Integrated Environmental Management Information Series

Specialist Studies 4

Department of
Environmental Affairs and Tourism

Other topics in the series of overview information reports on the concepts of, and approaches to, integrated environmental management are listed below and the first six are currently available on request. Further titles in this series are being prepared and will be made available periodically. Sequence of release and titles are subject to change.

Information Series 1:	Screening
Information Series 2:	Scoping
Information Series 3:	Stakeholder Engagement
Information Series 4:	Specialist Studies
Information Series 5:	Impact Significance
Information Series 6:	Ecological Risk Assessment
Information Series 7:	Cumulative Effects Assessment
Information Series 8:	Risk Assessment and Management
Information Series 9:	Life Cycle Assessment
Information Series 10:	Strategic Environmental Assessment
Information Series 11:	Linking Environmental Impact Assessment and Environmental Management Systems
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PREFACE

This document is one of a series of overview information reports on the concepts of, and approaches to integrated environmental management (IEM). IEM is a key instrument of South Africa's National Environmental Management Act (NEMA). South Africa's NEMA promotes the integrated environmental management of activities that may have a significant effect (positive or negative) on the environment. IEM provides the overarching framework for the integration of environmental assessment and management principles into environmental decision-making. It includes the use of several environmental assessment and management tools that are appropriate for the various levels of decision-making.

The aim of this document series is to provide general information on techniques, tools and processes for environmental assessment and management. The material in this document draws upon experience and knowledge from South African practitioners and authorities, and published literature on international best practice. This document is aimed at a broad readership, which includes government authorities (who are responsible for reviewing and commenting on environmental reports and interacting in environmental processes), environmental professionals (who undertake or are involved in environmental assessments as part of their professional practice), academics (who are interested and active in the environmental assessment field from a research, teaching and training perspective), non-governmental organizations (NGOs) and interested persons. It is hoped that this document will also be of interest to practitioners, government authorities and academics from around the world.

This document has been designed for use in South Africa and it cannot reflect all the specific requirements, practices and procedures of environmental assessment in other countries.

This series of documents is not meant to encompass every possible concept, consideration, issue or process in the range of environmental assessment and management tools. Proper use of this series of documents is as a generic reference, with the understanding that it will be revised and supplemented by detailed guideline documents.

ACKNOWLEDGEMENTS

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Opinions expressed and conclusions arrived at are those of the authors and are not necessarily the official view of the Department of Environmental Affairs and Tourism. Any misrepresentation of views or errors of fact are solely those of the authors.

All sources used have been acknowledged by means of complete references.

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SUMMARY

Over the past decade there has been considerable international debate regarding the limitations and weaknesses of environmental impact assessment (EIA). There has been a sharp focus on the use and practice of science in EIAs. A number of international studies have highlighted concerns surrounding the technical quality of EIA in general and specifically the inaccuracy of impact predictions. This document focuses on the specialist study phase of the EIA process. The aim is to provide an overview of the debate on the weaknesses, gaps and problem areas of specialist studies in EIA. Approaches to improve the scientific and technical quality of EIA specialist studies are suggested for environmental practitioners and specialists.

Identified areas of weaknesses in EIA specialist studies include:

- baseline studies;
- impact prediction and assessment;
- impact mitigation;
- post-EIA impact monitoring; and
- specialist study reporting.

This document provides guidance to the EIA practitioner in the following areas:

- Drafting and clarifying the terms of reference.
- Outlining the desired specialist study approach.
- Specialist reporting requirements.
- Choosing the appropriate specialists.
- Ensuring interdisciplinary interaction between specialists.
- Independent peer review and choosing the right reviewer.

This document provides guidance to the specialist in the following areas:

- Defining the scope of work.
- Establishing baseline environmental conditions.
- Field surveys and data collection.
- Identifying and predicting potential impacts.
- Prescribing mitigation measures.
- Implementing monitoring requirements.

Deficiencies in the scientific quality of EIA can be attributed to the following constraints:

- Insufficient budget and time.
- Deficient terms of reference.
- Limited date.
- Technical difficulties associated with impact predictions.
- Frequent design changes and withholding information.
- Political interference or pressure.

The challenge for science under these conditions is to remain scientifically credible by ensuring that reference is made to all existing and accessible scientific information (e.g. data and comparable studies), basing conclusions on logical and rational premises and clearly stating all limitations to the study. One of the tests that should be used is a peer review process by which other knowledgeable and experienced scientists are invited to comment on the scientific studies. The role of science in EIA is not necessarily to be comprehensive, but to describe the status of the environment and predict human impacts as accurately as possible. The challenge to science in EIA is to be problem-focused, interdisciplinary and self-critical.

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1. Introduction

Over the past decade there has been considerable international debate regarding the limitations and weaknesses of environmental impact assessment (EIA). *The International Study of the Effectiveness of Environmental Assessment* (Sadler, 1996) provided an overview of the global status of environmental assessment tools. The study also provided recommendations on ways to improve the effectiveness of EIA practice. This document focuses on the specialist study phase of the EIA process. The aim is to provide an overview of the current practice and quality of scientific studies in EIA.

It is important to note that not all EIAs have specialist studies. The requirement to undertake specialist studies depends on the outcome of the scoping process. For example, if all the issues that are raised during scoping can be addressed with the available information, then it may not be necessary to proceed through the full EIA process. The issues raised in the scoping phase of an EIA, which cannot be effectively addressed with the currently available information, form the basis for the terms of reference of specialist studies. These specialist studies are commissioned to provide the information necessary to respond to the key issues associated with the proposed project. Specialists are appointed to analyze the current situation and assess the various impacts in terms of their anticipated magnitude. The aim of the specialist study phase is to provide information on the positive and negative impacts associated with the project alternatives. The studies also present recommendations for mitigation actions that may either enhance potential benefits or minimize harmful effects. EIA is a process designed to facilitate and improve decision-making on development projects.

The role of the specialist in the EIA process is to (1) address issues raised during scoping and (2) provide sufficient information that can be used by decision-makers. In most countries, especially in developing countries, there is no established decision-making frameworks or criteria. Specialists thus have a critical role to play in ensuring that decision-makers have sufficient information to make rational and informed decisions.

EIA practitioners draw on inputs from a range of traditional scientific disciplines (e.g. social sciences, earth sciences and life sciences). The main benefit of using science in this manner in EIA is that the interdisciplinary nature of the process provides an effective way of translating good theory into good practice. Interdisciplinarity is the open information exchange and linkages between various scientific disciplines. However, scientific interdisciplinarity in EIA is not just a matter of integrating scientific results in an environmental report. More importantly, it is the basis for applying scientific knowledge in innovative and fresh ways to identify, define, interpret, analyze and solve environmental problems.

Traditionally science has advanced through experimentation, observation, verification and replication of broad principles, theories, laws and hypotheses. These are normally statements of interpretation that apply to a broad array of circumstances, and are subject to continual scrutiny through experimentation, observation, verification and replication. This scientific experimentation provides an historical and comprehensive record of results. However, EIAs are normally conducted under conditions of data shortage and short time schedules. There is often neither the historical record or comprehensiveness of monitoring to form a reliable picture of the status of the environment.

The demand for EIA has propelled scientists into what at times seems a murky world of forecasting (i.e. predicting future impacts or likely scenarios). Imprecision in predicting the response of both the natural and human environment to change stems from the complexity and interconnectedness of the various environmental elements (i.e. the biophysical, social and economic environment). Currently there is no single universally acknowledged body of theory or method that can be applied to the analysis and evaluation of predicted impacts in EIA. One of the limitations of science in EIAs is thus that, in order to understand the natural and social environment and to predict impacts, scientists have to reduce complex systems to simple models or representations of reality.

A number of South African EIA practitioners (for example, Weaver, *et al.*, 1998; Hill, 2000; O'Beirne, 2001) believe that some of the weaknesses associated with local EIA practice include (1) undertaking EIAs to ensure that the interests of the project proponent are protected and that the project is approved at minimal additional cost to the project proponent, (2) applying the least possible effort in order to satisfy minimum regulatory requirements, resulting in the associated "rubber stamping" process, (3) making the decision to proceed with a particular project before the EIA has been completed or has even commenced, (4) poor scientific quality and (5) deficient mitigation measures, a lack of monitoring and follow-up. These limitations in South African practice are not unique and have been shown by Hickie and Wade (1998) and Warnken and Buckley (1998) to be an international challenge.

Concerns regarding the scientific and technical quality of EIAs were first raised in the USA about 25 years ago (Eberhardt, 1976) and there has been considerable debate on the topic since then. The past decade has seen the publication of several international studies and papers with the aim of addressing these concerns, e.g. *Best Practice Environmental Management in Mining* by the Australian Environmental Protection Agency (1995), *The International Study of the Effectiveness of Environmental Assessment* by Sadler (1996) and *Principles of Environmental Impact Assessment Best Practice* by The International Association of Impact Assessment (IAIA) (1999). It is interesting to note that the weaknesses of EIA identified decades ago (Eberhardt, 1976; Beanlands and Duinker, 1984) are still prevalent in current EIA practices. Although greater rigour of science in EIA is desirable, various factors and pressures contribute to studies that do not adequately address questions and concerns raised during the scoping process.

Scientific content, including the precision and accuracy of predicted environmental impacts, is an area that has been audited in several countries. The findings of national audits conducted during the past 15 years in the UK, Canada, USA and Australia have ranged from high levels of precision and accuracy (Sadler, 1996) to less satisfactory outcomes (Bisset, 1985; Culhane, 1987; Henderson, 1987; Buckley, 1991; Sadler, 1996; Thompson, Treweek and Thurling, 1997; Wood et al., 2000), and include situations where EIA falls a long way short of the most basic scientific standards (Buckley, 1998). While these and other audits highlight various weaknesses, gaps and problem areas associated with EIA processes and practices, this document highlights problem areas specific to the scientific quality of EIA specialist studies.

2. Purpose of this Document

This document has been written for a wide audience. The objective is that it will serve as an initial reference text. The aim is to provide an introductory information source to government authorities, environmental practitioners, non-governmental organizations (NGOs), industry, project proponents, academics, students and other interested and affected parties (I&APs).

The focus of this document is on the specialist study phase of the EIA process. The aim is to provide an overview of the debate on the weaknesses, gaps and problem areas of specialist studies in EIA. Approaches to improve the scientific and technical quality of EIA specialist studies are suggested for environmental practitioners and specialists. This document does not provide guidelines on the practical requirements of the specialist report. Best practice in an ideal EIA process or situation is outlined.

3. Deficiencies in the Application of Science in Environmental Impact Assessment

Most of the criticism on the quality of science in EIAs focuses on the accuracy of impact prediction. However, most specialist study reports contain remarkably few testable predictions. As an exercise in applied science, EIA falls a long way short of the most basic standards (Warnken and Buckley, 1998). Key weaknesses associated with the technical and scientific quality of EIA specialist studies can be grouped into the following five areas:

1. Baseline studies (to describe the receiving environment and/or determine baseline environmental conditions):

- Poor use of relevant scientific literature.
- Lack of, or poor field surveys and associated data collection.
- Failure to describe limitations or constraints on survey methodology.
- Insufficient or inadequate data.
- Vague generalizations with no indication of the relative importance of a particular component.
- Largely descriptive, with little quantitative information to enable accurate impact prediction.

2. Impact prediction and assessment:

- Vague, descriptive, subjective and ambiguous impact predictions that are not quantified.
- Impact predictions often based on expert opinion through discussions and seldom through more systematic methods.
- No details of the criteria used to identify and evaluate impact significance.
- Failure to evaluate impacts according to established criteria.
- Technical difficulties associated with making accurate impact predictions.
- Failure to consider all impacts, including indirect and cumulative impacts.
- Failure to consider all phases of the proposed project (construction, operational and decommissioning phases).

3. Impact mitigation:

- Insufficient information provided on recommended mitigation measures.
- Little indication of the practicality, reliability and potential effectiveness of the mitigation measures.
- Measures recommended that don't address identified impacts.
- Lack of consideration of possibilities for enhancement of project benefits.

4. Post EIA impact monitoring:

- Requirements are generally vague and poorly designed or omitted.

5. Specialist study reporting:

- Lack of clarity.
- Poor interpretation of results.
- Failure to reference sources of data and other information.
- Poor presentation of information.

While the above-mentioned weaknesses relate primarily to the technical aspects of EIA, limitations in the process include the following:

- Lack of practical experience of certain specialists in identifying and predicting impacts.
- Appointing a specialist with inappropriate experience (i.e. a scientist in academia versus a specialist with extensive practical experience).
- Budgetary and time constraints.
- Poorly defined terms of reference.
- Frequent project design changes by the project proponent throughout the EIA process.
- Confidential project information important to the specialist studies being withheld by project proponents.
- Political interference or pressure.

- Lack of consistent specialist reporting structures leading to problems in integration.
- Inadequate communication between the project proponent, the authorities and the specialists.

A particular weakness is the delay in the transfer of information and new skills from the research community to practitioners. This results in a skills and information gap between the research community and those conducting and reviewing EIAs (Warnken and Buckley, 1998).

There are also few or no co-ordinated efforts or programmes to consolidate, supplement and share the information from EIAs in different industry sectors. The benefits of sharing information and having access to EIA documentation include (1) being able to identify issues readily and (2) being able to improve on previous practice from similar projects. Therefore the knowledge gained from (1) determining and predicting characteristic impacts of specific industries and (2) the success of mitigation measures is not captured and disseminated to practitioners and authorities. Improving the quality of EIAs is therefore being inhibited by the lack of knowledge management and information-sharing.

4. Guidance for EIA Practitioners

The focus of this section is on the measures and approaches that can be used by the EIA practitioner when commissioning and coordinating specialist studies. From an EIA practitioner's perspective, the following areas are important for promoting and improving the quality of specialist studies:

- Drafting and clarifying the specialist terms of reference.
- Outlining the desired specialist study approach.
- Specialist reporting requirements.
- Choosing the right specialists.
- Ensuring interdisciplinary interaction between specialists.
- Independent peer review and choosing the right reviewer.

This section contains information adapted from the following sources:

O'Riordan (1995), RSPB (1995), Therivel and Morris (1995), Treweek (1996), Hickie and Wade (1998), Le Maitre and Gelderblom (1998), Warnken and Buckley (1998), Weaver *et al.* (1998), Byron (2000), Byron *et al.* (2000), Wood *et al.* (2000) and Slootweg and Kolhoff (2001).

4.1 Drafting and clarifying the specialist terms of reference

Well-written and comprehensive terms of reference for specialist studies play an important role in ensuring that they are focused and provide the answers to questions raised during the scoping process. Poor terms of reference are often a result of a lack of understanding by the project proponent and/or consultant of exactly what is required for an informed decision to be made regarding a particular project proposal. The onus is on the EIA practitioner to communicate the key issues to the specialist and not assume shared knowledge. It is, however, important to ensure that the specialists know what is required of them without being too prescriptive about exactly what to do or how to go about it. It is also important to ensure that all interdependencies, interactions and information-sharing requirements between specialist studies are identified and specified in the terms of reference.

An approach the EIA practitioner can follow to improve the quality of terms of reference is outlined below:

- Draft the specialists' terms of reference to cover the key issues identified during the scoping process and specify explicitly any issues/points that must be excluded from the study.
- Appoint independent peer reviewers.
- Revise the specialists' terms of reference in consultation with the peer reviewers.
- Appoint the individual specialists.
- Convene a workshop with all the specialists required

for the EIA to clarify the terms of reference and determine the level and areas of specialist interaction and overlap.

- Present the final terms of reference for the specialist studies to the peer reviewers.

Apart from ensuring that the specialists are aware of what is expected of them, the terms of reference could include requirements such as:

- the use of recognized survey and data collection methods;
- the use of a scientific approach to provide an objective and reliable assessment of environmental impacts;
- the application of specific and consistent impact description and assessment criteria;
- the use of peer review and interdisciplinary consultation in the prediction and assessment of impacts; and
- the prescription of relevant, effective and affordable mitigation and monitoring requirements.

It is important that the terms of reference clarify and define the proposed project's particular scale and area of influence (e.g. site only, local, regional, national and international), and then calibrate those areas relevant to the EIA. This will ensure that the specialists investigate the range of impacts relevant to the different scales. For example, potential project impacts may be direct, whereas local, regional and greater scale impacts may be indirect, cumulative and/or secondary.

The manner in which the specialists will be required to deal with uncertainty and the lack of data should be understood clearly by all parties. The provision of an agreed set of definitions, terms and requirements to the specialists should assist in ensuring consistency.

4.2 Outlining the desired approach in the terms of reference

While in most cases the terms of reference do not prescribe particular study methods, they should clearly indicate what the EIA practitioner expects from the specialists and how this information should be communicated and presented.

To overcome many of the weaknesses, gaps and problem areas in specialist studies, the following should be included in their terms of reference:

- Outline the study approach and identify assumptions and sources of information.
- Perform a gap analysis to determine what information is available and what additional information needs to be collected.
- Describe the affected environment and determine the *status quo*.
- Indicate exactly how much of a particular resource or community (human or biological) will be affected, how intensely, and for what duration.
- Perform a sensitivity or vulnerability analysis.
- Identify current and future sources of risk associated with the proposed project during construction, operation and decommissioning.
- Quantify and give a full factual description of current and predicted impacts, including cumulative and indirect impacts (as well as "error margins" on these estimates).
- Assess and evaluate potential impacts on the area of influence according to the prescribed parameters and characteristics, including magnitude, spatial scale, timing, duration, reversibility/irreversibility, probability, significance and acceptability.
- Identify and assess alternative project options, including the "no-go" option, equally so that they can be compared objectively.
- Propose and explain mitigation measures for unavoidable impacts, and enhancement measures, according to the prescribed format, giving detailed prescriptions for their

implementation and methods to assess their likely success.

- Summarize the residual impacts after mitigation.
- Provide a detailed monitoring programme for mitigation measures and project implementation activities, explaining what should be monitored, when, how, how often and by whom.

4.3 Specialist reporting requirements

While a systematic and scientific approach is vital for specialist investigations, the findings need to be conveyed to the authorities and I&APs in easily understandable, non-technical language. The contents of specialist reports are often not suited to public reporting and it is the responsibility of the EIA practitioner to integrate the specialist information into the environmental impact report, so that it is more accessible to authorities and I&APs. The original specialist study report should, however, be available as a stand-alone report for reference, should further detailed information be needed.

The EIA practitioner can save time and effort by providing the specialist scientist with a standard document template of the prescribed reporting format, style and layout details, including requirements for headings, impact tables, figures and graphs. Using the template will ensure that the specialists provide the necessary information, report their findings in a consistent manner and that their reports can be integrated effectively into the overall environmental impact report.

The following reporting requirements can be included in the specialists' terms of reference:

- Production of a non-technical executive summary (the executive summary should be a summary with executable actions).
- An indication of the methods used (surveys, sampling), as well as the timing, extent and duration of each activity undertaken in the study.
- Use of generic criteria to evaluate impact magnitude and significance (see section 5.4).
- Provision of impact mitigation requirements for inclusion in the project's environmental management plan according to the prescribed criteria.
- The inclusion of maps, figures, tables and graphs to improve readability, accessibility and interpretation of the findings.
- The inclusion of a full reference list and identification of all sources of information (research papers, existing data and personal communications).

In addition to standard reporting requirements, the EIA can benefit from the provision of the following by the specialist scientist:

- A statement indicating whether the level of study was appropriate to the likely significance and impacts (and if not, why).
- A description of the limitations and constraints associated with the study methodology.
- An indication of what wasn't done, but could have improved the study, had there been sufficient time and/or funding.
- A statement on how uncertainty was dealt with.
- Fully explaining and putting the component's data units in perspective. For example, 5 ml in 5 X 103m3 is equivalent in scale to a teaspoon of water in a swimming pool.

4.4 Choosing the right specialist

The levels of knowledge, expertise and competence of the specialist scientist have a strong influence on the findings of the EIA. It is therefore important to ensure that the most appropriate people are chosen to do the required studies. Particular credentials to look for in a specialist include:

- demonstrated competence and a proven track record in the specialist topic (CV should include a list of peer reviewed publications and contract reports);
- appropriate academic and specialist qualifications; and
- professional membership of a recognized professional body.

A specialist's personal attributes and personality are as important as his/her technical credentials. Ideally, the chosen specialist should have good people skills and the ability to communicate and interact as a team player with other specialists. Having chosen the specialists, it is advisable that they confirm in writing that they are able to meet their terms of reference according to the specified requirements and within the agreed time and budget allocation.

4.5 Ensuring interdisciplinary interaction between specialists

Individual specialist studies are typically undertaken separately and usually provide discrete pieces of information, often fragmented in terms of spatial and temporal scales. The pieces of information can also be fragmented in terms of how questions are addressed. In large complex EIAs the sharing and sequencing of information is crucial. This is particularly important in those EIAs where a single question may need to be addressed by the provision of information from more than one specialist study. The terms of reference for the different studies must, therefore, be drafted to ensure that their data and findings can be integrated.

Most, if not all, project impacts are directly or indirectly related to one another and the need for collaboration between specialists in the design, planning, execution and reporting of their studies should be emphasized in their terms of reference. This can be achieved by convening specialist workshops as part of the specialist study phase in the EIA process. Co-ordinated specialist field visits also serve as a method for improving integration by sharing ideas.

Convening a specialist workshop as soon as the specialists have been appointed will help to:

- introduce the specialists to each other and clarify their respective areas of work;
- clarify the individual terms of reference and identify those where overlaps occur and where sharing of information is necessary;
- explain the prescribed impact identification, assessment and reporting requirements;
- obtain agreement on the identified issues, linkages and information;
- identify impact interactions, including indirect and cumulative impacts;
- identify gaps in the areas that need to be studied;
- align the individual specialist studies (in terms of timing and information provision);
- facilitate improvement in study effectiveness and efficiency; and
- encourage interdisciplinary interaction.

Providing each of the specialists with a copy of the scoping report will help to promote a better understanding of the need for interdisciplinarity. A second workshop is advisable once the specialists have completed their studies, so that they can report on their findings, and identify overlaps, linkages and potential gaps in information. There are substantial benefits to facilitating interdisciplinary interaction between specialists throughout the specialist study phase. These include saving time, cost and effort by preventing duplication or overlaps. There are also benefits in shifting the emphasis from considering discrete impacts caused by the project's individual activities towards determining the total impact on resources, society and the economy.

A matrix represents the simplest method for identifying interactions between specialist studies. Table 1 provides an example of the level of interaction between studies.

Table 1 : Hypothetical example of the level of information exchange between specialist studies anticipated for an EIA of a fuel storage facility

Specialist Study	S12. Health risk assessment	S11. Land use planning	S10. Groundwater	S9. Terrestrial ecology	S8. Legislation and policy	S7. Marine ecology	S6. Marine water quality	S5. Cost benefit analysis	S4. Contingency planning	S3. Risk assessment (construction & operation)	S2. Marine risk assessment	S1. Oil spill modelling
S1. Oil spill modelling	Weak			Weak		Strong	Strong	Strong	Strong		Strong	
S2. Marine risk assessment	Weak				Weak	Weak	Strong	Strong	Strong	Strong		
S3. Risk assessment (constr. & operat.)	Strong	Strong	Strong	Strong	Weak				Strong			
S4. Contingency planning	Weak				Weak							
S5. Cost benefit analysis	Strong	Weak		Weak	Weak	Weak						
S6. Marine water quality	Weak					Weak						
S7. Marine ecology					Weak							
S8. Legislation and policy		Strong		Weak								
S9. Terrestrial ecology		Strong	Weak									
S10. Groundwater	Weak	Weak										
S11. Land use planning	Strong											
S12. Health risk assessment												

S = Specialist Study

Information Exchange

None e.g. no information exchange anticipated
Weak e.g. some information exchange necessary
Strong e.g. frequent contact between specialists necessary

4.6 *Independent peer review and choosing the right reviewer*

It is advisable that all specialist studies are reviewed to ensure scientific quality. Specialists should be obliged to respond to and address the reviewer's comments. There should be prior agreement on the review process for specialist studies in the event that the specialist does not meet his/her terms of reference. It is advisable that all parties agree to the terms of reference and that these form part of the legal contract between the EIA practitioner and the specialist.

Choosing the right reviewer is as important as using the right specialist. The reviewer and specialist should complement each other in terms of their expertise. Appointing a peer reviewer to comment on the terms of reference before appointing and commissioning the specialist can benefit the study. The involvement of the reviewer early in the specialist study phase ensures that the specialist's terms of reference are sufficiently detailed and correctly focused.

A good review process is particularly valuable for the decision-making authorities, because it provides them with independent expert scientific comments and verification of the study. Other benefits include the following:

- Where appropriate, it helps to define and clarify the specialist terms of reference.
- It is an opportunity for reviewing the specialist's proposed approach to the study.
- The process ensures that the specialist has covered all the issues and topics in an appropriate manner, and at an appropriate level of detail.
- It provides quality assurance to ensure that the specialist study is of a suitably high professional standard.

5. Guidance for Specialists

The following aspects are considered important for ensuring that specialist studies are credible and of a high quality:

- Defining the scope of work.
- Establishing baseline environmental conditions.
- Field surveys and data collection.
- Identifying and predicting potential impacts.
- Prescribing mitigation measures and their implications.
- Implementing monitoring requirements.

This section contains information adapted from the following sources:

Beanlands and Duinker (1984), Hart *et al.* (1984), Institute for Environmental Assessment (1995), RSPB (1995), Therivel and Morris (1995), Sadler (1996), Buckley (1998), Hickie and Wade (1998), Weaver *et al.* (1998), Byron (2000) and Byron *et al.* (2000).

5.1 *Defining the scope of work*

Once the specialists have received their terms of reference, it is important to define the scope of the individual studies, so that the specialists can focus on the key issues and questions to be addressed. While each specialist should strive to use the best practicable science, methodological overkill has important repercussions on the efficiency and effectiveness of a study (Sadler, 1996). Scientists may tend to focus on their area of specialization and in the process neglect to address the key issues identified during the scoping phase.

Distributing the scoping report to the specialists should assist them in identifying and confirming the key issues and prevent them from duplicating effort where relevant information (such as background information on the receiving environment) may already be contained in the scoping report.

Frequently insufficient data exist from which to make a judgement about the nature and extent of impacts. The specialist needs to determine just how much data will be required to supplement existing information and assess whether a significant impact will occur. This can be accomplished through a combination of:

- consultation with the independent peer reviewer;
- interdisciplinary specialist workshops;
- collecting existing data on the area to be affected and then performing a gap analysis to determine what information is available and what information is still required;
- visiting the project site and its surrounds; and
- consulting with national, provincial and/or local government departments, as well as professional, statutory and voluntary organizations.

Consultation with the peer reviewer, other specialists, government departments and other organizations is recommended to assist the specialist to:

- identify existing data to assist in defining the baseline conditions;
- identify specific interdependencies between specialists in terms of information needs and formats;
- identify key issues and help define likely significant impacts; and
- avoid duplication of previous studies and assess the validity of field data.

It is advisable for consultation to take place between the specialists and key I&APs, who possess particular insights and relevant indigenous knowledge that may improve and add to the understanding of the affected environment.

5.2 Establishing baseline environmental conditions

Establishing the baseline environmental conditions is essential for describing the receiving environment, the *status quo* and for identifying and predicting potential impacts. It is therefore important that the baseline environmental data that are collected are relevant and able to address the questions raised during the scoping phase.

If time and funding allows, it is advisable that the process of environmental baseline investigations include the following tasks:

- An appropriate combination and balance of desktop studies, field surveys, site information collection and technical consultation.
- Consideration of all available documentary records, research papers and other relevant information.
- Use of recognized survey and analysis techniques.
- Identification and provision of appropriate (preferably quantitative) descriptions of the baseline environmental conditions.
- Identification of key environmental features that may enhance, constrain or limit the direction and rate of environmental change.
- Explanation of links, interactions and dependencies between environmental components.
- Verification of desktop and other information by systematic field surveys.
- Acknowledgement of the implications of gaps and limitations in information and data.

A prediction of change can only be as effective as the baseline information from which it is derived. It is thus important that the specialist puts the proposed project in perspective by comparing the current environmental state with the potential future state. The specialist must also indicate and emphasize where the baseline conditions may change due to natural extreme events or cyclical environmental processes. If these are beyond the influence of the proposed project, the specialist should indicate how these need to be taken into account in the project design or through other mitigation measures.

5.3 Field surveys and data collection

Field surveys and data collection form an integral part of the specialist study phase. Surveys for biophysical studies often require (1) the establishment of baseline environmental conditions, (2) an investigation of the importance and sensitivity of the project site and its receiving environment and (3) consideration of the potential impacts, alternatives and mitigation measures.

This section provides a guide to the specialist in planning and executing survey and data collection to meet EIA requirements:

- conducting new surveys;
- data types; and
- good survey practices.

Conducting new surveys

New survey data should provide sufficient information for (1) informed decisions regarding the value of the receiving environment, (2) the prediction of potential changes resulting from the proposed project and (3) a baseline for monitoring the project during and after construction.

Data types

Sources of data include maps, aerial photographs, actual or modelled data, species, population, community and ecosystem data for biological studies, and comparative data. An explanation should be provided where historical and/or comparative data would have been expected, but were not used, or where seasonal data could not be obtained.

Data archiving is another important consideration (so that data can be readily accessed for future use or auditing) and the need for new surveys and additional data should be co-ordinated between specialists, who should strive to share data wherever possible. Specialists should also be aware of each other's sampling methods and the need to inform one another of the sensitivity of the particular resource under investigation to the sampling methods of the other studies. For example, a rig used for drilling for groundwater samples can cause extensive damage to vegetation and its noise may repel sensitive animals and birds.

Good survey practices

Good survey practices are essential to ensure that sufficient high quality data are generated to make defensible and robust impact predictions. Considerations of space, time, and survey method and intensity are vital. The establishment of temporal and spatial boundaries for the EIA is critical to study design and the interpretation of results. It is important to identify how much, as well as the intensity, of the spatial scale and extent of a particular resource may be potentially impacted on or affected by the proposed project.

It is vitally important to ensure that the EIA time frame is of sufficient duration to enable the specialists to collect suitable and adequate data for impact prediction purposes. Temporal considerations, particularly survey timing and duration, have a strong influence on the quality of data collected and the level of detail and accuracy. An important consideration is ensuring that surveys are conducted at the most appropriate time and scale as different resources have different requirements for temporal sampling, e.g. botanical surveys need to be undertaken during the flowering season.

A snapshot picture is not always sufficient and repeated sampling is particularly important if the subject being sampled has a high natural variability that needs to be understood for impact prediction purposes. The specialist report should clarify this aspect by including a statement as to when surveys were conducted and the duration of these surveys. The report should also include an indication of the reliability of the data if surveys were conducted at sub-optimal or inappropriate times and were of inadequate duration.

Standard methods and techniques for information recording and surveying should be applied, while acceptable analytical methods must be used (RSPB, 1995). It is also important that the specialist indicates the degree of sampling effort and the intensity of the survey applied. This will help the peer reviewer to determine whether sufficient relevant information has been captured. It is good survey practice to provide an indication of the levels of precision and measures of confidence or uncertainty associated with the data presented.

5.4 Identifying and predicting potential impacts

Environmental management relies to a significant extent on the assumption that we can predict the environmental impacts of development reliably (Buckley, 1991). Predicting the magnitude of a project's potential impacts and evaluating their significance is at the core of the EIA process. It requires specialist technical skills and a thorough understanding of the receiving environment (George, 2000). This is often hampered by a lack of quantitative information. Impacts are also rarely known with certainty during the early stages of a project, particularly when project designs are often modified between approval and commissioning and again as operations proceed (Buckley, 1991).

Impact assessment is dependent on the type and quality of the information collected via surveys and other forms of data collection. The specialist needs to ensure that this information is sufficient for the purposes of evaluating impact significance and acceptability. Given that the use of qualitative information and observations is almost inevitable, there is always a measure of subjectivity in assessing impacts. It is important for the specialist to balance the extent of qualitative versus quantitative information and if little quantitative data exist, the specialist must provide extensive reference to literature to support the judgements made.

It is important to distinguish between impact magnitude and impact significance. For example, noise levels are likely to have a lower significance in an industrial than in a residential area. The significance of atmospheric emissions will vary according to whether the existing air quality is well within ambient standards or approaching the limits, or whether these standards are already being exceeded (George, 2000).

The following approach can be used as a guide to assist specialists during the process of impact identification and evaluation:

- Determine the potential impacts.
- Consider the range of impacts, including indirect, cumulative, secondary, short-, medium- and long-term, permanent or temporary and positive or negative effects.
- Describe and quantify potential impacts for all phases of the proposed project (construction, operation, decommissioning).
- Assess the significance of impacts likely to arise from the project against the reference condition (includes natural variation and not just a snapshot), rather than against the present state revealed by the field surveys.
- Evaluate the impacts according to prescribed impact assessment and evaluation techniques and criteria.
- Provide information on impact reversibility and the potential for mitigating the identified impacts.
- Provide details on how uncertainties and limitations in predicting potential impacts were dealt with.
- Explicitly state all assumptions made for assessing potential impacts.
- State the predicted post-mitigation significance of impacts, i.e. the significance of residual impacts after all proposed mitigation measures have been taken into account.

The different types of techniques for predicting impacts are summarized in Table 2.

Table 2: Techniques for predicting impacts

	Past experience	Numerical calculations or models	Experiments or tests	Physical or visual simulations and maps	Professional judgement
Strengths	Particularly valuable for complex effects which cannot easily be modelled, and might not otherwise be identified.	Can deal with circumstances that are specific to the action being assessed; quantification of primary effects (e.g. area of land take) is often straightforward.	Can model complex effects, e.g. by measuring the noise emitted from machinery, or the effect of a pollutant on a particular species.	Useful for visual and other spatial impacts, e.g. physical models, photo montages, computer graphic images, overlay maps.	Versatile and easy to apply.
Weaknesses	Can be unrepresentative of the action being assessed.	Use of more complex models requires a detailed understanding of the science, and may require considerable data; hidden errors can arise from inappropriate assumptions in models.	Can be expensive; may not be fully representative of the action being assessed.	Misleading if not modelled accurately.	Misleading if expertise not adequate for the task; difficult to substantiate.
Validation	Actual experiences should be quoted, and allowance should be made for the different characteristics of the proposal and its environment.	Complex models should only be used when simpler ones are inadequate for the purpose; data sources should be identified and shown to be valid; the validity of the model should be demonstrated, e.g. by referring to relevant professional literature.	Experimental arrangements should be shown to be representative of the proposal.	Written descriptions may be needed to support the simulation, e.g. in relation to different vantage points or time-dependency of the impact.	Reasoning and supporting data should be described, and qualifications and experience of each professional should be given in the EIA report.

Source: George (2000)

Impact magnitude and significance should as far as possible be determined by reference to legal requirements, accepted scientific standards or social acceptability. If no legislation or scientific standards are available, the EIA practitioner can evaluate impact magnitude based on clearly described criteria. Except for exceeding standards set by law or from scientific knowledge, the description of significance is largely judgemental, subjective and variable. However, generic criteria can be used systematically to identify, predict, evaluate and determine the significance of impacts resulting from project construction, operation and decommissioning. The suite of potential environmental impacts (to both the natural and human environments) identified in the EIA should as far as possible be quantified. The process of determining impact magnitude and significance should never become mechanistic. Impact magnitude is determined by empirical prediction, while impact significance should ideally involve a process of determining the acceptability of a predicted impact to society. Making the process of determining the significance of impacts more explicit and open to comment and public input would be an improvement of EIA practice. The following generic criteria, which have been drawn from the published literature and South African practice, can be used to describe magnitude and significance of impacts in a systematic manner. The criteria are:

- Extent or spatial scale of the impact.
- Intensity or severity of the impact.
- Duration of the impact.
- Mitigatory potential.
- Acceptability.
- Degree of certainty.
- Status of the impact.
- Legal requirements.

Describing the impacts in terms of the above criteria provides a consistent and systematic basis for the comparison and application of judgements. Ratings should be assigned for each criterion. The significance of impacts of the proposed project should be assessed both with and without mitigation action. The descriptors for the ratings are given in Table 3 below.

Specific examples are given below of the type of impact criteria that can be used and adapted for a variety of contexts and projects.

Table 3: Categories for the rating of impact magnitude and significance

Impact Magnitude and Significance Rating	
High:	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur.
Medium:	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low:	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.
No impact:	Zero impact.

Extent or spatial scale of the impact

A description should be provided as to whether impacts are limited in extent or affect a wide area or group of people. For example, impacts can either be site-specific, local, regional, national or international.

Table 4: Examples of criteria for rating the extent or spatial scale of impacts

Rating	
High	Widespread. Far beyond site boundary. Regional/national/international scale.
Medium	Beyond site boundary. Local area.
Low	Within site boundary.

Intensity or severity of the impact

A description should be provided as to whether the intensity of the impact is high, medium, low or has no impact, in terms of its potential for causing either negative or positive effects. The study should attempt to quantify the magnitude of the impacts and outline the rationale used. If country-specific legal or scientific standards are not available, international standards can be used as a measure of the intensity of the impact.

Table 5: Examples of criteria for rating the intensity or severity of impacts.

Rating	
High	Disturbance of pristine areas that have important conservation value. Destruction of rare or endangered species.
Medium	Disturbance of areas that have potential conservation value or are of use as a resource. Complete change in species occurrence or variety.
Low	Disturbance of degraded areas that have little conservation value. Minor change in species occurrence or variety.

Duration of the impact

It should be determined whether the duration of the impact will be short term (0 to 5 years), medium term (5 to 15 years), long term (more than 15 years, with the impact ceasing after the operational life of the development), or considered permanent.

Table 6: Examples of criteria for rating the duration of impacts

Rating	
High (Long term):	Permanent. Beyond decommissioning. Long term (More than 15 years).
Medium (Medium term):	Reversible over time. Lifespan of the project. Medium term (5 – 15 years).
Low (Short term):	Quickly reversible. Less than the project lifespan. Short term (0 – 5 years).

Mitigatory potential

The potential to mitigate the negative impacts and enhance the positive impacts should be determined. For each identified impact, mitigation objectives that would result in a measurable reduction in impact should be provided. If limited information or expertise exists, estimates based on experience should be made. For each impact, practical mitigation measures that can affect the significance rating should be recommended. Management actions that could enhance the condition of the environment (i.e. potential positive impacts of the proposed project) should be identified. If no mitigation is considered feasible, this must be stated and the reasons provided. The rating both with and without mitigation or enhancement actions should be recorded. Quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation action should be provided where appropriate.

Table 7: Examples of criteria for rating the mitigatory potential of impacts

Rating	
High:	High potential to mitigate negative impacts to the level of insignificant effects.
Medium:	Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent some negative effects.
Low:	Little or no mechanism to mitigate negative impacts.

Acceptability

Criteria and standards that exist for acceptability are either emissions-based or they relate to the receiving environment (e.g. air quality, water quality or noise). Establishing the acceptability of a potential impact is as important as determining its significance. An impact identified as being non-significant by a specialist may be unacceptable to a particular section of the community. On the other hand, a significant impact may be acceptable if, for example, adequate compensation is given. The level of acceptability often depends on the stakeholders, particularly those directly affected by the proposed project. Ratings that can be used for acceptability are given below.

Table 8: Examples of criteria for rating the acceptability of impacts

Rating	
High (Unacceptable):	Abandon project in part or in its entirety. Redesign project to remove impact or avoid impact.
Medium (Manageable):	With regulatory controls. With project proponent's commitments.
Low (Acceptable):	No risk to public health.

Degree of certainty

A description should be provided of the degree of certainty of the impact actually occurring as unsure, possible, probable, or definite (impact will occur regardless of prevention measures). Where relevant, there should be some cross-reference to key indices derived from a risk analysis study.

Table 9: Examples of criteria for rating the degree of certainty of impacts

Rating	
Definite:	More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.
Probable:	Over 70% sure of a particular fact or of the likelihood of that impact occurring.
Possible:	Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
Unsure:	Less than 40% sure of a particular fact or the likelihood of an impact occurring.

The following additional categories can also be used:

Status of the impact

Specialists should describe whether the impact is positive (a benefit), negative (a cost) or neutral.

Legal requirements

Specialists should identify and list the specific legal and permit requirements that could be relevant to the proposed project.

5.5 Developing mitigation measures

The quantitative accuracy and precision of impact predictions is particularly important for prescribing mitigation measures. This is critical, especially for those impacts, pollutants or resources that require the setting of a site-specific discharge limit or need to be within legislated standards. A common approach to describing mitigation measures for critical impacts is to specify a range of targets with corresponding allowable exceeding frequencies (Buckley, 1991) and an associated monitoring and evaluation plan.

Given that inaccurate impact predictions are frequently made, it may be advisable that EIAs emphasize the mitigation and monitoring components of the project. These two aspects are internationally considered to be the weakest areas of EIA practice. Mitigation measures and monitoring programmes are not enforced to the extent that they should be. Another factor contributing towards inadequate information provided on mitigation measures is related to the fact that specific impacts are not always known and, can thus not be mitigated. Furthermore, specialists often require considerable design and engineering input to be able to recommend effective and feasible mitigation measures. This information is often not available at the stage in the project cycle at which the EIA is undertaken.

It is advisable that mitigation measures should be conceptualized and designed in collaboration with other specialists and the project engineers. This ensures that the various mitigation measures are compatible with each other, and that these measures are incorporated into the project design.

To ensure successful implementation, mitigation measures should be unambiguous statements of actions and requirements that are practical to execute. Mitigation measures should be supported by feasible specifications for an environmental management plan.

The following considerations can guide the specialist scientist to improve the effectiveness of mitigation measures:

- For each positive impact, determine whether it can be further enhanced, and for identified negative impacts, state whether mitigation measures are avoidance measures, replacement measures, reduction measures, restoration measures or compensatory measures (see box below for a summary of the different types of mitigation).

- For each identified impact, provide mitigation objectives (tolerance limits) that would result in a measurable reduction.
- If limited knowledge or expertise exists on such tolerance limits, the specialist should estimate based on experience.
- For each impact, recommend practically attainable mitigation actions that can measurably affect the significance rating.
- Where relevant, mitigation actions should consider enhancement options, soft engineering solutions or using the construction and operation methods or processes to reduce environmental effects.
- Non-traditional or new innovative techniques should be investigated and should form part of the considerations for the custom-design of mitigation measures to particular problems.
- Mitigation measures should, where possible, be based on successful case studies or measures applied successfully in other projects.
- Provide a precise description for each recommended mitigation action.
- The mitigation actions should be affordable, feasible and achievable with defined criteria for success.
- Mitigation measures for addressing identified impacts should not result in, or create additional impacts of their own.
- If no mitigation is considered feasible, this must be stated and reasons provided.
- The significance rating with and without mitigation measures should be provided.
- The proposed mitigation actions that will be implemented should be provided.
- A specified implementation date, time and sequence should be provided.
- A clear assessment of the likely success of the proposed measures should be provided.
- The person responsible should be provided for implementing particular mitigation measures identified.
- Quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of proposed mitigation actions should be provided.

Table 10 below summarizes the different approaches to prescribing and designing mitigation measures.

Table 10: Different categories for prescribing and designing mitigation measures

1. Avoidance:	Mitigation by not carrying out the proposed action or the unacceptable parts of the proposed action. For example, if the only area available for a regional airport happens to be an area of extensive wetlands that would be filled in by construction of the airport, avoidance of the action would be the only reasonable way to protect those wetlands.
2. Minimization:	Mitigation by scaling down the magnitude of a project, reorienting the layout of the project or employing technology that reduces the factors generating the undesirable environmental impact.
3. Rectification:	Mitigation through the restoration of environments affected by the action. For example, areas cleared for the installation of pipelines or power lines can be rehabilitated and then replanted with native vegetation.
4. Reduction:	Mitigation by taking maintenance steps during the course of the action. For example, storm water management systems can be designed to trap sediments from developed areas.
5. Compensation:	Mitigation through the creation, enhancement or acquisition of environments similar to those affected by an action. This step should only be considered after all steps above have been completed. As a last resort, donation of land or money for a regional programme of habitat creation or enhancement should be considered.

(Source: Council on Environmental Quality Regulations, 40 CFR 1508.20, cited in the US EPA Resource Manual for Environmental Impact Assessment Review, 1998)

Ideally enforcement of mitigation measures would be achieved by ensuring that the measures are guaranteed by a legally binding agreement or required by authorization conditions or are an obligation on the part of the project proponent (i.e. contained within the environmental management plan).

5.6 Monitoring requirements

Monitoring provides a vital feedback loop to (1) evaluate and verify the predictions made in the specialist studies, (2) determine the success of mitigation measures and (3) identify and rectify possible post-project problems (Byron, 2000). It also provides valuable information that may be used to improve future EIAs, while helping to improve the scientific rigour of EIA practices in general. In South Africa, monitoring is seldom required or enforced by legislation. There are no data or follow-up studies to show the accuracy of impact predictions, and more importantly, whether or not the prescribed mitigation measures were successful or even feasible. However, monitoring programmes are usually devised to monitor compliance rather than to test impact predictions and track the achievement of the mitigation objectives.

The costs associated with monitoring activities make it important and essential to maximize the benefits derived from them. The following is recommended to improve monitoring programmes:

- The monitoring programme should be well-structured with clear, accurate and fully described monitoring requirements and procedures.
- It should be properly resourced and expertly undertaken and managed.
- It should include all relevant project phases (pre-construction, construction, operation and decommissioning);
- The monitoring programme should enable the assessment of the site-specific validity of prescribed mitigation

measures and should be aimed at systematically and comprehensively ensuring that all mitigation measures are performing as expected.

- Standard techniques or methods of data collection should be used and made explicit, so that the data can be used for comparative purposes.
- Standard data analysis techniques should be applied.
- The monitoring programme should provide information enabling the testing and comparison of actual impacts with predicted impacts by addressing clearly defined questions and providing for repeatability and control.
- The sampling programme should have appropriate timing and frequency according to the aspects monitored. Short-term monitoring may not identify important trends necessary for determining whether or not impact predictions were accurate and mitigation measures appropriate.
- The monitoring programme should have a quality control mechanism for assessing the data to ensure lack of bias and credibility.
- The monitoring programme should be reviewed regularly and linked directly to effective mechanisms for implementing corrective action promptly.
- The results should be communicated to decision-makers and made available to the public in clear non-technical language.

Monitoring on its own serves no purpose, unless it includes follow-up and corrective actions. Monitoring results should be made available, so that the effectiveness and efficiency of predictive methods and mitigation measures can be improved. Making monitoring results available will enable researchers to test and verify the impact predictions communicated in the EIA process.

6. Conclusions

The role of the specialist in the EIA process is twofold:

(1) The specialist has to address the issues raised during scoping.

(2) He/she has to provide sufficient information for decision-making.

Traditional science is a system of study involving hypothesizing, observation and experimentation, the purpose of which to test and refine explanations of the phenomena being studied. However, in EIA scientific information is used to predict anticipated impacts without necessarily having recourse to repeatable testing and experimentation (i.e. EIAs are not designed to test and refine explanations). It is for this reason that the impact prediction methods employed in EIAs have to be rigorous and peer-reviewed. The role of specialists in EIAs is crucial, because they document and evaluate the magnitude of human impacts on the environment.

The challenge for specialists under these conditions is to remain scientifically credible by ensuring that reference is made to all existing and accessible scientific information (e.g. data and comparable studies), basing conclusions on logical and rational premises and clearly stating all limitations to the study. One of the tests that should be used is a peer review process, by which other knowledgeable and experienced scientists are invited to comment on the studies. The role of scientific studies in EIAs is not necessarily to be comprehensive, but to describe the status of the environment and predict human impacts as accurately as possible. The challenge for specialists in EIA is to be problem-focused, interdisciplinary and self-critical.

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8. Glossary

Definitions

Affected environment

Those parts of the socio-economic and biophysical environment impacted on by the development.

Affected public

Groups, organizations, and/or individuals who believe that an action might affect them.

Alternative proposal

A possible course of action, in place of another, that would meet the same purpose and need. Alternative proposals can refer to any of the following, but are not necessarily limited to these:

- alternative sites for development
- alternative projects for a particular site
- alternative site layouts
- alternative designs
- alternative processes
- alternative materials.

In IEM the so-called "no-go" alternative also requires investigation.

Authorities

The national, provincial or local authorities that have a decision-making role or interest in the proposal or activity. The term includes the lead authority, as well as other authorities.

Baseline

Conditions that currently exist. Also called "existing conditions".

Baseline information

Information derived from data that:

- records the existing elements and trends in the environment; and
- records the characteristics of a given project proposal

Decision-maker

The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal.

Decision-making

The sequence of steps, actions or procedures that result in decisions, at any stage of a proposal.

Environment

The surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, cultural, historical, and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Assessment (EA)

The generic term for all forms of environmental assessment for projects, plans, programmes or policies. This includes methods/tools such as EIA, strategic environmental assessment, sustainability assessment and risk assessment.

ainability assessment and risk assessment.

Environmental consultant
Individuals or firms that act in an independent and unbiased manner to provide information for decision-making.

Environmental Impact Assessment (EIA)
A public process that is used to identify, predict and assess the potential environmental impacts of a proposed project on the environment. The EIA is used to inform decision-making.

Fatal flaw
Any problem, issue or conflict (real or perceived) that could result in proposals being rejected or modified.

Impact
The positive or negative effects on human well-being and/or the environment.

Integrated Environmental Management (IEM)
A philosophy which prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level - that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools to a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).

Interested and Affected Parties (I&APs)
Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business associations, trade unions, customers, consumers and environmental interest groups. The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered I&APs.

Lead authority
The environmental authority at the national, provincial or local level entrusted, in terms of legislation, with the responsibility of granting approval to a proposal or allocating resources and for directing or coordinating the assessment of a proposal that affects a number of authorities.

Mitigate
The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

Non-governmental organizations (NGOs)
Voluntary environmental, social, labour or community organizations, charities or pressure groups.

Proponent
Any individual, government department, authority, industry or association proposing an activity (e.g. project, programme or policy).

Proposal
The development of a project, plan, programme or policy. Proposals can refer to new initiatives or extensions and revisions to existing ones.

Public
Ordinary citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process, depending on their particular concerns and the issues involved.

Roleplayers
The stakeholders who play a role in the environmental decision-making process. This role is determined by the level of engagement and the objectives set at the outset of the process.

Scoping
The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Screening
A decision-making process to determine whether or not a development proposal requires environmental assessment, and if so, what level of assessment is appropriate. Screening is initiated during the early stages of the development of a proposal.

Significant/significance
Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic). Such judgement reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts.

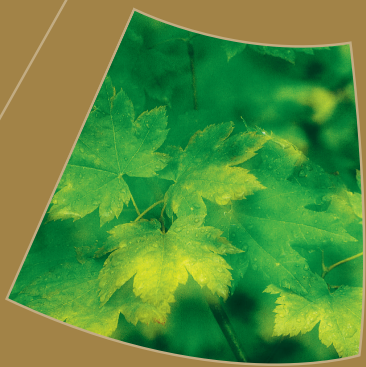
Stakeholders
A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Stakeholder engagement
The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies, depending on the nature of the proposal or activity and the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term "public participation".

Stakeholder engagement practitioner
Individuals or firms whose role it is to act as independent, objective facilitators, mediators, conciliators or arbitrators in the stakeholder engagement process. The principle of independence and objectivity excludes stakeholder engagement practitioners from being considered stakeholders.

Abbreviations

CBO	Community-based Organization
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management Systems
I&AP	Interested and Affected Party
IEM	Integrated Environmental Management
NGO	Non-governmental Organization
SEA	Strategic Environmental Assessment



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