SECTOR GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR HYDRO-POWER DEVELOPMENT PROJECTS IN RWANDA

FOREWORD AND DISCLAIMER

The Organic Law No. 04/2005 on modalities for protection and conservation of environment requires all projects to be subjected to environmental impact assessment, albeit at various scales. This is consistent with the National Constitution, the Vision 2020, and the environmental sustainability principles enshrined in Agenda 21 and the Millennium Development Goals to which Rwanda subscribes, especially MDG 7 on ensuring environmental sustainability. In order to make these provisions operational, the Government of Rwanda (GoR), through REMA, is formulating subsidiary legislations including general guidelines, regulations and sector-specific guidelines. This document – the sector-specific guidelines for EIA in the hydropower generation and transmission- is one of a series of sector-specific EIA guidelines and other instruments to effectively implement the EIA legislation in Rwanda. It is intended to serve as a guide and provides, among others, a checklist of key issues to consider in a typical EIA process for hydro-power projects; a classification of hydro-power projects; an outline of key steps in the EIA process for hydro-power including public/ stakeholder consultations and reporting framework. They are intended to improve the quality of the EIA process and ease the process of reviewing and approving the EIA reports. These standard guidelines are particularly important considering the diversity of stakeholders and experts involved in the EIA process, and the fact that most review work will be done by decentralised entities (Districts).

REMA strongly recognizes the importance of exploiting Rwanda's natural resource potential to generate electricity and other essentials for powering the country towards the EDPRS and Vision 2020 aspirations. REMA reiterates that the ability of our natural resources to continue supplying electricity will depend on how well environmental resources are managed. EIA is an important tool for facilitating such balanced development. This guide should be used together with other EIA instruments that have been developed by REMA.

These guidelines have been made at a time when Rwanda is undergoing socioeconomic tremendous transformation. It goes without saying, therefore, that these guidelines will remain a flexible administrative tool with room for adjustment wherever and whenever deemed appropriate.

Dr. Rose MUKANKOMEJE

Director General, REMA

EXECUTIVE SUMMARY

Guidelines Description

In general, hydro-electric power projects will range from pico, micro and small dams generating a few megawatts serving a few households or users, to large scale dams/ installations that produce thousands of megawatts of electric energy. They also may be community projects or be large nation-wide regional transboundary projects.

No single hydro-electricity project investment is expected to invoke all the safeguard policies that are potentially relevant to the sector however, due to uncertainty of the demand–driven approach, all safeguards with potential application are treated within this framework.

The Safeguards which could reasonably be expected to be invoked by some of these power transmission and grid-extension related HEP investments are:

1) Environmental Impact Assessments (EIAs) requirements according to donor agency guidelines and GoR regulations (REMA);

2) Key issues such as health impacts;

3) Impacts on landscape and pollution;

4) Natural Habitats, including conservation areas, flora and fauna;

5) Forestry, including natural forest and plantations that may be lost as well as critical habitat areas;

6) Cultural Property relating to safeguarding cultural heritage;

7) Involuntary Resettlement including Compensation caused by projects;

8) Disclosure

The Purpose of this document

More specifically, the hydropower sector-specific guidelines are expected to:
Provide necessary information to hydropower projects developers on the necessary steps and procedures for carrying out environmental impact assessment by:

i. Providing an environmental impact assessment procedure which is in line with national and international regulations;
ii. Providing criteria for project classification according to their impacts;
iii. Taking into account specific concerns of HEP projects in the environmental impact assessment process;
iv. Determining roles and responsibilities of all stakeholders in the EIA process;
v. Improve the involvement of all partners in HEP projects.

While there are concerns that exploiting all the HEP potentials in the country may have significant environmental and social impacts, the overall goal of the energy policy (MININFRA 2004a) is supportive to EIA and to environmental sustainability

"*The national energy policy aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner*". Rwanda Energy Policy, MININFRA, 2004.

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GLOSSARY OF TERMINOLOGY

Authority: The national institution, ministry or agency with statutory and technical responsibility ultimate decision making on EIA. REMA is the designated 'authority' for all issues related to environment in Rwanda.

Cumulative Environmental Assessment (Cumulative impacts/effects): The total effects on the same aspect of the environment resulting from a number of activities or projects. Cumulative impacts are long-range, long-term or short-term knock-on effects, or the effects of incremental impacts by one project to already existing impacts within the sector or region.

Developer/Proponent: The entity, person, company/agency — proposing to develop/implement/install a new project/sub-project or expand an existing project under the hydro-electrification strategy.

Direct impacts: An effect on the environment brought about directly by the project.
Disclosure: Information availability to all stakeholders at all stages of the development.

Environment: The physical, biological and societal components and processes that define our surroundings.

Environmental impact assessment (EIA): A systematic, comprehensive, logical process of analysis of a project and its effects (positive and negative) on the environment based on prevailing baseline conditions and a description of the mitigation measures that will be undertaken out in order to avoid or minimize these negative effects.

Environmental Impact Statement: Report presented to the authority by the developer stating, in sufficient detail, the likely impacts or consequences that his/ her project is likely to have on the environment and its components – economic, ecological, socio-cultural, etc., and the measures take to address them. The EIS is prepared by a qualified expert (EIA practitioner) on behalf of the developer.

Environmental Management Plan (EMP): A set of mitigation, monitoring and institutional measures to be taken during implementation, operation and decommissioning to eliminate adverse environmental and social impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the actions needed to implement these measures and at times even the financial cost of the actions.

Involuntary resettlement: the act, decision or process to migrate or relocate from a place to another as a result of an undesired condition (such as an environmental calamity) or in public interest. Resettlement implies that rights of abode have been rescinded or lost in one area but compensated in another either by the state, insurance agencies or other interested parties. But involuntary underlies the fact that the affected party is usually not the initiator but is forced or conditioned into such a decision.

Lead Agency: Ministry or Agency with primary responsibility or statutory powers to make decisions regarding EIA and post-EIA follow-up activities from the policy and regulatory

standpoints. This is usually the line ministry or department under which the hydro-power project falls i.e. the Ministry responsible for energy. Even where more than one sector is involved, the line ministry takes responsibility for political and regulatory decision making in liaison with the authority (REMA).

Mitigation measures: The actions identified in an EIA to negate or minimize the negative environmental impact that a project may have on the environment.

Pollution: Contamination altering the state of purity (e.g. chemical effluent discharge into a surface water body).

Project and sub-project: A set of planned activities designed to achieve specific objectives within a given area and time frame. With respect to hydroelectric development projects, the terminology can be confusing. In some donor agencies for example the World Bank, all proposals subject to intermediary loans are sub-projects.

Project Brief: A summary of the project document showing the project profile (objectives, proponents, technology to be used, size of the investment, where the investment or project is to be implemented, etc.

Public Participation/ Consultation: may be defined as a process or framework in which the results of the EIA and proposed mitigation measures are shared with or communicated to the wider public so that interested parties can express their opinions or views on the proposed project. An effective public participation process should ensure that the information and method of communication, as well as the venue and timing, are accessible and convenient to enable all interested stakeholders to participate. Also, the decisions made should:

- reflect full and active stakeholder representation;
- reflect consensus between decision-maker and stakeholders understand each other's concerns;
- reflect public trust and confidence;
- be accepted as legitimate by stakeholders;
- be accepted as legitimate by stakeholders and
- be improved by public participation.

Scaning: Is a non-statutory, preliminary review of potential environmental and socio-economic issues, conducted to identify environmental and social issues, and on the basis of which to decide whether a detailed EI study should be undertaken and how.

Scoping: Is the initial stage that determines the likely major environmental parameters that will be affected and the aspects of the project that are likely to cause these effects.
Screening: The determination of the level of assessment that will be conducted. In the case of GoR, screening will place the project into one of three environmental categories (I, II, or III). At this stage, it may be decided that the project does not require a full EIA and therefore can proceed based on the Project Brief recommendations.

Stakeholder: Any person or group that has an interest in the project, and the environmental affects that the project may bring about.

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
CBD	Convention on Biological Diversity
CITES	Convention on Trade in Endangered Species
CMS	Convention on Migratory Species
EAC	East African Community
EDPRS	Economic Development and Poverty Reduction Strategy
EIA	Environmental Impact Assessment
EIR	Environmental Impact Review
ElS	Environment Impact Statement
EM	Environment Management Plan Manager/Environmental Manager
EMF	Electromagnetic Field
EMP	Environmental Management Plan
ERC	Environment Review Committee
FIs	Financial Institutions
GEF	Global Environmental Facility
GHG	Green House Gas
GoR	Government of Rwanda
GTZ	German Technical Cooperation
HEP	Hydro Electricity Power
KVa	Kilo Volt Amperes
KW	Kilo Watt
KWh	Kilo Watt Hours
MINALOC	Ministry of Local Government, Community development
MINICOFIN	Ministry of Finance and Economic Planning
MININFRA	Ministry of Infrastructure Development
MINIRENA	Ministry of Natural Resources
MINITERE	Ministry of Environment, Lands, Water, Forestry and Mineral Resources
NBI	Nile Basin Initiative
NEPAD	New Partnership for Africa's Development
NGOs	Non Government Organisations
OP	Operational Procedures
PRA	Participatory Rural Appraisal
PRP	Project Resettlement Plan
PV	Photo Voltaic
REMA	Rwanda Environment Management Authority
RIS	Reservoir Induced Seismicity
RURA	Rwanda Utilities Regulatory Authority
SOPs	Standard Operating Procedures
SME	Small Micro Enterprise
STD	Sexually Transmitted Disease
ToR	Terms of Reference
UNDP	United Nation Development Programme
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCD	World Commission on Dams
WHC	World Heritage Convention
WHO	World Health Organisation

PART 1 GENERAL INTRODUCTION

1.1 About the Guidelines

These sector-specific EIA guidelines are intended to serve as basic framework or checklist of key issues to be considered by developers, practitioners, and other actors involved in the EIA processes regarding hydropower development in Rwanda. They are intended to cover all types of hydropower projects i.e.:

i) Construction of new hydropower generation dams or reservoirs;
ii) Upgrading of existing hydropower stations;
iii) Construction of hydro-power substations;
iv) Construction of high voltage electricity transmission lines

These HEP sector-specific EIA guidelines are intended to apply to all proposals that undergo EIA in accordance with the Organic Law No.4/ 2006 on Environment. They are expected to be used by:

1) HEP Project proponents;
2) REMA EIS reviewers and Monitoring experts;
3) Independent consultants/ EIA Practitioners
4) Stakeholders affected by the HEP project developments and/ or proposals;
5) Community representatives and/ or interested parties.

The developments in the energy sector in Rwanda today indicate that there will be opportunity to undertake any or a number of these projects. Hence, these guidelines have could not have been formulated at a more opportune time.

1.2 General Country Context

1.2.1 Rising Demand for hydroelectricity in Rwanda

After a successful post-genocide recovery process, the Government of Rwanda (GoR) has embarked on a rapid, focused development process in order to attain its long-term goals enshrined in the Vision 2020, the Millennium Development Goals (MDGs) and the Medium term strategy- the Economic Development and Poverty Reduction Strategy (EDPRS). The information and communication technology (ICT) based economic transformation and industrialization drive under the EDPRS, have created a huge energy demand which requires innovative energy and environmental policy. To meet the energy challenges, the GoR has embarked on a strategy to explore and exploit her natural resource endowments with potential for energy. These include methane gas, hydroelectric power, geothermal and solar among others. At the time of writing these guidelines, Rwanda had established Africa's largest solar plant at Mount Jali in the outskirts of Kigali city, tested its first extract of methane gas from Lake Kivu, and had identified more than 170 potential sites form small hydropower development. Hydropower is among the cleanest and most reliable source of electricity. Rwanda's large

drainage network and its terrain have enhanced its potential for hydro-power development. But its terrain, the ecological sensitivity of some of the potential hydropower sites, and the complex relationships with which downstream community and transboundary interests, make hydropower development a sensitive issue. These developments have potentially significant impacts on the environment which could, in turn, undermine the long-term sustainability and reverse the achievements already realized. Innovative mechanisms are therefore needed to ensure that such development interventions are not undertaken at the expense of a healthy and sustainable environment. Environmental Impact Assessment (EIA) is therefore an important aspect for successful and sustainable exploitation of Rwanda's hydropower potentials. These guidelines are expected to provide a strategic and operational framework for developers, EIA practitioners and the GoR regulating agencies and other interest groups to ensure quality EIA work.

1.2.2 Purpose and objectives of the Guidelines

Environmental Impact Assessment (EIA) is a process whose ultimate objective is to provide decision makers with indication of likely environmental consequences of a proposed activity.

The objectives of an EIA are to:

- ✓ determine environmental compatibility of the project
- ✓ evaluate and select the best project alternative from the options available
- ✓ identify and evaluate the significant environmental impacts of the project
- ✓ incorporate environmental management plans and monitoring mechanisms
- ✓ assess the environmental costs and benefits of the project to the community

This document provides technical guidance to support sound EIA practices and outcomes across all phases of HEP development - scoping, feasibility studies, design phases, construction and operational phases. They are intended to provide mandatory advice and guidance on:

- issues and criteria considered in EIA;
- available EIA process options;
- information requirements for the various EIA processes; and
- drafting appropriate EIA reports (or EISs).

In presenting a clear and comprehensive statement of those components which need to be included in an EIA report for HEP projects, the guideline will not only assist developers and their consultants prepare better quality EIA reports but will also ensure that sufficient information is available for a proper assessment and for good decision making.

The principle objectives of these guidelines are to:

- ✓ aid in the preparation of reports that are comprehensive in content and to reduce cost of EIA
- ✓ protect the environment from costly and irreversible mistakes
- ✓ aid review of the reports
- ✓ avoid time delays and cost overruns.

One of the key aspects of hydroelectric power projects is the specificity of each proposal especially in terms of design and location. EIA practitioners and reviewers must thus look at the particular circumstances of each proposed project occasioned by differences in design and location. Stakeholders must understand that differences such as the nature of human settlements around the project site, vegetation types, nature of parent rock at/ around the site or orientation of the slope, etc., can make a large difference in the types of impacts created.

1.3 Scope of the Guidelines and need for continuous review

This guide has been developed in the absence of specific HEP laws describing the range of project sizes that should be subjected to EIA. While there are various activities that require EIA, the guidelines hereafter are sector specific to hydro-electricity development. There is a general classification of activities that require EIA such as an activity out of character with its surroundings, any structure of a scale not in keeping with its surroundings, and Major changes in land use. For an HEP Dam Construction and Power Generation Project in Rwanda, EIA must aim at answering the following eight questions:

Whether the project will/is likely to:

(a) induce or result in flooding of areas that are of significance to human settlement, agriculture, animal husbandry, or similar?

(b) Flood areas which support animal or plant life (including the level of significance) or especially vulnerable ecosystems?

(c) Flood areas which contain historic remains or landscape elements which are of importance to the local population?

(d) Drain rivers or change the flow of water in such a way that it creates considerable changes for the environment and the utilisation of natural resources?

(e) Cause substantial changes in the flow of nutrient elements and fish production and/ or related aquatic environments?

(f) Create a risk for increased spread of water-borne diseases?

(g) Change the way of life of the local population in such a way that it leads to considerably increased pressure on the natural resource base?

(h) Obstruct or lead to substantial changes in the local population's exploitation or use of natural resources other than those directly affected by the project?

In answering the above questions/ problems, the level of analytical and presentation detail will depend on the extent of relevance or impact of each theme to the project and site. Thus, the EIA report should reflect the site specific issues and be tailored to address the potential impacts of the

proposed project in space and time. Proponents and consultants are advised to refer not only to the current policy and strategy reports formulated by relevant ministries/ agencies (e.g. energy policy and strategy, EDPRS, Land Use and Urban Development Master Plans of the various districts and urban authorities, etc., but also past documents to gain insight into where the country is coming from. They also need to ascertain the current policy thinking with respect to likely future developments so as make predictions (or anticipation) of what is likely to happen if different development scenarios are implemented. It should be emphasized that EIA is about the future because even the projects for which EIA is done are expected to accrue in future.

As our understanding and awareness of the environment improves, and as new challenges arise, these guidelines will be updated to reflect new ideas and emerging issues. In particular, these guidelines are likely to be reviewed when new legislations come up especially in the areas of energy and infrastructure development, as anticipated.

PART 2: LINKS BETWEEN HEP PROJECT CYCLE AND EIA

2.1 Need for EIA in the HEP Projects

Careful analysis of the HEP project cycles, described – in simple terms, indicates that any development proposal listed in article 67 of the Organic Law on Environment (No. 04/2005), and the EIA General Guidelines, must undergo EIA in respect of which a Certificate will be issued before commencement of the developments. The Certificate of approval is based on the commitment to implementing an environmental management plan (EMP). Hydropower power projects, irrespective of the size and location, are subjected to full and detailed EIA.

A proponent applying for an EIA license shall submit in electronic form and in 10 well printed and bound copies of his/her EIS (EIA report) and any such additional copies as may be reasonably required by the Director General or authorized agent. The Guidelines for submission of EIA reports in soft copy version are in Annex III and its Appendix 1.

2.2 Environmental assessment phases in relation to the project development cycle

EIA work takes place at or earlier than the conception stage of the project. The EIA report (EIS) is part of the documentation on which the project approval decisions is based.

In relation to project development procedures where projects are designed in concept to a certain point and are then put out to tender, with the winning bidder committed to implementing the project, the timing of EIA approval may be problematic. Table 2.1 below indicates the environmental assessment activities which should be conducted and at which stage of the project development process.

Table 2.1: Environmental assessment phases in relation to the HEP development cycle

Preparatory/ Inception phase	Construction/ Engineering phase	Operation phase
1. Identification/Preparation	Pre-feasibility	Environmental Scan
2. Subsidy Agreement (loan agreement in the case of on-lending arrangements through commercial banks	Feasibility	1. Project brief 2. Scoping 3. EIA preparation phase
3. Subsidy Disbursement (loan disbursement in the case of on-lending arrangements through commercial banks)	Detailed Design	Environmental management plan (EMP) formulation
	Construction	Formulate environmental management plan (EMP) formulation Monitor compliance with specifications on site
	Operation	- Environmental monitoring - Audits by REMA, concerned utility agencies and Local Authorities

2.3 Required Expertise

All EIA activities are multi-sectoral and therefore, a multi-disciplinary team is required to undertake EIA. A Competent team required to undertake EIA for hydro-power projects must have proven skills in the following disciplines:

Essential qualifications

- Civil and/ or construction engineering, preferably those with specialization or special expertise in structures
- Electrical engineering
- Hydrogeology, hydrology and water resources management
- Agriculture, environmental science and/ landscape ecology

Other disciplinesl

- Public health and sanitation engineering
- Socioeconomics (social anthropology, public administration and law)
- Surveying and/ or mapping
- Financial and economic analysis
- Sound engineering

In each of these areas, the minimum academic qualification should be a Bachelor's degree or an internationally recognized professional qualification[1]). Beyond the skills and experience, approval by a professional body or recommendations from existing clients may be required because of the professional integrity required in the assignment. Except in special circumstances (e.g. large scale international projects where a majority of experts may be drawn from regional or

[1] These include Chattered Institute of Surveyors, Association of Certified Chartered Accountants.

international market), it is recommended that EIA practitioners be registered with certified by the Authority. This will facilitate standards monitoring and professional development.

2.4 Pertinent National Environmental Legislative and regulatory framework

Rwanda's environmental legislative regime is still evolving. For ease of reference, the main legislations that must be consulted in relation to EIA for hydro power development are outlined in Annex 4. A number of relevant laws and regulations are in the process of formulation, yet others will have to be formulated in the process during the operation of these Guidelines.

Important to Note:
The EIA shall be duly signed and dated by either the proponent or his appointed legal representative and countersigned by the EIA consultant. The Environmental Law makes it an offence for any proponent or EIA consultant who submits a false report or submits a report containing misleading statements, or provides false or misleading information. Such proponent is liable to a fine or imprisonment or both imprisonment and a fine, as the law shall provide.

2.4.1 Categorizing Hydro power projects

Like all other projects, environmental impacts of hydro electric power projects vary with size and location of projects. In HEP development, project size matters perhaps more than other considerations. In the context of EIA, these guidelines categorize HEP projects into 5 categories and therefore, HEP projects are characterized into 5 classes as per the following Table 2.4.

Table 2.4 Classification of hydro power projects by size and output capacity

S/No	Type	Capacity
1	Large Hydro	>500MW
2	Medium –Large Hydro	10-500MW
3	Mini Hydro	500kW-10MW
4	Micro Hydro	5-500kW
5	Pico Hydro	<5kW

1 kW (kilowatt) = 1000Watts; 1 MW (megawatt) = 1, 000, 000Watts

The EIA team has to ensure that all key environmental issues are investigated and their likely impacts taken into account in the project design. The EIA report has to articulate in sufficient detail, shall not comprise statements of a general nature but instead shall provide substantive and indicative information on the proposed activity, the measures proposed to mitigate all adverse impacts as well as the opportunities for environmental enhancement so as to enable a proper assessment.

2.4.2 The Significance of Magnitude

There are great variations in parameters such as discharge, head, storage requirements, reservoir area and fluctuations, river regulation requirements and technological solutions. Public opinion on damage to the environment caused by HEP schemes usually refers to large projects with major river and reservoir regulation features associated with them. What might be considered minor inconveniences in small or medium size projects with or without storage, are often significant in large-scale hydropower projects.

Similarly, the *risk of triggering earthquakes* through establishment of artificial water bodies like storage reservoirs is more to do with the project size because, the weight of much water on tectonically susceptible landmasses. Considerably too, is the loss of land and forest cover and the controversy of increases in greenhouse gas emissions, associated with hydropower development.

The problem of resettlement of people as a consequence of dam building is also highly sensitive to the scale and type of project being considered. However, if socio-economic factors are added as criteria, the picture becomes more realistic but complex.

A high dam does not automatically mean a large reservoir or vice versa. Neither does a high head power scheme necessarily result in a large installed capacity in absolute terms. In a mini hydro scheme, the scale may be small in absolute terms but big in relative terms, e.g., when the entire flow of a local stream is diverted or stored for power generation purposes, loss of water availability downstream is virtually 100%. The message here is that environmental impact is measured both in absolute and relative terms. Project size alone may not be an appropriate determinant of environmental impacts. A mini hydro project built without regard for potential environmental problems in steep terrain, utilizing the sole water source of a local community may cause major damage through erosion, slides, loss of water for alternative uses, impaired water quality, silting downstream, etc. Also, it is important to note that large hydropower stations often inversely use fewer natural resources to produce a unit of electricity than do smaller ones.

PART 3: THE EIA PROCESS

3.1 Project Proponent

The project proponent may be private, government or any organisation whose intention is to undertake a project which might have both negative and positive impacts on the environment (biological, physical or socio-cultural including economic impacts).

3.2 Project Preparation

Central to HEP EIA is project planning which will assist decision makers in implementation. There are key resources required to successfully conduct the EIA and these include:

- Qualified multi-disciplinary staff;
- Technical guidelines for screening, scoping, prediction, evaluation and mitigation;
- Information about the environment;
- Analytical capabilities for doing field work, laboratory testing, library research, data processing, photomontage, surveys and predictive modelling;
- Administrative resources;
- Institutional arrangements including, inter alia, a formal process for integrating the EIA into decision-making about projects;
- Review, monitoring and enforcement powers.

3.2.1 Event of exemption

The objective of screening is to determine the extent to which a project is likely to affect the environment, therefore to determine the level of assessment required. Screening is generally guided by the following criteria:

- Location of project
- Type and size of project
- Potential impacts against set thresholds and standards.

However, all hydro-power projects, irrespective of size or location, are subjected to some form of EIA, the detail of which is subject to the categorisation. This is because they are generally located in ecologically sensitive areas and result in change in natural water flow one way or the other.

Table 3.2.1: Screening Categories for HEP Development Projects

Screening Category	Definition	Types of HEP Projects/ Activities
I	Projects normally subjected to limited environmental impact review	▪ Power sub-stations <100Kw, ▪ Single phase power distribution lines, ▪ Triple phase power distribution lines < 1 km in length
II	Projects for which adequate mitigation measures have to be determined either directly or through EIA	▪ Hydropower < 500 Kw, ▪ Power sub-stations <1000 KVA, ▪ 3-phase power distribution lines < 10 km
III	Projects requiring full and detailed EIA	▪ Hydropower> 500 Kw ▪ Electric power transmission Lines, 3-phase power distribution Lines> 10 km, ▪ Power sub-stations 1000 KVA ▪ Often involved large water reservoirs and involuntary resettlement of people/ socioeconomic activities.

3.3 Project Brief

A project brief is necessary for REMA to determine the category of the project. This arises out of the screening process which assesses the cost or benefit of the particular project.

The Project Brief should include:

- Detailed particulars of the developer including names and addresses and contact people; (sponsor)
- Description of pre-project environment at and around the site;
- Objectives and characteristics of the project and reasonable alternatives;
- Major activities that will be conducted during site preparation, construction, operational and post-operational/ decommissioning phase;
- Specification of materials to be used;
- Products and by-products including liquid and solid waste.
- Financing, including sources;

Project briefs are concise documents (10 pages) that should contain the following information:

Characteristics of the Project

- *Brief description of the proposed project* including type of project, the form of energy source, size of the project in terms of capacity installed, transmitted or distributed length of transmission, distribution lines, and number of people to benefit from the project, raw materials needed as well as product by product.
- *Reasons for proposing the project* (justification of the project, project objectives)
- *Background of the project:* How was the project conceived? Findings from previous studies such as energy supply and demand analysis that contributed to the conception of the project; relationship with other existing/planned projects.

- *Project site:* Maps and photographs of the project location relative to surrounding physical, natural and man-made features; existing land uses on/ around the site and any future planned land uses; protected and sensitive areas e.g. national parks, forests, wetlands, sites of cultural interest; alternative project sites; reasons for choosing the particular site.
- *Baseline data* should include information relevant to the proposed project. This includes biophysical conditions of the site and affected areas e.g. geology and soils, climate and rainfall conditions, settlement areas, land requirements for construction, land use and tenure; and socioeconomic and cultural information such as sites of cultural or historic value; human population and demographic trends, local government structure, major economic activities, public health and education infrastructure.
- *Physical form of the development:* layout, buildings, other structures, construction materials, etc., including details of: energy source, energy generated, transmitted or distributed. Particularly for HEP Transmission and Grid Extension generation: size/ extent of transmission line, voltage, number, length; distribution lines — voltage, number and length; energy demand and supply in the project area; raw material consumption rate; access roads; project land within project boundary; site preparation activities such as clearing of land, forests, drilling blasting and excavation of land; time needed for project development.
- *Construction practices:* Specific construction techniques to be used with emphasis on any potential impacts of construction such as noise and dust. Needed housing, transportation and other facilities for workers.
- *Preliminary analysis of alternatives*: The brief should indicate reasonable alternatives to meet project objectives. This may lead to alternatives that are sounder from an environmental, social, cultural and economic point of view from the original proposed project. Alternatives can be other energy sources, construction of smaller energy facilities, alternative sites and different technologies.
- *Other large development projects ongoing or planned for within the area of influence of the energy project*.

Characteristics of the potential impacts
A brief description of the likely impacts of the project considering the following factors:

- Impacts on people, human health, gender distribution of social-economic benefits, fauna and flora, soils, land use, material assets, water quality and hydrology, air quality, climate, noise and vibration, the landscape and visual environment, historic and cultural heritage resources, and the interactions between them.
- Nature of the impacts (are they direct, indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, positive or negative.
- Extent of the impacts (geographical area, size of the affected population / habitat! species);
- Magnitude and complexity of the impacts
- Probability of the impacts
- Duration, frequency and reversibility of the impacts
- Mitigation incorporated into the project design to reduce, avoid or offset significant adverse impacts
- Transboundary nature of the impact.

The six major Impact zones include:

a) Upstream Watershed and River Reaches
b) Reservoir Area and Water Body
c) General Project Area, Access and Transmission Corridors
d) Dam, Spillway and Power Station Area
e) River Reach Dam to Tailrace
f) River Reach Downstream of Tailrace including Delta Complex

Terms of reference for EIA

Issues to be considered in preparing the ToRs should include but not be limited to the following:

Objectives of the HEP Power Generation Plant EIA

- Project activities
- Problems being addressed
- Planning of the *HEP Power Generation Plant*
- Need for the *HEP Power Generation Plant*
- Long term validity of the project
- Project design
- Project implementation, operation and maintenance

Legal and Policy framework

- Summary of important environmental legislation and regulations
- International protocol and local environmental policies
- Planning of future constraints (future natural parks, road and railways construction)

Route (Transmission Corridor) selection

- Criteria for route selection
- Analysed route alternatives
- Description of the selected route and reasons of the choice

Territory description around the line route

- Geographic data (information on topography, orography, hydrography, geology, seismology, etc)
- Data related to human activities (population presence and density, land use, infrastructures such as airport and highways, natural parks, naturalistic trails)

Environmental impact identification and assessment

- Identification of all environment issues relevant to the different phases of the specific project (construction, operation)
- Identification of the areas of impact around the line
- Hereafter are the reported potential environmental issues.

Public health

- Electric and magnetic field requirements

Ecological considerations

- Effect on flora and fauna
- Effect on endangered species
- Effect on soil
- Effect on breeding populations of fish and wildlife
- Effect on wetlands, rivers, aquifer, if any
- Effect on aerial extent of their habitat

Social, economic and cultural including

- Employment
- Social disruption (resettlement)
- Migration or immigration
- Communication (roads opened up, closed, re-routed, etc)
- Local economic impacts

Landscape

- Areas opened up or closed
- Visual impacts
- Blending with surroundings
- Recreation facilities

Land use

- Effect on land use
- Possible multiple uses

Water

- Effect on surface water
- Effect on underground water
- Effect on flow regimes

Mitigation and Monitoring

- Comprehensive and detailed plan of mitigation measures
- Compensation schemes, training
- Monitoring plans.

Conclusions and Recommendations

- Summary findings
- Economic benefits, etc.

3.4 Scoping for HEP Dam Construction and Power Generation

Scoping is an important component in EIA methodology. During scoping, the main environmental and social issues are identified. The depth of analysis required for each impact is also identified and stated in the ToR.

The scoping exercise will determine among others, the following:

- Suggested delineation of the appropriate boundaries to be considered in the EIA
- Questions about the proposed project which should be answered through the EIA
- Identification of the potentially significant impacts of the project which shall be addressed in the EIA;
- Alternatives to the proposed action
- The full range of stakeholders to be consulted and suggestions for full public involvement in the process;
- Identification of full range of stakeholders who may be affected or are interested in the proposed project;
- Identification of other past, present, or foreseeable future projects in the areas that may be impacted upon by, or will impact on the proposed project
- How the proposed project conforms to existing laws, policies and regulations
- The major issues, impacts and considerations involved in or that need to be addressed by the EIA;
- How these issues should be addressed by the EIA
- The methodology for public participation in the EIA
- The availability, type and quality of data required for the EIA
- The amount of person months required to satisfactorily carry out the EIA
- The logistical and practical arrangements that need to be in place for the study to achieve its purpose.

The Scoping exercise mainly aims at:

- Providing an opportunity for consultants, relevant authority, project proponent, interested parties and affected parties to express their views and concerns regarding the proposal before an EIA proceeds;
- To focus the study on key and relevant issues for quick decision making;
- To facilitate an efficient assessment process that saves resources, time, cost and delays.
- Identifying potential stakeholders with an interest in the project;

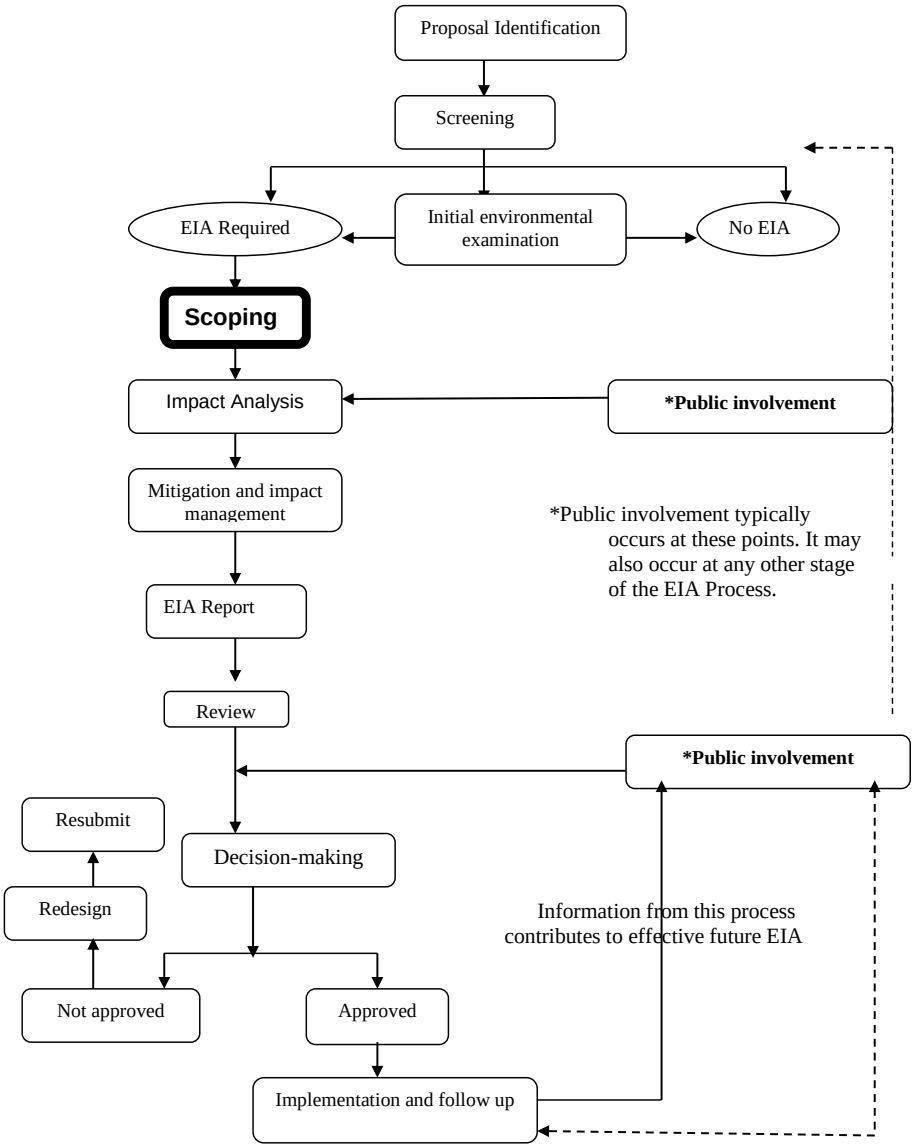

Figure 3.4: Scoping in the EIA process

3.5 Environmental Impact Assessment for HEP Dam Construction and Transmission Lines

Once the scoping exercise has identified the key issues to be included in the EIA, the next step in the EIA process is to carry out a detailed study of the key impacts. At the same time it is important to explain why some impacts are considered insignificant. The study should ensure that it attempts to answer the following questions:

- What environmental and social impacts will occur as a result of the project?
- What will be the extent, magnitude and duration of the impacts?
- What will be the significance of these impacts within the local, national, regional, and international context?
- What can be done to mitigate, reduce, or avoid altogether the negative impacts, or optimise positive impacts?
- What residual impacts might need compensation?

Many methods have been proposed to carry out the study. These include matrices, questionnaires, checklists, overlays, networks, models and simulations.

In these guidelines, has been designed a table clearly indicating four Dimensions of Hydropower Projects – which can ably be referred to as variables of interest in assessing environmental impacts in the sector*(see table 3.5 below).*

The study should also identify and assesses alternatives to the project. Only the best alternative (one with the least adverse impacts) should be selected based on less negative impacts and cost-benefit analysis. An important alternative to be analysed always is the ***"no project".*** This is a very important analysis because it helps the proponents measure the impacts from the project against those which would have taken place without the project.

The team undertaking the EIA should be multi-disciplinary in nature. The team should include but not be limited to an ecologist, biologist, archaeologist, social scientist, soil scientist, economist/demographer, engineer, etc. Some countries in the region may request the participation of a local consultant familiar with the project area.

Public meetings within the project area are recommended as an integral part of the EIA study. Some countries in the region request that public hearing meetings are publicised in the press. These meetings enable interested and affected parties to contribute their concerns which might have been overlooked during the scoping exercise. The public meetings should be chaired by an independent person. Minutes of the public meetings and any other correspondence from stakeholders should be kept. They will form part of the EIA report (as appendices).

Table3.5: Four Dimensions of Hydropower Projects – variables of interest in assessing environmental impacts

MAGNITUDE ➢ MW installed power ➢ GWh power production ➢ km2 inundated land ➢ km2 drainage basin ➢ km diversion ➢ m head ➢ m dam height ➢ m3/sec discharge ➢ m3 dam volume ➢ no. of turbines/generators ➢ construction cost	**PHASE** ➢ planning ➢ field investigations ➢ design ➢ tender documents ➢ construction ➢ operations ➢ commissioning ➢ decommissioning
COMPONENT ➢ drainage basin ➢ up-stream river ➢ spillway ➢ powerhouse ➢ switchyard ➢ dam ➢ transmission lines ➢ tailrace ➢ access road ➢ reservoir shores ➢ reservoir ➢ water body ➢ ancillary structures ➢ operators village ➢ down-stream river	**SECTOR** ➢ regional economy ➢ national economy ➢ social structures ➢ household economy ➢ nature ➢ research ➢ people ➢ jobs ➢ institutions ➢ wildlife ➢ private business ➢ culture ➢ national self-sufficiency ➢ emotions

3.5.1 Phases in the Environmental Impact Assessment Process

There are three inter-connected standard phases of the EIA process: screening, environmental impact study and decision-making (see figure 3.4). The decision-making phase results in the issuing or refusal of an EIA Certificate by REMA. Formal EIA processes begin when the project concept has been submitted to REMA and terms of reference for the EIA study drafted and approved.

3.5.2 Environmental Impacts and Mitigation Measures

1. Issues of Technical Nature

A) Dam Failure*:* Dam failure leads to massive flooding and mudslides and/or rock falls and can cause loss of human life, wildlife, infrastructure and property. This may occur during construction or operation or decommissioning.

Dam failures occur due to:

- Soil erosion (erosion of upstream slope protection, erosion of downstream slope protection, excessive leakage and/or excessive settlement);
- Weak embankment dams of earth fill usually for which dam engineers had not been engaged;
- Overtopping;
- Tunnel (tailrace) stability problems caused by *Smectite* (dry clay in rocks that later expands on absorbing water);
- Weakness Zones and Faults in bedrock (**either** beds or layers of particularly weak rock in a series of sedimentary or metamorphic rocks; **or** a zone of crushed and/or altered rock formed by faulting or other tectonic movements).

Mitigation

- *Control water level in reservoir*: this depends on the ability to release water. A controlled rate of filling and lowering is required and is particularly important during first impoundment. The performance and release capacity of the outlet structures are essential to the safety of any dam. It is not advisable as is often done to plug diversion tunnels so they cannot be operated by gates or valves after dam construction is completed, unless adequate release capacity is ensured through other structures.
- Drainage capacity must be sufficient to let even large leaks pass through freely without creating high pore pressures or seepage forces which can be critical and threaten the stability of the dam.
- Stones in the upstream slope protection must consist of sound rocks with sufficient weight to withstand the action of waves and ice sheets from the reservoir.
- Borrow pits and quarries should preferably be located within the future reservoir area so that potential scars in the landscape are avoided. Blast craters and test pits should be backfilled as soon as possible and ignition wiring, markings and miscellaneous litter from the activities must be collected and removed.

B) Erosion and Sedimentation: Ground sediment run-off generated by rain may end up into the river or stream. Ground water discharge may also supply the river with sediments as gullies are normally developed this way. Sediments may also abruptly feed into the river when landslides occur on the valley sides or due to bank erosion. Sedimentation occurs naturally in meandering rivers, canals, lakes and reservoirs but is induced in engineering works like settling basins. All reservoirs will ultimately be filled with sediment and organic material because sedimentation as a natural geomorphologic process can only be controlled but not halted.

Possible mitigation

Flushing of sediments from de-sanders and small reservoirs with minimum use of water, mostly surplus flood discharge.

C) Run-off and Water Losses: Impoundments in rivers will always result in runoff changes of water in the downstream reach of the river. Variations relate basically to temporal changes in flow that result from regulation further upstream. Changes within a reach of river will depend on the river discharge, its surface area and its groundwater interactions with the riverbanks. Extremes vary from completely dry river beds to abnormal floods caused by larger than natural river releases from the reservoir. It's common that natural discharge variations are replaced by a fairly steady flow pattern with sharply reduced peaks and low-flows.

Mitigation

- Changes in runoff patterns must always be considered in project specific terms related to the operation period.
- Only draw conclusions after knowing reservoir regulation rules, investigating water utilization potentials and studying people's preferences and habits e.g., prevent unnecessary upstream river diversions for irrigation purposes.
- Acknowledge that values and needs may change over time with today's' positive situation becoming negative tomorrow.

D) Regulated River Reaches and Environmental Flows: Dewatered reaches of a few kilometres from the dam to the tailrace are typical of modern hydropower projects. Effect varies from negligible where the power station is located at the foot of the dam, to major for basin diversion schemes. Associated environmental problems include altered flow regime downstream of the tailrace or diversion canal. Whether recipient body is the same or a different river, it will be affected in proportion to the upstream storage and release pattern. Short term peaking in areas with marginal storage opportunities and strong daily demand fluctuations, may upset the normal flows to the detriment of users and aquatic ecology.

Mitigation

- Evaluate restrictions to night shutdowns and rate of change of turbine flow, in terms of the environmental flow conditions.
- The goal of environmental flows is to provide a flow regime that is adequate in terms of quantity, quality and timing for sustaining the health of the rivers and other aquatic ecosystems. They can be categorised as:
    - historical flow record methods
    - hydrological index methods
    - habitat simulation methods;
    - holistic methods.

In assessing the river, investigate these factors:

- Occurrence of unique habitats and/or sensitive aquatic species within reach
- Quantity of unique habitats and/or sensitive aquatic species downstream in relation to remaining quantities of the same elsewhere
- Importance of the river water to the terrestrial fauna
- Importance of the river water to people and their livelihood
- Importance of the river water from an amenity point of view
- Importance of the river water from a scenic/touristic point of view
- Maintenance of the freshwater aquatic ecosystem
- Maintenance of a good quality of water released from the reservoir including water temperature and oxygen levels

- Effect of spilling at the dam and sediment flushing releases and their relation to the natural flooding cycle

E) Barrage and Water transfer Effects: Placing the dam across the river and having a diversion arrangement transferring water out of the river basin naturally interferes with natural stream-flow conditions in ways that may also be felt upstream in a river or watershed. Fish and aquatic life may be prevented from migrating upstream for breeding and feeding in upstream food webs.

Mitigation

- Construct fish ladders (upstream migratory corridors) where necessary.

F) Green House Gas (GHG) Emissions from Reservoirs: Such gases are produced when organic material decomposes under anaerobic conditions. The highest production of methane occurs in shallow tropical reservoirs where a warm, nutrient rich water body low in dissolved oxygen is established below approximately five metre depth. This contributes to global warming.

Mitigation

- Regularly clean reservoir of plant debris and prevent excessive artificial nutrient addition (runoff agricultural fertilisers or otherwise) into reservoir.

G) Temperature Effects and Density Currents*:* Thermal pollution occurs when temperature change inducement by man decreases the distribution and abundance of aquatic animals which society value and probably undermines recreational values like swimming and fishing downstream. Problems may occur if water is got from a very cold reservoir at high elevation and dropped into a warmer lake at lower altitude.

Mitigation

Manage out-flowing water temperatures through selective withdrawal through intake towers.

H) Groundwater: If aquifer water quantity is undermined, it may facilitate saltwater intrusion. Severity of impact is totally dependent on site-specific conditions e.g., groundwater levels, recharge conditions and gradients as well as soil/rock permeabilities, storage and transmissivity properties.

Mitigation

- Investigate groundwater levels, recharge conditions and gradients as well as soil/rock permeabilities, storage and transmissivity properties.

I) Water Quality: Hydropower projects affect the quality of water being stored, diverted or released from turbines. Effects can be grouped under: natural chemical composition, dissolved substances (gases and salts), suspended matter (sediments and organics), temperature and biological processes (bacteria, algae, vectors). Serious health related organisms which live and breed in stagnant or sluggish flowing water bodies will cause problems of schistosomiasis (or bilharzia), yellow fever, filariasis (elephantiasis) and onchocerciasis (river blindness).

Mitigation

- Frequent water quality measurements and management procedures should be conducted by water quality specialists who predict water quality changes from studying the

chemical composition of a representative sample of river and relating it to site-specific conditions and scheme features.
- Focus on impoundments and their liminological aspects as they relate to river basin diversions, spilling and turbine releases.
- Ensure massive campaign to eradicate disease vectors around the development.

J) Land Use and Access: Environmentally, the most costly land use changes take place with the establishment of reservoirs in cultivated and settled areas but, major reservoirs in productive forest areas can also be a major cost factor on the project, both in real monetary and opportunity cost terms.

Mitigation
- Seek the least cost alternative and de-vegetate only where necessary. Effort should be made to re-vegetate areas that require greening.

K) Reservoir Induced Seismicity (RIS)*:* Reservoirs (man-made lakes) are known to induce earthquakes. Depths of water of more than **100m**, and volumes greater than **1km^3** classify the project as prone to RIS. RIS triggering conditions are complex, and associated with particular geomorphologic conditions, highlighted by a particular risk area of occurrence, and the manner of impoundment and reservoir operation.

Mitigation
- Conduct extensive geological studies of area before establishing power plant.

2. Socio-economic and institutional issues

A) Health
- Malaria
- Yellow fever, Filariasis, Dengue and other diseases
- Onchocerciasis
- Behavioural diseases linked to workers'/contractor camp
- Access to water (and/ or sanitation problems) when river beds dry up.

Mitigation
- Conduct ground water studies in area and riparian zones to establish if they are vulnerable to over-exploitation prior to project establishment and eradicate disease vectors.

B) Relocation of People*:* Dams and reservoirs are the most frequent cause of displacement of people. Whereas the size of displacement and resettlement adds to the seriousness of the problem, the real focus should be on the issue of socio-economic and socio-cultural results of any relocation caused by the development. However, social indicators might show that relocating people might improve their economic status than under present conditions.

Mitigation
- Ensure multidisciplinary participatory approach to hydropower planning;
- Enforce resettlement policy with focus on:
    - Restoring and improving displaced people's livelihood;
    - Moving people in groups;

- Informing people and ensuring their participation;
- Allocating ample resources;
- Enhancing/developing community organizations;
- Considering the position of host communities;
- Accessing the present living conditions and defining incentives for improvement.

- Prevent impoverishment (landlessness, homelessness, poor health, food insecurity, loss of access to common property assets, social disruption, etc) by ensuring that:
  - A policy framework exists that defines affected groups' rights and eligibility in the process of being moved off their land and resettled.
  - Proper social surveys are conducted with risk analyses built in and sound follow-up from removal to reestablishment.
  - The economic and financial analysis is realistic and provides timely input to project planners to assist them in internalizing the problem of relocating people and in optimizing the project with this in focus.
  - People's participation and strong organizational framework exist at local levels.

C) Minority Questions: Minorities (indigenous people) will have:

- A close attachment to ancestral territories and to natural resources in these areas;
- Self-determination and identification by others as members of a distinct cultural group;
- An indigenous language, often different from the national language;
- Presence of customary social and political institutions; and
- Primary subsistence-oriented production.

Linked problems may arise from reservoir establishment and access road construction.

Mitigation

- Identify local preferences through direct dialogue, incorporate indigenous knowledge into project planning and use appropriately experienced specialists early enough;
- Pay proper attention to socio-economic issues from the outset so as to turn mitigation measures into opportunities for improved welfare and local economic and institutional development.

D) Cultural Heritage: Cultural heritage refers to sites, customs, structures or remains of archaeological, historical, religious, cultural or aesthetic values. They may also include unanticipated discoveries of archaeological features e.g., concentrations of pottery, worked stone and animal or human bones which are of significance to archaeologists, historians, anthropologists and palaeontologists).

Mitigation

- Pay special attention to existing and traditional ways of natural resource management and production.
- If archaeological chance finds do exist,
  - Notify department of antiquities;
  - Request for a representative to make a site inspection;
  - Cease work in the vicinity of the find until the visit of a representative; and
  - Wait for decision by department of antiquities on possible salvage or excavation.

E) Visual Effects, Concepts of "Sense of Place" and Wilderness: Poorly planned sighting or project facilities may destroy an important wilderness area, or panoramic view of landscapes.

Mitigation

- Conduct proper landscape planning, design and management.

F) Regional Considerations: Factors hinging on institutional and human resources inefficiency or deficiency, a poor legal structure and inadequate private sector plus failure to incorporate views of affected communities and local NGOs during project formulation and implementation may fail the HEP project.

Mitigation

- Incorporate views of affected communities and local NGOs during project formulation;
- Promote education and training, build managerial capacity for project, build strong leadership and offer conducive salaries for employees balanced across the regional board for projects shared amongst several countries;
- Comply with prevailing laws and regulations.

3 Biological Effects and Mitigation

A) Effects on algae: Poisonous blue algae may bloom outside the outlets of regulated rivers at the expense of true algae. When river is transformed into an impoundment or man-made lake, algal production and diversity will increase dramatically, although riverine benthic algae will be eliminated due to reduced light penetration, gas exchange, increased sediment deposition and flourishing lacustrine species. Increase in algal production will particularly be prominent in the first few years because of increased nutrient supply due to the decay of flooded organic material.

Mitigation

- Revert to original water regime.

B) Effects on Aquatic Macrophytes: When a new man-made lake is created from a river, aquatic macrophytes (often termed water-weeds) obtain improved conditions for development and dispersal because they are most suited to survive in a lake than in a river. The dense mats of floating water-weeds will significantly increase evapo-transpiration of water from the lake's surface and impede navigation and fishing by choking propellers and nest. At the hydropower plants, the water-weeds may prevent turbine operation by blocking screens and intakes. Furthermore, the dense mats of plats reduce light penetration and gaseous exchange at the water surface; the decay of dead plants is likely to increase the formation of hydrogen sulphide which will endanger downstream water consuming communities and fish survival. The weeds also harbour snakes and hosts of schistosomiasis, plus other vertebrate vectors.

Mitigation

- Biologically, mechanically and to a limited extent chemically eliminate the weeds (i.e., integrated weed control).

C) Effects on Zooplankton: Some species become more abundant with creation of regulated lakes.

D) Effects on Macro-invertebrates: When a river is changed into a reservoir, most of the rheophilic (fast flowing water) species will disappear. In reservoirs where complete de-oxygenation occurs, for long periods, the entire fauna may disappear.

Mitigation

- Prevent stratification and keep the draw-down to a minimum. Draw-down also allows lake bottom deposits to dry out and become aerated. Re-inundation then stimulates the nutrient release much as in new reservoirs.
- The drying out of large areas of river bed should be prevented by constructing sills and other stream enhancement features.

E) Effects on Fish: Impoundment of natural lakes and rivers may have deleterious and beneficial effects on fish and fisheries at least as regards fish production and availability of recreational areas for fishing. The composition fish species will always be changed after the development of HEP schemes because resident riverine species will be replaced by lacustrine species.

Mitigation

- Construct fish ladders although, these cannot be as good as natural conditions in facilitating fish migration and secondly the older fish may not be as strong as juveniles so may fail to go over the fish ladders or through the turbines;
- Prevent over-fishing in the reservoirs;

F) Effect on Amphibians, Reptiles and Crocodiles: Rarely negatively affected by dam construction however the impact of inundating large stretches of swampy ground or rainforest is tantamount to destroying breeding sites and habitats for some of these fauna. Amphibians, i.e., salamanders, newts, frogs and toads with restricted geographical ranges are endangered when large reservoirs are built in lowlands.

Mitigation

- Particular care should be taken to prevent damaging breeding sites and habitats and, reducing the available food for endangered species.

G) Effect on Birds: An artificial lake often increases the diversity of bird life in region, providing habitats for a number of waterfowl and other wetland birds. But where large stretches of swampy ground or rainforest are inundated, the loss of habitats for rare birds could be substantial. Birds may be electrocuted or may simply collide into the wires and die.

Mitigation

- Undertake detailed bird census to establish presence of any endangered bird.
- Fluctuations in water level in reservoirs may be kept at a minimum to give better nesting sites and feeding habitats for the majority of lake birds.
- Rich bird marshlands should not be inundated or allowed to dry out, especially if they contain breeding sites or important feeding grounds for endangered species.
- Parts of rivers with reduced waters should be manipulated by constructing numerous small weirs to attract birds and other animals.
- When roads have to be constructed through regions containing nesting sites or feeding grounds for endangered or threatened species, care should be taken to reduce human

disturbance. After construction of the hydro project, such roads should be closed except for necessary maintenance.
- Use underground cables where possible to prevent bird electrocution.
- Use modern devices and/or designs for power line construction so that birds can perch on them without getting electrocuted.
- Pay serious attention to choice of line alignment relative to local topography to prevent bird collisions with cables.

H) Effects on Mammals: Dam related changes in flood patterns greatly affect beavers and otters amongst other mammals.
- Large mammals are affected by loss of habitat for feeding and breeding during inundation.
- Also, large mammals will be affected by hydropower projects mainly through disturbance and improved access by the human population.

Mitigation
- Hydropower schemes **should never** be designed in or close to a national park.
- Caution must be taken not to block migration routes of rare or economically important mammals or, to inundate their breeding and feeding sites.
- Establish artificial mineral licks in areas deficient in submerged vascular plants, particularly if the HEP scheme has changed the flood pattern or otherwise damaged the aquatic vegetation.

4 Effects and Mitigation Related to Project Components or Impact Zones

A) Drainage Basin: Physical presence and erosive potential of access roads and the danger of ecosystem exploitation and biodiversity losses that may follow improved access and use.
- Development potential for local residents and management potential for owners due to improved access on roads and reservoir.
- Watershed management needs to protect reservoir from silting.

Mitigation
- Whether impacts on the drainage basin constitute problems or opportunities is site specific and project specific.

B) Upstream River Reaches: Ecosystem changes due to the break in the natural food chain or circulation of organisms and fish caused by barriers or diversions.
- Floating organisms or objects fed by activities or conditions in the upstream reaches may cause impacts on downstream project components.

Mitigation
- Cannot mitigate but conduct scientific monitoring so as to provide experience for future river basin developments.

C) Reservoir Area and Water Body: Loss of land, scenic beauty and other natural resources
- Relocation of people, homes, economic activities and infrastructure
- Removal or not of trees and other biomass from area to be inundated
- Use of reservoir for fishing, recreation, transport, water supply, irrigation, etc
- Use of reservoir area for quarrying construction materials or depositing spoil

- Use of reservoir perimeter for foreshore (or drawdown) agriculture
- Water logging of cultivated reservoir banks
- Impaired usability and aesthetics of a regulated water body with varying water levels
- Water quality predictions in terms of suspended sediments, eutrophication, temperature and other chemical/physical/biological parameters
- Aquatic biology assessment in terms of water body as biotope for fish species, aquatic nuisance plants, etc
- Reservoir water as source of water borne diseases
- Loss of water through evapo-transpiration
- Physical behaviour of reservoir water mass in terms of stratification, density currents, wave erosion of banks with stability problems, etc.

Mitigation

- Can only be mitigated according to specific project real setting.

D) Downstream River Reaches: Temperature changes due to low shallow flows, flow augmentation or mixing of diverted waters

- Effects on wildlife watering and river crossing habits
- Changed flow regime towards either extreme low-flows (nearly dry river beds downstream of dams and diversions) or more stable discharges downstream of tailrace outlet.
- Lowered groundwater levels and impaired riparian cultivation or forest growth.
- Aquatic ecosystem changes with special effects on fish and their food chains.
- Changes in river utilisation for irrigation water supply, recreation (e.g. white water rafting, sports, fishing) effluent discharges, fishing, navigation, etc
- Erosion of river beds and scour at bridge abutments downstream of sediment trapping reservoirs, or the opposite effect of bed aggradations where flows retain sediment content under more calm and steady flows.
- Variations in fluvial geomorphology combined with nutrient supply changes and discharge reductions/fluctuations, which will affect riverine habitats, wetlands, delta formation ad estuarine ecology or ocean fisheries.

Mitigation

- Can only be mitigated according to specific project real setting,. no generalized concepts.

E) Dam, Spillway and Diversions: Location in relation to unique riverbed features, areas of cultural significance, tributary streams of ecological value, etc.

- Selection of type and material may be important to fish ladder feasibility, fish survival downstream, ability to install flexible withdrawal facilities, water related disease vectors and general risk assessments and public safety.
- Design features may be influenced by landscape design requirements, aesthetics, public health and recreational issues.

Mitigation

- EA work must identify potential problems at the earliest possible stage to influence planners/designers in selecting solutions that minimise later mitigation actions and maximise the ability of permanent constructions to meet uncertainties in the environmental situation.

F) Water Conveyance Facilities: Layout and system design, e.g., open air penstocks versus tunnel solutions, should consider environmental factors like loss of land, scenery, wildlife habitats and trekking routes, etc and public safety.

- Groundwater of land areas over tunnel sections may be drained excessively.
- Deposits for tunnel spoil or use of tunnel spoil in erosion protection, beautification or as a gravel resource.
- Pollution and downstream fish kills due to initial flushing of tunnels in which residue of explosive compounds remain after conventional tunnel driving.
- Erosion risks associated with above ground pipelines.
- Land use changes, access problems, fish passage issues and public health threats caused by open channel flows in conveyance canals and headworks.
- Off-site problems from construction efficiency motivated disturbances like tunnel adits, access roads, temporary constructions camps etc.

Mitigation

- Canal and Tunnel alignment must be surveyed closely to reveal land use activities of economic, social, cultural and ecological nature.
- Clauses designed to protect the environment will be inserted in the construction specifications and tender documents.
- Initial flushing if runnels should be carried out with due regard for pollution risks downstream by timing this so that flows provide dilution or when it is least detrimental to downstream aquatic life and its ability to regenerate after such unavoidable flushing action.
- In sensitive settings, it may be required that tunnels be hosed down and polluted wash water be collected and treated before released into the environment.
- Tunnel spoil management must be an integral aspect of the hydropower engineer's planning responsibility.

G) Powerhouse: Layout and principal solution for example, open-air power house versus caverns in rock, should consider environmental factors like loss of land and biological resources, impaired scenery, access problems, public safety, war risks, etc.

- Deposit and possible use of excavated rock spoils
- Loss or gains in touristic values
- Environmental pollution from operation of machinery and access (oil contamination of water, noise, refuse from trash racks, vehicular traffic, etc)

Mitigation

- The EIA should treat the power house as an industrial project and foresee environmental requirements relevant to the specific setting of the powerhouse site
- Downstream river ecology may be affected by adverse environmental activities at the powerhouse and restrictions on effluents and pollution risks must be designed within a freshwater ecology context and incorporated in the licensing of the project.

H) Transmission Lines and Access Roads: Relocation of people

- Land use changes
- Wildlife impacts (birds, animal habitats and treks, etc)
- Visual disturbances to scenic, wilderness and other unique areas
- Improved access with potentials for natural resource exploitation or socio-economic development

- Erosion potentials
- Public safety from high tension wires or speeding traffic

Mitigation

- Population displacement and loss of land should be handled as for reservoirs.
- Power lines should avoid significant biotopes and animal or bird treks
- Post construction use and maintenance of accesses created by construction activities must be included in the EMP so as to avoid future problems and create opportunities where possible.

I) Contractors' camp and Ancillary facilities: Pollution problems that result from or due to:

- Land use changes
- Need to ensure against slum conditions arising from permanent use of temporary facilities
- Social problems
- Behavioural health problems

Mitigation

- Must Plan camp in relation to environmentally sensitive physical facilities lie water supply, sanitation and solid waste facilities and to socially sensitive issues of human behaviour.
- Strong management to enforce EMP.

5. Effects and Mitigation Related to Sectors of Society

A) Regional development: May induce environmental specific problems of social, institutional and economic nature

Mitigation

- Strengthened local administration will reduce project induced problems in the security, education, public services and social sectors.
- Private sector local economic opportunities may also be boosted through project support like credit facilities, sites and service schemes, transport arrangements or training.
- Repercussions caused by the scheme should be addressed by the developers.

B) Local People and Household Economies: People are affected through relocation programs and compensation for loss of property. Major projects however alter access, trade, jobs, use of common resources, break family ties, create exposure to other cultures, etc

Mitigation

- Project planning and social surveys should embrace areas in and outside the defined project area, and attempt to define and meet people's reactions and aspirations arising from project area changes.

C) Wildlife and Biodiversity: Wildlife and ecosystems depend greatly on conditions in adjacent biotopes and wilderness areas and unless such neighbouring areas are protected, wildlife conservation in the project area may be futile.

Mitigation

- Establish and protect buffer zones dictated by ecological demands.

- Use culturally appropriate and proven development approaches like community participation, community forestry, gender sensitive approaches, etc.

D) Health and Education: The project(s) may easily lead to public health problems and illiteracy. These may include vector bone diseases and STDs, HIV/AIDS.

Mitigation

- Establish awareness campaigns, health checks with preventive and curative services, schools and other social service functions so as to improve workforce performance and assist in preventing serious problems.

3. 6 Reporting and Documentation

An environmental Impact Statement (EIS) or EIA report is the main output from the EIA study. Its termed a statement because it states or articulates the likely environmental impacts of the project on the project site, surrounding areas and other distant or close aspects of the environment that are likely to be affected. It also states the measures that the developer intends to undertake to mitigate the impacts stated and the time frame. This latter part is called an Environmental Management Plan (EMP). For purposes of clarity especially for large projects, an EMP is a detailed separate report from the main EIS but annexed and clearly referenced to the main report. It is also advisable that thematic areas (e.g. impact on agriculture, human settlements, biodiversity, hydrology and water course, and/ or economic projections, etc.) be discussed in detail separately and submitted as Appendices to the main reports.

EIA Review and Public Hearing

EIA Review

REMA will constitute a panel of experts to review the EIA reports submitted. In addition to experts from the ministry responsible for hydropower development, water and hydropower utilities, conservation agencies and REMA, independent experts known as subject matter specialists may be co-opted by REMA to undertake the review.

Public hearing

Public hearing enables stakeholders who did not participate in the EIA study to have an input into the identified impacts and the proposed mitigation measures. Public hearings are undertaken to enable the local stakeholders to contribute to the decision making process by giving them opportunity to voice their concerns and assuring them that their ideas and suggestions will be incorporated. After these public hearing meetings, the EIA report should be revised to include the concerns raised during the meeting and those received thereafter as written memoranda. In organising public hearings, the following considerations should be made:

- appropriate and sufficient publicity should be made to ensure that all concerned stakeholders receive the notice of public hearing in time;

- Public notices should be made in language(s) that are easily understood by the affected people. Notices should also include when and where the public hearings will be conducted and addresses to which comments should be sent;
- As much as possible, stakeholders should submit questions in advance to enable the project development team to prepare responses in time;
- Deliberations should be facilitated in such a way as to enable poor, rural based stakeholders to air views. Dominance of one or several groups over others, should be carefully anticipated and appropriately managed;
- Mechanism to document all questions, issues and concerns raised and responses made. This record should be attached as an Annex to the final EIA report.

It is the responsibility of the proponent to identify and address, as fully as possible, the matters relevant to the specific proposal and to comply with the statutory requirements for EIA. The following factors are important when preparing an EIA report:

- Early Considerations of the Strategic Context
- Early Assessment of Options
- Identifying Issues
- Prioritizing Issues

3.7 Contents of the EIA Report (EIS)

The HEP EIA report should contain as much information about the site and project itself as possible. It should include at least: overview of the project, existing characteristics of the project area, potential impacts of the proposed project, identification and quantification of impacts, techniques used to quantify the impacts, results of detailed impact quantification, mitigation measures including environmental budgets (compensation, resettlements, monitoring and auditing), monitoring and auditing techniques.

The EIA shall provide a description of the following:

- ✓ the project and of the activities it s likely to generate;
- ✓ the proposed site, narrative of alternatives and reasons for rejecting alternative sites;
- ✓ the potentially affected environment, including specific information necessary for identity and assessing the environmental effects of the project;
- ✓ the material inputs into the project and their potential environmental effects;
- ✓ an economic analysis of the project; the technology and processes that shall be used, and alternative technologies and reason for not selecting them;
- ✓ the products and by-products of the project;
- ✓ the environmental effects of the project, including the direct, indirect, cut”’ short-term and long-term effects and possible alternatives;
- ✓ the measures proposed for eliminating, minimising or mitigating adverse impacts;
- ✓ an identification of gaps in knowledge and uncertainties which were encountered in compiling the required information;

- ✓ an indication of whether the environment of any other State is likely to be affected and the available alternatives and mitigating measures;
- ✓ how the information provided for in this regulation has been generated; and
- ✓ other matters as the authority may consider necessary.

Signature of the statement: The EIS shall be signed by all experts that undertook the impact study. A suggested format for an EIS is presented in Table 3.7. The submission procedure for soft copies is in Annex III.

Table 3.7: EIS Format and guide on content

Chapter/Section	Contents
Executive Summary	A summary of the main findings of the EIA study including the major positive and negative impacts, recommended actions and conclusions.
1. Introduction	Background to the study; information on general features of electrification project; objective of the study; justification of the development, policy, legal and institutional framework.
Legal and institutional framework	
Pre-project environment	
2. Project Description	Describes proposed project including project development objectives, technical description and alternatives to the project activities that the project will entail.
3. Project Design	Describes the geographic, ecological, social and temporal context of the project including transmission lines, power plants, access roads, water supply, etc.
4. Project Impacts	Predicts and assesses environmentally positive and negative impacts anticipated/identified as resulting from the electrification project, including an analysis of magnitude, significance and persistence. Mitigation measures are identified and opportunities for environmental enhancement explored.
5. Analysis of Alternatives	A comparison of alternatives to proposed project site, technology, operation. The zero option should be included in the analysis. Recommendations for the most preferable options.
6. Mitigation Measures	A detailed description of measures to avoid, eliminate, or minimise adverse impacts, including technical drawings of structures and costs for constructing or incorporating such measures.
Public consultation	
7. Environmental & Social Management Plan	An action plan for mitigation measures, giving a schedule for incorporating them, a monitoring schedule, an indication of responsibility for monitoring, identification of indicators that need to be monitored, monitoring methods, schedules for evaluations and audits, and institutional strengthening arrangements. A resettlement plan for displaced people should also be included.
8. Conclusions and recommendations	A statement of the environmental and social acceptability of the project and the viability of proposed alternatives
References	Citation of the literature consulted and/or referenced in the report
Appendices	▪ Terms of Reference for the study ▪ List of individuals/agencies/organisations consulted. ▪ Record of itinerary and consultation meetings ▪ Tables of relevant data ▪ Other relevant information

3.8 Monitoring

Monitoring in the EIA process happens at two levels to verify environmental impact prediction and adequacy of mitigation measures. Monitoring should include regular measurement of parameters like water levels, flows quality, sedimentation, observations of wildlife, fish, fish migration, fauna, flora, health monitoring, employment monitoring, income levels, control of resources, resettlements and compensation amongst any other.

3.9 Auditing

After the project has been implemented, it should be audited. The audit should be at three levels: the EIA report, the mitigation plan, and the institutional capacity to implement the mitigation plan. An audit will detect the weaknesses in the process or identify human and natural environment protection procedures.

PART 4: DETAILED GUIDE FOR PROJECTS SPONSORS & DEVELOPERS

4.1 Early Considerations of the EIA Strategic Context

Prior to embarking on an HEP project, there should be a comprehensive scoping study on upstream and downstream conditions of the area where dam construction is to be done, as well as the whole length of the area where the transmission line will pass/ be constructed.

- Land cover and tenure throughout the project area (both generation and transmission lines) need to be ascertained to determine the extent of displacement and requirements for compensation. It is important to ascertain land ownership;
- Noise pollution – often ignored or hardly understood but important issue in the hydro-power construction projects;

4.2 Early Assessment of Options

The objectives for the undertaking should be developed to fulfill any identified need and should encompass sustainable development principles, as embraced by the GoR, when identifying options for all aspects of the proposal. All feasible alternatives that could satisfy the proponent's objectives for the project should be considered. The main contention for HEP usually is whether the planned site is the most suitable for the project in which case an alternative site could be considered. It could also revolve around whether modifications in the project design and/ or implementation could be undertaken in such a way as to achieve the proponent's objective and fulfill environmental requirements. When weighing up options, the biophysical, socioeconomic costs and benefits throughout the project life cycle should be considered. The "*alternative activity*" scenario or option should also be included in these considerations.

4.3 Identifying Issues

The general framework for an EIA for an HEP project is usually a precursor to identify potential environmental issues; the proponent must be able to outline:

- The important characteristics of the project which will determine the scope of the potential impacts – for instance, how much water will be used and where it will come from? What will the nature of waste water or indeed other liquid wastes are? And how will these be treated?
- The proposed site and a preliminary assessment of sensitivity of the site; what are the alternatives?

Important to Note:

If the existing characteristic on the site is changed, for example, if the original structure is expanded, the scoping process for the EIA should be reviewed.

4.4 Expected Safeguard Issues

Table 4.4 suggests a list of the expected safeguard issues that should be considered in an Environmental Analysis of HEP projects.

Table 4.4: Expected Safeguard Issues and Mitigation Measures

Safeguard issues for HEP Development	Mitigation Measures
Natural Habitat Disturbance and Impacts on Forestry	• Strengthening local authorities and conservation personnel responsible for managing natural resources • Public Awareness Program • Agricultural extension programs • Provision for energy (kerosene subsidies and woodfuel lots as required during the construction period)
Impacts on Water and soil Quality	• Minimum bypass flows using weirs as flood control gates • Measures to reduce organic and inorganic waste runoff into water systems • Appropriate material handling, storage and disposal systems • Establish appropriately designed landfill sites • Restrictions on blasting • Appropriate locations for handling, storing and disposal of oil products and other harmful chemicals
Erosion and sedimentation	• Drainage and erosion prevention and modified construction techniques during the construction period • Re-vegetation program • Installation of settlement ponds and sediment traps
Pollution	• Measures to reduce organic and inorganic waste • Appropriate disposal of waste materials • Establish landfill sites • Restrictions on blasting • Appropriate locations of handling, storing and disposing of oil products & chemicals • Limited use of pesticides
Impacts on landscape	• Considerations of aesthetic and cultural values in design of project features • Re-vegetation program
Loss of Cultural Property	• Consultations with local leaders and spiritual leaders • Where possible, avoid all important cultural sites • Provisions for relocation of important cultural sites • Funds for conducting necessary rituals and ceremonies related to beliefs
Involuntary Resettlement and Compensation	• Avoid construction in and around settled areas • Consultations with affected persons • Resettlement plan and alternatives for affected persons • Cash compensation based on District assessment rates for loss of up to 25% of property or production • Strengthening of local authorities and line agencies responsible for carrying out resettlement and agricultural extension and possible involvement of local NGOs
Health and public safety	• Strengthening existing health facilities – perhaps with the active involvement of NGOs as support • Health awareness programs – hygiene, malaria and other water-borne diseases and STDs

	• Ensure effective sewage treatment and properly designed and managed camps to avoid insect and mammal disease carriers • Provisions to ensure safe drinking water sources are not polluted • Ensure safety training for workers, safety equipment for workers, and provide safe work conditions and safety management and inspections • Supervision of health facilities and worker safety measures during construction
Regional and International Agreements	• Review of all relevant regional and international agreements as required for Projects

4.5 Institutional Responsibilities in the Assessment and Management Process

The table 4.5 outlines the key tasks in the Environmental impact assessment and management processes and the institutions responsible or taking part.

Table 4.5: Institutional Responsibilities in EA and Management

Project stage or activity	**Responsible party**
Preliminary investigation	▪ Sponsor to inform RURA and REMA ▪ Permit from Water Directorate ▪ Co-operation with Wildlife Management if required
Initial Environmental Assessment (to be part of the Project Brief)	▪ Sponsor responsible for conducting study according to HEP guidelines ▪ Assessment by REMA and decision on whether to conduct a full-blown EIA or approve EA
Valuation of losses	▪ Multi-disciplinary Evaluation Team according to HEP guidelines ▪ Involvement of Electrogaz, etc and co-operation with affected people ▪ District and local authorities in co-operation with the sponsor ▪ Approval of by REMA and project sponsor
Resettlement Plan (if required)	▪ Multi-disciplinary Resettlement Team (Electrogaz ith support from consultants) according to HEP guidelines ▪ Local consultations and participation plan ▪ District and local authorities in co-operation with the sponsor ▪ Approval by REMA and project sponsor
Public Hearing	▪ REMA with assistance from Developer, RURA and Electrogaz
EIA Study	▪ Sponsor to conduct studies with input from various experts, including Electrogaz personnel and District staff according to HEP guidelines; ▪ Approval of by REMA and the donor agency for the project
Funding Approval	MININFRA in case of public project or the developer for private projects
Project Implementation	Developer implements the project co-operation with various authorities (District, etc.);
Monitoring	• The Authority in conjunction with the ministry responsible for electricity development and/ or the Public Utilities regulator; • Independent interest groups (non state entities)
Policy Review	▪ Electrogaz, RURA and Environmental Liaison Unit

4.6 Disclosure Requirements and Procedures for HEP Projects and Sub-Projects

Disclosure of information forms an essential part of the consultation and planning process of HEP projects. Thus:

- Every person has the right of free access to all information relating to the implementation of the Law to REMA or Lead Agency;
- Any person wishing to acquire such information may apply to REMA and be granted access for a prescribed fee;
- Freedom of access should not extend to proprietary information which shall be treated as confidential by REMA or any Lead Agency;
- REMA will be responsible for dissemination of information to public and private users, to carry out public information and education campaigns, exchange information with concerned agencies, including NGOs and liaise with various government authorities in identifying gaps;

Disclosure procedures for HEP sub-projects should conform to both donor agency and REMA guidelines. REMA EIA guidelines and the EIA guidelines for the energy sector both detail the requirements of public consultation and participation throughout the EIA process. Some of these requirements include:

- Information access will be provided to all public documents including the EA statement, EIAs and other relevant material concerning the project
- Public consultation during all project stages, involving all stakeholders is required, and this involvement will include time for feedback and comments to draft documents.
- REMA will coordinate the involvement in relevant government line agencies and departments and will disseminate information to these concerned parties
- Public hearings will be organised as a requirement for EIA approval including invitations and updates to local and national media.

4.7 Analysis of Impacts

The methods used for assessing project impacts and arriving at recommendations is based on a three-step procedure of making assessment of impacts, conclusions and recommendations more objective, easier to understand and possible to trace back if desired. The procedure combines the 'value' of the affected environment and the 'magnitude of impacts' to arrive at an 'overall impact assessment'.

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4.8 Analysis of Alternatives

The analysis of alternatives for HEP Projects should seek to compare various alternative options that may be available for any project, and thus determine which one represents the most desirable in view of environmental and social factors. The process should therefore include an analysis and

discussion of a range of alternatives to the proposed project that could feasibly meet the basic environmental and social standards. The analysis and discussion should include an evaluation of the merits of each alternative with respect to the following:

- Nature of the alternative sites/locations of the HEP Project;
- Feasibility of the alternative;
- The trade-offs of advantages and disadvantages of each alternative
- Cost effectiveness, including associated environmental costs and benefits of each alternative;
- Technology and engineering design;
- Interference and/or harmony with the surroundings and future plans
- Construction practices for each alternative
- Operations, including associated demands for energy and other inputs by the various alternatives;
- Risks associated with the alternative, including potential risks to human health
- Existence of important cultural and sensitive ecological systems and habitats in the proposed project area;
- Presence of endangered, rare and/or threatened species that may be at risk if the project is implemented;
- Conformity to existing policies, plans, laws, regulations, etc;
- The "No Project" alternative.

Where it may not be possible to quantify or attach monetary value to a certain set of environmental impacts for purposes of comparing the various alternatives, other approaches may be adopted for placing value on such environmental impacts and thus permitting a decision to be made on the alternative to be implemented. This may involve holding meetings, seminars and/or round table discussions involving stakeholders, and/or ranking the alternatives using various importance weighting techniques adopted on a project-by-project basis.

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4.9 Impact Mitigation Guidelines

The purpose of impact mitigation is to look for alternative and better ways of implementing the proposed project or associated activities so that the negative impacts are eliminated or minimised, while benefits are enhanced. Impact mitigation requires that the full extent of the anticipated environmental problems be understood.

Ecologically sensitive areas: The most important guideline in relation to the development of HEP or any project of this kind is the avoidance of sensitive and high biodiversity sites as locations for projects. This includes avoidance of National Parks and other areas with a high biodiversity or conservation value. Avoidance of these areas concerns not only project impacts but also the anticipated population influx and human development that may remain after project completion.

***Water resources*:** Changes in water flow and water quality are likely to occur when constructing a hydropower project, including run-of-the-river and mini- hydropower schemes. It is necessary to measure existing flows in terms of velocity of the proposed affected stretch of the river. Determining minimum by-pass flows will depend on good hydrological data. Another consideration is the generation capacity and needs which will in turn affect river flow. These

fluctuations in flow will be most noticeable in the dry season when greater percentages of water will be diverted to generate power. Water flow issues concern only HEP hydropower projects, most especially in dam construction and management.

Water quality covers issues of sedimentation and erosion, air pollution and changing aquatic biology. Sediment loads may increase during construction periods for hydro power projects and then may decrease during operation due to a reduction of flow in reservoirs. Measuring sediment loads during the various stages of project development and introducing measures to reduce loads during construction may be required for some HEP projects. Measures could include limiting construction activities to certain areas and protecting riverbanks from erosion. In addition, human activities that could contribute to erosion, such as increases in population and subsequent strains on natural resources, should also be addressed and monitoring. Measures for controlling human impacts could consist in establishing camps away from sensitive areas and working with local authorities in limiting population influx.

Pollution in the form of fuel, oil, lubricants and other chemicals need to be controlled and carefully monitored. This is not only for the construction period but in the case of diesel generation it will be an integral part of the operation period. Safe sites away from water sources and human population need to be designated for such harmful materials.

Increases in population due to camps and population influx into project areas, also present problems in terms of pollution and health. Poor sanitary conditions can lead to increased biological pollution (e.g. *E. coli* bacteria and unsafe drinking water. Other diseases to be noted are the spread of malaria (increases in stagnant water) and parasites (unsanitary conditions).

The spread of water hyacinths due to stagnant waters may be a problem in relation to hydropower development. Similarly, eutrophication of water sources due to humans pouring water with soap foam from washings into the water which exacerbates phosphorous levels. Monitoring and the introduction of physical and chemical controls should be considered.

Soil Degradation and Erosion: Related to water quality are the themes of soil degradation and erosion due to construction activities and potential increases in agricultural activities in HEP project areas. This may be primarily in the case of hydropower projects but population increases can be expected in an area where electricity is made available given the advantages of electricity and the relatively few rural areas that are presently supplied. Increased demand for food could result in shorter fallow periods, use of areas prone to erosion and other negative impacts that degrade the soil and cause erosion.

Changes in air quality in terms of dust, gaseous substances and other particulates should be monitored carefully.
Noise pollution is also an issue during construction and in the running of diesel generators. Limitations on location of machines and permanent structures should conform to safety and acceptable standards and may require consultations with locally affected people. ***Low Frequency Electromagnetic fields*** around or under pylons (High Voltage – HV) transmission lines are a cause for health concern because they may cause cancer.

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4.10 Identifying Opportunities from Positive Impacts

The EIA study should address positive impacts that may arise from the electrification. It should also explore opportunities for environment enhancement. The involvement of local communities in a participatory approach is essential in developing ways to enhance positive impacts.

4.11 EIA Approvals

REMA has an arrangement whereby its staff review the EIA report once it is submitted. One of the staff is expected to visit the project site and provide a field report. The members of the technical committee are drawn from the areas of health, planning, pharmacy, ecology, agriculture, sociology, engineering and the private sector.

The Director General can:

- Approve the project outright
- Require that the project be redesigned
- Refer back the project or part thereof to the developer for further assessment or submission of additional information as may be required to enable the Director General make a decision
- Reject the project in total or partially.
- The Director General may give approval and state the period for which the approval shall remain valid, and thereafter issue a Certificate of Approval

The Director General can revoke the approval where:

- There is non-compliance with the conditions set out in the certificate
- There is a substantial modification of the project implementation or operation which may lead to adverse environmental impacts
- There is a substantial undesirable effect not contemplated in the approval.

At this stage the developer is required to stop any further development pending rectification of the adverse impact. This safeguard is in addition to other requirements contained in the law.

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PART 5 MITIGATION MEASURES: THE ENVIRONMENTAL MANAGEMENT PLAN

5.1 Goals and Objectives

An Environmental Management Plan (EMP) should clearly define all environmental requirements for the successful integration of measures to eliminate, offset or reduce the expected impacts as identified in the EIA. EMP forms the link between the impacts and mitigation measures presented in the EIA and the implementation of a range of management activities. The EMP should outline the mitigation measures, monitoring activities and institutional arrangements to be followed during the pre-construction, construction and operation phases to avoid or control impacts as well as indicating the timing and budgets for the recommended mitigation and monitoring activities.

5.2 EMP Schedule

In addition, to outlining mitigation measures, responsibilities, participants and costs, a schedule of activities for mitigation and monitoring is required as an integral part of an EMP. A schedule should indicate implementation of mitigation measures in relation to project activities as a whole and the project stages, pre-construction, construction and operation.

5.3 Resettlement Issues

The main objective in resettlement is to ensure that the displaced people receive benefits from the project. Involuntary resettlement, if necessary and unavoidable, therefore, should be an integral part of the HEP projects and should be handled at the onset of the project, i.e. at the planning and feasibility stages. Involuntary resettlement should consider broken families and social networks, dismantled production systems and lost jobs.

5.3.1 Socio-economic Studies and Evaluation Reports

Socio-economic study is a baseline data that is collected within the project area about people/communities that would be affected by the project. The study should be carried out after demarcating the project area. Socio-economic issues are normally considered during Environmental Impact Assessment. However, most times it is not sufficient enough to be relied on completely for planning resettlement. A comprehensive survey of affected populations/communities is required in the case of the latter.

A comprehensive census should be carried out to identify the affected people on the household level. Vulnerable groups (women and children, female-headed households) should be considered in particular during this survey. Detailed calculation of household economies will be necessary in the social assessment and be the determinant in the compensation process. This is because most developments that have given cash compensation have left affected people worse off than they were before project development. The evaluation of assets (land and structures) and crops should be done in accordance with the laws of Rwanda and its development partners. A multi-disciplinary team of different experts (land surveyors, project technicians,

resettlement/compensation specialists, government representatives and others) will be required to evaluate project land and acquire the sizes of the individual plots that will be taken by the project. During this exercise of census and evaluation, the affected people, representatives of Local Authorities (Government Representative), the Developer, valuation and Resettlement Officials must be involved. A list of affected people and their affected properties should be clearly laid out in the Evaluation Report.

5.3.2 Identification of Affected People

The category of affected people are determined by the project area (Direct and Indirect Impact Zones) earmarked by the developer in consultation with the communities. The project area is then surveyed to establish exact boundaries. The people whose land lies within the demarcated land are those that are directly affected by the project. A survey of the individual plots should be carried out to establish the exact number of households affected plus the area and the sizes of those plots to be obtained by the project. After the survey, a map of the project area showing the individual plots should be produced.

The actual implementation of resettlement and compensation will be carried out by the Developer. In case of the construction of new houses and other infrastructure, the Developer will hire a consultant to supervise contractors and/or the labour of affected people if the plan indicates that they construct their own dwellings.

5.3.3 Criteria and Eligibility for Compensation

Eligibility for compensation is enshrined under the Rwandan Constitution (Article 29) and the Expropriation Law. The two laws regulate and give entitlement to those affected, whether or not they have written customary or formal tenure rights. The person to be expropriated is defined under article 2(7) of the Expropriation Law to mean any person or legal entity who is to have his or her private property transferred due to public interest, in which case they shall be legally entitled to payment of compensation.

The following categories will be eligible for compensation.

i. People who are in any way affected by the project
ii. People whose houses/structures will be affected by land acquisition.
iii. People who borrow land for cultivation and their crops or trees will be removed or damaged due to land acquisition activities.
iv. Any other group of persons that has not been mentioned above but is entitled to compensation according to the laws of Rwanda and policies of the project sponsor.
v. Persons who encroach on the area after the resettlement survey (census and valuation) are not eligible to compensation or any form of resettlement assistance.

5.3.4 System for Complaints and Grievances

Article 26 of the Expropriation Law N^0 18/2007 of 19/04/2007 provides complaints procedures for individuals dissatisfied with the value of their compensation. The Law stipulates that the unsatisfied person has a period of 30 days after the project approval decision has been taken to appeal (Article 19). The first step of redress is to inform those to be expropriated of their rights during the expropriation process. Articles 17-20 of the Expropriation Law obliges the representative government authority (that which is implementing the project requiring expropriation) to inform affected people of their rights at each stage of the process.

5.3.5 Resettlement Action Plan – timeframe and Budget

The resettlement budget for the proposed HEP project components should be fully included in the total project cost, which will be funded by the Developer. Approval of the project proposal by a developer will be dependent on a detailed budget that covers all social and environmental issues according to safeguard guidelines. To ensure the overall attractiveness of HEP, adequate resettlement finances will have to be provided by the Developer but plans need to be approved by REMA and the donor/project sponsor.

It is very important that a resettlement timetable which is well coordinated with HEP projects' activities be put in place early enough so that the resettlement exercise is implemented before project activities begin. Resettlement timetables should provide phased resettlement to allow work to go on in some locations of the project area that are not affected by resettlement. This will allow the developer to maximise effectively the use of time.

5.4 Environmental Monitoring Techniques and Process

Monitoring involves the use of indicators and is done by trained personnel. When the sponsor is identifying monitoring indicators he must ensure that the indicators selected are practical, easily measured, and where possible, measurements are quantitative. Qualitative measures may be appropriate, particularly where it is not possible or it is meaningless to make precise quantitative measurements. An example of quantitative measurements would be the measurement of water quality and air quality parameters where water quality or air quality are environmental issues. On the other hand, if soil erosion is an identified impact, it may not be practical to provide quantitative measurements to track soil erosion, or the prevention of such. In such a case, professional value judgement may be acceptable. Monitoring of mitigation measures as these relate to involuntary resettlement would be a relatively straight forward process where actual compensation can be measured (cash payouts, new houses built, trees planted (to mitigate loss of vegetation for a transmission land), or agricultural lands given in lieu of such lands lost during inundation for a mini-hydro scheme. Sponsors should prepare their monitoring programs with input from the Electrogaz monitoring and evaluation group.

5.4.1 Monitorable Environmental and Social indicators

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The following are indicators for monitoring the participation process involved in HEP projects.

- Number and percentage of affected households consulted during the planning stage
- Levels of decision-making of affected people
- Level of understanding of project impacts and mitigation/resettlement options
- Effectiveness of local authorities to make decisions
- Frequency and quality of public meetings
- Degree of involvement of women or disadvantaged groups in discussions

For social issues *(see table below)*, it is possible to identify some basic targets for projects. Table 4.7 presents some key social indicators that can guide tracking the EMP implementation. Monitoring and Evaluation will be undertaken by Electrogaz or other relevant authorities.

Table 4.7: Social Indicators and Possible Targets

Indicator	Baseline	Target
General		
Village access to roads		Roads maintained or improved
Consumer price index		Stable
Real GNP *per capita*		Exceed national average
Daily or monthly Calorie intake		No decrease, possible increases
Headcount index		Reduction of poverty and food poverty lines
Poverty gap index		No increase in poverty gap
Cultural heritage		No loss of cultural heritage site or full replace of site
Employment and Income		
Amount and number of small enterprise loans disbursed/repaid		Possible increase depending on demand and local economy
Number of small enterprises		Increase during construction in project area
Number of skilled labourers		Increase during construction in project area
Unemployment		Decrease during construction in project area
Number of unskilled wage earners		Increase during construction through employment of local labour
Number of skilled wage earners		Increase construction jobs for semi-skilled & unskilled people
Unskilled rural wage		Increase in average wages attributed to the project construction

5.4.2 Environmental Monitoring Indicators

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Environmental indicators are particular data that helps to present a meaningful picture of what is happening with the environment. They are useful in tracking changes overtime i.e., identifying trends. They can be based on physical, biological or chemical measures associated with environmental quality or natural resources. Process indicators can also be used to measure the level of response. Indicators make more sense when compared with targets. Some indicators and targets related to HEP Projects have been identified whenever possible but will be project-specific. A table of key environmental indicators below could guide environmental monitoring to assess how the EMP is being implemented.

Table 4.8: Environment Monitoring Indicators and Possible Targets

Indicator	Baseline	Target
AIR QUALITY		
Ambient air quality standards		Non-violation of international standards
Visibility		Visibility not hampered
Ambient noise levels		Acceptable noise levels by international standards
RIVER FLOW		
River flow speed		Unaltered or minor alterations in river flow
River flow pattern		No or little change in river flow
Velocity in reservoirs		Unaffected velocity or minor changes in velocity of reservoirs
WATER RESOURCES		
Salinisation level		REMA standards
Pollution level		Clean water supply
Siltation of water bodies		No or limited temporary siltation
Water transparency		Transparent clean water
Erosion load		No or limited temporary erosion load
Sedimentation load		No or limited temporary sedimentation load
Microbial counts in water		Low microbial counts in water
Level of water table		Maintenance of high water table
Volume of surface water		Abundant water supply
SOIL CONDITION		

Soil erosion incidence		Low rate of or no soil erosion incidence rate
Soil compaction		No soil compaction
Oil spillage		Controlled oil handling
VEGETATION		
Deforestation/ de-vegetation rate		Protection of natural habitats
Changes in species composition		Maintenance of composition
Endangered species		Protection of endangered species
Biodiversity		Prevention of loss in biodiversity
Ecological balance		Ecological restoration
AESTHETIC QUALITY		
Aesthetic state of falls		Positive aesthetic effect
Changes in natural terrain		Unaltered natural terrain
Skilled rural wage		Increase in average wages due to increase in demand during construction
Credit and savings groups established		Establishment of groups in project area
SECURITY AND SAFETY		

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PART 6 PUBLIC PARTICIPATION/ CONSULTATIONS

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6.1 Rationale for public participation

EIA is about making decisions that can potentially affect people, and so it's a good practice that those likely to be affected (directly or indirectly), have a say or an input into the process. For sensitive public interest infrastructure projects like hydropower – whatever the scale, organizing public consultations is downright difficult. Why? Their design are often complicated and they are developed over long periods of time they tend to affect or serve wide geographical and administrative areas that transcend ecosystems and administrative boundaries; and are thus likely to affect very many people. Major dilemmas in this respect, may include (a) defining or delineating the "public" (b) handling multiple stakeholders' interests, and (c) identifying or predicting issues that might arise after a very long time since roads affect people and places in a cumulative and sequential way.

6.2 Public Participation Strategy

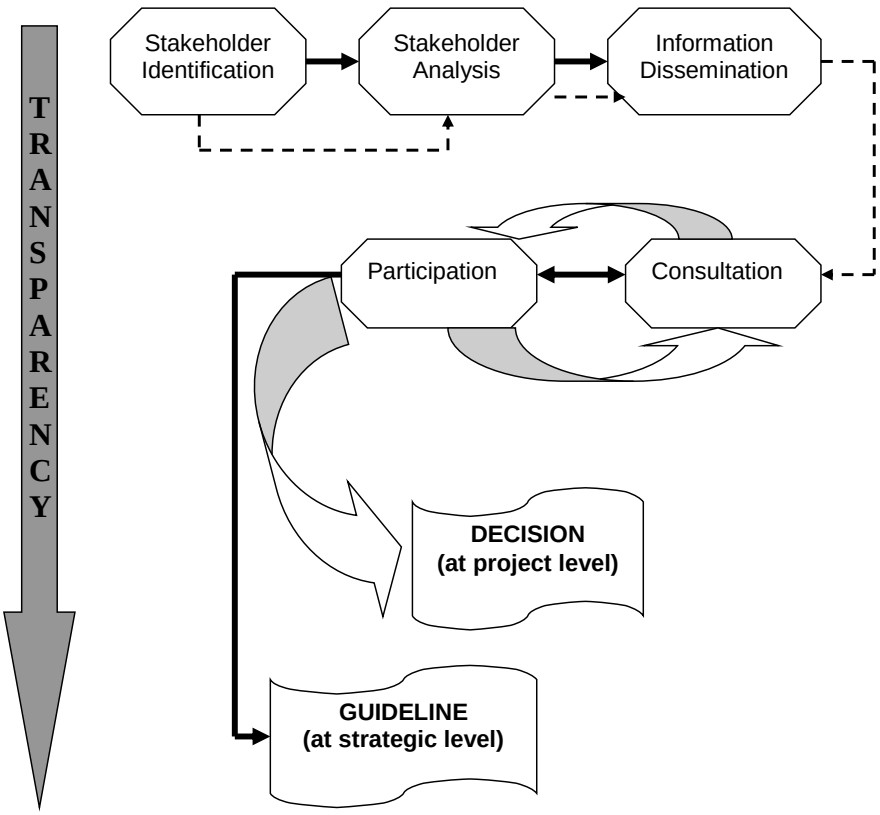
The public in the project area has a wealth of knowledge and information about the local conditions which would be valuable to the rural electrification programs. Therefore, it is expected to play a role in defining the concerns that may arise and in suggesting other available alternatives. In the rural electrification projects, it is imperative to have a complete public consultation plan with a public participation strategy (*see figure 4.15 below*).

The major strategy evolves around the provision of a full opportunity for involvement of all. Stakeholders who include the project beneficiaries, those likely to be adversely affected and other stakeholders who may have an interest in the rural electrification program for one area or another. Because of the difficulty in identifying the public, care must be taken in deciding who participates to ensure that a fair and balanced representation of views is obtained from those directly affected, the poor, minority groups as well as influential members of the public.

Public consultation should continue throughout the EIA process and project implementation. The process should ensure that it adheres to the following:

- The decision-making process allows full and active stakeholder representation;
- The decision-making process is accepted as legitimate by stakeholders;
- The decision-maker and stakeholders understand each other's concerns;
- The public has trust and confidence in the ultimate decision makers and the scheme;
- Key decisions are improved by public participation;
- Key decisions are accepted as legitimate by stakeholders.

Figure 4.15: A Model for the Public Participation Process



6.2.1 Public Consultation Plan

The method of public consultations will vary according to the project size and impacts scope, as well as sensitivity of the issues involved. The public may appropriately be involved through:

- Informing them about the proposed rural electrification opportunities through the various district administrative machinery i.e., local leadership systems
- Involving the public in scoping exercises
- Providing opportunities for open public meetings or hearings on the proposed rural electrification opportunities/projects.
- Inviting written documents on proposed rural electrification projects
- Involving the local officials and other opinion leaders
- Making relevant documents available to any interested member of the public.

Because public involvement and participation will take place through out the entire project cycle, it is necessary that the following stages as highlighted in the strategy be followed:

- Public Consultation before Inception of Project;
- Public Consultations during the Environmental and Social Study;
- Public Consultations during the Environmental and Social Study;
- Public Hearing.

6.2.2 Public Consultation before Inception of Project

In case the rural electrification project is an initiative of the Developer who is not a member of the local community of the project area, he should provide a project brief seeking public comments. This would be done in consultation with the Lead Agency or REMA. Wide publicity of this should be given through the local leadership system or/and the media.

6.2.3 Public Consultations during the Environmental and Social Study

Throughout all the stages of the study, the study team will seek public opinion/views on environmental and social aspects of the rural electrification project. Preferred methods of consultation may include Participatory Rural Appraisal (PRA), structured questionnaire, group discussions and interviews and the media among others.

6.2.4 Consultations after the Environmental and Social Impact Study

A social-environmental impact statement is a public document and can be inspected by any person. In consultation with the Lead Agency or REMA and in accordance with the guidelines for the Environment Impact Assessment in Rwanda; the statement shall be made available to the public. The points of display will be such that all concerned stakeholders can have access to the statement if they wish. Public comments and/or objections may be submitted to REMA in accordance with the Guidelines. Members of the public may also send written opinions or points of view on the statement to REMA and within such a time as specified by the guidelines (currently 30 days).

6.2.5 Public Hearing

Usually the Lead Agency or REMA may hold public hearings when they recognise that it is necessary to hear the opinion of the public. On the days contained in the notice for public hearings, all stakeholders and concerned parties may participate along with the developer and government authorities. Notification should contain full information about the location, time of proposed meeting and items to be considered by the meeting. The Developer will be responsible for preparing participation strategies and their implementation in collaboration with the Electrogaz.

6.2.6. Reporting

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ANNEXES

Annex I: Summary of the Requirements of an EIA Report for HEP Projects

(In accordance with Organic Law No. 04/2005, EIA General Guidelines and EIA Regulations and Ministerial Order on Hydro-power development (indicate No and other Reference)

In line with the Organic Law on environment, these provisions provide for EIA for all projects likely to have an impact on environment, in respect of which an EIA report is to be submitted, whose contents shall contain a true statement and description of:

(a) the name and address of the proponent;

(b) the ownership of the undertaking and of the land on which it is being conducted;

(c) the name, address, qualifications and experience of the consultant who undertook the EIA;

(d) the precise location and surroundings of the undertaking, the zoning of the site and the number of similar undertakings in the area;

(e) the principle, concept and purpose of the undertaking, including any likely future changes;

(f) the direct or indirect effects that the undertaking is likely to have on the environment;

(g) an assessment of the social, economic and cultural effects which the undertaking is likely to have on the neighbourhood and wider society;

(h) any actions or measures which the proponent proposes to take to avoid, prevent, change, mitigate or remedy, as far as possible, the likely effects of the undertaking on the environment;

(i) an assessment of the inevitable adverse environmental effects that the undertaking is likely to have on the environment, people and society, where it is implemented in the manner proposed by the proponent;

(j) an accurate assessment of the irreversible and irretrievable commitment of resources which will be involved in the undertaking, where it is implemented in the manner proposed by the proponent;

(k) any alternative manner or process in which the undertaking may be carried out as to cause less harm to the environment;

(l) an environmental management/ monitoring plan (EMP);

(m) information pertaining to the decommissioning of the project at the end of its life cycle and associated impacts, proposed measures to return the site as far as possible to its former state, or rehabilitation measures;

(n) in the case of a new infrastructure proposal, an EMP to be implemented during the construction phase; and

(o) such other information as may be necessary for a proper assessment and review of the potential impact of the undertaking on the environment, people and society.

On applying for an EIA license, a proponent shall submit to the Director General of the Authority or her designated Officer an EIA Report, also referred to as Environmental Impact Statement (EIS):

(a) in electronic form, and in 10 printed copies, and such additional copies as may reasonably be required by the Director General;

(b) Signed by the proponent or his duly appointed legal representative and countersigned by the consultant who prepared the report.

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Annex II: Procedure of Submission of EIA Reports in Soft Copy Versions

INTRODUCTION

As provided for under the Environmental Impact Assessment Regulations, and in accordance with the Rules of Disclosure (ref…), applicants submitting EIA reports are required to submit both hard copy and soft copy versions. The aim is to enable wider access to the EIA reports especially through web-based communication. This information will be available on the web-sites of the REMA and the Ministry holding the environment portfolio, in a format that is easily downloadable or otherwise user-friendly. All developers and proponents are requested to collaborate in order to facilitate service delivery.

Commented [D17]: Which reference

SPECIFICATIONS OF SOFT COPY VERSION

2.1 The soft copy version of the report, which should be identical to the hard copy version, should be submitted in electronic file preferably on a CD or flash diskette.

(a) As an EIA report of an HEP project is anticipated to be a large file owing to, Innovativeness in handling large files of soft documents is required in EIA especially since they often include images, maps and figures. For big files, the document should be broken into its different chapters with each chapter in a separate file. The executive summary also should be treated as a chapter and submitted in a separate file. If a chapter exceeds 50MB, then it should be further broken down into files of less than 50 MB.

(b) The table of contents also should be submitted in one separate file. All the chapters/headings/appendices listed under the table of contents should have proper naming. This is important to allow the user to know which file he/she is accessing.

(c) The table of contents should provide links to the different chapters including the executive summary and appendices.

(d) All file names must:

- be less than 8 characters
- be in small letters
- start with a letter

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2.2 The soft copy version should be page numbered, in the same order as the hard copy and should be submitted in either "Html" or 'PDF format'.

All html files must be in the html extensions file format. All image files must be in the gif/jpg extension file format.

2.3 The EIA section will open the electronic file in the presence of the applicants in order to ensure that the hard and soft copy versions are absolutely the same. In case the soft copy version does not contain documents, which are present in the hard copy version, the applicants would be called upon to fill in the form as per Appendix 1. The decision to accept or reject the soft copy version would be taken by the Authority's Department of EIA, Compliance and Enforcement the applicants would be informed at a later stage.

It is important to submit the soft copy versions of the EIA reports alongside the hard copies.

Appendix I

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Please indicate which documents are missing from the softcopy version of the EIA report

TITLE OF REPORT: ……

……

FULL NAME: ……..……...

DESIGNATION: ……..……..

PHONE: ……. **FAX**: …… **EMAIL**: ……..……

SIGNATURE: ……..……...

DATE: ……..……...

FOR OFFICE USE

Verified by: ……...
Signature: ……..……..
Date: ……..……..

Annex III: Format for an Environmental Monitoring Plan (EMP)

EMP should reflect the environmental impacts of each phase of an HEP project as follows:

1. **Site Preparation and Commissioning phase**

- Site characteristics (include plans/photographs/drawings/ showing the project area any environmental sensitive receivers and ambient air/water/sea water qualities);
- Works involved and proposed mitigating measures to prevent negative impacts on water course /road users/immediate neighbours;
- Social and cultural issues including conflicts over land tenure/ownership, boundaries, access roads, water ways, etc., and how they have been (or will be) addressed;
- Clauses to be included in contract documents to ensure implementation of proposed mitigating measures.
- Person(s) responsible for informing the authorities on the date of commencing works and monitoring the proposed mitigating measures;
- Reporting procedures to the authorities.

2. **Construction/ Operation Phase**

- Parameters to be monitored (e.g. effectiveness of the fire fighting provisions, traffic behaviour of people and goods during the construction phase, effectiveness of measures taken in respect of liquid and solid waste management, as well as dust particles especially arising from cement, earth extraction, stone crushing, etc.; handling of noise from people and machines during construction; measures adopted in respect of energy conservation and waste minimization techniques, etc);
- Monitoring methodology;
- Equipment to be used and calibration details e.g. if heavy concrete mixers or crane lifters are to be used;
- Monitoring locations and control stations;
- Monitoring frequency and duration;
- The institutional system by which monitoring data will be collected, collapsed (standards), analysed, interpreted and action taken if necessary to prevent or reduce unwanted impacts;
- Contingency plan (in case of emergencies such as uncontrolled discharge of pollutants, fire outbreak, natural calamities);
- Maintenance component including building maintenance, daily and periodical maintenance of the site, setting up of appropriate maintenance teams for treatment plant, standby generator, etc.
- Management structure for maintenance and monitoring.
- Reporting procedures to the authorities.

3. <u>Decommissioning phase</u>

- Works involved and proposed mitigating measures to prevent negative impacts on water course/road users/immediate neighbours.
- Clauses to be included in contract documents to ensure implementation of proposed mitigating measures.
- Person/s responsible for informing the authorities on the date of commencing works and monitoring the proposed mitigating measures.
- Reporting procedures to the authorities.

An EMP should not be taken as simply a nice piece of paper included in the EIA report to impress the decision-maker to issue a certificate. It should instead be a realistic plan of action that the developer or proponent can implement. This report should be furnished with the Building and Public Health Inspection Units of Local Governments, REMA Environmental Impact Assessment and Compliance Department, and other relevant authorities, depending on the nature, scale and purpose of the HEP project. It is proposed that progress reports on the EMP implementation should at least contain the following:

1) An executive summary.
2) Basic information on the HEP project including a synopsis of the project location, size, organization and management structure (for maintenance and monitoring), works

undertaken during the monitoring works; implementing technical staff and their competences;

3) A brief summary on the requirements of the EMP including all parameters monitored, methodology used, environment quality performance/standards limits, and environmental mitigating measures as recommended in the EIA report and consent condition imposed in the EIA license, and environmental requirements in contract documents.
4) Status on the implementation of the mitigating measures and pollution control measures.
5) Drawings/plans showing the project area, any environmental sensitive receivers and the location of the monitoring and control stations.
6) Monitoring results including date, time frequency and duration.
7) Presentation of monitored parameters (preferably graphical plots of trends including photographs, maps, graphs, tables,..);
8) Constraints and any factors which might have affected the monitoring results
9) A summary of non-compliance of the environmental quality performance limits.
10) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures, non or inadequate compensation of affected parties, etc.;
11) A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;
12) A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints;
13) A summary record of notification of summons, successful prosecutions for breaches of environmental protection/pollution control legislation, and actions taken to rectify such breaches;
14) A forecast of the works programme, impact predictions and monitoring schedule for the next three months; and
15) Comments, recommendations and conclusions for the monitoring period.

Annex IV: Major Legislations and regulations for Hydropower EIA projects

Commented [D20]: In legal and institutional framework

i. Organic Law N° 08/2005: Determines the modalities for the ownership, use and management of land in Rwanda;
ii. Organic Law N° 04/2005: Determines the Modalities for Protection and Conservation of Environment in Rwanda
iii. Law No. 16/2006 of 03/04/2006 on organization, operation and attributions of the Rwanda Environment Management Authority (REMA);
iv. Organic Law Nº 29/2005 of 31/12/2005; Determines the Administrative Entities of the Republic of Rwanda, including all its annexes.
v. Ministerial Order N° 001/2006: Authorization required for cutting and transporting trees at maturity;
vi. Ministerial Order of 9/8/2004: Bans the manufacture, importation, use and disposal of plastic bags/containers;
vii. Law Nº 18/2007 of 19/04/ 2007: On Expropriation and Acquisition of Land in public interest.
viii. Environmental Regulations (Collection, Storage, Treatment, Use, and Disposal of solid waste)
ix. Environmental Regulations (Management and Disposal of Waste water)
x. Refuse Collection Regulations, bylaws and Ordinances made by relevant Local Authorities;
xi. Environment Protection (Drinking Water Standards) Regulations
xii. Environment Protection (Environmental Standards for Noise) Regulations
xiii. Environment Protection (Standards for Air) Regulations
xiv. Environment Protection (Standards for Hazardous waste) Regulations.
xv. Environment Protection (Standards of Effluent Discharge Permit) Regulations

Commented [D21]: Check if they exist and put their Ref numbers. For those who do not exist remove them.

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Annex V: Key Institutions in HEP Development

	Institution/ Agency	Key interests and responsibilities
1	Ministry of Infrastructures (MININFRA)	Formulating policies, laws and standards for construction and extension of infrastructure including hydropower dams, transmission lines and distribution sub-stations.
2	Ministry of Natural Resources (MINIRENA)	Formulating policies, laws and standards for land administration and land use planning; environmental protection and natural resources utilisation.
3	Ministry of Local Government, Community Development, Good Governance and Social Affairs (MINALOC).	National policies and laws on decentralisation and local governance – supervising local government authorities which are responsible for building regulations and inspections; as well as local land use zoning.
4	Ministry of Health (MINISANTE)	Responsible for setting policy and guidelines and initiating national legislation relating to Sanitation and Public health issues as well as public safety – which are a key component of building and human settlements.
5	Ministry of Commerce, Trade, Industry, Cooperatives and Tourism (MINICOM)	Policies and laws relating to licensing of commercial and industrial activities including power supply.
6	City Council of Kigali	Responsible for implementation of land use zoning, building standards including adherence to EIA guidelines, and construction approval and inspection in Kigali city.
7	Rwanda Environmental Management Authority (REMA)	National authority responsible for regulations and standards setting, and overseeing the implementation of EIA guidelines. REMA will also be responsible for mobilizing, educating and sensitizing stakeholders to follow or participate in the implementation of the EIA guidelines.
8	Rwanda Utilities Regulatory Agency (RURA)	Imposition of regulations and standards on public utilities including electricity generation, transmission and distribution.
9	National Land Centre (NLC)	Land registration and land use planning throughout the country.
10	Electrogaz	National agency responsible for provision of water and electricity utilities, and have to provide technical guidance and inspection on aspects of housing infrastructure relating to water and electricity installations and use.
11	Rwanda Investment and Export Promotion Agency (RIEPA)	Investment advisory and support especially for real estate developers. RIEPA (now RDB) is expected to include Hydropower EIA guidelines as part of the advisory package and criteria for licensing investors involved

		hydropower generation, transmission and distribution
14	Private Sector Federation	Mobilising and sensitising members with interest in investing in the hydropower sector.
15	Commercial Banks and mortgage companies	Provide mortgage financing (housing loan) to developers. By including EIA guidelines among the set of criteria to be fulfilled by borrowers/ developers, these financing institutions will be important partners in the implementation of the HEP guidelines.
16	Major Construction/ real estate companies	Service providers in the construction of hydropower dams and transmission lines need to follow standards and good practices.
17	Civil society (including Private sector & NGOs)	Civil society and interested private entities have advocacy roles to ensure that all actors follow hydropower projects are beneficial to communities including proper resettlement. Developers
18	International Finance Corporation (IFC)/ World Bank	Long-term financing for large-scale infrastructure projects including HEP. WB is the lead international agency advocating for safety and environmental sustainability of hydropower projects, and most national EIA legislations have been shaped by its ESIA Procedures

Commented [D23]: Add them as developers

Annex VI: SAMPLE QUESTIONNAIRE FOR PUBLIC HEARING ON HYDROELECTRIC DAM CONSTRUCTION AND POWER GENERATION

Interviewer's Particulars
Questionnaire No:…… Date ……. Time: ……

Interviewer's Name:…… ……..……

I. Respondent's Personal Information

1. Names:……
2. Age bracket?
   i. under 17 years ____
   ii. 18 – 24 years ____
   iii. 25- 34 years ____
   iv. 35- 49 years ____
   v. 50- 65 years ____
   vi. > 65 years ____
3. Sex: A) Male B) Female

II. Contact Information

4. Address:
   Village……..……..……. Cell: ……...…Sector……..
   District ……..

5. Institutional address:
   Institution: …..……..
   Job Designation in Institution: ……..……
   Contact ……..…….. …….

6. What is your Academic Qualification?
   i. Primary School ☐
   ii. Ordinary Level Secondary ☐
   iii. Advanced Level Secondary ☐
   iv. University Graduate ☐

7. Are you knowledgeable about the positive and/or negative impacts of HEP development?

i. Yes ☐
ii. No ☐

V. Key Questions

8. Do you anticipate the project to create any flood areas which are of major significance for human settlement, agriculture, animal husbandry, or similar?

i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and give your advice.
……
……
……

9.Do you anticipate the project to create any flood areas which support animal or plant life worthy of protecting or especially vulnerable ecosystems?

i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and give your advice.
……
……

10.Do you anticipate the project to create any flood areas which contain historic remains or landscape elements which are of importance to the local population?

i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and what should be done.
……
……

11.Do you anticipate the project to drain rivers or change the flow of water in such a way that it creates considerable changes for the environment and the utilisation of natural resources?

i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and give your advice.
……
……

12. Do you expect the project to cause substantial changes in the flow of nutrient elements and fish production?

i. Yes ☐

ii. No ☐

If Yes; name the areas likely to be affected and give your advice.
……
……

13. Is there any risk of spread of water-borne diseases?

i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and give your advice and where possible, name the diseases most likely diseases to occur.
……
……

14. Is the proposed project likely to improve the living conditions in the local area?
i. Yes ☐
ii. No ☐

15. If Yes, in which ways
……
……
……

16. Do you expect the project to change the way of life of the local population in such a way that it leads to considerably increased pressure on the natural resource base?
i. Yes ☐
ii. No ☐

If Yes; name the most vulnerable areas and give your advice.
……
……

17. Do you expect the project to obstruct, or lead to substantial changes in the way the local communities' access or utilise the natural resources other than those directly affected by the project?
i. Yes ☐
ii. No ☐

If Yes; name the areas likely to be affected and give your advice.
……

THANK YOU VERY MUCH YOUR TIME AND COOPERATION

ANNEX VII

LIST OF PEOPLE MET AND INSTITUTIONS CONSULTED

	Names	**Position**	**Organisation**
1	Theobald Mashinga	Director/ EIACE	REMA
2	Minani J.M	EIA Officer	REMA
3	Gashugi Innocent	EIA Officer	REMA
4	Fidele Nteziyaremye	Technical Advisor in Sanitation Engineering	MININFRA
5	Bosco Kanyasheja		ElectroGaz
6	Barrow Lamin	Country Programme Officer	AfDB/ Country Office
7	Kirungi Brian	Team Leader	International Finance Coopération (IFC)
8	Kamurasi Alex	Operations Officer	World Bank/ Kigali
9	Isabirye Peter	Portfolio Management Consultant	World Bank/ Kigali
10	Akamanzi Claire	Deputy D.G/ Investment Promotion	RIEPA
11	Francois Twagirayezu	In-charge of Settlements	MININFRA
12	Aziza Benegusenga	Planning Officer	"
13	Joseph Mvurirwenande	Statistics & Demography	
14	Happy	Legal Officer	MINIRENA
15	Benoi NIYIGIRA	Water & Sanitation	MININFRA
16	Kamukunde Godfrey		Caisse Sociale du Rwanda
17	Bugingo Bosco	Advocate/ Mortgage Advisor	Independent Mortgage Advisor
18	Dr. Byamungu Livingstone		Development Bank of Rwanda
19	Nzayanga	Power Specialist	NELSAP/ Nile Basin Initiative
20	Nishimwe Rosine	Environment Officer	Nyarugenge district/ Kigali Kigali
21	Hakizimana Jacques	Environment Officer	Kicukiro District/ Kigali city
22			FAIR Construction
23			Real Contractors S.A.R.L
24			
25			