasible. There is not much point in setting conditions that the proponent clearly cannot comply with. From the side of the regulatory authority, clear and precise conditions take more effort to set; but are easier to monitor and enforce. In this regard it is important that each condition relates to one requirement and is not too vague.

During the monitoring of default for this study, it was found that the consent conditions varied quite widely in their clarity and enforceability. This is not entirely unexpected given the lack of formal standardised training courses for new staff and a high rate of staff turnover. Many personnel face an additional challenge in that they must review reports and set consent decisions in a language which is not their native tongue. This can lead to differences in the quality and clarity of conditions being set. Recommendations for improving the quality of the consent decisions include:

- implementing a standardised training course for regulatory authority staff
- pre-issue review of the consent decision by more experienced officers
- involving junior staff in follow-up so that they can experience which conditions are practical and enforceable
- training and accreditation (Tonn & Peretz 1999), and

- the provision of guidelines and decision support systems (Albayrak *et al* 2004; Tonn & Peretz 1999).

Bailey (1997) and Dik and Morrison-Saunders (2002) have both noted a preference among developers – and authorities – for less prescriptive conditions. This preference for process-orientated type conditions rather than goal-orientated, prescriptive ones hinges on the assumption that the former allow for more flexible management and reduce the need for monitoring many small, prescriptive conditions. However, in terms of actually determining the degree of default, this study found that goal-orientated conditions are easier to monitor as it is clearer when a particular prescript has been complied with or not. Process-orientated conditions would have to rely more on an assessment of whether the project was within the overall bounds of the consent decision to determine if the conditions had been complied with. Recommendations would thus depend to a large extent on what type of approach was considered desirable in any given context as to whether a more prescriptive, command and control type of approach or a more managerial one is chosen.

In the case where environmental management competence is readily available (such as a big project with dedicated environmental staff), process-orientated conditions can be extremely useful, particularly as they allow flexibility and obviate the need for the proponent to keep going back to the regulatory authority requesting amendments to the authorization for conditions which are no longer practical due to project changes. One of the most useful conditions to set in this case is the requirement for an environmental management plan (EMP) to be approved by the authority and then implemented by the proponent in conjunction with the appointment of an environmental control officer.

The development of standard conditions per sector/activity also bears consideration as an aid to managing default. Standard conditions can provide consistency (between consent condition and between the various regulatory authority offices), even out the quality of environmental consultant's reports by not relying solely on their impact predictions and can make monitoring easier. Obviously, some project specific conditions might also be required. Standard conditions could be developed by going through sectoral guidelines where available, by drawing together good recommendations from quality EIRs and by expert consensus.

A final important recommendation relates to the common default of proponents failing to submit documents that are required such as final layout plans, Operation and Maintenance manuals or EMPs after the consent decision is granted. The two main recommendations for dealing with this particular default would be to improve the amount of follow-up done by the Department and to withhold the consent decision until all required documents have been received.

5.4 Recommendations relating to impact management

The distribution of impact scores for this study was found to be very skewed towards low impact (that is, the majority of projects scored low on impact). It is recommended that further research be done so as to determine whether this is a situation unique to the study area or if there are other factors that could be influencing the distribution of impact at play.

George (2000c) has made the observation that most impacts result from bad management rather than from bad design. This study found this to be only partly true. Poor management tended to account for most of the *defaults* especially those relating to erosion, litter and poor waste management. If not corrected these can over time have significant impacts. Many of the significant *impacts* however could be attributed to bad design. This was for example evident for some bridge projects where bridges were incorrectly aligned with the flow of the river with the result that they obstructed flow, created erosion and channel changes and collapsed during the first high-water season. Minor road projects were another example, where lack of planning for, or inadequate design of, drainage structures led to erosion impacts and in some cases road wash-aways. Such impacts are of course exacerbated by poor management practices such as lack of maintenance; but on the whole poor design was found to be the triggering factor.

The implication of the above is that impact management actions need to focus on both design and site management. It is possible however, that both problems could have the same root cause – a lack of practical knowledge of environmental processes. It is postulated that for many years the consideration of the environmental sustainability of a project was not high on the list of political agendas or even widely featured in training institutions. Even now, environmental issues are sometimes regarded as blocking development, witness comments such as those by South Africa's President, Thabo Mbeki that environmental laws were slowing down economic growth and those of the Minister of Housing, Lindiwe Sisulu that "housing delivery will no longer be held hostage by butterfly eggs" (Macleod 2006, no page number). Environmental issues were also not awarded prominence in early training courses and degrees. There may thus be a legacy of limited understanding of environmental issues which could contribute to a basic lack of understanding of the bigger environmental picture.

If the main contributing factor to impact is a lack of environmental awareness then capacity building would be an obvious, if somewhat long-term, management solution. This could be either formal – such as accredited training courses – or informal in that the regulatory authority and/or environmental consultant can provide advice and feedback regarding actions on site. Capacity building may also need to be coupled with funding in some cases, at least to start with. The excuse of not having money to budget for environmental requirements is then at least eliminated. Capacity building is likely to be the most suitable long-term option particularly for basic infrastructure projects where the underlying problem is generally one of a lack of understanding and acceptance of environmental issues.

Enforcement

Apart from capacity building, there is also a case for some enforcement to take place to manage impact. While serious enforcement actions could be reserved for cases of blatant disregard for environmental issues (not just capacity problems), more minor infringements can also be subject to some form of corrective action to help to encourage compliance. The US EPA (1992) advises that a balance between education and enforcement activities be found. It can be argued that the follow-up process could present the ideal opportunity to do both at once via joint site visits. These visits with key stakeholders such as the proponent, engineers and contractors, could allow the on-site identification of impacts along with a discussion of why the impact occurred, how it will be remediated and how future similar impacts can be prevented. Similarly, impacts that were avoided by environmentally sound work should be highlighted and commended. This would allow on-the-project learning to take place. If fines have to be issued due to serious transgressions then the reasoning can also be explained on site. In this way, both the regulatory authority and the development team can gain an understanding of what the other party needs and why actions are being undertaken as they are. This would be an ideal situation and not one that occurs all the time. It is suggested that even if this immediate feedback regarding project performance is not possible, that the applicant still receive some kind of feedback from the follow-up process, even if this is just a report noting that the site was inspected and any significant instances of impact that need to be corrected. This use of the follow-up process as an educational as well as enforcement opportunity is one that presents a fruitful future research direction.

Use risk screening

A further useful means of managing impact lies in the use of the risk screening tool. This would help to ensure that follow-up resources are focused on projects that would most benefit from follow-up. This is especially useful where the resources of the regulatory authority may be stretched (George 2000c). Additionally, there is a better chance of resolving impacts at the prediction and pre-decision stages of the EIA process than post decision (Morrison-Saunders 1996); which makes the early identification of potentially problematic projects by means of the screening tool particularly useful. The regulatory authority would then need to ensure that the EIRs for those projects which are screened as problematic deal properly with the issues of impact identification and remediation. Wilson (1998) notes that it is not enough for EIRs to simply predict impacts and state potential mitigation measures, they must also describe how and why those mitigation measures are expected to work. In this regard the regulatory authority will have to ensure that sub-standard EIRs are rejected. Finally, projects that could be problematic may necessitate consent conditions that require the submission of an EMP and the appointment of an on-site environmental control officer.

5.5 Recommendations relating to the management of both default and impact

Given the positive effect that follow-up appears to have had on reducing default over time for this study, it is strongly recommended that follow-up continue. Around two fifths of all applications (that is the 39% that fell into the low default-low impact quadrant) are unlikely to require much in the way of follow-up, being neither default nor impact risks. The remaining two-thirds however, would benefit from some kind of follow-up process and the focus should be largely on correcting default as this is where the majority of projects fell.

The following section presents some recommendations for management of default and impact in the South African context. While these recommendations have been based on the outcomes of this study, the need to ensure wider applicability has also been kept in mind and generic recommendations have been made where possible. The approach(es) chosen should be those which best meet the needs of each follow-up process and also those suited to the project-specific context at hand. The options for managing a public project such as a low-cost housing scheme for example, are likely to be very different to those available to manage a private golf estate development. So while the recommendations have been kept generic to ensure wider applicability, there may also be project-specific requirements that need to be taken into account.

5.5.1 Promote environmental awareness

A lack of environmental awareness can contribute to environmental management problems, whether these problems arise on the part of the proponent, the regulatory authority or the community. Studies have found that providing environmental training for proponents and their staff can help to improve environmental management (Bailey 1997; Dasgupta *et al* 1999) and that making contractors aware of mitigation possibilities can help to reduce default (Van Velzen *et al* 2004). Similarly, this study found that environmental issues that the regulatory authority highlighted and discussed with proponents – such as the presence of a wetland on a project site – were usually better understood and managed by the proponent. Consent conditions relating to the highlighted issue were also more likely to be complied with, indicating that raising environmental awareness around an issue may help to reduce default.

If heightened environmental awareness of an issue can improve compliance and the manner in which a project is implemented, then environmental awareness capacity building is recommended as an important environmental management tool. Ways in which this capacity building can take place are many and only a few can be highlighted here. It is, however, the context in which the education process takes place that will to a large extent determine how effective it is. It is, for example, no use issuing booklets on how to manage a project in an environmentally appropriate manner to contractors that are illiterate.

Some of the more appropriate capacity building techniques that would be worthwhile assessing in future studies include publicity (both positive and negative), mentoring, workshops, offering reduced penalties for environmental non-compliance provided that a proponent commits to sending staff on environmental training courses (US EPA 1992) and ensuring that environmental requirements are clearly specified in tender and contract documentation. The follow-up process itself can also be extremely useful in helping to educate the proponent as to what is environmentally acceptable and what is not.

An important related issue involving the regulatory authority and capacity is raised by George (2000b:108). He notes that "[p]rediction practice is to a large extent conditioned by the requirements of competent authorities. In countries whose EA systems are fairly new, there is often a lack of consultancy organizations with EA expertise and experience. EIA reports may initially provide little more than baseline data, project data, and the consultants' professional opinions on likely impacts. Competent authorities may compensate for this with a review process which is itself based on professional judgments, made by the reviewers…. In consequence, a review process may become established which accepts inadequate prediction practice, and allows it to continue." This has become a problem for South African EIA practice and several authors have remarked on the need for better quality EIRs (Wood C 1999; DEAT 2004c; Kruger & Chapman 2005). Apart from the obvious need for capacity building among some environmental practitioners, authorities should also be trained to recognise and deal with sub-standard EIA reports. A firm position on what constitutes acceptable work and what doesn't needs to be taken. This is particularly important in the Eastern Cape where there are five regional offices of the authority. A further solution could come with the establishment of a registration and certification authority for environmental practitioners as is provided for in NEMA (RSA 1998, Section 24H).

5.5.2 Implement Environmental Management Plans/Systems

The implementation of environmental management plans and systems as project management tools is well supported in the literature (Bailey 1997; World Bank 1999; George 2000c; Hulett & Diab 2002; Marshall 2002, 2005; DEAT 2004b). Morrison-Saunders and Bailey (1999:168) even go so far as to suggest that "…simple impact or issue identification and the establishment of environmental management programmes during the pre-decision stages of EIA may be all that is necessary for ultimate environmental management protection purposes".

The implementation of an EMP or EMS can have benefits for the proponent as well as the authority. EMPs provide guidance for the applicant as to how to achieve the environmental measures required by the authority by detailing how the mitigation measures specified in the EIR can be translated into practice during project implementation (DEAT 2004b). As such, they act as valuable bridges between the EIR and the actual implementation of a project (Marshall 2004; Morrison-Saunders & Arts 2004). They also allow the proponent some flexibility in project implementation (Marshall 2002) and can serve a capacity building function in that their successful implementation often requires that environmental training and the appointment of environmental staff takes place (US EPA 1992). Thus by implementing an EMS, the environmental management ability of a firm is often improved. This can have not only an environmental benefit, but also an economic one for the firm as the implementation of a certified EMS such as ISO 14001 can enhance a firm's competitiveness (Kwon *et al* 2002) and even its market value (Konar & Cohen 2001).

The regulatory authority stands to benefit from the implementation of an EMP too. By allowing the proponent some freedom to manage the project in accordance with the EMP rather than solely via consent conditions means that non-substantive project changes can be handled via the EMP rather than by making amendments to the consent decision. This can save time and paperwork. A further advantage of EMPs is that they shift the responsibility of managing the project onto the proponent which is in line with the general environmental principle of "polluter pays". Studies have also shown that companies that have an accredited EMS (such as ISO 14001), have fewer environmental violations than companies that aren't ISO 14001 accredited (Dasgupta *et* *al* 2000; Kwon *et al* 2002), which can help to reduce the burden of enforcement on the authority.

It is thus recommended that the applicant be required to implement a good quality EMP, coupled with regular EMP audits or the appointment of an ECO to oversee the implementation of the EMP. These audited EMPs should be supplemented with joint (regulatory authority plus proponent and engineers/contractors) follow-up audits that allow for the sharing of information and learning experiences between the various stakeholders.

However, while they can be exceptionally useful environmental management tools, EMPs are not a magic bullet and there are a number of factors that need to be considered before requiring that an EMP be implemented for a particular project.

The probability of an EMP being submitted prior to project implementation

Morrison-Saunders *et al* (2004) have suggested that one of the benefits of an EMP is that a consent decision can be taken even if the final project details are not yet available. The proponent then has the flexibility to make minor changes to the project as it is implemented as these changes can be managed via the EMP. This suggestion has its merits, but it pre-supposes that an EMP will be drawn up and implemented. One of the areas of significant default found by this study was the failure of applicants to submit documentation such as EMPs after they have received a consent decision. Thus simply setting a consent condition that requires that an EMP be implemented is not sufficient as the EMP is not likely to be submitted to the authority. Instead, the authority needs to ensure that an EMP is submitted (and approved) prior to any consent decision being made, and that the consent is then issued with a condition stating that the approved EMP must be implemented.

The need to ensure that EMPs are implemented

An EMP can obviously only be of benefit if it is actually implemented. Observations made during the follow-up carried out for this study indicate that an EMP needs to be coupled with implementation monitoring by a competent environmental person if it is to be of real benefit. Others have made similar observations about the need for supervision (World Bank 1996; George 2000c; Gallardo & Sánchez 2004). Where there is no such supervision, the EMP can become just another document used to obtain a development permit with little relevance to the proponent thereafter.

The ease of monitoring EMPs as part of follow-up

It was found during the course of this study that following-up on EMPs was time-consuming and difficult. Most of the difficulty lay in the fact that the requirement for an EMP constituted a single condition in the environmental authorization, but the EMP itself consisted of many items that could be checked for default. A choice therefore had to be made as to whether to monitor only the condition in the consent decision that required that an EMP be implemented or whether to also monitor compliance with the EMP itself. For this study, only the consent condition requiring that an EMP be implemented was assessed for default as otherwise the monitoring process became very time-consuming.

Expense and practicality of requiring EMPs for smaller projects

EMPs can be expensive to commission and even more expensive to implement especially if regular audits are required. In the case of small projects where there is barely funding available for the EIA process, the requirement for an audited EMP can be beyond the financial reach of the applicant. Ironically, it is often these small projects that could most benefit from the control of an audited EMP and the capacity building experience it provides.

A possible solution would be to start requiring EMPs and audits as standard with all EIA approvals so that they are viewed – and budgeted for – as part of the EIA process. At present they are still often largely regarded as an unnecessary added expense by proponents. This is one of the benefits of the new EIA regulations which make it mandatory for EMPs to be submitted for EIA projects and for conditions relating to project management and monitoring to be set in the authorization (RSA 2006, section 38(1)(d)(ii)).

The quality of EMPs

At present there is no standardised framework for EMPs, either nationally or internationally, but it is suggested that they contain: a summary of the predicted environmental impacts; a description of the proposed mitigation measures; a description of the proposed monitoring programme; clear indications of who is responsible for what; proposed implementation and reporting time-frames and costing (World Bank, 1999). A section on sanctions or penalties should also be included as this tends to improve the chances of the EMP being adhered to. Marshall (2002) also provides a good example of a practical EMP and suggests the inclusion of a section on measures of success (such as photographs of a required mitigation measure in place or a record of no complaints from surrounding land-owners).

It is also recommended that a guideline document be provided by the national authority on EMPs. The 2006 EIA regulations do state what needs to be incorporated into draft EMPs (RSA 2006) and an information booklet on general information regarding EMPs is available (DEAT 2004b), but further guidance would be beneficial.

As EMPs form the vital link between the mitigation measures proposed in the EIR and the actual implementation of these measures in practice, it is important that they are flexible and practical working documents (World Bank 1999; Marshall 2002).

5.5.3 Request post construction audit reports

Another useful environmental management tool that is recommended is the requirement for post construction audit reports to be submitted by the proponent to the regulatory authority. These reports are basically documents compiled either by the proponent or an environmental consultant that report on how the project was implemented, what mitigation measures were put into place, what problems were encountered, what solutions to those problems were implemented and so forth. They are essentially an account of how the project was implemented and need to provide proof that the necessary environmental requirements were complied with. To this end they should contain photographs and other documentary evidence proving compliance.

While the regulatory authority has only fairly recently tried this approach, a similar one has been used successfully by the National Energy Board in Canada (Farrand *et al* 2004). Knowing that a performance report will have to be submitted to the regulatory authority may encourage proponents to comply with their consent decision conditions. These reports are also an extremely useful means for the regulatory authority to keep an eye on projects and determine whether further follow-up action to a particular project is needed, without having to first do a site visit.

The success of this approach relies on the assumption that the post construction reports will actually be submitted (non-submission of such documents being a common default encountered in this study) and that they will be unbiased and accurate. To this end, it is recommended that these reports are compiled by independent environmental practitioners. Although this has cost implications for the proponent, it is likely to result in a more useful report at the end of the day.

5.5.4 Strengthen enforcement

Strengthening the regulatory authority's response to non-compliance is also recommended as a means of managing default and impact. Rossouw and Wiseman (2004) have made the comment that South Africa has sound democratic environmental principles but that compliance and enforcement are lacking. This lack of enforcement has been noted by others too (Duthie 2001; Hulett & Diab 2002; Friend 2004). South Africa has recently taken steps to create a dedicated compliance and enforcement directorate within the national Department of Environmental Affairs and Tourism and several hundred environmental management inspectors have been trained and are in the process of being appointed in terms of NEMA (RSA 1998, Section 31D) (DEAT undated).

One of the advantages of using enforcement as an environmental management tool is that a few, well considered and high profile success cases can reduce the overall need for enforcement by setting an example and deterring others from defaulting (US EPA 1992; Shimshack & Ward 2005). It would thus be recommended that follow-up include a few, well chosen cases of enforcement and that the follow-up process be tied into the Environmental Management Inspectorate initiative.

The types of enforcement actions implemented will depend to a large extent on the legal provisions of a country and the general attitude towards enforcement. In a country where environmental default is regarded as serious and there are clear legislative provisions for enforcement, formal legal procedures are perhaps more likely to be followed. In general, enforcement can be via informal mechanisms such as site visits, phone calls and warning letters or more formal ones that involve civil or criminal legal actions (US EPA

1992). Sometimes creative enforcement mechanisms are also possible such as making a violator restore a degraded area or implement a community education programme (US EPA 1992).

As noted previously the principles of co-operative governance can make legal actions by the regulatory authority against government applicants very difficult. Some potential solutions to this problem include encouraging donor agencies to implement their own sanctions; incorporating environmental conditions into private funding agreements and withholding funding until environmental obligations are met (George 2000c). The Development Bank of South Africa makes use of this to some extent (Heydenreich & Barlow-Weilbach 2004) but do not enforce legislation. Indeed, their mandate – as with many such funding agencies – is development. The US EPA (1992) proposes the use of bilateral compliance agreements, public pressure and an internal appeals system as options for encouraging compliance for government agencies. They also note that creative financing solutions have been found to bring about compliance and cite an example of citizens voluntarily increasing their taxes in order to finance pollution control. Although this latter scenario is extremely unlikely to happen here in South Africa, it does indicate that creative and workable solutions can be found.

5.6 Recommendations regarding risk screening

The screening of applications at an early stage for default or impact risk is feasible and can add a lot of value to the EIA process as a whole. The risk screening tool developed for this study shows promising results and it is recommended that it be implemented on a long-term basis.

As the tool has not yet been subjected to long-term use, it is also recommended that its effectiveness and efficiency be assessed on a regular basis, especially for the first few months of use. Fine tuning will inevitably be required, such as for the thresholds set for triggering follow-up. It may, for example, be wise to set a fairly low trigger threshold (say, follow-up being triggered for projects predicted to score 40% or higher on default and “medium” or lower on impact) to catch most defaulters and send a strong example early on in the programme and then raise thresholds as companies come into compliance. Resources can then be directed to other activities such as more in-depth monitoring or enforcement or education. There is however also a case for setting follow-up thresholds high (for example 60% default and above or “medium-high” impact and above) and only following-up on a few, serious offenders and letting spill-over effects such as those reported on by Shimshack and Ward (2005) influence other non-targeted projects. Whichever approach is taken, it would be beneficial to target some projects that were not screened out as needing follow-up to check that the screening process is working properly and to confirm that the non-screened projects were in actual fact low default and/or impact. Should further refinement of thresholds be necessary, the addition of some screening questions to the screening tool could also be considered. It may be that the tool, while simple and effective, may be too ambitious given the often severe capacity constraints of the authority and a paper-based checklist may stand a better chance of being utilised (particularly by staff who may not be skilled in computer use).

5.7 Recommendations regarding future research directions

Follow-up has had a marked effect on reducing the rates of default and impact (Section 3.2.3.2), and should therefore be continued on a long-term basis and implemented throughout the country as a whole. This follow-up process needs to be standardised so as to facilitate the collection and evaluation of data and the results of follow-up need to be shared. In this respect it would be fruitful to extend follow-up to the rest of the Eastern Cape and then to the remaining eight provinces. The extension of follow-up and standardisation thereof offers numerous opportunities for further research.

If follow-up is extended to other provinces, then comparisons between the various provinces becomes possible and it can be determined if the outcomes of this study are applicable to the rest of South Africa or if they are valid for the study area only.

Given that new EIA regulations and listed activities came into effect during the course of this study (RSA 2006), some work will need to be done on re-aligning the follow-up process proposed here with the new regulations. The concept of follow-up will remain the same, but some follow-up work to obtain default and impact scores for new listed activities will be required. It is further recommended that ways of integrating the current EMI initiative into follow-up be explored.

It was suggested in section 4.4 that the predominance of low impact projects may indicate that the wrong types of activities are getting caught by the EIA regulations and that too many inherently low impact projects are being subjected to an unnecessary EIA process. The introduction of new listed activities for the new EIA regulations (RSA 2006) offers an ideal opportunity to explore whether this is indeed the case or not. If the new listed activities also score predominantly low on impact (in the current study area and using the same follow-up procedure), then it indicates that low overall impact is not due to the activity type itself, but rather due to other factors such as the EIA process being successful in reducing impact. Further research would be needed to confirm this.

Further testing and refinement of the risk screening tool is also recommended. In particular, default and impact scores for the new listed activities will need to be obtained and the practicality of the tool assessed.

Consideration should also be given to means of involving the community more closely in follow-up as they provide a useful watchdog function. The US EPA (1992); Hunsberger *et al* (2004); Noble (2004) and Slinger *et al* (2005) have all commented on the potential benefit of involving communities in follow-up and provide useful examples of how this could be done.

Finally, one of the advantages of follow-up is that it allows learning from experience to take place. In order to capitalise on this it would be necessary to explore the best means of establishing a practical system for capturing and sharing follow-up results. It is only by building on the lessons of the past that the EIA and follow-up process as a whole can become truly sustainable.

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Appendix 1 – Listed Activities

Activities listed in terms of Schedule 1 of Government Notice R1182 as part of the 1997 EIA regulations.

Note: The third column gives the abbreviation commonly used to denote this activity type as used in this thesis. Thus for example, "roads" means listed activity 1(d), that is "roads, railways, airfields and associated structures". Activities that were not relevant for this thesis have not been given an abbreviation.

Activity number	Activity	Abbreviation used for this activity in this thesis
1	The construction, erection or upgrading of -:	
a)	facilities for commercial electricity generation with an output of at least 10 megawats and infrastructure for bulk supply	Electricity
b)	nuclear reactors and facilities for the production, enrichment, processing, reprocessing, storage or disposal of nuclear fuels and wastes	-
c)	transportation routes and structures, and manufacturing, storage, handling or processing facilities for any substance which is dangerous or hazardous and is controlled by national legislation *Note this activity includes fuel storage*	Hazmat
d)	roads, railways, airfields and associated structures	Roads
e)	marinas, harbours and all structures below the high-water mark of the sea and marinas, harbours and associated structures on inland waters	-
f)	above ground cableways and associated structures	-
g)	structures associated with communication networks, including masts, towers and reflector dishes, marine telecommunication lines and cables and access roads leading to those structures, but not including above ground and underground telecommunication lines and cables and those reflector dishes used exclusively for domestic purposes	Telecom
h)	racing tracks for motor-powered vehicles and horse racing, but not including indoor tracks	-
i)	canals and channels, including structures causing disturbances to the flow of water in a river bed, and water transfer schemes between water catchments and impoundments	-
j)	dams, levees or weirs affecting the flow of a river	Dams
k)	reservoirs for public water supply	Reservoirs
l)	schemes for the abstraction or utilization of ground or	WSS

	surface water for bulk supply purposes	
m)	public and private resorts and associated infrastructure	Resorts
n)	sewage treatment plants and associated infrastructure	STW
o)	buildings and structures for industrial, commercial and military manufacturing and storage of explosives or ammunition or for testing or disposal of such explosives or ammunition	-
2	The change of land use from	
a)	[residential use to industrial or commercial use] – activity suspended	-
b)	[light industrial use of heavy industrial use] – activity suspended	-
c)	agricultural or zoned undetermined use or an equivalent zoning to any other land use	Land use1
d)	use for grazing to any other form of agricultural use; and	-
e)	use for nature conservation or zoned open space to any other land use	Land use2
3	The concentration of livestock, aquatic organisms, poultry and game in a confined structure for the purpose of commercial production, including aquaculture and mariculture.	-
4	The intensive husbandry of, or importation of, any plant or animal that has been declared a weed or invasive alien species.	-
5	The release of any organism outside its natural area of distribution that is to be used for biological control	-
6	The genetic modification of any organism with the purpose of fundamentally changing the inherent characteristics of that organism.	-
7	The reclamation of land, including wetlands, below the high-water mark of the sea and in inland waters.	-
8	The disposal of waste as defined in section 20 of the [Environment Conservation] Act, excluding domestic waste, but including the establishment, expansion, upgrading or closure of facilities for all waste, ashes and building rubble.	Waste
9	Scheduled process listed in the Second Schedule to the Atmospheric Pollution Prevention Act, Act 45 of 1965 (APPA).	APPA

Appendix 2 – Monitoring Form

MONITORING FORM:

SECTION 1 – GENERAL

Reference number ………………………………………………………..

Date of inspection ………………………………………………………..

Person(s) inspecting ……………………………………………………….

Reason for inspection ☐ routine ☐complaint ☐follow-up ☐other

Project life cycle stage……………………………………………………….

SECTION 2 – COMPLIANCE WITH CONDITIONS

Consent conditions:	Y – fully complied with	…… out of ………conditions
	P – partly complied with	…… out of ………conditions
	N – not complied with	…… out of ………conditions
	? – cannot monitor condition	…… out of ………conditions
	N/A	…… out of………conditions

Overall impact of project on environment ☐ low ☐ l-m ☐ med ☐ m-high ☐ high

SECTION 3 – ACTIONS TAKEN ON SITE

Photographs taken
☐ Yes ……………………………………………………….
☐ No ……………………………………………………….

Evidence collected/sampling done
☐ Yes ……………………………………………………….
☐ No ……………………………………………………….

Communication with relevant parties/ requests made
☐ Yes ……………………………………………………….
☐ No ……………………………………………………….

SECTION 4 – RECOMMENDATIONS/ACTIONS TO BE TAKEN

Monitoring
☐ Project okay, further monitoring unlikely unless problem
☐ Project okay, routine annual monitoring
☐ Action required, schedule follow-up visit
☐ Other

Actions to be taken

-

Appendix 3 – List of Projects Followed-up on

Appendix 3
List of projects followed-up

Project ref number	Activity	Locality	Applicant	Consult	Env impact	%default
1	1g - telecom	Lukhanji	Company - cell	CEN	1	0
2	2c - agric to other	Gariep	LM - Gariep	Exempt	2	100
3	1l - wss	Emalahleni	DM - CHDM	PCT	2	40
4	1k - reservoirs	Inxuba Yethemba	DM - CHDM	CHDM	2	83
5	8 - waste	Senqu	LM - Senqu	GPT	3	63
6	1l - wss	Emalahleni	DM - CHDM	PCT	1	50
7	1g - telecom	Lukhanji	Company - cell	CEN IEM	1	0
8	8 - waste	Maletswai	LM - Maletswai	GPT	3	58
9	1j - dams	Intsika Yethu	Govt	Engineer	1	0
10	1j - dams	Senqu	Govt	Terratest	1	0
11	2c - agric to other	Elundini	LM - Elundini	Greenergy	3	71
12	1j - dams	Emalahleni	Other	Coastal & Resource Management	2	44
13	1g - telecom	Emalahleni	Company - cell	CEN	1	28
14	1l - wss	Inxuba Yethemba	LM - Inxuba Yethemba	Exempt	1	100
15	1c - hazardous	Intsika Yethu	Company - fuel	Exempt	1	67
16	2c - agric to other	Emalahleni	LM - Emalahleni	Greenergy	3	40
17	1g - telecom	Emalahleni	Company - cell	A & E	1	13
18	8 - waste	Inkwanca	LM - Inkwanca	Kwezi-V3	1	67
19	2c - agric to other	Lukhanji	DM - CHDM	Exempt	1	50
20	2c - agric to other	Senqu	Company - other	Exempt	3	100
21	1a - electricity	Intsika Yethu	Eskom	Exempt	1	0
22	1n - stw	Inxuba Yethemba	LM - Inxuba Yethemba	Conservation Management Services	1	67
23	1d - roads	Sakhisizwe	Govt	Engineer	1	47
24	1d - roads	Emalahleni	DM - CHDM	Engineer	2	100
25	1c - hazardous	Tsolwana	Pvt individual	None	1	0
26	1d - roads	Emalahleni	Govt	Terratest	2	60
27	1j - dams	Elundini	Govt	PCT	1	29
28	1n - stw	Emalahleni	LM - Emalahleni	Greenergy	1	80
29	1j - dams	Senqu	LM - Senqu	GPT	2	30
30	1d - roads	Intsika Yethu	Govt	Dynacon	3	25
31	1a - electricity	Senqu	Eskom	Terratest	1	0
32	2c - agric to other	Intsika Yethu	Govt	Exempt	1	0
33	1a - electricity	Emalahleni	Eskom	Terratest	1	33
34	1l - wss	Engcobo	LM - Engcobo	Merryweather	1	33
35	2c - agric to other	Tsolwana	LM - Tsolwana	Exempt	2	100
36	2c - agric to other	Sakhisizwe	LM - Sakhisizwe	Greenergy	2	100
37	1l - wss	Senqu	LM - Senqu	PCT	1	100
38	2c - agric to other	Inkwanca	LM - Inkwanca	Exempt	1	71
39	2c - agric to other	Inkwanca	LM - Inkwanca	Exempt	3	88
40	1g - telecom	Emalahleni	Company - cell	A & E	1	6
41	1a - electricity	Gariep	Eskom	Exempt	1	0
42	1d - roads	Emalahleni	DM - CHDM	Engineer	1	100
43	1c - hazardous	Sakhisizwe	Company - fuel	Engineer	1	0
44	2c - agric to other	Gariep	LM - Gariep	Exempt	2	100
45	1d - roads	Emalahleni	Govt	Greenergy	1	50
46	1n - stw	Emalahleni	LM - Emalahleni	Greenergy	3	67
47	1l - wss	Emalahleni	Company - other	Exempt	1	50
48	1g - telecom	Senqu	Company - cell	Cebo	1	45
49	8 - waste	Inkwanca	LM - Inkwanca	Engineer	1	64
50	1g - telecom	Intsika Yethu	Company - cell	A & E	1	25
51	2c - agric to other	Sakhisizwe	LM - Sakhisizwe	Greenergy	3	80
52	1l - wss	Intsika Yethu	LM - Intsika Yethu	Exempt	1	0
53	1j - dams	Gariep	Govt	Anton Bok	2	75
54	2c - agric to other	Gariep	LM - Gariep	Exempt	2	100
55	1d - roads	Elundini	SANRAL	Terratest	3	50
56	1d - roads	Emalahleni	SANRAL	Terratest	3	40
57	1c - hazardous	Maletswai	Company - fuel	Exempt	1	50
58	1l - wss	Intsika Yethu	DM - CHDM	PCT	1	0
59	1l - wss	Intsika Yethu	DM - CHDM	PCT	1	0
60	1c - hazardous	Lukhanji	Pvt individual	Sillitoe	1	25
61	1n - stw	Senqu	LM - Senqu	GPT	3	60
62	8 - waste	Maletswai	LM - Maletswai	GPT	2	71
63	8 - waste	Gariep	LM - Gariep	GPT	1	33
64	1c - hazardous	Maletswai	Company - fuel	Exempt	1	0
65	1c - hazardous	Sakhisizwe	Company - fuel	Exempt	1	0
66	1c - hazardous	Intsika Yethu	Company - fuel	Engen	1	50
67	1j - dams	Emalahleni	Engineer	Greenergy	1	53
68	2c - agric to other	Tsolwana	LM - Tsolwana	Exempt	4	100
69	1j - dams	Intsika Yethu	LM - Intsika Yethu	Engineer	2	44

70	1c - hazardous	Lukhanji	Company - fuel	Kantey & Templer	1	0
71	1c - hazardous	Emalahleni	Company - fuel	Engineer	1	0
72	2c - agric to other	Gariep	LM - Gariep	Exempt	2	86
73	1n - stw	Gariep	LM - Gariep	Cebo	2	67
74	1j - dams	Maletswai	LM - Maletswai	GPT	2	57
75	2c - agric to other	Lukhanji	DM - CHDM	Greenergy	2	100
76	1l - wss	Intsika Yethu	Engineer	Merryweather	1	0
77	2c - agric to other	Elundini	LM - Elundini	Greenergy	3	80
78	1d - roads	Lukhanji	Engineer	Greenergy	2	100
79	1d - roads	Lukhanji	Engineer	Greenergy	1	100
80	2c - agric to other	Senqu	Setplan	Exempt	2	100
81	2c - agric to other	Lukhanji	Pvt company	Terreco	2	25
82	1l - wss	Intsika Yethu	DM - CHDM	PCT	1	14
83	1n - stw	Engcobo	LM - Engcobo	Engineer	4	83
84	1j - dams	Intsika Yethu	Engineer	Greenergy	2	64
85	2e - open space	Elundini	LM - Elundini	Greenergy	1	33
86	1d - roads	Emalahleni	LM - Emalahleni	Engineer	1	60
87	1d - roads	Lukhanji	Engineer	Greenergy	2	100
88	1d - roads	Engcobo	LM - Engcobo	All Green	5	78
89	1m - resorts	Gariep	LM - Gariep	Landplan	1	67
90	1n - stw	Tsolwana	LM - Tsolwana	Terratest	2	40
91	1l - wss	Sakhisizwe	DM - CHDM	Merryweather	3	92
92	2c - agric to other	Gariep	LM - Gariep	Landplan	1	100
93	1n - stw	Senqu	LM - Senqu	GPT	1	83
94	8 - waste	Elundini	LM - Elundini	Greenergy	3	28
95	8 - waste	Elundini	LM - Elundini	Greenergy	3	73
96	1c - hazardous	Lukhanji	Company - fuel	Shell	1	25
97	1c - hazardous	Lukhanji	Company - other	Exempt	1	25
98	1g - telecom	Lukhanji	Company - cell	A & E	1	0
99	1g - telecom	Senqu	Company - cell	Lokisa	1	21
100	1l - wss	Intsika Yethu	DM - CHDM	PCT	1	50
101	1l - wss	Engcobo	LM - Engcobo	PCT	2	82
102	1d - roads	Elundini	Govt	Terreco	3	50
103	1c - hazardous	Lukhanji	Company - fuel	Exempt	1	0
104	1l - wss	Tsolwana	LM - Tsolwana	Engineers	1	86
105	2c - agric to other	Inxuba Yethemba	LM - Inxuba Yethemba	Engineer	2	0
106	1d - roads	Intsika Yethu	Engineer	Merryweather	3	63
107	1j - dams	Elundini	LM - Elundini	Greenergy	1	40
108	1l - wss	Engcobo	LM - Engcobo	Merryweather	1	70
109	9 - APPA	Sakhisizwe	Pvt company	Terratest	2	75
110	1l - wss	Sakhisizwe	DM - CHDM	Merryweather	1	58
111	1g - telecom	Inxuba Yethemba	Company - cell	EIM	1	50
112	1l - wss	Engcobo	DM - CHDM	Terratest	3	83
113	1c - hazardous	Inxuba Yethemba	Pvt individual	None	1	0
114	1g - telecom	Inxuba Yethemba	Company - cell	Exempt	1	0
115	1g - telecom	Sakhisizwe	Company - cell	Exempt	1	0
116	1g - telecom	Senqu	Company - cell	EIM	1	50
117	9 - APPA	Elundini	Pvt company	Terreco	1	33

Notes:
Project number refers to the number given to a project for this study (the Departmental reference number has not been included for the sake of confidentiality)
Activity types have been listed by the number given in the Government Notice R1182 (a copy of this list is attached as Appendix 1)
Locality is by municipal area

Appendix 4 – Risk Screening Tool

Appendix 4 - risk prediction worksheet for test 1 and test 2

Ref number	Project number	Activity	Locality	Applicant	Consultant	Predicted impact	Predicted impact	Predicted % default	Predicted default
2004-033	test 1-1	1l - wss	Emalahleni	Engineer	Greenergy	1.66	LM	59	M
2004-034	test 1-2	1n - stw	Intsika Yethu	LM - Intsika Yethu	PCT	1.56	LM	38.25	LM
2004-036	test 1-3	1g - telecom	Lukhanji	Company - cell	Exempt	1.19	L	30.65	LM
2004-038	test 1-4	2c - agric to oth	Emalahleni	DM - CHDM	Greenergy	1.84	LM	63.25	MH
2004-042	test 1-5	1g - telecom	Emalahleni	Company - cell	CEN	1.13	L	23.25	LM
2004-044	test 1-6	1g - telecom	Lukhanji	Company - cell	CEN	1.07	L	21.75	LM
2004-049	test 1-7	1l - wss	Lukhanji	Govt	Merryweather	1.47	L	44.75	M
2004-050	test 1-8	1g - telecom	Senqu	Company - cell	EIM	1.17	L	35	LM
2004-052	test 1-9	1g - telecom	Gariep	Company - cell	EIM	1.22	L	39.75	LM
2004-054	test 1-10	1g - telecom	Emalahleni	Company - cell	EIM	1.13	L	33.5	LM
2004-055	test 1-11	1g - telecom	Lukhanji	Company - cell	Exempt	1.19	L	30.65	LM
2004-062	test 1-12	1l - wss	Gariep	DM - CHDM	PCT	1.50	L	55.75	M
2004-066	test 1-13	1c - hazardous	Engcobo	Company - fuel	Exempt	1.58	LM	38.15	LM
2004-068	test 1-14	1g - telecom	Inxuba Yethen	Company - cell	Exempt	1.19	L	30.9	LM
2004-070	test 1-15	1a - electricity	Gariep	Eskom	Other	1.38	L	33.25	LM
2004-087	test 1-16	1l - wss	Sakhisizwe	LM - Sakhisizwe	Engineer	1.74	LM	60	M
2004-089	test 1-17	1c - hazardous	Inxuba Yethen	Company - fuel	Other	1.29	L	30.75	LM
2004-090	test 1-18	1l - wss	Senqu	LM - Senqu	GPT	1.78	LM	57	M
2004-091	test 1-19	1c - hazardous	Emalahleni	Company - fuel	Other	1.35	L	32	LM
2005-003	test 1-20	1g - telecom	Intsika Yethu	Eskom	Exempt	1.21	L	23.9	LM
2005-005	test 1-21	1g - telecom	Sakhisizwe	Company - cell	Exempt	1.28	L	32.65	LM
2005-008	test 1-22	1g - telecom	Intsika Yethu	Company - cell	Exempt	1.21	L	26.4	LM
2005-009	test 1-23	1c - hazardous	Lukhanji	Company - fuel	Exempt	1.24	L	30.65	LM
2005-015	test 1-24	1a - electricity	Lukhanji	Eskom	Terratest	1.32	L	25	LM
2005-020	test 1-25	1l - wss	Gariep	LM - Gariep	GPT	1.74	LM	65.5	MH
2005-023	test 1-26	1l - wss	Emalahleni	DM - CHDM	PCT	1.41	L	49.5	M
2005-025	test 1-27	1g - telecom	Emalahleni	Company - cell	Exempt	1.25	L	32.15	LM
2005-029	test 1-28	1l - wss	Engcobo	DM - CHDM	Merryweather	1.81	LM	58.5	M
2005-042	test 1-29	1c - hazardous	Lukhanji	Company - fuel	Kantey & Temple	1.12	L	19.5	L
2005-051	test 1-30	1d - roads	Maletswai	DM - CHDM	Landplan	1.64	LM	60.25	MH
2005-053	test 1-31	1g - telecom	Senqu	Company - cell	Exempt	1.28	L	33.65	LM
2005-058	test 1-32	1c - hazardous	Lukhanji	Company - fuel	Kantey & Temple	1.12	L	19.5	L
2005-062	test 1-33	1c - hazardous	Engcobo	Company - other	Other	1.83	LM	47.5	M
2005-066	test 1-34	1c - hazardous	Inxuba Yethen	Company - fuel	Kantey & Temple	1.12	L	19.75	L
2005-067	test 1-35	1c - hazardous	Maletswai	Company - other	GPT	1.73	LM	44.5	M
2005-073	test 1-36	1l - wss	Intsika Yethu	DM - CHDM	PCT	1.38	L	43.75	M
2005-074	test 1-37	1l - wss	Tsolwana	DM - CHDM	PCT	1.53	LM	53.75	M
2004-018	test 1-38	1a - electricity	Intsika Yethu	Eskom	Terratest	1.35	L	20.75	LM
2003-032	test 1-39	1n - stw	Senqu	LM - Senqu	GPT	1.98	LM	61.5	MH
2003-021	test 1-40	8 - waste	Senqu	LM - Senqu	GPT	1.98	LM	58.75	M
2005-082	test 1-41	1n - stw	Senqu	LM - Senqu	GPT	1.98	LM	61.5	MH
1999-039	test 2-1	1g - telecom	Emalahleni	Company - cell	CEN	1.13	L	23.25	LM
1999-014	test 2-2	1g - telecom	Gariep	Company - cell	CEN	1.22	L	29.5	LM
1999-008	test 2-3	1g - telecom	Tsolwana	Company - cell	Other	1.41	L	36.25	LM
1999-037	test 2-4	2e - open space	Inxuba Yethen	Pvt individual	Landplan	1.07	L	37.75	LM
1999-015	test 2-5	1n - stw	Inkwanca	LM - Inkwanca	Cebo	1.66	LM	67	MH
1999-017	test 2-6	1g - telecom	Maletswai	Company - cell	Other	1.36	L	31.75	LM
1999-002	test 2-7	8 - waste	Sakhisizwe	LM - Sakhisizwe	PCT	1.88	LM	59.5	M
1999-036	test 2-8	1l - wss	Elundini	Engineer	Engineer	1.68	LM	54.25	M
1999-052	test 2-9	1g - telecom	Elundini	Company - cell	A & E	1.30	L	27.5	LM
1999-030	test 2-10	2c - agric to oth	Elundini	LM - Elundini	Greenergy	2.20	LM	62.25	MH
1999-028	test 2-11	2c - agric to oth	Senqu	LM - Senqu	Exempt	1.83	LM	60.4	MH
1999-006	test 2-12	1g - telecom	Lukhanji	Company - cell	Exempt	1.19	L	30.65	LM
1999-045	test 2-13	1g - telecom	Lukhanji	Company - cell	A & E	1.07	L	25.75	LM

Appendix 5 – Accuracy of the Risk Screening Tool

Appendix 5
Worksheet showing predicted impact and default matches for the test projects

Test 1 data set

Ref number	Activity	Locality	Applicant	Consultant	Predicted impact	Actual impact	Predicted % default	Actual default
test 1-1	1l - wss	Emalahleni	Engineer	Greenergy	2	1	59	54
test 1-2	1n - stw	Intsika Yethu	LM - Intsika Yethu	PCT	2	2	38	50
test 1-3	1g - telecom	Lukhanji	Company - cell	Exempt	1	1	31	0
test 1-4	2c - agric to other	Emalahleni	DM - CHDM	Greenergy	2	2	63	83
test 1-5	1g - telecom	Emalahleni	Company - cell	CEN	1	1	23	9
test 1-6	1g - telecom	Lukhanji	Company - cell	CEN	1	1	22	0
test 1-7	1l - wss	Lukhanji	Govt	Merryweather	1	2	45	89
test 1-8	1g - telecom	Senqu	Company - cell	EIM	1	1	35	50
test 1-9	1g - telecom	Gariep	Company - cell	EIM	1	1	40	0
test 1-10	1g - telecom	Emalahleni	Company - cell	EIM	1	1	34	0
test 1-11	1g - telecom	Lukhanji	Company - cell	Exempt	1	1	31	0
test 1-12	1l - wss	Gariep	DM - CHDM	PCT	2	2	56	63
test 1-13	1c - hazardous	Engcobo	Company - fuel	Exempt	2	1	38	0
test 1-14	1g - telecom	Inxuba Yethemba	Company - cell	Exempt	1	1	31	0
test 1-15	1a - electricity	Gariep	Eskom	Other	1	1	33	25
test 1-16	1l - wss	Sakhisizwe	LM - Sakhisizwe	Engineer	2	1	60	58
test 1-17	1c - hazardous	Inxuba Yethemba	Company - fuel	Other	1	1	31	33
test 1-18	1l - wss	Senqu	LM - Senqu	GPT	2	1	57	60
test 1-19	1c - hazardous	Emalahleni	Company - fuel	Other	1	1	32	0
test 1-20	1g - telecom	Intsika Yethu	Eskom	Exempt	1	1	24	33
test 1-21	1g - telecom	Sakhisizwe	Company - cell	Exempt	1	1	33	0
test 1-22	1g - telecom	Intsika Yethu	Company - cell	Exempt	1	1	26	0
test 1-23	1c - hazardous	Lukhanji	Company - fuel	Exempt	1	1	31	0
test 1-24	1a - electricity	Lukhanji	Eskom	Terratest	1	1	25	50
test 1-25	1l - wss	Gariep	LM - Gariep	GPT	2	2	66	50
test 1-26	1l - wss	Emalahleni	DM - CHDM	PCT	1	1	50	33
test 1-27	1g - telecom	Emalahleni	Company - cell	Exempt	1	1	32	0
test 1-28	1l - wss	Engcobo	DM - CHDM	Merryweather	2	2	59	40
test 1-29	1c - hazardous	Lukhanji	Company - fuel	Kantey & Temple	1	1	20	0
test 1-30	1d - roads	Maletswai	DM - CHDM	Landplan	2	2	60	67
test 1-31	1g - telecom	Senqu	Company - cell	Exempt	1	1	34	0
test 1-32	1c - hazardous	Lukhanji	Company - fuel	Kantey & Temple	1	1	20	0
test 1-33	1c - hazardous	Engcobo	Company - other	Other	2	1	48	67
test 1-34	1c - hazardous	Inxuba Yethemba	Company - fuel	Kantey & Temple	1	1	20	0
test 1-35	1c - hazardous	Maletswai	Company - other	GPT	2	1	45	0
test 1-36	1l - wss	Intsika Yethu	DM - CHDM	PCT	1	2	44	82
test 1-37	1l - wss	Tsolwana	DM - CHDM	PCT	2	2	54	100
test 1-38	1a - electricity	Intsika Yethu	Eskom	Terratest	1	2	21	50
test 1-39	1n - stw	Senqu	LM - Senqu	GPT	2	3	62	50
test 1-40	8 - waste	Senqu	LM - Senqu	GPT	2	2	59	67
test 1-41	1n - stw	Senqu	LM - Senqu	GPT	2	2	62	20

Test 2 data set

Ref number	Activity	Locality	Applicant	Consultant	Predicted impact	Actual impact	Predicted % default	Actual default
test2-1	1g - telecom	Emalahleni	Company - cell	CEN	1	1	23	54
test2-2	1g - telecom	Gariep	Telkom	CEN	1	1	30	64
test2-3	1g - telecom	Tsolwana	Company - cell	LDS	1	1	36	0
test2-4	2e - land use	Inxuba Yethemba	Pvt individual	Landplan	1	2	38	100
test2-5	1n - stw	Inkwanca	LM - Inkwanca	Cebo	2	2	67	100
test2-6	1g - telecom	Maletswai	Company - cell	Eko Impak	1	1	32	0
test2-7	8 - waste	Sakhisizwe	LM - Sakhisizwe	PCT	2	2	60	91
test2-8	1l - wss	Elundini	Engineer	Engineer	2	1	54	50
test2-9	1g - telecom	Elundini	Company - cell	A & E	1	1	28	12
test2-10	2c - land use	Elundini	LM - Elundini	Greenergy	2	3	62	90
test2-11	2c - land use	Senqu	LM - Senqu	Exempt	2	1	60	100
test2-12	1g - telecom	Lukhanji	Telkom	Exempt	1	1	31	50
test2-13	1g - telecom	Lukhanji	Company - cell	A & E	1	1	26	19

Appendix 6 – Additional Information
Paper presented at IAIA(sa) conference, 2008

LIFE AFTER THE EIA CONSENT DECISION: AN EASTERN CAPE EXAMPLE OF BEST PRACTICE IN FOLLOW-UP

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ABSTRACT

Following-up after an EIA consent decision has been granted is a vital, but often neglected part of EIA practice, both nationally and internationally. This paper briefly describes the importance of EIA follow-up and why it is seldom implemented. Two of the key reasons for lack of implementation are uncertainty as to how to manage follow-up and the perception that follow-up is resource intensive.

The paper then presents an example of a simple and non-resource intensive follow-up process that was implemented in a region of the Eastern Cape by the regulatory environmental authority. The focus of this process was on assessing default and overall impact for 117 projects approved in terms of the 1997 EIA regulations. After the implementation of the follow-up programme, the average annual rate of default dropped from 56% to 29%, indicating that follow-up was successful in reducing rates of default. The overall environmental impact of projects also declined, although to a more limited extent.

The results of the follow-up were then taken a step further and used to create a simple spread-sheet based risk screening tool that could be used to predict the default and overall impact risk presented by new EIA applications. This would allow new EIA applications most likely to benefit from follow-up to be screened out at an early stage in the application process. The risk screening tool appears promising, with statistically significant matches between predicted and actual default and impact scores for 3 out of 4 test samples. Impact was slightly more accurately predicted than default.

Key words: *EIA, EIA follow-up, Eastern Cape, risk screening, default, compliance, overall environmental impact*

INTRODUCTION

EIA follow-up has been identified as an important principle of best practice in EIA (IAIA and IAE, 1999). This is largely due to the fact that while EIA provides decision-makers with information on the *potential* environmental consequences of proposed projects; follow-up provides feedback on the *actual* consequences of those projects (Marshall *et al*, 2005). Projects do not always proceed as planned and there may be unexpected impacts, a lack of adherence to consent conditions or mitigation measures may prove to be ineffective. Follow-up offers the opportunity to assess these issues and to implement corrective measures where necessary (US EPA, 1992; Arts & Nooteboom, 1999). It also offers an ideal opportunity to learn from experience and to apply the lessons learned to future EIAs and EIA-related decisions (Dipper *et al* 1998; Arts *et al* 2001). Without this feedback from follow-up, EIA can remain essentially an exercise in prediction and faces the danger of becoming little more than an administrative process (Marshall *et al*, 2005).

Yet, despite the importance of follow-up, very few EIA processes continue past the consent decision stage (Culhane, 1993; Petts & Eduljee, 1994; Glasson, 1999; Arts *et al*, 2001; Morrison-Saunders & Arts, 2004) and South Africa has been no exception[1] (Wood 1999; Duthie 2001; Hulett & Diab 2002; Weaver 2003).

There are a number of reasons for this lack of follow-up, but two of the key ones are a lack of resources (particularly personnel and budget) and uncertainty as to how to implement and manage a follow-up process, particularly on the side of the regulatory authority. The South African EIA legislation provides considerable guidance on the pre-decision EIA procedures that need to be followed, but offers little in the way of guidance as to what should happen post-decision. Not only is there little guidance for authorities as to how to actually go about conducting follow-up, but there is also little clarity as to how to deal with issues that may arise as a result of the follow-up process. Authorities are often reluctant to follow-up in case projects are found to have had unacceptable outcomes; which could then reflect badly on the authorities or require them to make unpleasant choices (Dipper *et al*, 1998; Arts & Nooteboom, 1999; Arts & Morrison-Saunders, 2004).

The aim of this paper is to offer some guidance for follow-up, in the form of an example of a successful pilot follow-up process that was implemented in the Eastern Cape. This follow-up process was based on international principles of best practice (as per Marshall *et al*, 2005) and did not require a special budget or even additional staff (although both would have been helpful and would be necessary for long-term sustainability of the project). It is hoped that the lessons learned during the implementation of this follow-up process could be of use to other regions of South Africa. The essential components of the process are outlined below.

AN EASTERN CAPE EXAMPLE OF FOLLOW-UP

The study area

Follow-up was implemented in the Ukhahlamba and Chris Hani district municipal areas of the Eastern Cape. These areas fell under the administration of the Queenstown office of the Eastern Cape environmental authority, the Department of Economic Development and Environmental Affairs (Figure 1).

The study area is largely rural in nature and the EIA applications received in this area are thus mostly for basic infrastructure type projects, such as roads and water supply schemes. Other regions of South Africa may experience a predominance of other project types (such as a coastal area receiving applications for coastal developments), but this regional variation should not negatively affect the follow-up process being proposed here as the basic principles are generic enough to be applied anywhere in the country.

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[1] Reference is made here specifically to the relative lack of legal provision for follow-up as part of South Africa's EIA regulations. The authors are aware of the valuable work being carried out by the Environmental Management Inspectors ("Green Scorpions"), and the follow-up concept being discussed in this paper could form an important complement to their more specialised enforcement role.

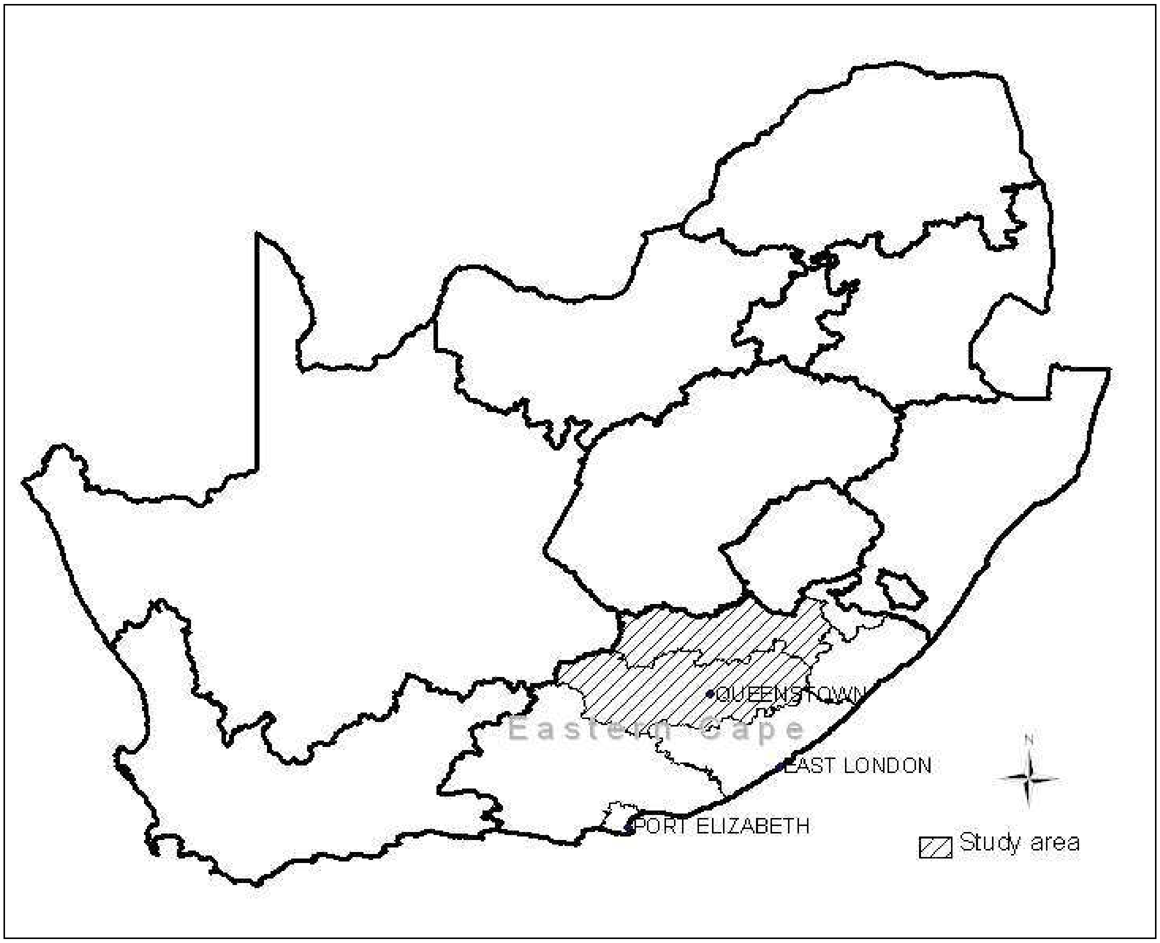


Figure 1. The study area.

Selecting projects for follow-up

As the authority wanted a general status quo on post consent decision matters in the region, all projects approved by the regulatory authority between 2000 and 2004 were initially targeted for follow-up. This was found to be a bit ambitious and time and cost constraints required that some of these projects be discarded. The projects that were discarded were those that were very remote (such as those that required a 4 hour drive one-way, of which there were only a few cases) and some that were already very well represented in the follow-up sample (such as fuel storage and cell phone tower projects). Projects that were known to have not gone ahead or those that fell outside of redefined provincial boundaries were also discarded. In total, 117 projects were subjected to follow-up. These 117 were generally representative of the types of EIA applications received by the region and consisted primarily of water supply schemes, roads, low-income housing developments, sewage treatment works, waste disposal sites, telecommunication towers and fuel storage facilities.

Responsibility for follow-up

In line with the limited guidance given in the 1997 EIA regulations and the "polluter pays" principle of NEMA, it was decided that the regulatory authority would undertake the follow-up inspections, while the applicant would be responsible for any costs relating to repairing environmental damage caused by default or improper management. This approach proved adequate, but there is also scope in the long-term for requiring the applicant to shoulder more of the follow-up burden by appointing environmental control officers (ECOs) or auditors to undertake regular follow-up. This is particularly useful for projects that require more than one follow-up visit. It was not however the preferred approach for this study as most of the projects were too small to justify the expense of making the applicant undertake accredited audits or appoint ECOs.

What follow-up focused on

Follow-up cannot focus on every conceivable issue that might be of environmental importance and what is seen as important can vary from region to region. In the case of this study the regulatory authority wanted to assess the degree of compliance with the conditions of authorization as well as the overall environmental impact that the project had had on the environment, so chose these as the two focus issues for follow-up.

Assessing default and impact

Default and impact were very simply assessed by going out to the project site and using a pre-designed and standardized monitoring form to record how many of the conditions of authorization were complied with and what the overall impact of the project on the environment appeared to be.

Default was determined by checking the conditions of authorization for a particular project against what had actually transpired on site. Default was however found to seldom be a clear-cut case of "yes, condition complied with" or "no, no compliance", so a range of default scoring categories (based on similar work by Bailey & Hobbs, 1990) were provided, namely:

- Yes, consent condition complied with. This was used where there was a clear case of full compliance, or where an environmental requirement had been met but the means of doing so was not exactly as stipulated in the authorization.
- No, condition not complied with. This scoring was given where there was a clear case of non-compliance.
- Partial compliance. A scoring of partial compliance was given when only part of a condition was complied with or where compliance was limited.
- No information or unable to determine compliance with any certainty. This scoring category was necessary to record cases where default could not be established.
- Not applicable. Projects sometimes change during implementation, making some conditions of authorization no longer valid. In these cases a default scoring of not applicable was necessary.

Default was then calculated as a percentage of conditions not complied with out of those that were applicable and could be assessed.

Impact was rated on a 5-point qualitative ordinal scale of low, low-medium, medium, medium-high and high using expert judgment and comparison with other similar projects. No provision was made for a category of "no impact" as it was assumed that a project would have some effect on the environment, however minor.

Use was also made of photographs and of informal on-site interviews with project personnel (if present). Most of the site visits were conducted unannounced and by a team of two to three regulatory authority staff. Unannounced site visits were preferred as they were easier to arrange and because they allowed the project to be seen in its normal state rather than tidied up by the applicant because s/he knew that regulatory authority was undertaking inspections. A multi-person team was preferred because it was safer, allowed training of new staff, tempered expert judgments of default and impact and allowed the transfer of follow-up skills.

Post follow-up

After monitoring each of the selected projects for impact and default, the default and impact scores were captured in an electronic spreadsheet for further analysis. Follow-up reports were also sent to applicants where corrective actions were required or where commendable efforts had been made to comply with the environmental authorization. These reports were found to be a highly effective way of alerting the applicants that follow-up was being carried out (particularly in cases where unaccompanied site visits were undertaken), and may thus serve as a valuable means of promoting compliance as the applicants become aware that they are being checked up on.

ASSESSING THE EFFECTIVENESS OF FOLLOW-UP

The follow-up process was very effective in reducing rates of both default and impact (Figure 3). There was a marked drop in the overall annual average rate of default from 56% in 2003 (before follow-up started) to an average of 29% in 2005 (after follow-up, which commenced towards the end of 2003). Overall impact also showed a decrease due to follow-up, albeit to a less marked extent than default. Overall impact dropped from an average of just under 2 (low-medium impact) to an average of just above 1 (low impact).

Implementing a follow-up process, even a simple one, thus appears to be worthwhile. Apart from direct effects such as improving compliance, there are likely to be knock-on effects such as the regulatory authority being perceived as having "less bark and more bite" and proponents taking the EIA process more seriously.

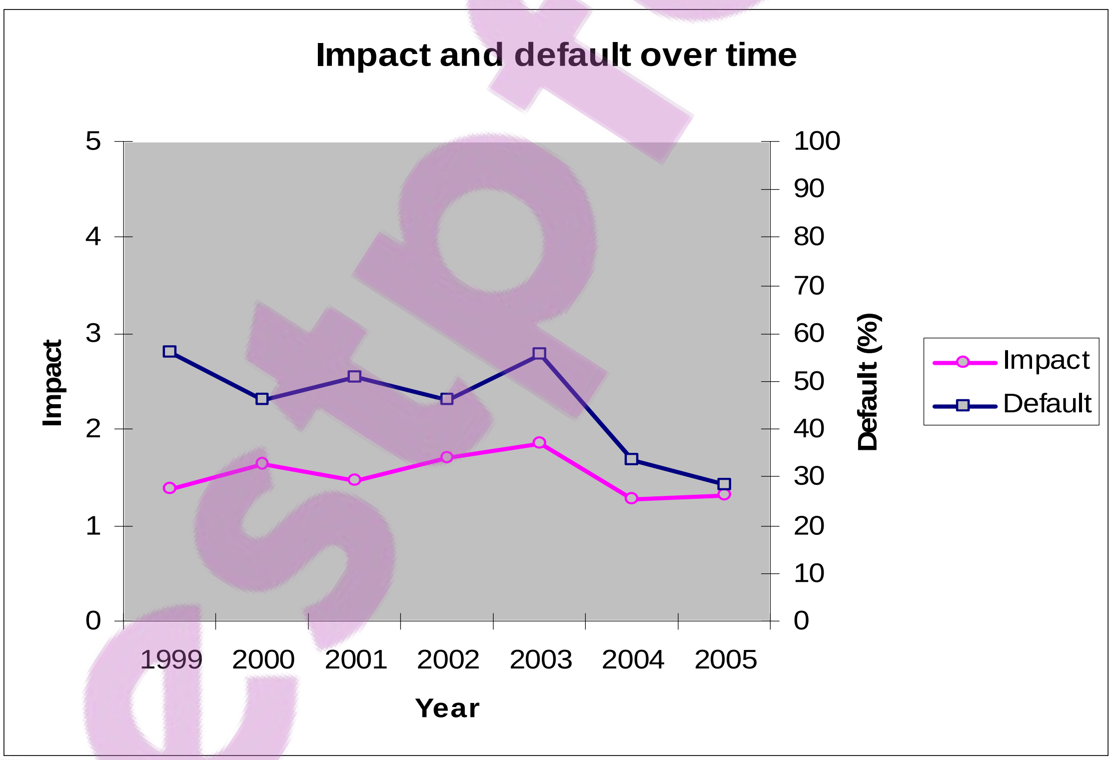


Figure 3. Rates of average impact and default over time. Note that the year refers to the year in which EIA applications were received. Follow-up commenced towards the end of 2003.

TAKING THE FOLLOW-UP PROCESS ONE STEP FURTHER - SCREENING FOR DEFAULT AND IMPACT RISK

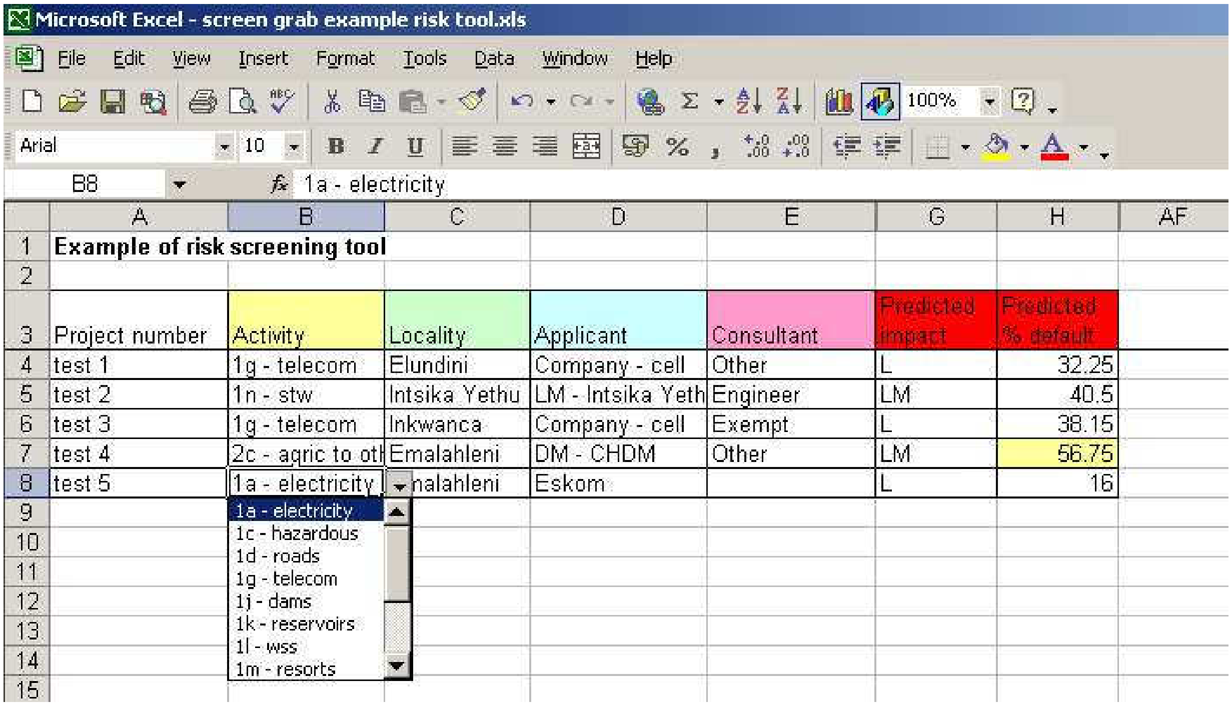
As indicated earlier, one of the reasons that follow-up is not carried out is due to a lack of resources. It would therefore be very useful if projects that would most benefit from follow-up (e.g. those that are likely to be default risks) could be identified at an early stage of the EIA application process. Being able to identify or screen out projects most in need of follow-up would not only allow the authority to direct resources to where they would add most value (US EPA, 1992; Sadler, 1996; Arts & Nooteboom, 1999; George, 2000), but would also allow concerns regarding default or impact risks to be addressed early on in the EIA application process. This early identification of potentially problematic applications can be particularly useful if the authority needs to use the consent decision as a lever to get the necessary measures to mitigate the default and impact risk into place. Most applicants will accede to reasonable requirements from the authority if doing so facilitates their chances of receiving authorization, but once they have received their EIA approval there is little incentive for them to comply further.

The obvious question that arises is: how can one identify projects that need follow-up? The approach taken by this study was to use the past performance of approved projects (that is, the default and overall impact scores from the follow-up process) to predict the future performance of similar projects. A screening checklist can also be used to identify projects in need of follow-up, but can be subjective and cumbersome to use, which is why it was not preferred here.

Although using the past environmental performance of projects to predict the likely performance of future similar ones is simple in theory, in practice several challenges had to be met. For while projects may share some similarities (such as having the same applicant), they are also all unique and new applications may be very different to ones that were followed-up on. Prediction was therefore based on four core components or similarities that all projects shared (that is activity type, applicant, locality and environmental consultant) rather than on the performance of complete projects. As each new EIA application would consist of some combination of applicant, locality, activity type and consultant, the likely default and impact risk could be predicted based on these different combinations. There are of course other similarities that projects might share, such as the contractor used, but the four chosen and used here were the components most commonly available at the start of the EIA application process, which is when screening is most useful.

The follow-up results were thus split into activity type, applicant, locality and consultant and then further broken down as necessary into sub-components under each of the four main components. For example, the component of activity type was comprised of the different listed activity types, while the 12 municipal areas of the study area made up the component of locality. Risk was then estimated by calculating the average default and impact scores for each sub-component. For example, for activity type, all road projects followed-up on were extracted from the follow-up database and the average default and impact scores for road projects was calculated; similarly with waste disposal sites, telecommunication towers and so forth.

The average scores were then used to provide the basis of the risk screening tool by creating a worksheet in Excel (Figure 4) which had a column for each of the four project components (applicant, activity type, locality and consultant) and a drop-down list in each of the column cells for the user to select the desired sub-component (such as the municipal area under locality or the type of activity under activity). As soon as the sub-component was selected Excel would return the relevant average default and impact scores for that sub-component (through the use of Excel’s “if-then” logic function). These scores were then added together to yield an overall impact risk and default risk rating, allowing the identification and prioritization of projects that would potentially benefit from follow-up.



Project number	Activity	Locality	Applicant	Consultant	Predicted impact	Predicted % default
test 1	1g - telecom	Elundini	Company - cell	Other	L	32.25
test 2	1n - stw	Intsika Yethu	LM - Intsika Yeth	Engineer	LM	40.5
test 3	1g - telecom	Inkwanca	Company - cell	Exempt	L	38.15
test 4	2c - agric to oth	Emalahleni	DM - CHDM	Other	LM	56.75
test 5	1a - electricity	nalahleni	Eskom		L	16

Figure 4 showing an example of the risk screening tool. In this example, project number "test 4" should be targeted for follow-up for default and impact, while project "test 2" may present an impact risk.

The advantages of using a risk screening tool such as the one described above is that it is simple, low-cost, objective and easy to adapt and recalibrate. It also provides a clear indication of which projects may present a default or impact risk.

ASSESSING THE EFFECTIVENESS OF RISK SCREENING

How effective was the risk screening tool at identifying potentially problematic projects? To determine the answer, the default and impact scores predicted by the risk screening tool for two test sets of projects were compared with the actual default and impacts scores for those same projects. In order to prevent bias (from seeing what the screening tool predicted and then going out into the field and scoring the projects using expert opinion), the actual data set was collected before undertaking the risk screening process to obtain the predicted data set. A further control measure that was implemented was to use two test data sets. Test 1 used data collected after the implementation of the follow-up process while Test 2 was used as a control with data collected before the implementation of the follow-up process.

Wilcoxon matched-pairs tests were then used to determine if the matches between the predicted and actual scores were significantly different or not. Wilcoxon tests were chosen as they were most suited to the non-parametric nature of the data. The results of these tests (Table 1) indicated that, except for the default scores for test 1, there is no significant difference between the predicted and actual scores. The risk screening tool thus appears to successfully predict impact, and to a lesser extent default. It could thus prove to be a very useful tool for the authority to use to screen out projects which should be subject to follow-up.

Table 1. The results of the Wilcoxon matched-pairs test between the predicted and actual results. Note that for the Wilcoxon matched-pairs test, the null hypothesis is that there is no significant difference between the pairs of scores (which in the case of this study would indicate that there is little difference between the predicted and actual scores, indicating a good match).

Variables	Results	Significance level
Test 1		
Predicted & actual default	T = 257, Z = 2.5 (n = 41)	Significant (p = 0.02)
Predicted & actual impact	T = 304, Z = 1.64 (n = 41)	Not significant (p = 0.10)
Test 2		
Predicted & actual default	T = 25, Z = 1.43 (n = 13)	Not significant (p = 0.15)
Predicted & actual impact	T = 33, Z = 0.87 (n = 13)	Not significant (p = 0.38)

CONCLUSIONS

Follow-up is an essential part of good EIA practice and it does not have to be complicated or expensive to be effective. An example of a simple follow-up process in the Eastern Cape was presented and reductions in both default and impact due to follow-up were noted.

Further value was added to the follow-up process by utilizing the results of follow-up to help identify future EIA applications that may present a default or impact risk. This was done through the creation of a simple spreadsheet based screening tool, which has shown promising results.

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