REPUBLIC OF RWANDA

Ministry of Infrastructure

ENERGY WATER AND SANITATION AUTHORITY (EWSA)

Electricity Access Rollout Programme (EARP)

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR EARP

September 2012

EXECUTIVE SUMMARY

The Strategic Environmental Assessment (SEA) process in Rwanda is a relatively new advance in managing the environment. The National dialogue in Rwanda has focused over the past several years on the critical interactions of environment, poverty, and development. This is reflected in Rwanda's efforts to develop Strategic Environmental Assessment (SEA) as an instrument for integrating environmental considerations into country policies, plans, and programs (PPPs).

Rwanda Environment Management Authority (REMA) set out guidelines and procedures for SEA that will enable policy-making, macro or strategic planning, and program formulation to assess for and implement mechanisms to support environmental sustainability, while supporting their effectiveness for economic and social development.

SEA facilitates adherence to international legal conventions to which Rwanda is a party, including: UN Convention on Biological Diversity (UNCBD) 1992; UN Framework Convention on Climate Change (UNFCCC) 1992; UN Convention to Combat Desertification (UNCCD) 1994; Basel Convention 2005; Convention on International Trade in Endangered Species (CITES) 1973; Kyoto Protocol 1998; RAMSAR Convention on Wetlands of International Importance 1971; Rotterdam Convention 2004; Stockholm Convention 2001; Vienna Convention 1985 and four related protocols; and the Cartagena Protocol 2000.

SEA contributes to the achievement of the Millennium Development Goals (MDGs), particularly the goals of environmental sustainability and poverty reduction. SEA also facilitates Rwanda's implementation of the goals of NEPAD which includes "placing Africa on a path of sustainable growth and development through eradicating poverty, building peace, and conserving the integrity and diversity of its ecosystems, most notably its forest resources" (OAU 2001). Additionally, SEA supports Rwanda's commitments to the EAC, CEPGL, and COMESA.

Strategic Environmental Assessment (SEA), as characterized in the EIA *General Guidelines* (REMA 2006), is an assessment tool that coordinates with EIA and

expands the scope of assessment beyond the project level to address the impacts and cumulative effects of major policies, plans, and programs (PPPs) on the environment.

The Electricity Access Roll Out Programme (EARP) falls under the PPPs which requires the SEA prior to implementation.

The Programme is classified as Environment Category 2 according to the Bank's Environmental and Social Assessment Procedures. This classification requires carrying out a Strategic Environmental Assessment and preparing the associated Environmental and Social Management and Monitoring Plan.

The programme has three components which are the grid Roll-out which shall finance the construction and installation of medium and low voltage; green connections which shall finance a range of activities to improve affordability for the consumers and technical assistance, capacity strengthening, and implementation support. For the implementation arrangements, projects department has been established to consolidate all existing specific projects

The programme is expected to cover all the 30 districts countrywide, however the programme activities may differ from each district or zone. The programme activities are divided in four phases which are: design and planning phase, construction phase, post construction phase/ operations and decommission phase.

A number of opportunities for EARP have been identified and range from the high need of electricity for various uses, possibility of attracting people from scattered habitat to the electrified villages to live in agglomerations, willingness of communities to give a small portion of their land for the programme activities, willingness of consumers to pay for connections to the availability of funds to implement the programme activities.

However the programme shall meet a major constraint as habitat in most of the rural areas of the programme is scattered making difficult to connect those eligible households.

To realize the primary EDPRS target for the electricity sector, the Government of Rwanda through EWSA has embarked on a country-wide programme of tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration and reach rural consumers and service providers currently off the national grid with an overall schedule of the EARP activities extending up to end of 2017

In Rwanda, legislative and policy framework for environmental assessment are clearly highlighted the most of the laws, policies and guidelines such as: Constitution of the Republic of Rwanda, Rwanda Vision 2020, National Environmental Policy National Environmental Law, Environmental Impact Assessment Regulations, Ministerial order N° 003/2008 of 15/08/2008 relating to the requirements and procedure for Environmental Impact Assessment, General guidelines and Procedures for SEA of 2010, National Policy on EIA, Energy Policy, Land Policy.

In addition, Rwanda is a signatory country of many international and regional convention and treaties related to the environmental protection and legislative environmental guidelines and most important the World Bank operation policies since it is the major funding agency of EARP activities.

The SEA team has examined the possible alternatives for delivering the goals and objectives of the programme. For this particular programme, some options have been considered. In seeking the best alternative, the “status quo” or “do nothing” option and the actual on grid electrification were considered and the alternatives analysis shows that the EARP implementation emerged as the best alternative.

In assessing the impacts of EARP activities, rural electrification has been the cornerstone of rural energy programs in developing countries including Rwanda. Electricity has provided a safe and efficient energy source for residential and public lighting, pumping drinking water, irrigation, refrigeration, rural industries, and many others. Clearly, rural electrification has been beneficial to developed societies, and most early policy planners felt that the same or similar benefits could be achieved in developing societies

The study further reveals that the programme and its activities will have potential impacts (both positive and negative) on the surrounding and connected communities, both directly and indirectly as there will be direct and indirect interactions between project activities and the environment. For negative impacts, mitigation measures have been proposed at all phases of the programme.

With the main objective of ensuring compliance with the SEA management plan, a monitoring and evaluation plan has been set up right from the beginning of the programme operation phase and an environmental audit shall be timely carried out.

The study therefore concludes that the Electricity Access Roll out programme shall not have adverse impacts on the environmental hence can be implemented. However it further recommends that the programme should be implemented as it has no significant adverse impacts on the environment, during implementation of the programme alternatives should be considered on the route, and right of way, choice of the construction materials, choice of the reuse and disposal of waste water and solid wastes, that some activities shall require deep analysis prior to implementation of specific project, the monitoring and evaluation process of the SEA should be done parallel with the monitoring and evaluation of EARP activities to minimize costs and save time and also an environmental audit shall be carried on a regular quarterly basis to ensure compliance with the SEA impact mitigation measures and minimization.

ACRONYMS

ADB	African Development Bank
BADEA	Banque Arabe de Développement Economique en Afrique
BP	Bank Policies
CAS	Country Assistance Strategy
CFL	Compact Fluorescent Lamp
CEPGL	Economic Community of the Great Lakes Countries
COMESA	Common Market for Eastern and Southern Africa
CSP	Country Strategy Paper
DDP	District Development Plan
EA	Environmental Assessment
EAC	East African Community
EARP	Electricity Access Roll out Programme
EDPRS	Economic Development and Poverty Reduction Strategy
EIA	Environmental Impact Assessment
EPC	Engineering Procurement Construction
ESA	Environmental Security Assessment
ESMF	Environmental and Social Management Framework
EWSA	Energy Water and Sanitation
FDG	Focus Discussion Group
GEF	Global Environment Facility
GDP	Growth Domestic Product
GoR	Government of Rwanda

HH	Household
IBA	Important Bird Area
IDA	International Development Agency
IMCE	Integrated Management of Critical Ecosystem
IWRM	Integrated Water Resources Management
MDG	Millennium Development Goal
MINAGRI	Ministry of Agriculture
MINALOC	Ministry of Local Government
MINEAC	Ministry for East African Community
MINECOFIN	Ministry of Finance and Economic Planning
MININFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
NAFA	National Agro Forestry Authority
NEPAD	New Partnership for Africa's Development
OFID	OPEC Funds for International Development
OP	Operational Facility
OUA	Organisation de l'Union Africaine
PCB	PolyChloroBiphenyle
PPE	Personal Protective Equipment
PPP	Policy, Plan, or Program
PRSP	Poverty Reduction Strategy Plan
RAP	Resettlement Action Plan
REMA	Rwanda Environment Management Authority

RPF	Resettlement Plan Framework
SEA	Strategic Environmental Assessment
SWAp	Sector Wide Approach
UNCBD	UN Convention on Biological Diversity
UNCCD	UN Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
WHO	World Health Organization

GLOSSARY OF TERMS

Environment: The physical factors of the surroundings of the human being including land, water, atmosphere, climate, and the biological factors of fauna and flora as well as the cultural, social, and economic aspects of human activity.
(Adapted from REMA 2006)

Environmental impact: Effects on the environment and natural resources that may be positive and/or negative and produce benefits and/or costs.
(Adapted from REMA 2006)

Environmental Impact Assessment (EIA): The systematic evaluation of a project to determine its impact on the environment and natural resources.
(Adapted from REMA 2006)

Environmental security: A condition in which a nation or region, through sound governance, capable management, and sustainable utilization of its natural resources and environment, takes effective steps toward creating social, economic, and political stability and ensuring the welfare of its population. (FESS 2009)

Environmental sustainability: Management of natural resources and the environment that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

Policy: Strategy with defined objectives, set priorities, rules, and mechanisms to implement objectives. (Adapted from Partidário 2009)

Plan: Priority, option, or measure for resource allocation according to resource suitability and availability, following the orientation of and implementing relevant sectoral and global policies.
(Adapted from Partidário 2009)

Program: Organized agenda with defined objectives to be achieved during program implementation, with specification of activities and program investments, in the framework of relevant policies and plans.(Adapted from Partidário 2009)

Project: A detailed proposal, scheme, or design of any development design or development activity, which represents an investment, involves construction works, and implements policy/planning objectives. (Adapted from Partidário 2009)

Scoping: A process of establishing the principal issues to be addressed in the SEA, the decision criteria, and indicators of desirable outcomes.

Screening: A process of determining whether SEA is required for a specific PPP.

Social sustainability: Social sustainability refers to the continuous betterment of human well-being and welfare through access to health, nutrition, education, shelter, and gainful employment, as well as through maintenance of effective participation in decision-making within and across generations.
(Adapted from Maler and Munasinghe 1996)

Stakeholders: Individuals, communities, government agencies, private organizations, non-governmental organizations, or others having an interest or stake in the SEA process and outcomes of the policies, plans, and/or programs.
(Adapted from REMA 2006)

Strategic Environmental Assessment (SEA): "A systematic, ongoing process for evaluating at the earliest stage, the environmental quality and consequences of alternative visions and development intentions incorporated in Policy, Planning or Programme initiatives to ensure full integration of relevant biophysical, economic, social and political considerations." (EAC 2005).

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1. INTRODUCTION

The Strategic Environmental Assessment (SEA) process in Rwanda is a relatively new advance in managing the environment. The National dialogue in Rwanda has focused over the past several years on the critical interactions of environment, poverty, and development. This is reflected in Rwanda's efforts to develop Strategic Environmental Assessment (SEA) as an instrument for integrating environmental considerations into country policies, plans, and programs (PPPs).

Rwanda Environment Management Authority (REMA) set out guidelines and procedures for SEA that will enable policy-making, macro or strategic planning, and program formulation to assess for and implement mechanisms to support environmental sustainability, while supporting their effectiveness for economic and social development. These SEA guidelines incorporate elements of the concept and practices of Environmental Security Assessment (ESA). ESA focuses on building a comprehensive understanding of the linkages among environmental impacts and human security in specific contexts and their relationships to development objectives, including economic growth and poverty reduction. ESA thus strengthens the capacity of SEA to ensure that PPPs meet their development goals in conformance with Target 9 of the Millennium Development Goal (MDG) 7 of environmental sustainability.

Organic Law on environmental protection (No. 04/2005 of 8/04/2005) requires development projects, activities, and programs that may affect the environment to undergo environmental impact assessment. REMA is charged with the coordination, regulation, and oversight of the environmental impact assessment process.

REMA has mainstreamed Environmental Impact Assessment (EIA) into its institutional structures and instruments, having created both general and sector-specific guidelines for EIA to be used as a tool for the mitigation of environmental impacts that may result from development project activities. The *General Guidelines and Procedures for Environmental Impact Assessment* (REMA 2006) provides a protocol for the practice and conduct of EIA to comply with Rwandan

legal and institutional frameworks and serves as a framework for ensuring the quality and effectiveness of the EIA process.

Strategic Environmental Assessment (SEA), as characterized in the EIA *General Guidelines* (REMA 2006), is an assessment tool that coordinates with EIA and expands the scope of assessment beyond the project level to address the impacts and cumulative effects of major policies, plans, and programs (PPPs) on the environment.

SEA general guidelines and procedures, as presented in a document, incorporate concepts and practices of Environmental Security Assessment (ESA). These guidelines are designed to inform strategic decision-making that integrates environmental protection, economic growth, and social well-being. These guidelines will help ensure that SEA is:

1) Conducted in compliance with legal and institutional frameworks on environmental protection in Rwanda; and

2) Established as an efficient and effective assessment tool that, by extension, strengthens EIA and is aligned with regional and global assessment trends and practices.

1.1. Concept, background and context

1.1.1. Concept of Strategic Environmental Assessment (SEA)

Strategic Environmental Assessment (SEA) is a tool for assessing environmental implications of PPPs and ensuring the integration of these implications into the formulation and implementation of the PPPs. SEA is flexible in structure and adaptable to specific decision-making processes and their socio-economic and political contexts. SEA guides the formulation of policies, plans, and programs as it assesses their potential effects on the environment through processes involving broad stakeholder participation. SEA enhances environmental awareness, integrates environmental sustainability into decision making, facilitates coordinated action across development sectors, and contributes to the attainment of environmentally sound, integrated, and balanced development policies, planning, and programs.

SEA further strengthens strategic decision-making as it evaluates and integrates considerations of environmental factors and their inter-linkages with economic and social considerations. The integrative capacity of SEA may be understood as a continuum: at one end, it may mainstream environment with economic and social concerns into strategic decision-making; at the other end, it may achieve full integration of environmental, social, and economic factors into a holistic sustainability assessment (OECD 2006).

SEA is based on key principles of sustainability including: early proactive consideration of the environmental effects of strategic actions; broad institutional and public engagement; analysis and integration of qualitative and quantitative information within a dynamic, interactive framework; early warning of potential cumulative effects and large-scale changes; and identification of best practicable options that can be articulated from the policy level to the individual project level. SEA complements and strengthens Environmental Impact Assessment (EIA) at the project level by: identifying prior information needs and potential impacts; addressing strategic issues and concerns that may relate to project justification; and streamlining the project review process.

SEA guidelines are based on the principle that the public has both a right to be informed of policies, plans, and programs, as well as to express opinions on these PPPs, have comments taken into account, and be informed of final decisions and reasons why they were taken. SEA is undertaken as a process within a dynamic of continuous, interactive, and broadly participatory decision-making processes. SEA recognizes the social dimension of sustainable development and the critical role of human capital in development.

SEA provides a flexible framework that accommodates the iterative nature of policy and planning, engages stakeholder institutions (public, private, and civil society) in the various steps involved in the formulation and implementation processes of the PPPs, and builds a sustainable support base. An effective SEA is an adaptable and continuous process that focuses on strengthening governance and institutions.

SEA is a transformative assessment tool that has been described as a process that "contributes to the institutional, structural, and cultural changes needed for environmental integration and sustainable development" (Sadler 2002) and provides "a holistic understanding of the environmental and social implications of the policy proposal, expanding the focus well beyond the issues that were the original driving force for the new policy" (Brown and Thérivel 2000).

SEA can identify and enable implementation of environmental safeguards to mitigate significant negative impacts, major ecological damage, and large-scale irreversible loss of natural resources. With its wide strategic scope, SEA facilitates the transboundary dissemination of information and promotes harmonization of policies and programs among neighboring countries and within regions. SEA can provide a "basis for future international cooperation and conflict resolution concerning regional impacts at a regional level" (REMA 2006). SEA has even greater capacity in this regard, given that it can generate early warning of cumulative environmental effects and engage stakeholders proactively in testing alternatives.

SEA aims to ensure that environmental issues are addressed from an early stage in the process of formulating plans and programmes, and incorporated throughout this process.

The main benefits of SEA are that it:

- pro-actively informs the development of plans and programmes;
- identifies the opportunities and constraints which the environment places on development;
- provides guidelines to ensure that development is within sustainable limits;
- has the ability to integrate across areas, regions or sectors;
- improves the way in which cumulative effects are dealt with in environmental assessments, for example, through the use of thresholds and limits of acceptable change; and
- focuses on the maintenance and enhancement of a chosen level of environmental quality, rather than on minimizing individual impacts.

The fundamental benefit of SEA is that it aims to integrate the concept of sustainability into the formulation of plans and programmes.

1.2. Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), and Environmental Security Assessment (ESA)

1.2.1. SEA – EIA Relationship

In Rwanda, SEA has emerged based on the recognition that the EIA process cannot address strategic needs to assess and understand the cumulative environmental impacts of policies, plans, and programs that may affect ecosystems, dependent communities, and the economy at the country and transboundary levels. Nor can EIA fully address the mitigation or prevention of these impacts, which tend to be of significant scale and magnitude.

SEA is intended to consider potential environmental impacts in relation to policies, plans, and programs (PPPs), whereas EIA evaluates potential environmental impacts of projects that are awaiting approval. SEA helps integrate environmental sustainability into PPPs by considering cumulative impacts and mitigation measures as they devolve progressively from policy to plan to program to project, where EIAs generally are applied.

Table 1 shows some of the differences and similarities between SEA and EIA in their functional characteristics and hierarchical relationship. The complementary characteristics of SEA and EIA are such that these two assessment tools for guiding development strategy and implementation can be considered as members of a family under the term “environmental assessment.”

Table 1. SEA – EIA Differences and Similarities

SEA	EIA
Implementation involves multiple institutions	Implementable by a developer, whether public or private
Decision-making at the PPP level	Decision-making at the project level

Proactive to help ensure incorporation of environmental considerations in PPPs	Reactive to project proposals
Continuous and iterative process	Discrete activity with a clear beginning and end
Focus on policies, legislation, regulations, and institutions	Focus on technical solutions
Broad range of alternatives	Narrow range of alternatives
Early warning of cumulative effects	Limited review of cumulative effects
Emphasis on integrating environmental concerns in the PPPs	Emphasis on mitigation
Broad perspective that identifies synergistic and cumulative effects, as well as unintended consequences	Narrow perspective that focuses on direct and, to some extent, indirect impacts of proposed activities upon existing conditions

SEA fills a critical gap left by EIA procedures and processes in that SEA uses flexible, adaptive, and diversified approaches to inform strategic decision-making at the PPP level. It can thus provide the context and parameters for EIA. Another assessment tool that offers complementary analytic perspectives to SEA is Environmental Security Assessment (ESA). In critically analyzing existing environment and social vulnerabilities and stresses that need to be taken into account by PPPs, ESA helps to strengthen SEA, as discussed in the following section.

1.2.2. ESA – SEA Relationship

Environmental Security Assessment (ESA) provides a conceptual basis and analytic framework that complements SEA by capturing some of the multifaceted linkages and contexts that are often decisive for the successful implementation and management of PPPs. Environmental security assessment emerged from a growing recognition that in natural resource dependent

countries like Rwanda, environmental degradation hinders efforts to address socio-economic challenges and achieve higher levels of human security. According to one widely accepted definition, "environmental security is a condition in which a nation or region, through sound governance, capable management, and sustainable utilization of its natural resources and environment, takes effective steps toward creating social, economic, and political stability and ensuring the welfare of its population."

This emphasis on human security recognizes that PPPs do not merely produce impacts upon stakeholders, but rather unfold within a pre-existing, dynamic context that interacts with the PPPs while reflecting certain needs, concerns, and attitudes of stakeholders that should be taken into account. PPPs that are well-designed on paper and accurately explained to the public nevertheless can fail due to unanticipated difficulties or unintended consequences associated with inadequate attention to the already existing contextual reality. ESA provides a critical analysis that seeks to identify potential pitfalls so that decision makers can make necessary adjustments to increase the likelihood of success of PPPs.

Environmental impacts, though significant, tend to be intervening variables that produce indirect effects that act in concert with other dimensions of human security—such as living conditions, access to land and water, food security, economic growth, demographics, migration, health conditions, and formal and traditional institutions. When these interactions prove to be negative, the achievement of poverty reduction and economic growth is made significantly more difficult. By anticipating and examining these interactions, as well as the existing attitudes and needs of stakeholders (especially those most vulnerable), it is possible to formulate strategies that can mitigate obstacles to human security before they arise.

Through empirical research and field interviews, ESA makes use of both quantitative and qualitative environmental, social, and economic data to anticipate possible scenarios and their consequences. Qualitative and quantitative data enrich each other, leading to a sharpening of understanding of what information is the most salient in the context of affected populations and the PPP. Qualitative data also serves as a backstop in those instances when quantitative data is unavailable or incomplete. Undertaken in the broad framework of SEA, these complementary

elements of ESA can promote effective prioritization of potential problems and the development of precautionary or remedial measures in the context of the PPPs. Appendix 1 provides a set of sample questions for the formulation of a qualitative profile of the area(s) affected by the PPP.

While SEAs and ESAs have distinctive orientations and objectives, ESA can play a complementary role to help bring attention to the implications of key aspects of SEAs for PPPs. Thus, ESA:

- Helps to increase attention to the likely impacts of PPPs on affected populations in the context of their current conditions.
- Highlights the importance of qualitative data and understanding in evaluating PPPs.
- Brings attention to people as active participants who are both acting upon and being affected by PPPs.
- Increases awareness of human security as a contributor to the success of PPPs.
- Emphasizes the importance of effective communication and appreciation of public attitudes and considers how they may affect the PPPs.
- Takes particular account of the dynamics of existing environmental stresses and vulnerabilities and asks how they may affect the PPPs.
- Encourages dynamic contextual analysis that takes into account the relevance of the expressed needs of stakeholders.

Table 2: ESA – SEA Differences and Similarities

ESA	SEA
Does not focus on a particular policy, plan, program, or project	Focuses on a particular policy, plan or program
Primary goal: Averting vulnerability, insecurity/conflict and supporting movement toward sustainable development	Primary goal: Ensuring incorporation of environmental considerations in PPPs to achieve sustainable development
Emphasizes human security and environmental	Emphasizes integration of environmental

issues that impact people's needs, concerns, and attitudes	concerns in the PPPs
Informs political, economic, social, and environmental decision making	Informs decision making on a PPP
Analyzes environmental problems in dynamic context to deepen understanding of how environmental problems are contributing to situations of vulnerability	Analyzes background of the PPP and its formulation process with a view to determining the need for SEA
Analyzes reciprocal linkages among environmental stress/scarcity, mismanagement of natural resources, pressure factors and consequences	Generally provides a one-way analysis of environmental impacts of PPPs and impacts of alternatives within PPPs
Engages in dialogue to understand the concerns/grievances of affected communities	Consults with relevant government authorities and the public
Develops strategies to address causes rather than symptoms, based on incentives to change behaviors	Develops strategies for integrating environmental concerns in a PP
Achieves the implementation of steps to enhance human security and prevent or reduce conflict	Achieves the implementation of steps to integrate environmental concerns in the PPP and mainstream environment in a PPP
Uses both quantitative and qualitative information to anticipate possible vulnerabilities and consequences	Uses mostly quantitative data to measure the magnitude of impacts and consequences
Promotes effective prioritization of potential problems and the development of precautionary or remedial measures	Establishes the significance of impacts to be taken into account in the PPP formulation and implementation process

1.2.3. ESA, SEA, and EIA Complementary Relationships

Figure 1 below gives a schematic representation of ESA, SEA, and EIA complementary relationships. The figure presents a cascading relationship of various levels of government objectives and actions, with policies on the highest strategic level at which SEA can be applied to identify cumulative impacts and to integrate preventive or mitigating considerations. Environmental sustainability considerations are then reflected in plans and strategies that give effect to SEA-integrated policies.

Similarly, programs as instruments for the implementation of plans and strategies integrate preventive and mitigating measures. At the project level, prevention and mitigation of localized negative environmental impacts are specifically stipulated and implemented in Environmental Management Plans that can be monitored by Environmental Audits. ESA captures the dynamic context of issues related to the PPP at each of the strategic and operational levels.

ESA, SEA, and EIA are not necessarily implemented according to the optimal, cascading approach represented in Figure 1. For example, it is a practical reality in many developing countries that PPPs are not always formulated and implemented in hierarchical order. Plans and strategies often are formulated without the guidance of policies. Nevertheless, in such circumstances, SEA may be applied directly to a plan, strategy, or program.

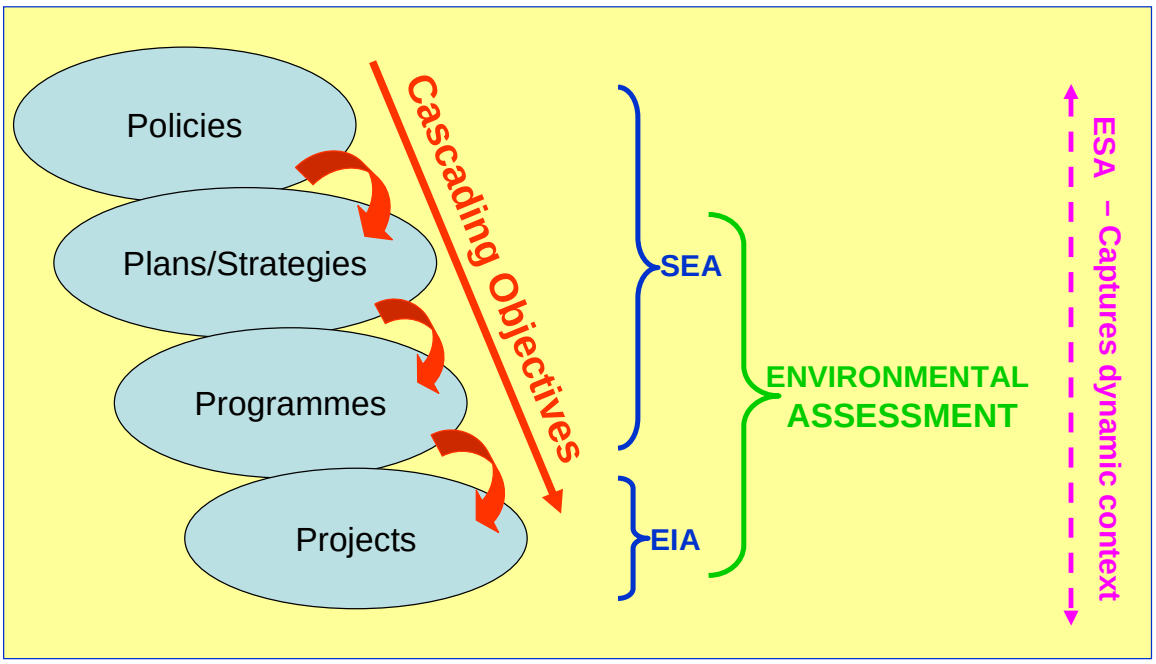

Figure 1. ESA, SEA, and EIA Complementary Relationships

1.3. Background and Context for the Development of SEA Guidelines in Rwanda

Rwanda Vision 2020, a national strategy that aims to transform Rwanda from a low-income to a middle-income country, includes six pillars for development: good governance and a capable state; human resource development and a knowledge-based economy; private sector-led development; infrastructure development; productive high value and market-oriented agriculture; and the promotion of regional economic cooperation and integration. Vision 2020 identifies domestic and regional security, national reconciliation, good governance, and economic transformation as key measures for achieving the Millennium Development Goals (MDGs). Protection of the environment through sustainable natural resource management is included in Vision 2020 as a cross-cutting issue that the Government of Rwanda believes will not only be affected by the country's economic transformation but also play an important role in achieving the country's development goals (MINECOFIN 2000).

In 2003, the Government of Rwanda further advanced discussions on the interactions between environmental conditions and poverty and their implications for development. Rwanda partnered with the United Nations Development Programme (UNDP) on a pilot project to test the feasibility of measuring qualitative and quantitative indicators for monitoring and assessing poverty-environment linkages and for identifying relevant policy options. The Poverty and Environment Mapping (PEM) pilot project demonstrated that mapping poverty with environment can be an effective tool for integrating environmental issues into poverty reduction planning and monitoring at the national, sectoral, and local levels, and that it can be an effective advocacy tool for mobilizing and targeting investment to address priority concerns (UNDP 2006).

The Constitution of 2003 clearly articulates the rights and responsibilities of all citizens and the role of the state vis-à-vis the environment:

> Every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The State shall protect the

environment. The law determines the modalities for protecting, safeguarding and promoting the environment (GoR 2003).

The rights established by the Constitution form the basis for the environmental protection, conservation, and management policy of 2004 that is given effect by Organic Law No. 4/2005 of 8th April, 2005 (GoR 2005).

Organic Law, Chapter II, Article 7, Principle 1 stipulates that precaution or preventive measures result from an environmental evaluation of policies, plans, projects, development activities, and the social welfare of the population. These measures "are aimed at identifying consequences of certain activities and hinder their commencement in case there arise consequences identified by an environmental impact assessment" (GoR 2005). The provision implies that environmental assessment would have broader scope than the project-based EIA, but it does not specify what form of environmental assessment would be required. On the other hand, in Chapter IV, Articles 67-70, Organic Law sets out specific guidelines for EIA and stipulates that every project, and those programmes and policies that may affect the environment, shall be subjected to EIA before obtaining authorization for implementation.

In 2005, in recognition of the substantial role of environment and natural resources in sustainable development, the Government of Rwanda joined the UNDP/UNEP Poverty Environment Initiative (PEI) to develop a strategy to mainstream environment into national planning processes and economic development strategies. REMA served as Rwanda's implementing partner, and responsible parties included: the Ministry of Lands, Environment, Forestry, Water and Mines (MINITERE); Ministry of Finance and Economic Planning (MINECOFIN); United Nations Development Programme (UNDP); and the United Nations Environment Programme (UNEP). Other partners included: the Ministry of Agriculture (MINAGRI); Ministry of Local Governance (MINALOC); Ministry of Infrastructure (MININFRA); and the Ministry of Commerce, Industry, Investment Promotion, Tourism and Cooperatives (MINICOM).

REMA implemented the PEI program as a participatory, multi-ministry process involving two phases over four years. PEI Phase I (2005- 2006) produced case studies and advocacy tools for informing policy in support of the formulation of a second PRSP and of District Development

Plans (DDPs). The second PRSP, entitled the Economic Development and Poverty Reduction Strategy (EDPRS), was formulated as a comprehensive development agenda, supported by detailed sector strategic plans, to be used as an operational tool (Ghanimé et al. n.d.). In contrast to the PRSP 1, where national poverty reduction priorities focused on improving social indicators, the EDPRS (2007-2012) strategic plan focuses on economic growth, whereby production and economic management sectors are given higher planning and financing priorities. The EDPRS prioritizes environment as both a critical cross-cutting issue and a stand-alone sector (REMA 2009). PEI Phase II (2007-2009) focused on enhancing the contribution of sound environmental management to poverty reduction, sustainable economic growth, and achievement of the MDGs. PEI Phase II focused on integrating environment into national policy and district planning, policy, and budget processes to implement the EDPRS (UNDP 2006).

In 2009, REMA began implementation of the Decentralized Environment Management Project (DEMP), a five-year (2008-2013) project designed to strengthen environmental policy, planning, and legislative capacity at the national level, increase management capacity at the district and lower levels, and empower people by promoting sustainable alternatives while protecting environmental resources. The model is based on the recognition that decentralization can be an effective mechanism for promoting sustainable use of natural resources when people are directly involved in the planning and decision-making processes associated with those resources (REMA 2009).

With support from the PEI and the DEMP, a National Task Team facilitated a district-based training workshop that focused on enabling stakeholders to acquire and use evidence-based information, environmental assessment, and advocacy tools to promote effective integration of environment into decision making. The training strategy incorporated key principles of Strategic Environmental Assessment (SEA). This effort served not only to build awareness of SEA, but also to generate recommendations for how to promote the mainstreaming of environment and natural resource issues into the EDPRS and to identify strategies for scaling up SEA during the second phase of the PEI (UNDP n.d.). The EDPRS as finalized (MINECOFIN 2007) identifies the development of SEA guidelines as a key intervention for articulating management of the

environment and for ensuring optimal utilization of natural resources, as a complementary sector intervention, to achieve its strategic targets (REMA 2010).

The promotion of SEA through the PEI and DEMP was intended to strengthen institutional capacity to consider environmental issues when developing or revising national, sectoral, and district development strategies and plans. Various existing factors were considered as supporting the rationale for applying SEA in Rwanda, including:

i. Visibility of environment on the political agenda;
ii. Recognition of the need to strengthen policy, legislative, and institutional frameworks to promote sustainable development and integrate planning with budgeting;
iii. Commitment to promoting the decentralization policy and a stakeholder-driven sustainable development process;
iv. Promising first steps toward integrated policy making through the application of a sector-wide approach and thematic clusters; and
v. Demonstrated commitment to undertaking environmental assessment of development programs (UNDP n.d.).

The results of the pilot application of SEA in Rwanda showed that SEA can go beyond the integration of environment in the planning process to include good governance, awareness-raising, and multi-sectoral planning, as well as to add value to the preparation of overarching strategies such as the EDPRS and thus contribute to the achievement of MDGs (Ghaniné et al. n.d). The results also highlighted the need to strengthen application of SEA as a planning and decision-making process so that it is not perceived as a narrow environmental assessment tool but rather a more comprehensive and upstream approach to mainstreaming environmental issues.

In coordination with the EDPRS priorities for sustainable development to be implemented by the various sectors, the Ministry of Natural Resources released a five-year Environment and Natural Resources Strategic Plan (ENRSSP) for 2009-2013 that aims to ensure sustainable management of natural resources and the environment to meet EDPRS and MDG targets, Vision 2020 goals, and international commitments (MINIRENA 2009). The intention is to streamline priorities,

institutional mechanisms, financing of identified priorities, and the monitoring and evaluation frameworks that will guide implementation of the EDPRS.

REMA developed the SEA guidelines pre to integrate environmental sustainability considerations in the formulation and implementation of PPPs that involve actions to promote economic development and poverty reduction, which may have significant effects on the environment.

2. POLICY, LEGISLATIVE, AND INSTITUTIONAL FRAMEWORK FOR SEA

Rights to a healthy environment for the inhabitants of Rwanda as provided for in the Constitution of 2003 formed a basis for the Environmental Protection, Conservation and Management Policy of 2004, which is given effect by the Organic Law No. 04/2005 of 8th April 2005, which determines the modalities for the protection, conservation, and promotion of environment in the country.

Organic Law No. 04/2005 and its regulations in the form of Ministerial Orders are implemented through Law No. 16/2006 of 3rd March 2006 that established the Rwanda Environmental Management Authority (REMA) as the regulating agency and determined its organization, functions, and responsibilities. Following its legal mandate, REMA has put in place environmental management tools and guidelines, including general and sector-specific guidelines for EIA.

Principle 1 of Article 7 in Organic Law 04/2005 stipulates precautionary measures that are informed by the results of both environmental assessment of policies, plans, projects, and development activities and assessment of social well-being. However, although the legal provision for the deployment of an SEA instrument appears to be present, only EIA is adequately treated in the law and in the general and sector-specific guidelines issued by REMA. REMA envisages the conduct and mainstreaming of SEA to proceed along the lines of the EIA regulations as articulated in Guideline 3 (REMA 2006), in which REMA would develop screening criteria to determine which PPPs require SEA and which are exempt.

2.1. International and Regional Context of SEA

SEA facilitates adherence to international legal conventions to which Rwanda is a party, including: UN Convention on Biological Diversity (UNCBD) 1992; UN Framework Convention

on Climate Change (UNFCCC) 1992; UN Convention to Combat Desertification (UNCCD) 1994; Basel Convention 2005; Convention on International Trade in Endangered Species (CITES) 1973; Kyoto Protocol 1998; RAMSAR Convention on Wetlands of International Importance 1971; Rotterdam Convention 2004; Stockholm Convention 2001; Vienna Convention 1985 and four related protocols; and the Cartagena Protocol 2000.

SEA contributes to the achievement of the Millennium Development Goals (MDGs), particularly the goals of environmental sustainability and poverty reduction. SEA also facilitates Rwanda's implementation of the goals of NEPAD which includes "placing Africa on a path of sustainable growth and development through eradicating poverty, building peace, and conserving the integrity and diversity of its ecosystems, most notably its forest resources" (OAU 2001). Additionally, SEA supports Rwanda's commitments to the EAC, CEPGL, and COMESA.

3. BACKGROUND AND INTRODUCTION

3.1. Overview of Rwanda

Rwanda is a landlocked country situated in Central Africa and is surrounded by the Democratic Republic of Congo in the West, Uganda in the North, Tanzania in the EAST and Burundi in the South. Its surface area is 26,338 km^2 with a hilly and mountainous relief with an altitude ranging from 1000 to 4500m above sea level. Its population is estimated to eleven millions.

Rwanda is characterized by rainy and dry season with an average of 110 – 220 mm per month and an average temperature of 24.6 to 27.6 c for the hottest months of August and September.
The vegetation ranges from dense equatorial forest in the north-west of the country to tropical savannah in the east.
Rwanda is divided in 5 administrative provinces as shown in the map below:

Rwanda is country is predominantly agricultural with few options that would reduce the pressure on land resources. Agriculture contributes 47 per cent of the GNP and accounts for 71 per cent of the country's export revenue. It is the main source of income for 87 per cent of the population (MINAGRI 2006).

3.2. Economic growth and the environment

Rwanda's economy and the livelihoods of her people are dependent on natural resources such as water, land, air, plants and animals. These natural resources are increasingly under pressure from unsustainable use resulting in environmental degradation. The challenge is to utilize natural resources to develop the economy while at the same time conserving the environment to avoid the adverse impacts of pollution, soil erosion, deforestation and general degradation.

Over the past years, Rwanda's economic growth, as shown by trends in real GDP, has been on the increase, mainly due to good performance of the tertiary and secondary sectors. This could be taken as an indicator that economic growth is not putting much pressure on natural resources. However the same growth, if not controlled may lead to an increase of pollution loading which may affect the environment.

3.3. Poverty and Environment

Rural areas are relatively poorer than urban areas. Poverty in rural areas is 62.5 per cent compared to 13 per cent for Kigali City and 41.5 per cent for other towns. Extreme poverty in rural areas is 40.9 per cent of the population (ROR 2007). Poverty also strikes hard in rural areas where 45 per cent cannot meet their food needs (ROR 2006). In terms of inequality, the Gini coefficient compared to the situation of 2000 has shown an increase from 0.47 to 0.51. This indicates that there is still inequity in access to national revenue including access to natural resources, especially to the land (ROR 2007).

The five major causes of poverty as identified in Ubudehe survey conducted in 2005 are the lack of land, soil infertility, weather conditions, lack of livestock (often linked to soil infertility) and ignorance (ROR 2007). The first four causes are directly linked to the environment. The same survey identified also sickness, polygamy and lack of access to water among other causes of poverty.

3.4. Poverty, soil erosion and food security

Rwanda is among three countries in Africa, experiencing unusual heavy soil losses. About half of Rwanda's farm land has shown evidence of modest to severe erosion. Besides being acidic, most of the soils are exhausted from continuous faming by farmers who have limited, if any alternatives.

Poverty is also associated with environmental degradation. Equally, with reduced environmental products, poverty will deepen increasing the pressure on environment even more.

3.5. Population, health and human settlements

3.5.1. Population in Rwanda

A country's population and how it is geographically distributed can influence the state of the environment through the rate of growth and household formation, access to basic services and infrastructure, age distribution and employment opportunities, rural and urban environment and wealth of natural resources. The impact of human needs on available resources, in the context of emerging economies, poses a strain on available public infrastructure, limited land and natural resources, for instance forests and water bodies.

Rwanda is administratively divided into five provinces to include Kigali City, 30 districts and 416 sectors. The population distribution according to the new provinces is shown in table 3.

Table 3: Population distribution per province

PROVINCE	**POPULATION %**
Kigali city	9.6
Southern	25.5
Western	24.1
Northern	18.4
Eastern	22.3
Total	**100**

Source: NISR et.al. 2008 – EICV2

3.5.2. Human settlement

Rwanda lacks a human settlement development framework. This has largely contributed to the expansion of unplanned residential areas in urban centres, poor land management, environment degradation and impoverishment of the rural population deprived of basic infrastructure and income generating activities other than agriculture.

Under Vision 2020, the development of human settlements will be planned and development inspired by concentration of infrastructure and urban utilities (ROR 2000). The EDPRS flagship 'Vision 2020 Umurenge, provides a development framework that sectors should follow during infrastructure planning and deployment to ensure sustainable development (ROR 2007). Many districts are already incorporating this framework into local planning.

3.5.3. Environmental health

Environmental health is aimed at developing and maintaining a clean, safe and pleasant physical environment in all human settlements, to promote the social, economic and physical well-being of all sections of the population. It comprises a number of complementary activities, including the construction and maintenance of sanitary infrastructures, the provision of services, public education, community and individual actions, regulation and legislation.

The objective of Vision 2020 is to have a satisfactory state of health for both urban and rural population - without being exposed to pollution; to have all swamps cleaned up with a view to reducing the presence of malaria vectors in particular; for each town or development pole to have a unit for the treatment and disposal of solid wastes; and for households to develop awareness and practice minimum hygiene and sanitation measures.

3.5.4. Waste management

Waste water and solid waste management in Rwanda takes different forms: from public toilets to selected area based sewerage management plants. The technology employed varies from site to site depending on the terrain, newness of neighborhood and level of urbanization, among others. The concept of providing public toilets, especially in commercial or public areas is so under developed and posses a hygienic challenge.

Generation of solid, liquid and gaseous wastes has been increasing at the same level as industrial development. The complexity of wastes, along with the rising socio-economic development, has introduced large portions of non-degradable wastes to the environment. These include plastics, scrap metals and other goods.

3.6. Land use and agriculture

3.6.1. The agriculture sector

The agricultural sector has been given a high priority in the government's planning for development. The current national thrust is for the sector to move from subsistence to commercial mode of production. This strategy aims to increase household incomes and lead to a 50 per cent reduction in poverty over twenty years (ROR 2008).

The agriculture sector which currently contributes significantly to national GDP (32.6 per cent) has of recent experienced remarkable growth.

3.6.2. The state of land use and agricultural development in Rwanda

Arable land: Rwanda is a small country with an area of 26,336 km2. The total arable land is about 1.4 million hectares, which is 52 per cent of the total surface area of the country. However the actual area cultivated has exceeded 1.6 million ha in recent years. Another 0.47 million ha is under permanent pasture, so well over 70 per cent of the country's total land surface is exploited for agriculture (ROR 2008).

Land use Land use is largely influenced by a number of factors, the main ones being climate, socioeconomic (culture and population dynamics) and government policies.

Cultivated land increased from 782,500 to 899,133 ha or from 64 per cent to 74 per cent in absolute terms between 1984 and 2002 (Mpyisi *et.al*. 2003). This increase occurred at the expense of pasture, fallow and woodlots. The share of pasture and fallow decreased from 22 per cent in 1990 to 14 per cent in 2002 and woodlots decreased from 11 per cent in 1990 to 7 per

cent in 2002. These trends persist today and this implies that the land is being farmed intensively with no fallow at all.

Land reform: The Vision 2020 and the medium term strategy (the EDPRS) have focused on land administration and land use management as key areas for the land reform process that will support sustainable development. These efforts have come up against significant challenges such as population pressure in both urban and rural areas which have led to land degradation.

3.7. Key environmental issues associated with the agricultural sector

The main issues putting pressure on agricultural productivity include high population density on the limited land resource. This has led to land fragmentation and reduction of farm sizes, continued intensive cultivation of land with no fallow and soil erosion, over cultivation without restoration of soil nutrients, weak extension and research services and increased vulnerability to climatic shocks like drought or heavy rains. The use of fertilizers and agricultural chemicals has polluted water; and agricultural activities and general mismanagement of the wetlands have further degraded and destroyed them.

3.7.1. Soil erosion

Agriculture practiced on the slopes of hills and mountains, coupled with deforestation has caused extensive land degradation and soil erosion. About 40 per cent of Rwanda's land is classified by the FAO as having a very high erosion risk with about 37 per cent requiring soil retention measures before cultivation. Only 23.4 per cent of the country's lands are not prone to erosion (ROR 2008).

3.7.2. Climate-related threats

Climate-related shocks like drought and flooding are becoming more regular. The poor are particularly vulnerable to these shocks. The eastern and south eastern regions (Umutara, Kibungo, Bugesera and Mayaga) are most affected by prolonged drought while the northern and western regions (Ruhengeri, Gisenyi, Gikongoro and Byumba) experience abundant rainfall that usually causes erosion, flooding and landslides (Twagiramungu 2006).

3.8. Industry and mining

3.8.1. Industrial Sector in Rwanda

Industrialization and human resource development are part of the Government of Rwanda's strategy for achieving the Vision 2020 (ROR 2000). Despite the developments in the last 5 years, however, Rwanda's industrial base remains generally weak and uncompetitive.

Assessments conducted in 2001 showed an increase in the establishment of a wide variety of small scale commercial and industrial operations particularly garages and artisanal mining operations.

As is typical in developing countries, most of the industries are located in urban areas. About 63 per cent of industries are located in and around Kigali. The median age of establishments located in Kigali is 9 years, while for those located outside Kigali the median age is just 4 years (NISR 2006). This implies that development of the industrial sector in Rwanda, particularly in locations outside Kigali, is basically a very recent phenomenon.

3.8.2. Industry and economic growth

Industry grew by only 10 per cent in 2007 as compared to 11 per cent in 2006 (NISR 2008). Its contribution to GDP appears to have stagnated at 14 per cent where it has been since 2001. Much of the growth in the industry sector is hampered by poor infrastructure in terms of roads and energy.

3.8.3. Mining

Mining is an activity that involves excavation of the surface and subsurface for the purpose of exploiting and processing minerals. These minerals are for economic and industrial development in local and foreign markets. Mining is a non-renewable resource activity with great potential. However, although it utilizes a small area of the land it can have significant and often irreversible environmental impacts.

3.8.4. Cleaner production

The Rwanda Cleaner Production Centre has been established and is promoting the cleaner production approach in Rwanda. Under the Cleaner Production pilot programme, 10 enterprises were participating in the programme.

Another module on Cleaner Production was undertaken under the Lake Victoria Environmental Management Project II and primarily targeted training the private sector and touring neighbouring countries to learn from best practices. All these efforts are beneficial towards sustainable industrialization and they will be further augmented by a full project on Cleaner Production once it is implemented through the ministry with the mandate for industrial activities – Ministry of Trade and Industry (MINICOM).

4. STATE OF THE ENVIRONMENT IN RWANDA

4.1. Biodiversity and genetic resources

4.1.1. Current state of biodiversity

Biodiversity can be defined as the variability of life expressed at the ecosystem, species and genetic levels. It provides a large number of goods and services that sustain our lives. Biodiversity is the combination of life forms and their interactions with each other and with the rest of the environment that has made the earth a uniquely habitable place for humans (SCBD 2000). The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by the influence of humans.

Although Rwanda is a small country, it has a remarkable variety of ecosystems and of flora and fauna. Its location at the heart of the Albertine Rift eco-region in the western arm of the Africa's Rift Valley is a contributory factor. This region is one of Africa's most biologically diverse regions. It is home to some 40 per cent of the continent's mammal species (402 species), a huge diversity of birds (1,061 species), reptiles and amphibians (293 species), and higher plants (5,793 species) (Chemonics International Inc. 2003, MINITERE 2005).

4.1.2. Ecosystem and habitats

The Albertine Rift is considered to have the highest species richness in Africa. It is considered a biodiversity hotspot containing more endemic mammals, birds, butterflies, fish and amphibians than anywhere else in Africa. Habitats supporting such an array of biodiversity are very varied. Being at the heart of the Albertine Rift, Rwanda's habitats are equally varied, ranging from afro-montane ecosystems in the northern and western regions to lowland forests, savannah woodlands and savannah grasslands in the southern and eastern regions.

There are other habitats around volcanic hot springs and old lava flows, especially in the northern and western part of the country. Rwanda also has several lakes and wetlands which are

rich in different species. Though not yet well surveyed, all these ecosystems host a rich variety of fauna and flora and micro-organisms.

Besides these natural ecosystems, as an agrarian country, Rwanda agro-ecosystems comprise cultivated land, agro-pastoral areas, grassland, grazing and fallow land (MINITERE 2003a).

4.1.3. Species Diversity

Flora

Rwanda harbours very diverse flora due to a considerable geo-diversity and a climatic gradient from west to east. The number of vascular plants is estimated at around 3000 species originating from the different bio-geographical regions (Fischer and Killmann 2008).

About 280 species of flowering plants from Rwanda are considered to be endemic to the Albertine Rift. Of these endemic species, about 20 are restricted to Rwanda, 50 species confined to Rwanda and Eastern Congo and 20 species found only in Rwanda and Burundi.

Twenty one species are found additionally in the forests of western Uganda, eastern Congo, Rwanda and Burundi. Examples of these distribution types are *Impatiens bequaertii* (Balsaminacea), *Impatiens mildbraedii* (Balsaminacea), *Monathotaxis orophila* (Annonaceaa*) or Liparis harketii* (Orchidaceae) (Fischer and Killmann 2008).

Fauna

Rwanda shelters 151 different types of mammal species, eleven of which are currently threatened and none of which are endemic. Among them are the primates (14 to 16), with half of the remaining world population of mountain gorillas (*Gorilla gorilla berengei*). The gorillas are found in the Volcanoes National Park.

Others includes the owl-faced monkey (*Cercopithecus hamlyni*), the mountain monkey (*Cercopithecus hoesti*) in Nyungwe, the Chimpanzee (*Pan troglodytes*) in Nyungwe and Gishwati, and the Golden monkey (*Cercopithecus mitis kandti*) found in Volcanoes National Park. There are also 15 species of antelope, and a wide diversity of species such as buffalo,

zebra, warthog, baboon, elephant, hippopotamus, crocodile, tortoise and rare species such as the giant pangolin (Chemonics International Inc. 2003, MINITERE 2005).

Rwanda is one of the top birding countries with 670 different birds having been recorded. Four of species of birds in Rwanda are threatened with extinction: the shoebill (*Balaeniceps rex)* found in Akagera; Grauer's rush warbler (*Bradyptrus graueri*) found in Volcanoes National Park in Nyungwe and in the swamps of Rugezi; the Kungwe apalis (*Apalis argentea*) found in Nyungwe; and the African or Congo barn owl (*Phodilus prigoginei*) found along Lake Kivu (Chemonics International Inc. 2003).

4.1.4. Conservation status of biodiversity

This rich biodiversity is mainly conserved in protected areas (three national parks, natural forests, wetlands). These cover almost 10 per cent of the national territory while the rest of the country is densely populated.

The Volcanoes National Park is home to about 30 per cent of the global population of Mountain Gorilla (*Gorilla gorilla beringei*). It has other 115 mammals' species, including the golden monkey (*Cercopithecus mitis kandti),* elephants, buffaloes, 187 bird species, 27 species of reptiles and amphibians and 33 arthropod species. CITES consider *Rana anolensis, Chameleo rudi* and *Leptosiaphos grauer* endangered (MINAGRI 1998, Chemonics International Inc. 2003).

Nyungwe National Park has 75 species of mammals, including 13 species of primates with some on the IUCN Red list such as the Eastern Chimpanzee (*Pan troglodytes schweinfurthii*), owl-faced guenons, (*Cercopithecus hamlyni*) and the Angolan Colobus monkey (*Colobus angolensis ruwenzorii*). The national park is also considered an African Important Bird Area (IBA) with 285 bird species comprising 25 endemic to the Albertine Rift (Plumptre *et. al.* 2002, Fischer and Killmann 2008).

The wildlife in the ***Akagera National Park*** comprises 90 species of mammals, 530 bird species and 35 fish species. The most threatened species are rhinoceros, large carnivores, particularly lions. Many species in the Akagera National Park are protected by the CITES convention such as *Loxodonta africana* (African elephant), *Sincerus caffer* (buffalo), *Panthera leo* (leopard) and

Tragelaphus spekii (sitatunga). (MINITERE 2003a, MINITERE 2005). The flora of the Akagera National Park is diverse and 6 species of orchids are recorded. The grass savanna is dominated by *Themeda triandra* and *Hyparrhenia* sp. accompanied with normal species like *Sporobolus pyramidalis* and *Botriochloa insculpta*.

Natural forests are rich in fauna species. Gishwati forest includes species such as *Pan troglodytes schewinfurthii, Colobus angolensis ruwenzorii, Potamochoerus porcus, Cephalophus nigrifons, Dendrohyrax arboreus, Felis serval* and *Felis aurata* (MINAGRI 2002 in Munanura *et. al*, 2006).

Rugezi wetland is habitat to an endangered bird and hosts 60 per cent of the global population of Grauer's swap-warbler (*Bradypterus graueri*). It is also habitat to 19 bird species, including two species of *Threskiornithidae,* protected by CITES.

4.1.5. Threats to biodiversity

With the highest population density in Africa, coupled with its dependence on agriculture, the major threats to the biodiversity and genetic resources in rwanda are mainly linked to population pressure and the problem of land scarcity. other threats to the biodiversity are mainly the habitat loss and loss of genetic resources

4.2. Forest and protected areas

4.2.1. Current Status of Forestry Resources in Rwanda

Rwanda forests and woodlands can be classified into four categories: the natural forests of the Congo Nile Ridge comprised with Nyungwe national park Gishwati, and Mukura; the natural forests of the Volcanoes national park; the natural forests in the savannah and gallery-forest of the Akagera national park and remnants of gallery-forests and savannahs of Bugesera, Gisaka and Umutara; and forest plantations dominated by exotic species (*Eucalyptus sp, Pinus sp, Grevillea robusta*) and trees scattered on farmlands (agroforestry) and along antierosion ditches.

4.3. Water and wetlands resources

4.3.1. Introduction

Generally water resources have a direct influence on the quality of life of the people, their health and their overall productivity. Thus, water is essential, not only to human life but for animals, agriculture, industrial development, hydropower generation, transport, socioeconomic development and poverty eradication.

In Rwanda the abundance of water resources is reflected by the existence of a network of wetlands in various parts of the country. Wetlands and aquatic lands are generally represented by lakes, rivers and marshes associated with these lakes and rivers (MINITERE 2005). The water resources are mainly influenced by rainfall and evaporation and hence climate information and preparedness are essential in the management of water resources (NBI 2005).

4.3.2. Status of water and wetland resources

Rwanda is divided into two major drainage basins: the Nile to the east covering 67 per cent and delivering 90 per cent of the national waters and the Congo to the west which covers 33 per cent and handles all national waters (Chemonics International Inc. 2003, MINITERE 2005, NBI 2005).

The country's hydrological network includes numerous lakes and rivers and its associated wetlands. A recent inventory of marshlands in Rwanda conducted in 2008 identified shows 860 marshlands, covering a total surface of 278 536 ha, which corresponds to 10.6 per cent of the country surface, 101 lakes covering 149487 ha, and 861 rivers totaling 6462 km in length (REMA 2008).

The major lakes include Kivu, Bulera, Ruhondo, Muhazi, Cyohoha, Sake, Kilimbi, Mirayi, Rumira, Kidogo, Mugesera, Nasho, Mpanga, Ihema, Mihindi, Rwampanga and Bisoke. The major rivers include the Akagera, Akanyaru, Base, Kagitumba, Mukungwa, Muvumba, Nyabarongo, and Ruvubu in the Nile Basin and Koko, Rubyiro, Ruhwa, Rusizi, Sebeya in the Congo Basin (Chemonics International Inc. 2003, Kabalisa 2006, NBI 2005).

4.3.3. Water availability and use

The pressures on water resources primarily result from utilizing the natural resources to meet basic needs as well as social-economic development. The effects of water resources use is demonstrated in the changes in the quantity and quality of water. All aspects of human activities in Rwanda have produced varying impacts and degrees of modification to the available water resources and these impacts are manifest at the catchment and sub-catchment levels as the following examples illustrate.

4.3.4. Domestic water use

The figures from EWSA show that the water demand in Kigali city is 55,080 m3 per day, whereas nominal production is 30,525 m3 per day. This illustrates a deficit in the drinking water requirements for Kigali. It is estimated that water demand over the next decade will double in Kigali and rural areas and more than double for the semi-urban settlements.

4.3.5. Industrial water use

The study on the Knowledge and Management of Water data done under the preparation of the National Management of the Water Resources Project (PGNRE) indicates that industrial water requirements will be between 300,000 and 900,000 m^3/yr by 2020 in urban areas. The study also projects that coffee washing stations will consume 130.000 m ^{3}/yr by the year 2010 in the rural areas (PGNRE 2005).

4.3.6. Agriculture water use

Rwanda's agriculture is rain-fed and is therefore exposed to vagaries of climate fluctuation. Many areas which use poor farming methods without integrating soil and water resources conservation tend to have weak agricultural productivity. In such instances, soil moisture becomes the limiting factor for crop growth (Kabalisa 2006).

4.3.7. Status of wetlands in Rwanda

The marshlands are the most physically and chemically heterogeneous of all aquatic ecosystems in Rwanda. They are in effect seasonal wetlands. The water table is near or above the lowest

ground surface during the wet season and they do not have large flood plains (generally less than 200m wide) or great length (Chemonics International Inc. 2003).

The most recent inventory of wetlands was conducted in 2008 by REMA through the Integrated Management of Critical Ecosystems (IMCE) project funded by GEF and World Bank. This inventory showed that Rwanda has 860 marshlands and 101 lakes covering a total surface of 278,536 ha (10.6 per cent of the country surface area), and 149,487 ha, respectively (REMA 2008). This inventory also found 861 rivers totaling 6,462 km in length. 41 per cent of the inventoried marshlands are covered by natural vegetation, 53 per cent are under cropping, (which represents about 148 344 ha) and about 6 per cent are fallow fields.

4.3.8. Value of wetlands and their role in economic development

Wetlands are known to be the world's most productive ecosystems. Some of the wetland functions that humans benefit from include nutrient cycling, sediment and pollution retention, flood mitigation and groundwater recharge. In addition to these indirect benefits, wetlands are sources of wildlife, fish, wood and several non-timber products that are widely used by neighbouring populations. Most importantly, wetland soils can have great agricultural potential when properly used.

4.3.9. Threats to water and wetland resources

Enormous pressure, over the recent years, has been exerted on the water and wetlands resources through various emerging and increasing uses driven by the growing population.

Some of these threats include agricultural intensification, pollution, invasive species, overuse and an inadequate institutional framework to manage the wetlands. Some of these threats, in the case of water, have affected both the quantity and quality of water available. Climate change is also contributing to degradation of swamps. With decreasing amounts of rainfall, the hydrological regime of wetlands is being threatened due to:

- Inadequate institutional framework for wetlands management
- Over-exploitation
- Land use practices
- Agriculture intensification

- Pollution
- Invasive species

4.4. Energy resources

4.4.1. Introduction

Rwanda has considerable opportunities for energy development – from hydro sources, methane gas, solar and peat deposits. Untapped resources for power generation amount to about 1,200 MW. Most of these energy sources have not been fully exploited. As such, wood is still the major source of energy for 94 per cent of the population and imported petroleum products consume more than 40 per cent of foreign exchange.

4.4.2. The energy crisis in Rwanda

Several indicators point to an energy crisis in Rwanda including: accelerated deforestation, a biomass energy deficit and deterioration in electricity generation and distribution systems. 2

The major part of the energy consumed in Rwanda today still comes from wood (80.4 per cent). Yet studies carried out as far back as 1981/82 and 1989/90 already showed a gap of 3,000,000 m^3 of wood for energy needs only (Privatization Secretariat undated).The lectricity generation capacity in Rwanda is shown in the table below:

Table 4: Current electricity generation capacity

Category	Name	Installed capacity (MW)	Available capacity (MW)
In house hydropower	Ntaruka	11.76	6
	Mukungwa	12.5	11
	Gihira	1.8	1.8
	Gisenyi	1.2	1.2
Imported hydropower	Rusizi 1 (SNEL)	3.5	3.5
	Rusizi 2 (SINELAC)	12	8
Micro hydropower	Nyamyotsi	0.075	0.075
In house thermal power	Jabana	7.8	7.8
	Gatsata 2	4.77	0
	Gatsata 1	1.8	0
Rental thermal power	Aggreko 1 (Gikondo)	10	10
	Aggreko 2 (Mukungwa)	5	5
Solar power	Kigali solar	0.25	0.25
Total		**72.445**	**54.625**

Source MININFRA 2009a

4.4.3. Sources of energy in Rwanda

The energy sector in Rwanda is made up of three sub-sectors: power, hydrocarbon and new and renewable sources of energy. Amongst the renewable sources of energy are biomass, solar, peat, wind, geothermal and hydropower. Biomass is the most used and dominates both the demand and supply sides of the Rwandan economy. The current national energy balance of 86, 11 and 3 per cent of all energy consumed is used in the form of biomass, hydrocarbons and electricity, respectively.

4.4.4. Biomass or primary energy balance

Biomass is used in the form of firewood, charcoal or agricultural residues mainly for cooking purposes in Rwandan households, and also in some industries (MININFRA 2008a). In the rural areas, biomass meets up to 94 per cent of national needs; with the balance being met by other options such as kerosene, diesel, dry cells, grid and non-grid electricity, biogas, solar, wind and other renewable energies. Biomass is already in short supply with the country facing a biomass deficit of over 4 million m3 per year.

4.4.5. The power sub-sector

EWSA has been the sole integrated electricity supplier in the country. Rwanda imports electricity through cross-border interconnections of about 15.5 MW from the DRC and SINELAC and about 3MW from Uganda (MININFRA 2009a).

4.4.6. The hydrocarbon sub-sector

Rwanda is completely dependent on imported petroleum products. Hydrocarbons serve as a source of electricity by powering diesel generators, and are also used in the transport sector. About 42 per cent of the electricity produced in Rwanda is produced by diesel generators. Information on the petroleum sector is scanty and is therefore not included here.

4.4.7. Methane gas

One of the biggest inputs into the electricity grid in the near future will be power generated from methane gas extracted from the bottom of Lake Kivu. It is estimated to contain about 55 billion m3 of dissolved methane gas (MININFRA 2009b). Lake Kivu offers the best alternative for

energy because of its relatively low construction cost and low estimated operating costs and is a key government priority.

4.4.8. Peat, geothermal and wind energy

Peat

Rwanda has peat reserves estimated at 155 million tones and therefore has the potential to replace wood, charcoal and fuel oil (MININFRA 2008b). It is estimated that about a third is commercially extractable and can be used for direct use as source of heat or for production of electricity. While power production from peat is still in a planning stage, the use of peat as burning fuel has already been tested in community institutions, for brick making and in the cottage industry (MININFRA 2009a).

Geothermal

Rwanda possesses geothermal resources in the form of hot springs along the belt of Lake Kivu with a power generation potential of about 170-320 MW. Preliminary technical exploration studies are currently being conducted.

Wind

The potential of wind as a source of energy is currently being investigated. A national wind atlas is going to be developed with the support of the Belgian Government.

4.5. Climate change and natural disasters

4.5.1. Rwanda's climate

Climate is the average prevailing weather conditions for a specific geographical region over a period usually exceeding 30 years. Due to its high altitude, Rwanda enjoys a tropical temperate climate. The average annual temperature ranges between 16 and 20°C, without significant variations. Rainfall is abundant although it has some irregularities. Winds are generally around 1-3 m/s (Twagiramungu 2006). With an economy heavily dependent on rain fed agriculture, climate is of particular importance.

4.5.2. Temperature

Rwanda's average temperature varies according its topography. Low temperatures are observed in the regions of high altitude with average temperatures ranging between 15 and 17°C. In some parts of the volcanic region, temperatures can go below 0°C. Moderate temperatures are found in areas with intermediary altitude where average temperatures vary between 19 and 21°C. In the lowlands (east and southwest), temperatures are higher and the extreme can go beyond 30°C in February and July-August.

4.5.3. Rainfall

The rainfall patterns are characterized by four seasons, a short rainy season from September to November and a longer season between March and May. Between these seasons are two dry periods, a short one between December and February and a long one from June to August. Rainfall ranges from about 900 mm in the east and southeast to 1500 mm in the north and northwest volcanic highland areas.

4.5.4. Climate change in Rwanda

The meteorological stations that are currently operational are not representative enough to provide a true picture of climate variability. However, observations and analysis from existing data shows that over the last 30 years, some parts of Rwanda have experienced unusual irregularities in climate patterns including variability in rainfall frequencies and intensity, persistence of extremes like heavy rainfall in the northern parts and drought in the eastern and southern parts.

4.5.5. Floods

Heavy rainfall, in combination with natural factors like topography, is having great impact in some areas. Floods and landslides are the main disasters in the high altitude regions mainly during the rainy seasons. Indeed in light of Rwanda's topography, the potential for flash flooding in many parts of the country is ever present.

5. ELECTRICITY ACCESS ROLL OUT PROGRAMME

5.1. Introduction

The EARP process was kicked off during the National Electricity Access Program Donor Roundtable which was held in Kigali on the 23rd March 2009 during which the development partners re-affirmed the support for the GoR's efforts to advance mainstreaming the sector wide approach (SWAP) in the energy sector, with the overall objective of rapid growth and poverty reduction.

Under this objective, there is a need of creating jobs in the rural areas by providing more access to electricity. The SWAP framework and process is a means of steering away from business as usual modalities of fragmented aid delivery to the energy sector, project-by-project; towards a sector development perspective led by Government and shaped by the basic tenets of donor engagement consistent with the Paris declaration on aid effectiveness. It is anchored in national priorities, alignment, harmonization, and joint accountability and managing for results.

In light of the high and sustained investments of the Program and financing requirements for technical assistance and implementation, the Partners agreed that every effort should be advanced to seek ways and means of lowering unit connection costs over the program period via the mainstreaming of established good practices in choice of equipment and materials, network design and construction methods and practices.

The Partners and sector institutions also endorsed the proposed 80-10-10 shared financing policy: GoR and Development Partners (80%), EWSA (10%), and Customers (10%), for meeting the grid investment requirements of the five year Program. To enhance sustainability of the Program over the longer term, the share financed by development partners would be expected to shrink coupled with a corresponding increase in the Rwandan share of program financing.

For effective and timely implementation of the annual grid connection targets called for under the Access program and sustainability thereof, it was found essential for EWSA to operate as a commercial enterprise and be accorded a sufficient level of operational autonomy.

The Partners and sector institutions expressed strong support for the five year Program and together pledged contributions totalling US$ 357.3 million, representing 95 % of the financing for technical assistance and investment requirements of the US$ 377 million National Access Program. Irrespective of the financing mechanism(s) utilized, where practical and in accordance with the policy of their government or organization, the Development Partners adopted the partnership principles consistent with the Paris declaration on aid effectiveness as outlined in the MOU signed by the Partners on July 3, 2008.

The nature of the EARP activities gave rise to environmental and social concerns during the preparation and implementation of the project as the program activities are located throughout Rwanda. However, a spatial coverage of the program may emerge during the programme preparation for the planning and construction of stations, substations, the transmission and distribution network.

Therefore, in compliance with Organic Law on Environmental Protection of Rwanda and the World Bank's Safeguards Policies, the GoR, represented by EWSA prepared an Environmental and Social Management Framework (ESMF) with the aim of establishing a mechanism to determine and assess future potential environmental and social impacts of the EARP, and then set out mitigation, monitoring and institutional measures to be taken during implementation and operations of the proposed investments/activities, to eliminate their adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The programme has been implementing its activities basing on the requirements and recommendations of the ESMF.

Due to variation of programme activities locations and timing, Environmental Assessments (Environmental Management Plans and Environmental Impact Assessment) have been conducted for the project subcomponents. However EARP being a programme, a SEA has been found to be a long term and sustainable tool for all EARP activities.

5.2. Rationale of the SEA for EARP

The concept of sustainable development requires EIA to be expanded beyond projects level. SEA is the assessment of impacts of policies, plans, programmes which are higher than the project level. SEA shall involve impacts identification and analysis of the Electricity Access Roll out Programme (EARP) in order to establish its potential cumulative effects on environment over the long-term.

For effective integration of decision making with sustainable development criteria, SEA has proven an effective tool in restraining environmental degradation at national and global levels.

As mentioned earlier, SEA and project level EIA have a close tiering relationship, similar to tiering from policy to project (the policy poses the general objectives for the planning, plans are the general framework for the formulation of programs and the programmes orient the preparation of concrete development projects). According to this tiering approach, the type and detail of environmental information necessary depends on the relevant needs of decision makers.

In this particular case of EARP one needs general and qualitative environmental information to identify major environmental problems, without dealing with specific impacts.
Then, when implementing project level EIA it will be necessary to identify specific impacts and technical information of the project or sub-project. Since it is important that EIA must be carried out not only at project level, but also for master plans for development of regions, sectors, provinces, cities and industrial zones, SEA is a vital tool in such cases.
To determine as to whether an SEA was required or not for EARP making process was the next step using information from the previous steps which are the identification of the main characteristics of EARP and the analysis of EARP formulation process as illustrated in figure 2 ; a guiding flow chart for the determination.

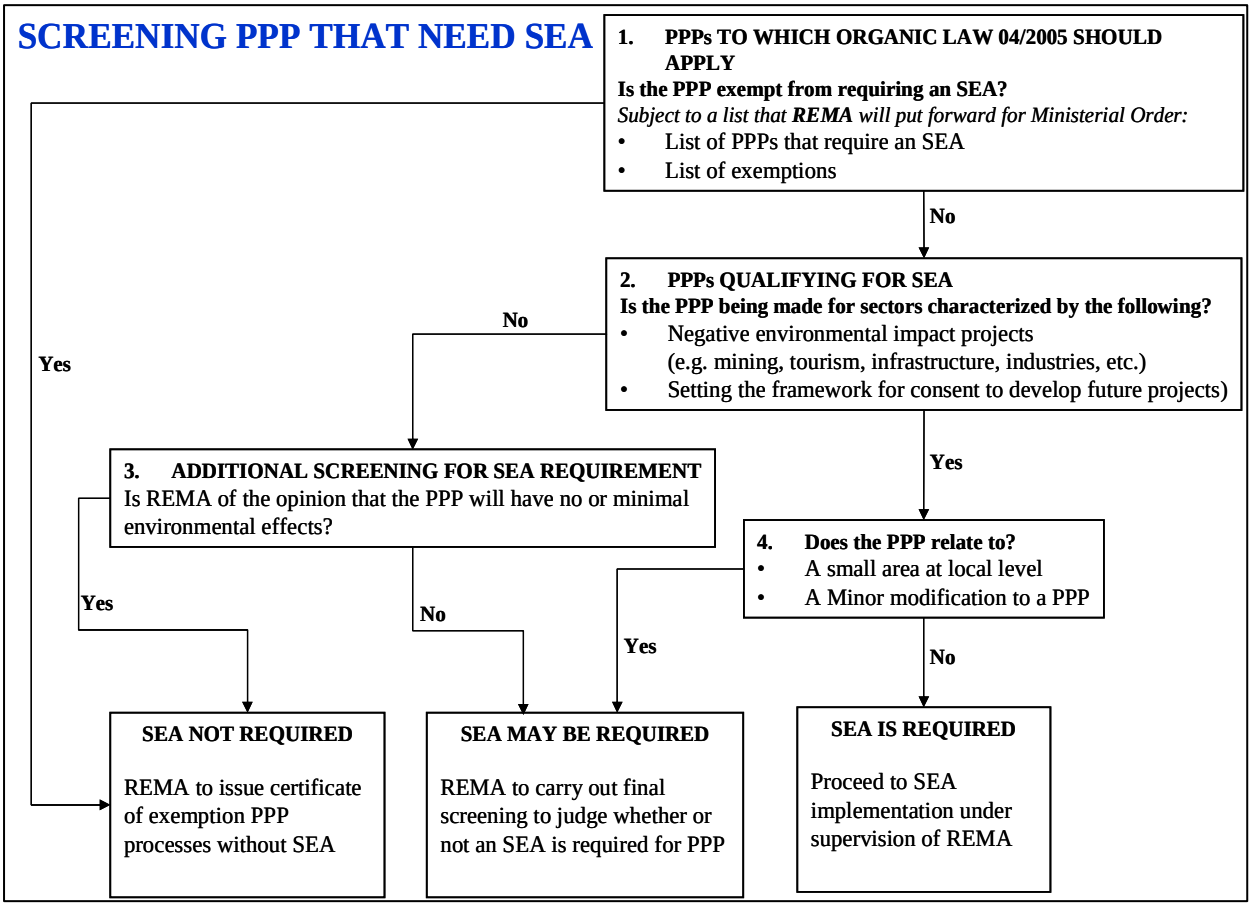

Figure 2: Flow Chart for Determining if a PPP needs SEA (REMA 2010)

The Organic Law 04/2005 makes provision for environmental assessment of PPPs that may have negative effects on the environment. However, their specification in the form of lists as has been done for projects requiring or exempted from EIA has not yet been achieved.

The decision flow shown in figure 2 therefore assumes that a list of PPPs subject to and those exempt from SEA will be gazetted in a Ministerial Order on the recommendation of REMA as the regulatory agency.

Energy projects as stated in the organic law 04/2005 require an EIA. In addition, considering the sub components of EARP, EIA is required for all its activities. As stated before: "*SEA helps integrate environmental sustainability into PPPs by considering cumulative impacts and*

mitigation measures as they devolve progressively from policy to plan to program to project, where EIAs generally are applied."

For the case of EARP, by applying the screening of PPPs that need SEA (Figure 2 above) the following observations can be made:

(i) EARP has to be in compliance with national legislation on the environment;

(ii) EARP is made for sectors characterized by likely negative environmental impacts infrastructure project (in this case, energy infrastructures); the effects and of the area likely to be affected are characterized by:

- Probability, duration, frequency and reversibility of the effects.
- Cumulative nature of the effects.
- Risks to human health or the environment (for example, due to accidents);
- Magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected).
- Value and vulnerability of the area likely to be affected due to:
    - special natural characteristics or cultural heritage;
    - exceeded environmental quality standards or limit values; or
    - intensive land-use.
- Effects on areas or landscapes that have a recognised national or international protection status.

(iii) EARP is made for sectors characterized by setting the framework for consent to develop future project;

(iv) EARP activities are related to a big area at the national level;

Hence basing on the above observations,

(v) SEA is required for EARP; proceed to the implementation of SEA under the supervision of REMA.

5.3. Background of the Electricity Access Roll Out Programme (EARP)

The Government of Rwanda, in its effort to sustain economic growth, has increased and stabilised the power production since the severe power shortages in 2004. However, infrastructure bottlenecks in the urban areas and limited access in the rural areas have emerged as a significant constraint. One of three major strategic objectives of the Economic Development and Poverty Reduction Strategy (EDPRS 2008-2012) is to expand access while also improving the quality and lowering the cost of economic infrastructure – especially transport, power, and communications.

In connection with the mentioned strategy, the Government of Rwanda through Energy, Water and Sanitation Authority (EWSA) has embarked on a country-wide ***Electricity Access Program*** to realize the primary EDPRS target for the electricity sector of tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration. This will require about 160’000+ with new grid connections, and will also include efforts to reach rural consumers and service providers currently off the national grid.

In this regard, EWSA has established a new Electricity Access Scale-up Roll-out Program (EARP) as a part of its corporate structure. The program will be implemented within the framework of a Sector Wide approach (SWAp) to encompass all donors active in the sector under one common sector investment program. The overall investment envelope for the first SWAp time (2009-2013) was estimated at $378 million, for the program period covered by the Prospectus that has been endorsed by all the partners and key sector institutions in Rwanda, including EWSA.

5.4. Objectives of the Project

The overall objectives of the Electricity Access Roll-out Project include:

- to increase access to electricity according to the above targets;
- to increase revenues from electricity by utilizing the existing and added infrastructure optimally;
- to apply new appropriate proven technologies with the primary aim of reducing costs and increasing reliability;
- reduce overall project cost by the implementation of appropriate technologies and standards applicable for the market;
- reduce technical and commercial losses of electricity through the correct metering procedures and through the design of more efficient systems

The programme specific objectives are two-fold:

i) Increasing electricity access to households and priority institutions at a scale consistent with the targets of the EDPRS and;

ii) Assisting the GOR mainstream the energy sector-wide approach (SWAp) and process by establishing a functioning donor partnership framework for sustained financing of investment and capacity strengthening, aligned with national priorities and results. *Specifically, the key outcome indicators for the project objectives, and that are aligned with the Africa Action Plan, are proposed as follows*:

Objective 1 – number of new connections at Households level (HH) and, institutions;

Objective 2 - share of sector financing from donors (for investment and capacity strengthening), that is aligned with the Government's sector investment prospectus

The primary EDPRS target for the electricity sector according to the Country Assistance Strategy (CAS's) strategic theme of growth and supporting policy and investment interventions for improving economic infrastructure is aimed at tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration. This will require about 160,000+ new grid connections, and also include efforts to reach rural consumers and service providers currently off the national grid.

The project will also provide an effective means to advance implementation of the Government-led sector-wide approach and ongoing harmonization process in the electricity sector; a first in the Bank's energy practice and that is expected to set an example for electricity access scale up programs in other countries in sub-Saharan Africa.

The prospectus outlines the overarching spatial least cost rollout plan and priority connection targets through the medium term, the rollout strategy and the financing policy platform for the EARP. Additionally, the EARP implementation will be subject to a monitoring, evaluation and results framework as well as the oversight and accountability process of regular reviews as agreed with the energy sector working group (SWG), chaired by Ministry of infrastructure (MININFRA) on advice from the partners.

A number of development partners so far have committed to support the program including World Bank IDA, World Bank GEF/ESMAP CEIF, African Development Bank, BADEA, OFID, Saudi Funds, Netherlands, Japan, and others.

5.5. Policy and strategic context of EARP

The Electricity Access Roll Out Programme is within the GoR's one of three major strategic objectives of the Economic Development and Poverty Reduction Strategy (EDPRS 2008-2012) which is to expand access while also improving the quality and lowering the cost of economic infrastructure – especially transport, power, and communications.

To realize the primary EDPRS target for the electricity sector, the Government of Rwanda through EWSA has embarked on a country-wide programme of tripling access by 2012 to about

16 percent of households and at least 50 percent of identified public institutions in health, education and local administration and reach rural consumers and service providers currently off the national grid.

The EARP phase 1 which covers the four year period, 2009-2013 has been developed in response to the need of electrification programme in rural and urban area. It provides a comprehensive and robust policy/strategic framework for the energy sector, and it is broadly supported by the Development Partners and other sector stakeholders, many of whom were closely involved in its formulation.

5.6. Programme components

The project has three components (a) Grid Roll-out; (b)"Green connections"; and (c) Technical assistance, capacity strengthening, and implementation support.

(a) **Grid rollout** - The project will finance Medium Voltage (MV) and Low Voltage (LV) grid reticulation, distribution grid strengthening and rehabilitation to reach the required transfer capacity to the targeted areas and customer connections including partial subsidies of connection costs for qualifying households, and priority institutions. This component will involve civil works related to construction of towers and substations, clearing of land and vegetation, use of oil lubricants for the transformers all which will trigger the Environmental Assessment (OP4.01, BP 4.01, GP 4.01) policy. Modern manufactured transformers are no longer manufactured using PCBs and therefore there is no need for testing the equipment for PCBs. Specifically though as an emphasis, the tender documents will highlight this requirement.

(b) **Energy Efficiency Component "Green connections" -** The project will finance a range of activities to improve affordability for the consumers and reduce the need for additional generation resources. The program would include energy efficient Compact Fluorescent Lamps (CFLs), incentives to promote the use of solar hot water heaters sold through private dealers and specific initiatives to buy down connection costs for the poorest households including mainstreaming of the use of low cost "ready boards" in homes.

The disposal of the used CFLs triggers Environmental Assessment (OP4.01, BP 4.01, GP 4.01) policy.

(c) **Technical assistance, capacity strengthening, and implementation support –** This component will support components (a) and (b) outlined above that are linked to the first project development objective. Additionally, this component will support the second development objective of mainstreaming the SWAp framework and process. This component will not trigger any safeguards requirements.

5.7. Implementation arrangements

i. **Component (a) Grid rollout –** EWSA has established a Projects Department that consolidate within the authority all existing project-specific and that also manages and oversees the national grid rollout and connections program. The strategy for achieving the latter target was two-fold: (a) expanded outsourcing of household connections and LV network reticulation to local construction capacity mobilized to the maximum, coupled with a program for strengthening and expanding local contractor pool for the mid-to-longer term; (b) utilization of turn-key EPC (Engineer, Procure, Construct) contracts tendered competitively to qualified international firms , especially in the current Economic Development and Poverty Reduction Strategy (EDPRS) period when local capacity is insufficient to meet the connections targets, especially for grid extensification projects that involve MV reticulation as well.

As the program progresses beyond the current EDPRS time frame, the share of large EPC contracts is expected to decline as local capacity and locally sourced materials and equipment increases. Rwanda is a potential pilot country for the use of country procurement systems.

ii. **Component (b) "Green Connections"** – The ***CFL program*** for new customers is managed by the existing energy efficiency unit in EWSA and paired with the ongoing CFL replacement campaign. It is expected that the component will be able to benefit from Carbon Credits for the realized emission reduction.

iii. **Component (c) Technical assistance** – EWSA, is the authority responsible for projects within MININFRA (the ministry in charge of energy), and MININFRA is be responsible for the respective portions of this component.

5.8. Environmental issues of EARP activities

The World Bank has number of operational policies for various projects and one them is the OP 4.01 (Environmental assessment). OP 4.01 helps to determine the appropriate extent and type of EA required for a given project and classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Basing on the World Banks' Environmental and Social Assessment Procedures EARP is classified as *Category B* programme. A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

The scope of EA for Category B project may vary from project to project, but it is narrower than that of *Category A* EA. Like *Category A* EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Hence, this World Bank classification requires EARP as the proponent of the programme, to carry out a Strategic Environmental Assessment and prepare the associated Environmental and Social Management and Monitoring Plan.
In addition, Principle 1 of Article 7 in Organic Law 04/2005 stipulates precautionary measures that are informed by the results of both environmental assessment of policies, plans, projects, and development activities and assessment of social well-being.

However, although the legal provision for the deployment of an SEA instrument appears to be present, only EIA is adequately treated in the law and in the general and sector-specific guidelines issued by REMA. REMA envisages the conduct and mainstreaming of SEA to proceed along the lines of the EIA regulations as articulated in Guideline 3 (REMA 2006), in which REMA would develop screening criteria to determine which PPPs require SEA and which are exempt.

5.9. Programme main activities description

The programme is expected to cover all the 30 districts countrywide, however the programme activities may differ from each district or zone. The programme activities are divided in four phases which are:

- Design and Planning Phase
- Construction Phase
- Post Construction Phase (Operations)
- Decommission Phase

5.9.1. Design and Planning Phase

During the design phase, the expected activities:

- ***Site Selection and Routing***: adequate survey and mapping are carried out for new transmission and distribution routes, stations and substations site selection to avoid sensitive ecosystems, densely populated areas that would cause immense land acquisition and resettlement.

- ***Land Acquisition /Compensation***: acquisition of land owned by the general public where the identified routes for the distribution and transmission network including the location for the cabins and creation of Right of Way (ROW) and station and substation location fall in accordance with the Resettlement Policy Framework (RPF) and a separate Resettlement Action Plan (RAP) to address the compensation related concerns of the project.

5.9.2. Construction Phase

During the construction phase, the following key activities are expected to occur:

- ***Horizontal and Vertical Clearances:*** Clearing of the path where the transmission and distribution infrastructure will pass is the initial activity that will occur during the construction phase. This done is in order to create the vertical and horizontal clearance required when constructing electricity transmission lines.

The clearing process will follow the international dimension in installation of distribution and transmission networks specified below. The horizontal and vertical clearances shall be according to VDE 0210 and as noted in the table below:

Clearance dimensions

Type of activity	Clearance	< 36 kV	132 kV
Terrain available to pedestrians only	[m]	7.0	7.0
Roads and thoroughfares	[m]	8.0	8.5
Railways	[m]	10.5	10.5
Power supply circuits	[m]	2.5	3.5
Communication circuits	[m]	4.0	4.0

Table 5: The horizontal clearances according to VDE 0210

- ***Provision of Site Access***: this activity consists of the provision and maintenance of all access from the main highways to the transmission and distribution line routes during erection and construction of stations and substations as required. Access roads shall be constructed in such a way that they can be used for maintenance of the line by four wheel drive vehicles up to a total weight of 7.5 tons. The length of the access road is the distance between the edges of public roads to the tower, stations or substations location.

- ***Clearing of Right-of-Way:*** An electric line right-of-way (ROW) is a strip of land that an electric utility uses to construct, maintain, repair or replace an overhead or underground power line. The ROW allows the utility to provide clearance from trees, buildings and other structures that could interfere with the line installation, maintenance and operation. It usually is 3 to 6 meters feet wide unless terrain, vegetation, or unusual construction conditions require a wider easement

This activity requires the clearance of the right-of-way, fell any vegetation and dispose of waste material along the entire length of the transmission lines. The transmission line right-of-way is 15 meters wide for the 30 kV lines symmetrical about the centreline.

All trees, snags, stumps, shrubbery, ant hills and undergrowth exceeding 2 meters in height as measured on the downhill site are cut to a maximum stump of 20 cm along the right-of-way. All trees adjacent to the right-of-way which could fall across the conductors or against the towers will be cut, this criterion shall apply with the conductors displaced 53° from the vertical in either direction.

In addition to the clearing required on the right-of-way all trees, bush stumps and snags to each tower location will be cut, regardless of height and clearance to conductor to a maximum stump of 25 cm, in an area of 8 by 8 meters around a 30 kV tower. In some cases, electric distribution lines are built along wooded areas or near existing trees. This is often the case when electric distribution lines are built along roadways or at the rear of residential lots. Therefore, trees in these areas may need to be trimmed and sometimes removed.

- ***Excavation Works***: After the transmission and distribution network path has been cleared as specified above, there will be excavation related works related to construction of access and maintenance roads, excavations works for the stations and substations and for creating the foundations for erecting the towers.

- ***Construction of Foundation:*** foundations will be designed for all specified tower types, for any type of soil to be found, both in dry and fully submerged conditions, and for rock. Tower foundations will normally be of reinforced or mass concrete type. Concrete foundations will be the standard foundation for the poles and towers. Excavation will be confined to a minimum working area consistent with efficient operations.

- ***Erection of Towers:*** Tower structures that will be erected will be of the self supporting lattice-type steel frame with square bases. The general outlines of the towers may be varied but the general dimensions, phase spacing, clearances, and the configuration of the conductors and earth wire must be approved.

- ***MV/LV Substations" Cabins":*** MV/LV mini substations or cabins shall be installed in different sites along the transmission path. These mini substations will play the role of stepping down the electricity from MV to LV before distributing to consumers. These substations are basically small housing units made of concrete and fitted with transformers and electrical gadgets.

5.9.3. Operation and Maintenance Phase

During operation phase the expected activities include, operation and maintenance of the transformers, circuit breakers, circuit switches and capacitors that will have been installed during the construction phase.

- ***Line Route (ROW)***: a permanent area (40m in width, i.e. 20m clear of the route centre line) of land will be kept to accommodate the transmission line, when completed. A parallel strip of land through those sections of the route which pass through vegetation shall be completely cleared. In addition, any tree that may fall in the direction of the overhead line shall be cleared unless located more than 20 m plus the height of the tree clear of the route centre line.

Routine maintenance is carried out along the ROW to ensure the appropriate clearances between towers, conductors and vegetation and other objects are maintained according to the required

safety/operation specifications listed above. A 5m wide path along the line route will be required in the absence of a public road. Maintenance is normally carried out twice a year (dependent on site conditions).

- ***Station and substation Maintenance:*** A continuous maintenance program will be required for the stations and mini substations. This will involve periodic replacement of coolants/lubricants in the transformers. EWSA/EARP will no longer use transformers containing PCBs (as commonly used in old equipment) which are toxic to the environment and humans. They also have agreed to a program of replacing old transformers and disposing of any hazardous/toxic materials in accordance with international best practice. Rwanda is a signatory to international conventions on the use and control of hazardous substances.

5.9.4. Decommissioning

Decommissioning of the programme will involve dismantling and removing all the structures from mini substation sites, dismantling the supporting infrastructure (towers) and all those structures that were associated with this project implementation. Some of the impacts of this project phase are similar to those that have been discussed during construction and operational phase.

But there are those impacts that are specific to project decommissioning after the project life is over. After the project decommissioning, EARP will rehabilitate the site to its former status or near what it was before the project was commissioned. EARP will be responsible for preparing the decommissioning plan as specified by the Organic Law, the project proponent remains responsible for this. As per the regulations of REMA the proponent will bear the costs for decommissioning and site rehabilitation.

5.10. Programme opportunities

- Both the rural and urban population highly need electricity for various uses

- Electrified villages shall attract people from scattered habitat to live in the agglomeration and enjoy the benefits of electrification
- People have been impatiently waiting for electrification to start up or improve many businesses which require electricity

KIMANA Alfred a hair dresser in Musheri sector in Nyagatare said:"with electricity the number of clients will increase, the working hours will also increase once I get electricity which will replace the battery I am using now."

- Communities are willing to give a small portion of their land for the programme activities as they are the ones to benefit from electricity connection.
- In most of the programme areas, have the purchasing power to pay their contributions for electricity connections
- The need for capacity building of farmers and other beneficiaries will bring more people who need training
- Local residents in the programmes areas will have opportunities for employment, hence raising their livelihoods
- Funds for the programme planning, implementation, monitoring and evaluation are available

5.11. Programme constraints

- Habitat in most of the rural areas of the programme is scattered making difficult to connect those eligible households (*As per the programme implementation, eligible*

households are those located in a radius of 5 kilometres from the Medium Voltage Lines and up to a radius of 50 metres from the Low Voltage Lines).

5.11.1. Key programme issues

The status quo assessment that included the scoping phase and situation assessment phase of the project highlighted some of significant issues and concerns.

Key issues in the situation assessment included the following:

- The difficulties to deal with scattered habitats
- Environmental issues which require continuous mitigation measures during the implementation of the programme for MV lines and construction of stations and substations
- Expropriation exercise which requires continuous evaluation and compensation

5.12. Programme schedule of activities

The Electricity Access Roll Out Programme is within the GoR's one of three major strategic objectives of the Economic Development and Poverty Reduction Strategy (EDPRS 2008-2012) which is to expand access while also improving the quality and lowering the cost of economic infrastructure – especially transport, power, and communications.

To realize the primary EDPRS target for the electricity sector, the Government of Rwanda through EWSA has embarked on a country-wide programme of tripling access by 2012 to about 16 percent of households and at least 50 percent of identified public institutions in health, education and local administration and reach rural consumers and service providers currently off the national grid.

The overall schedule of the EARP activities extend up to end of 2017

The number of connections, the yearly increase percentage of connections, the number and distances of both the medium and low voltage, the cost of the transmission and distribution lines, the substations and the cost per connection are shown in the tables below:

Year	Number of HH	3 % Increase / Year	Number of connection	MV	LV
2012	1,246,505.89	0.10	124,651	1,246.51	2,493.01
2013	1,246,505.89	0.15	186,976	1,869.76	3,739.52
2014	1,246,505.89	0.20	249,301	2,493.01	4,986.02
2015	1,246,505.89	0.20	249,301	2,493.01	4,986.02
2016	1,246,505.89	0.18	224,371	2,243.71	4,487.42
2017	1,246,505.89	0.17	211,906	2,119.06	4,238.12
	TOTAL	**1.00**	**1,246,506**	**12,465.06**	**24,930.12**

Table 6: Schedule of EARP activities for the MV and LV lines

Year	Cost MV (USD	Cost LV (USD)	Cost Substation (USD	Cost Service conn (USD	TOTAL (USD)
2012	37,395,176.81	37,395,176.81	6,232,529.47	37,395,176.81	118,418,059.89
2013	56,092,765.21	56,092,765.21	9,348,794.20	56,092,765.21	177,627,089.84
2014	74,790,353.62	74,790,353.62	12,465,058.94	74,790,353.62	236,836,119.79
2015	74,790,353.62	74,790,353.62	12,465,058.94	74,790,353.62	236,836,119.79
2016	67,311,318.26	67,311,318.26	11,218,553.04	67,311,318.26	213,152,507.81
2017	63,571,800.57	63,571,800.57	10,595,300.10	63,571,800.57	201,310,701.82
	373,951,768.09	**373,951,768.09**	**62,325,294.68**	**373,951,768.09**	**1,184,180,598.95**

Table 7: Schedule of EARP expenditures for MV, LV lines and substations

6. POLICY, LEGAL, INSTITUTIONAL AND ADMNISTRATIVE FRAMEWORK

6.1. Legislative and policy framework for environmental assessment in Rwanda

6.1.1. Constitution of the Republic of Rwanda

In consideration of the Constitution of the Republic of Rwanda of June 4, 2003 as amended to date, article 49 states that every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The state shall protect the environment. The law determines the modalities for protecting, safeguarding and promoting the environment.

6.1.2. Rwanda Vision 2020

The vision 2020 of Rwanda gives strategic actions and inter alia institutes the principle of precaution to mitigate the negative effects caused to the environment by the socio-economic activities, to institute the "polluter pays" principle as well as preventive and penal measures to ensure the safeguard of the environment and to require the environmental impact study of any development project.

6.1.3. National Environmental Policy (NEP)

The overall objective of the Environmental Policy is the improvement of man's wellbeing, the judicious utilization of natural resources and the protection and rational management of ecosystems for a sustainable and fair development.

The Policy seeks to achieve this through the following objectives:

i. To improve the health and the quality of life for every citizen and promote sustainable socio-economic development through a rational management and utilization of resources and environment;

ii. To integrate environmental aspects into all the development policies, planning and in all activities carried out at the national, provincial and local level, with the full participation of the population;

iii. To conserve, preserve and restore ecosystems and maintain ecological and systems functioning, which are life supports, particularly the conservation of national biological diversity;

iv. Optimum utilization of resources and attain a sustainable level of consumption of resources;

v. To create awareness among the public to understand and appreciate the relationship between environment and development;

vi. To ensure the participation of individuals and the community in the activities for the improvement of environment with special attention to women and the youth and

vii. To ensure the meeting of the basic needs of today's population and those of future generations.

6.1.4. National Environmental Law

The Organic Law n° 04/2005 o f 08/04/2005 determining modalities of protection, conservation and promotion of environment in Rwanda regulates the Environmental impact Assessments. In its article 67: Every project shall be subjected to environmental impact assessment, before obtaining authorization for its implementation. This applies to programmes and policies that may affect the environment. Article 68 specifies the main points that an Environmental Impact Assessment must include. Article 69 stipulates that the environmental impact assessment shall be examined and approved by the Rwanda Environmental Management Authority or any other person given a written authorization by the Authority.

The environment impact assessment shall be carried out at the expense of the promoter. Article 70 states that an order of the Minister having environment in his attributions establishes the list of projects for which the public administration shall not warrant any authorization without an Environmental Impact Assessment describing direct and indirect consequences of the project to the environment.

6.1.5. Law N° 18/2007 of 19/04/2007 relating to expropriation in the public interest

The law defines the activities or projects that can be classified as public interest and process and requirements for expropriation activities as well as the cost for goods and other infrastructure to

be expropriated. The law provides a window for appeal for somebody who is not satisfied by the cost of compensation.

6.1.6. Environmental Impact Assessment Regulations, 2006

REMA has now developed the EIA regulations which provide a guide and requirements for EIA in Rwanda. According to these new regulations, Article 1 makes it mandatory for all the projects listed under schedule I to be subjected to a full scale EIA.

The Article further states that no environmental authorization shall be granted by the Authority for any project in Schedule I to these Regulations if no environmental impact assessment has been submitted to the Authority in accordance with the provisions of these Regulations. The Article states that any project listed under Impact Level III of Schedule I to these Regulations shall require a full environmental impact assessment by preparation of an environmental impact report, unless the Authority refuses permission.

6.1.7. Ministerial order N° 003/2008 of 15/08/2008 relating to the requirements and procedure for Environmental Impact Assessment

Article 1 stipulates that Environmental Impact study is a systematic way of identifying environmental, social and economic impacts of a project before a decision of its acceptance is made. In article 3, the developer submits an official application which includes a project brief of the proposed project to the authority. Article 4 specifies that within thirty (30) calendar days after receipt of the project brief and after its analysis, the Authority shall submit the Terms of reference to the developer for the Environmental impact study.

6.1.8. General guidelines and Procedures for SEA, 2010

Organic Law on environmental protection (No. 04/2005 of 8/04/2005) requires development projects, activities, and programs that may affect the environment to undergo environmental impact assessment. REMA is charged with the coordination, regulation, and oversight of the environmental impact assessment process. Rwanda Environment Management Authority (REMA), in coordination with the Ministry of the East Africa Community (MINEAC), is developing guidelines for Strategic Environmental Assessment (SEA) to complement the

existing Environmental Impact Assessment (EIA) guidelines for Rwanda. The goal is to expand the application of environmental assessment principles and practices to the formulation and implementation of development policies, plans, and programs (PPPs). These policies, plans, and programs (The case of Electricity Access Rollout Programme - EARP) involve actions to promote economic development and poverty reduction that potentially will have significant effects on the environment.

6.2. Relevant policies

6.2.1. National Policy on EIA

The Constitution of the Republic of Rwanda, adopted in June 2003, ensures the protection and sustainable management of environment and encourages rational use of natural resources. Organic Law (No. 04/2005 of 08/04/2005) and various socioeconomic development policies and strategies such as “Rwanda Investment and Exports Strategic Action Plan, 2005-2007” and “Vision 2020” call for a well regulated environment management system that takes into account principles of sustainable development while at the same time contributing to poverty reduction.

The Organic Law (Article 67) requires that projects, programmes and policies that may affect the environment shall be subjected to environmental impact assessment before obtaining authorisation for implementation. Article 69 gives REMA legal authority to oversee the conduct of EIA.

EIA is an invaluable tool for environmental management in a trans-boundary context, playing role in information dissemination between Rwanda and neighbouring countries and widening the scope of understanding of impacts beyond its borders. EIA process in Rwanda provides a pretext and basis for future international cooperation and conflict resolution concerning environmental impacts at a regional level.

6.2.2. Energy Policy

The national policy goal is to meet the energy challenges and needs of the Rwandan population for economic and social development in an environmentally sound and sustainable manner.

Since 1994, the energy sector as well as the overall economy has gone through structural modifications, where the role of the Government has changed, markets have been liberalised and private sector initiatives encouraged. Hence, the energy policy document has to take into account structural changes in the economy and political transformations at national and international levels.

The national policy objective for the development of the energy sector is to provide an input in the development process by establishing an efficient energy production, procurement, transportation, distribution, and end-user systems in an environmentally sound manner.

The Energy Policy, therefore, focuses on market mechanisms and means to reach the objective, and achieve an efficient energy sector with a balance between national and commercial interests.

An interactive and participatory process between Government, other stakeholders and relevant groups has been necessary as part of the formulation process in order to incorporate views of market actors and energy consumers to address the complex nature of the sector. Specifically, the energy policy takes into consideration the need to:

i. Have affordable and reliable energy supplies country wide;
ii. Reform the market for energy services and establishes an adequate institutional framework, which facilitates investment, expansion of services, efficient pricing mechanisms and other financial incentives;
iii. Enhance the development and utilisation of indigenous and renewable energy sources and technologies,
iv. Adequately take into account environmental considerations for all energy activities,
v. Increase energy efficiency and conservation in all sectors; and
vi. Increase energy education and build gender-balanced capacity in energy planning, implementation and monitoring.

Domestic energy demand has grown rapidly due to population growth and the increase in economic activities especially during the last ten years. The vision of the energy sector is to effectively contribute to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner. The mission of the energy sector is to create conditions for the provision of safe, reliable, efficient, cost-effective

and environmentally appropriate energy services to all sectors on a sustainable basis. By fulfilling its vision and mission, the energy sector will contribute to social economic development, and in the long-term framework, poverty reduction.

The national energy policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner.

6.2.3. Land Policy

Apart from a few scattered land regulations, most of which date back to the colonial period, Rwanda has never had a proper land policy nor has it ever had a land law, a situation that enhances the existing duality between the very restrictive written law and the widely practised customary law, giving rise to insecurity, instability and precariousness of land tenure.

The Rwandan Government, therefore, found it compelling and necessary to establish a national land policy that would guarantee a safe and stable form of land tenure, and bring about a rational and planned use of land while ensuring sound land management and an efficient land administration.

Currently, the land tenure system in Rwanda operates in a dual legal system: On one hand, there is: the customary law, which governs almost all the rural land and promotes the excessive parcelling out of plots through the successive father-to-son inheritance system. And on the other, there is the written law, which mostly governs land in urban districts and some rural lands managed by churches and other natural and legal persons. This law confers several land tenure rights to individuals such as land tenancy, long term lease and title deeds (particularly in towns).

6.2.4. National Land Law

Land ownership in Rwanda is determined by the Organic law N°08/2005 of 14/07/2005 determining the use and management of Land in Rwanda. It also institutes the principles that are respected on land legal rights accepted on any land in the country as well as all other appendages whether natural or artificial. The Law provides the definitions of some key words:

- Construction area is an area purposely for human settlement, trade and industries, an area reserved for recreation and other basic activities of public utility.
- Area not for construction is an area reserved for agriculture, afforestation, grazing, reserved tourist places and recreational gardens.
- The ownership of Land is determined by article 4, which announces that, any person or association with legal personality has the right over the land and to freely exploit it as provided for by this organic law in article 5 and 6.

6.2.5. Rwanda building control regulations

The Rwanda Building Control Regulations serves as a standard reference for the regulation of planning and design of all buildings in Rwanda. The regulations will facilitate professional practice in the construction sector and reduce the emergence of informal developments so as to ensure well planned and safe building and housing facilities which are environmental friendly in the country. The document also provides regulations in the different areas including electrical installations; Safety: equipment, escape routes and fire alarm; Site activities: construction and site operations etc.

6.3. International legislative framework

6.3.1. Environmental International Conventions

Rwanda has signed and ratified the following environmental international conventions which are to some extent in line with this project and the national policies and laws:

- The international Convention on Biological diversity and its habitat signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 017/01 of 18 March 1995;
- The CARTAGENA protocol on biodiversity to the Convention on Biological biodiversity signed in NAIROBI from May 15, to 26, 2000 and in NEW YORK from June 5, 2000 to June 4, 2001 as authorized to be ratified by Law No 38/2003 of 29 December 2003;
- The United Nations framework Convention on Climate Change, signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 021/01 of 30 May 1995;

- The Kyoto Protocol to the framework on climate c h a n g e adopted at Kyoto on March 6, 1998 as authorized to be ratified by Law No 36/2003 of December 2003;
- The RAMSAR International Convention of February 2, 1971 on Wetlands of International importance, especially as water flows habitats as authorized to be ratified by Law No 37/2003 of 29 December 2003;
- The STOCKHOLM Convention on persistent organic pollutants, signed in STOCKHOLM on 22 May 2001, as approved by Presidential Order No 78/01 of 8 July 2002;
- The ROTTERDAM International Convention on the establishment of the international procedures agreed by states on commercial transactions of agricultural pesticides and other poisonous products, signed in ROTTERDAM on 11 September 1998 and in New York from 12 November 1998 to 10 September 1999 as approved by Presidential Order No 28/01 of August 2003 approving the membership of Rwanda;
- The Basel Convention on the Control of Tran boundary Movements of Hazardous wastes and their disposal as adopted at Basel on 22 March 1989, and approved by Presidential Order No 29/01 of 24 August 2003 approving the membership of Rwanda;
- The Montreal International Conventional on Substances that deplete the Ozone layer, signed in London (1990), Copenhagen (1992), Montreal (1997), BEIJING (1999), especially in its article 2 of London amendments and Article 3 of Copenhagen, Montreal and Beijing amendments as approved by Presidential Order no 30/01 of 24 August 2003 related to the membership of Rwanda;
- The Bonn Convention opened for signature on June 23, 1979 on conservation of migratory species of wild animals as authorized to be ratified by Law No 35/2003 of 29 December 2003;
- The Washington agreement of March 3, 1973 on International trade in endangered species of Wild Flora and Fauna as authorized to be ratified by presidential Order No 211 of 25 June 1980.

6.3.2. International agreements

The following table indicates different agreements, date of signature and date of ratification where Rwanda is a signatory:

Table 8: Environmental assessment related agreements

No	Agreement	Date of signature	Date of ratification
1	Agreement on the biological diversity	10/06/1992	18/03/1995
2	Agreement - Context of the United NATIONS on the climate changes	10/06/1992	18/08/1998
3	Agreement related to the fight against desertification	10/06/1992	22/10/1998
4	The agreement Vienna on the protection of the ozone layer		6/12/2002
5	Agreement of Ramsar related to humid zones of international importance particularly the wild housing	1971	6/6/2003
6	International Agreement for the trade of the species in the process of disappearance (IATSPD)	20/10/1980	18/01/1981
7	Conservation Agreement of the animals of the migrating wild species (CMS)	23/06/1979	06/06/2003
8	African Agreement on the nature conservation and natural resources	15/09/1968	20/05/1975

These treaties and international agreements are relevant for the protection and the conservation of the environment and in particular the biodiversity in Rwanda together with the mobilization of funds as well at the bilateral and multilateral level.

6.4. World Bank Environmental and Social Safeguards Policies

World Bank Operational Policies (OP) and Bank Procedures (BP) Environmental Assessment - BP4.01 and OP 4.01 (January 1999 all of which require environmental assessment of projects proposed for World Bank financing to help ensure that they are environmentally sound and sustainable. The World Bank provides guidance on EA requirements through the Environmental

Assessment Sourcebook (World Bank 1994) which includes sectoral guidelines. The World Bank EA process is implemented through a set of Operational Policies/Directives whose primary objective is to ensure that Bank operations do not cause adverse impacts and those they "do no harm". These safeguard policies are grouped into Environment, Rural Development, Social Development and International Law.

The following safeguard policies have been considered in this SEA.

6.4.1. OP/BP 4.01 Environmental Assessment (January 1999)

Environmental Assessment is one of the 10 safeguard policies of the World Bank. The World Bank Environment and Social Safeguard Policy aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01. The World Bank system assigns a project to one of three project categories, as defined below:

Category A: Environmental Assessments are normally required because the project may have diverse significant impacts (projects in this category are forestry, large industrial plants, irrigation and drainage, mineral development (including oil and gas), pipelines (oil, gas, and water), resettlement, rural roads, tourism, urban development, large transmission lines, etc.).

Category B: A limited environmental analysis is appropriate, as the project may have specific environmental impacts. Projects in this category include agro-industries (small scale), aquaculture & marine culture, small industries, mini-hydropower station, public facilities (hospitals, schools, housing complexes, rural electrification, telecommunications, small-scale tourism, rural water supply, etc.

Category C: Environmental analysis is normally unnecessary, as the project is unlikely to have significant environmental impacts. Projects in this category include education, family planning, nutrition, institutional development, technical assistance, etc.

6.4.2. OP/BP 4.04 Natural Habitats (June 2001)

The Bank supports the conservation of natural habitats and the maintenance of ecological functions as a basis for sustainable development. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

6.4.3. OP 4.36 Forests (November 2002)

Aims to reduce deforestation and enhance, through sustainable economic development, the environmental and social contribution of forests. The Bank does not support projects which involve significant conversion or degradation of critical forest areas or related critical natural habitats.

6.4.4. OP/BP 4.11 Physical Cultural Resource (July 2006)

Cultural property is defined to include both remains left by previous human inhabitants (e.g. middens, shrines) and unique natural environmental features such as canyons and waterfalls. The Bank does not support projects that will significantly damage non-replicable cultural property and assists only those projects that are sited or designed so as to prevent such damage.

6.4.5. OP 4.10 Indigenous Peoples (July 2005)

Indigenous peoples in particular geographical areas are identified by having: a close attachment to ancestral territories and to the natural resources in these areas; self-identification and identification by others as members of a distinct cultural group; an indigenous language, often different from the natural language; presence of customary social and political institutions; and primarily subsistence-oriented production.

The Bank's objective is to ensure that indigenous peoples do not suffer adverse effects from Bank financed projects and that they receive culturally compatible social and economic benefits. Effectively the World Bank requires a project to develop a program for addressing issues based on the informed participation of the indigenous people themselves. Any project that affects indigenous peoples is expected to include components or provisions that incorporate an "Indigenous Peoples Development Plan".

6.4.6. OP/BP 4.12 Involuntary Resettlement (December 2001)

Details involuntary resettlement, emphasizing the severe economic, social and environmental risks, if unmitigated. It ensures that the population displaced by a project receives benefits from it and also covers those with usufruct or customary rights to land or other resources taken for the project. The Operational Policy is specifically inclusive, ensuring that all those affected both directly and indirectly by project developments are compensated as part of the project. Affected population, include those with income derived from informal sector and non-farm activities, and from common property resources. The absence of legal title does not limit rights to compensation. The World Bank's Policy objectives urge that involuntary resettlement be avoided whenever possible. If unavoidable, displaced persons need to:

- Share in project benefits,
- Participate in planning and implementation of resettlement programs, and
- Be assisted in their efforts to improve their livelihoods or standard of livings or at least to restore them, in real terms, to pre-displacement levels or levels prevailing prior to the beginning of project implementation, whichever is higher.

6.4.7. OP 7.50: International Waterways

Operational Policy (OP)/Bank Procedure (BP) 7.50: Projects on International Waterways may affect the relations between the World Bank and its borrowers, and between riparian states. Therefore, the Bank attaches great importance to the riparians making appropriate agreements or arrangements for the entire waterway, or parts thereof, and stands ready to assist in this regard. In the absence of such agreements or arrangements, the Bank requires, as a general rule, that the prospective borrower notifies the other riparians of the project.

The Policy lays down detailed procedures for the notification requirement, including the role of the Bank in affecting the notification, period of reply and the procedures in case there is an objection by one of the riparian's to the program.

6.4.8. OP 7.60: Disputed Areas

Operational Policy (OP)/Bank Procedure (BP) 7.60: Projects in Disputed Areas may affect the relations between the Bank and its borrowers, and between the claimants to the disputed area. Therefore, the Bank will only finance projects in disputed areas when either there is no objection from the other claimant to the disputed area, or when the special circumstances of the case support Bank financing, notwithstanding the objection. The policy details those special circumstances. In such cases, the project documents should include a statement emphasizing that by supporting the project, the Bank does not intend to make any judgment on the legal or other status of the territories concerned or to prejudice the final determination of the parties' claims.

6.5. Environmental Institutions

Institutional framework for environmental management in Rwanda : The institutional framework for environmental management is currently enshrined in the Organic Law determining the modalities of protection, conservation and promotion of the environment in Rwanda, published in the Official Gazette RWA Nº 9 of the 1st May 2005, particularly in its chapter III relating to the establishment of the institutions.

In Rwanda, the implementation of natural resources management and environment policies and sectoral strategies involves several stakeholders, including government state institutions, NGOs, civil society, the private sector, decentralised entities and donors.

Likewise, at regional levels, many actors in the five member countries are involved in carrying out environmental management interventions at different levels, using different modalities and applying different standards. In order to co-ordinate and harmonise different management approaches besides policies, laws, regulations, agreements and standards.

Ministry of Natural Resources (MINIRENA)

MINIRENA is a multisectoral ministry covering five sectors: Lands, Water Resources, Forest, Mining and Environment. Environment is a cross cutting sector because it covers the four other sectors. MINIRENA is responsible for the development of policies, laws and regulations as well

as coordination of all activities in the management of land, water resources, forest, mining activities and environment, as well as their follow up and evaluation.

Other key Ministries and institutions

- **MINAGRI:** sets national policies on agriculture, livestock and fisheries and provides guidelines and standards for land use management including terracing. MINAGRI is also charged with development of arable land for agricultural production and animal husbandry. The Ministry works closely with RAB,LWH and RSSP which provide technical support and regulatory oversight in the procurement and distribution of agriculture and livestock facilities for beneficiary communities.

- **MINALOC:** Under the framework of decentralization, MINALOC oversees the implementation of the decentralization process as well as relevant community and social protection programmes. This Ministry is also responsible for environment governance and therefore for mobilizing the public to participate in the management and protection of natural resources.

Districts are responsible for production and protection of water, tourism, and the environment. Similarly, cities, towns, and municipalities are responsible for land and environmental management, urban planning, road maintenance, maintenance of protected and recreational areas, and providing drinking water, sanitation, and waste treatment and disposal. MINALOC is over-seeing various community environment management related programmes in the districts. These include: Vision 2020 Umurenge, HIMO, Ubudehe and CDF which involve poor communities to participate in various initiatives aimed at enhancing their income.

- **MINICOM**: sets policy for trade, tourism and cooperatives and industries (including small scale artisans). MINICOM is responsible for the promotion of industries, trade and organization of agro-livestock production cooperatives and management of protected tourism areas. The Ministry promotes export and marketing of handcraft and tourism as well development and regulation cooperatives and rural association. MINCOM is

therefore charged with integrating environment in trade and industrial policies and strategies including promotion of friendly environmental export trade of handcraft and tourism; promotion of cooperative and rural associations.

- **MININFRA**: is responsible for setting policies related to energy include electricity; urbanization and settlements; road and communication infrastructure; Meteorology, Urban Water supply. MININFRA oversees the resettlement and housing of people. The Ministry is also charged with constructing infrastructures that protect the environment where different assessments are prioritized. Besides organizing human settlement MININFRA has the mandate for town planning, public infrastructure and transport; the management of water supply as well as actions to encourage water harvesting in the settlement and housing sector.
- **MINECOFIN**: is responsible for Macroeconomic policy instruments, resource mobilization, and coordination of development partners and allocation of budgets to different Ministries and sectors. MINECOFIN is also charged with overseeing and advising on the formation of various Funds (including the Environment and Forestry Funds). It is also concerned with mainstreaming natural resources and environment concerns in the budgetary, PRSP and DDP processes.
- **MINIJUST**: is the lead Ministry responsible for development and advising on formulation of laws and regulations in the country. The Ministry oversees the formulation and enactment of various laws and regulations including those that are pertinent and regarding to the ENR sectors. It is charged with advising and following up regional laws including the domestication of EAC treaty as well as providing advisory and legal support pertinent to conflicts resolution.
- **MIGEPROFE**: sets policies and guidelines for mainstreaming gender in formulation and implementation of central and local governments′ programmes. The Ministry is mandated to guide MININERA and local governments to mainstream gender related issues in natural resource and environment management and mobilize communities (women, men and youth) in the activities of natural resource and environment protection and management.
- **MINISANTE**: is responsible for development and overseeing the implementation of Environmental health related programmes that mitigate water borne diseases,

malnutrition and HIV/AIDS. The Ministry is also concerned with promoting of hygiene among the population; developing policies, strategies and guidelines for sanitation as well as medical waste disposal and treatment.

- **MINEDUC**: is responsible for training human resources in the management and protection of natural resources; It oversees the implementation of environmental education programmes in schools (by supporting Environmental Clubs), as well as initiating the process of mainstreaming environmental assessment into schools.

- **Rwanda Environment Management Authority (REMA)**
- In 2002, Rwanda Environment Management Authority (REMA) was established to act as the implementation organ of environment-related policies and laws. REMA is also tasked to coordinate different environmental protection activities undertaken by environmental promotion agencies; to promote the integration of environmental issues in development policies, projects, plans and programmes(due the implication of EIA and SEA); to coordinate implementation of Government policies and decisions taken by the Board of Directors and ensure the integration of environmental issues in national planning among concerned departments and institutions within the Government; to advise the Government with regard to the legislation and other measures relating to environmental management or implementation of conventions, treaties and international agreements relevant to the field of environment as and when necessary; to make proposals to the Government in the field of environmental policies and strategies.
- **Rwanda natural resources Authority (RNRA):** RNRA is an authority under the Ministry of Natural Resources that heads the management of promotion of natural resources which is composed of land, water, forests, mines and geology. It is entrusted with supervision, monitoring and to ensure the implementation of all issues relating to promotion and protection of natural resources, Implementing national policies, laws, strategies, regulations and government resolutions in matters relating to the promotion and protection of natural resources; Making follow up and to implement international conventions Rwanda ratified on matters relating to natural resources management, Advising the Government on appropriate mechanisms for conservation of natural

resources and investments opportunities; establishing cooperation and collaboration with other regional and international institutions with an aim of harmonizing the performance and relations on matters relating to management of natural resources. RNRA is coordinate and supervise activities of its 3 child agencies, which are: National Land Centre (NLC), OGM, Integrated Water Resources Management (IWRM) and National Forestry Authority (NAFA).

- **Energy Water and Sanitation (EWSA) :** Energy, Water and Sanitation Authority has as mission to create conditions for the provision of sufficient, safe, reliable, efficient, cost-effective and environmentally appropriate energy, Water and Sanitation services to households and to all economic sectors on a sustainable basis. EWSA has a vision of contributing effectively to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner.

- **RDB (**Rwanda Development Board) : The Rwanda Development Board is evidence that Rwanda is open for business. It is truly a "one stop shop (Centre) for all investors". Rwanda Development Board was set up by bringing together all the government agencies responsible for the entire investor experience under one roof.

This includes key agencies responsible for business registration, investment promotion, environmental clearances, privatization and specialist agencies which support the priority sectors of ICT and tourism as well as SMEs and human capacity development in the private sector. RDB is responsible for Policies and strategies that promote tourism; It is also responsible for generating and management of information on tourism potentials in/ and around protected areas and other potential sites for tourism. This includes generating spatial information on planning, monitoring and management of ecosystems. RDB is spear-heading the establishment and implementing of collaborative management regimes in protected areas- which encompasses improving access to wildlife resources and revenue sharing between communities, local authorities and central treasury. Collaborative management is geared towards curbing Illegal hunting/ poaching with a view to protect endangered species.

- **Rwanda Utilities Regulatory Agency (RURA)**

  The RURA energy sector's mission is to control and regulate an efficient, sustainable and reliable energy sector in a transparent and fair manner for the benefit of all stakeholders.

- **Provincial, District and Lower level Environmental Committees**

  The Rwandan National Environment Policy of 2003 also proposed the establishment of provincial, district and lower level environmental committees beside the establishment of REMA responsible for environmental protection.

7. ALTERNATIVES AND OPTIONS FOR EARP

The purpose of this chapter is to examine the possible alternatives for delivering the goals and objectives of the programme. For this particular programme, some options have been considered. In seeking the best alternative, the "status quo" or "do nothing" option and the actual on grid electrification were considered and the alternatives analysis shows that the EARP implementation emerged as the best alternative.

7.1. Alternative Routes

An analysis of alternative routes is undertaken through mapping and involvement of all the stakeholders in this selection process. At the end of this process, alternative routes will selected among the possible ones, based on the following general siting criteria (which are related to economic and environmental values):

i. Avoidance of restricted zones (forests, parks);
ii. Distance from zones of landscape value;
iii. Distance from mountain edges, preference for valley routings;
iv. Distance from urban areas;
v. Route with constant slope;
vi. Minimisation of infrastructure crossing (e.g. highways, other power lines, etc.).

7.2. On-Grid Electrification

Provide on-grid electrification. This is the alternative that is proposed by this programme. Through this all target sectors will be provided with electricity from the existing grid system and the new ones to be constructed. The programme is expected to significantly reduce demand for firewood, as this is the primary source of heating and lighting in Rwandan communities. This alternative will contribute positively to improving the lives of the target communities through reduced exposure to smoke, improvement in living conditions, increased communication via use of mobiles and opportunities for seeking alternative livelihood options. Local government

institutions will also benefit through reduced time and money spent on sourcing firewood from local communities, as well as increase in accessibility to information through various media sources, internet and improved communication.

7.3. No Project Alternative

A No Project (Do nothing option) alternative would primarily mean that the status quo will be maintained and in a sense the environmental impacts (adverse) will not occur. However the positive benefits will be forgone in terms of providing more access to electricity to the Rwandan population which would have in turn spurred and contributed to economic growth.

If the "do nothing option" was considered, some benefits would be missed out and it would mean the following:

- The pressure on the use of fuel wood would remain
- There would be no conservation of the fragile and diminishing forest cover of the country since there would be no provision of an alternative source of energy
- The benefits of the programme for domestic electricity supply would be missed out,
- The benefits from access to electric power for schools and public services such as health centres would be completely lost,

Picture above: **RWIMBOGO HEALTH CENTER** in Rwikimiro cell, Rwimbogo Sector, Gatsibo District in the Eastern Province

With connection to electricity, Rwimbogo Health Centre would:

- Improve their services, be able to keep Vaccines in the fridges and have reliable sterilizations

- Annually save a considerable amount of (1,880,000 RwF) of money otherwise spent on buying diesel and maintenance of the generator

During the construction phase there would be no temporary employment opportunities for local contractors,

- There would be no employment or supply services and provisions for workers and to contractors,
- Within the respective programme areas there would be no opportunities for petty trading and small business service provision along the power line routes,
- Potential beneficiary enterprises such as small industries and other agricultural processing businesses lacking electricity would still be affected,
- Data management with computers and communication facilities like access to internet, charging of mobile phones; electric lighting at night, extended opportunities for work and study would be evidently missed out,
- Socio-economic development would not be achieved if the programme is not implemented,
- Generally, employment opportunities that would be created by the programme would be miss out,

7.4. Comparison of Alternatives

The second alternative “providing on-grid electrification” is the most feasible in light of the easy availability of hydropower in the country, the positive environmental benefits, and most importantly because this is what the local communities prefer. The third alternative of “no-build” is not feasible because electricity is included as a measure of development in a village and therefore is always given high priority in the list of developmental activities for any country. It is impossible for the government to overlook this demand especially since the country is a major generator of hydropower energy. While there will be no environmental cost from this alternative, with increasing population it is expected that the demand for fuel wood will increase each year, putting very heavy pressure on the already dwindling forest resource.

7.5. Impacts of rural electrification in Rwanda

Rural electrification is believed to contribute to the achievement of the MDG. We investigated electrification impacts on different indicators. We used household data that we collected in Rwandan in villages with and without electricity access. We account for self selection and regional differences by using households from the electrified villages to estimate the probability to connect for all households – including those in the non-electrified villages. Based on these probabilities we identify counterfactual households and find robust evidence for positive effects on lighting usage.

Effects on income and children's home studying become insignificant if regional differences are accounted for. Electrification is widely believed to contribute to the achievement of the Millennium Development Goals (MDGs), based on the assumption that sustainable access to modern energy services fosters economic and social development, and leads to improvements in the quality of life. Yet, particularly in rural Sub‐Saharan Africa electrification rates are still low, as only 11 % of the population use electricity. In rural Rwanda, the electrification rate is even considerably lower at 1.3 % (UNDP/WHO 2009). As part of the efforts to achieve the MDGs it is among the national policy priorities of most countries to improve access to electricity. The national target for Rwanda, for example, is to augment the overall electrification rate to 30 % by 2020 – six times the rate in 2005. The international donor community joins these efforts and has increased its support to the energy sector in general and electrification projects in particular (IEG 2008).

Rwanda, like the majority of Sub‐Saharan Countries, faces a serious lack of electricity supply, which is part of a general energy shortage. While around 25 % of Rwandan urban households are connected to the electricity grid, only 1.3 %had access to some form of electricity in rural areas in 2005 (UNDP/WHO 2009). The per capita electricity consumption is one of the lowest in the world and concentrated in the main cities:

The capital Kigali alone accounts for more than 70 % of the total national low‐voltage electricity consumption. Investments in new generation or network capacities have been very

limited in the past, such that energy sector reform advanced only slowly. Apart from imports from neighbouring countries, supply mainly consists of outdated hydroelectric power stations, thermal power stations acquired in 2004 making up as much as half the available national electricity generation of 71 MW in 2010 (MININFRA 2010). Before 1994, less than 20 micro - hydro power plants existed with capacities of around 50 to 100 kW. In 2008, only one of them was operational (SHER 2008). Adding to these supply constraints, the hilly and land - locked character of the country makes the provision of energy to rural areas difficult and expensive. The Government of Rwanda defined several objectives and targets in order to tackle the persistent problem of rural energy poverty in the country, including increased access to grid electricity (MINECOFIN 2000). As a consequence, a variety of activities in cooperation with the international community has addressed these problems. Most recently, the *Electricity Access Roll out Programme*, financed predominantly by the Rwandan Government, World Bank, and the Netherlands, has the ambitious objective to attain a national electrification rate of 16 % by 2014. As regards electricity generation, the exploitation of large methane gas deposits in Lake Kivu has recently started. The extraction is technically challenging, but has potentials to multiply installed generation capacity in the country and even allow for electricity exports.

Rural electrification has been the cornerstone of rural energy programs in developing countries including Rwanda. Electricity has provided a safe and efficient energy source for residential and public lighting, pumping drinking water, irrigation, refrigeration, rural industries, and many others. Clearly, rural electrification has been beneficial to developed societies, and most early policy planners felt that the same or similar benefits could be achieved in developing societies.

Recently questions have been raised regarding whether the benefits of rural electrification for a developed society can be duplicated in the developing country context. Low rural incomes may prevent rural families from connecting to the electrification grid. The original assumptions of development planners regarding rural electrification may not necessarily be fulfilled. Because electrification projects involve high capital expenditures, the actual impact of rural electrification in developing countries needs to be evaluated. Socioeconomic impacts are examined in Electricity access rollout programme, the study evaluates effects on rural productivity and social

equity, and investigates conditions complementary to successful outcomes from rural electrification.

The analyses will be based on recent field surveys covering all 30 districts in Rwanda. Costs and some specific economic benefits of rural electrification are examined in other studies in this study. The purpose of the study is to determine the corporative subsidy required to extend the central grid to villages including periphery Kigali with different economic profiles.
The provision of electricity in rural areas is widely believed to be a stimulus to increased agricultural productivity and output through irrigation and mechanization, to the growth of rural industries, and to raising the living standards of rural people. In most developing countries, rural electrification is considered important enough to subsidize extensively .

The role of international aid organizations is a key one in this area, both because a significant part of the funds being spent on rural electrification are in the form of loans at concessional rates from these groups, and because much of the technical and planning advice on electrification and other energy alternatives in development of rural areas emerges from these lenders as well. The introduction of electricity through the grid to rural areas is preceded by its use in the urban areas and large towns. In one sense then rural electrification can be separated from electrification in general, because investments in generation and distribution are also investments in future rural electrification.

7.5.1. Social economic Benefits

Africa is the second largest continent in the world, yet its energy consumption is one of the lowest in the world. This is especially true for rural sub-Saharan Africa where only 8% of the population has access to electricity. Although Africa’s greenhouse gas emissions are the lowest in the world, it is still prudent that the strategies for rural electrification be renewable energy sources because Africa is extremely vulnerable to climate change Currently the most pursued renewable energy source is solar photovoltaics (PVs); however, this paper argues that hydropower and a more efficient use of biomass energy will be more successful in rural areas. The key here is remembering that rural electrification should come hand in hand with

development. The solutions to rural electrification in sub-Saharan Africa must generate an increase of income and not just lighting.

While ultimately, desirable to arrive at a measure of net benefits in terms of economic development due to electrification, it is simpler to first view gross benefits result from rural electrification, and compare these assumed benefits with evidence from projects, without explicitly considering costs. Developmental benefits often cited as potentially or possibly due to rural electrification are numerous, This myriad of benefits have rarely been tested empirically, however, and quantitative evidence existence is difficult to find. A difficulty here is that some of the most important assumed benefits are the hardest to measure. Another related problem is that detailed measure, as discussed above.

Another related problem is that detailed studies over a long period of time would be needed to capture all benefits, and effects become more difficult to assign the causes as time passes. Here, both direct benefits to households, agriculture, and industry; and in terms of social and public uses, employment, indirect benefits environmental improvements, foreign exchange savings, demographic changes, political stability, and modernization, will be considered, in at least a qualitative and whenever possible, a quantitative way.

One major use of rural electrification is lighting which brings benefits of increased study times and improved study environment for school children, extended hours for small businesses were wider off-farm and non-farm employment like the use of milling machines, stationeries, saloons telephone charging carpentry, internet cafes wielding increased rural markets, and improved environment for rural development. Greater security is another important aspect were majority of the respondents acknowledge that there is an improvement in security were light don't give safe havens for criminals.

Another common use is for television which provide both information and entertainment e.g. health programmes, government programmes like news, majority of the people interviewed during the data collection strongly believed that electrification of has great importance because they can now follow government programmes and also enjoy entertainment like music, drama

etc without barrier contrary to non electrified areas surveyed complained that they hardly get informed on government programmes and other entertaining programmes.

Barber at work

Coffee washing Machine

Paradigm shift was another important element of rural electrification whereby the majority of the respondents asserted that they are planning to switch to business other than agriculture were majority have small farming fields which are not productive for income generation. This shift from agriculture to business will lead to environmental protection and it is anticipated that their income generation will boost. One respondent by the name of Mukagasana Dativa from Bugesera district said that once their area is electrified she will automatically switch to business other than agriculture which is less productive in terms of yields and income.

Due to availability of electricity, the use of modern health equipments is possible.

Health improvement has been a critical issue during the survey in most health centers we visited, doctors assert that airborne diseases have been on the decline in an electrified areas while in non electrified areas, airborne diseases is still rampant due to the high use of kerosene which cause strong smoke. In the short-term, households improved their quality of life through better lighting and reduced indoor-air pollution.

In Nyagatare district, Matimba sector, there was evidence of waterborne diseases like bilharzias and diarrhea before the treatment of water from Nyabwishwongwezi River, after electrification water was treated and now people around that area enjoy clean water which resulted to waterborne disease on the decline. In the medium and longer-term, households and communities diversified their income and received improved public services such as education, health, and potable water. Infant and maternal mortality rates have drastically decreased due to the decease of mothers give births at home as due to long distances well as using modern equipments in many electrified health centers.

Water treatment plant at Nyabwishongwezi

Demographic factor was evident whereby electrification was proved to decrease the rural to urban migration, business people in the rural setting who were planning majority believed they will not move to urban areas due to the fact their business is booming. Furthermore, the respondents believed that as long as they can have access to electricity, the will start thinking about different income generating activities in their settings other than migrating to urban areas. This will help to reduce the rural to urban migration and hence will help to combat poor social and infrastructure problems in urban areas in Kigali city and other towns.

The use of computers has been possible in government and private institutions, in electrified zones government institutions like health centers, sector offices and schools they are enjoying using computers in their daily activities, some institutions are using internet modems for internet purposes. However in non electrified areas schools are complaining that they cannot introduce computer sciences as a course due to lack of electricity and this goes contrary with the EDPRS and MDGs targets.

In some parts where electrification has taken place, some people argue that the value of their land has almost doubled; this was evident in the districts of Musanze, Rubavu, Nyabihu, Bugesera, Gatsibo, Nyagatare and the periphery of Kigali city. The availability of electricity increases the value of land and house as assets.

Having passed through the benefits of rural electrification in Rwanda, the non electrified areas face numerous problems due to lack of electricity, some of the problems experienced in non electrified areas in the surveyed areas during the Strategic Environmental assessment study included the following, low level business, poor performance at school due fewer hours of studying, poor health caused by airborne and waterborne diseases in areas with unclean water, high level of maternal and infant mortality rates, environmental degradation caused by the overstretching the environmental ability and security problems.

8. NATURE AND EXTENT OF KEY ENVIRONMENTAL IMPACTS OF EARP ACTIVITIES

This project and its activities will have potential impacts (both positive and negative) on the surrounding and connected communities, both directly and indirectly as there will be direct and indirect interactions between project activities and the environment. This chapter identifies analyses and classifies these impacts that could arise from the activities of the project, either during the construction phase or the operational phase.

The impacts also apply on socioeconomic environment (health, security, economic activities, employment, finances, population; present land use; planned development activities; community structure; distribution of income, goods and services; recreation; public health; cultural properties, etc) and to the biophysical environment (fauna, flora, water, air, soil, landscape) and.

All these impacts affect the environment and the community at different degrees, and their duration differs also. That is why the impacts are classified differently according to their range in space and time as described as such in this study.

8.1. Impacts classification and identification

8.1.1. Impacts Classification

The range of the impacts varies in space and time. The intensity of these impacts is classified according to the following criteria:

- Impacts on fauna and flora
- Loss of habitats
- Transformation of natural landscapes
- Impacts on the human health
- Effects on the present use of available natural resources
- Impact on social activities in the region of the project
- Abandonment of either use or future production of natural resources.

The criteria of classification of the impacts as being high, middle or weak are according to:

- Extent/Size and geographical extent
- Ecological context
- Irreversibility
- Duration, incidence and frequency

Table 9: Classification and analysis of significance ranking for impacts

Significance of impacts	**Implication for project**	
	Negative impacts	**Positive impacts**
Very Low significance	Negligible effects	Negligible effects
Low significance	Acceptable effects	Some benefits
Moderate significance	Effects are serious enough to cause serious concerns. Changes to the project should be considered	Appreciable improvements to or will sustain resources
High significance	Unacceptable effects. The project should not proceed unless design is changed so that the significance of this impact is reduced to acceptable levels	Very substantial to the existing resources
Very high significance	An automatic fatal flaw. The project should not proceed unless design is changed so that the significance of this impact is eliminated or reduced to acceptable levels.	Extremely beneficial and enduring

8.1.2. Impacts identification

Impacts during Construction phase

A. Positive Impacts

Throughout the construction period, local inhabitants of this area are positioned to benefit in the following aspects:

i. ***Employment*** to the locals with the bulk of the staff recruited from within the area. The developer will commit to a policy that gives priority to the locals in the neighborhood at the time of employing casual or skilled labor: ***positive impact, local and temporal.***

ii. ***Government revenues*****:** revenues shall be collected by Government from the procurement of construction materials and finishes, employees' salaries, such as; VAT from sold products (the whole trading chin) among others: ***positive impact, national and permanent.***

iii. ***Project as an income earner to truck and machine owners*** **:** Truck and machine owners will earn from renting out their vehicles for transportation of construction material and machines that will do various construction activities (excavations, clearing, loading, leveling, using graders, excavators, among others) : ***positive impact, national and temporal.***

iv. ***Affordability of medical insurance for workers*****:** Employees shall from their pay afford medical insurance (Mutuelle de santé) and even pay school fees for their children: ***positive impact, national and temporal.***

8.1.3. Negative Impacts

As the construction goes on, there will be a number of excavations, soil disturbance and increased traffic around the site as a result of heavy trucks delivering various construction materials and taking away the generated waste including construction debris. All these are likely to pollute and degrade the environment, through mud slides, noise, and dust and air pollution. Potential adverse impacts emanating from construction activities are described in detail here below:

Earth excavations

During site clearing, foundation excavation and site levelling, large masses of soil are likely to be displaced.

Expected adverse impacts

The predictable impacts from such earth movement are:

- The excavation and earth moving might expose the ground to potential erosion from both storm water run-off and wind: ***negative impact, local and temporal***
- The likelihood of air pollution and respiratory diseases as a result of dust from the site especially in the early stages of construction: ***negative impact, local and temporal***
- Increased movement of traffic on site especially from trucks disposing off the excess murrum and other excavation equipment being a potential source of noise pollution and gases from exhaust fume: ***negative impact, local and temporal***
- Possibility of oil spillage from machines such as; excavators, trucks, wheel loaders all used for excavation, which might contribute to soil degradation: ***negative impact, local and temporal***

Heavy truck and machine movement

It is obvious that there are bound to be trucks delivering construction materials and disposing debris to dumping sites. This project might also require equipment such as; excavators, wheel loaders, dampers for purposes of clearing (case of substations), leveling and moving earths.

Expected adverse impacts

With the truck movements a number of impacts related to heavy machine and truck movements are likely to occur, which are:

- Considerable amounts of exhaust fumes resulting from various engines such as earth compacting equipment, generators, dumpers and trucks: ***negative impact, local and temporal***
- Noise pollution to neighboring residents: ***negative impact, local and temporal***

Disposal of construction debris

Most activities involved in the construction phases are waste generators, such as: excavated glasses, metal and debris, concrete, card board, organic waste on site (from fruits, foods…), among others.

Expected adverse impacts

Debris from the different activities during construction shall definitely affect the environment. The likely impacts of such solid waste generated are:

- Contamination from cement and lime of the storm water drainage along the road: ***negative impact, regional and permanent,***
- Bad odors from waste due to decomposing organic waste (food, fruit, scraps): ***negative impact, local and temporal,***
- Poor solid waste management creates an eye sore giving the natural beautiful scenery a less pleasing perspective: ***negative impact, local and temporal,***
- Dumping sites are potential habitats for vectors and diseases; e.g. mosquitoes, flies, etc.: ***negative impact, regional and permanent,***
- Sharp objects and falling debris e.g. glass, steel bars, nails from construction works, possess a threat to the workers on site because of expected injuries to be occurred, cuts and accidents and accidents from falling debris or workers falling: ***negative impact, local and permanent***

Sanitary facilities

During the planning phase of the project, temporary toilets (Ecosan preferably) shall be planned for being used during site preparation, construction and operational project phases. Given the big number of workers expected during the construction phase, many impacts can be predicted, which are:

- Possible bad odors from the latrines that may be a dangerous and nuisance to the neighboring residents: ***negative impact, national and temporal,***
- Likelihood of ground water and surface water contamination from the site toilets may be a potential impact: ***negative impact regional and permanent,***

Impacts during Operational phase

8.1.4. Positive Impacts

During the operational phase, the expected positive impacts or benefits include:

Impacts on Local and National Economy

Employment/Jobs generation and poverty alleviation

Implementation of the project will result in the creation of many direct new jobs/ employment opportunities for surrounding local communities and generally, other related Engineers from countrywide. This will include opportunities for employment on connected areas as well as various aspects of infrastructure rehabilitation management and safeguarding: ***positive impact, local permanent and national permanent.***

Diversified impacts

Substantial economic diversified effects will result during operation of the project. These include: Numerous jobs, will be indirectly created or supported by electricity uses activities providing goods and services to the project. Sectors of the economy that are closely related to the project include the retail and wholesale trading sectors, manufacturing, construction, transport and financial sectors; the development will enhance the value of neighbouring properties: ***positive impact, national and permanent.***

Improved community and public revenues

Increased employment opportunities and other diversified effects downstream in the economy will provide opportunities for increased revenue for rwanda revenue authority due to augmented expenditure in the form of taxes payment, v.a.t, etc from different business created due to the presence of electricity. The businesses operating on the site will also make substantial contributions in the general development of local communities as they will be occupied by diversified activities involved in the whole development chain: ***positive impact, national and permanent.***

Impacts on Infrastructure and general urban development

As all districts in Rwanda are currently being developed through a rapid urbanization (creation of commercial centers), which has not been matched by the provision of infrastructure especially in electricity and other energy sources.

- The EARP programme will aim to fulfill a growing demand and urgent need for modern property such as electricity energy infrastructures: ***positive impact, national and permanent.***
- The EARP programme development will also serve as sources of employment and development of private sector of course related national revenues like commercial destination and provide food products processing/ agro-industries for the local area and for the whole country and even the region. Due to this, it is predictable that the project will provide a gorgeous and exciting alternative marketable and commercial spirit, which will increase the economic and trading development to a great extent. The project is fully compatible with the general development tendency in the area and will maximize the potentialities of the project focused area: ***positive impact, national and permanent***.

- It is projected that the EARP programme will set a model for well planned, structured and aesthetical development in different districts in the country as well as excite the promotion and redevelopment of other possible progammes and projects as well as enhancing other development activities in the area including the area to be developed as an integrated lump providing a huge and full range of services. It is anticipated that implementation of the program together with other key projects in the whole country areas will help to persuade and push forward the agenda for the management of energy sector as whole: ***positive impact, national and permanent.***

Impacts on general Security of the area

It is anticipated the project will improve the general security in the country areas from the light availability as the measures of protecting the country will be enforced also the region will benefit to this security system: ***positive impact, local and permanent.***

8.1.5. Negative Impacts

As mentioned earlier in the project description, the main components of the project are: the construction of sub stations, medium and law voltage lines infrastructures, the access road designing. Other additional infrastructure will be set up such as service connections facilities.

Commercial activities and other businesses will increase accordingly because of the presence of electricity. Given the size of the sites and activities involved, it is anticipated that the project will generate considerable amounts of solid wastes at the time of construction and operation (disposed wastes during construction), which will require proper management.

The mismanagement of solid and faecal wastes could be, a source of bad odor, a high potential of disease transmitting vectors and a source of leaching that can lead to ground and surface water pollution and water borne diseases. The following are negative impacts provided during operational phase:

Solid waste disposal

Once the project components are fully operational, it is expected that the occupants shall generate solid waste, such as; construction Brocken materials. Solid wastes from the activities mentioned above if not well managed shall have the following impacts on the environment:

- Degradation of the environmental quality. i.e. water and soil quality: ***negative impact, regional and permanent,***
- Health risk for communities, workers and neighboring residents because of mismanagement of organic wastes which could lead to disease transmitting vectors such as flies, mosquitoes, bugs, etc.: ***negative impact, regional and permanent,***
- Creation of bad odors from small fecal dumping masses: ***negative impact, local and permanent***
- Leaching from litter dumping sites: ***negative impact, local and permanent,***

Soil erosion and dust from construction sites

- A compound left bare without proper land husbandry, without grass and trees for soil cover, shall definitely give way to erosion. The outcome of such negligence of not protecting the soil thereby leaving the land exposed might have an effect on the

environment and humans. Soil erosion and landslides might occur to the maximum and minimum rate due to the steepness/less of the site and storm water run-off: ***negative impact, local and temporal,***

- Respiratory diseases from dust inhalation by the construction sites occupants, workers and neighborhood during dry season: ***negative impact, local and temporal.***

8.2. EARP activities, related environmental impacts and their Mitigations measures

The sub-project being a national development agenda in the energy sector has immense benefits that could save the country losses in terms of power rationing and frequent outages. However poor planning of the sub-project could also affect the environment that supports millions of Rwandese through the project potential hazards that the project could pose to the public, pollution of water resources and atmospheric resources.

8.2.1. Positive Impacts

Positive impacts of these project are various and diverse in nature. They range from employment opportunities, to wealth creation, industrialization, improvement in service delivery to technology transfer and capacity building.

8.2.2. Socio-economic Benefits

The positive impacts are numerous and wide-ranging. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. In the construction phase there will be temporary employment opportunities for local contractors and those who will be employed or supply services and provisions for workers and to contractors. Within the respective project areas there will be opportunities for petty trading and small business service provision along the power line routes.

Significant social benefit will come through employment generation and safer more efficient operation of key services, through provision of electricity access to the villages along the transmission and distribution lines served by the project. Potential beneficiary enterprises

affected by and contributing to regional socio-economic transformation will be small industries and other agricultural processing businesses which need electricity.

The long-term direct positive impact is therefore in access to reliable electricity supplies, which will lead to better provision and easier management of goods and services, and enable new facilities for processing and storage. There will be better availability and supply of safe and clean water (which needs pumping); data management with computers is made possible and communication facilities like Internet can be made available, as also charging for mobile phones; also, electric lighting adds to security at night and enables extended opportunities for work and study.

Electricity would support overall investment in education and strengthen the ongoing effort of capacity building to overcome critical constraints in the implementation of development programmes. Essential to this effort would be power supply to health facilities for the installation of cold storage facilities for the safe transportation and storage of vaccinations and other vital medications. As a consequence the quality of life and extent of economic opportunity will be changed for the better. Social and environmental costs, not least in noise and air pollution, associated with existing generator usage will be reduced and there may be a more limited requirement for firewood cutting and collection. On employment the project expects to employ local casual unskilled and skilled labor on-site.

This is exclusive of indirectly employed people who will provide support and related services including those trading in foodstuff for the workers on site and construction personnel during the site preparation phase of the project. An estimated total of 200 laborers will be employed in this project over a period of 18 months. At this point it the number of women workers or those directly affected by the Project/Firm who could be employed is unknown but EARP will advise that this group of persons be given priority.

Environmental Benefits

Increased transmission and distribution of electricity to the Kigali population will ease the pressure on the use of fuel wood that is rampant in the city and in effect would help to conserve

the fragile and diminishing forest cover of the country by providing an alternative source of energy.

Adverse Impacts during Design/Planning and Construction Phase

Adverse impacts of the proposed distribution and transmission network are those unintended effects of the project that have negative to sustainable development and the environment. The following adverse impacts are anticipated to occur during the design/planning and construction phase of the project.

Permanent Land Loss/Acquisition

In order to construct the substations, create a new transmission and distribution network land will definitely have to be acquired for the "mini"substations, creating the new routes and Right of Way (ROW). The EARP/EWSA team of surveyors have taken great care to ensure that as little land as possible is acquired by routing the new transmission line away from settled areas. The land to be acquired is required for the following purposes;

Construction of Access Roads

The construction of access roads can impact the environment through vegetation clearance and compaction of land and a permanent loss of land. Provided temporary access roads are rehabilitated and existing roads/tracks are used for access to minimise the number of new roads required, the impact is not expected to be significant.

Construction of Right of Way (ROW)

Possible interference with or fragmenting of land uses along the ROW, opening of remote lands to human activities such as settlement, agriculture and vegetation. These effects can be significant if natural areas such as wetlands are affected. The routes identified are well established corridor for transport of goods and the cumulative effects from the Programme will not be significant.

Construction of Transmission Line poles

Clearing of vegetation, site compaction and land acquisition has the potential to change land use patterns. However, the area required for each tower and the transmission line is not expected to have a major adverse impact on land use patterns.

Land expected to be Acquired

Only small land will be permanently lost to the tower bases. The farming of crops will be allowed to continue once tower construction is completed. Disruption to crop production will therefore be experienced for a period of one year only. A compensation plan, detailed budget and implementation plan will be undertaken and included in the ARAP Report which addresses both permanent and temporary loss of assets.

Mitigation Measures

Efforts have been made during the identification of the transmission and distribution line routes to ensure that the paths are routed in areas with minimal settlement as possible to avoid land acquisition or displacement. Structures along the identified routes and the PAPs will be compensated for the land to be and destroyed structures to pave way for the construction of the sub stations in accordance with appropriate expropriation and resettlement laws.

Establishing/Pegging Final Alignment of Transmission Line

The first site activities before mobilisation of equipment will be final survey and soil investigations required for final design of line and tower foundations. After determining tower locations and before commencement of civil works the Contractor will make a terrain reconnaissance which may include rock drilling tests at each tower location. This provides a final opportunity to make minor realignments to the route to avoid any further environmental and social impacts.

Determination of Final Alignment at Survey and design Stages

- Avoid sitting transmission line through protected areas, other environmentally sensitive areas or through mature forest stands.
- Avoid cultural and heritage sites.

- Site transmission line towers on high points of land such that conductors can be strung over valleys thereby eliminating the need to remove trees.
- Locate transmission lines along the base of mountain slopes, rather than down the centre of valleys where large birds could come into contact with conductors.
- Locate transmission lines to avoid running through villages and instead run lines behind villages.
- Consult villagers regarding location of valued village resources and locate transmission lines to avoid these features.
- Situate transmission lines not far away from roads, but behind roadside forested areas so as to minimise visual intrusion.
- Minimise the need to construct new access tracks wherever possible.
- Use existing access roads and tracks wherever available.
- Ensure minimum clearance distances between conductors and ground, waterways, road crossings, buildings, communication systems etc. are incorporated into design.

Permanent Minor Loss and Destruction of vegetation cover/crops

The route for the transmission lines are generally agricultural land where the following variety of crops including fruits and other trees: Avocado trees, Tomato, Pepper, Orange trees, Mango trees, Grevillea , Ficus spp trees, Eucalyptus Trees, Euphorbia Trees, Flowers, Cassava, Euphorbia live fences, Maracuja, Cactus tree, Lemon trees, Papaya trees, etc are present and planted countrywide. These crops and trees will inevitably have to be removed to pave way for the construction of the transmission line which includes the “cabins”, towers and creating the Right of Way. However, the area required for each tower and ROW for the transmission line is not expected to have a major adverse impact on land use patterns.

Mitigation Measures

This impact is unavoidable and the crops destroyed will be compensated at full market value before any construction works commence. The compensation and resettlement process will be prepared for approval by the bank and REMA/RDB.

- Limit ROW to 40m width, however, the undergrowth in the ROW should be allowed while only leaving a narrow strip to be completely cleared to allow stringing of the line conductors.
- Strictly define ROW clearing activities in the contract specifications and in the Environmental Management Plan (EMP).
- String conductors under tension to minimise potential damage to remaining ground vegetation.

Disruption in Daily Living and Movement Patterns

It is anticipated that the construction activities will result in some intrusions and disruptions in the daily living and movement patterns of the property owners. Such disruptions are anticipated to be of high significance, but of a short-term nature, and could be caused by the movement of construction vehicles and frequent entries to the properties as a result of the construction activities. This would especially occur in the following cases:

- Where private dwellings and farm worker accommodation are situated near to the proposed transmission lines.

Mitigation Measures

The negative social impacts on the living and movement patterns of the property owners during the operation phase of the project are anticipated to be of low significance and of a short duration, as maintenance of the transmission lines would not be undertaken on a daily basis.

Aesthetics and visual related impacts- visual intrusion on the landscape

Construction works especially when construction the 4 cabins and towers are likely to cause visual related impacts mainly by having activities out of touch with the natural environment in some cases. The tower structures are regarded as being the most visually intrusive component of transmission lines. It is anticipated that the construction of the proposed transmission lines will impose a visual impact on the immediate surrounding area. However, it is proposed that the new transmission line be constructed using CRS towers for the majority of the route. These towers are smaller, less steel-intensive, and less visually intrusive.

Mitigation Measures

The frame-like structure of the Transmission line tower presents a low degree of view obstruction as a result of it not being a solid structure, and allows for blending with background colour/patterns of most landscapes. With the use of the CRS towers, the degree of view obstruction will be further reduced as these towers are less steel-intensive. Shortly after erection, once natural weathering of the steel frame has occurred, the towers are typically marginally shiny and reflective.

Water Resources

The construction of towers may interfere with the natural drainage systems and modify flow of surface water, and these changes can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams and other drainage channels.

The contractor should concern to keep areas of lower elevation as far as possible, in order to minimize the visual impacts associated with the proposed transmission lines.

Disruption of Infrastructure and Services

Without the implementation of appropriate management measures, general services (such as underground pipes, existing distribution lines) could be damaged during the construction period. Any disruption in the services (especially in the local electricity supply should distribution lines be damaged) could potentially have a negative impact on local enterprises (e.g. businesses activities). The nature and extent of the impact will depend on the length of the interruption in general services. The contractor is expected to undertake the rehabilitation works and construction works sometimes in the vicinity of energized lines. This could lead to frequent power interruptions and black outs or even de-energisation of lines.

Mitigation Measures

- The contractor should establish whether there is any infrastructure located near or inside the transmission lines servitude in order to avoid any damage to these during the construction phase.
- Discussions should be held with the relevant parties whose infrastructure could be negatively affected.

- The Local Authorities should be informed of the construction schedules to ensure the minimum disruption of such infrastructure.
- The contractor shall make sure that the Time Schedule provides for adequate advance notice to the Employer as to when shut-downs and/or partial de-energizing of existing equipment are required. The Contractor shall make provisions to be able to shift teams and equipment in order to continue work at other sites if the shut-down cannot be granted for the requested period at the requested dates. He shall be able to resume the works scheduled during shut-downs when they are granted, with a reasonable advance notice. The required interruptions shall be kept to a minimum in terms of length of the shut-down.
- Property owners and nearby communities should be informed well in advance of the construction schedule and any changes to this work schedule.
- Heavy vehicles should make use of the existing access roads on private properties as far as possible. In cases where private roads are to be used, this should be negotiated with the property owner before the construction period commences.
- Construction vehicles should keep to the speed limit and should avoid busy roads, as far as possible.
- Construction activities should not be undertaken after-hours or over weekends.
- Construction should preferably not take place during the harvesting season.
- Property owners should be informed when maintenance of the transmission lines will be undertaken on their properties.

Temporary /Limited Fugitive Dust and Noise

Noise resulting from access road and transmission line construction may disturb neighbouring communities and local fauna. This impact will be of a temporary nature only and can be minimised by adopting appropriate mitigation measures including maintaining equipment and vehicles to manufacturers' standards and limiting operating times to daylight hours. Dust will be an issue during the construction of access roads and clearing of vegetation along the ROW, especially since it is recommended that construction take place during the dry season.

However, as most construction activities will be undertaken remote from residential areas, the impact is not expected to be major. Fugitive dust will be localised and may be emitted from construction works e.g., excavations and stock piles of materials including machinery as well as from truck traffic during the construction phase including installation of the towers, construction of access roads and "cabins". This could cause health related impacts to the communities around and workers in the project site.

Dust impacts will be localised and experienced only in the specific areas where the excavation for tower installation and substation construction will occur. Vehicular movement on gravel roads could lead to dust pollution in some areas during dry conditions. This impact would be of a short duration during the construction phase. Dust pollution could also take place during maintenance and inspection of the lines. This impact will be localized and of a short duration, and is anticipated to be of low significance.

Mitigation Measures

- The dirt roads and exposed construction areas should be moisturised during the dry season to prevent or minimise the fugitive dust emissions.
- Proper location of material stockpiles, especially sand and soil downwind from the commercial, residential and other establishments will be required; Frequent wetting of the stockpile and working area; screening of or providing wind breaks for stockpiles;
- Workers in the project site must be equipped with the necessary and required Personal Protective Equipment (PPE) prescribed by the construction industry to mitigate dust impacts
- Routing of the lines should preferably not be in close proximity to residential dwellings.
- The construction schedule should be communicated with potentially affected parties.
- Construction timeframes should be discussed with property owners.
- Dust-suppression techniques should be used along gravel roads, when required.

Wildlife: There are no protected wildlife conservation areas along the alignments to be crossed, so there is likely to be only minor impacts on wildlife during the construction phase as a result of disturbance from movement of people and machinery and loss of habitat from the establishment of the 40m ROW along the length of the route. The proposed route passes mainly through a landscape that has already been greatly disturbed by mixed subsistence farming. Wildlife populations have already been severely impacted both in numbers and diversity.

Soil Erosion

During the construction phase, activities involving preparation, stripping, grading, soil removal, backfilling, compacting, disposal of surplus and excavation of the earth surface to pave way for the installation of the "substations" and erection of the towers will lead to localized soil erosion and run off when rains are experienced. The building of foundations for transmission line towers can potentially exacerbate soil erosion.

In addition to the loss of productive land due to soil erosion and land acquisition for tower construction, soils can be impacted as a result of disposal of waste materials, and compaction with heavy machinery used for the establishment of towers and the transmission line. This impact is only expected to occur in the areas where excavation works will be carried out either to construct a substation or erect a tower.

These impacts can be managed by restricting the use of heavy machinery and vehicles to designated work areas and installing soil protection works in areas sensitive to erosion prior to construction.

Mitigation Measures

- To prevent soil erosion during site preparation, disturbed soils should be compacted immediately.
- Windblown erosion is to be prevented by soil compaction and wetting the ground to prevent rising of soil particles.
- The final site grade in the cabins should include an adequate drainage channel that should facilitate drainage and avoid flooding and pooling. A site drainage plan should be

developed to protect against erosion. Protecting stockpiles through the use of silt fencing and reduced slope angles should be used to minimize soil erosion during construction.

- Design and construct transmission line towers with staggered legs so as to eliminate the need to excavate a level pad into slopes on which to construct towers.
- Clear only a narrow path to facilitate pulling the nylon rope between towers to string conductors.

Accidents/Hazards

As a result of the operation of equipment and machinery during construction, there is a likelihood of accidents occurring especially to the workers.

Mitigation Measures

- All workers need to be provided with the recognized and appropriate Personal Protective Equipment while at the construction site including gloves, dust masks, boots, goggles, and overalls among others.
- ONLY competent workers and staff should be allowed to operate any machinery and equipment to reduce the incidents of accidents.
- During the construction the project site should be completely sealed off and warning signs erected informing the general public to keep off the construction site when construction is in progress.
- Personal protection gear must be provided and its use made compulsory to all.

Storage and Management of solid waste

Solid waste materials during the construction include paper wrapping, scrap metal, excavated soils, polythene, plastic and metal will cause pollution and littering of the immediate and localized environment.

Mitigation Measures

- The contractor should engage a refuse handling company to remove the wastes from the site to the recommended dumping site.

- Warning signs against littering and dumping within the construction site should be erected by the contactor.
- Excavated top soil should be used as backfill by the contractor

8.2.3. Adverse Impacts during Operation and Maintenance Phase

The following adverse impacts are anticipated to occur during the operation and maintenance phase of the project. Two universal concerns about transmission line projects are (1) disposal of polychlorinated biphenyls (PCBs) once used in electrical equipment, and (2) possible health impacts of electromagnetic fields (EMF) associated with power transmission lines.

Polychlorinated biphenyls (PCBs) Impacts

PCBs used to be widely used as insulators in electrical equipment, including transformers, capacitors, switches, voltage regulators etc. They are of concern because they are powerful toxins, even at low concentrations, and they persist and bio-accumulate in the environment creating adverse health impacts and adverse ecological changes. Intentional PCB production was ended in most countries by 1980 and most transformers and capacitors built after 1980 do not contain PCBs. The major exception to this is transformers and other PCB applications produced since 1980 in the former Soviet Union.

The Basel Convention on Persistent Organic Pollutants lists PCBs as one of 12 target persistent organic pollutants requiring particular attention. This is also reflected in the WB EA Sourcebook update dealing with “Privatization and Environmental Assessment: Issues and Approaches” (March 1994). This states that the WB considers the use of PCB containing transformers a “red flag”.

Refurbishment of any substations for this Project will need to check whether any such old transformers/equipment will be replaced and appropriate safeguards taken. This is not an issue with new transformers, as they will not contain PCBs.

Health Effects of Electromagnetic Fields (EMF) Impacts

Electric and Magnetic Fields (EMF) are invisible lines of force that surround any electrical device. Power transmission lines, electrical wiring, and electrical equipment all produce EMF. There are many other sources of EMF as well. Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T).

Most electrical equipment has to be turned on, i.e., current must be flowing, for a magnetic field to be produced. Electric fields are often present even when the equipment is switched off, as long as it remains connected to the source of electric power. In summary, voltage produces an electric field and current produces a magnetic field. The US National Institute of Environmental Health Services and the National Institutes of Health has prepared a comprehensive report on electric and magnetic fields associated with the use of electric power which is available on the World Wide Web at: http://www.niehs.nih.gov/emfrapid.

Electric fields are shielded or weakened by materials that conduct electricity—even materials that conduct poorly, including trees, buildings, and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. However, both electric fields and magnetic fields decrease rapidly as the distance from the source increases. As a precautionary measure, EARP/EWSA has adopted internationally accepted standard ROW width of 40m along their high voltage transmission lines.

All habitation and structures are excluded from the ROW to ensure safety of people and animals from EMFs as well as from direct electric shocks and “flashover”. With respect to substations, in general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation

equipment is typically indistinguishable from background levels **(http://www.niehs.nih.gov/emfrapid).**

Based on a recent in-depth review of extensive scientific literature (World Health Organization's International EMF Project), the WHO has concluded that "despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health" (http://www.who.intpeh-emf/WhatisEMF/en.html). The low levels referred to by the WHO are levels expected to be found outside the 40m ROW proposed for the Project. It is concluded therefore that provided the proposed 40m ROW is enforced along the proposed transmission line route, there will not be any adverse health effects to people along the route.

Accidents at work place from operating of machineries and equipment by workers

The potential for accidents and hazards occurring in the "substation" during the operation of the equipment is a likely adverse impact that could lead to loss of life or injury to the workers.

Public Safety

Placement of low slung lines or lines near human activity (e.g. highways, buildings) increases the risk for electrocutions. Also, towers and transmission lines can disrupt airplane flight paths in and near airports and endanger low-flying aircraft.

Mitigation Measures

- All workers entering the construction site must be equipped with PPE including goggles, factory boots, overalls, gloves, dust masks, among others. The PPE should be those that meeting the international standards of PPE.
- Personal protection gear will be provided and its use made compulsory to all. The entire workforce of the plant should be trained in the use of protective gear, handling of chemical products and acid storage cells, electric safety equipment, procedures for entering enclosed areas, fire protection and prevention, emergency response and care procedures.

- Training given to the employees should be backed by regular on- site training in safety measures.
- Machines and Equipments must be operated only by qualified staff and a site supervisor should be on site at all times to ensure adherence.
- The contactor must develop workers' Health and Safety Manual for which all the workers should be conversant with for response in case of accidents.
- At tower positions where occasional flooding may cause damage to towers or foundations, protective embankments shall be erected or alternative measures shall be proposed by the Contractor.

Maintaining Access Roads

The maintenance of access roads can impact the environment through vegetation clearance and compaction of land and a permanent loss of land. Provided temporary access roads are rehabilitated and existing roads/tracks are used for access to minimise the number of new roads required, the impact is not expected to be significant.

Mitigation Measures

- Use existing access roads and tracks wherever available.
- Decommission and rehabilitate excess temporary access tracks as soon as they are no longer required.
- Where access is required across agricultural lands use temporary access paths during the dry season involving placement of geo-textile over aggregates where necessary.
- Minimise the need for access tracks whenever possible.
- Construction to proceed in the dry season if possible to minimise soil erosion and mass wasting and to limit loss of crops (which are not grown in the dry season); where construction is required in the rainy season, potentially unstable slopes to be avoided.

Fire risk

The risk of fire outbreaks during bad weather e.g. storms, winds etc cannot be overruled especially when the towers crash or if electrical faults occur in the "mini" substations. Also

failure to maintain the ROW could cause the overgrowth of nearby trees that could end up crashing on the lines during poor weather and hence cause fire outbreaks of black outs.

Mitigation Measures

- A robust fire prevention program and fire suppression system should be developed by the contactor for use in each cabin.
- All of the cabins site must contain fire fighting equipments of recommended standards and in key strategic points. This should include at least, Carbon dioxide systems, Detection/alarm systems and portable fire extinguishers among others.
- A fire evacuation plan must be posted in various points of the cabins including procedures to take when a fire is reported.
- EWSA/EARP should continuously ensure that the ROW is kept clear by regular trimming of trees and maintenance.

Bird Strikes/Collusions

Transmission and distribution networks are known to be a potential source of bird strikes that get entangled to the lines causing their injury or even instant death. This is especially more significant when large flocks of birds migrates from one point to another and usually get struck by these transmission or distribution lines.

Mitigation Measure

Once established, the transmission line may cause increased risk of collision of birds in flight, however this risk is expected to be minimal since the route does not pass through any known migratory bird routes.

Aesthetics and visual related impacts- visual intrusion on the landscape

Construction works especially when construction the mini substations are likely to cause visual related impacts mainly by having activities out of touch with the natural environment in some cases.

The tower structures are regarded as being the most visually intrusive component of transmission lines. It is anticipated that the construction of the proposed transmission line will impose a visual impact on the immediate surrounding area.

Mitigation Measures

However, it is proposed that the new transmission line be constructed using CRS towers for the majority of the route. These towers are smaller, less steel-intensive, and less visually intrusive.

8.3. Environmental Impacts and Mitigation Measures

Project Activity	Potential Environmental issues	Management/Mitigation Measures	Responsibility	
			Planning and Implementation	**Supervision and Monitoring**
8.3.1. Pre-construction Stage				
Design and location of Distribution lines	Impact due to location of target sectors close to sensitive ecosystems	1.Route selection in close consultation with RNRA, EWSA field staff to avoid sensitive areas; 2.Route selection approved by REMA and District Authorities 3.Align routes alongside farm roads and footpaths where possible, alongside forest edges where habitats are already degraded to an extent, and will involve minimum tree felling to minimize design	REMA, District authorities EARP/EWSA	a. Requires 'No Objection' Clearance from MINELA, RNRA, b. REMA and District Environmental Officer c. District Administrative Approval d. Public Consensus from local residents
8.3.2. Construction Stage				
Clearing of RoW along distribution line	Removal of forest cover in biological corridor	1.Ensure that only those trees marked by the forestry staff are felled 2.Follow standard EWSA procedures and practices in clearing RoW 3.Explore possibility of planting low growing vegetation	Contractor, RDB, EARP/EWSA	- Environmental Officers of EARP/EWSA - District Environmental.

		in RoW 4.Reforestation or afforestation to make up for forest cover loss		Officer - REMA
	Workers could damage species & Habitats outside RoW	1.Mark RoW boundary & prohibit cutting outside; 2.Only fell trees that have been marked by Forestry staff; 3.Prohibit hunting or fishing by workers and enforce strictly; 4.Train workers in importance of wildlife and habitats; 5.Locate labor camps where no forest clearance is needed;	Contractor	Environmental Officer, EARP/EWSA
	Impact on private land holdings	1.Route the distribution lines along edge of settlements 2.Where routes cross private land, avoid alignments too close to houses or cutting through the center of fields	Contractor	Environmental Officer, EARP/EWSA
	Risk of forest fires if cut vegetation is burnt	1.Leave cut material to rot down in situ and do not burn; 2.Leave a covering of grass & other low vegetation in RoW; 3.Dispose of trees as required by Department of Forestry	Contractor	Environmental Officer, EARP/EWSA
Delivery of RE materials to drop off points	Air pollution from vehicular movement	Minimize number of deliveries through timely scheduling	Contractor	Environmental Officer, EARP/EWSA
	Carriage of materials to site could block access	Consult farmers when transporting material	Contractor	Environmental Officer, EARP/EWSA
Excavation at pole sites	Dust may blow from cleared areas	Avoid using large machinery, Manual excavated at pole sites and minimize disturbance at excavated sites,		

	Effect on local drainage and soil erosion	Located poles at a minimum distance of 30 m from rivers, and construct these on stable ground	Contractor	Environmental Officer
	Excavation for poles could damage water pipes in village	1Consult community to identify and avoid infrastructure	Contractor	Environmental Officer
	Work in villages may create noise, dust & impede access	1.Inform communities of work in advance; 2.Identify sites of local significance; locate no poles nearby; 3.Consult custodians of facilities (monasteries, nunneries, schools, clinics, etc) and avoid working at sensitive and religious times;	Contractor	Environmental Officer, EARP/EWSA
Social and cultural impacts	Economic benefits if local people are employed	Employ as many local residents as possible in workforce	Contractor	Environmental Officer, EARP
	Importing foreign workers can cause environmental and social problems at labour camps and in host community	1. Ensure imported workers are provided with housing that has ample toilets, proper drainage and treatment for sewage. 2. Collect solid waste weekly and bury offsite. 3. Instruct workers on required behavior in host community and prohibit them from hunting and fishing. 4.Camps must be cleaned up and restored after project is completed	Contractor	Environmental Officer

	Diseases can be introduced into host communities from social and sexual contact with imported workers	1.Initial screening of workers for HIV/AIDS, TB, malaria, swine flu, etc.; 2.Facilitate access to the nearest Health facility for check up; 3.Raise worker/community awareness of risks of socially & sexually transmitted diseases; 4.Practical measures, e.g. free condoms for workers;	Contractor	Environmental Officer
	Workers and communities are at risk from accidents on site	Prepare and implement a site Health and safety plan that includes measures to: -Exclude the public from all constructions sites; -Ensure that workers use personal protection equipment; -Provide Health & Safety training for all personnel; -Follow documented procedures for all site activities; -Keep accident reports and records; -Inform local communities about the work and dangers	Contractor	Environmental Officer
	Impact on private land and infrastructure	Conduct awareness programs/meetings Grievance redress mechanism in place	EARP/EWSA	Environmental Officer
8.3.3. Operation and Maintenance				

Provision, Operation and maintenance of new RE system	People cannot use new electrical machines during power cuts so income may suffer	Field personnel should report power outages to the ESD and repair faults quickly and effectively	EARP/EWSA	EARP/EWSA
	Consumers are at risk of electrocution if they do not understand the dangers of electricity	1.Train and supervise EARP/EWSA operatives to ensure that they c heck house wiring carefully and reject if deficient; 2 .Public education to raise villagers' awareness of dangers of electricity and how to utilize the system safely.	EARP/EWSA	EARP/EWSA
	EARP/EWSA workers are at risk if they do not follow EARP/EWSA procedures when clearing RoW or repairing faults	1.Follow EARP/EWSA O&M and H&S manuals and revise these manuals if necessary to increase safety of workers; 2.Regular training of EARP/EWSA workers to raise awareness of dangers and working procedures to be followed; 3.Improve supervision of field workers; 4. Regular management reviews of safety record, with remedial action where necessary.	EARP/EWSA	EARP/EWSA
	People will not be very tolerant of power cuts once they become used to the benefits of electricity	1.As above: repair faults quickly and affectively; 2.Conduct system maintenance regularly and diligently	EARP/EWSA	EWSA

9. MONITORING PLAN/PROTOCOL FOR MV AND LV LINES.

9.1. Monitoring Plan

A detailed environmental monitoring plan has been developed to verify that predictions of environmental impacts are accurate and that unforeseen impacts are detected at an early stage and allow corrective measures to be implemented, if needed. During the construction phase the plan provides for dust, noise, visual impacts, service disruption and safety monitoring.

During the operation period, monitoring is planned in terms of routine inspection of the health and safety of the workers, disruption impacts during maintenance of ROW, fire hazards. The Monitoring Plan is developed is presented at the end of this report as part of the EMP.

Environmental monitoring is an essential component of project implementation. It facilitates and ensures the follow-up of the implementation of the proposed mitigation measure, as they are required. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. Monitoring includes:

- Visual observations;
- Selection of environmental parameters at specific locations;
- Sampling and regular testing of these parameters.

Monitoring should be undertaken at a number of levels.
Firstly, it should be undertaken by the Contractor at work sites during construction, under the direction and guidance of the Supervision Consultant who is responsible for reporting the monitoring to the implementing agencies, EWSA. It is not the Contractor's responsibility to monitor land acquisition and compensation issues.

EWSA should in turn undertake independent monitoring of selected parameters to verify the results of the Contractor and to audit direct implementation of environmental mitigation measures contained in the EMP and construction contract clauses for the Project. EWSA also

have the direct responsibility to implement and monitor land acquisition and compensation issues as outlined in the ARAP. Their Project teams should include an environmental monitoring and management specialist as well as a sociologist experienced in land acquisition and compensation issues. REMA has the overall responsibility for issuing approval for the Project and ensuring that their environmental guidelines are followed during Project implementation. Their role therefore is to review environmental monitoring and environmental compliance documentation submitted by the implementing authorities and they would not normally be directly involved in monitoring the Project unless some specific major environmental issue arose.

Environmental monitoring of the following parameters is recommended as a minimum for EARP subprojects:

Noise Levels Monitoring

Although noise during construction is not expected to be a problem with the Project, periodic sampling of Contractor equipment and at work sites should be undertaken to confirm that it is not an issue. Noise level monitoring could be supplemented by consulting with Project Affected People in the first instance to identify the level of monitoring required.

Soil Erosion Monitoring

The excavation of earth for the establishment of towers, temporary and permanent access roads, and storage facilities will exacerbate soil erosion. It will, therefore, be the responsibility of the Contractor's environmental inspectors to ensure the implementation and effectiveness of erosion control measures. Focus should be given to work sites where soil is disturbed and its immediate environ as well as along the ROW during and after vegetation clearing.

Monitoring of Vegetation Clearing

Unique stands of indigenous trees should not be removed for the establishment of towers. The Contractor's environmental inspectors should make sure that the unique tree stands identified during the present study should not be removed.

Monitoring Rehabilitation of Work Sites

The Contractor's environmental inspectors should ensure that areas used as temporary campsites for workers are progressively rehabilitated as they are no longer required. Once a site is rehabilitated it should be "signed off" by either EWSA/EARP environmental staff.

Monitoring of Accidents/Health

The Contractor's environmental inspectors must make sure that appropriate signs are posted at appropriate locations/positions to minimise/eliminate risk of electrocutions.

In addition the environmental inspectors should make sure that:

- EWSA will have overall responsibility to oversee that all environmental measures are put in place and that regulations are enforced. The construction supervision consultant should assist
- EWSA in this process in order to make sure that contractors fulfil the environmental requirements.

The following parameters could be used as indicators:

- Presence of posted visible signs on towers, etc.;
- Level of awareness of communities pertaining to dangers/risks associated with power lines;
- Presence/absence of unique stands of indigenous trees along the power line establishment route; and
- Accident reports. Records on actual accidents associated with the establishment of the transmission line could be compiled with the help of local peasant association officials, teachers/students of local schools.

Responsibilities and Costs for Environmental Mitigation Measures

The table below outlines the overall package of environmental mitigation measures that will be implemented in relation to the facility as outlined in detail in the EMP document. The table also assigns general responsibilities for implementing each group of mitigation measures.

Consistent with the EARP/PCU and World Bank's contracting strategy of integrating environmental protection and mitigation activities into the Contractor's Scope of Work, the specifications for many of the activities were included in the bid package upon which the Contractor is developing its base rates. Therefore, since many of the costs associated with environmental protection and mitigation activities are included in the Contractor's base rates, it is not possible to present a detailed accounting of all the monies devoted to the project's construction phase environmental protection and mitigation activities.

These costs are therefore described as 'Within contract budget' in table below. Similarly, mitigation or monitoring measures that will be carried out by EWSA/EARP staff, with no additional expenditure required, are described as 'Within operational budget' in the table below.

9.2. Environmental Management and Monitoring Plan (EMMP)

Potential impacts	Mitigation measure	Parameters to be monitored	Location	Method	Monitoring Frequency	Responsibility	Cost
9.2.1. Pre-construction							
Impact due to location of target villages biological corridor	1.Route selection in close consultation with RNRA, EWSA field staff to avoid sensitive areas;	RDB/EC clearance process	MV lines	Route selection and	n/a	EARP, EWSA	n/a
	2.Route selection approved by REMA and District Authorities	RDB/EC clearance process	MV lines	Field investigation by Environmental officer (EO)	n/a	REMA	n/a
	3.Route should be selected so that clearance along forested areas are avoided wherever possible; where there is no alternative to routing lines through forest, align routes alongside farm roads and footpaths where	RDB/EC clearance process	MV lines	Mapping of field information	n/a	EARP, EWSA	n/a

	possible, alongside forest edges where habitats are already degraded to an extent, and will involve minimum tree felling.						
9.2.2. Construction							
Removal of forest cover in protected area	1.Ensure that only those trees marked by the forestry staff are felled 2.Follow standards, EWSA procedures and practices in clearing ROW	Number of violations	MV lines	Site Observations	Two weeks	EWSA&EO	Included in CB
	Explore possibility of planting low growing vegetation in RoW	Revegetation of RoW	MV lines	Site Observations	Two weeks	EWSA&EO	n/a
Workers could damage species & Habitats outside RoW	1.Mark RoW boundary & prohibit cutting outside; 2.Only fell trees that have been marked by forestry staff;	Number of violations	MV lines	Site Observations	Two weeks	EWSA&EO	n/a
	3.Prohibit hunting or fishing by workers and enforce strictly	Number of illegal reports	Camp sites	Site Observations surveys	Monthly	EWSA&EO	n/a
	4.Train workers in importance of wildlife and habitats;	Number of illegal reports	Labour camps	Contractor records	Monthly	EWSA&EO	Included in CB

	5.Locate labour camps where no forest clearance is needed;	Number of illegal reports	Labour camps	Site Observations	Monthly	EWSA&EO	Included in CB
	6.Provide adequate food supply so workers do not need to hunt or fish	Illegal activities	Labour camps	Site Observations	Monthly	EWSA&EO	Included in CB
Impact on private land holdings	Route feeders along edge of villages, avoid locating poles in centres of fields	Feeder alignment	MV lines	Site Observations	Monthly	EWSA&EO	n/a
Risk of forest fires if cut vegetation is burnt	Leave cut material to rot down in situ and do not burn. Leave a covering of grass & other low vegetation in RoW;	Number of fires	MV lines	Site Observations	Two weeks	EWSA&EO	n/a
	Dispose of trees as required by Department of forest	Disposal of trees	MV lines	Site Observations	Two weeks	EWSA&EO	Included in CB
Delivery of RE materials to drop off points - Air pollution from vehicular movement	Minimize number of deliveries through timely scheduling	Number of deliveries	Drop off points	Site Observations	Monthly	EWSA&EO	n/a
Carriage of materials to site could block access	Consult farmers when transporting material	Number of consultations	MV and LV lines	Site Observations; Village survey	Monthly	EWSA&EO	n/a
Excavation at pole	Avoid using large machinery, manual	Site	MV lines	Site	Monthly	EWSA&EO	n/a

sites-dust may blow from cleared areas	excavation at pole sites and minimize disturbance at excavated sites,	Observations		Observations			
Effect on local drainage and soil erosion	Locate poles at a minimum distance of 30 m from rivers, and construct these on stable ground		MV lines	Site Observations	Monthly	EWSA&EO	n/a
Excavation for poles could damage water pipes in villages	Consult community to identify and avoid infrastructure	Number of consultations	MV and LV lines	Site Observations; Village survey	Monthly	EWSA&EO	n/a
Work in villages may create noise, dust & impede access	1.Inform communities of work in advance;		MV and LV lines	Site Observations; Village survey	Monthly	EWSA&EO	n/a
	2.Identity sites of local significance; locate no poles nearby;		MV and LV lines	Site Observations; Village survey	Monthly	EWSA&EO	n/a
	3.Consult custodians of facilities (monasteries, nunneries, schools, clinics, etc) and avoid working at sensitive and religious times;		MV and LV lines	Site Observations; Village survey	Monthly	EWSA&EO	n/a
Economic benefits if local people are employed in contractor's	Employ as many local residents as possible in workforce	Number of locals employed	All sites	Site Observations; worker survey	Monthly	EWSA&EO	n/a

workforce							
Importing foreign workers can cause environmental and social problems at labor camps and in host community	1. Ensure imported workers are provided with housing that has ample toilets, proper drainage and treatment for sewage.	Number of observations from camp site	All sites	Site Observations; worker survey	Monthly	EWSA&EO	Included in CB
	2. Collect solid waste weekly and bury offsite.		All sites	Site Observations	Monthly	EWSA&EO	
	3. Instruct workers on required behaviour in host community and prohibit them hunting and fishing.		All sites	Site Observations; worker survey	Monthly	EWSA&EO	
	4. Camps must be cleaned up and restored after project is completed.		Labour camps	Site Observations; worker survey	Monthly	EWSA&EO	
Diseases can be introduced into host communities from social and sexual contact with imported workers	1.Initial screening of workers for HIV/AIDS, TB, malaria, swine flu, etc.;	Contractors record on Health issues	Labour camps	Site Observations; worker survey	Monthly	EWSA&EO	Included in CB
	2.Facilitate access to the nearest Health facility for check up;		Labour camps	Site Observations; worker survey	Monthly	EWSA&EO	
	3.Raise worker/community awareness of risks of socially & sexually transmitted disease;		Labour camps	Site Observations; worker survey	Monthly	EWSA&EO	

	4.Practical measures, e.g. free condoms for workers;		Labour camps	Site Observations; worker survey	Monthly	EWSA&EO	
Workers and villagers are at risk from accidents on site	Implement Health and safety plan that includes measures to: -Exclude the public from all construction sites; -Ensure that workers use personal protective equipment and Provide Health & safety training for all personnel; -Follow documented procedures for all site activities and Keep accident reports and records; -Inform local communities about the work and dangers	Health and safety mgt. plan	Labour camps	Site Observations	Monthly	EWSA&EO	
9.2.3. Operation and Maintenance							
Provision, operation and maintenance of new RE system	Field personnel should report power outages to the EWSA and repair faults quickly and effectively	# reports and repairs	MV and LV lines	Reports observations	Monthly	EWSA&EO	n/a
	1.Train and supervise EWSA field operatives to ensure that they check	Training and awareness	All sites	Reports observations	Monthly	EWSA&EO	n/a

	house wiring carefully and reject if deficient; 2. Public education to raise villagers' awareness of dangers of electricity and how to utilize the system safety.	reports					
	1.Follow EWSA O&M and H&S manuals and revise these manuals if necessary to increase safety of workers; 2.Regular training of EWSA workers to raise awareness of dangers and working procedures to be followed 3. Improve supervision of field workers; 4. Regular management reviews of safety record, with remedial action where necessary	Training and supervision reports	All sites	Reports observations	Monthly	EWSA&EO	n/a
	As above: repair faults quickly and effectively Conduct system maintenance regularly and diligently	Repair and maintenance reports	All sites	Reports Observations	Monthly	EWSA&EO	n/a

- **EO:** Environmental Officer**; CB:** Capacity Building**; RE:** Rural Electrification**; O&P:** Operation& Maintenance
- **RDB/EC:** Rwanda Development Board/Environmental Compliance**.**

9.3. Environmental Management and Monitoring Costs

The table below provides a summary of the capital (one off) costs that will be incurred by either the contractor or EWSA during monitoring. The costs to be met by the contractor in ensuring mitigation will be contained in the final bid document and for this reason cannot be reflected in this table at this point in time. The costs for resettling and compensating the PAPs will be met by EWSA and is contained in the separate Abbreviated Resettlement Acton Plan already developed as a separate document.

9.3.1. Environmental Management and Monitoring Costs

Activity	**Estimated Cost in (USD)**	**Cost to be met by**
Compensation for displaced persons or destroyed crops and vegetation	To be provided in RAP	EWSA/EARP
Mitigating Impacts of civil construction related works	Within Contractor's Budget. The costs associated to mitigating the impacts of the construction activities will be met by the contractor.	Contractor
TOTAL CAPITAL COSTS		

Recurring costs imply costs that will be met by EWSA either on annual or monthly basis. At this point in time, the costs related to replacement of new PPE will largely depend on the rate of wear and tear, however and is part of the overall budget for EWSA.

Cost related to maintenance of the fire equipment will be met biannually and costs towards solid waste disposal will be monthly throughout the project life:

Activity	**Estimated Cost in (USD)**	**Cost to be met by**
Procurement of PPE for staff	Costs to be incurred depending on the rate of wear and tear of the PPE.	EWSA/EARP
Regular Maintenance of Fire Equipment	To be included in the maintenance budget of EWSA and has to be available after every 6 months Per Cabin	EWSA/EARP
TOTAL RECURRING COSTS		

10. PUBLIC CONSULTATION AND STAKEHOLDERS CONSULTATION

Public consultation, or simply consultation, is a regulatory process by which the public's input on matters affecting them is sought. Its main goals are in improving the efficiency, transparency and public involvement in large-scale projects or laws and policies. Consultation with the communities started on the on-set of the SEA preparation, this was especially when the design of the Project was final enough to allow the start of the study. Public consultations were held primarily during the following periods namely Field visits and Literature review (Laws, strategies, policies decrees among others).

10.1. Why is public consultation important?

Public Consultation improves the quality of rules and programmes and also improves compliance and reduces enforcement costs for both governments and citizens subject to rules. Public consultation increases the information available to governments on which policy decisions can be based.

Public Consultation increases the level of transparency and it may help to improve regulatory quality by: Bringing into the discussion the expertise, perspectives, and ideas for alternative actions of those directly affected; helping regulators to balance opposing interests; Identifying unintended effects and practical problems. Using pre-notification it is possible to foresee more easily the consequences of some planned policies, becoming one of the most productive ways to identify administrative burdens; Providing a quality check on the administration’s assessment of costs and benefits; Identifying interactions between regulations from various parts of government; Consultation processes can also enhance voluntary compliance for two reasons: first because changes are announced in a timely manner and there is time to adjust to changes, and second because the sense of legitimacy and shared ownership that gives consultation motivate affected parties to comply. Consultation can also have some impact if it is used for

amending legislation. Changing legislation using public consultation is more difficult and time-consuming than when amending less formal government policy documents.

10.2. Tools used during public consultation

10.2.1. Public hearings

A hearing is a public meeting on a particular regulatory proposal at which interested parties and groups can comment in person. Regulatory policymakers may also ask interest groups to submit written information and data at the meeting. A hearing is seldom an independent procedure; rather, it usually supplements other consultation procedures. During the Strategic Environmental Strategy (SEA), the EARP employees conducted public hearings in the surveyed areas across the country; several meetings were conducted based on their occupation and locations. Examples of the people who participated in the public hearings included local leaders (mayors, Executive Secretaries of the sectors, cells and villages), Traders, Teachers, Farmers, students, doctors, youth committees and women committees among others.

One of the public hearings conducted by the EARP Environmental and Social safeguards staff with different stakeholders in Nkungu Sector in Rusizi district.

Public hearing

10.2.2. Focus group discussions

The focus group discussion (FGD) is a rapid assessment, semi‐structured data gathering method in which a purposively selected set of participants gather to discuss issues and concerns

based on a list of key themes drawn up by the researcher/facilitator (Kumar 1987).A focus group involves encouraging an invited group of participants to share their thoughts, feelings, attitudes and ideas on certain subject. To keep the session on track while allowing respondents to talk freely and spontaneously, the facilitator uses a discussion guide that lists the main topics or themes to be covered in the session. It serves as a road map that guides the facilitator in covering the list of topics and keeping the discussion on track.

The number of items in the guide is generally kept to a minimum to leave enough time for in‐depth discussion. It should focus only on relevant research issues. The sequence of topics in the guide usually moves from general to specific ones. The Environmental and social safeguards staffs employed this tool where it was possible to gather some important information that concerned the EARP activities, people from different walks of life participated in focus group discussions.

One of EARP staff conducting the focus group discussion to a cluster of people in Burera district.

10.2.3. Compensation

Experience elsewhere in sub-Saharan Africa indicates a high risk potential with large, lump-sum cash payments to parties who have little experience with money management. While EWSA shall provide compensation in cash consistent local law requirements, EWSA will also include a number of additional benefits that are not represented in the cash compensation package.

Though not legally required, the incremental costs of these benefits will be borne by EWSA so as to assure compliance with EWSA stated commitment to follow the guidelines and

recommendations of the World Bank, while complying with the local law requirement to provide cash compensation valued at real replacement value.

10.2.4. Key Principles

The key principles committed upon by EARP in this SEA are the following:

- Compensation of Project-Affected People will be carried out in compliance with Rwanda's legislation and World Bank's Policies and Procedures on involuntary resettlement.
- The vast majority of Project-Affected People derive their livelihood from agriculture. They will be offered an option including the provision of agricultural land of equivalent potential to that of the land they have lost,
- Both Physically-Displaced People and Economically-Displaced People will be compensated for their losses of livelihood,
- EARP will assist PAPs' in restoring their affected livelihoods, and will provide transitional assistance as necessary as long as livelihoods are not restored to their previous level,
- The RAP implementation and outcomes will be monitored and evaluated as part of a transparent process,
- PAPs will be informed and consulted during the whole course of EARP activities, implementation and evaluation.

10.2.5. Conditions of Eligibility for Compensation

Cut-Off Date

The practical Cut- Off Date for implementation of the SEA will be deemed to be the date at which the census of affected people and affected assets was completed. No structure or field established in the Project-Affected Area after census shall be eligible for compensation.

Crops

Compensation for crops will be done on the basis of the requirements of Rwandan law. Under this law, landowners and leaseholders are entitled to be compensated at market value for land; tenants for crops and property on the land that they rented; property owners for the value of any property on expropriated land. Specific rates for compensation are set at the District level based on local market surveys. In all instances, farmers will be given sufficient notice to be able to harvest their crops prior to occupation by EARP activities.

Non Perennial Crops

In situations where the farmer cannot be given sufficient notice to harvest his crop, compensation will be paid based on the market value of the non perennial crop.

Perennial Crops

The calculation of the value of perennial crops for compensation is also based on the market rates and which has been determined already by the government of Rwanda at the district level and includes the type of crops, the age and size or area under which the crops are grown. These factors have been used as the basis for the calculation of perennial crop loss.

Impact on people's livelihoods

A comprehensive study of Project-Affected People has been carried out during the preparation of SEA study and EARP socio-economic study was undertaken and it was found out that no adverse impact was found due to EARP activities.

10.2.6. Affected Villages

Main Physical and Socio-Economic Characteristics of households in the project area

Most of the surveyed households during the study are village dwellers who are mainly subsistence farmers. Data from the socio-economic surveys have been used to calculate an index based on household possessions, income opportunities, education levels and health statistics in the study area. The purpose of such indices is not so much to serve as a tool of absolute

measurement, but to allow comparison of measurements across different geographic and cultural settings.

The score is made up by valuing different items that reflect economic affluence and non-economic well-being, using information from the following topic categories on which data were collected:

- Education, including the maximum level of education attained for children and adults
- Infant health, including data on the prevalence of fever and diarrhea during the last week in children 1-4 years old, and of skin diseases among children less than 10 years old
- General health, including the presence of latrines, mosquito-nets, access to modern health care and consumption of animal protein the previous day
- Housing, including the material of the roof, the walls and the floor of the main house of the compound
- Equipment, including furniture, bedding, purchased items such as radios, bicycles and any item.
- Revenue, including the presence of regular revenue through employment, retirement, remittances, assistance to saving groups, and travel

Health Services

Health authorities indicated that HIV/AIDS is visible; it manifests through other diseases, such as Tuberculosis, AIDS may not be recognized as an underlying cause. There is a relatively low prevalence of Sexually Transmitted Diseases (STDs).

Water Supply

Household water in the project site and in the surveyed villages is largely taken from the nearby river and stream and other unprotected sources. In general the quality of water used for household purposes in the project area extremely low.

AIDS Awareness

The results of a focused survey on AIDS awareness reveal that most people in the area know about AIDS and are aware of its possible causes. As a method against HIV infection, the most common suggestion was fidelity to one's spouse, use of protection and marrying young.

Schools

Schools in the project area were visited to gather baseline information. In the area, the primary schools and secondary schools are mainly public schools.

Impact on Residential Structure

EARP activities seldom destroy residential structures in all parts which were surveyed; this is because of the nature of the activities which are mainly to connect people to the national grid. In all surveyed areas across the country, there was no any case of destroyed residential structure due to EARP activities.

Impact on Public and Community Infrastructure i.e. Roads, Water supply, public Community Buildings, churches, Business, and impact on cultural sites.

Across the surveyed areas during data collection, the EARP activities don't destroy public and community infrastructure. The only destruction is mainly the clearing of trees and crops during the construction of MV lines. EARP has the valuation team which conducts the valuation of the damaged properties for compensation.

10.3. Stakeholders and their roles in the programme

Various stakeholders play different roles in the programme. Those stakeholders are either public, private:

- **Electricity Access Rollout Programme (EARP)**: The Electricity Access Roll Out Programme has major roles of planning, designing, implementing, monitoring of the MV, LV lines and substations construction to ensure sustainability.

- **Funding partners**: the programme beneficiates funds in the form of grant or loan from various stakeholders such: World Bank, OFID, BADEA, JICA, Ducth Government, and ADB.

- **Energy Water and Sanitation (EWSA) :** Energy, Water and Sanitation Authority has the key role of creating conditions for the provision of sufficient, safe, reliable, efficient, cost-effective and environmentally appropriate energy to contribute effectively to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner.

- **Ministry of Infrastructure (MININFRA)**: is responsible for setting policies related to energy including electricity. MININFRA oversees the resettlement and housing of people and is also charged with constructing infrastructures that protect the environment where different assessments are prioritized.

- **Rwanda Environment Management Authority (REMA):** acts as the implementation organ of environment-related policies and laws to promote the integration of environmental issues in development policies, projects, plans and programmes (due the implication of EIA and SEA).

- **Rwanda Development Board (RDB):** The Directorate of Environment and Compliance has the role of issuing environmental clearance after analysis and reviewing of the Environmental Management Plans and Environmental Impact Assessment reports.

- **Ministry of Natural Resources (MINIRENA):**MINIRENA is a multisectoral ministry covering five sectors: Lands, Water Resources, Forest, Mining and Environment. Environment is a cross cutting sector because it covers the four other sectors. MINIRENA is responsible for the development of policies, laws and regulations as well as coordination of all activities in the management of land, water resources, forest, mining activities and environment, as well as their follow up and evaluation.

- **MINECOFIN**: is responsible for macroeconomic policy instruments, resource mobilization, and coordination of development partners and allocation of budgets to different Ministries and sectors. MINECOFIN is also charged with overseeing and advising on the formation of various Funds (including the environment compliance and enforcement). It is also concerned with mainstreaming natural resources and environment concerns in the budgetary processes.

- **MINIJUST**: is the lead Ministry responsible for development and advising on formulation of laws and regulations in the country. The Ministry oversees the formulation and enactment of various laws and regulations including those that are pertinent and regarding energy and environment.

- **Rwanda Utilities Regulatory Agency (RURA): t**he RURA energy sector's mission is to control and regulate an efficient, sustainable and reliable energy sector in a transparent and fair manner for the benefit of all stakeholders.

- **Provincial, District, sector, cell and village authorities** play a very major role in the prioritization of areas to be electrified and assist in sustaining the programme activities.

11. MONITORING AND EVALUATION

11.1. General objective of Monitoring and evaluation

Monitoring and evaluation is a key component of SEA and is an integral part of EARP responsibility and obligations. It has the following general objectives:

- Monitoring of compensation progress, of specific situations of economic or social difficulties arising from the implementation of the compensation process, and of the compliance of the actual implementation with objectives and methods as defined by World Bank Principles and Rwandese regulations.

- Audit of the completion of compensation, through and assessment of the short- mid- and long-term impacts of the compensation on affected households, their incomes and standards of living, the environment, local capacities, housing, etc.

Monitoring allows to correct implementation methods “in real time” during Project implementation, and also to check whether general objectives have been met and whether compensation program can be deemed complete. Monitoring and auditing include an internal tier and an external tier.

11.2. Internal Monitoring

11.2.1. Objectives

Monitoring will address the following aspects:

- Social and economic monitoring: follow-up of the status of potential land speculation, environmental and health situation, livelihood restoration including agriculture, small businesses, employment and other activities;
- Monitoring of vulnerable people

- Technical monitoring: supervision of infrastructure construction where relevant, and grievances and grievance management system

11.2.2. Indicators and Frequency of Monitoring

During the active phase compensation, the following five key progress indicators will be measured internally by EARP on a quarterly basis:

- Numbers of households and individuals affected by Project activities;
- Numbers of households and individuals displaced as a result of Project activities;
- Numbers of households and individuals resettled by the Project;
- Grievances (open, closed); and
- Amounts of compensation paid per category (structures, land, crops, others).

11.3. External Monitoring

EARP will hire a suitably qualified external social auditor with significant experience in compensation to carry out two reviews annually with reviews focusing on the assessment of compliance with social commitments contained in Rwanda legislation, and in the World Bank Principles.

Objectives of these six-monthly reviews are as follows:

- To assess overall compliance with the SEA and other social commitments made in the Environmental and Social documentation,
- To verify that measures to restore or enhance Project-Affected Peoples' quality of life and livelihood are being implemented and to assess their effectiveness,
- To assess the extent to which the quality of life and livelihoods of affected communities are being restored in an appropriate manner.

Beyond commitments identified in this SEA, this review will also assess overall compliance with other mitigation measures to address non resettlement-related social impacts. The types of commitments that will be verified by the external monitoring expert include the following:

- Pollution prevention - dust and noise management in communities,
- Community safety - awareness raising programs in communities on communicable diseases; community awareness of project traffic routes and traffic safety briefing,
- Infrastructure and services - reinstatement of damaged infrastructure and compensation process; project use of water not affecting communities; and roads shared with the public are maintained in reasonable condition
- Community liaison - community awareness of project activities; complaints procedures; camp rules; recruitment process; project traffic speed limits; pre-warning of blasting, noisy activities and other planned disruptions; procurement process and regular community meetings and access to community liaison officers,
- Grievance management – follow up of grievances reported; accessibility of Community Liaison Officers; community awareness of complaints procedures and complaints close out.

12. CONCLUSION AND RECOMMENDATIONS

The SEA study report reveals that EARP activities have both positive and negative impacts that are classified as direct, indirect and cumulative impacts. The programme has a significant number of positive impacts starting from projects design to the implementation phase.

In addition, some negative impacts will be created by the programme; however they mitigation measures will be in general mitigated and shall be carefully given much attention during implementation phase of the programme.
The study therefore concludes that the Electricity Access Roll out programme shall not have adverse impacts on the environmental hence can be implemented.

However the study recommends the following:

- The programme should be implemented as it has no adverse impacts on the environment
- During implementation of the programme alternatives should be considered on the route, and right of way, choice of the construction materials, choice of the reuse and disposal of waste water and solid wastes,
- Further some activities shall require deep analysis prior to implementation of specific project,
- The monitoring and evaluation process of the SEA should be done parallel with the monitoring and evaluation of EARP activities to minimize costs and save time,
- An environmental audit shall be carried on a regular quarterly basis to ensure compliance with the SEA impact mitigation measures and minimization.

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14. LIST OF APPENDICES

14.1. Impact matrix

IMPACT MATRIX				
Positive impacts				
Impact Activities	**Direct impacts**	**Indirect impacts**	**Cumulative impacts**	**Significance of impacts and reason why**
Construction phase				
Job creation for local residents near the sites	ok			**Significant** due to lines construction works
Income earner for the truck , construction materials and machine owners	ok			**Significant** due to lines construction works
Revenue from procurement of construction materials, finishes	ok			**Significant** due to lines construction works
From their pay, workers can afford medical insurance "mutuelle", school fees for education of their children	ok			**Significant** due to lines construction works
Improved access roads	ok	ok		**Significant** due to lines construction works
Operation phase				
Employment to various people	ok			**Significant** due to connection to electricity
Diversification of business requiring electricity	ok	ok		**Significant** due to connection to electricity
Improved livelihoods of local and nearby households	ok			**Significant** due to connection to electricity
Improved architectural scenage of the area	ok			**Significant** due to connection to electricity
Improved security due to lighting	ok	ok		**Significant** due to connection to electricity
From their pay, workers can afford medical insurance "mutuelle", school fees for education of their children	ok	ok		**Significant** due to connection to electricity
Revenue from procurement of operational equipment	ok			**Significant** due to connection to electricity

Impact Matrix

Negative impacts	Direct impacts	Indirect Impacts	Cumulative impacts	Significance of impacts and reasons why
Construction phase				
Loss of vegetation	ok			**Significant** due to excavation works and Right of way clearance
Loss of flora and fauna	ok			**Not significant** as the selected areas shall not be in the protected areeas
Traffic congestion from trucks transporting construction materials or debris	ok			**Significant** due to the frequency of truck movements
Solid waste generation.e.g. construction debris, soil piles from excavations	ok			**Significant** due to excavation works, organic waste from workers
Destruction of utility lines.i.e. water and electric lines	ok			**Not significant** as electric lines and water pipes are properly designated
Noise pollution from trucks, constuction works (vibrations, machines and workers)	ok			**Significant** due to the frequency of truck movements and excavation and leveling works.
Dust from the construction works	ok			**Significant** due to the frequency of truck movements and excavation and leveling works.
Exhaust fumes from machines and heavy trucks	ok			**Significant** due to the frequency of truck movements and excavation and leveling works.
Soil erosion from earth excavations and stock piles	ok			**Significant** due to excavation works
Cultural heritage destruction.e.g grave yards, battle fields, cemetries.etc.		ok		**Not significant** since no physical cultural resources shall be violated
Construction accidents or injuries	ok			**Significant** resulting from sharp objects, irresponsible mistakes, negligence of workers or ignorance.
Fire outbreaks	ok			**Significant** resulting from irresponsible mistakes, negligence of workers or ignorance.
Electric shocks	ok			**Significant** resulting from irresponsible mistakes, negligence of workers or ignorance.
Oil spillage that might degrade soils and possibly cause fire outbreaks	ok	ok		**Significant** resulting from irresponsible mistakes, negligence of workers or ignorance.
Storm water drainage and disposal	ok		ok	**Significant** due to ground runoff and water from the roof
Theft increase due to increase in human movements		ok		**Significant** due to increased human activities
Operation phase				
Solid waste generation	ok	ok		**Significant** due to programme
Liquid waste bathrooms and toilets	ok	ok		**Significant** due to programme
Water off the roof, surface drains and storm water disposal	ok	ok	ok	**Significant** due to water from the roofs and surface runoff
Fireout breaks	ok			**Significant** resulting from negligence of workers and users
Electric shocks	ok			**Significant** resulting from negligence of workers and users
Decommissioning phase				
Solid waste from demolition works	ok	ok		**Significant** due to demolition of the infrastructure
Loss of employment	ok	ok		**Significant** due to demolition of the infrastructure
Social impacts on beneficiaries	ok			**Significant** due to demolition of the infrastructure
Loss of access to electricity	ok			**Significant** due to demolition of the infrastructure

14.2. List of consulted People

S/N	District	Sector	Cell	Village	Name of respondent	Sector
1	Bugesera	Gashora	Biryogo	Kanyonyomba	Kubwimana Theoneste	Private sector
2	Bugesera	Gashora	Kagomasi	Kiruhura	Mukagasana Dativa	Local government/Village
3	Bugesera	Ruhuha	Kindama	Kindama&Kagaserc	Ndereyimana Manasseh	Local government/Village
4	Burera	Cyanika	Nyagahinga		Bazaka Jean Pierre	Telecommunication
5	Burera	Kagogo	Kayenzi		Nyiraneza Dancille	Local government/ Cell
6	Burera	Kagogo	Kayenzi		Bizimana Innocent	Education
7	Gakenke	Ruli	Gikingo	Nyamugali	Ishimwe Olivier	Telecomunication
8	Gakenke	Ruli	Gikingo	Nyamugali	Mukandinda Solange	Local government/ Cell
9	Gakenke	Ruli	Gikingo	Nyamugali	Kanamugire Wellars	Agriculture
10	Gasabo	Nduba	Gasura	Kigufi&Uruhahiro	Bugingo Elysee	Private sector
11	Gasabo	Nduba	Gasura	Agacyamo	Mahoro Eliezer	Private sector
12	Gatsibo	Rwimbogo	Rwikimiro		Ngabo Raymond	Health
13	Gatsibo	Rwimbogo	Ndama	Ndama 1	Ndayambaje Paul	Private sector
14	Gisagara	Ndora	Mukandi		Mutegarugori Martine	NGO - COMPASSION-Rwanda
15	Gisagara	Kibilizi	Douane		Mukagatare Marcelline	Private sector
16	Gisagara	Ndora	Mukandi		Umutoni Theodosie	NGO - COMPASSION-Rwanda
17	Gisagara	Ndora	Mukandi		Mutangana Jean Placide	Religion
18	Gisagara	Ndora	Cyamukuza		Mukankomeje Felicite	Education
19	Huye	Tumba	Cyarwa	Urunana	Ingabire Emmanuel	Local government/village
20	Huye	Mukura	Bukomeye	Taba	Byukusenge Adria	Local governement/ sector
21	Kamonyi	Gacurabwenge	Gihinga	Kambyeyi	Mukankusi Josephine	Agriculture
22	Kamonyi	Runda	Gihara	Gihara	Mukarusine Mediatrice	Health
23	Karongi	Rubengera	Bubazi	Bubazi	Ntezimana Anastase	Health
24	Karongi	Bwishyura	Kayenzi		Nirere Lydia	Private sector
25	Karongi	Gasenyi	Gasenyi		Rukundo Emmanuel	Education
26	Karongi	Gasenyi	Gasenyi		Nigure Thomas	Education
27	Kayonza	Rukara	Nyagahandagaza		Sabukuru Olive	Education
28	Kayonza	Rukara	Nyagahandagaza		Musabwa Victa	Education
29	Kicukiro	Gahanga	Nungu		Joe	Private sector
30	Kicukiro	Gahanga	Nungu	Mugendo	Uwingeneye Francine	Private sector
31	Kirehe	Nyamugari	Bukora	Bukora	Rukundo Abdoul Karim	Health
32	Kirehe	Nyamugari	Bukora		Rwakirenga	Private sector
33	Kirehe	Nyamugari	Bukora		Kayiranga	Agriculture
34	Kirehe	Rukira	Kibatsi	Rwankeneka	Burambo Johnson	Transport
35	Kirehe	Nyamugari	Bukora		Murebwayire Gastorine	Health

36	Muhanga	Shyogwe	Mbare	Rubugurizo	Hodare Marcellin	Local government/ cell
37	Muhanga	Shyogwe	Mbare	Rukaza	Rukundo Fulgence	Private sector
38	Muhanga	Shyogwe	Mbare	Nyabisindu	Mayira Felix	Private sector
39	Musanze	Kinigi	Nyonirima		Ngirabakunzi Jean Marie	Private sector
40	Musanze	Kinigi	Kaguhu		Safari Gabriel	Public services
41	Musanze	Kinigi	Nyabigoma		Sebanani Jean	Tourism
42	Ngoma	Rukira	Kibatsi	Rwanyineka	Mugenzi Elehotel	Private sector
43	Ngororero	Muhororo	Myiha		Uwiragiye Julienne	Local government/Sector
44	Ngororero	Ngororero	Nyange& Kiziguro		Sibomana Leonidas	Local government/Sector
45	Nyabihu	Mukamira	Kanyove	Rubaya&Kanyove	Kanyeshuri Francois	Local governement/Sector
46	Nyabihu	Mukamira	Kijote		Hakizimana Damascene	Private sector
47	Nyabihu	Mukamira	Kijote		Ntegeyimana Vedaste	Private sector
48	Nyabihu	Bigogwe	Kijote		Nsengimana Jean de Dieu	Private sector
49	Nyagatare	Karangazi	Rubagabaga		Mugisha Ernest	Education
50	Nyagatare	Matimba	Rwentanga		Karekezi John	Agriculture
51	Nyagatare	Musheri	Nyagatabire	Nyagatabire	Nyiransabimana Sperata	Local governement/Sector
52	Nyagatare	Musheri	Nyagatabire		Kimana alfred	Private sector
53	Nyagatare	Matimba	Nyagatabire	Nyagatabire	Kirezi Joy	Private sector
54	Nyagatare	Matimba	Rwentanga	Nyabwishongwezi	Hategekimana Francois	Private sector
55	Nyagatare	Karangazi	Musenyi	Nyirangegene	Mazimpaka Jean de Dieu	Private sector
56	Nyamagabe	Gasaka	Ngiryi	Karambi	Mazimpaka Claudien	Agriculture
57	Nyamagabe	Gasaka	Nyamugali	Murico	Nteziyaremye Naphtal	Private sector
58	Nyamasheke	Nyabitekeri	Ntango		Niyitegeka Reuben	Local government/ cell
59	Nyamasheke	Ntango	Ntango	Ntango	Kubana J Paul	Health
60	Nyamasheke	Bushenge	Karusimbi	Mwito	Gahamanyi Ildephonse	Agriculture
61	Nyanza	Mukingo	Gatagara	Cyahafi	Hakizimana Vianney	Private sector
62	Nyanza	Busasamana	Rwesero	Nyabisindu	Sibomana Emmanuel	Private sector
63	Nyanza	Busasamana	Kibinja	Rugali	Uwiringiyimana Milliam	Agriculture
64	Nyanza	Busasamana	Kibinja	Rugali	Hashima Violette	Private sector
65	Nyarugenge	Mageragere	Ayabaramba		Ngarambe Wellars	Local government/Sector
66	Nyarugenge	Mageragere	Nyarufunzo		Nshimiyimana Pascal	Education
67	Nyaruguru	Ruheru	Kabere	Uwigisura	Sekamana Jean Claude	Local governement/ sector
68	Nyaruguru	Ruheru	Kabere		Burindwi JMV	Private sector
69	Nyaruguru	Munini	Ngarurira		Rugambage Bertin	Private sector
70	Nyaruguru	Rusenge	Raranzige		Nzakama Gaspard	Education

71	Nyaruguru	Ruheru	Kabere	Uwigisura	Mbangutse Jean Claude	Local governement/ sector
72	Nyaruguru	Kibeho	Mubuga		Habitegeko Francis	Local govvernment/ district
73	Nyaruguru	Rusenge	Raranzige		Niyonkuru Jeremie	Health
74	Nyaruguru	Ruheru	Kabere		Gatete Clement	Private sector
75	Rubavu	Nyakiriba	Nyarushamba	Bazirete new	Gashugi jean Baptiste	Telecommunication
76	Rubavu	Nyakiriba	Nyarushamba	Bazirete new	Mutunzi Samuel	Transport
77	Rubavu	Nyakiriba	Nyarushamba	Bazirete new	Nzayihorana Leonidas	Agriculture
78	Rubavu	Nyakiriba	Nyarushamba	Bazirete new	Hakizimana Adolphe	Agriculture
79	Rubavu	Mudenge	Rungu	Gahenerezo	Manishimwe Jackson	Private sector
80	Ruhango	Byimana	Mahembe		Mukakarera Monique	Education
81	Ruhango	Ruhango	Munini		Ndayisaba Abias	Private sector
82	Rulindo	Cyungo	Rwiri		Simparingoma Donath	Private sector
83	Rulindo	Rukozo	Mukaka		Nsabimana Theoneste	Agriculture
84	Rulindo	Rukozo	Mukaka		Muteteli Godelive	Agriculture
85	Rusizi	Nkungu	Ryamuhirwa		Nikuze Beata	Local governement/Sector
86	Rusizi	Nkanka	Rugabano	Cyibumba	Ndamyimana Theophile	Private sector
87	Rutsiro	Kageyo	Kigeyo		Bisangabagabo Sylvestre	Local government/ sector
88	Rutsiro	Kivumu	Kabere		Nyirasinumvayo Claudine	Private sector
89	Rutsiro	Kivumu	Kabere		Uwambajimana Florence	Private sector
90	Rutsiro	Kivumu	Kabere		Bizimana Damascene	Local governement/village
91	Rutsiro	Kivumu	Kabere		Nyirahabimana Triphonie	
92	Rutsiro	Kivumu	Kabere		Bazimaziki Uziel	Religion
93	Rutsiro	Kivumu	Kabere		Nyiramfashabakuze Emertha	Private sector
94	Rutsiro	Kivumu	Nganzo		Sibomana Christine	Education
95	Rutsiro	Kivumu	Nganzo		Duhuze Florence	Education
96	Rutsiro	Kivumu	Nganzo		Niyigena Marie Rose	Education
97	Rutsiro	Kivumu	Nganzo		Nirere Constantine	Education
98	Rutsiro	Kivumu	Nganzo		Ntirenganya jean Michel	Education
99	Rwamagana	Gishari	Ruhunda		Hakizimana Jean Marie	Health
100	Rwamagana	Kigabiro	Cyanya		Umutesi Jeannette	Local governement/Sector
101	Rwamagana	Gishari	Ruhimbi		Mukagashagaza Perpetue	Private sector
102	Rwamagana	Mukarange	Nyagatovu		Murengezi Samuel	Education
103	Rwamagana	Muhazi	Nsinda		Kabagambe Theogene	Private sector