ENGLISH VERSION

Etude d'Impact Environnemental

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Ministère
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General Directive for Conducting an Environmental Impact Assessment

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DISCLAIMER

The following is an English translation of the official French-language text of the "General Directive for Conducting an Environmental Impact Assessment". The translation has been undertaken so as to make the environmental review process more readily comprehensible to English-speaking project proponents. All possible efforts have been taken to ensure that the English translation reflects the intent of the official French-language version. However, readers are reminded that this English translation is not an official version of the General Directive. For exact meanings of words and expressions used in this translation, the user should rely on the official text of the Decree as released by the Ministry of the Environment.

INTRODUCTION

Following the adoption of the law on the Malagasy Environment Charter (Charte de l'Environnement Malgache) and the promulgation of the decree on the Compatibility of Investments with the Environment (Mise en Compatibilité des Investissements avec l'Environnement - MECIE)[1], any public or private investment projects likely to have adverse environmental impact should be subjected either to an Environmental Impact Assessment (EIA), or to an Environmental Commitment Program (ECP) depending on their technical nature, scale and the sensitivity of the project site.

Pursuant to the legal and regulatory provisions referred to above, the Ministry responsible for the environment, with the support of the National Environmental Office[2] (ONE) shall elaborate or contribute to the elaboration of environmental technical guidelines. This document presents the general guidelines for the preparation of an environmental impact assessment of projects subjected to the aforementioned procedure, which are listed in Appendix 1 of the MECIE decree.

The objective of these guidelines is to provide project proponents with a basic structure indicating the nature, the scope and the extent of the environmental impact assessment to be conducted. It sets forth **the principles of an explicit and consistent approach** aimed at providing the information required for the environmental assessment of such projects by the relevant authorities, and improving decision-making by the relevant governmental authorities as regards their authorization.

Considering the specificity of each project, these general guidelines should be used with the relevant sectoral guide, as appropriate. The sectoral guide defines more precisely the topics to be considered for the proposed project.

These general guidelines are divided into three distinct sections :

- The first section sets out the nature of an environmental impact assessment (EIA) and specifies its main characteristics, requirements and objectives, as well as the general approach to EIA preparation.

- The second section presents the content and structure of an impact assessment. The approach set out enables proponents to collect the data necessary for the environmental analysis and assessment of a project.

- The third and last section provides the modalities of submission of the impact assessment to the National Environment Office (ONE), as well as EIA reporting requirements.

The Minister responsible for the environment, with the support of the ONE, intends to review the guidelines periodically in order to update their contents. In this respect, users' comments and suggestions will be highly appreciated and will be taken into consideration in future updates.

[1] Decree No. 99 954 of December 15, 1999

PART I: NATURE OF AN IMPACT ASSESSMENT

An environmental impact can be defined as the effect over a given period of time and within a limited space of a human activity on a resource of the biophysical and human environment, compared to its original condition without the project.

1.1. CHARACTERISTICS OF AN ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Impact Assessment (EIA) is an instrument instituted by a law and regulations for a better integration of environmental considerations into development and a better use of resources and territory.

The EIA is aimed at taking into account environmental concerns during every phase of execution of a project, i.e. design, start-up, operation and closure (where appropriate). It helps the proponent to conceive an environmentally sound project while being acceptable at the technical and economic levels.

The EIA is used to predict and identify the beneficial and adverse ecological and social impacts of a project. The relative importance given to *adverse impacts* should lead to the definition of *mitigation* or *compensatory measures* which will contribute to reduce such impacts. The study may also make it possible to develop other project alternatives or options which are less harmful to the environment.

The analysis of options and alternatives is intrinsic to any project design and environmental assessment approach. Thus, the objective is to select the alternative which best fits the objectives of the project and which is acceptable for the parties concerned at the same time.

In this respect, the EIA takes into account the views, reactions, interests and major concerns of all the parties concerned, in particular those of individuals, groups and communities living in the project implementation area.

1.2. LEGAL, REGULATORY AND ADMINISTRATIVE REQUIREMENTS

1.2.1 Environment Charter

In compliance with *Article 10* of *law No. 90-033 of December 21st, 1990 on the Malagasy Environment Charter,* and *law No. 97-012 of June 6th, 1997* modifying and supplementing some of its provisions, public or private investment projects likely to have an adverse impact on the environment should be subjected to an Environmental Impact Assessment (EIA).

1.2.2 MECIE Decree

In application of Article 10 of the Environment Charter, the decree No. 99 954 of December 15th, 1999 *revising decree No. 95-377 of May 23rd, 1995* relative to the Compatibility of Investments with the Environment (MECIE), sets forth the rules and procedures to be followed by project proponents in conducting an EIA. **Figure 1** summarizes the environmental assessment process and the place of the EIA in such process.

This decree defines *inter alia* the scope of the impact assessment, the projects subjected to assessment, the process to be followed, the study contents, the assessment procedure as well as public participation in the assessment. The proponent's impact assessment should comply with the decree's requirements and the project should be assessed in accordance with rules set forth in the decree.

1.2.3 Applicable Laws

The proponent should comply with the requirements of laws and regulations applicable in Madagascar in areas where the latter exist and which relate to various aspects of the project. Key texts to be taken into consideration are listed in **Appendix 1.**

1.2.4 Standards

The project, as defined by the proponent, should demonstrate that it would respect the environmental standards of reference in force. In the absence of national standards, the proponent shall apply the relevant standards established, accepted or recommended by international organizations affiliated to the United Nations. If several standards are available, the criteria used for their selection should be included in the study.

Useful information and data on standards are made available for proponents by the ONE, in collaboration with the Ministry responsible for the environment and the sectoral ministries directly concerned.

1.3. OBJECTIVES OF SUSTAINABLE DEVELOPMENT

The objectives of sustainable development are to maintain ecological integrity, improve economic efficiency and promote social equity. A project executed in the perspective of sustainable development aims at finding a balance between these three objectives for the welfare of the existing population and future generations. The impact assessment is *a planning instrument which supports the realization of sustainable development objectives.*

1.4. KEY ASPECTS AND SCOPE OF THE ENVIRONMENTAL IMPACT ASSESSMENT

It is suggested that the EIA be run parallel with project development, during the feasibility study for instance. The incorporation of foreseeable beneficial and adverse environmental impacts into project planning increases its chances of success as well as its contribution to sustainable and equitable development.

FIGURE 1:
THE PLACE OF IMPACT ASSESSMENT IN THE ENVIRONMENTAL ASSESSMENT PROCESS

Phase of project	Environmental Procedure	Action
Identification	Preparation – Screening	- Inquire about the legal requirements - Collect relevant information
Pre-feasibility Study	Scoping	- Get an idea of the main issues arising from the project - Define the activities to be conducted
Feasibility study	Realization of impact assessment	- Predict and identify the potential impacts - Analyze and assess the extent, the importance and the significance of key impacts - Develop mitigation strategies to reduce adverse impacts
Implementation	Environmental Control and Monitoring	- Application of environmental protection measures and mitigation and/or compensatory measures - Potential application of new mitigation and/or reclamation measures - Environmental monitoring and follow-up
End of project and post assessment	Environmental review	- Identify the lessons learned for future projects

The scope of studies to be conducted for the identification of the environmental impacts of a project and the direction to be given to such project in order to better adjust it to the receiving environment depend on the seriousness of the potential negative impacts, the vulnerability of the environmental resources to be protected, the nature and the complexity of the project, as well as the information available on the project site.

Article 11 of the MECIE decree stipulates that the impact assessment should include at least:

- A document certifying the legal status of the project site ;
- A description of the investment project;
- An analysis of the environmental system affected or likely to be affected by the project;
- A prospective analysis of the potential impacts of proposed interventions on the system previously described;
- A Project Environmental Management Plan (PEMP)
- A non-technical executive summary prepared in Malagasy and in French.

The proponent is invited to appeal to recognized scientific expertise for support in conducting such a study.

1.5. PUBLIC CONSULTATION AND INFORMATION

The proponent is advised to initiate a communication process during the study so that the views of the interested parties can influence both project design and choice and EIA preparation. The impact assessment must take into consideration the interests, values and concerns of local or regional populations, according to the individual cases, and report on their implication in the project planning process.

A communicative approach adopted at the beginning and throughout the study will help to improve the *social integration* of the proponent's project. Past experience shows that the affected populations have an empirical and concrete knowledge of the area where they live. Their consultation can provide valuable information on the area. Moreover, the local populations may suggest innovative solutions which can improve the proponents' proposals.

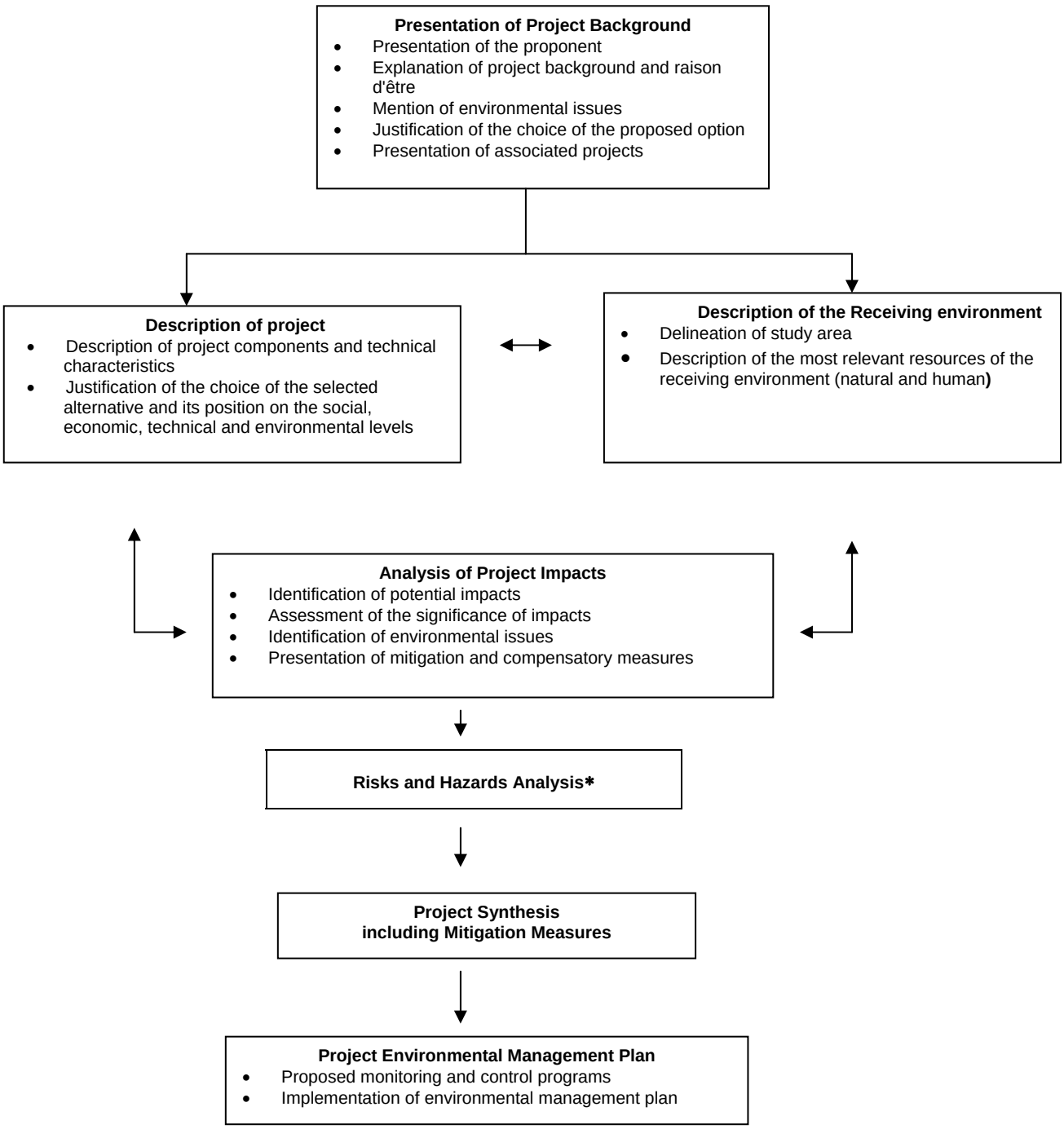
Unlike the public survey and assessment process provided for in the official procedure of environmental assessment, the public consultation and information process conducted during the realization of the EIA is not a mandatory step. The initiative and the means to be used are the direct responsibility of the project proponent, and should be adapted to his needs.

1.6. APPROACH TO THE PREPARATION OF THE IMPACT ASSESSMENT

The approach to the preparation of the impact assessment must comply with the decree's requirements. The approach suggested on **Figure 2** shows the key steps and provides broad indications for the realization of the EIA and the preparation of the relevant report.

The next section gives the detailed contents as well as the structure of the impact assessment.

FIGURE 2 : APPROACH TO THE PREPARATION OF THE IMPACT ASSESSMENT REPORT



* To be applied depending on the specificity of the project

PART II: CONTENTS AND STRUCTURE OF THE IMPACT ASSESSMENT

The contents of the impact assessment and the structure of the report are subdivided into seven major steps or sections including the presentation of project background, technical description of the project, description of the receiving environment, impacts analysis, risk and hazard assessment, project synthesis including mitigation measures and presentation of the project environmental management program.

2.1 PRESENTATION OF PROJECT BACKGROUND

This section discusses the elements which are behind the project. It includes a presentation of the proponent and an overview of the background explaining *inter alia* the raison d'être and the justification of the project and the project site.

2.1.1 Presentation of the Proponent

The objective of this section is to better identify the proponent. It includes:

- The proponent's name and business name and his subsidiaries (as appropriate);
- General information on the company or the firm and its fields of activity;
- General information on the proponent's experience and know-how in the field relevant to the proposed project
- Identification of the project manager and the consulting firm or companies in charge of the realization of the impact assessment;
- Description of the proponent's environmental and sustainable development policy, if any.

2.1.2 Project Background and Justification

This section presents the objectives, the raison d'être and the main technical characteristics of the project at the initial planning stage while taking into account the environmental and socioeconomic background for its integration in the establishment area.

In this respect, this section should identify the issues or needs justifying the execution of the project and the choice of the site. It should present the ecological, technical and/or economic constraints or requirements related to project execution and operation, in particular in terms of significance and implementation schedule, taking into account the existing plans, schemes or programs. This section should also identify the potential environmental, social, economic and technical issues arising from the project at local and regional levels, as well as at national and international levels, as appropriate.

In some cases, it may be appropriate to discuss and compare possible alternative options to solve the issues or meet the needs for which the proponent proposes his project. By proceeding to a summary *comparison of the different options,* including the 'no project' scenario or delayed execution, the proponent should be able to justify the reasoning and the criteria used to select the option. Environmentally speaking, this comparison can be essentially based on the most significant permanent benefits or drawbacks and the temporary drawbacks of highest concern.

Finally, this section should demonstrate that the proposed project is the best alternative to meet the expected objectives, to solve the issues or to meet the identified needs. The objective is also to ensure a better social integration of the project.

2.2 PROJECT DESCRIPTION

This section describes the project components and technical characteristics at every phase of its execution, including the related activities involved as they appear at the initial planning stage. It also describes the resources used, the operation or processing methods, the expected outputs, the pollution and nuisances arising from the project considering the applicable reference standards.

A comprehensive and satisfactory description of the project should include useful information for the identification of impact sources and effects, and the analysis and assessment of project impacts. The proponent is invited to refer to the relevant sectoral guide or the authorities concerned to agree upon the most relevant elements of his project to be described, if necessary.

The following list provides the main characteristics of a project. The list is not necessarily exhaustive and the proponent can adapt it to his needs. The choice of elements to be considered depends largely on the project scale and nature as well as the context of its integration into the receiving environment. The elements to be considered include:

2.2.1 Project Components and Technical Infrastructures

- Purpose of production or economic objective and target clients;
- General map of project components, or layout plan, on an appropriate scale (including traffic and access roads, structures and buildings);
- Project terrain and its legal status ;
- Specific layouts of elements of project design and, if necessary, a map in the perspective of the integration of project components into the surrounding landscape;
- Description or layout of building site facilities and other temporary infrastructures (access paths, engine parks, points of connection to existing networks or to the receiving environment, storage or loading areas, sanitary facilities, water and slurry treatment equipment, housing facilities, canteen, administrative buildings, car parks, etc.)
- Description of project start-up, planning and construction activities: deforestation, clearing, burning, removal of topsoil, drilling, excavation, dynamiting, digging, cutting and backfilling, river crossings, use of heavy equipment, use of herbicides and pesticides, demolition or relocation of buildings, etc;
- Description or layout of buildings and other permanent structures, as well as ancillary facilities (road, railway, port and airport facilities, power transmission corridors, water supply system, unloading, handling and storage areas, etc.)
- Project duration and the commitment to prepare closure plans for project facilities a few years before the termination of activities;
- Implementation schedule for each phase of the project, required labor, working hours and future development phases.

2.2.2 Resources Used

- Raw materials, additives and materials used (source, quantity, characteristics, storage, transport, etc.)
- Natural resources used, renewable or not, such as soils or geological resources, water (supply, control, derivation, containment), forest and biological resources, etc.
- Human resources (recruitment plan, labor required, number of staff, qualification, camp, supply methods at campsite and work site, etc.)
- Energy demands, types of energy used and their source.

2.2.3 Operation and Processing Methods

- Products and by-products expected as project objectives;
- Operation and processing methods, equipment used as well as process diagrams;
- Measures for sound use and conservation of resources (reduction at the source, improved effectiveness of the use and the application of recovery technologies: re-use, recycling, composting, etc.)
- Soil, surface water and groundwater, air and wildlife protection methods and measures (dust suppression devices, tailing dams, impoundment, etc) including temporary measures;
- Overall appraisal of the main production and operation stages.

2.2.4 Pollution and potential nuisances directly induced by the project

- Air emission and odors;
- Noise and vibrations;
- Pollutant discharge into surface water and groundwater (quantity and physicochemical and biological characteristics, treatment and management process, precise location of discharge points);
- Introduction or infiltration of substances into the ground;

- Residues, wastes and wastewater produced (quantity and nature, use in connection with project activities, management and treatment process, disposal sites and methods, connection to appropriate draining systems, final destination of rubble and debris, etc).

2.3 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The description of the receiving environment is essential to the environmental analysis in order to obtain an appropriate knowledge of the components of the project site.

This activity includes the delimitation of the study area and the characterization of the relevant components of the environment as well as their state before the project in order to:

- obtain an overview of the baseline ecological, socioeconomic and social conditions of the study area

- identify the components likely to be affected by the project within the study area, in particular those components of high environmental concern identified during the presentation of project background and justification;

- better comprehend the interactions between the components of the physical environment and those of the biological and human environment ;

- better comprehend the dynamics of ecosystems which will be affected by the project;

- determine the ecological and economic potentialities of such components in order to express the trends observed in terms of integrity, and to determine the direct or indirect impacts of the project.

2.3.1 Delimitation of the Study Area

The proponent should determine and justify the limits of the study area which correspond to the project area of influence: it should include all the portions of the territory which may be affected by the project and its related activities (e.g.: access roads to the site, borrow areas and transport corridors, etc).

Depending on the project area of influence, the limits of the study area will be recorded on a map. The description of project components and the specific studies will take into account the appropriate level of perception in view of the expected impacts.

2.3.2 Description of the Most Relevant Components of the Receiving Environment

The impact assessment should provide the most comprehensive description of the biophysical and human environments, *as they exist before the project,* and express the trends observed in terms of integrity. For this purpose, the study should include any information which will facilitate the understanding or the interpretation of the data included in the study report.

After the identification of all environmental components which could be potentially affected by the project, the proponent should proceed with the collection of useful information about the receiving environment using existing literature and baseline studies available at government agencies, research institutions, archives, non governmental or private organizations, international organizations, etc.

Field surveys, investigations or inventories are sometimes necessary when there are no data available or in order to supplement the knowledge about some relevant resources. In such cases, the intervention of a multidisciplinary team is required and the methods used must apply scientifically accepted techniques or approaches in the relevant fields (e.g.: choice of parameters, sampling procedures, analysis methodology, sampling period, etc).

Finally, the description on the baseline condition of the relevant environmental components should be linked with the major issues and concerns already identified, as well as the expected impacts of the project.

The characterization data should be analyzed, summarized and should be relevant in order to ensure the comprehension and the analysis of potential site evolution after project implementation.

The impact assessment should consider the following at project site level and its area of influence:

- Physical environment ;
- Biological environment ;
- Human environment (social, economic and cultural).

The study should at least include a map showing the current land use and the key project elements proposed. **Appendix 2** provides a list of useful information for site description.

2.4 ANALYSIS OF PROJECT ALTERNATIVES

The objective of this section is to show that the proposed project or the project alternative selected by the proponent among other possible options is an acceptable solution from the technical, economical and environmental point of view.

Depending on the nature and the objectives of the project, the proponent may have to present several alternatives. Such alternatives may relate to specific activities or elements of the project, their location or diverse implementation and operation techniques.

Thus, this section should discuss project alternatives including site and technological alternatives if necessary, in view of meeting project objectives or needs. This should be followed by a comparative analysis of the alternatives to enable the choice of the preferred alternative and justify it as objectively as possible. If there are no alternatives, the proponent should proceed directly with the analysis of impacts.

2.4.1 Description and Comparative Analysis of Alternatives

The executive description of project alternatives, located on a map, should provide appropriate detailed information related to the processes and activities likely to affect the environment. Since the impacts of a project are identified both in space and time, the distinction of the different phases of activities (e.g. preparatory phase, construction or start-up phase, operational phase, reclamation phase) and the schedule of work to be conducted should also be included.

The criteria for comparison are first defined at the technical, economic and environmental levels. The criteria selected should help to discriminate the alternatives between themselves. On the environmental level, the comparison may be based primarily on the most significant permanent drawbacks and benefits and on the temporary drawbacks of highest concern.

Subsequently a comparative statement of alternatives should be established to enable the choice of the preferred alternative and justify it as objectively as possible.

2.4.2 Selection of the Preferred Alternative

This section sets out the reasons why the proposed project was selected a priori or among the possible alternatives. It shows why the alternative selected is overall the best solution on the technical, economic and environmental levels.

2.5 IMPACT ANALYSIS

This section identifies and assesses the potential environmental impacts associated with the project. It suggests the measures to be taken to reduce or avoid the adverse impact on the quality of the environment.

While the determination of impacts is based on apprehended facts, their assessment involves a value judgment. Based on the valorization of the environment components and the standards in force, such

an assessment will help not only to establish thresholds of pollutant emissions or levels of discharge into the environment, but also to identify mitigation measures for the most significant impacts or the monitoring and follow-up actions needed for unspecified impacts.

This phase will include the following steps:

- Identification of the potential impacts of the project on the receiving environment;
- Assessment of the environmental impacts;
- Identification of mitigation measures.

The study should at least present an appropriate methodology for the identification and assessment of the impact of project activities in relation with the receiving environment components. The methods and techniques used should be explicit, objective and replicable enough to enable the reader to follow easily the proponent's reasoning while identifying and assessing the impacts.

The study should provide a clear definition of the criteria and terminology used for the identification of potential impacts and their classification based on different level of significance.

2.5.1 Identification of Potential Impacts

This step is conducted by confronting the components of the receiving environment with the elements of each project phase.
Potential impacts should be identified for each correlation between project activities and the relevant environmental component. The impacts on the environmental component are typically identified for the physical environment, and the biological and human environments. Then it will be possible to describe the direct sources of impact on soils, air and water and to infer the impacts of the expected changes in the physical environment on the biological and human environments.

2.5.2. Assessment of Impact Significance

This step relates to the assessment of impacts in order to determine if the predicted changes are significant enough to justify the application of impact mitigation, monitoring and follow-up measures. The assessment is made by considering the most objective criteria which will help in determining the significance of impacts.

As such an assessment relies partly on a value judgment, it is recommended that the views of the affected population be taken into account during the determination of impact assessment criteria.

The criteria to be considered in the quantitative assessment include:

- Impact intensity or extent based on the level of disturbance of the environment and the sensitivity, vulnerability, unicity or scarcity of the affected component;
- Impact scale (spatial dimension such as the extent or the area affected);
- Duration of impact (temporary, irreversible);
- Impact frequency and the probability of impact occurrence (intermittent, occasional);
- Level of uncertainty of impact (reliability of estimate);
- The value of the affected component for the local population (potentially affected population);
- Risks on population health, safety and welfare;
- Linkage effect (link between the affected component and other component).

Once the assessment technique is used and the results are analyzed, a list of impacts is established and the impacts are classified. Impact classification may attempt to identify:

- Beneficial and adverse impacts;
- Direct or indirect impacts;
- Cumulative impacts.

The proponent is invited to explain the impact analysis methodology used in his assessment.

2.5.3 Issues

After impact assessment, the next step will be to identify and describe the environmental issues, i.e. the environmental concerns likely to support or call into question the very existence of the project. Such issues will be given special consideration during the formulation of the mitigation measures.

2.5.4 Impact Mitigation

This step discusses the appropriate actions or measures to avoid, eliminate or reduce adverse impacts, or to increase the benefits of positive environmental impacts.

Depending on the case, mitigation measures for adverse impacts will be proposed for each phase of activity, source of impacts, action or activity with adverse effect on one or several environmental resources. The study should specify the actions, works, systems or corrective measures proposed for each phase of the project.

In order to reduce or eliminate the adverse impacts with **mitigation measures**, it is necessary to consider the application of **compensatory measures** such as the compensation of expropriated people.

Finally, the study should address **the residual impacts** which will remain after the application of mitigation measures. These impacts generated by the project should be the subject of an environmental monitoring program.

Mitigation and compensatory measures may be general or specific. General measures are intended to reduce the adverse impacts of a project as a whole while specific measures are aimed at reducing the adverse impacts on a specific environmental resource.

An evaluation of the expenses incurred, i.e. the cost of measures considered for the mitigation of project impacts should be included in the EIA to the extent possible.

2.6 Risk and Hazard Assessment

According to their specificity, the realization of some projects, in particular industrial and heavy infrastructure projects, could involve significant risks of technological accidents and other hazards to the environment or public health. In this case, the impact assessment should identify and provide an appropriate assessment of such risks and hazards, and present an appropriate safety and contingency measure plan. Such measures will apply to the protection of the surrounding populations and the safety of project employees and the identified risk areas.

2.6.1 Analysis of risks of technological accidents

First, the study should identify the hazards associated with the project. If the study shows that the project is not likely to generate major technological accidents liable to endanger public safety or affect the environment, the information collected during the identification of hazards is sufficient and the proponent should use it to develop the appropriate measures to be applied.

If the proponent cannot prove that there is no risk of major technological accidents, he should proceed with the risk assessment. Based on a review of past accidents which occurred in similar projects, the analysis should predict the hazards and the scenarios of potential major accidents in order to evaluate their consequences, frequencies and risks. The analysis of technological risks should be performed using data and estimates justified by appropriate references.

The study should delineate the hazard areas on the territory which will be taken into consideration during the planning of contingency measures. A deep knowledge of the endangered environmental components is also necessary in the event of accidents. A discussion on the risks and factors which could cause technological accidents should be included.

2.6.2 Safety Measures and Contingency Plan

The study should describe on-site safety measures and plan implementation. A non-exhaustive list of safety measures which may be relevant to various projects is given below:

- Limitation of access to the site ;
- Safety facilities (control system, emergency stop system, fire-fighting system, communication system, etc.)
- Toxic and hazardous product storage facilities;
- A risk management program (protection of personnel, training of employees, emergency drills, simulation of emergency situations, etc.)
- A program for an update of safety measures established, as needed.

Based on the identification of hazards and technological accidents, the study should also provide a contingency plan to be implemented in the event of accident. A non-exhaustive list of emergency measures is given below:

- Accident scenarios: consequences and risk areas ;
- Relevant information in the event of emergency;
- Emergency intervention structure ;
- Communication systems ;
- Intervention measures and actions anticipated for each accident scenario ;
- Protection measures to protect the populations in risk areas ;
- Means designed to alert the affected populations;
- A program for an update of emergency measures, as needed.

2.7 Synthesis of the Selected Project

This section presents the selected project including the mitigation and compensatory measures to be applied by the proponent.

2.8 Project Environmental Management Plan

The impact assessment leads to an environmental control and monitoring program which will be implemented during each phase of the project and, if necessary, after project closure. This section is the basis of the proponent's environmental terms of reference, in the form of an Environmental Management Plan (PEMP)

2.8.1 Control Program

Control consists in ensuring that the proponent carries out his environmental commitments and obligations and applies the mitigation measures necessary for adverse impacts during the project life.

The program should include at least:

- The list of environmental legal and regulatory requirements and obligations for the realization of the project;
- The description of the means and methods designed for a smooth running of work, and correct operation of equipment and facilities, and to make the right decisions and apply the correct measures in the event of problems occurring during their realization;
- The description of environmental protection measures and means ;
- Hazards assessment and prevention, protection and safeguard measures as well as safety parameters ;
- The commitments by the proponent to apply mitigation measures for the adverse impacts of the project;
- The timing or the schedule of implementation of mitigation measures;
- The mechanisms and the frequency of submission of periodic reports on the results of the control and monitoring program to the relevant authorities (Ministry in charge of the Environment, ONE and other relevant technical ministries).

It should be stressed that the control program can be revised periodically in the light of the performance of the mitigation measures planned during project implementation. The program will

help to redirect the continuation of the work and to improve project execution in order to meet the expected objectives, if necessary.

2.8.2 Monitoring Program

Monitoring consists of following the evolution of specific resources of the natural and human environments affected by the project. This activity is aimed at validating the assumptions relative to the environmental performance of the project and the effectiveness of mitigation measures, if necessary.

This program should include at least:

- The identification of actions and resources to be monitored ;
- The description of activities and means designed to monitor the actual impacts of the project on the most sensitive environmental resources ;
- The sampling and analysis procedures required ;
- The schedule of implementation of monitoring measures ;
- The measures and means designed to cope with unforeseen circumstances and to adjust mitigation and control measures accordingly, and to incorporate the appropriate modifications into the management plan, if necessary;
- The names of responsible individuals, the mechanisms and the frequency of execution and diffusion of the results of the environmental monitoring program.

PART III: PRESENTATION OF THE IMPACT ASSESSMENT

This section specifies the reporting requirements of the impact assessment.

3.1 Impact assessment report

The impact assessment should be presented in a clear and concise way, and should include all items necessary for the good understanding of the project and its impacts discussed in the previous section, while respecting a logical and rigorous presentation order.

Information should be presented in a synthetic way using tables and, if necessary, charts, layouts or maps at the appropriate scales to the extent possible. Any other information likely to make the text heavy (inventory or sampling methodologies, techniques used, complete list of species, etc.) should be provided in a separate section or in appendices to the report.

The methods and criteria used should be presented and explained by mentioning their sources or references, reliability, accuracy degree and limitation.

Information sources should be mentioned in reference. The name, profession and function of the individuals who contributed to the realization of the impact assessment should be indicated and integrated into the report.

If the proponent has conducted public consultations before the realization of the study or the submission of the report, he is invited to provide the results of such consultations including the points of litigation with the public, and to reflect the incorporation of certain concerns and proposals expressed.

The report should be accompanied by a non-technical executive summary prepared in French and in Malagasy intended for public information and public assessment of the study. It should be prepared in a clear and simple way to facilitate the understanding of the study by the affected populations. The executive summary, discussed separately and enclosed with the impact assessment report should contain the following major items:

- Description of the baseline conditions of the site and its environment
- Project description
- Major project impacts and their relative significance
- Mitigation measures.

The elements which should be included in the main report are listed below:

- An executive summary of the study
- Contents
- Lists of tables, figures and layouts
- Introduction
- Project background and justification
- Description of the receiving environment
- Project description
- Alternative and impact analysis
- Risk and hazard assessment
- Project Synthesis
- Project Environmental Management Plan
- Conclusion
- Bibliographical references
- Appendices
    - List of the members the study team (name, profession, function)
    - Maps
    - Minutes of information sessions, record of interagency, public, NGO meetings
    - Inventory and sampling methodologies and detailed results
    - Reference documents and unpublished references

- Any other useful information for the understanding of the project as a whole.

3.2 Confidential information and data

In order to respect the confidentiality of certain information and data (commercial, financial, technical, industrial or scientific) which might be detrimental to the proponent, it is recommended that he provide such information in a separate document of the impact assessment and clearly identified as being of a confidential nature.

During the stage of public consultation or assessment of the project, the proponent's consent will be required regarding the disclosure of confidential information and elements.

3.3 Submission of report

The documents submitted to the ONE should include the complete impact assessment report, the executive summary and any other related document (complementary information, relevant sectoral reports) necessary to the good understanding of the project and its environmental repercussions. These documents should comply with the requirements of MECIE decree and include all the administrative elements required. The proponent is invited to contact the ONE, the Ministry of Environment or the ministry of supervision of the project to obtain the details relative to the admissibility of his project. The documents submitted should include:

- A written request from the proponent addressed to the Executive Manager of the ONE
- The receipt of payment justifying the proponent's contribution to the cost of assessment of his project. The amount of the contribution will be communicated to the proponent by the ONE
- Supporting documents related to the amount of projected investment, validated by the appropriate authorities
- Nine (9) copies of the impact assessment report
- Nine (9) copies of the summary
- A copy on diskette or CD-ROM compatible with WORD6.0 or a later version should also be submitted.

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ANDRE, P., DELISLE, C.E., REVERET, J.-P., SENE, A. et al., 1999. L'évaluation des impacts sur l'environnement : Processus, acteurs et pratique. Presses internationales Polytechnique, Québec, Canada, 416 p.

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Vol.1. Instructions, planification multisectorielle, infrastructure : 587 p.
Vol.2. Agriculture, secteur minier et énergie, industrie et artisanat : 751 p.
Vol.3. Catalogue des normes antipollution : 663 p.

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APPENDIX 1: LAWS, DECREES, ORDERS

Law N °90 033 of December 21, 1990	Malagasy Charter of the Environment
Law N °95-017 of August 25, 1995	Tourism Code
Law N °98-029 of January 20, 1999	Water Code
Law N °99-022 of August 19, 1999	Mining Code
Decree °N 95-607 revising Decree N °95-312 of April 25, 1995	Creation and organization of the Office National de l'Environnement (ONE)
Decree N °99-954 of December 15, 1999 repealing Decree 95-377 of May 23, 1995	Compatibility of Investments with the Environment
Decree N °96-1293 of December 30, 1996	Creation and management of areas of tourism significance
Decree N °97-822	Creation, organization and operation of the National Council for the Environment (CNE)
Decree N °98-962, repealing Decree N °97-355 of April 10, 1997	fixing the Attributions of the Minister of the Environment, and the general organization of his Department
Decree N °2000-170	Application requirements of Law N° 99-022 Mining Code
Interdepartmental order N °4355/97 of May 13, 1997	Definition and delimitation of sensitive areas
Closure N °4743/97/MINEV	Creation and organization of the Technical Committee for the Evaluation of Environmental Impact Assessment

APPENDIX 2: CHECKLIST OF ENVIRONMENTAL RESOURCES

I CHARACTERISTICS OF THE AFFECTED AREA OR REGION

1. Physical Environment

1.1 Climate, Weather Conditions and Air:

The local climatic framework (microclimate), or failing that, the regional framework (mesoclimate or macroclimate), with an emphasis on the aspects which could affect project activities and impacts:

- Radiation
- Air temperature and rainfall (including ombrothermic diagrams)
- Atmospheric pressure
- Relative humidity
- Nebulosity, fog frequency
- Evaporation and evapotranspiration
- Wind direction and wind speed, inversions of local winds
- Air quality

1.2 Geology, relief and pedology:

At local or regional level, as appropriate, with an emphasis on sensitive or problematic geological and soil characteristics, as well as topographic features likely to be affected by the project:

- Geological units, tectonics, bedrock and alteration, mineral resources, etc.
- Altitude, topography, slope, exposure, etc.
- Soil and sub-soil characteristics, soil sensitivity to landslides and erosion, soil permeability and fertility, physicochemical characteristics (soil formation, pH, nutrients, organic matter), …etc.

1.3 Water and Hydrological Cycle:

At local and regional level, as appropriate:

- Surface water, banks and wetlands (rivers, streams, lakes and other stagnant water, etc.), hydrographic network, watersheds, bathymetry, sedimentological regime, annual or seasonal low water, annual flows, physicochemical characteristics and water quality, water resources and uses (drinking water, irrigation of cultivated areas, fishing) …etc.
- Groundwater: types of water tables, location, depth (piezometric map), physicochemical quality of water tables, types of formation and water supply, natural recharge, direction of flow, surface and underground drainage, vulnerability to pollution, etc.
- Littoral water, coastal areas and seas: physicochemical characteristics, bathymetry, turbidity, currents, tides, swell, vulnerability of shores and coastal areas to water activity, etc.
- Water uses and hydrographic network: drinking water supply, irrigation of cultivated areas, fishing, navigation, bathing, washing, etc.

2. Biological Environment

The description of the biological components should identify the existing ecosystems, biological diversity resources, biotopes or specific habitats, areas to be protected as well as conservation and protection measures in compliance with the existing legislation. It is important to highlight the degree of biological diversity and endemism, and the scientific or conservation interest of the affected area or region.

2.1 Ecosystems:

- Existing types of ecosystems : terrestrial, aquatic, marine and coastal, wetlands
- Description and functions of the natural environment (ecologically sensitive)
- Protected areas and sensitive areas
- Types of interactions or relationships between the fauna, the vegetation and the natural environments
- Sustainability and fragility (capacity of adaptation to changes, proportions of rare or specific ecosystems affected by the project, modes of exploitation, etc.)
- Local, regional, national or international interest (of a scientific, cultural, customary, recreational, aesthetic, historical, or educational nature)
- Conservation and protection measures and status (in compliance with national legislation and regulations, international conventions)

2.2 Flora and vegetation:

- Floral biodiversity: floral composition (species present), species richness, endemism, specific plants or other phytogenetic resources (ecological, commercial, aesthetic values), rare, vulnerable, endangered or protected species
- Characteristics of vegetation cover: types of settlement, presence of fragile or exceptional settlements, cover rate, density, relative abundance, physiognomy, development stage, annual cycles, distribution, regeneration capacity, flora and fauna relationship, etc.

2.3 Fauna:

- Faunal biodiversity: faunal composition, species richness, endemism, rare, vulnerable, endangered or protected species, useful species and pests
- Ecological and behavioral characteristics of faunal communities: absolute abundance, density, relative abundance, presence index, biogeographic distribution, specific habitats, vital area and territory, movements and migrations, food, reproduction, annual cycles, mortality factors, fauna and flora relationship, etc.

3. Human Environment

The description of the human environment should take into account the elements and characteristics of the social, economic, cultural and spatial environment of the affected area and its surroundings or the affected region.

3.1 Social :

- Demographic status : number and density of population, age and sex structure demographic tendencies (fecundity, birthrate, mortality; growth, projections), spatial distribution, migration patterns, rural exodus, urban crowding, etc.
- Socio-sanitary profile: organization of public health (social services, health structures, medical and paramedical personnel), major diseases, waste management, drinking water treatment, water decontamination
- Food and nutritional status
- Type of social and community organization
- Political and administrative framework (local and regional)
- Resource persons and their dynamics at village level in the study area (personalities, administrative authorities, traditional authorities, professional associations, interest groups, NGOs, etc.)
- Public service infrastructures (energy and power lines, telecommunication lines, water supply systems, wells, sewerage systems, banks, etc.), community and institutional infrastructures (hospital, health centers, pharmacies, schools, public administration, municipal services, religious institutions, social and cultural recreational services)

3.2 Economy :

- Types of economy or economic activities practiced by the local populations or existing in the affected region
- Working conditions and employment status in the affected area: working population, unemployment rate, income and wages, availability of qualified labor, etc.
- Agricultural activities, production systems and food safety
- Industrial and mining activities and productions
- Craft industry
- Trade, services and tourism
- Access to and use of natural resources

3.3 Culture :

- Cultural heritage: habits and customs, customary activities, fundamental values, religious and/or ancestral beliefs, ethnic languages or dialects, education level and illiteracy rate, leisure, etc.
- Lifestyles depending on the nature and types of exploitation of natural resources, degree of dependence of the local populations to ecosystems and natural resources (economic, cultural, religious, etc. dependence)
- Concerns, views, interests and hopes of the local populations
- Awareness of environmental issues, behavior towards nature
- Architectural, archaeological and landscape heritage and any other elements of patrimonial interest either protected or not by cultural property laws or regulations.

3.4 Space :

- Current and future use of the land area with reference to municipal and regional land development and planning policies, maps, plans and regulations if necessary
- Land use map before project implementation
- Access to property (land aspects) and land management patterns
- Roads and other surface transport infrastructures, road and track traffic (flows, level of service, state of roads, current traffic, etc.)
- Other transportation networks (railway, waterways, sea, air)

II. Pollution, Nuisances and Threats to the Environment

1. Air Pollution

- Type, content and causes of surrounding pollution sources: dust, suspended solids, greenhouse gas emissions (carbon dioxide, nitrogen oxide, chlorinated and fluorinated compounds), contaminants including heavy metals, sulfur dioxide, organic substances, carcinogenic substances, radionucleides, pathogenic germs, etc.
- Presence of unpleasant odors and their causes depending on the direction of dominant winds, ambient air quality and type and content of environmental pollution sources
- Alteration of background noise: noises and vibrations and their causes

2. Threat of soil and groundwater degradation and pollution

- Type, content and causes of surrounding pollution sources (e.g.: heavy metals, radionucleides and residual organic compounds from pesticides and fertilizers, pathogenic germs, etc.)
- Threats of soil degradation by natural phenomena (e.g.: erosion, lixiviation of nutritive substances, soil compaction, salinization, acidification, silting, stranding) or by human-induced pressures (e.g.: clearing, deforestation, agricultural practices, land pressure, etc.)
- Deterioration of groundwater quality, level and natural recharge

3. Threat to Surface Water and Pollution

- Type, content and causes of surrounding contamination or degradation sources : oxygen content, biological and chemical oxygen demand (BOD/COD) parameters, organic matter such as pesticide residues, suspended matter, turbidity, odor, taste, temperature, flow rate, pH, pathogenic germs and water diseases, stagnation of insalubrious water, waste water and waste-generated lixiviates, etc.
- Alteration of hydrological balance: changes of flow rate and annual flow, drying up of springs, samplings or derivation of rivers, etc.

4. Threat of Ecosystem Degradation and Pollution

Identify all types of pollution and threats related to natural phenomena and some human-induced pressures (current and potential use of natural resources or any phenomena affecting natural balance, ecological functions, interactions between living organisms and their environments, trophic chains, habitat integrity of species communities, etc).

5. Pollution and Threats to Some Plant and Animal Species

Give special consideration to natural phenomena (e.g.: infectious and parasitic diseases, fluctuation of predation level or intraspecific competition, etc.) and human-induced pressures (e.g.: introduction of exotic species, authorized and illicit harvesting, excessive harvesting, marketing, food supply, use of toxic products with selective effect or not, etc.) causing a reduction or a risk of extinction of specific species or the biological diversity of the affected area.

6. Specific Threats

- Seasonal atmospheric disturbances and risks of bad weather: duststorms and sandstorms, hail, downpours, atmospheric depressions, cyclones, floods, droughts
- Risk of natural disasters : earthquakes, landslides, rockfalls
- Pest proliferation or invasion (e.g.: locusts, rats)
- Bush fires.