GOVERNMENT GAZETTE
OF THE
REPUBLIC OF NAMIBIA

WINDHOEK – APRIL 2008

CONTENTS

GOVERNMENT NOTICE

MINISTRY OF ENVIRONMENT AND TOURISM

NO. 1 2008

Draft Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP)

PROCEDURES MADE UNDER PART III OF THE REGULATIONS FOR STRATEGIC ENVIRONMENTAL ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The Minister has, Under Part X: General Provisions, Section 56 of the Environmental Management Act, 2007 (Act No. 7 of 2007, made the Regulations for Strategic Environmental Assessment and Environmental Impact Assessment, Government Notice No. 1 and the Procedures and Guidelines as set out in this Document

Definitions

This document is a procedure and guideline document and serves as a reference and supportive text only and cannot take the place of legal advice in a specific situation governed by legislation. This document will not take the place of any regulations published by Directorate of Environmental Affairs, Ministry of Environment and Tourism.

Issued by

The Directorate of Environmental Affairs; Ministry of Environment and Tourism
Private Bag 13
WINDHOEK
NAMIBIA

Available on the Ministry of Environment and Tourism web site:
http://www.met.gov.na

Written By

Dr. Sindila Mwiya of Risk-Based Solutions (RBS) and the project undertaken in consultations with the Directorate of Environmental Affairs, Environmental Assessment Regulations Steering Committee comprising: Mr. Teofilus Nghitila (Chair), Dr. Freddy Sikabongo (MET-DEA), Mr. Sem Shikongo (MET-DEA) and Dr. Kirsten Probst (GTZ Advisor to MET), Ms. Saima Angula (MET-DEA) and Ms. Paulina Kadila (MET-DEA).

Disclaimer

Citation

Directorate of Environmental Affairs, 2008. Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plans (EMP), Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek.

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BACKGROUND TO THIS DOCUMENT

1. “The State shall actively promote and maintain the welfare of the people by adopting policies aimed at ...

   The maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future...” [Constitution of the Republic of Namibia - Article 95 (1)].

2. The Environmental Management Act, 2007, (Act No. 7 of 2007) sets out the following principles of environmental management:

   (i) Renewable resources must be used on a sustainable basis for the benefit of present and future generations;

   (ii) community involvement in natural resources management and the sharing of benefits arising from the use of the resources, must be promoted and facilitated;

   (iii) the participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties;

   (iv) equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects;

   (v) assessments must be undertaken for projects which may have a significant effects on the environment or the use of natural resources;

   (vi) sustainable development must be promoted in all aspects relating to the environment;

   (vii) Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;

   (viii) the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;

   (ix) the reduction, re-use and recycling of waste must be promoted;

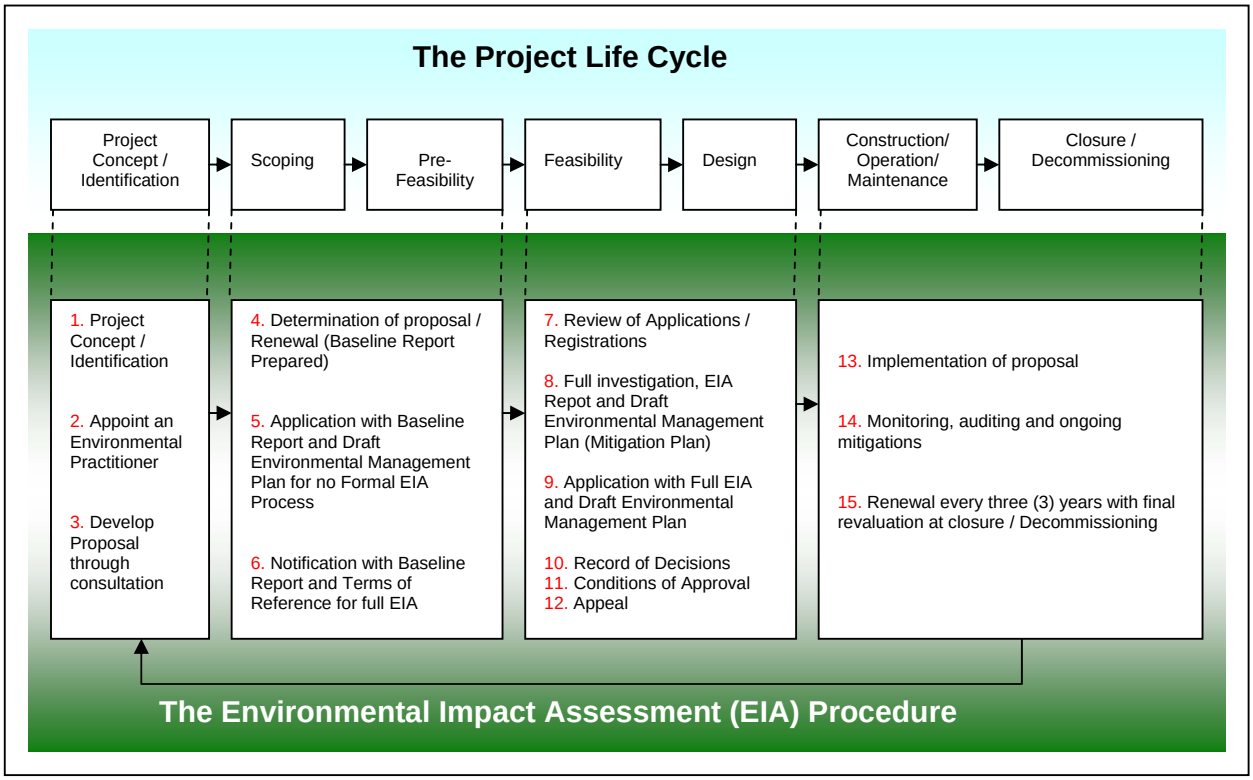
   (x) a person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as

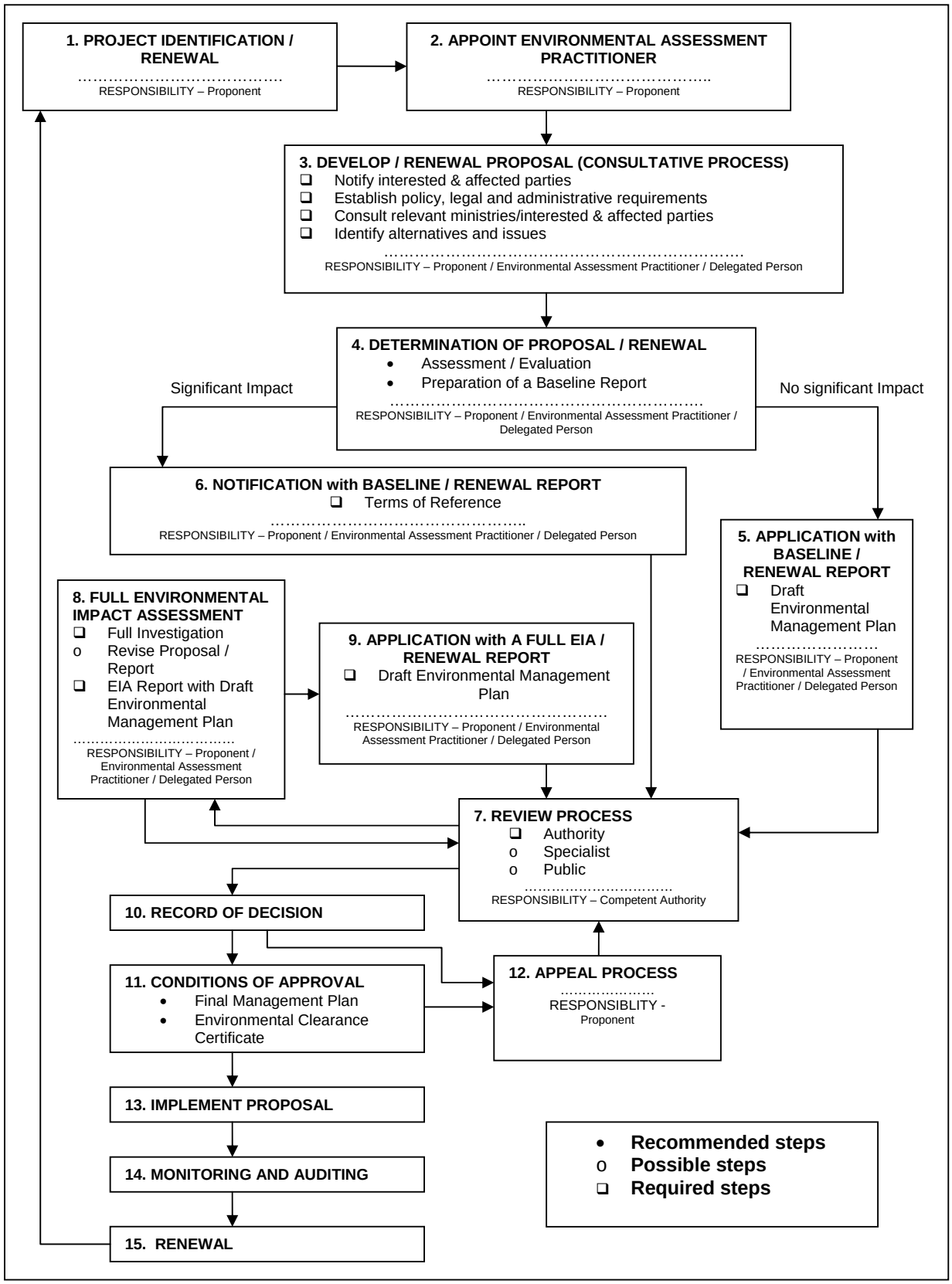
are reasonably required to be implemented to prevent further environmental damage;

(xi) where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and

(xii) damage to the environment must be prevented and activities which cause such damaged must be reduced, limited or controlled.

PART 1: PROCEDURES FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

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❑ Establish policy, legal and administrative requirements
❑ Consult relevant ministries/interested & affected parties
❑ Identify alternatives and issues
RESPONSIBILITY – Proponent / Environmental Assessment Practitioner / Delegated Person
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RESPONSIBILITY – Proponent / Environmental Assessment Practitioner / Delegated Person
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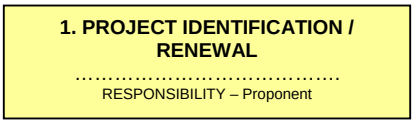
STAGE 1: PROJECT IDENTIFICATION / RENEWAL

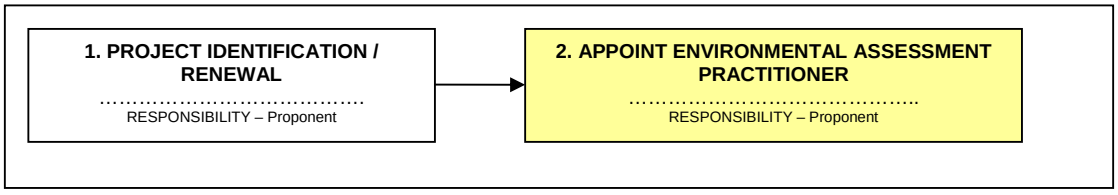


During the identification stage the proponent shall determine whether or not a proposed project or modification to an existing project is likely to have significant environmental effects.

The environmental assessment process should begin early in the project planning stage. This will ensure that planning and decisions reflect environmental values, avoid unnecessary delays or procedural corrections later in the planning process, and minimize potential conflicts. In addition, design changes can be incorporated into the project planning to avoid or reduce environmental impacts identified by an EIA. On the other hand, if major project decisions are made and/or funding committed before the EIA occurs; then the EIA can have little influence on choices regarding project or activity design, sitting, technology, scale, beneficiaries or the like. At worst, the environmental assessment may become simply an exercise to meet a requirement—not an appropriate way to achieve environmentally sustainable development.

The responsibilities for identifying / renewal/ revision of a project rest with the proponent who should make sure that all the provisions of the Environmental Management Act, the Regulations for environmental assessment and management, Procedures for Environmental Assessment and Management and the Guidelines for Environmental Assessment and Management are followed.

STAGE 2: APPOINTMENT OF AN ENVIRONMENTAL ASSESSMENT PRACTITIONER

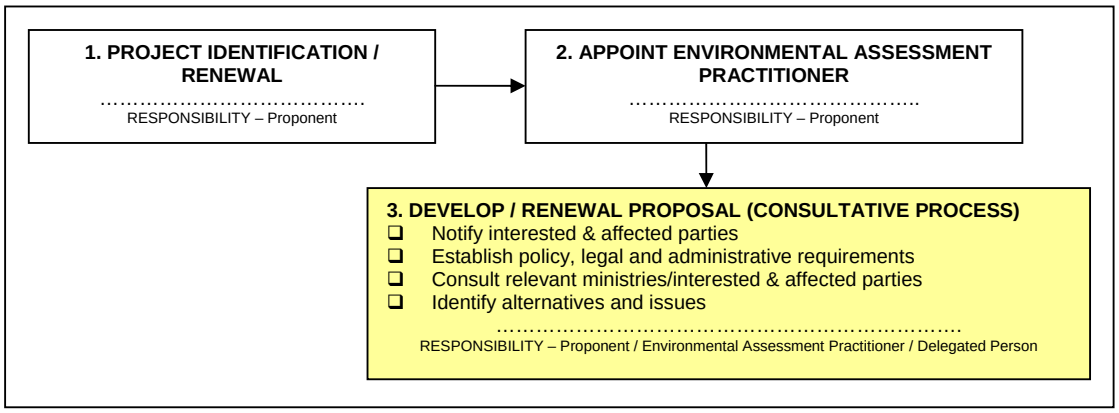


Once a project has been identified the next stage for the proponent is to decide on who will develop the full project proposal. The aim of developing / renewal of the project proposal is to have a clear communicable document which should set out what exactly is proposed or need to be done and where etc. The proponent has two choice and these are:

(i) Appoint an independent qualified and experienced environmental assessment practitioner (Consultant /s);
(ii) Appoint a qualified and experienced person within the structure of the proponent.

It is the responsibility of the proponent to appoint a quality and experienced person and to submit the name to the competent authority and to make sure that all the provisions of the Environmental Management Act, the Regulations for environmental assessment and management, Procedures for Environmental Assessment and Management and the Guidelines for Environmental Assessment and Management are followed.

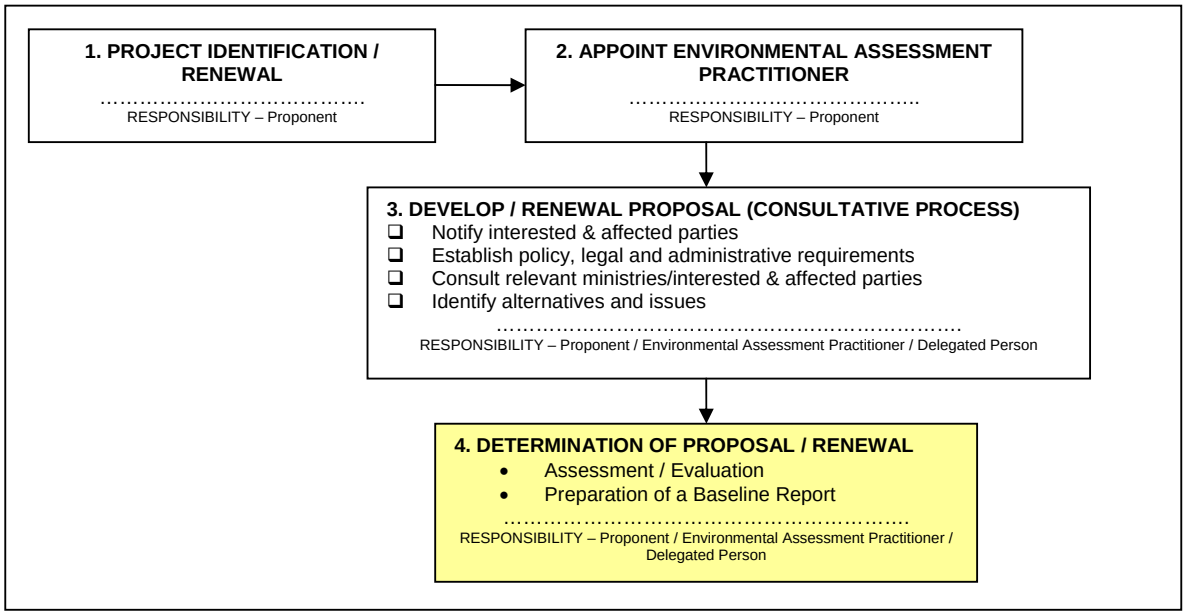
STAGE 3: DEVELOP / RENEW A PROJECT PROPOSAL



This stage involves the development of the proposal through a consultative process with all the relevant stakeholders and collecting all the relevant baseline information. Baseline information provides the basis for predicting and monitoring environmental effects and helps to identify environmental problems and alternative ways of dealing with them. Sufficient information about the current and likely future state of the environment should be collected to allow the likely effects by the proposed project to be adequately predicted. Notices about the proposed project must be placed in the local newspapers and the stakeholders should be given at least two (2) weeks to comment on the proposal.

It's the responsibility of the proponent / environmental assessment practitioner / person to make sure that all the provisions of the Environmental Management Act, the Regulations for environmental assessment and management, Procedures for Environmental Assessment and Management and the Guidelines for Environmental Assessment and Management are followed.

STAGE 4: DETERMINATION OF PROPOSAL / RENEWAL



Based on all the information collected during the early stages including the development of the proposal at Stage 3 of the project development, the proponent / environmental assessment practitioner / person must determine whether the project will have:

(i) Significant impacts; or
(ii) No significant impact.

The determination process will consider all possible or likely scenarios and alternatives based on the baseline data collected and in accordance with the provisions of the Act and the Regulations. A draft baseline / renewal report must be prepared with a draft management plan for no significant impacts or with the terms of reference for project with likely significant impacts and covering all the relevant aspect of a baseline study as outlined in stage 3.

The significance of a predicted impact depends upon its context and intensity. Significance varies with the setting or context. For example, the loss of one hectare of park in an urban setting may be more significant than the same quantitative loss in a more rural setting—unless of course that hectare is habitat for an endangered species (or belongs to you!). A new or rehabilitated road in an urban area could be far less significant than the same road in a remote or wilderness setting.

The intensity of an impact depends upon the degree to which an action:

- Affects public health, safety, or livelihood;
- Affects unique characteristics of an area (culturally or historically important resources, park lands, prime farmlands, wetlands, wild and scenic rivers, ecologically critical areas);

- Is likely to be highly controversial;
- Is highly uncertain or involves unique or unknown risks;
- Establishes a precedent; or
- Adversely affects endangered or threatened species or habitat.

Thus, determining "significance" will involve expert judgment. This judgment is influenced by applicable national or international laws protecting the environment, by regulations of the funding institution, and also by societal perceptions about what are important.

Characteristics of environmental impacts to be used;

Magnitude

- The absolute or relative change in the size or value of an environmental feature. Uncertainty is likely in forecasting the magnitude of change, and some upper and lower estimates may need to be given.

Direction

- The impact will represent a beneficial or adverse change. It is therefore important to know the direction of the impact as beneficial impacts are welcome. Adverse impacts are cause for most concern.

Extent

- The area affected by the impact -- e.g., in hectares of productive agricultural land or kilometres of river. A distinction here between on-site and off-site impacts is often useful.

Duration

- The time period over which the impact will be felt. Some impacts may be very short term (i.e., during construction), some may occur over a number of years, and some may be permanent. It is often desirable to specify duration in terms of short-term (i.e., 1 year or less), medium-term (i.e., 1 to 10 years), and long-term (i.e., more than 10 years).

Frequency

- Refers to the return period for impacts which will recur over and over again—e.g. seasonal water quality problems. Return period can often be specified by interval—e.g. annually or less, 1 to 10 years, 10 to 100 years.

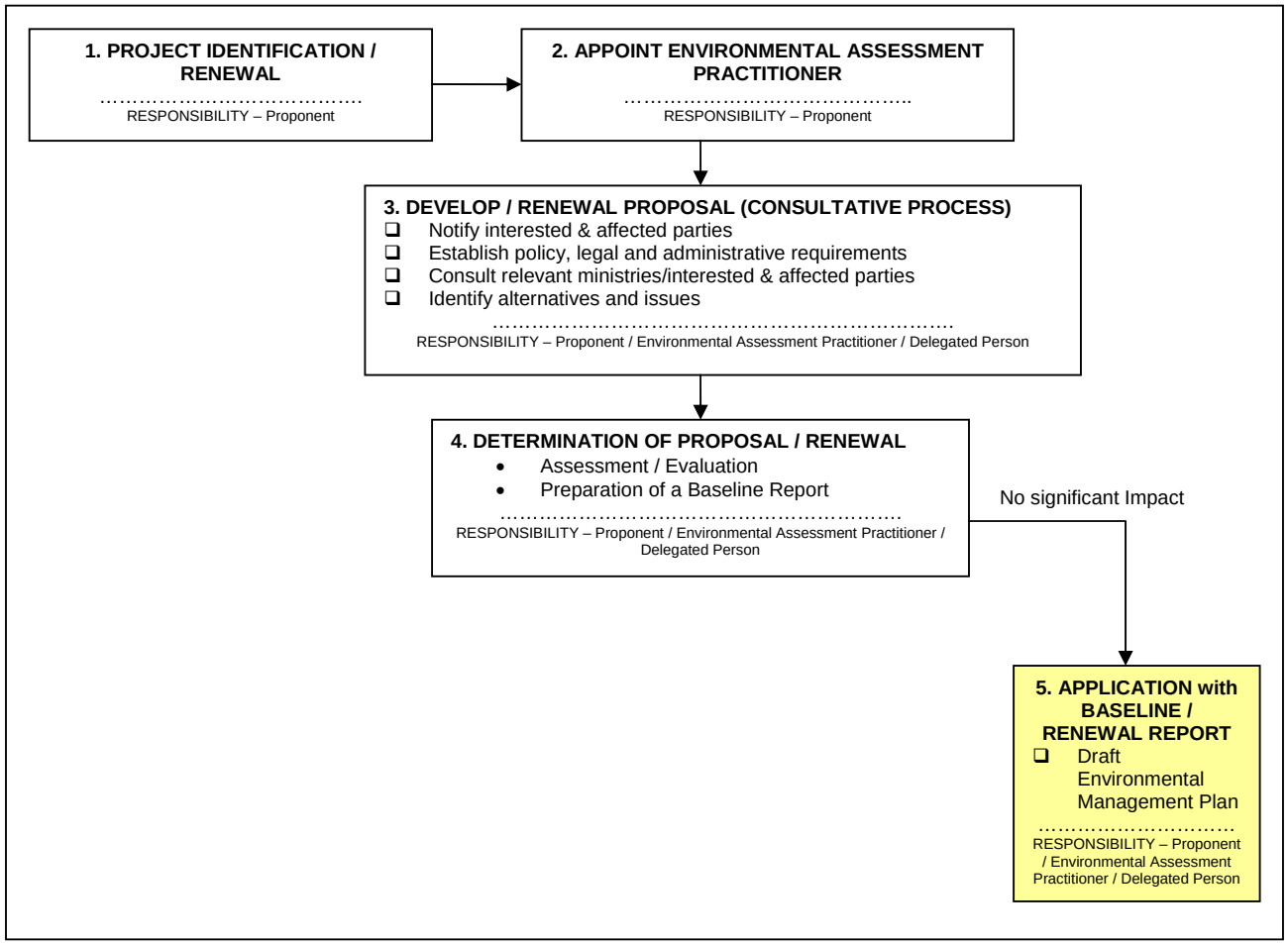
Reversibility

- Refers to the permanence of the impact. Several distinctions are possible here. Impacts may be reversible by natural means at natural rates, reversible by various forms of human intervention at reasonable costs, or be, for all practical purposes, irreversible. Irreversible impacts are likely to be more severe as this assumes permanent damage to the environment.

Likelihood of Occurrence

- Refers to the possibility of a particular impact occurring as forecast. Here, an estimate is made about how certain the impact prediction is, given the limitations of environmental science. Again, establishing categories of analysis such as "definite," "probable" and "possible" may come in useful if they are well-defined.

STAGE 5. APPLICATION (NO SIGNIFICANT IMPACT)

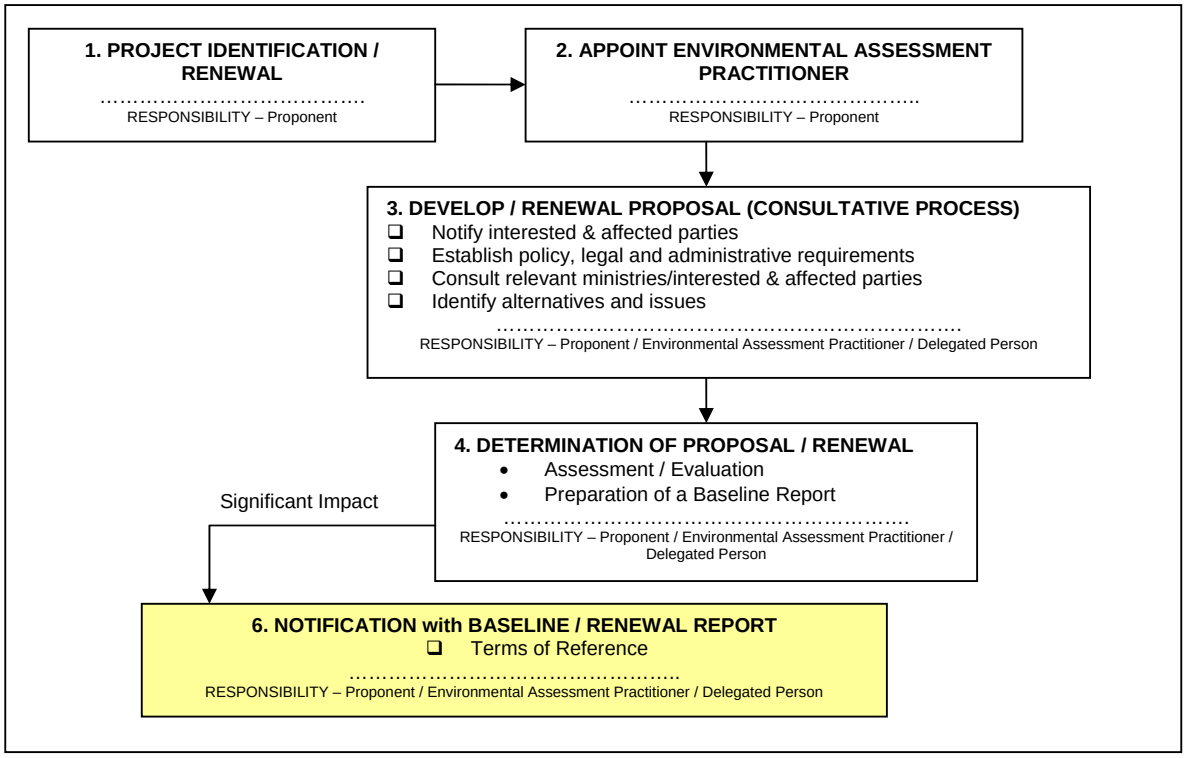


The application Stage 5 is the first stage at which the proponent formally contacts the competent authority for an Environment Clearance Certificate for a project determined to have no significant impact. The Guideline on Environmental Assessment and Management should be used to guide this decision. If it is felt that the project is not likely to result in significant impacts and/or that sufficient mitigations to maximise benefits have already been included, there will be no need for a formal assessment. The proponent / Environmental Assessment Practitioner / Person must submit the following:

(i) A Completed Formal Application Form for Issuing of an Environment Clearance Certification;
(ii) Application Fee of two thousand Namibian Dollars (N$2000.00);
(iii) A Baseline Report about the proposed Project;
(iv) A Draft Environmental Management Plan.

The competent authority shall review the application and revert to proponent in writing within thirty (30) working days from the day of the registration submission / resubmission.

STAGE 6. NOTIFICATION (SIGNIFICANT IMPACT)

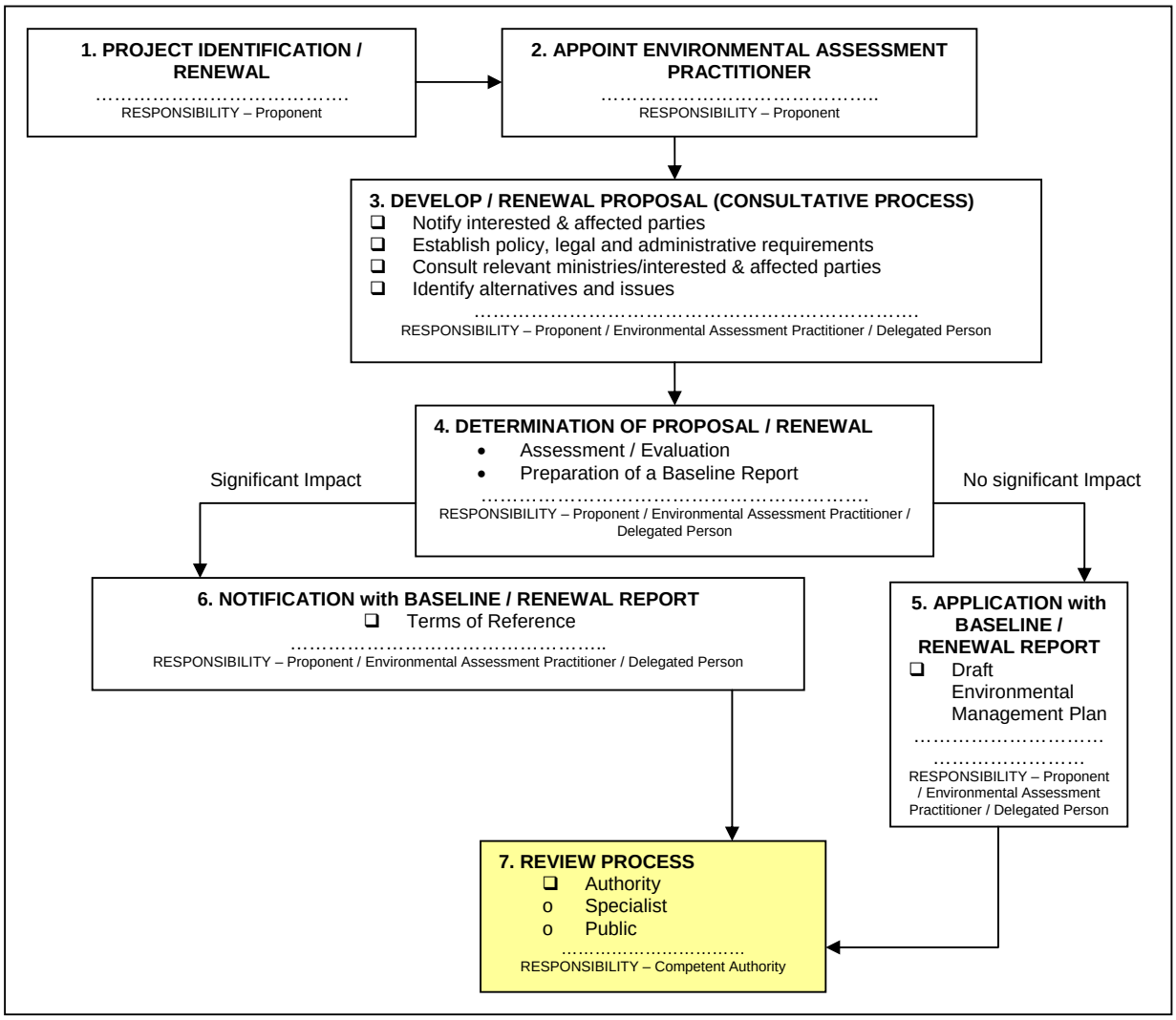


The notification Stage 6 is the first stage at which the proponent formally contacts / notices the competent authority on the intentions to undertake a full EIA for a project proposal determined to have significant impact. The Guideline on Environmental Assessment and Management should be used to guide this decision. The proponent / Environmental Assessment Practitioner / Person must submit the following:

(i) A Completed Formal Notification Form for the intention to undertake a full Environmental Impact Assessment;
(ii) Registration Fee of One Thousand Five Hundred Namibian Dollars (N$1500.00);
(iii) A Baseline Report about the proposed Project;
(iv) Terms of Reference for a full EIA study.

The competent authority shall review the notification and revert to proponent in writing within thirty (30) working days from the day of the notification submission / resubmission.

STAGE 7. REVIEW



The review stage is very important for both the application (no significant impact project proposal) and the notification (significant impacts project proposal). For the application and the notification under the significant and no significant impacts project proposals respectively, the review process is done by the competent authority upon payment of the application / notification fee and may forward the application or the notification to a specialist for review or invite the public for comments.

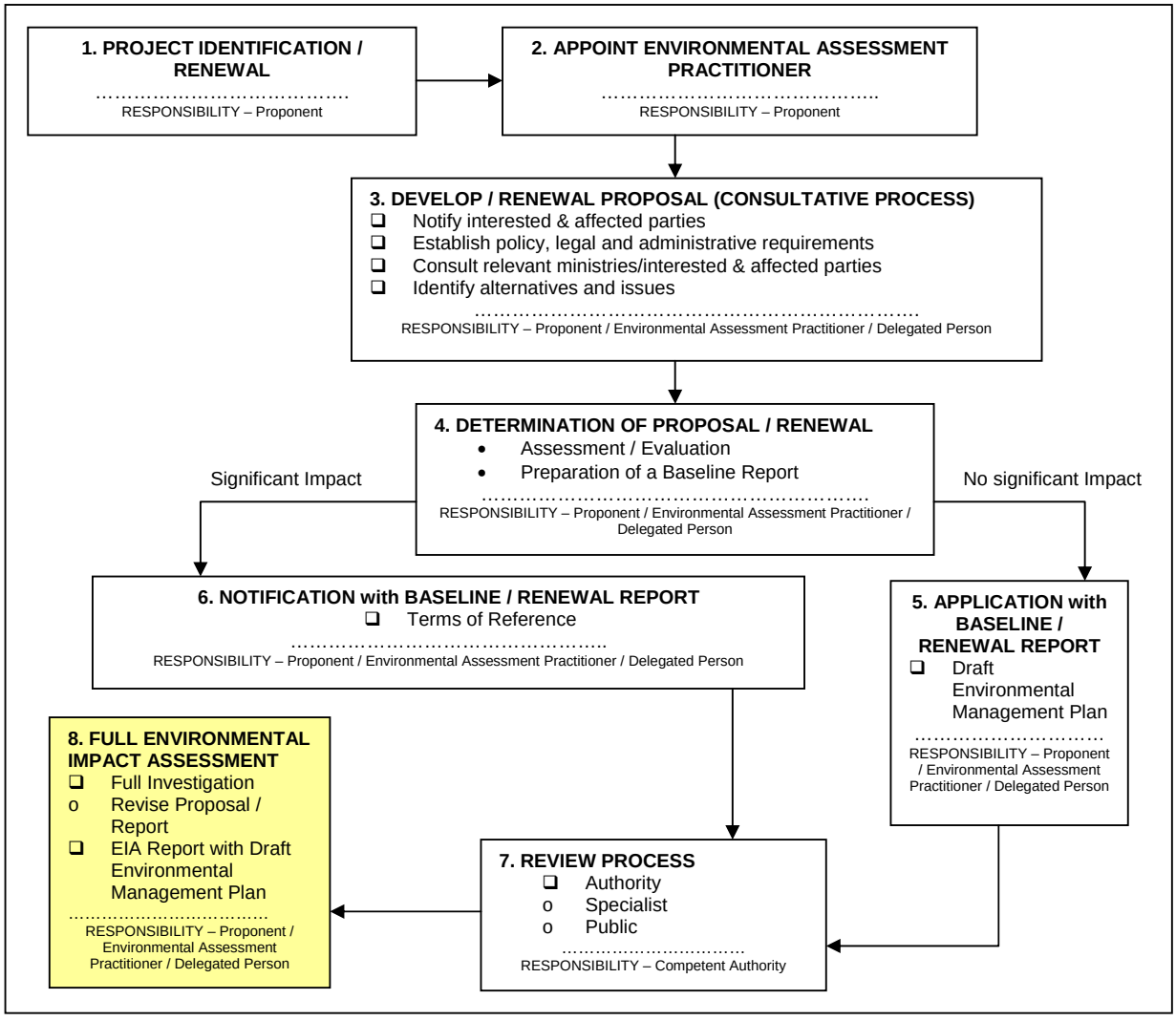
From the review process the application for project proposals with no significant impact may have one of the following outcomes:

(i) Record of decisions that is positive for the proponent (approved);
(ii) Record of decisions that is negative for the proponent (not approved) and the proponent may appeal the record of decisions;
(iii) Record of decisions that recommends the application to go for notification for a full EIA / amendments as the case may be.

For project proposals with significant impacts, the notification form and fee together with baseline report and the terms of references must be submitted to the competent authority for review. The competent authority will review the documents with the assistance of local and/or outside experts, sector Ministries, and any other organisations/individuals as considered necessary. The cost of external review shall be borne by the proponent. The recommendations and final decisions of the competent authority shall be recorded and made known to the proponent within thirty (30) working days from the day of the notification submission / resubmission. From the review process the notification for project proposals with significant impact may have one of the following outcomes:

(i) Record of decisions that is positive for the proponent (approved) to undertake the full EIA;
(ii) Record of decisions that is negative for the proponent (not approved) and the proponent may requested to change the terms of reference or what ever the case may be before implementing the full EIA;
(iii) Record of decisions that recommends the notification not to go for a full EIA but an application for Environmental Clearance Certificate.

STAGE 8. ENVIRONMENTAL IMPACT ASSESSMENT



It should become clear during the notification or classification stages of the proposal whether there will be significant impacts and if a full EA will be necessary or not. Where a full EA is required there are three main components to all EA that need to be followed and these are:

(a) Scoping;
(b) Investigation including specialist involvement; and
(c) Preparation of the Report comprising Part 1 – Environmental Impact Assessment (EIA) and Part 2 – Environmental Management Plan.

A full outline and guidance on each of the above process EA components is provided in Part 2 of this procedural and guidance document.

(i) Scoping

Scoping involves the review or build on the baseline report prepared during the early stage of the plan or programme development. This determines the extent of and approach to the investigation and should endorse the Terms of Reference established earlier. The proponent (and his/her consultant), in consultation with the competent authority, other relevant sector specific authorities, interested and affected parties, must determine which alternatives and issues should be investigated and the procedural framework that should be followed, as well as the report requirements. It is the responsibility of the proponent to ensure that all the stakeholders are given adequate opportunity to participate in environmental assessment process. The Scoping process should indicate or confirm the following:

- the authorities and public that are likely to be concerned and affected,
- methods to be used in informing and involving concerned and affected parties and opportunities for public input.
- specific reference to disadvantaged communities regarding the proposed project;
- the EA team, Terms of Reference and the confidentiality required.

If the proposal is likely to affect people, the proponent should consider the following guidelines in the scoping process:

- the location of the development in relation to interested and affected parties, communities or individuals,
- the number of people likely to be involved, the level of education and literacy of parties to be consulted,
- the socio-economic status of affected communities,
- the degree of homogeneity of the public involved,
- history of any precious conflict or lack of consultation,
- social, cultural, traditional or preferred language within the community,

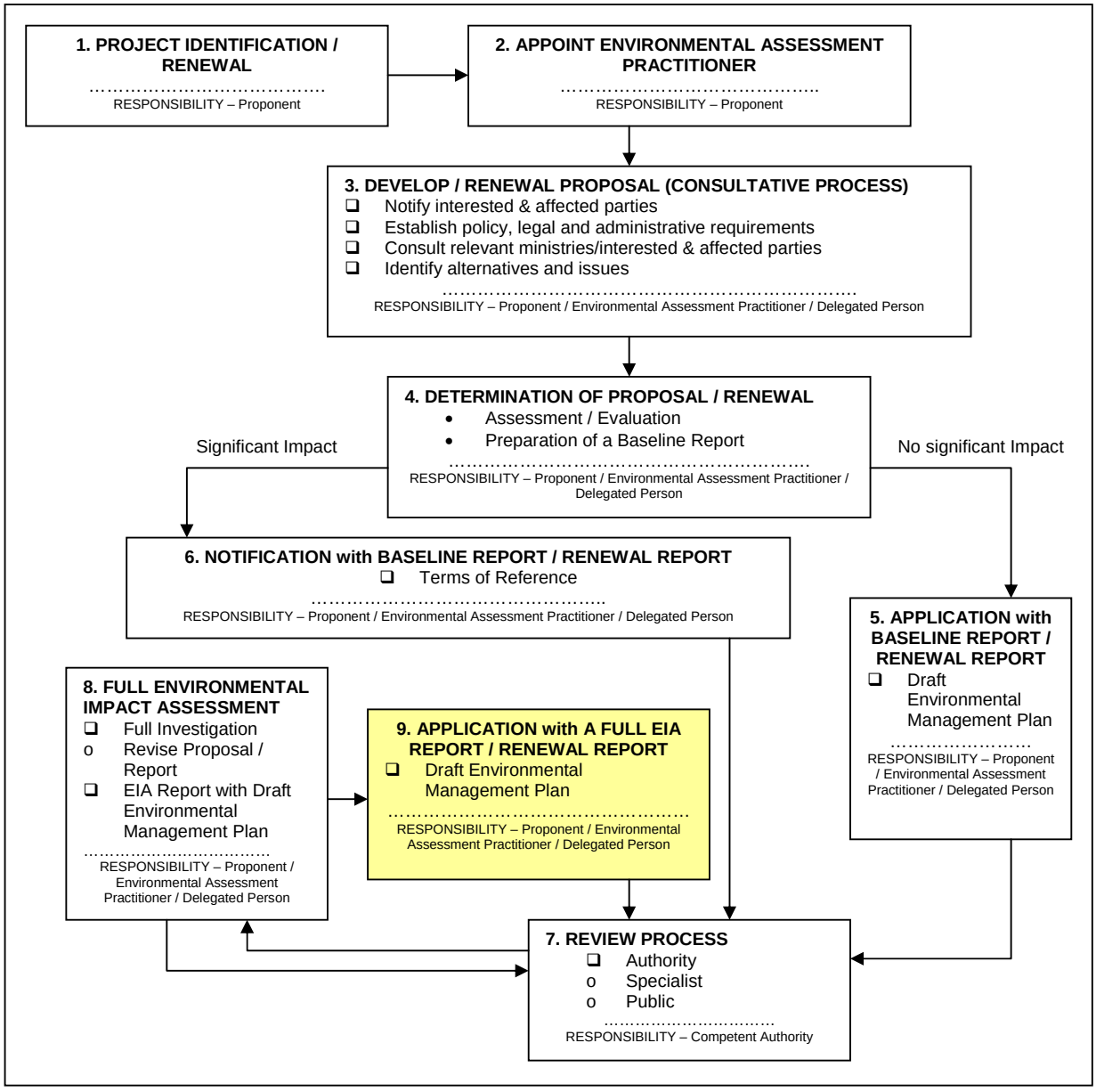
(ii) Investigation

The investigation includes literature research and field work, and is guided by the terms of reference and the scoping decisions. It is intended to provide the proponent / Environment Assessment Practitioner / delegated person with enough information on the positive and negative aspects of the proposed project, and feasible alternatives, with which to make a decision.

(iii) Report

In deciding the length and the level of detail to be provided in an Environmental Report, the proponent should bear in mind the purpose of the report as a public consultation document. It is likely to be of interest to a wide variety of readers, including decision-makers, environmental assessment practitioners, statutory NGOs, and members of the public. It should be written and prepared with this range of users in mind, and should include a non-technical summary covering the general outline as shown in the guideline (Part 2 of this Document).

STAGE 9. APPLICATION (SIGNIFICANT IMPACT)



Once the full EIA (See guideline Part 2 of this Document on how to undertake a full EIA) has been completed an application for an Environmental Clearance Certificate is submitted to the competent authority. The following documents must be submitted to the competent authority:

(i) A Completed Formal Application Form for Issuing of an Environment Clearance Certification;
(ii) Application Fee of Two Thousand Namibian Dollars (N$2000.00);
(iii) A Full Environmental Impact Assessment Report about the proposed Project;
(iv) A Draft Environmental Management Plan (EMP).

From the review process the application for project proposals with significant impact may have one of the following outcomes:

(i) Record of decisions that is positive for the proponent (approved);
(ii) Record of decisions that is negative for the proponent (not approved) and the proponent may appeal the record of decisions;
(iii) Record of decisions that recommends the application to go for specialist opinion or amendments of the full EIA.

The competent authority shall review the application and revert to proponent in writing within thirty (30) working days from the day of the application submission / resubmission.

STAGE 10. RECORDS OF DECISIONS

Whether or not a proposal is approved, there should be a record of decision, which should include reasons for the decision. This record of decision should be made available by the competent authority to any interested party, including the public. Any conditions of approval must be reflected in the record of decision.

STAGE 11. CONDITION OF APPROVAL

Once a project has been approved, the competent authority, in consultation with the proponent, may set a number of conditions. Such conditions may provide for a clear Environmental Management Plan, which specifies tasks to be undertaken in the construction, operational and decommissioning phases of the development. Provision is also made for an Environmental Clearance Certificate, whereby penalties for not adhering to the conditions of approval are agreed upon.

STAGE 12. APPEAL PROCESS

The decision making process provides an opportunity for appeal through the Minister. Besides appealing to the decision-making authority, appellants have the right to a court of law with the provisions of the Act and if malpractice is suspected.

STAGE 13. IMPLEMENTATION OF PROPOSAL

Once approved, a project may be implemented in accordance with the conditions of approval.

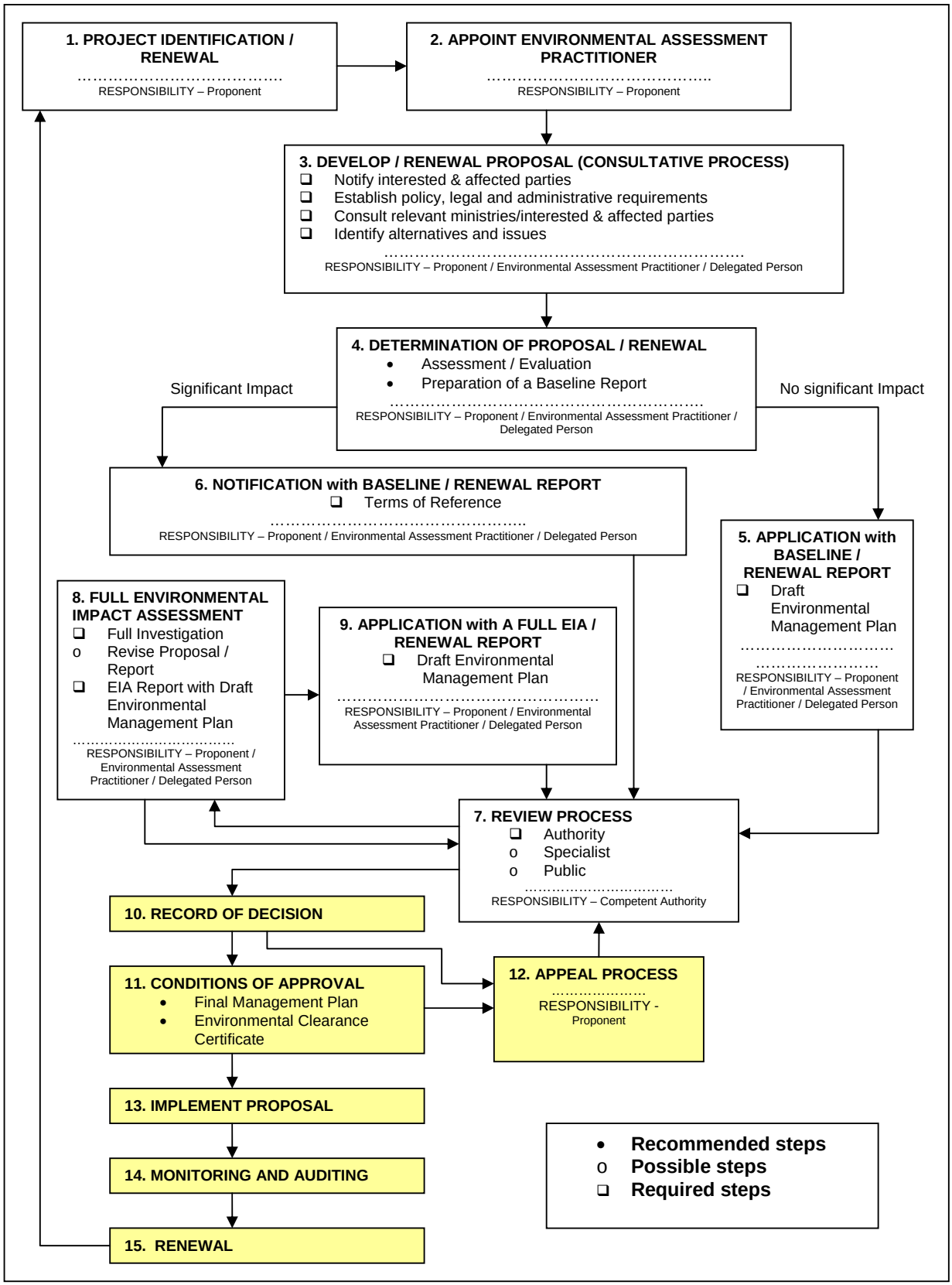
STAGE 14. MONITORING AND AUDITS

By mutual agreement, a monitoring strategy and audit procedure will be determined at this early stage so that the proponent can make the necessary budgetary provisions well in advance. Environmental monitoring is systematic measurement of key environmental indicators over time, and within a particular geographic area. The geographic area of interest may be the location of the project or activity, or a more extended area, including a body of water or watershed, an ecosystem, a country, or a multi-country region. The boundaries of the monitoring area correspond to the area in which environmental impacts of the project may be significant. Indicators are signals of, or proxies for, environmental or ecosystem health. That is, they communicate information about environmental status or change. Like an EIA study, monitoring is concerned with changes from baseline environmental conditions caused by the project activities. Thus, monitoring requires a baseline study or data and the following are examples of indicators:

- health or population of a key species with sensitivity to an environmental factor of concern;
- water turbidity, dissolved oxygen, or bacteria levels;
- level of water table;
- new area cleared for cultivation;
- percentage of land lying.

STAGE 15. RENEWAL OF ENVIRONMENTAL CLEARANCE CERTIFICATE

The renewal of the Environmental Clearance Certificate is part of the conditions of approval of any application. The renewal period will vary but will not be more than three (3) years and will depend on the specific type of project proposal. The date of expiry and renewal will be indicated on the Environmental Clearance Certificate. The renewal process must always be done three (3) months before the date of expiry of the Environmental Clearance Certificate. Failure to renew an Environmental Clearance Certificate on time and unless the project has been abandoned, will result in a fine / penalty as prescribed in the Act and the Regulations.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PART 2: GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

1. THE PROJECT PROPOSAL

1.1 INTRODUCTION

EIA has a role in each phase of the project lifecycle from initial concept to decommissioning. This includes:

(i) Initial examination during a pre-feasibility phase;
(ii) Detailed assessment, if required based on an initial analysis;
(iii) Detailed mitigation plans as a follow-up to the initial examination or detailed assessment to accompany the design phase;
(iv) Monitoring (and adjustment as appropriate) of mitigation measures carried out, during construction and/or operation;
(v) Re-assessment at decommissioning or abandonment of a project.

The EIA process begins by gathering information about the activity, project and this covers characterising the purpose and need for the activity or project the purpose and need should be defined in terms of the need for the project. The description of purpose and need should include such information as the intended beneficiaries, the results to be expected, and the rationale for how the project is expected to achieve the results. Describing the purpose or need for the project in this fundamental way is vital to understanding the alternatives that may be available.

What the project intends to do must also be characterised covering the objective or purpose. Without knowing what the proposed action is, it's not possible to know how the action could alter the environment, much less what the impacts of those alterations would be. To understand the components of the project, it very important for the Environmental Assessment Practitioner to communicate with proponent or developers, project designers, engineers, and whoever else is involved in formulating the action and, if possible, visit a similar activity or project. By knowing what the activity or project components are specifically, you can determine what is or is not likely to be a problem. For example, in a national park, air or noise may not likely be a problem, but loss of habitat could be.

It's important to consider all the parts of a project. For example, reservoirs may require haul roads, intake structures on a river and pipelines to carry water to feed the reservoir, or borrow areas at some distance from the site. Road construction, including rehabilitation, may require borrow areas, quarry sites or temporary detour roads. The Environmental Assessment Practitioner should define not just the action, but all subsidiary components.

1.1 ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT SITE OR AREA

The baseline environmental data sets required will vary depending on the project specific. In general, however, the following data will be needed:

(i) General climatic information such as annual rainfall patterns, longer-term flood and drought cycles, wind patterns;
(ii) Land-use zones such as agricultural, urban, protected area;
(iii) Resource use by the people such as the forestry, aquaculture, agriculture, fishing, natural grasslands for grazing;
(iv) Type of habitats present such as the forest, desert, grassland;
(v) Physical characteristics such as the soil type, topography, erosion potential, presence of streams, surface and ground water characteristics;
(vi) Biological characteristics such as the fauna and flora species present and their significance in terms of food source for the people, endangered species etc;
(vii) Status of any protected areas such as national or other parks, reserves, or other as defined by national or other laws that could be affected by the action, including protected areas in any possible zone of impact including direct or indirect, upstream or downstream, description of location, characteristics, conditions; and
(viii) Location and information about designated, classified, or gazetted relevant legislations affecting the specific project.

1.2 SOURCES OF ENVIRONMENTAL DATA SETS

During the project development stage the sources of data sets will be based on the available resources about the project specific. The sources of information include:

(i) Published material in different libraries;
(ii) National meteorological services in Windhoek;
(iii) Line Ministries, Regional Councils, Local Authorities, Parastatals and Government Agencies;
(iv) Local villagers, farmers, and residents;
(v) Direct observation during a site visit;
(vi) University of Namibia;
(vii) Polytechnic of Namibia;
(viii) Other training centres;
(ix) Local NGOs, consultants, and experts;

1.3 TYPES OF DATA SETS

Effort should be devoted to collecting and using available maps to identify and chart the location and movement of human and natural resources. Maps may display environmental or economic/social information, or they may combine the two categories. Map resources to look for include:

- **Topographical and physical maps** at the scale 1/10000 to 1/20000 provide information on: inhabited areas; major wind directions; waterways and water bodies; different types of vegetation cover; sensitive and fragile areas; protected forests; and, classified forests.

- **Maps, plans and sketches of the proposed project or activity** provide information on: land use around the selected site; areas disturbed during construction, and type of disturbance; existing or planned solid waste collecting systems, especially for urban projects; and, existing or planned liquid waste collection systems.

Economic and social data sets should also be collected and type of data will vary depending on the type of project. Such data sets may include the following:

(i) Crops and livestock raised, and associated agricultural practices (e.g., tillage and harvesting methods, pesticide and fertilizer use);
(ii) Agriculture, rain-fed or irrigated;
(iii) Local water sources and usage;
(iv) Community resources (e.g., raw building materials, land ownership and distribution, work patterns, role of women);
(v) Local sanitation facilities and hygiene practices;
(vi) Population size and demographics (e.g., principal diseases, health and family planning practices, sex/age distribution);
(vii) Local religion, culture, and traditions;
(viii) Literacy levels and educational training facilities; and
(ix) Community organization, leadership, communication, and types of occupations.

1.4 THE SCREENING / DETERMINATION OF PROPOSAL

The determination of a proposal or screening is the first and simplest stage of considering the environmental impacts of an activity. Based on the general characteristics of the project, screening determines the type of environmental assessment process the project will require.

The determination process results in one of three outcomes:

(i) The nature of the project demands a full EIA;
(ii) By its nature, the project is unlikely to have any significant environmental impacts;
(iii) The project may or may not require a full EIA; further inquiry is indicated.

Determination is an element of any EIA process and is generally undertaken at the stage of project identification. Most environmental impact assessment processes involve initial screening protocols to evaluate the level of likely impacts and the extent of environmental review needed. In accordance with the provisions of the Act and the Regulations, categories of activities, which are either likely or unlikely to have a significant effect on the environment respectively and thus distinguish the level of environmental review needed, are divided into four (4) groupings and these are:

(i) Construction and related activities;
(ii) Land use planning and development activities;

(iii) Resource extraction, manipulation, conservation and related activities;
(iv) Other activities.

Environmental determination or screening can involve some initial and limited efforts to assess the nature and significance of likely impacts. The guiding principle is the list of activities that may be subject to full EIA. Under some definitions of project proposal determination, this step includes using simple impact identification methods, such as guided questions or checklists, to help redesign projects at an early stage. The details to the different types of activities subject to an environment assessment process in accordance with the Act and Regulations are as follows:

1. Construction and related activities

(a) the erection or construction of facilities for the commercial generation of electricity with an output of more than **one** megawatt;
(b) the erection or construction of facilities for the commercial transmission and supply of electricity with the exception **of power supply lines of less than 2 kilometres in length**;
(c) the erection, construction or upgrading of nuclear reactors and installations for the production, enrichment, reprocessing and disposal of nuclear fuels and wastes;
(d) the erection, construction or upgrading of manufacturing, storage, handling or processing facilities for any hazardous substance, including transportation routes, structures and facilities connected therewith, and for the purpose of this clause “hazardous substance” means any substance declared as hazardous substance in terms of section 3(1) of the Hazardous Substances Ordinance, 1974 (Ordinance No. 14 of 1974), or in terms of any other law relating to the control of hazardous substances;
(e) the construction of public roads;
(f) the construction or upgrading of railways and harbours and associated structures;
(g) the construction or upgrading of airports, airfields and associated structures;
(h) the erection or construction of any structure below the high water mark of the sea;
(i) the erection or construction of any structure associated with aquaculture activities where such structures are not situated within an aquaculture development zone declared in terms of section 33 of the Aquaculture Act, 2002 (Act No. 18 of 2002);
(j) the erection or construction of cableways and associated structures;
(k) the erection or construction of communication networks including towers, telecommunication lines and cables as well as structures associated therewith including roads;
(l) the erection or construction of motor vehicle and motorcycle racing and test tracks;
(m) the construction of canals and channels including the diversion of the normal flow of water in a riverbed and water transfer schemes between water catchments and impoundments;
(n) the construction of dams, reservoirs, levees and weirs;

(o) the erection and construction of tourism facilities and associated structures including all wheel drive trails or activities related to tourism that may have a significant effects on the environment;
(p) the erection and construction of sewage treatment plants and associated infrastructure;
(q) the erection and construction of buildings and structures for manufacturing, processing, industrial or military activity;
(r) the erection and construction of veterinary, protected area or game proof and international boundary fences;
(s) the erection and construction of waste sites, including any facility for the final disposal or treatment of waste;
(t) the erection and construction of oil refineries; and
(u) the construction of oil, water, gas and petrochemical and other bulk supply pipelines.

2. Land use planning and development activities

(a) The rezoning of land from -
  (i) residential use to industrial or commercial use;
  (ii) light industrial use to heavy industrial use;
  (iii) agricultural use to industrial use;
  (iv) use for nature conservation or zoned open space to any other land-use;
(b) reclamation of land from below or above the high-water mark of the sea or associated inland waters;
(c) alteration of natural wetland systems;
(d) any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976 (Ordinance No. 11 of 1976);
(e) the establishment of resettlement schemes; and
(f) the declaration of an area as an aquaculture development zone in terms of section 33 of the Aquaculture Act, 2002 (Act No. 18 of 2002).

3. Resource extraction, manipulation, conservation and related activities

(a) prospecting, quarrying, mining, mineral extraction or mineral beneficiation activity;
(b) the farming or importation or release or contained use of any genetically modified organism or plant or animal species that may have a significant impact on the environment;
(c) the genetic modification of any organism with the purpose of fundamentally changing the inherent characteristics of that organism;
(d) the abstraction of ground or surface water for industrial or commercial purposes; and
(e) clearance of forest areas, reforestation and afforestation.

4. Other activities

(a) pest control programmes;
(b) the import, processing and transit of genetically modified organisms; and
(c) the import, processing, transit or export of waste.

1.5 THE PLAYERS IN THE EIA PROCESS

The responsibilities of individuals and groups of individuals who participate in the EIA process vary from project to project. In each case, the roles should be explicitly delineated, and the procedure to be followed should be understood by all the players, including the public. The following is general outline of the players in the EIA process:

(i) **Competent Authority / Decision-maker** – an organ of state which is responsible, under any law, for granting or refusing an authorisation;
(ii) **Environmental Assessment Practitioner** – is the person, agency or company having responsibility for preparing the EIA;
(iii) **Proponent** – can be a government agency, a private firm or individual wishing to initiate the project;
(iv) **Reviewer** – is the person, agency or board with responsibility for reviewing the EIA and assuring compliance with published guidelines or regulations;
(v) **Other Government Agencies** – are agencies with a special interest in the project. They may be components of the national government services or they may be associated with region, town or villages;
(vi) **Expert Advisors** – are persons with the specialised knowledge required to evaluate the proposed action. They may come from within or outside the government service.
(vii) **Public** – includes citizens and the press;
(viii) **Special Interest Groups** – includes environmental organizations, Non Governmental Organisations (NGOs), Community Based Organisations (CBOs), labour unions, professional societies, and local associations;
(ix) **International** – refers to neighbouring countries or intergovernmental bodies, multilateral and indicates the need in some cases for consultations with these bodies.

1.6 STAKEHOLDERS PARTICIPATION IN THE EIA PROCESS

Stakeholders' participation in the EIA process is a critical component in achieving transparent decision-making. Stakeholders' consultation and participation should begin in the earliest phases of project planning and continue through the decision-making and implementation process. In accordance with the Regulations, it's the responsibility of the proponent, to make sure that stakeholders involvement and participation in an EIA process is undertaken and documented as part of the EIA reporting process.

Stakeholders' involvement can be formalised by scheduling public hearings and public information sessions, creating public advisory and/or liaison groups, and periodically distributing information / notices in the daily newspapers concerning the status of project planning. Stakeholders' involvement in the EIA process gives all interested and affected parties such as local communities and individuals a voice in issues that may bear directly on their health, welfare, and quality of life. An open flow of environmental information can foster objective consideration of the full range of issues involved in project planning and can allow communities and citizens to make reasoned choices about the benefits and risks of proposed actions.

2. THE BASELINE STUDY

2.1 INTRODUCTION

The baseline study forms part of the determination process. A baseline study attempts to establish what environmental conditions will be in the absence of the proposed project. Three general principles should guide baseline studies:

(i) **Concentrate on relevant and important factors.** Historically, environmental specialists have wasted considerable effort on gathering information and performing analyses not directly relevant to assessing the nature and degree of environmental impacts. Early baseline studies compiled lists of things in the affected environment, and told little about ecosystem function and response. Today, baseline studies need to be more focused on the ecosystem properties most sensitive to disturbance;

(ii) **Establish the appropriate geographic areas in which the environment is to be "baselined."** This requires understanding where impacts arising from the project are likely to occur. For this, the Environmental Assessment Practitioner must consider the phases of the activity from planning through decommissioning and determine the geographic areas likely to be affected by each phase. Areas to consider include: the site itself, the immediate site vicinity or neighbourhood, the watershed, the airshed, the general area or region (transport routes, off-site construction quarries, disposal areas, etc.), the specific administrative jurisdictions, and areas with economic and trade linkages to the project site. (The last category is particularly relevant to socioeconomic or fiscal impacts), Note that different project alternatives can affect different geographic areas. Avoid the common mistake of concentrating too much on the site of the activity itself and not on the surroundings;

(iii) **Provide a level of descriptive detail** that is sufficient to indicate the nature of the natural and human resources that are potentially affected by the proposed action. The level of detail will vary with the nature of the proposed action and affected resources, as well as with the availability of data and the priority concerns identified in the scoping process. In some instances, the establishment of baseline data may require that data survey work be expanded, refined or extended through seasons or years in order to establish reliable environmental information over time.

2.2 ELEMENTS OF A BASELINE STUDY

The elements of the environment to be characterised in baseline study must include the following aspects:

Geology
- Regional and local geological setting,
- Bedrock formations,
- History of geological stability or instability

Topography
- General topography of region,
- Specific topography of project area

Soils
- Soils mapping,
- Soil series properties,
- Constraints to development

Groundwater Resources
- Nature of water-bearing formations,
- Recharge zones and rates,
- Sustainable safe yields,
- Locations and depths of existing wells,
- Quality

Surface Water Resources
- Drainage basins and sub-basins,
- Named and unnamed water bodies and watercourses,
- Regulatory classification of water bodies,
- Flow regimes,
- Water quality data and evaluation,
- Identification of existing permitted discharges to surface waters

Terrestrial Communities
- Spatial arrangement of vegetative community types,
- Vegetative species-abundance listings,
- Wildlife species-abundance listings,
- Records of threatened and endangered plant and animal species

Aquatic Communities
- Nature of aquatic habitats,
- Species-abundance listings for aquatic macro-invertebrate and fish communities,
- Ecological indexing of community data

Environmentally Sensitive Areas
- Identification of wetlands,
- Floodplains,
- Steep slopes,
- Stands of mature vegetation,
- Aquifer recharge areas,
- Areas of high water table,
- Areas of rock outcrop,
- Prime agricultural lands and mining.
- Identification of existing protected areas such as national parks

Air Quality
- Regional quality and trends,
- Data from local monitoring stations,

- Reported exceedances of standards

Sound Levels
- Existing sound levels,
- Sources of sound

Land Use
- Existing patterns of land use in region,
- Regional and local planning for future use, zoning

Demography
- Censused or estimated population,
- Recent trends and projections for future population

Socioeconomics
- Economic and social structure of communities,
- Tax rates,
- characteristic types of development

Infrastructural Services
- Nature and status of human services such as police and fire protection, hospitals, schools, utilities, sewage, water supply, solid waste disposal

Transportation
- Layout and function of existing roadways, railways, airports; existing and projected capacities and demands

Cultural Resources
- Location and characterization of identified cultural resources (archaeological, historical, cultural, landmark), potential for unidentified resources to be present in project area

Project Economics
- Comparative analysis of proposed alternatives with present worth cost-effective criteria, cost/benefit criteria, or other methods

2.3 THE PROCEDURE

In accordance with the provisions of the Act, for project determinations that do not require a full EIA, a draft environmental management plan must be developed as part of the baseline study. The baseline report and draft management plan must be submitted to the competent authority for review as part of the application process.

In accordance with the provisions of the Act, for project determinations that require a full EIA, the Terms of Reference are required to be part of the baseline report and must be submitted to the competent authority as part of registration stage. Once the registration has been noted by the competent authority, the proponent may proceed to the full EIA implementation stage which may start with some preliminary assessment based on the baseline work carried out earlier.

3. PRELIMINARY ASSESSMENT

3.1 INTRODUCTION

Preliminary assessments are essentially rapid, streamlined EIA studies using simplified or more generic tools. Preliminary assessments are conducted when the next stage after the determination process has found that further environmental scrutiny of a project is necessary and the project will automatically demand a full EIA study as per schedules provided in the Act.

Preliminary assessments may require less than one person-week to more than one person-month of effort, depending on the need and the available background studies and site surveys. They can involve the use of many of the simpler methods, such as checklists and matrices, often used at the later stages of the full environmental impact assessments.

3.2 CHOOSING TOOLS

It is important to recognise that environmental impact assessment studies are not primarily undertaken as research studies to advance knowledge but as inputs to **planning** and **decision making processes** for which **time**, **technical** and **cost constraints** are operative. Typically, there are several alternative methods available to perform a single EIA task. High-level criteria to apply when selecting a method include:

(a) **Appropriateness.** The assessment method chosen should be appropriate to the specific task for which it is to be used—that is, the method should produce the needed output. For example, during preliminary assessments, fairly simple assessment methods can provide 'order of magnitude' assessments of impact which may be entirely appropriate. Sophisticated methods which provide very detailed and precise output are probably not appropriate at this stage of the EIA process. On the other hand, simple methods may be too crude and approximate for use in detailed stages of impact prediction.

(b) **Economy.** A method should be cost-effective. That is, it should permit an environmental analysis of the required quality to be completed as economically as possible. The resource needs of the alternative assessment methods available for similar kinds of tasks vary considerably. (Factors affecting resource requirements include: quantity and quality of data input required, the quantity and skills of staff required for their use, the overall length of time required to obtain usable output, etc.)

3.3 AVAILABLE TOOLS

The ranking of alternative assessment methods may differ from project to project. For example, in some circumstances, considerations of economy may conflict with those of appropriateness, replicability, and consistency. If so, a trade-off between these different goals of good assessment practice will have to be faced. However, in a well-organised EIA system, the resolution of such conflicts should not be a

serious problem. The following are some of the common tools that are used in the EIA process:

(a) Checklists;
(b) Interaction matrices;
(c) Decision Support Tools (Manual and GIS Map Overlays).

3.3.1 Checklists

Checklists offer the advantage of simplicity. They bring structure to gathering and classifying information, to identifying potential environmental impacts, and to thinking about possible mitigation options. They also help in reaching tentative conclusions on the extent of environmental impact. It is important to note that, no matter what the structure of checklists, a variety of sources can be used to develop them; local individuals, experts, and other concerned parties. A simple checklist can be comprised of the following categories:

- **Simple checklists.** As the name implies, these are simple lists of environmental factors, conditions or characteristics whose presence or absence is to be noted. They usually provide no guidance on a) the assessment of impacts on these factors, b) any useful predictive techniques, or c) the type of data needed;
- **Descriptive checklists** provide guidance on assessment, with corresponding information on appropriate measurements and predictive techniques;
- **Scaling checklists** attempt to indicate the importance of impacts to decision-makers;
- **Questionnaire checklists** can provide a thorough and useful step-by-step procedure, particularly useful to non-experts.

Checklists are widely used in EIA processes to guide decision-making, especially during the pre-feasibility and planning phases of the project lifecycle, when it is most critical to anticipate adverse impacts and to include mitigating measures in projects. Checklists are designed:

- To help ***identify significant negative impacts*** by providing the right questions to ask regarding the various project activities and the respective environmental components that may be affected. Checklists can be used to determine environmental impact thresholds, thus indicating whether a full-scale EIA is needed for a particular project;
- To provide a ***systematic approach*** to the environmental screening of development projects. A checklist forces the assessment to consider a standardised set of activities or effects for each proposed action, thus bringing uniformity to the assessment process;
- To indicate ***how and why certain project activities have environmental impacts*** which will allow planners to transfer those principles to the screening of projects not specifically addressed by the checklists;
- To assist in ***identifying appropriate mitigation measures*** to be incorporated into the project design; and,
- to ***increase environmental awareness and understanding*** of the relationship between environmentally sound practices and sustainable development.

3.3.2 Interaction Matrices

The main disadvantage of checklists is that they generally fail to link specific development activities with given impacts and this led to the development of matrices, perhaps the most popular and widely used EIA methodology (Bisset, 1987). Typically, matrices combine two checklists. Alternative actions (measures, projects, sites, designs) are listed as column headings, while the rows are the criteria (environmental outcomes) that should determine the choice of alternative. In each cell of the matrix, a conclusion can be listed indicating whether the alternative action is likely to have a beneficial or adverse effect relative to the indicated criterion. In some matrices, the conclusion is stated as a numerical value or symbol indicating the level of intensity of the effect. There is an opportunity, moreover, to apply relative weighting to the various criteria when evaluating the completed matrix.

An interaction matrix allows the identification of cause-effect relationships between specific activities and impacts, but does not easily distinguish between direct and indirect impacts. The entries in the cells of the matrix can be either qualitative or quantitative estimates of impact. Each cell can also be divided diagonally to display an estimate of both impact severity and significance. Matrices are useful for impact identification and for displaying the results of both impact analysis and impact assessment.

Examples of the matrices developed and used by Mwiya, (2003) for the assessment of the relationship and influence of different data sets with respect to the likely impacts that may be associated with a solid waste disposal sites in the arid and semiarid environments are shown in Figures 3.1 – 3.4.

KEY: **(1 on 2 = high), STANDS for '1' which is PRECIPITATION has a HIGH direct or indirect influences on '2' which is TEMPERATURE,** **Where VERY LOW = 1D1, LOW= ID2, HIGH = ID3 and VERY HIGH = ID4**			
1. PRECIPITATION	**(1 on 2) = Low**	**(1 on 3) = Very High**	**(1 on 4) = Very Low**
(2 on 1) = high	**2. TEMPERATURE**	**(2 on 3) = Very High**	**(2 on 4) = Low**
(3 on 1) = Very high	**(3 on 2) = Very high**	**3. EVAPO-TRANSPIRATION**	**(3 on 4) = Low**
(4 on 1) = Very high	**(4 on 2) = Low**	**(4 on 3) = High**	**4. WIND**

Figure 3.1: Example of the matrix evaluation of the climatic component data sets.

KEY: (1 on 2 = high), STANDS for '1' which is INDUSTRIES has a HIGH direct or indirect influences on '2' which is TYPE OF WASTE, Where VERY LOW = 1D1, LOW= ID2, HIGH = ID3 and VERY HIGH = ID4				
1. INDUSTRIAL ACTIVITIES	(1 on 2) = Very High	(1 on 3) = Very High	(1 on 4) = Very High	(1 on 5) = Very High
(2 on 1) = Very high	2. TYPE AND AMOUNT OF WASTE	(2 on 3) = Very High	(2 on 4) = Very High	(2 on 5) = Very High
(3 on 1) = Very high	(3 on 2) = Very high	3. LIKELY CONTAMINANTS	(3 on 4) = Very High	(3 on 5) = Very High
(4 on 1) = Very Low	(4 on 2) = Very Low	(4 on 3) = Very Low	4. ECOLOGICAL SETTING	(4 on 5) = Low
(5 on 1) = Very high	(5 on 2) = Very High	(5 on 3) = High	(5 on 4) = Very High	5. COMMUNITY SETTING

Figure 3.2: Example of the matrix evaluation of the environmental component data sets.

KEY: (1 on 2 = high), STANDS for '1' which is GEOLOGY has a HIGH direct or indirect influences on '2' which is GEOMORPHOLOGY, Where VERY LOW = 1D1, LOW= ID2, HIGH = ID3 and VERY HIGH = ID4			
1. GEOLOGY	(1 on 2) = Very High	(1 on 3) = Very High	(1 on 4) = Very High
(2 on 1) = Very High	2. GEOMORPHOLOGY	(2 on 3) = Very High	(2 on 4) = High
(3 on 1) = Very high	(3 on 2) = Very High	3. WATER	(3 on 4) = Very High
(4 on 1) = Very high	(4 on 2) = Low	(4 on 3) = High	4. GEOTECHNICAL PROPERTIES

Figure 3.3: Example of the matrix evaluation of the ground component data sets.

KEY: (1 on 2) = high STANDS for '1' which is CLIMATIC has a HIGH direct or indirect influences on '2' which is ENVIRONMENTAL, Where VERY LOW = 1D1, LOW= ID2, HIGH = ID3 and VERY HIGH = ID4			
1. CLIMATIC COMPONENT	**(1 on 2) = High** The climatic components influence the mobility and nature of the contaminant sources and contain pathway factors that have an influence on the target factors within the environmental components such as fauna & flora.	**(1 on 3) = High** The climatic components influence the efficiency of potential pathway factors within the ground components, which includes faults and fractures opening due to erosion.	**(1 on 4) = Very high** The climatic components have a great indirect influence on the type of mitigation. The indirect influences are due to the direct influences of the climatic components on the environment and ground components.
(2 on 1) = high Gas emission as one of the sources from the environmental components and is a health hazard, which contributes to the amount of greenhouse gases emitted into the atmosphere.	**2. ENVIRONMENTAL COMPONENT**	**(2 on 3) = High** The environmental components consist of source factors as well as target factors within it. It influences the type of ground condition and material to be used.	**(2 on 4) = Very high** Environmental components have a great influence on the type of mitigation due to the source and target factors within it.
(3 on 1) = high Ground components have a direct influence on some of the climatic components such as the amount of surface runoff, infiltration, and local wind direction due to topography influences and other ground components.	**(3 on 2) = high** The influence of ground to the environmental components pronounced due to the number of pathways within the ground model that can enable the sources within the environmental model to reach the target of concern in both models.	**3. GROUND COMPONENT**	**(3 on 4) = Very high** The ground component has a great influence on the mitigation. These include influences on location depending on the nature of the ground condition. Both pathways and targets factors are found within the ground component.
(4 on 1) = high The mitigation has to reduce the role of the pathway factors of the climatic components by designing structures that can stand climatic fluctuations.	**(4 on 2) = high** The mitigation is the barrier for the source and target factors within the environmental components. It can cause some impacts to some target factors within the environmental components, which include damage to flora due to poor mitigation.	**(4 on 3) = High** The mitigation is the main barrier and it can be a source as well as a pathway factor if poor engineered site structures are constructed	**4. MITIGATION**

Figure 3.4: Example of the matrix evaluation of the climatic, environmental and ground components interactions and influences on waste disposal design. This general matrix assessment is an example of assessment process that could be used to evaluate the influences of various data sets before and after they are grouped into climatic, environmental and ground components as well as the characterised components as part of the EIA preliminary assessments.

3.3.3 Decision Support Tools (Manual and GIS Map Overlays).

This technique has always been extremely useful in identifying areas that have high environmental sensitivity. The technique entails the separate mapping of various critical environmental features - wetlands, steep slopes, soils, floodplains, bedrock outcrops, wildlife habitats, vegetative communities, and cultural resources at the same scale as the project's site plan. The environmental features are mapped on transparent plastic in different colours. The maps are then overlain on the project map to highlight the areas of highest environmental sensitivity (Figure 3.5).

Nowadays Geographical Information Systems (GISs) are used to computerise the overlay process. Environmental features are mapped, and the mapping digitised and stored in the GIS database. The mapped features can be combined to

produce computer-generated displays of one or more environmental features in a specified geographical area. If the GIS mapping is conducted systematically, information acquired on specific projects can be combined, and the GIS database becomes more detailed over time.

Even if resources or time do not allow you to physically construct overlays or to use a GIS system, comparing the maps of information about the setting with maps or plans that you have of the proposed action can be very useful. The comparison should explore how various kinds of resources/areas may or may not overlap with the geographic area affected by the proposed action. The Environmental Assessment Practitioner will need to be careful about comparing maps of different scales, so you will often not have a precise indication of areas of overlap, but you will be able to see areas of potential conflict that need to be investigated further. Figure 3.5 illustrates an example of the process methodology.

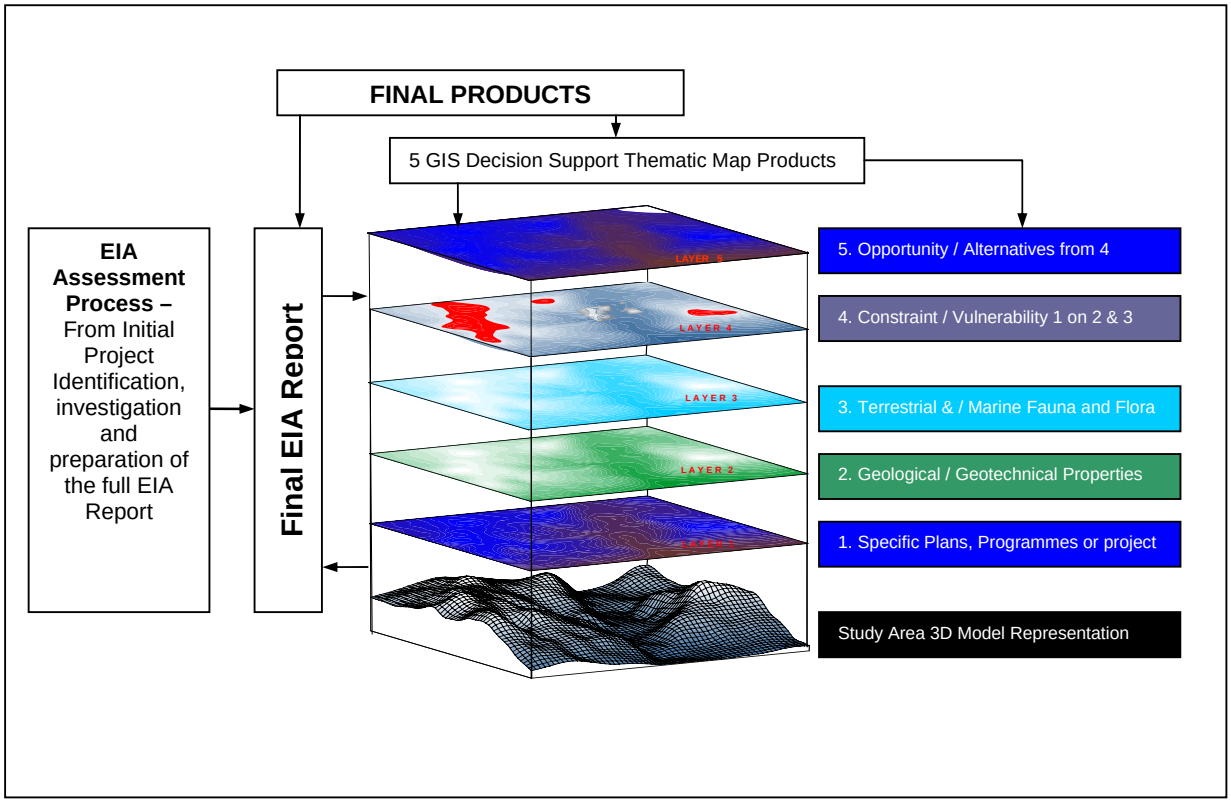

Figure 3.5: Shows a summarised Knowledge-Based Model Representation of model methodological Phase Approach and the EIA Final Report Product, together with five (5) GIS or Manual Decision Support Thematic Map Overlays.

4. DETAILED ASSESSMENT

4.1 INTRODUCTION

Once a decision to conduct a full EIA study is made, the scoping process is initiated to determine the key issues and choices of alternatives to be examined in the full EIA. Issues include, but are not limited to:

- time scale;
- geographical scale;
- budget;
- affected environment; and
- significant impacts.

The scoping process is intended to assure that:

- real problems are identified early and studied properly;
- that issues which are not significant or which have been treated in prior EIAs are eliminated from detailed study; and
- that the final EIA report is balanced and thorough.

Scoping is an early, open part of the EIA process. It is typically carried out in a meeting or series of meetings involving the project proponent, local experts, the public, and the responsible government agencies. The structure of the meetings may vary depending on the nature and complexity of the proposed action and on the number of interested participants. The different types of scoping meetings that may be undertaken are as follows:

- Small-scale scoping meetings might be conducted like business conferences, with participants contributing in informal discussions of the issues;
- Large-scale scoping meetings might require a more formal atmosphere, like that of a public hearing, where interested parties are afforded the opportunity to present testimony;
- Other types of scoping meetings could include "workshops," with participants in small work groups exploring different alternatives and designs.

In defining the boundaries of the EIA, scoping defines the interdisciplinary expertise needed for the EIA. As part of the scoping exercise, Terms of Reference are typically developed for each of the individual team members. As is the case with all procedural and analytical stages of the EIA process, documentation of the scoping process should be systematic and thorough.

4.2 IDENTIFY ALTERNATIVES TO BE STUDIED

EIAs should consider the impacts of three alternatives:

- the proposed activity for the proposed project under consideration;
- the no-action alternative; and
- other alternatives to the proposed activity that fulfils the general objective or need.

In most cases, various legal requirements and instruments will require that all three must be considered. Identifying and describing feasible alternatives should be carried out as soon as possible after the purpose and need are established; in this way, project planning does not bias the assessment toward one alternative or another.

Alternatives should offer legitimate and substantive choices. Ideally, the alternatives evaluated should provide decision-makers with different geographical locations for the action and with different technical or planning solutions for meeting the same need or objective.

4.3 IDENTIFY POTENTIAL IMPACTS

Any or all of the elements of the environment characterised in the baseline study and or preliminary assessments may be affected by the proposed activity. The EIA seeks to identify what the impacts may be, and then to predict or quantify them. Identifying the potential impacts of an activity and its alternatives combines science and art. A wide range of scientific tools and methods ranging from simple to complex ones are available. However, the application of tools is subject to limitations due to inadequate data, complex relationships, and limited time and resources. The art lies in knowing when to apply each tool and how to make important assumptions in the absence of complete information.

The simplest and most commonly used tools are checklists, matrices, map overlays, and network analyses. Other more sophisticated tools can be employed, such as computer-based geographic information systems. Knowledge-Based Systems (KBS), experienced judgment, and simple logical reasoning all help to fill data gaps and ensure that the tools are applied in a sound manner.

4.4 PREDICT POTENTIAL IMPACTS

Once potential impacts are identified, the next step is to quantify these impacts, that is, to predict the extent of their influence or of the changes in environmental conditions that would be caused by the proposed action and its alternatives. To do so requires an understanding of the important cause-and-effect relationships. The no-action alternative is critical, as it serves as a baseline against which the other alternatives can be measured. When the environmental consequences of the other alternatives are weighed against their projected benefits, the no-action alternative can sometimes be the preferred alternative and the one selected. The no-action alternative is defined by the baseline study.

In general, there are two approaches that are commonly used to predict ultimate impacts and these are:

(a) **Quantitative analysis relies** on simulation models, such as air quality or water quality models, that represent the linkages between elements of ecosystems or other environmental components in mathematical terms. Simulation modelling tends to be complex, expensive, and data-intensive. Its use may be limited due to data and financial constraints common to

most developing countries. However, it's important to note that, not all quantitative analyses need to rely on models. The number of people affected, such as those relocated or subject to some describable change in the environment, can be counted; the acres of habitat disturbed can be measured; the per capita amount of sewage or solid waste generated can be estimated; the loss of an economic resource and its income value can be calculated.

(b) **Qualitative analyses** rely on professional judgment or intuitive reasoning to predict cause and affect relationships and ultimate impacts. Often, these types of predictions are most appropriate given resource constraints. One straightforward way to systematically consider impacts qualitatively but systematically is to think about linkages among impacts. Road-related wildlife deaths, for example, are a function of projected traffic volumes and speeds. Traffic volume and speed, in turn, depend upon the type and kind of road and the population in an area; the level and significance of impact would depend upon the types of wildlife in the area and whether migration or reproductive patterns would be severely affected.

4.5 CLASSES OF IMPACTS

Environmental impacts cannot be described in one word. Each impact has a number of dimensions which together create a full description of the impact. Typical descriptors or dimensions must be undertaken and if possible, a forecast or prediction should be made for each dimension. In order to be able to clearly describe the different types of impacts, it's important to know the different classes associated with the specific project proposal. The following are general classes of impacts:

(i) **Direct (Primary) vs. Indirect (Secondary) Impacts**. Direct impacts are those effects that are generally associated with the construction, operation, or maintenance of a facility or activity. They are generally obvious and quantifiable. Indirect impacts are induced changes in the environment, population, economic growth and land use. Examples of indirect impacts include: strip settlement associated with new roads, waterborne disease associated with abandon construction borrow pits, or siltation of rivers and streams caused by construction activity;

(ii) **Short-Term (Temporary) vs. Long-Term (Permanent) Impacts**. Impacts can be short-term or long-term depending upon the persistence or duration of the impacts. The duration of impacts may have a lot to do with the project phase in which they occur: pre-operational (e.g., construction), operational, or post-operational (e.g., after project completion or decommissioning);

(iii) **Impacts can also occur in anticipation of a project**. The threat of an activity or project considered undesirable can lead to loss of land value, making it difficult to transfer nearby properties, even before the project occurs. Likewise the promise of an action considered desirable may induce people to move to the location, in hopes that they will become project beneficiaries. Concerns about relocation can be more intense before a move than the actual relocation. It is a common pitfall to ignore those impacts occurring in the

planning and assessment phase or those that occur after the project has served its useful life.

(iv) **Positive (Beneficial) and Negative (Adverse) Impacts**. Although the term "environmental impact" has come to be interpreted in the negative sense, many actions have significant positive effects that should be clearly defined and discussed. This is particularly appropriate for redevelopment or remedial actions whose specific purpose and need is to remedy any undesirable conditions;

(v) **Cumulative Impacts**. Cumulative impacts are those environmental impacts that result from the incremental impact of the proposed action on common resource when added to other past, present, and reasonably foreseeable future actions. Circumstances generating cumulative impacts could include: water quality impacts from an effluent discharge that is combined with other point source discharges or from non-point source runoff; or loss and/or fragmentation of environmentally sensitive habitats (forests, wetlands, farmlands) resulting from several separate development projects within the same area. The assessment of cumulative impacts is difficult, in part due to the speculative nature of the possible future actions, and in part due to the complex interactions that need to be evaluated when considering collective effects. Water and quality modelling provides the means to study the likely effects of cumulative impacts.

4.6 DETERMINE SIGNIFICANCE OF IMPACTS

The significance of a predicted impact depends upon its context and intensity. Significance varies with the setting or context. For example, the loss of one hectare of park in an urban setting may be more significant than the same quantitative loss in a more rural setting, unless of course that hectare is habitat for an endangered species. A new or rehabilitated road in an urban area could be far less significant than the same road in a remote or wilderness setting. The intensity of an impact depends upon the degree to which an action:

- affects public health, safety, or livelihood;
- affects unique characteristics of an area (culturally or historically important resources, park lands, prime farmlands, wetlands, wild and scenic rivers, ecologically critical areas);
- is likely to be highly controversial;
- is highly uncertain or involves unique or unknown risks;
- establishes a precedent; or
- adversely affects endangered or threatened species or habitat.

Thus, determining "significance" involves a judgment. This judgment is influenced by applicable national or international laws protecting the environment, by regulations of the funding institution, and also by societal perceptions about what are important.

4.7 COMPARE AND EVALUATE ALTERNATIVES

Once the level of potential impacts has been predicted, the Environmental Assessment Practitioner will need to weigh and compare the various types of

impacts in order to decide on the preferred alternative. Of necessity, this process involves value judgments and trade-offs between environmental and economic gains and losses. Therefore, the methods you use to make the comparisons should be as explicit and transparent as possible.

There are various systematic approaches that can help in this effort, such as environmental indices, cost-benefit analysis, hypothetical choice approaches, and multi-criteria analysis. However, all involve subjective and value-laden premises, since comparisons must be made between unlike things. The different categories of tools all attempt to produce numerical estimates of the environmental impacts of projects or activities. Because such estimates are never certain, all of the techniques are particularly concerned with the range of likely outcomes, or the probability of a particular result and such tools include the following:

(i) **Simulation Modelling** (Impact Prediction). In this approach to environmental impact assessment, the principal cause-effect relationships of a proposed action are set out in a mathematical model capable of predicting future environmental conditions. Such models come in all degrees of complexity, from simple variations on mass balance equations (e.g., for estimating nitrate-nitrogen in groundwater) to highly complex multivariate systems. Some models include statistical routines for estimating error associated with model outputs. All but the simplest involve computer modelling. Environmental effects that have been mathematically modelled include: thermal plumes, noise, transportation, air emissions, storm water runoff, pollutant transport in water, pollutant transport in soils, risk assessment, ecological risk assessment, and wasteload allocations;

(ii) **Risk Assessment** refers to analyses that assess the potential risk of harm a project or activity will impose on individuals, communities, and ecosystems. Risk assessment begins with predictions of the conditions likely to result from a project or activity. It then must evaluate the risk these conditions pose to individuals, communities and ecosystems;

(iii) **Cost-Benefit Analysis** is a formalised accounting of the anticipated costs and benefits of an action. Cost-benefit analysis is of particular use when comparing alternative forms of an action. The "costs" of an action include, but are not limited to the economic costs, the risks to long-term environmental quality and public health, and the impacts to natural and man-made resources. Benefits include monetary benefits, but also extend to beneficial changes in the quality of life, protection of sensitive environmental resources, and long-term enhancements to human health and welfare. Under costs-benefit analysis, both costs and benefits are usually assigned monetary values. This entails difficult and possibly controversial value judgements—e.g., what is the monetary value of one case of childhood asthma. Furthermore, there is no objective criteria one can apply to compare the inherent value of an endangered species with the economic benefits of a hydroelectric dam.

4.8 CHARACTERISTICS OF ENVIRONMENTAL IMPACTS

The following characteristics of environmental impacts must be utilised when characterising environmental impact assessments for all EIA reporting process in Namibia:

(i) **Magnitude**: the absolute or relative change in the size or value of an environmental feature. Uncertainty is likely in forecasting the magnitude of change, and some upper and lower estimates may need to be given.

(ii) **Direction**: the impact will represent a beneficial or adverse change. It is therefore important to know the direction of the impact as beneficial impacts are welcome. Adverse impacts are cause for most concern.

(iii) **Extent:** the area affected by the impact such as in hectares of productive agricultural land or kilometres of river. A distinction here between on-site and off-site impacts is useful.

(iv) **Duration**: the time period over which the impact will be felt. Some impacts may be very short term (i.e., during construction), some may occur over a number of years, and some may be permanent. It is often desirable to specify duration in terms of short-term (i.e., 1 year or less), medium-term (i.e., 1 to 10 years), and long-term (i.e., more than 10 years).

(v) **Frequency**: refers to the *return period* for impacts which will recur over and over again—e.g. seasonal water quality problems. Return period can often be specified by interval—e.g. annually or less, 1 to 10 years, 10 to 100 years.

(vi) **Reversibility**: refers to the permanence of the impact. Several distinctions are possible here. Impacts may be reversible by natural means at natural rates, reversible by various forms of human intervention at reasonable costs, or be, for all practical purposes, irreversible. Irreversible impacts are likely to be more severe as this assumes permanent damage to the environment.

(vii) **Likelihood of Occurrence**: refers to the possibility of a particular impact occurring as forecast. Here, an estimate is made about how certain the impact prediction is, given the limitations of environmental science. Again, establishing categories of analysis such as "definite," "probable" and "possible" may come in useful if they are well-defined.

4.9 IDENTIFY AND PREPARE MITIGATION AND MONITORING PLANS

Mitigation is the purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment. Mitigation is a general concept that could include the following list of categories:

- Avoiding impacts altogether by not taking a particular action;
- Minimising impacts by limiting the magnitude of the action;
- Rectifying impacts by repairing or restoring particular features of the affected environment;
- Reducing impacts over time by performing maintenance activities during the life of the action; and

- Compensating for impacts by providing additions to or substitutes for the environment affected by the action.

Note that the mitigation approaches above are arranged in order of their desirability. In other words, it is more desirable to avoid impacts than to rectify impacts after the fact or provide compensation for them. The culmination of the EIA process should be the preparation, testing, and implementation of practicable mitigation and monitoring work plans.

6. EIA REPORTING PROCESS

6.1 INTRODUCTION

Communicating findings is an essential part of the EIA process. The purpose of the EIA process is to foster better decision-making. This demand both that the EIA process to be technically sound and that the findings be communicated clearly. The report's level of detail and sophistication should be commensurate with the potential impacts. The following items should be included in the EIA report:

(i) **Executive Summary.** Concise discussion of significant findings and recommended actions;

(ii) **Policy, Legal, and Administrative Framework.** Discussion of the policy, legal, and administrative framework within which the EA is prepared. The environmental requirements of any co-financiers should be explained;

(iii) **Project Description.** Concise description of the project's geographic, ecological, social, and temporal context, including any off-site investments that may be required by the project (e.g., dedicated pipelines, access roads, power plants, water supply, housing, and raw material and product storage facilities);

(iv) **Baseline Data.** Assessment of the dimensions of the study area and description of relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences. Current and proposed development activities within the project area (but not directly connected to the project) should also be taken into account;

(v) **Environmental Impacts.** Identification and assessment of the beneficial and adverse impacts likely to result from the proposed project. Mitigation measures, and any residual negative impacts that cannot be mitigated, should be identified. Opportunities for environmental enhancement should be explored. The extent and quality of available data, key data gaps, and uncertainties associated with predictions should be identified / estimated. Areas that do not require further attention should be specified.

(vi) **Analysis of Alternatives.** Systematic comparison of the proposed investment design, site, technology, and operational alternatives in terms of their potential environmental impacts; capital and recurrent costs; suitability under local conditions; and institutional, training, and monitoring requirements. For each of the alternatives, the environmental costs and benefits should be quantified to the extent possible, and economic values should be attached where feasible. The basis for the selection of the alternative proposed for the project design must be provided;

(vii) **Mitigation Plan.** Identification of the feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels, and estimation of the potential environmental impacts; capital and recurrent costs; and institutional, training, and monitoring requirements of those measures. The plan (sometimes known as an “action plan,” or “environmental mitigation or management plan”) should provide details on proposed work programs and schedules. Such details help ensure that the proposed environmental actions are in phase with

engineering and other project activities throughout implementation. The plan should consider compensatory measures if mitigation measures are not feasible or cost-effective;

(viii) **Environmental Management and Training.** Assessment of the existence, role, and capability of environmental units on-site, or at the agency and ministry level. Based on these findings, recommendations should be made concerning the establishment and/or expansion of such units, and the training of staff, to the point that EA recommendations can be implemented.

(ix) **Environmental Monitoring Plan.** Specification of the type of monitoring, who would do it, how much it would cost, and what other inputs (e.g., training) are necessary

(x) **Appendices**

(a) **List of EA Preparers**--individuals and organizations.

(b) **References** -- written materials used in study preparation. This list is especially important given the large amount of unpublished documentation often used;

(c) **Record of Interagency/Forum/Consultation Meetings** -including lists of both invitees and attendees. The record of consultations for obtaining the informed views of the affected people and local NGOs should be included. The record should specify any means other than consultations that were used to obtain the views of affected groups and local.

7. ENVIRONMENTAL MANAGEMENT PLANS

7.1 INTRODUCTION

The Environmental Management Plan (EMP) is key document and should consists of the set of measures to be taken during implementation and operation to eliminate, offset, or reduce adverse environmental impacts to acceptable levels. Also included in the plan are the actions needed to implement them. An EMP should include the following items:

(i) identification and summary of all the significant adverse environmental impacts that are anticipated;
(ii) description and technical details for each mitigation measure, including the type of impact to which it relates and the conditions under which it relates and the conditions under which it is required (e.g., continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate;
(iii) institutional arrangements with respect to the assignment of the various responsibilities for carrying out the mitigation measures (e.g., responsibilities which involve operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);
(iv) implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans;
(v) monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures, and provide information on the progress and results of mitigation; and
(vi) integration into the total project cost tables of the cost estimates and sources of funds for both the initial investment and the recurring expenses for implementing the mitigation plan.

One of the key documents required for the approval to proceed with or without a full EIA is the Draft Environmental Management Plan. The following is a summary of the key elements of an Environmental Management Plan (EMP):

☐ **Compliance with the EMP**
- Contractual commitment
- Financial provision
- Roles and responsibilities
- Penalties / incentives
- Monitoring

☐ **Environmental awareness**
- Environmental code of conduct
- Training programme

☐ **Employment / social structures**
- Recruitment
- Employment conflict
- Demographics
- Influx of jobseekers

☐ **Public relations / land use conflict**
- Noise
- Vibrations
- Aesthetics
- Information dissemination
- Complaints and grievances
- Trespassing
- Illegal access into restricted areas

☐ **Site establishment**
- Siting and utilisation of campsites, prospecting works, etc.

☐ **Roads and tracks**
- Alignment
- Dust, erosion
- Haphazard and off-road driving
- Maintenance

- Road safety

☐ **Pollution control and handling of hazardous**

- substances
- Pollution
- Health

☐ **Litter and waste management**

- Minimisation, recycling
- Collection
- Treatment
- Storage
- Transportation
- Disposal

☐ **Protecting the biophysical environment**

- Air quality
- Ground and surface water resources
- Water consumption
- Protective ground cover, topsoil
- Erosion
- Habitats and biodiversity
- Endemic and protected species
- Rescue operations
- Poaching and collection of animals and plant material
- Invasive species

☐ **Landscape quality**

- Visual intrusion and degradation
- Tourism potential
-

☐ **Protecting heritage sites and artefacts**

- Cultural
- Historical
- Archaeological
- Palaeontological

☐ **Health and safety**

- Harsh climatic conditions
- HIV / AIDS
- Occupational risks and hazards
- Public risks and hazards

☐ **Decommissioning**

- Restoration and rehabilitation
-

7.2 ENVIRONMENTAL MITIGATION AND MONITORING

Mitigation is the implementation of decisions or activities designed to reduce the undesirable impacts of a proposed action on the affected environment. Mitigation is a general concept that includes prevention or avoiding undesirable impacts. In contrast, monitoring is focused on ascertaining what these adverse impacts are, measuring them, and determining whether or not mitigation is working successfully, and/or when mitigation is necessary. Monitoring is therefore an implicit part of the definition of environmentally sound design; monitoring is a necessary complement to mitigation. Thus, the process of environmentally sound project development does not stop when project environmental effects have been identified and predicted. The design and implementation of environmental mitigation and monitoring plans are the essential, final steps in the EIA process. Environmentally sound design requires that one or both of the following conditions are satisfied:

the project's adverse impacts on the environment and natural resource base are zero or very limited; and/or
all reasonable steps have been taken to minimise adverse impacts and maximize positive impacts.

In the EIA process, environmental mitigation and monitoring implementation plans cannot be developed with specificity until after the most significant impacts and mitigation measures have been identified. In the absence of a specific plan, EIA Practitioners inevitably devote the bulk of their effort to the earlier steps of the EIA process: describing the affected environment, examining the alternatives, describing the environmental impacts, and recommending effective mitigation measures.

By the time the Environmental Assessment Practitioner reach the stage of mitigation and monitoring work plan development they have often consumed almost all the days assigned to the EIA, and have no time left to give proper attention to implementation issues. Frequently, this means that implementation plans for mitigation and monitoring do not provide sufficient detail on how mitigation and monitoring will be accomplished; who will be responsible for implementing each measure; who will be responsible for monitoring to determine if mitigation is working; how often will it be done, or what will be the cost in time in money.

Thus, the EIA process has too often resulted in excellent findings and recommended mitigation measures that never move beyond the shelf of the proponent who paid for the assessment. The following the recommended project management tactics for effective mitigation and monitoring:

(i) The Terms of Reference for the EIA Process should specify the portion of the total EIA that must be devoted to mitigation and monitoring work plan development;
(ii) Experience with mitigation and monitoring plan development should be a requirement for choosing EIA team leaders;
(iii) Those involved with implementing mitigation and monitoring plans should be involved in plan development. This helps assure realistic mitigation and monitoring plans. Plans should be field-tested before full implementation.

(i)

Environmental monitoring is systematic measurement of key environmental indicators over time, and within a particular geographic area. The geographic area of interest may be the location of the project or activity, or a more extended area, including a body of water or watershed, an ecosystem, a country, or a multi-country region. The boundaries of the monitoring area correspond to the area in which environmental impacts of the project may be significant. Indicators are signals of, or proxies for, environmental or ecosystem health. That is, they communicate information about environmental status or change. Like an EIA study, monitoring is concerned with changes from baseline environmental conditions caused by the project, program or activity. Thus, monitoring requires a baseline study or data set. The following are the example of indicators:

(i) health or population of a key species with sensitivity to an environmental factor of concern;
(ii) water turbidity, dissolved oxygen, or bacteria levels;
(iii) level of water table;
(iv) new area cleared for cultivation;
(v) percentage of land lying fallow.

Mitigation of adverse environmental impacts should be pursued at multiple points in the project design and implementation process covering the following stages:

(i) **During design**. Mitigation via design changes to the project is always the preferred mitigation method. Ideally, design changes prevent impacts from occurring in the first place. Such design changes may include changes in: project configuration, content, implementation, timing, technology employed in some activities, material used, etc. Where impacts cannot be prevented, design changes introduce mitigation activities into the project implementation plan and budget. Such changes may include maintenance or operating practices, remediation, or offsetting activities;
(ii) **During project implementation**. Monitoring may uncover adverse impacts that may jeopardize activities, the environment or the natural resource base. Corrective measures may then be needed to minimise the adverse effects;
(iii) **After a project ends**. Responsible sunsetting or decommissioning may require remediation or “clean up” of environmental damage caused by the project or activity. Should this occur, the costs of mitigation may be

significant, e.g. cleanup of toxic or radioactive waste, desalinisation of soils, etc.

7.3 FUNDING / BUDGETING FOR MITIGATION ACTIVITIES

The regulation makes provisions submission of financial grantee for decommissioning/rehabilitation/restoration/aftercare costs as a condition of approval or issue of an Environmental Clearance Certificate. A number of good financial instruments are available including insurance, bond or bank grantee. Effective mitigation design should not significantly increase project costs. Mitigation measures can often be implemented in such a way that their impact on total project costs is minimal. However, funding of mitigation measures is usually a critical issue. Too often, funds for implementing mitigation measures are not provided or budgeted, and it is often a last minute chore to find the money necessary to implement mitigation measures. Proponents should keep in mind that generally, the later mitigation is considered in the project cycle, the greater the costs may be become. If mitigation costs appear too high, even when mitigation is considered early in the project cycle, then proposed interventions should be re-examined.

7.4 THE ENVIRONMENTAL MONITORING PLAN

Project or activity environmental monitoring has three major phases and these are:

(i) design of the monitoring plan;
(ii) plan implementation; and
(iii) data analysis/dissemination.

Monitoring is planned and coordinated via the monitoring plan. In practice, monitoring plans should be integrated with mitigation plans. Like mitigation plans, monitoring plans are essential elements of projects with significant impacts on the environment. Monitoring plans will clearly identify the following:

(i) which indicators are to be monitored, at what level of detail, how they should be analysed, and how the data is to be disseminated;
(ii) the institution(s) responsible for carrying out the monitoring;
(iii) the funding sources or mechanisms which will support the monitoring;
(iv) triggering events requiring mitigation actions, and how this will be effected.

7.4.1 Gathering, Analysing and Disseminating Data

Gathering, analysing, and disseminating key environmental data and its linkage to mitigation actions are at the heart of the monitoring plan. Monitoring focuses on the key impacts identified by the EIA process. It provides timely information in

a useful format to decisions and such information and questions include the following:

(i) **Which indicators to monitor?** Determining which indicators to monitor requires understanding what questions the monitoring is attempting to answer. These questions are defined by the most significant impacts and uncertainties identified in the environmental assessment process. For example:

Eutrophification and Siltation;

- if eutrophification and siltation are potentially significant impacts of an agricultural productivity project, monitoring would focus on these aspects of water quality.

Aquifer Depletion or Soil Salinity;

- if aquifer depletion or soil salinity are of concern, the health of key salt-sensitive plant species and seasonal well water levels might be a focus of monitoring activity.

Water;

- Quantity: Rainfall amounts, river discharge, ground water depth, aquifer extent, natural storage and drainage parameters.
- Quality: Chemical, physical and biological characteristics. (e.g., pH, salinity, temperature, dissolved oxygen) (May be proxied by population of species sensitive to water quality changes
- Reliability: Seasonal, annual, high/low waters. Recharge rates. Availability of substitute resources. Variability of rainfall and climate over time (evaluated, e.g., by review of lake sedimentation cores, etc.)
- Accessibility: Access rights, conflicts.

Soils;

- Erosion: Wind and water erosion of arable lands. Gullies? Sheet erosion?
- Productivity: Soils physical and chemical characteristics. Productivity of agriculture, pastures, forests, etc. (May be proxied by heand population of plant species sensitive to soil quality chan
- Land resources and their potential: Percent of needs satisfied, percent of unsuitable land under production.
- Fallow periods: Length of fallow period and relation to soil fertility regeneration capacity.

Vegetation/Flora;

- Permanent vegetation ratio: Ratio of permanent vegetation zones versus zones cleared and put under production.
- Composition and density of natural vegetation: Species composition and density.
- Cleared zones: Percent tree and shrub cover.
- Productivity: Productivity (including secondary products).
- Others: Habitats quality, species diversity, etc. Also: local community access and control over resources.

Fauna;

- Populations: Number of species, density.
- Habitat: Extent (size, surface) and quality

Others;

- Unique zones and special ecosystems: Depends on location and zone type. Can be defined by geological, historical, sacred, archeological, biologically unique characteristics.

(ii) **What level of resolution is appropriate?** The expense of and time required for data collection, processing and analysis grow rapidly with the level of detail. Level of detail is defined by (1) the temporal resolution, and (2) the spatial resolution of monitoring data. Temporal resolution is how often data is collected from each source (seasonal, monthly, weekly, etc). Spatial resolution is how closely the data points are spaced (that is, the number of different points from which the data is gathered). For this reason, it is important early in the design of monitoring plans to establish the necessary and sufficient level of detail. This will vary depending on the site conditions and the size and complexity of the problem. Important considerations include the following:

- Frequently, analysts overestimate data needs and then gather and attempt to analyse too much data. The objective of a monitoring plan is to find the simplest, least-cost indicators and methods for measuring change that will satisfy environmental objectives.
- The amount of time needed for analysis is often grossly underestimated.
- Timing and frequency of collection depend on both the project timetable and seasonal factors. For example, baseline data should be collected before the project begins and at a minimum to measure final status at close-out. Seasonal requirements for data collection may include the start of the rainy season or of harvesting periods, etc.

(iii) **How will monitoring data be analysed and disseminated?** Raw environmental data is seldom useful to decision-makers. For example, if many plants of a key species exhibit yellowing leaves, what does this mean in terms of soil quality or water table changes? And, the even more critical question for project managers and overseers: does it mean that mitigation is unsuccessful? Does it indicate that additional mitigation measures are required? The purpose of data analysis is to reduce information to a format which allows project decision-makers to adjust mitigation strategies. The purpose of dissemination is to deliver this data to these decision-makers and other stakeholders in a timely manner.

(iv) **Which institution(s) should be responsible for environmental monitoring?** Responsibilities for implementation, data processing and dissemination must be clearly established under the monitoring plan. Key questions which must addressed include:

- Which institution will do which monitoring tasks? Who will collect specifically what information?

- Who will manage the information? Are there conflicting responsibilities or interests?
- Is an independent firm or institution to be involved?

7.4.2 The Problem of the Counterfactual

When monitoring reveals changes in environmental conditions, it is often difficult to know whether to attribute them to the project, or to what would have happened in any case. The imaginary or hypothetical situation which would exist in the absence of the project or activity is called the "counterfactual." Good monitoring strategies are designed to provide a continuous benchmark of "background" or "normal" environmental change to the extent possible. For example:

- Variability can be dealt with in part by selecting a comparative situation, population, etc. which presumably is subjected to the same set of overall non-project changes, but is not receiving similar project related interventions. At the same time, by focusing monitoring on representative situations and model interventions, the financial and human resource requirements for monitoring and evaluation can be more effectively managed without sacrificing comparative results. The key here, however, is to ensure that the sample situations selected are truly "representative."
- Often multiple stations or sampling locations are chosen within a target area, as well as in the area selected as the control. Monitoring of change of both the target and control environments and populations prior to the initiation of interventions establishes an initial baseline, but also helps ensure that comparison areas were validly chosen and a number method are available.

Dealing effectively with the issue of the counterfactual demands specialized expertise. When embarking on environmental monitoring design it is advisable to consult approaches from various disciplines, as well as the more general works. The special constraints to monitoring of social and economic systems must be recognised. Pre-intervention monitoring is easier for physical and biological systems than for human populations where the anticipation of an intervention can affect perception and behaviour, resulting in responses such as land speculation, depletion of resource stocks, or simply resistance to the potential loss of one's land or culture.

7.5 INTEGRATED APPROACHES TO MITIGATION AND MONITORING

The following are the general steps in an integrated mitigation and monitoring process:

(i) Given the major impacts identified by previous steps in the EIA process, identify possible mitigation measures;
(ii) Obtain participation of agencies and affected parties;

(iii) Identify authority for controlling or mitigating impacts;
(iv) Design an environmental mitigation plan;
(v) Define mitigation and monitoring objectives;
(vi) Determine data requirements;
(vii) Review the relationship of data requirements to monitoring objectives;
(viii) Determine data availability;
(ix) Conduct feasibility evaluation;
(x) Define monitoring system;
(xi) Implement the environmental mitigation and monitoring plan;
(xii) Collect data;
(xiii) Analyse data;
(xiv) Evaluate impacts;
(xv) Response by responsible agencies or parties;
(xvi) Document changes;
(xvii) Refine mitigation strategies;
(xviii) Implement effective mitigation measures;

7.6 TYPES OF MONITORING

There are several generic forms of monitoring, the purposes of which overlap:

- **Tracking.** Monitoring to determine if activities are on schedule and to identify any unanticipated constraints or issues. Often tracking is internal to a project and carried out by the managers and/or affected parties. However, when tracking is used as a form of oversight or control, or an activity is politically sensitive, it is often desirable to use outside expertise, both to maintain objectivity and additional checks and balances over decision-making;
- **Impact or Effects Monitoring.** Monitoring to assess impacts on target or non-target populations in order to determine whether interventions are having desired outcomes or whether they are creating other unanticipated negative (or positive) effects. This type of monitoring may be particularly important whenever there are uncertainties about possible future environmental impacts, including activities which are expected to have beneficial impacts, or where measures may be needed to mitigate possible negative effect. The functions of impacts/effects monitoring include: (1) documenting the accuracy and/or adequacy of predicted effects; (2) providing a foundation for examining theories of causes and for finding explanations which (when supported by sufficient data accuracy/adequacy) can be used to improve decision-making and policy (see also ***research monitoring*** and ***problem identification monitoring*** below); (3) providing warning flags to concerned parties (communities, agencies, politicians, etc.) of unanticipated problems or altered conditions and trends, or the approach of critical threshold levels for environmental indicators; and (4) serving as the information base and feedback system for decision-making regarding impact control and management;

- **Research Monitoring.** Often interventions may initially be in the form of limited projects to test a development hypothesis or model. Research monitoring helps determine whether hypotheses are correct; to identify reasons for failure; to help identify alternatives and additional opportunities; and to provide lessons from experience which may then be used to refine more effective approaches. For example, efforts to development community-based irrigation or agro forestry management may require that results and environmental impacts be followed closely to ensure that activities are actually leading to sustainable natural resource management, and to suggest more effective approaches;
- **Mitigation Monitoring.** Monitoring to determine the suitability and effectiveness of mitigation plans which are designed to diminish or compensate for adverse environmental effects from implemented activities. Mitigation monitoring plans are frequently required for grants prior to their approval, even when an environmental assessment has not been prepared;
- **Compliance Monitoring.** Monitoring whose objective is to ensure that specific conditions or standards are met, e.g. inspection or periodic checks to determine whether levels of pollutant emissions/discharges are within limits specified by permit. This form of monitoring resembles a policing function.
- **Monitoring as Postponed Decision-Making.** When decisions must be made under conditions of uncertainty (created, for example, by inadequate information, factual or value conflicts, etc.), the monitoring plan can serve as a "kind of relational contract where the parties create a structure through which to address problems and make decisions over time".
- **Problem Identification.** This type of monitoring is of broader scope and is used to identify the most important issues and constraints requiring additional analysis or interventions. Ecological monitoring by the by the Southern African Development Community's sectoral groups, falls in this category. Efforts to obtain greater understanding of the natural resource base, and of environmental trends in the region and individual countries, are used by SADC officials to prioritise issues and make the case for developing future projects.
- Finally, **baseline data collection** can be regarded as a form of monitoring. Baseline data collection is a continuous process which should be refined both during the environmental assessment, and as project is implemented. This form of monitoring helps influence project design changes and mid-course corrections, and defines appropriate mitigation measures. More often than not monitoring approaches fall into one or more of these categories with no clear distinction among them, making it difficult to classify a particular monitoring approach as being of any one form. For example, where do the following aspects of monitoring fall: (1) measuring and evaluating program/project goals and sub-goals achievement? (2) monitoring/assessing economic and social change: e.g. income, quality of life, increase and diversification of export products, etc; (3) monitoring/evaluating effects on the environment and

natural resource base in order to support sustainable development? While specific categorisation may not be possible, the exercise of trying to do so can be very useful, because it focuses early attention on the rationale for undertaking monitoring activities, and should therefore improve the efficiency and specificity of monitoring plans.

GLOSSARY

Affected Environment

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

Alternatives

A possible course of action, in place of another, that would meet the same purpose and need (of proposal). Alternatives can refer to any of the following but are note limited hereto: alternative sites for development, alternative site layouts, alternative designs, alternative processes and materials. In Integrated Environmental Management the so-called "no action" alternative may also require investigation in certain circumstances.

Assessment

The process of collecting, organising, analysing, interpreting and communicating data those are relevant to some decision.

Background

The surrounding environment that is uncontaminated by a local source of pollution.

Baseline

Reference emission level. The term is used with different meanings in different contexts. It can denote:

- the historical emission level of an entity in a reference year,
- the projected future emission level of an entity if no extra mitigation measures are taken (business-as-usual scenario).

Benchmarking

Under benchmarking, some average emissions level, or a percentage thereof, is used as a uniform target for all emitters in the group for which the average applies.

Cleaner Production

The continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency, and reduce risks to humans and the environment. Cleaner Production can be applied to the processes used in any industry, to products themselves and to various services provided in society.

Consistence

Possible time span of influence associated with a specific negative or positive impact linked to the proposed project development.

Continual Improvement

Process of enhancing the environmental management system to achieve improvements in overall environmental performance in line with an organisation's environmental policy.

Climatic Components

Represent data sets that characterise the influences of climate on the proposed project.

Coverage

An area of influence that maybe covered because of the likely positive or negative impacts associated with the proposed project.

Data

Knowledge that describes a characteristic of an object or aspect.

Data Set

Group of data that describes the various characteristics of the same object or aspect.

Development

The act of altering or modifying resources in order to obtain potential benefits.

Environment

Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation. NOTE – Surroundings in this context extend from within an organization to the global system.

Environmental Components

Represent data sets that describe the relations and interactions between human activities and the local ecosystems.

Environmental Aspect

Element of an organisation's activities, products or services that can interact with the environment NOTE - A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact

Environmental Impact

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Environmental Impact Assessment

A process of examining the environmental effects of a development.

Environmental Impact Report

A report describing the process of examining the environmental effects of a development proposal, the expected impacts and the proposed mitigating measures.

Environmental Issue

A concern felt by one or more parties about some existing, potential or perceived environmental impact.

Environmental Management System (EMS)

The part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

Environmental Audit

A systematic and documented verification process of objectively obtaining and evaluating evidence to determine whether an organisation's environmental management system (EMS) conforms to the environmental management system audit criteria set by the organisation, and for communication of the results of this process to management.

Environmental Objective

Overall environmental goal, arising from the environmental policy that an organisation sets itself to achieve, and which is quantified where practicable.

Environmental Performance

Measurable results of the environmental management system, related to an organisation's control of its environmental aspects, based on it's environmental policy, objectives and targets.

Environmental Policy

Statement by an organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

Evaluation

The process of weighing information, the act of making value judgements or ascribing values to data in order to reach a decision.

Ground Components

Represent data sets that describe the local ground conditions.

Groundwater

Water beneath the earth's surface, accumulating as a result of infiltration and seepage, and serving as the source of springs, wells, etc.

Independent Consultant

A consultant not in the permanent service of the applicant. In addition a consultant ceases to be independent if: involved in any design or work of the same project OR Earns more than 50% of his or her work from the same company OR Payment depends on the successful authorisation of the application. Consultants in the permanent services of the applicant are referred to as "in house" consultants.

Influence

The degree of relevance associated with a particular data set with respect to proposed project and performance.

Integrated Environmental Management (IEM)

IEM provides an integrated approached for environmental assessment, management, decision-making and to promote sustainable development and the equitable use of resources. Principles underlying IEM provide for a democratic, participatory, holistic, sustainable, equitable and accountable approach.

Interested Party

Individual or group concerned with or affected by the environmental performance of an organisation / project.

Integrated Pollution Prevention and Control

This principle aims to achieve integrated prevention and control of pollution arising from large-scale industrial activities. It lays down measures designed to prevent or, where that is not practicable, to reduce emissions in the air, water and land from these activities, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole.

Inventory

Data base of a legal entity obtained by applying a protocol for emissions accounting and reporting.

Irreversible Impact

When the character, diversity or reproductive capacity of an environment is permanently lost.

Knowledge

Data or Data set that describes a characteristic of an object or aspect.

Land Use

The activities that take place within a given area or space.

List of Activities

Development actions that are likely to result in significant environmental impacts as identified by the Act.

Life Cycle Analysis

A system-oriented approach estimating the environmental inventories (i.e. waste generation, emissions and discharges) and energy and resource usage associated with a product, process or operation throughout all stages of the life cycle.

Life Cycle Management

An integrated concept for managing the total life-cycle of goods and services towards more sustainable production and consumption, building on the existing procedural and analytical environmental assessment tools and integrating economic, social and environmental aspects.

Management of Pollution

Use or processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of recourses and material substitution

NOTE - The potential benefits of prevention of pollution include the reduction of adverse environmental impacts, improved efficiency and reduced costs.

Mitigations

Any action intended to either reduce or avert exposure or the likelihood of exposure to sources that are not part of a controlled practice, or which are out of control as a consequence of an accident.

Monitoring

The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures.

Negative Impact

A change that reduces the quality of the environment (for example, by reducing species diversity and the reproductive capacity of the ecosystem, by damaging health, property or by causing nuisance).

Polluter Pays Principle

The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment. This means that the polluter should bear the expenses of carrying out the above-mentioned measures decided by public authorities to ensure that the environment is in an acceptable state.

Pollution Prevention

The use of processes, practices, materials, products or energy that avoids or minimises the creation of pollutants and waste, and reduce overall risk to human health or the environment.

Precautionary Approach

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Probability

Likelihood of having actual influence associated with a specific positive or negative impact taking place.

Receptor

A person living nearby to a source of pollution; the person who may receive any impacts resulting from an industrial activity.

Reference Level

This can be an action level, intervention level, investigation level or recording level. Such levels may be established for any of the quantities determined in the practice of environmental protection.

Relevant Authority

The environmental authority on national, regional or local level entrusted in terms of the Constitution and in terms of the designation of powers and responsibility for granting approval to a proposal or allocating resources.

Remedial Action

Action taken to reduce negative impacts that might otherwise be received.

Sustainable Consumption

The use of services and related products which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and

pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations.

Sustainable Development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Scoping

The process of identifying the significant issues, alternatives and decision points which should be addressed environmental assessment process, and may include a preliminary assessment of potential impacts.

Significant Impact

An impact that, by its magnitude, duration of intensity alters an important aspect of the environment.

Upgrade

Includes the enlargement or expansion of an activity, but excludes regular or routine maintenance and the replacement of inefficient or old equipment, plants or machinery where such does not have a detrimental effect on the environment.

Value Judgement

A statement of opinion or belief which is not capable of being falsified by comparison with fact.

ANNEX 1: APPLICATION FORM FOR ENVIRONMENTAL CLEARANCE CERTIFICATE.

ANNEX 2: NOTIFICATION FORM TO CONDUCT A FULL EIA

ANNEX 3: APPLICATION FOR TRANSFER OF AN ENVIRONMENTAL CLEARANCE CERTIFICATE