

**NATIONAL UNIVERSITY OF RWANDA**

**FACULTY OF SCIENCE**

**BIOLOGY DEPARTMENT**

**MASTERS IN BIODIVERSITY CONSERVATION**

# **Assessment of effectiveness of Environmental Impact Assessment (EIA) and its potential implication for sustainable development in Rwanda**

Submitted in partial fulfillment of the requirements for the degree  
of Masters in Biodiversity Conservation

By

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**Assessment of effectiveness of Environmental Impact Assessment (EIA)  
and its potential implication for sustainable development in Rwanda**

## **DECLARATION**

The research herein was undertaken at National University of Rwanda under the supervision of Dr. Theophile NIYONZIMA.

The study reflects the original endeavor of the candidate. Where the resources of others have been used, they have been duly acknowledged in the text. This dissertation has not been submitted in any form for a degree to any other University.

.....

Theogene NGABOYAMAHINA

.....

Dr. Theophile NIYONZIMA

## DEDICATION

*To the Almighty God for your infinite love, your help when I was helpless.*

*To my beloved Mother and Wife for your affection*

## **ABSTRACT**

Environment and Climate Change have been selected as cross cutting issues for the Economic Development and Poverty Reduction Strategy (EDPRS II), as Rwanda gears towards longer-term targets like the Vision 2020 and the Millennium Development Goals (MDGs). Although our country is blessed with an abundance of natural resources, including a high biological diversity the tendency has been towards over-exploitation and degradation due to high population growth. EIA is internationally recognized as a key tool to guide us on a path to sustainable development.

The aim of this study was to assess the effectiveness of EIA and its potential implication for sustainable development in Rwanda. This study was conducted in the CoK and focused on two important steps of EIA namely decision making for EIA certificates delivery and the implementation of Environmental Management Plan (EMP) of EIA reports recorded by REMA and RDB and show their consequential implications for sustainable development.

Questionnaire (40 copies in total) and interview were administrated to EIA lead authority (REMA and RDB staff), EIA experts, developers, EIA researchers and local authorities in the CoK (at District and sector levels).

Results from this study show that REMA and RBD face some challenges in decision making phase for the delivery of EIA certificates and in the follow up phase of EIA in Rwanda. ToR are not well developed sometimes due to lack of training, required skills and specific regulations to prepare the ToR for some new projects with advanced technologies, while developers do not comply with their EMP as planned in EIS. From all mentioned challenges, this study suggests to improve capacity building for EIA staff, developers and EIA experts and strengthen EMP monitoring and auditing for all running projects in order to allow EIA to produce intended results in promoting sustainable development.

**Keywords:** Environmental Impact Assessment, Environmental Management Plan, Environmental Impact Statement, Developer, EIA Experts

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## ACRONYMS

|         |                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------|
| APEIER: | Association pour la Promotion des Etudes d’Impacts Environnementaux au Rwanda                              |
| AU :    | Environmental Auditing                                                                                     |
| CBA :   | Cost-Benefit Analysis                                                                                      |
| CEA :   | Cumulative Effects Assessment                                                                              |
| CoK :   | City of Kigali                                                                                             |
| EA :    | Environmental Accounting                                                                                   |
| EA :    | Environmental Assessment                                                                                   |
| ECA :   | Economic Commission for Africa                                                                             |
| EDPRS:  | Economic Development and Poverty Reduction Strategy                                                        |
| EF :    | Ecological Footprints                                                                                      |
| EIA :   | Environmental Impact Assessment                                                                            |
| EICV:   | Enquête Intégrale sur les Conditions de Vie des Ménages<br>(Integrated Household Living Conditions Survey) |
| EIS :   | Environmental Impact Statement                                                                             |
| EM :    | Environmental Monitoring                                                                                   |
| EMMP:   | Environmental Mitigation and Monitoring Plan                                                               |
| EMP :   | Environmental Management Plan                                                                              |
| EMS :   | Environmental Management System                                                                            |
| ESA :   | Environmental Security Assessment                                                                          |

|           |                                                 |
|-----------|-------------------------------------------------|
| MDG's:    | Millennium Development Goal                     |
| MINIRENA: | Ministry of Natural Resources                   |
| NISR :    | National Institute for Statistics of Rwanda     |
| PA :      | Product Assessment                              |
| PPP :     | Policy, Plan, or Program                        |
| PSF :     | Private Sector Federation                       |
| RDB :     | Rwanda Development Board                        |
| REMA:     | Rwanda Environment Management Authority         |
| RoR :     | Republic of Rwanda                              |
| SA :      | Sustainability Analysis                         |
| SEA :     | Strategic Environmental Assessment              |
| SoE :     | State of Environment                            |
| TOR :     | Terms of Reference                              |
| UNDP:     | United Nations Development Programme            |
| UNEP:     | United Nations Environment Programme            |
| WCED:     | World Commission on Environment and Development |

# CHAPTER ONE: INTRODUCTION

## 1.0 Background

Rwanda contains an extraordinary diversity of genetic material and natural resources which has the potential to be used in a range of economic development (REMA, 2009). Rwanda's economy and livelihoods of her people depend on natural resources. However, balancing socio-economic, political and ecological priorities is particularly challenging. While biodiversity provides the basis for economic growth, the tendency has been towards over-exploitation and degradation (Rwanyiziri, 2011). As human population in our country increased through time without an increase of natural resources, degradation of environment continued to exacerbate as result of pressure on natural resources, massive deforestation, wetland drainage, water degradation, loss of biodiversity, climate change and pollution in its various forms, etc. (REMA, 2005). Demography and poverty dynamic have serious negative impact on the nature and lead to the environmental degradation and loss of biodiversity (UNEP, 2011). This may hinder economic development if nothing is done (REMA, 2009). Even if the poverty is reducing, (from 36% in 2005/06 to 24% in 2010/11) 44.9 % of Rwandans live in abject poverty, with 22.1% poor in urban areas and 48.7% poor in rural areas (NISR, 2012).

Results from Integrated Household Living Conditions Survey (EICV3) show that population of the country has grown from 9.5 million people in 2005/06 to an estimated 10.8 million in 2010/11. Kigali City recorded the most population growth. In this line, the City of Kigali (CoK) should be given a particular attention. In the last 18 years, the CoK expended with unplanned settlement and constructions (hotels, industries, roads) sometimes without considering environmental issues. Today, however, the consequences of inevitable urbanization of CoK should draw the attention of decision-makers. The CoK attracts more people from rural area of our country. As it develops, the CoK offers unlimited investment opportunities that will increasingly attract investors and visitors from all over the world. Such demographic transition from a rural model to an urban model, also known as urbanization has profound consequences (COK, 2011). Currently the CoK face many problems of solid waste collection and transport system, wastewater treatment, pollution from industrial area and motor vehicles, rainwater collection etc. After the 1994 Genocide against the Tutsi, the Government of Rwanda began to revitalize the national economy by developing various sectors. Urbanization increased also in our country with unplanned residential area, industries, road construction without taking into account environmental concerns. (<http://www.kigalicity.gov.rw> ).

In promoting national development, Rwanda has focused on economic development, based on environmental sustainability (REMA, 2005). Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs and aspirations (WCED,1987). Sustainable development encompasses the economic, environmental and social dimension of development process (Bond et Al., 2001). In this context, Rwanda adopted plans and strategies that call for a well regulated environment management and principles of sustainable development. Vision 2020 and EDPRS (Economic Development and Poverty Reduction strategy) emphasize economic development and poverty alleviation considering environmental sustainability that is aligned to international development targets including Millennium Development Goal 7 (MDG 7) which promotes environmental sustainability (GoR,2007). Moreover, Rwanda initiated also policies in all main economic sectors (environment, agriculture, energy, mining, industry...) towards sustainable development. For instance, The National Environment Policy was set out in 2003 (REMA, 2005). The lead government Ministry for environment is the Ministry of Natural Resources (MINIRENA), while Rwanda Environment Management Authority (REMA), established in November 2006, has the overall responsibility of environmental management (GoR,2006). One of the key functions of REMA includes the implementation of Environmental Impact Assessment (EIA) that was established under the Organic Law n° 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda in article 67 that requires to each projects, programmes and policies that may affect the environment, to be subjected to Environmental Impact Assessment (EIA) before obtaining authorisation for implementation (REMA, 2009).

EIA is a decision support tool employed to identify and evaluate the probable environmental consequences, both positive and negative, of a proposed activity or project in order to facilitate informed decision-making and sound environmental management (Matthew et al., 2004). EIA helps to ensure that the likely effects of new development on the environment are fully understood and taken into account before the development is allowed to go ahead. (Nsengimana, 2011).

The concept of effectiveness includes both substantive (whether it achieves its purposes) and procedure (whether it is undertaken according to established criteria) (Sadler, 1996 cited by Wood 2003). For EIA to effectively contribute to sustainable development, it needs to show that it can contribute to poverty alleviation, employment creation and improved economic development (Weaver, 2002). Rwanda like other developing countries face many challenges in EIA processes especially insufficient staff; insufficient training and inadequate material; lack of adequate environmental awareness especially about EIA; lack of participation of some EIA stakeholders, lack of baseline data;

shortage of funds to conduct EIA studies, lack of respect of all provided steps of EIA procedures especially follow up phase., ... (MUNYAZIKWIYE, 2010). This last challenge is related to the no implementation of Environmental Management Plan (EMP) as planned in the Environmental Impact Statement (EIS). EMP is an action plan or management strategy used to ensure that the mitigation actions and the monitoring requirements recommended in the EIA are systematically implemented throughout all phases of the project (Weaver, 2003). The implementation of the Master Plan of City of Kigali and all development projects initiated in Rwanda requires an efficient and effective EIA towards environmental sustainability (COK, 2011).

This study will contribute to assess EIA effectiveness in Rwanda by analysing how projects that get EIA certificate complied with their EMPs as indicated in their EIS and how EIA contributed to sustainable economic development in our country. This study will also contribute to analyse challenges, good practices and lessons learned of completed project in the CoK from 2005 to July 2012.

### **1.1 Problem statement and Justification**

The EIA adoption in Rwanda was pressed by environmental challenges posed by environmental degradation such as soil erosion; deforestation; wetland drainage; water degradation; climate change, the loss of biodiversity (Mashinga, 2007).

However, EIA legislation and practices rarely respect all EIA steps. It would appear that EIA is more theoretical than practical (McDonald and Brown, 1995; cited by Weaver 2003). Consequently, there is a concern about EIA effectiveness. (Wood, 2003). Nevertheless, this does not necessarily mean EIA is completely ineffective (Weaver, 2003).

REMA has the responsibility to develop EIA guidelines, organise the EIA procedure by undertaking screening, guiding developers on assessment procedures, conducting public hearings, reviewing EIA reports based on the terms of reference (ToR) and taking decisions on approval or disapproval of proposed projects and auditing all implemented projects (REMA, 2012). Since February 2009, Rwanda Development Board (RDB) became the EIA administrative body through its unit of Environmental Compliance, Awareness and Cleaner Production. Every year RDB receive not less than 100 projects requesting EIA certificate. However, REMA sometime suspend EIA certificates delivered by RDB when they don't comply with environmental regulations (REMA, 2012).

As in other developing countries, EIA in Rwanda face many challenges related to insufficient baseline data, funding, shortage of staff, lack of adequate resources, low awareness among developers (developers perceive EIA as a barrier or a legal requirement instead of appreciating its value as a planning tool) and Strategic Environmental Assessment (SEA) which is not conducted, etc (Munyazikwiye, 2010). Other challenges are related to EIA process especially on the development of term of references (TOR), the effectiveness of public participation, quality of Environmental Impact Report, Environmental Impact Statement (EIS) that are not made available to all public.( in media, advertisement, libraries. and EIA monitoring note conducted (Nsengimana, 2011). More often application of EIA is done after project development has commenced, while others apply as a consequence of the project having been halted by regulatory authorities (Mashinga,2007) . This does not allow opportunity to address the impacts that would have been avoided (Nsengimana, 2011).

EIA is still new in Rwanda and few studies were conducted to assess EIA implementation. Some authors like Munyazikwiye (2010) recommended to conduct further studies on environmental monitoring and audits of the approved projects, to ascertain if the EMP and mitigation measures submitted during the EIA studies are implemented (Munyazikwiye, 2010).

Therefore, this study focus on 2 stages of EIA process (decision making for EIA certificate by lead agency namely REMA and RDB) and follow up phase of the projects recorded from 2006 to August 2012 in the CoK. The first section of this study shows challenges, good practices and lessons learned by different stakeholders (REMA, RDB, Developers, EIA experts, local communities) in EIA implementation in the COK and its effectiveness in promoting sustainable development in Rwanda. The second section will present the current perceptions of developers, lead agencies and local community on EIA follow up phase (EMP implementation) and lessons learned from completed projects in CoK.

## **1.2 Objectives**

The overall aim of this study is to determine the effectiveness of EIA of completed projects in the CoK from 2006 to August 2012 towards promoting sustainable development in Rwanda. This study will contribute to enhancing the effectiveness of EIA by assessing the implementation of Environmental Management Plan (EMP) as mentioned in EIA reports recorded by REMA and RDB and show consequential implications for sustainable development in Rwanda.

### **1.2.1 Specific objectives**

Specific objectives are: (1) to determine challenges and opportunities of lead agency in the process of decision making on EIA certificates and follow up phase of EIA in Rwanda; (2) to assess if the implementation of EIS of completed projects in the CoK complied with their EMP; (3) to propose suggestions and recommendations for pragmatic refinements to EIA process of decision making and follow up phase.

### **1.2.2 Research questions**

1. What are the challenges faced by REMA and RDB in the process of decision making on EIA certificates and follow up phase of EIA in Rwanda ?
2. To which extent do developers comply with their EMP to produce intended results in promoting sustainable development?

## **1.3 Hypothesis**

- A. REMA and RDB face challenges in EIA decision making and follow up phase of EIA in Rwanda.
- B. Developers don't comply with their EMP to produce intended results.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

There are different tools related to the promotion of environmental protection namely Environmental Auditing (AU), Product Assessment and life-cycle analysis (PA), Environmental Management System (EMS), Environmental Management Plan (EMP), Strategic Environmental Assessment (SEA), Environmental Security Assessment (ESA), Ecological Footprints (EF), Risk Assessment (RA), Cost-Benefit Analysis (CBA), Environmental Accounting (EA), Cumulative Effects Assessment (CEA), State of Environment (SoE), Sustainability Analysis (SA) and Environmental Monitoring (EM). Amongst those tools, EIA is the most widely practiced (Munyazikwiye, 2010). This chapter will focus on EIA showing its background and its link with others environmental management tools. Emphasis will be made on EIA implementation in Rwanda especially on its follow up phase (Monitoring and auditing).

### **2.2 EIA background**

Prior to 1970, project and policy appraisals were based largely on technical and cost-benefit analyses. EIA has been in existence since 1970 when it was introduced by the US Environmental Policy Act (NEPA). Australia, Canada and New Zealand followed US lead in 1973. EIA was approved in many European and developing countries in the late 1980s. The Principle 17 of Rio Declaration of Environment and Development endorsed the use of EIA as a national instrument. (Weaver, 2003). By 1996, more than 100 countries worldwide had EIA systems (Weaver 2003). Then EIA spread faster in the most of the countries because it was required by funding bodies like the World Bank, USAID and others as a part of a funding approval process (Nsengimana, 2011). In Rwanda, EIA is still new, the process started in 2005 and became a legal requirement after the enactment of Organic Law No.04/2005 of 2005 determining the modalities of protection, conservation and promotion of environment in Rwanda.

The main goal of EIA is to anticipate the significant environmental impacts of development proposals before a commitment is made to a particular course of action (Morgan, 1998; Wathern, 1988; Wood, 2003). On long term, EIA promotes sustainable development by ensuring that development projects do not undermine critical resources and ecological functions on the well-being, lifestyle and livelihood of communities and people who depend on them (REMA, 2006).

The scope and methodologies of EIA have evolved greatly over the past decade. Some are in the form of regulations, others have EIA guidelines and advanced countries have included consideration of biodiversity and climate change issues (Glasson & Salvador 2000).

### **2.3 EIA in developed and developing countries**

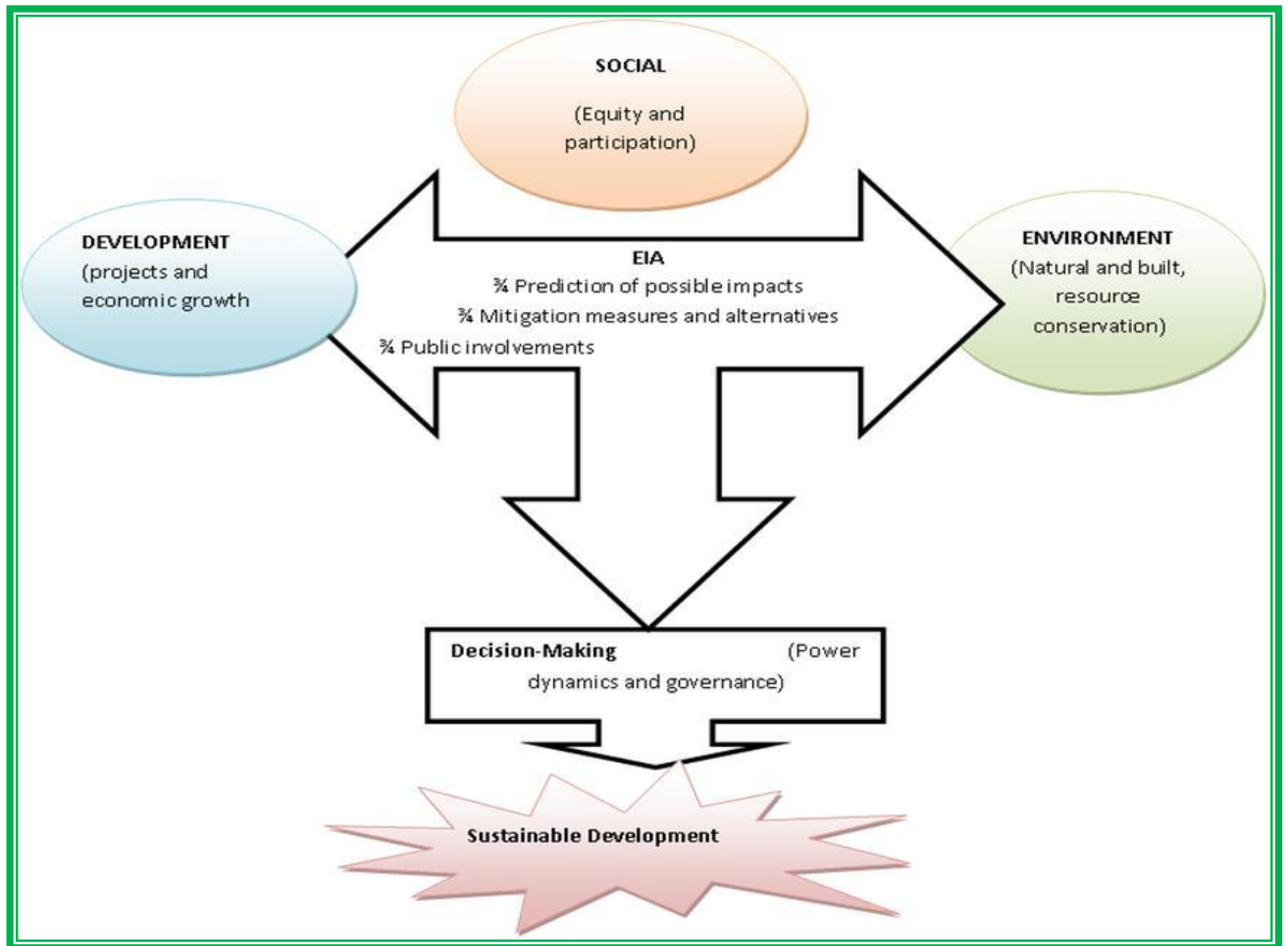
EIA systems vary from country to country in the developed world as well as in developing countries (Weaver 2003). Despite these variations, on the whole, EIA in developing countries tends to be very different from EIA in the developed world due to different reasons (Boyle 1998). First of all, in developing countries, EIA was a 'top-down' initiatives on request of Governments and development assistance agencies on projects basis while in developed countries it was a 'bottom-up' initiatives created as a response to a request by local community for better environmental protection. Therefore, there is less widespread acceptance of EIA by the general public in developing countries, where it is often perceived as being a barrier to development rather than an aid (Nsengimana, 2011).

Then, EIA process face more challenges in developing countries than in developed countries. For instance, there is weak screening process (sometimes EIA is undertaken to meet development agencies aid requirements (Wood, 2000), EIA reports in developing countries are often confidential (Bisset, 1992) and the lack of trained human resources and of financial resources often leads to the preparation of inadequate and irrelevant EIA reports (Clark, 1999), the decision making for EIA certificates may be influenced by corruption (Boyle, 1998; Donnelly et al., 1998). Finally, the follow up phase of EIA (Monitoring and auditing of impacts) has been a missing step in EIA implementation in most of developing countries (Boyle 1998).

### **2.4 Link between EIA and Sustainable development**

The reality of environment and development are closely related. They all aim at improving welfare of the society (Weaver, 2003). Sustainable development encompass 3 main pillars namely Development, Environment and Social (REMA, 2009). Sustainable development can be described as 'development that meets the needs of the present without compromising the ability of future generations to meet their needs and aspirations' (WCED 1987). The concept of sustainable development was embraced at the United Nations Conference on Environment and Development (UNCED) in Rio 1992 and the importance of EIA as a tool in achieving sustainable development was recognized in principle 17 of the Rio Declaration. (Le Gouais, 2003).

Many Authors interpret the main aim of EIA more broadly, viewing it as an important element of sustainable development strategies (Sadler, 1996; Glasson et al., 1999; Petts, 199b cited by Weaver 2003). As described in the following figure , EIA is a key support tool for sustainable development because it guarantees long term benefits by providing necessary information for decision makers ensuring that development projects do not undermine critical resources and ecological functions on the well-being, and livelihood of communities (Nitz and Holland, 2000 cited by Matthew et Al., 2004).



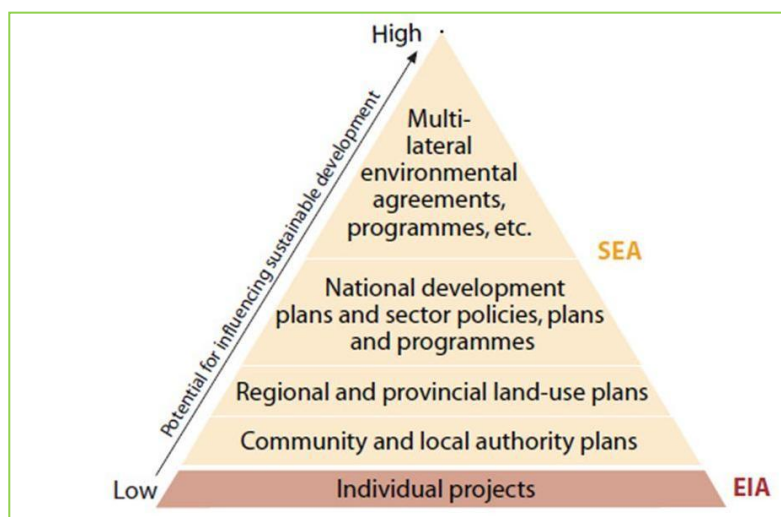
**Figure: 1.** The link between EIA and sustainable development (Zeremariam, 2003: 12 cited by Munyazikwiye, 2011)

The figure no 1 gives a schematic representation of complementary relationships between EIA and SEA considering the three main pillars namely social, economic and environment. The first and foremost characteristics of EIA which helps to achieve sustainable development is its capability of incorporating the concerns of affected and interested people, as Glasson *et al.* (2005) reveal that public participation in EIA aims to establish a dialogue between the public and decision-makers and to ensure that decision-makers assimilate the public's views into their decisions.

Amongst the basic requirements for the achievement of sustainable development there are: a secured and effective political system, a self-reliant and sustained economic system, a social system that provides solutions to relieve the tensions arising from disharmonious development and a production system that respects the obligation to preserve the ecological base for development (WCED, 1987).

## 2.5 Relationship between Strategic Environmental Assessment (SEA) and EIA

SEA is defined as a decision-making support instrument for the formulation of sustainable spatial and sector policies, plans and programmes, aiming to ensure an appropriate consideration of the environment (UNEP, 2004; Fischer, 2003). Figure 2 shows the contribution of SEA and EIA in promoting sustainable development (Weaver, 2003)



**Figure: 2** Level of planning, EIA, SEA and sustainable development

SEA is a process that aims to integrate environmental and sustainability considerations into strategic decision making on policy, plan and program level.

Figure 2 shows that EIA is conducted on low level of individuals project while SEA is applied on higher lever to integrate environment in national development plans, sector policies or programs. SEA is recognized as a tool that has been proven effective in restraining environmental degradation at national and global level (REMA, 2006). SEA and EIA complementally assessment tools for guiding development strategy. The figure no 2 shows also that EIA has low potential influence on sustainable development than SEA

### Difference and similarities between SEA and EIA

Table 1 shows some differences and similarities between SEA and EIA in their functional characteristics. SEA and EIA are both complementary tools for guiding development strategy while supporting environmental sustainability.

**Table 1:** SEA-EIA differences and similarities

| Level & Role           | SEA                                                                                              | EIA                                                                      |
|------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Implementation</b>  | Involve multiple institutions                                                                    | Implemented by developer whether public or private                       |
| <b>Decision-making</b> | At policy, plan or program (PPP) level                                                           | At project level                                                         |
| <b>Prevention</b>      | Proactive to ensure incorporation of environment into PPP<br>Early warning of cumulative effects | Reactive to the project proposal<br>Limited review of cumulative effects |
| <b>Timing</b>          | Continuous and iterative process                                                                 | Discrete activity with clear beginning and end                           |
| <b>Focus and range</b> | Policy, legislation, regulation<br>Broad range of alternative                                    | Focus on technical solution<br>Narrow range of alternative               |
| <b>Emphasis</b>        | Integrating environmental concern into PPPs                                                      | Emphasis on mitigation                                                   |

Source: REMA, 2011

## 2.6 Economic benefits of EIA process

EIA helps developers to predict the magnitude of development's impacts on the environment, social and economic. EIA helps also to evaluate the significance of the impact and incorporate advance corrective measures into the project in order to minimize environmental risks and financial costs. The process ensures financially and economically efficient projects with guarantee to attain long term profits. <http://www.rdb.rw/one-stop-centre/environment-impact-assessment.html>

## 2.7 Which projects require EIA in Rwanda?

The list of works, activities and projects that have to undertake an environmental impact assessment are: construction and repair of international and national roads, large bridges, industries, factories, hydro-dams and electrical lines, public dams for water conservation, rain water harvesting for agricultural activities and artificial lakes, large hotels public building which accommodate more than one hundred daily, extraction of mines and public land fills among others. (GoR, 2008a).

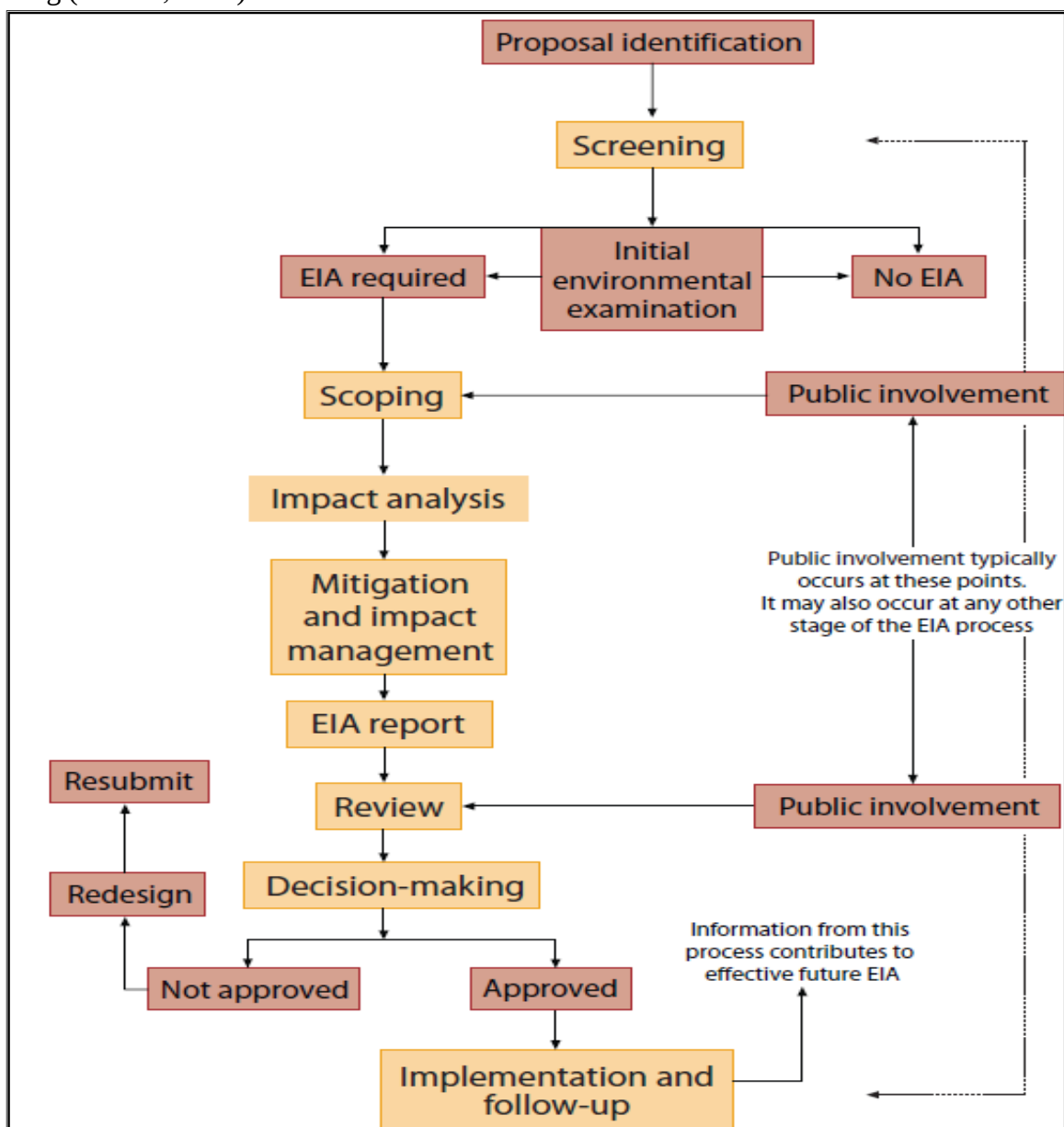
(See appendix 5 for projects require EIA in Rwanda).

<http://www.rdb.rw/one-stop-centre/environment-impact-assessment.html>

REMA has the power to order a developer to conduct an EIA to be done for a project that is not on the list if it is evident that there is a possibility for the project to have negative effects on the environment. (GoR, 2008a).

## 2.8 Steps in EIA process

EIA process in Rwanda has four main phases, namely: 1) Environmental Impact Assessment Initiation Phase, 2) Environmental Impact Study Phase, 3) Decision-Making and Authorization Phase and 4) Monitoring (REMA, 2006)



Source: UNEP, 2002

**Figure 3:** Steps in EIA process

Figure 3 shows that EIA is a process which has different steps. All steps are complementary and directly connected in respective order. This study analyses in more details the two last steps: Decision-making and implementation and follow up.

## 2.9 EIA application and trend in Rwanda

After the 1994 Tutsi genocide, Rwanda began to revitalize its economy with many projects developments with urbanization and industrial growth. EIA was mainstreamed into institutional and instruments as a solution and as a tool to be used for mitigation of environmental impacts that may result from development projects (REMA, 2011). From 2005 to August 2012, more than 460 development projects were awarded EIA certificates. Most of them helped Rwanda to make good progress towards Vision 2020, EDPRS and MDGs while protecting and conserving our environment. However, EIA is still new in Rwanda and face some problems in all steps of its process from the initiation phase to the follow up phase. Other challenges are related to the insufficient baseline data, funding, shortage of staff, lack of adequate resources, lack of enough environmental awareness among developers (developers perceive EIA as a barrier). In decision making and authorization phase, there are some cases when REMA as leading agency cancel EIA certificates delivered by RDB when they do not comply with environmental regulation.

### 2.9.1 Project with EIA certificate from May 2005 to August 2012

Table 2 shows that from May 2005 to August 2012, REMA and RDB delivered a total number of 460 certificates with a high percentage (45 %) related to construction category.

**Table 2:** Projects received during the period of May 2005-August 2012

| Category of the project | Total      | %          |
|-------------------------|------------|------------|
| Agriculture             | 24         | 5          |
| Construction            | 207        | 45         |
| Energy                  | 16         | 3          |
| Hotel                   | 45         | 10         |
| Industry                | 14         | 3          |
| Mining                  | 106        | 23         |
| Petrol Station          | 27         | 6          |
| Tourism                 | 11         | 2          |
| other                   | 10         | 2          |
| <b>Grand Total</b>      | <b>460</b> | <b>100</b> |

Source: REMA database, 2012

Table 2 is not exhaustive. There are some running projects without EIA certificates. Amongst them we can highlight uncontrolled introduction of plants such as Macadamia, Moringa, Neem and Jatropha for bio-fuels. An EIA study should be undertaken to assess if all above mentioned species cannot be invasive species (REMA, 2009).

## **2.9.2 EMP application in the EIA process**

The EMP for proposed project provides all the details of the project activities, impacts, mitigation measures, time schedules, costs, responsibilities and commitments proposed to minimize environmental impacts of the activities throughout the project cycle (REMA, 2009). EMPs can be prepared at different times in a project's life. There are two types of EMPs: Construction EMPs (CEMPs), and Operation EMPs (OEMPs). CEMPs are developed to ensure that appropriate environmental management practices are followed during a project's construction. OEMPs are developed to ensure that appropriate environmental management practices are followed during a project's operation and decommissioning (DIPNR, 2004).

### ***2.9.2.1 Purpose , objectives and format of EMP***

There is a reliance on the EMP to ensure that a project's actual environmental impacts are consistent with those evaluated in the environmental impact assessment (EIA) process (DIPNR, 2004). EMP contributes to guide the implementation of the proposed project in an environmentally friendly and socially acceptable manner (Nsengimana, 2011). The EMP is therefore fundamental stage to the EIA process.

The objectives of the EMP include the following (Weaver, 2003):

- ✓ To ensure that the project complies with the applicable national, social and legal requirements, social policies and procedures.
  - Reduce the harmful characteristics of impact sources by devising less harmful ways of effecting project activities.
  - Streamline better management practices including Cleaner Production as an integral part of project implementation.
- ✓ To provide technical information and recommendations to help select and design the best alternative.

An effective EMP should ensure that the application of best practice of environmental management to a project, implementation of a project's EIA including its conditions of approval or consent, compliance with environmental legislation, proper management of environmental risks associated with a project (DIPNR, 2004). The format of EMP depends on the size and the complexity of the projects to be followed up.

In general, the format of EMP includes: a summary of impacts, recommended mitigation measures, statement of compliance with standards, allocation of resources and responsibilities, schedule of required actions, monitoring and auditing programmes, contingency measures for greater than expected impacts and state policy and standards (Hermogene, 2011). The following table shows some key element of EMP

**Table 3:** Keys elements to include in the EMP

| EMP Elements                    | Content                                                                                                                                                            | Main end user                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Background</b>               | Introduction<br>Project Description<br>EMP Context<br>EMP Objectives<br>Environmental Policy                                                                       | All stakeholders – internal and external<br>Community groups<br>Approval or Consent Authority                                                              |
| <b>Environmental Management</b> | Environmental Management and<br>Structure<br>Responsibility<br>Approval and Licensing<br>Requirements<br>Reporting<br>Environmental Training<br>Emergency Contacts | Proponent's management and supervisory staff<br>Approval or Consent Authority                                                                              |
| <b>Implementation</b>           | Risk Assessment<br>Environmental Management<br>Activities<br>and Controls<br>Environmental Management<br>Plans or Maps<br>Environmental Schedules                  | Proponent's management and supervisory staff<br>Construction Staff and Site Staff<br>Community groups<br>Operations Staff<br>Approval or Consent Authority |
| <b>Monitor and Review</b>       | <b>Environmental Monitoring</b><br><b>Environmental Auditing</b><br><b>Corrective Action</b><br><b>EMP Review</b>                                                  | Proponent's management and supervisory staff<br>Approval or Consent Authority                                                                              |

Source: (DIPNR, 2004)

#### **2.9.2.2 EMP's preparation and review**

A construction EMP (CEMP) is generally developed in the same time as the project design and when related activities are undertaken. Each process should influence the other. An operation EMP (OEMP) should be developed before commencing operation of an activity or development (DIPNR, 2004).

An EMP is not static. It may be reviewed and amendment during the life of a project in order to improve project's environmental management and its effectiveness. Review timings depend on the nature and scale of the project but would typically be undertaken when there is a change in the scope of the project, following significant environmental incidents, when there is a need to improve performance in an area of environmental impact, at the completion of environmental audits, and at the end of a project (to allow for improvements in subsequent projects) (DIPNR, 2004).

### **2.9.2.3 Key components of the EMP**

The monitoring (conducted by project developer), evaluation and environmental audits (conducted by lead agency) are very important components of the EMP carried out during the project's lifespan and decommissioning phases of the project (REMA, 2008). Monitoring and auditing provide adequate information on the changes of variables in time and space and in particular on the occurrence and magnitude of impacts through a systematic and continuous measurement and recording of project's variables (Glasson *et al*, 2005). Furthermore, monitoring is a good tool in project management because it facilitates the identification of the anticipated impacts and therefore rectify or address that change before being uncontrollable (Dipper *et al.*, 2000 cited by Munyazikwiye 2010) .

EIA auditing helps to make EIA credible and practical tool rather than being a paperwork exercise which aims simply to obtain a development permit (Ahammed and Nixon, 2006; Dipper *et al.*, 2000). Different authors show that monitoring and auditing are the weakest areas in the EIA implementation in Rwanda and has different challenges and criticism due to the limited resources in lead authority organizations (Mashinga, 2007, Munyazikwiye , 2010, Nsengimana, 2011).

## **2.9.3 EMP implementation in the EIA process in Rwanda**

### **2.9.3.1 Role of project developers in EMP implementation**

EMP is implemented by the project developer under supervision of lead authority. If the development is approved, the developer might be required to implement an environmental management plan (EMP) as indicated in EIS, in some instances, decommissioning of the project (REMA, 2006). This step is often a neglected aspect of EIA (Weaver, 2009). In most of cases, after project approval and EIA certificate delivered, the implementation of identified environmental controls is not conducted as planned in the EIS. Projects developers use their EIS as paperwork rather than a practical tool (Mashinga, 2007). One method of improving the effectiveness of the EIA process is to strengthen a project's EMP (DIPNR, 2004).

### **2.9.3.2 Role of REMA and RDB in EMP implementation**

#### ***a) Oversight monitoring***

REMA as the lead agency is responsible for the protection of environment in Rwanda. REMA plays the leading oversight role of monitoring and auditing the activities of the project according to the Organic Law establishing REMA and its functions.

#### ***b) Site inspection visits***

REMA has to undertake regular site visits to inspect and audit the proponent's activities and evaluate compliance with the EMP. REMA can also recommend to a proponent to stop work immediately if an unacceptable impact on the environment is occurring or is likely to occur.

If necessary, REMA can recommend to concerned proponent to carry out the EMP review. The following table highlights to total number of projects by sector audited by REMA from May 2005 to August 2012.

According to the working arrangements between RDB and REMA, in accordance to the Cabinet Minutes of 25/3/2009, RDB carry out the EIA activities on behalf and under the supervision of REMA; conducting Environmental Audit and prepare reports thereon is part of RDB's duties and responsibilities. Concerning Developer's responsibilities in the EMPs implementation, she/he must prepare undertake the daily and routine monitoring to ensure compliance to the EMP. Developer must also prepare and submit annual audit report to REMA (REMA,2006).

### **2.10 Example of good practices in EMP implementation in the CoK**

Even if EMP implementation in Rwanda faces some challenges, there are some developers who can be mentioned as good practices examples in EMP implementation such as Skol International in Rwanda, Pyramide mining society, LWH/MINAGRI , .... Table 4-5 show sample of good practice of EMP implementation.

**Table 4 : EMP for EIA report for expansion of Kigali SERENA, April 2008**

| Impact       | Mitigation measures                                                                                                        | Implementation schedule and approx costs                                                                                                                                                                                      | Responsible person                 | Monitoring                                                                                                                                                                                                   |
|--------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water Use    | Hotel management to educate guests on water reduction                                                                      | On-going exercise. This will require in- house resources.                                                                                                                                                                     | Hotel Manager                      | Hotel Manager to have key performance indicator on water use per guest and benchmark with international best practices.                                                                                      |
| Energy use   | Install power saving devices.                                                                                              | On-going exercise                                                                                                                                                                                                             | Hotel Engineer.                    | Develop an energy indicator per guest and benchmark with best                                                                                                                                                |
| Waste water  | Waste water treatment plant                                                                                                | To be implemented and commissioned before occupation. Plant is expected to cost Usd 125,366.00                                                                                                                                | Developer and Project Manager      | During construction the project Manager will ensure contractor follows plan. During operation the Hotel will analyse samples every month for the first three months after commissioning and thereafter every |
| Solid Waste  | Segregate solid waste at source. Have coloured bins one for organic materials and another for plastics and other inorganic | The Hotel management to train staff on importance of good environmental management. This should be done within first three months. Thereafter the Hotel to invest in colored bins and train staff on segregation. This should | Hotel Manager                      | Hotel Manager to draw a plan and ensure compliance. An environmental audit should be conducted one year after the project is operational.                                                                    |
| Noise levels | During construction there will be normal noise from                                                                        | The contractor will buy and provide the protective clothing at commencement of project and thereafter as required.                                                                                                            | The contractor will be responsible | Contractor will monitor on daily basis and allow only workers with safety gear into site.                                                                                                                    |

Source: EIA report Expansion of Kigali Serena, April 2008

Table 5 shows an EMP for EIA report for the proposed development of five (5) hill sprinkling irrigation systems on the coast of Cyangwe and Nasho lakes in Kirehe District and in the Valley of Muvumba river in Nyagatare district, Eastern Province

**Table 5 :** The EMP for EIA report for the in Kirehe and Nyagatare District

| Phase                   | Impacts                                                                                                                       | Mitigation/Enhancement measures                                                                                                                                                                                                                                                                                                                                                                                                             | Responsible Institution                                                                                                            | Estimated costs (frw)                                                          |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Design and Mobilisation | Use of shared international waterways (Muvumba river, L. Cyambwe, Mpanga and Nasho, all in the Akagera basin) for Irrigation. | <ul style="list-style-type: none"> <li>MINAGRI/ IAI-GFI through the respective channels are required to formerly notify riparian countries that might be affected downstream or upstream (Uganda, Tanzania and Nile basin countries) of the project activities, in case this has not yet been done. As per the “Projects on International waterways- OP/BP-7.50”</li> </ul>                                                                 | • MINAGRI                                                                                                                          | No cost Applicable. Needs to be done formerly in writing during project design |
|                         | Expropriation without compensation                                                                                            | <ul style="list-style-type: none"> <li>Completion of the socio-economic study that has already been started by the LWH project. This will identify the actual affected parties worth compensation.</li> <li>Preparation of a Resettlement Action Plans (RAPs) for identification of the parties worth compensation, procedure to follow when compensating those involuntary displaced and the estimated amount for compensation.</li> </ul> | <ul style="list-style-type: none"> <li>MINAGRI/ IAI-GFI Project</li> <li>Kirehe and Nyagatare district officials.</li> </ul>       | 10,000,000                                                                     |
| Construction phase      | Destruction of crops at Construction commencement without an early warning of the farmer                                      | <ul style="list-style-type: none"> <li>The project should have a clear planning schedule of the project milestones and an early warning system to inform the farmers of the project construction commencement.</li> <li>Plantations that have project works traversing them will require compensation with the guidance of the RAP.</li> </ul>                                                                                              | •MINAGRI /IAI-GFI Project                                                                                                          | Inclusive in the RAP and socio- economic cost mentioned above.                 |
|                         | Complaints of low wages for skilled and unskilled labour during construction                                                  | <ul style="list-style-type: none"> <li>Project coordination to ensure contractors pay wages to the minimum threshold recommended by the labour law and stipulated in the ministerial order.</li> </ul>                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>MINAGRI /IAI-GFI Project.</li> <li>Kirehe and Nyagatare district labour officers</li> </ul> | No cost applicable                                                             |

|  |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                   |                                   |
|--|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
|  | Oil spillage resulting in soil and water contamination | <ul style="list-style-type: none"> <li>The contractors are required to have machines and automobiles in good condition, certified by the “Automobile Inspection centre”, in order to reduce on the likelihood of oil spillage.</li> <li>Re-fueling, oil change, maintenance works, repair works will need to allocate a restricted area at the site installed office area. This area shall have a cemented floor and a sand stock for use in the absorption of spilled oil.</li> <li>As for the lake water quality contamination by oil spillage from the pump station, an oil interceptor should be installed at the pump station and its stand-by generator. This will collect oil that would have been spilled hence avoiding water quality contamination.</li> </ul> | <ul style="list-style-type: none"> <li>Contractors executing works at both sites.</li> <li>Follow up by GFI project Site officers</li> <li>REMA</li> </ul>                        | Inclusive in the contractor’s sum |
|  | Dangerous borrow pits                                  | <ul style="list-style-type: none"> <li>Borrow pits need to be identified, marked out, and refilled and the area rejuvenated so as to avoid any of the likely; injuries, health hazards occurring or habitat for rodents and venomous reptiles.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>Contractor</li> <li>Follow up by GFI project Site officers</li> </ul>                                                                      | Inclusive in the contractor’s sum |
|  | Occupational health hazards during construction        | <ul style="list-style-type: none"> <li>Spraying of water regularly to suppress excessive dust during construction is strongly recommended;</li> <li>Workers on site will be provided with appropriate protective gears such as; wellington boots, helmets, nose masks, eye goggles and overalls.</li> <li>The constructor should enforce and impress on their workers to use the gears. To this effect, the contractor shall have a staff department specifically following up on the safety compliance on site.</li> <li>The contractor is required at the time of contract signature, to access Insurance covering injuries or death at the site. This will act as security over any occurring occupational health hazards for the workers on site.</li> </ul>         | <ul style="list-style-type: none"> <li>Contractor</li> <li>MINAGRI/ AI-GFI site officer.</li> <li>Kirehe and Nyagatare director of infrastructure and health inspector</li> </ul> | Inclusive in the contractor’s sum |

To be continued..

Source: MINAGRI, EIS April 2011

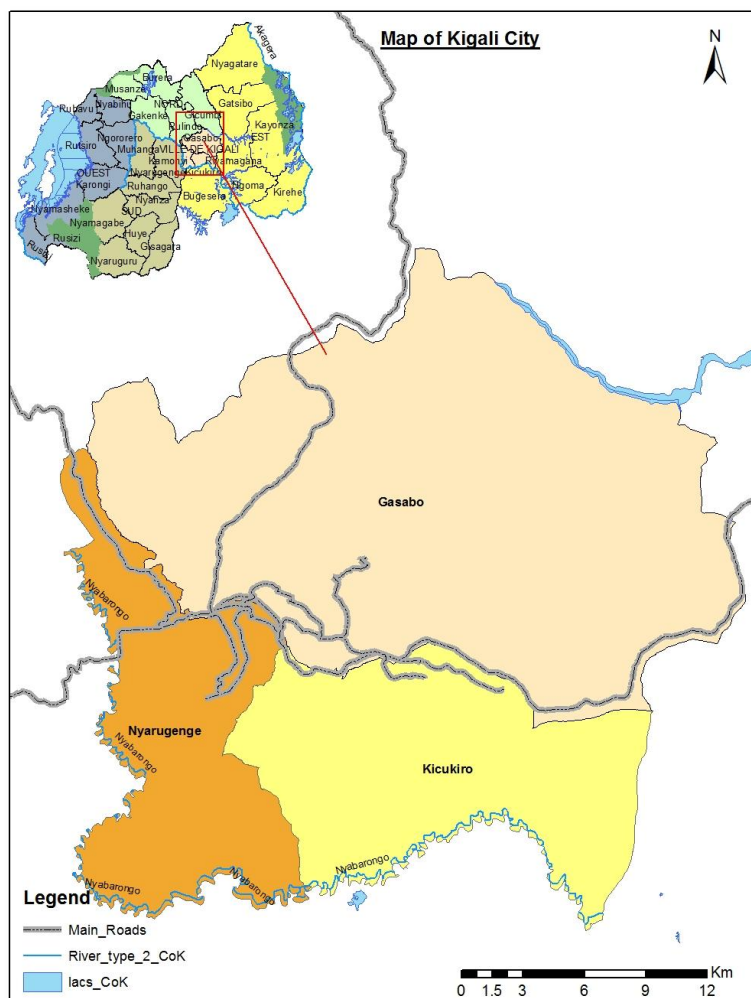
## CHAPTER THREE: MATERIAL AND METHODS

### 3.1 Introduction

This chapter provides a description of the study area, the material and the methods used. The study area includes geographical location and brief demographic background indicators of CoK. The research design and methods illustrates the construction and administration of questionnaire as well as sampling techniques, while the data collection strategy includes the quantitative research method for primary data and desktop approach methodology for secondary data.

### 3.2 Study site

This study was conducted in the City of Kigali, the Capital of Rwanda (1°04' and 2°51''S, and 28°53' and 30°53'E). Located at Rwanda's geographical heart, its climate is tempered by high altitude that ranges from 1350 meters (Nyaborongo basin) to 2,055 meters (Mt. Jali).



**Figure 4 :** Map of working site

The City of Kigali started in 1907 as a small site. Currently it covers an area of approximately 731 km<sup>2</sup> and made up of three Districts namely Gasabo, Kicukiro and Nyarugenge. The City of Kigali is one of the fastest growing cities in Africa and has the fastest rate of urbanization (MININFRA, 2007). Following the 1994 genocide against the Tutsi, many genocide survivors feel safer in the CoK far away from where they experienced tragic events. As a result, in the City of Kigali, more than anywhere else, there is a high concentration of people. It is presently inhabited by approximately 1 million inhabitants.

(<http://www.kigalicity.gov.rw/spip.php?article109>).

### **3.3 Methods**

#### **3.3.1 Literature review**

Before starting this study, we reviewed relevant documentation related to EIA in order to have an overview of what has been said, who the key writers are, what are the prevailing theories and hypotheses, what questions are being asked, and what methods and methodologies are appropriate and useful.

#### **3.3.2 Questionnaire survey**

Questionnaire is the main method that was used in this study. Primary data were collected through questionnaire survey addressed to all EIA staff from REMA and RDB and some key stakeholders involved in EIA process (developers, EIA experts) and public organisation with interest in EIA process in Rwanda namely APEIER and Private Sector Federation (PSF) and local communities affected by EIA project in COK. In total 40 copies of questionnaires were administrated to above mentioned respondents

##### ***3.3.2.1 Questionnaire design and planning***

Questionnaire was composed by a combination of closed and open ended questions. The average time spent on administering each questionnaire did not exceeds 30 minutes.

I developed two type of questionnaire: the 1st type was reserved to EIA authority (REMA and RDB) concerning the process of decision making and follow up phase of EIA in Rwanda while the 2nd type concerned EIA experts, developers, and PSF and local communities to seek their view regarding EIS implementation in Rwanda. The questionnaires are attached in annex 2 of this study.

### ***3.3.2.2 Pre-testing of the questionnaire***

Before administration of the questionnaire, we conducted a pilot study using a selected sample on 5 individuals (N=5) in order to make adjustment on the length, structure and wording of the questionnaire.

### **3.3.3 Interviews**

Interview was conducted also on EIA lead authority (REMA and RDB staff) EIA experts and EIA researchers and local authorities in the CoK (on District and sector levels). An interview guide is attached in the annex 3 of this study.

## **3.4 Data analysis**

The data were collected from the field using questionnaire. I also collected EIA's data recorded by REMA and RDB from May 2005 to August 2012. All data were processed and analysed in MS excel and the Statistical Package for Social Sciences (SPSS) Version 13.0 (SABUHHORO, 2006). SPSS was used to summarize data in tables, figures. In order to test whether there are significant differences in the frequency of responses between variables, the Chi-square test ( $\chi^2$ ) was used. For small sample sizes we used Fishers Exact test.

### **Hypothesis-testing**

The hypothesis of this study will be tested by using Chi square test, t-test or F-test.

### **Generalizations and interpretation**

After data analysis, I interpreted them considering the results of similar studies. I made generalization of results obtained from the CoK to country level. Then, I proceed by interpretation that generated our recommendation on country level.

## CHAPTER FOUR: RESULTS

### 4.1 Introduction

This chapter aim to present and describe the questionnaire survey results. According to the objectives of this research, the results are presented in four sections, notably, respondents' background, profile and experience, perception of developers and EIA expert in the implementation of EMP in EIA process, challenges and opportunities in the process of decision making and follow up phase of EIA in Rwanda, role of lead authority (REMA & RDB) in the follow up phase of EIA and EMP implementation and effectiveness of EIA in Kigali city and its contribution for sustainable development. All results are shown in frequencies and percentages which are presented in tables and figures.

### 4.2 Respondents' background, profile and experience

#### 4.2.1 Institution and job title of respondents

In total, 40 respondents from RDB, REMA, EIA experts, developers and local authorities in the CoK, participated in questionnaire survey.

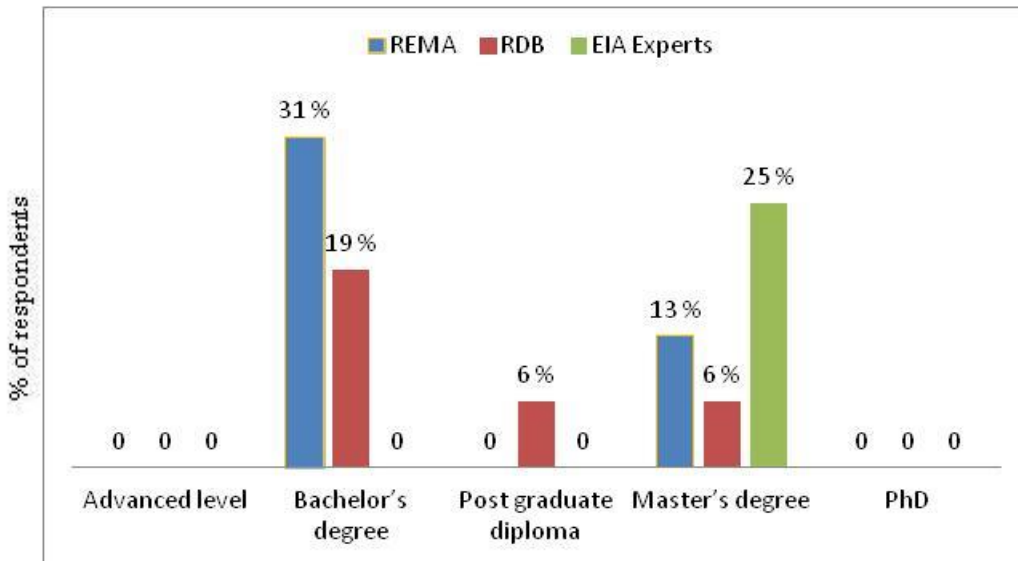
Table 5 shows a low number of respondents in RDB. This is due to the few staff in RDB's department in charge of EIA and cleaner production. In REMA, most of our respondents belong to the department of environmental regulations and pollution control (DERPC) which deals with environmental monitoring and Auditing and EIA process.

**Table 6:** Institution of respondents

| Category                                       | Frequency | Percent    |
|------------------------------------------------|-----------|------------|
| Rwanda Development Board (RDB)                 | 5         | 13         |
| Rwanda Environment Management Authority (REMA) | 7         | 18         |
| EIA Experts                                    | 10        | 25         |
| Developers                                     | 8         | 20         |
| Local authorities                              | 10        | 25         |
| <b>Total</b>                                   | <b>40</b> | <b>100</b> |

#### 4.2.2 Respondent's qualification and experience

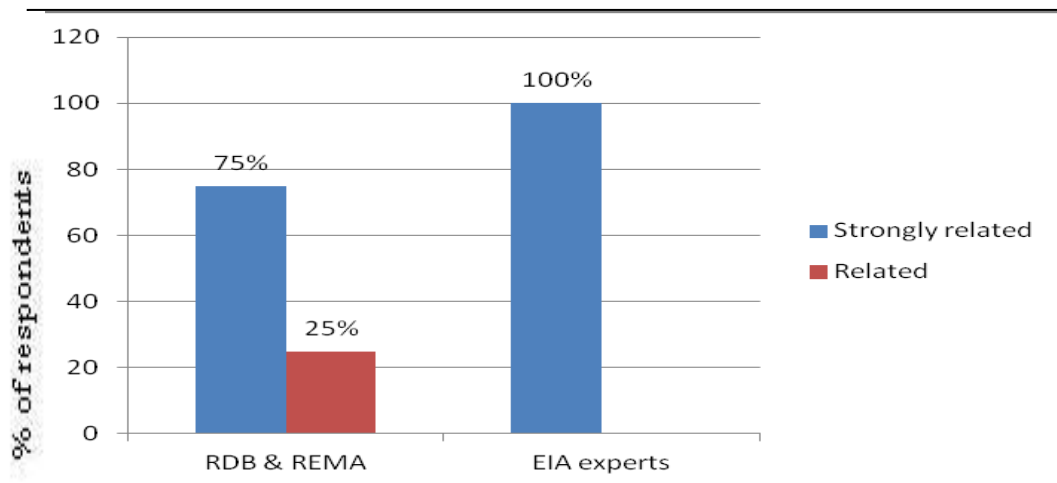
Figure 5 shows that the majority (50%) of respondents in RDB, REMA have a Bachelor's degree (BSc), while all EIA experts' respondents to this research have Masters Degree. Highly educated EIA professionals prefer to work as consultants in order to earn more money. This question was not applied to developers and local authorities because they are not directly involved in development of ToR.



**Figure 5:** Level of education of respondents (in %, n=16)

#### 4.2.3 The relationship between domain of studies of EIA practitioners and their current job

Figure 6 shows that 100% of EIA experts' respondents believe that their current job is strongly related to the EIA process while in REMA and RDB that relationship is 75%.

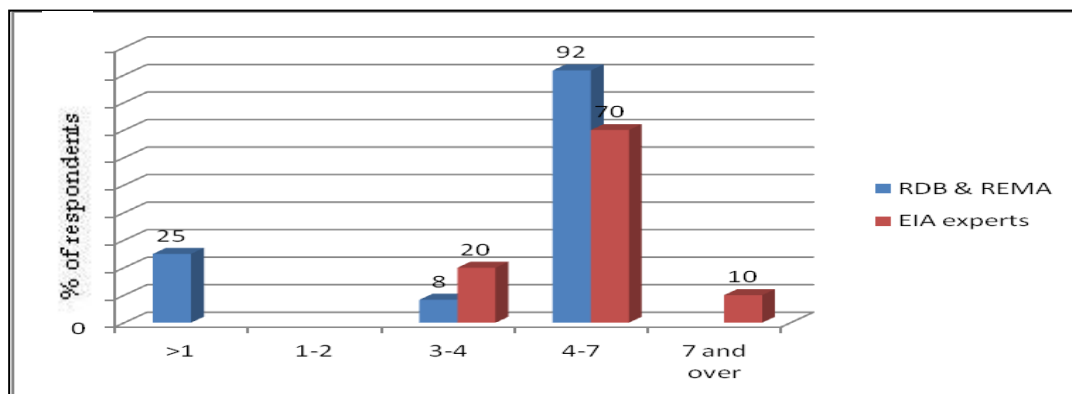


**Figure 6 :** Respondent's relationship between domain of their studies and current job

#### 4.2.4 The level of experience in the current job

Results from this study (figure 7) showed that the majority of EIA officers in RDB and REMA and EIA experts have between four and seven years of experience in EIA process and shows also that only 10% of EIA experts has more than seven years experience. These results are obvious since REMA started in 2005 with two EIA officers. 25% who have less than 1 year belong to REMA staffs who were recently recruited in the department of Environmental regulations and pollution control.

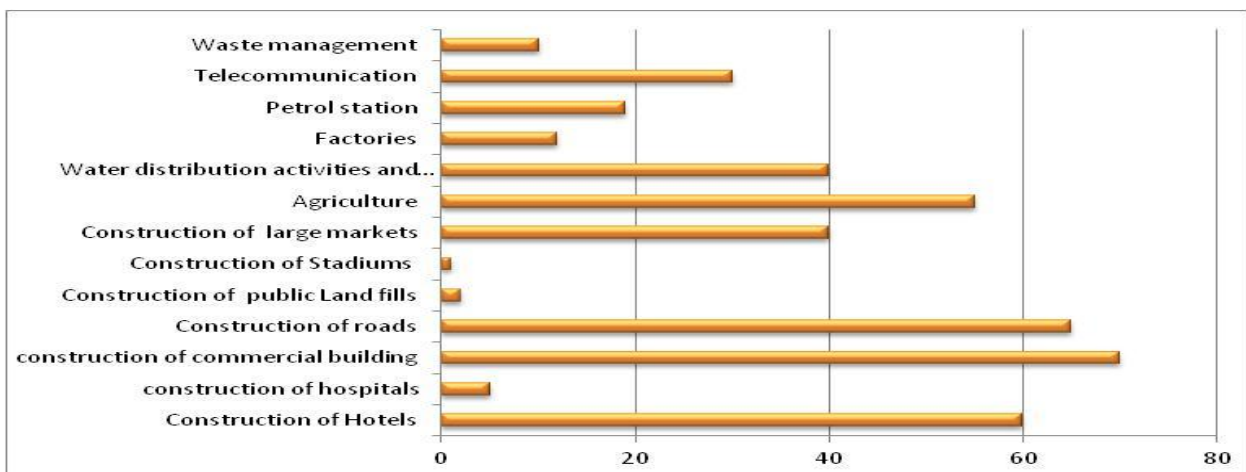
(In %, n=15 for EIA officers in RDB & REMA and n=10 for EIA experts)



**Figure 7:** Level of experience of respondents

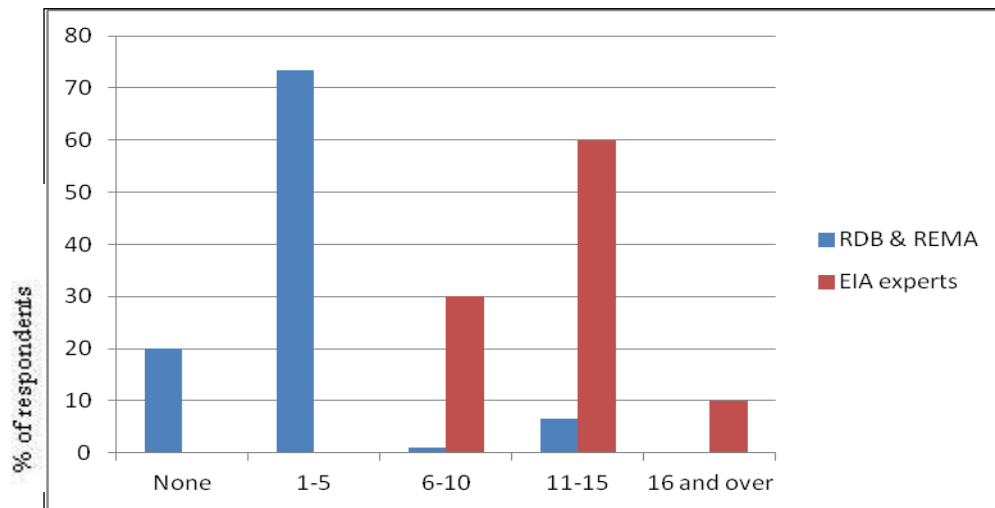
#### 4.2.5 The types of projects subjected to EIA in COK

Figure 8 shows that the majority of respondents (around 80%) were more involved in construction projects. This is due to the growth of urbanization accompanied with many construction project of hotels, commercial and habitation building in the COK.



**Figure 8 :** Type of projects in which respondent are involved in with EIA

#### 4.2.6 Professional training attended by respondents

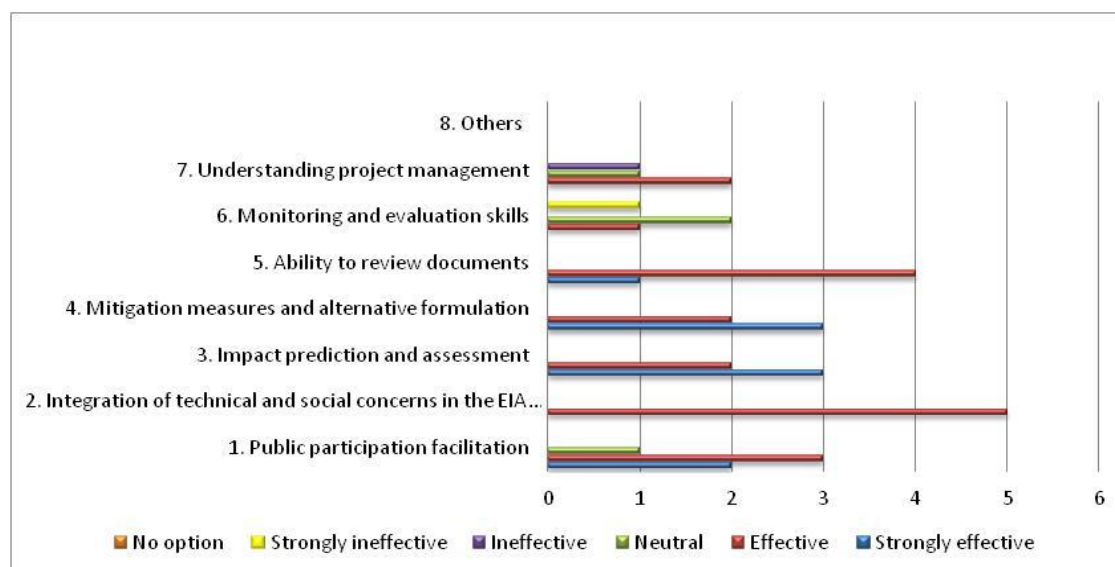


**Figure 9 :** Number of professional training attended by respondents

The figure n° 9 allow to make a comparison between the training attended by RDB and REMA EIA staff ( more that 70 % of respondents attended one to five professional training sessions) and EIA consultants who attended more professional training ( 60% attended 11-15 professional training). The results of this research also show that 20 % of REMA EIA staff have not yet attended any professional training. Moreover, it shows also that the highest number of people who attended sixteen and above professional training sessions were consultants.

#### 4.2.7. Relevant skills of RDB and REMA staff to the EIA process

The figure n° 10 highlights that more than 80% of EIA staff from RDB & REMA (n=12) believe that they are more efficient in the review of project proposals and 60 % are strongly effective in mitigation measures. Instead, 10% are strongly ineffective in monitoring and evaluation skills. This shows that REMA and RDB have to increase training of EIA staff in the area of monitoring and evaluation and project management



**Figure 10:** Relevent skills of lead agency' staff to the EIA process

### 4.3 Challenges faced in the process of EIA certificates delivery and follow up phase

#### 4.3.1 Challenges faced by lead agency in the 3 main steps of EIA process

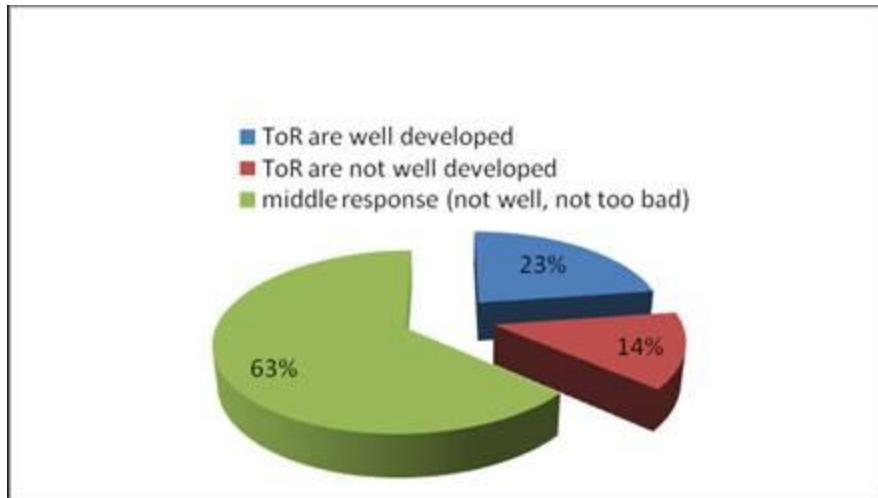
The following table n° 6 mentions some main challenges faced by REMA and RDB in the process of EIA certificates delivery and follow up phase of EIA in Rwanda.

**Table 7 :** Challenges faced by REMA & RDB in some EIA process

| Phase                                           | Challenges/gaps                                                                                                                                  |                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                 | On Policy level                                                                                                                                  | On implementation level                                                                                                                                                                                                                                                                       |
| 1. Scoping (TOR)                                | <ul style="list-style-type: none"> <li>-Lack of specific regulations for some new projects</li> <li>-Too old regulation in some areas</li> </ul> | <ul style="list-style-type: none"> <li>-Lack of specialized skills in some new areas</li> <li>-Some projects are getting ToRs without visiting them</li> </ul>                                                                                                                                |
| 2. Decision making for EIA certificate delivery | <ul style="list-style-type: none"> <li>-Pressure of development</li> </ul>                                                                       | <ul style="list-style-type: none"> <li>-Some decisions are influenced by development plan.</li> </ul>                                                                                                                                                                                         |
| 3. Monitoring and Auditing                      | <ul style="list-style-type: none"> <li>-Lack of time (few staff)</li> <li>-Non involvement of local authorities</li> </ul>                       | <ul style="list-style-type: none"> <li>-Lack of equipment, laboratories in the country.</li> <li>-Lack of ownership by developers</li> <li>-Developers do not implement their EMP after getting EIA certificates</li> <li>-Weak monitoring and auditing of EMP on the side of REMA</li> </ul> |

#### 4.3.2 Perception of respondents on the development of term of reference in the EIA process

Figure 11 show that 63% of respondents believe that ToR are slightly developed (not well and not too bad). This question was asked to EIA staff from REMA and RDB and EIA experts (n=22). Respondents explained that TOR are not well developed due lack of enough time (one interviewer affirmed that are some few cases when ToR were developed without site verification visit) , low capacity of EIA experts in development of ToR and lack of generic guideline for ToR in Rwanda.



**Figure 11:** Perception of respondent on the development of term of reference in the EIA process

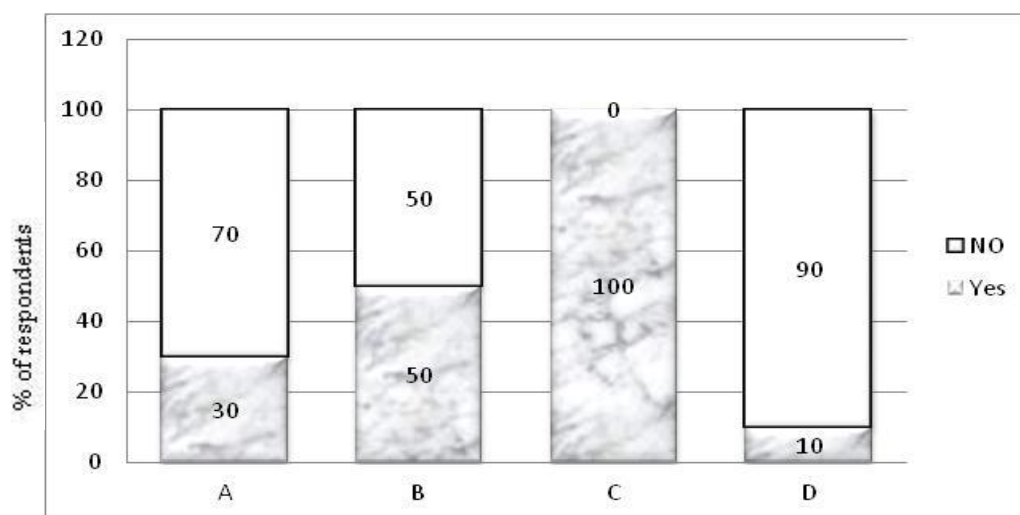
#### 4.3.3 Collaboration between REMA and RDB in the process of decision making on EIA certificates and follow up phase of EIA process in Rwanda

The collaboration between REMA and RDB were assessed based on the following points:

- A REMA participate in the phase of decision making for EIA reports
- B RDB delivers EIA certificate without REMA contentment
- C Sometimes REMA cancels EIA certificates for projects that do not comply with environmental regulations
- D Regular meeting with REMA and RDB to discuss on EIA issues

Figure 12 highlights the collaboration between REMA and RDB in the process of decision making on EIA certificates delivery and follow up phase of EIA process in Rwanda.

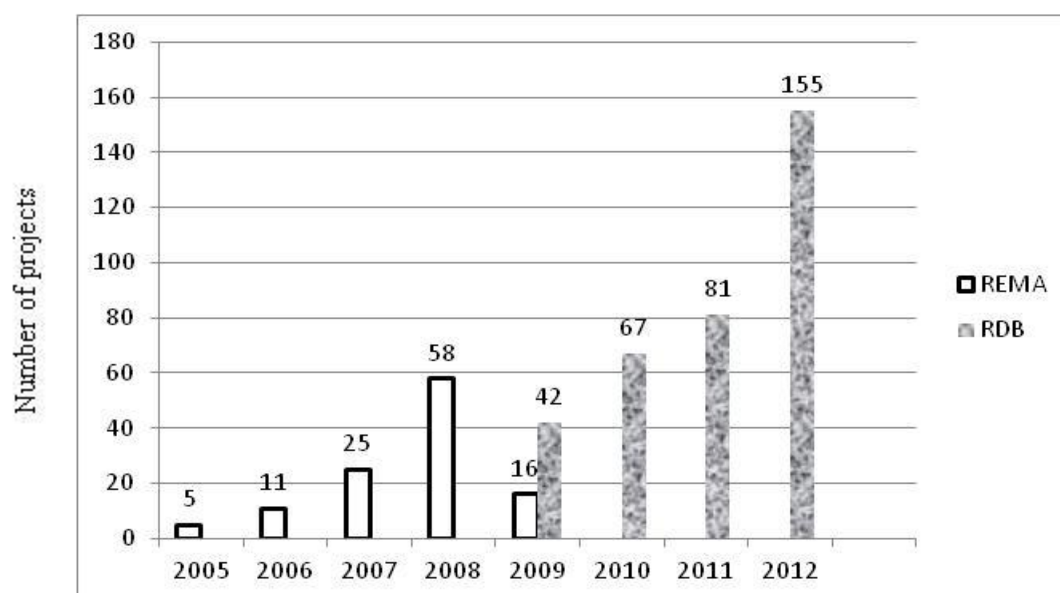
90% of respondents said that there is no regular meeting with REMA and RDB to discuss on EIA issues and sometimes REMA cancels EIA certificates delivered by RDB for projects that do not comply with environmental regulations (100% of respondents).



**Figure 12 :** Collaboration between REMA and RDB in EIA processes

#### 4.3.4 Total number of projects with EIA certificate from 2005 to August 2012

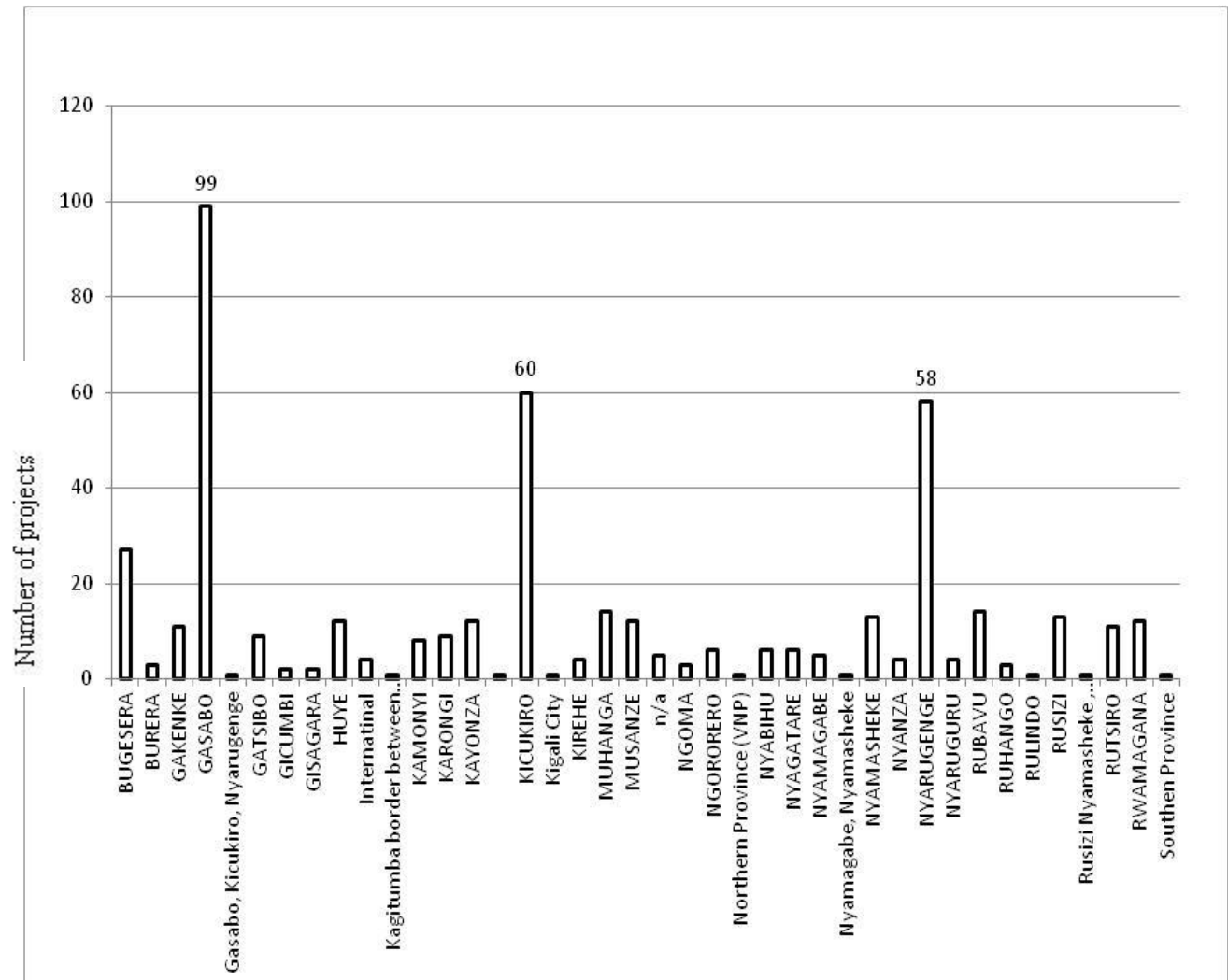
Figure 13 shows that in total 460 certificates were delivered by REMA (from 2005-2009) and RDB (from 2009 to August 2012). There is a high increase of EIA certificate delivery from 2010 to 2013 due to increase of development projects especially construction in the COK.



**Figure 13 :** Total number of projects with EIA certificate from 2005 to August 2012

#### 4.3.5 Comparison of total number of EIA certificates by District delivered from 2005 to August 2012

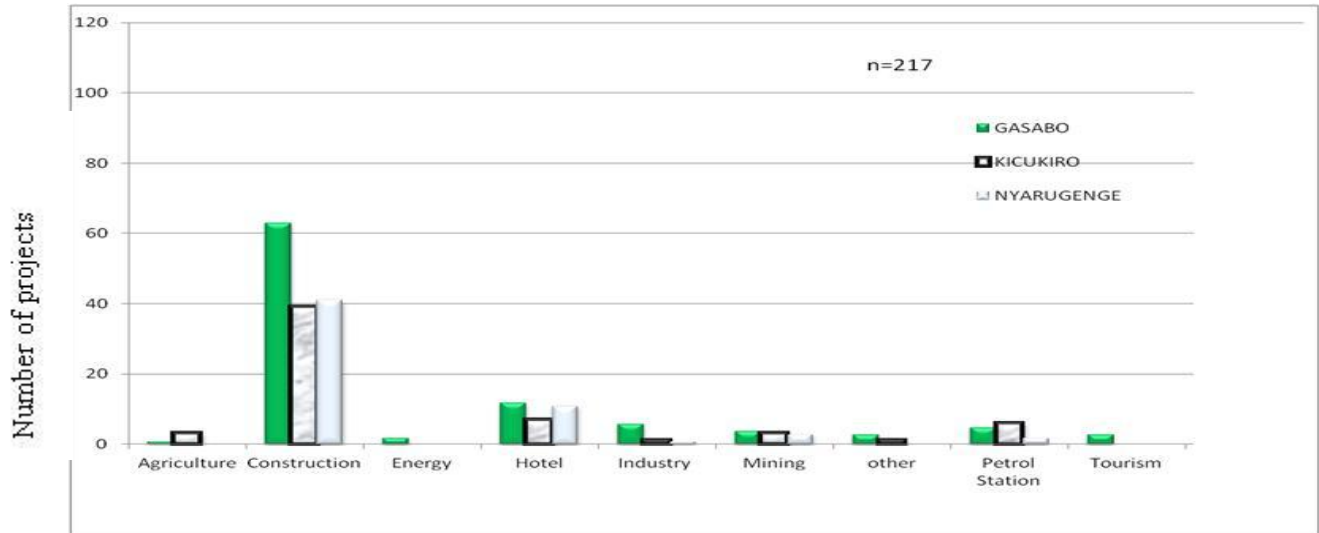
Figure 14 put the CoK on the top of record in highest number of project with EIA certificates with 47.6% of all EIA certificates in the whole country due to increase of development project in Rwanda from 2005 to 2012, especially construction project in the COK.



**Figure 14:** Total number of projects with EIA certificates by District from 2005 to August 2012

#### 4.3.6 Total number of EIA certificates by category the COK

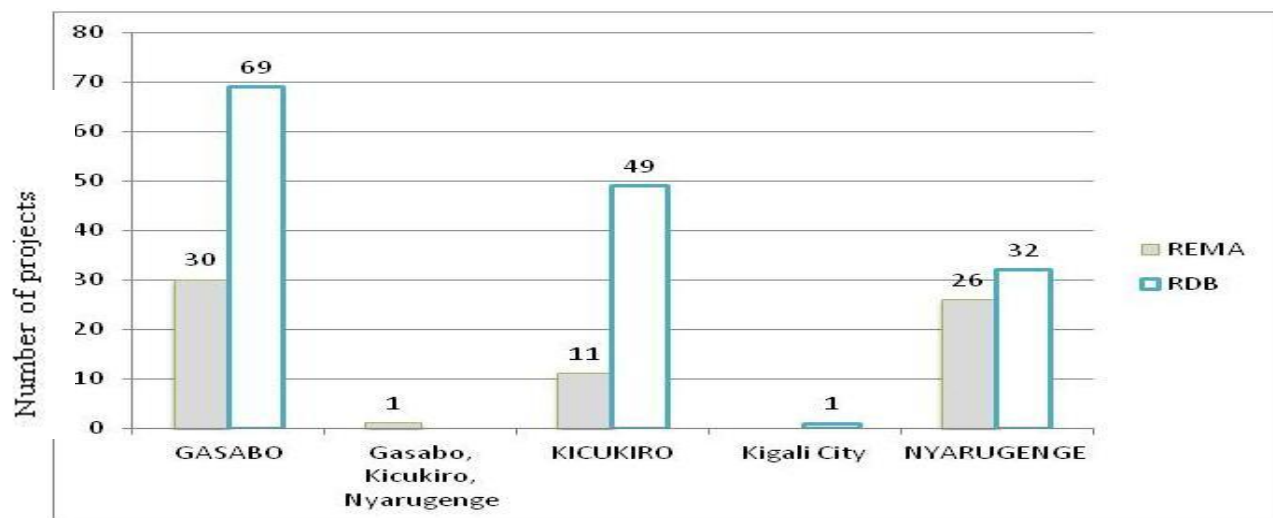
The figure n° 15 shows that from 2005 to August 2012, in the COK, 65.8 % of EIA certificates delivered were related to the construction. Most of recorded project were related to construction of hotels, commercial buildings, residents houses, roads in the COK.



**Figure 15 :** Total number of projects with EIA certificates in the City of Kigali from 2005 to August 2012

#### 4.3.7 Total number of EIA certificates in the COK from 2005 to August 2012

Figure 16 shows the total number of EIA certificates delivered by REMA and RDB in the COK from 2005 to August 2012. In total 219 EIA certificates were delivered in the COK, with 68 delivered by REMA and 151 by RDB. Gasabo District is in head with 100 projects.



**Figure 16 :** Total EIA certificates by category delivered in the CoK

### 4.3.7 Examples of projects with EIA certificate cancelled by REMA

The results of this study (100 % of respondent) revealed that REMA cancelled some EIA certificates (4 projects) of projects that did not comply with environmental regulations. Table 8 mentions some examples.

**Table 8 :** Examples of EIA certificates cancelled by REMA

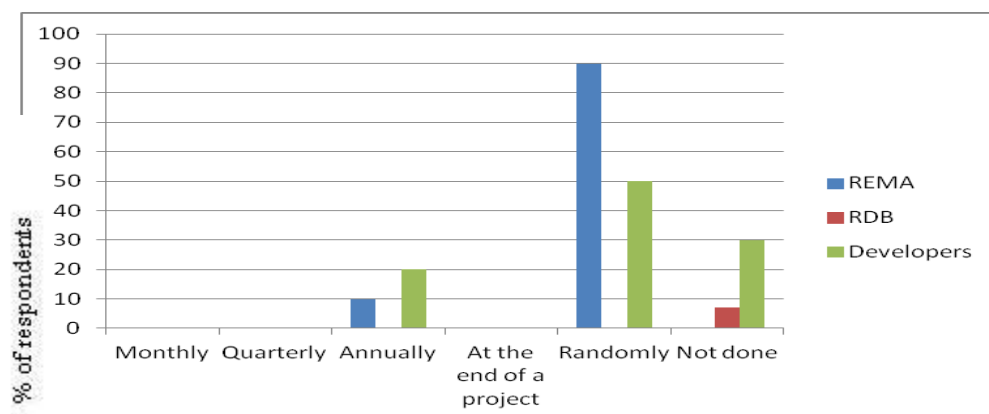
| Project             | Location         |
|---------------------|------------------|
| Merez project       | Musanze District |
| Zion Temple project | Musanze District |
| Petrol station      | CoK              |

### 4.4 Monitoring and auditing of EMP of EIA process by REMA, RDB, developers.

Respondents were asked to give their perception on the way monitoring and auditing of EMP is conducted by lead authority and developers in order to comply with EIS. The figure no 17 to 21 give some explanations.

#### 4.4.1 Frequency of monitoring and audits of EMP implementation of running projects

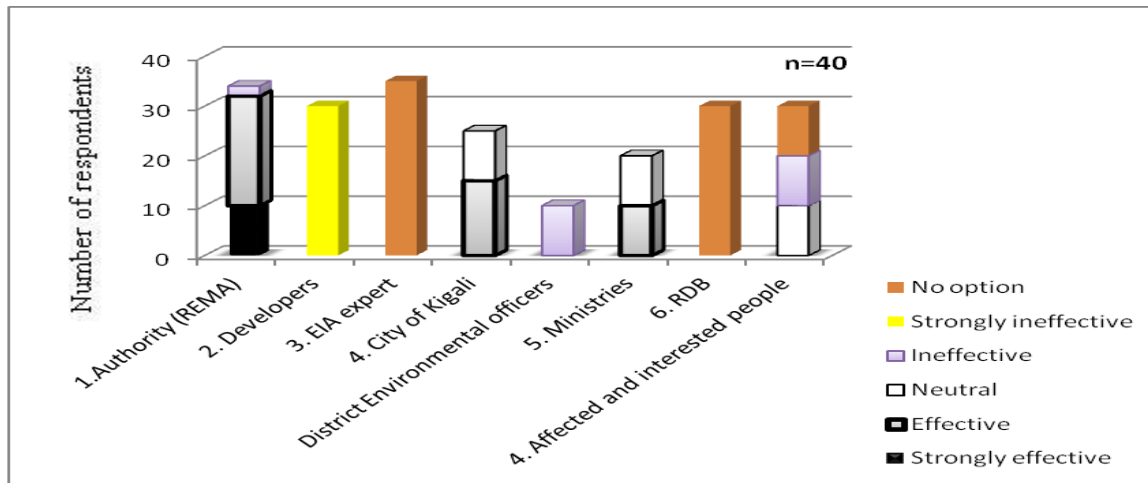
From results mentioned in the figure n° 17, its clear that 90 % of respondents assume that monitoring and auditing are conducted randomly without respecting EMP monitoring plan. The results of this research show also that 100 % of REMA respondents confirm that EMP auditing was only conducted below 50 % of projects with EIA certificates due to the lack of time.



**Figure 17 :** Frequency of Monitoring and audits of EMP in EIA process

#### 4.4.2 Stakeholders involvement in the implementation of EMP of EIA process

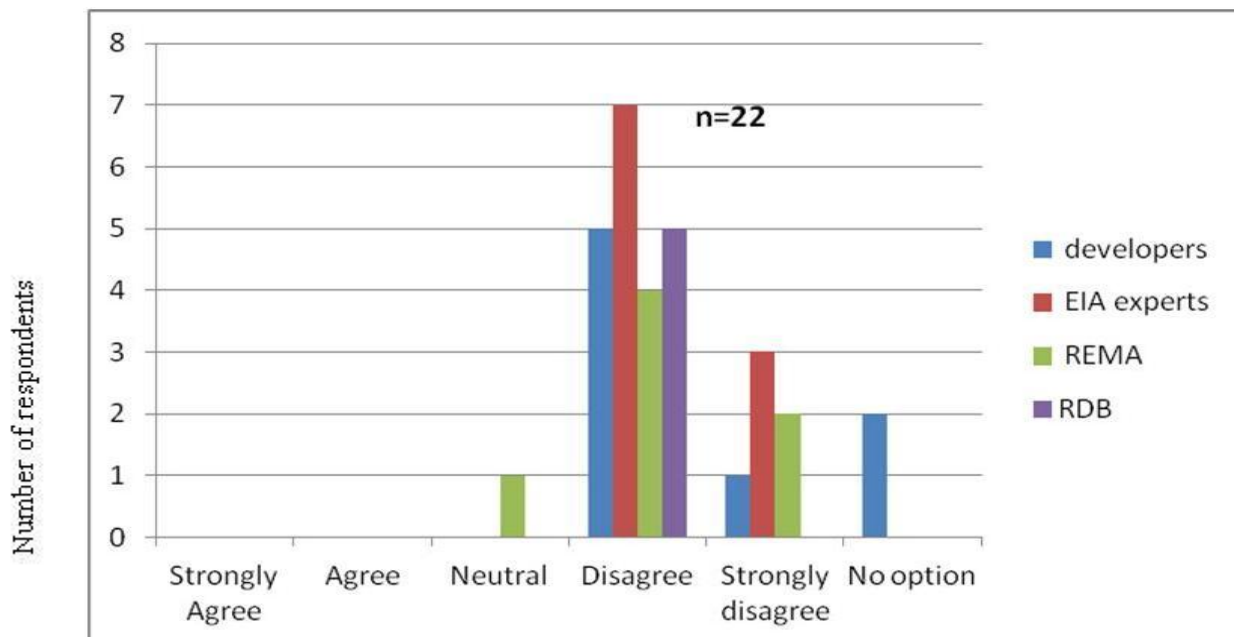
Figure 18 shows that developers are the most ineffective stakeholders in the implementation of EMP (72%) while EIA experts, RDB and affected people believe that they are not involved in the monitoring of EMP for EIA process



**Figure 18 :** Stakeholders in the involvement in the implementation of EMP for EIA process

#### 4.4.3 Perception of respondents on the compliance of developers with their EMP implementation in EIA process.

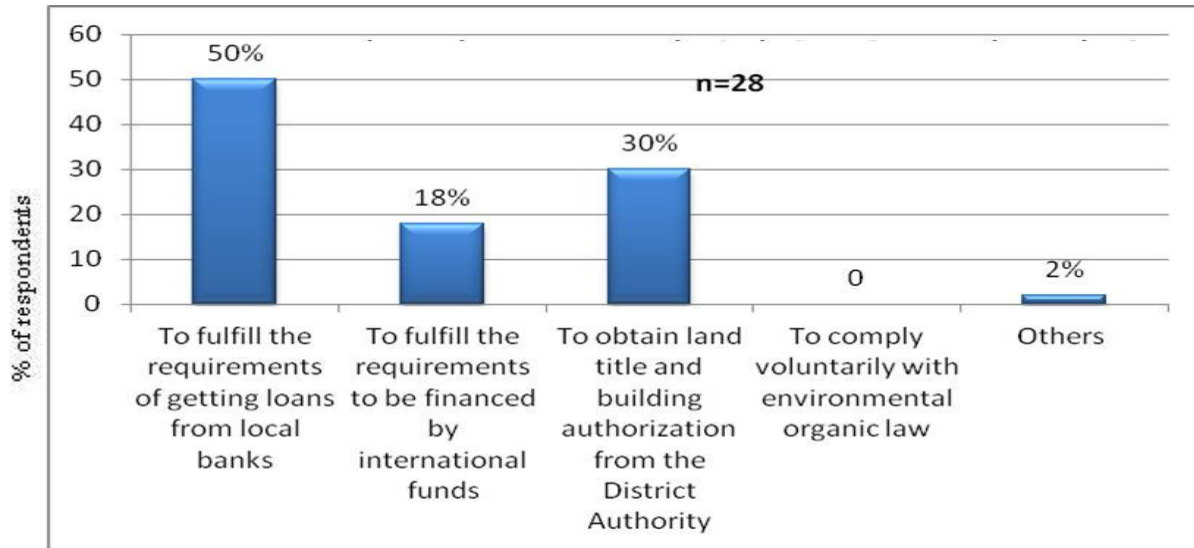
Figure 19 shows that all responded (100%) disagree on the compliance of developers while implementing their EMP of EIA process.



**Figure 19 :** Compliance of developers with their EMP implementation

#### 4.4.4 Reasons given by developers to submit their projects to the authority

Figure 20 shows that voluntarily compliance with environmental organic law is not amongst developers' reason to submit their project to the authority, while 50% submit in order to fulfill bank requirement or international sponsors.



**Figure 20 :** Reason given by developers to submit their projects to the authority

#### 4.4.5 Relationship between developers and their EIA consultants in the EIA process

Considering the role played by EIA consultants in the elaboration of EMP, respondents were asked developers continue to request their help in the implementation on the EMP. The table no 9 explains that relationship.

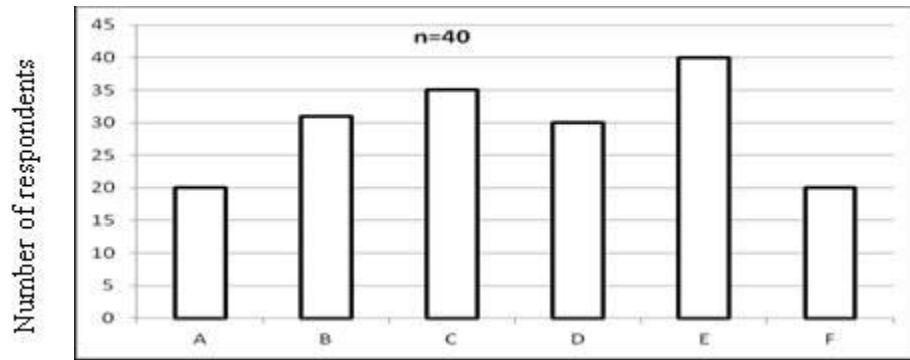
**Table 9 :** Relationship between developers and their EIA consultants in the EIA process

| Relationship                                                                               | Score n=40 |
|--------------------------------------------------------------------------------------------|------------|
| Developers provide enough information and follow-up during the preparation of EMP for EIS. | 10         |
| Developers hire a consultant to elaborate EMP monitoring report without any follow-up.     | 35         |
| Regular meeting with developers, consultant and lead authority                             | 0          |
| Developers do not know anything about EIA                                                  | 20         |

Table 9, shows a high score of respondent (87%) who believe that developers do not fully participate in the EMP preparation.

#### 4.4.6 The reason of developer's non compliance with their EMP in EIA process

Figure 21 gives illustrates the reasons given by respondents to explain why developers do not comply with their EMP for EIA process. 87% of respondents (35 out of 40 individuals ) believe that developers avoid the cost of conducting EMP monitoring and local authorities are not fully involved in EMP auditing. REMA and RDB do not follow all EMP as required.



**Figure 21 :** Reasons of developer's non compliance with their EMP in EIA process

- A. Lack of time
- B. Developers do not understand the EMP
- C. Avoid cost of conducting EMP monitoring
- D. Lack of follow up to EMP on REMA side
- E. Local authorities not fully involved in EMP auditing
- F. no sanction planned for those who do not conduct internal monitoring

#### 4.5 Contribution of EMP implemented for EIA process in promoting sustainable development of the affected and interested people.

Table 10 shows that 61 % of respondents judge effective the EMP of EIA process implemented in the City of Kigali especially for job creation and resolving environmental problems and improving social, economic and environmental of affected people in the CoK (n=54)

**Table 10 :** Contribution of EMP of EIA process towards sustainable development

|                                                                                                         | <b>Strongly effective</b> | <b>Effective</b> | <b>Neutral</b> | <b>Ineffective</b> | <b>Strongly ineffective</b> | <b>No option</b> |
|---------------------------------------------------------------------------------------------------------|---------------------------|------------------|----------------|--------------------|-----------------------------|------------------|
| 1. Contribution in resolving and prevention of environmental problems (soil erosion, pollution, etc     | 5                         | 10               | 3              |                    |                             |                  |
| 2. Contribution in job creation, taxes,                                                                 | 3                         | 15               |                |                    |                             |                  |
| 3. Contribution in social wellbeing of affected and interested people<br>studies are not well developed |                           | 8                | 7              | 3                  |                             |                  |

Respondents highlighted other indicators of contribution of EMP implementation for EIA process in promoting sustainable development such as

- Public participation in decision making for EIA process.
- Incorporating the concerns of affected and interested people.
- Guarantees long term benefits
- Contribution in biodiversity conservation

## **CHAPTER FIVE: DISCUSSION**

### **5.1 Introduction**

In this chapter, the discussion of questionnaire survey results is based on a critical analysis of obtained results and its comparison with other EIA findings of different authors and researchers from different countries. Concerning data quality, it was difficult to get all copies of EIS in both REMA and RDB offices. This is a general concerns in many environment departments (e.g. South Africa – Wood, 2002). Interview with high authorities in EIA process was also not possible because they are always busy to allow research appointment.

### **5.2 Challenges faced by REMA and RDB in the process of decision making on EIA certificates and follow up phase of EIA in Rwanda**

As indicated in the table n° 6 showing challenges faced by REMA & RDB in some EIA process, this study focused on 3 main steps of EIA process (elaboration of TOR , decision making for EIA certificate delivery and follow up phase) which affect immediately the implementation of EMP as planed in the EIS. Some challenges mentioned in this study such as lack of skills, equipments, among others, are significantly related to the level of education and number of training received by EIA officer in REMA and RDB (section 4.2.6) where REMA Staff in charge of EIA process have Bachelor's degree (75%) while all EIA experts' respondents to this research have Masters Degree (100%) with more experience in EIA process (10 % wit 7 year and over) . The EIA consultants in Rwanda are more educated than EIA officers (Munyazikwiye, 2010). Furthermore, the current job of 25 % EIA officer in REMA and RDB is not strongly related to the EIA process. This situation is similar to Mozambique and other developing countries where EIA is still young (Hatton *et al.*, 2003 cited by Munyazikwiye, 2010). Having an EIA department of only scientist's staff has a negative effect on EIA effectiveness as submitted by Holm-Hansen (1997). This research showed that 10% of REMA and RDB's EIA staff is inefficient with technical skills related to the monitoring, auditing, evaluation and understanding of project management (section 4.2.7). This constitutes a hindrance to implement the follow up phase of EIA process (Hermogene, 2011). The lack of trained human resources and of financial resources often leads to the preparation of inadequate and irrelevant EIA reports (Clark, 1999), the decision making for EIA certificates may be influenced by corruption (Boyle,

1998; Donnelly et al., 1998). A lack of capacity to implement policy is characteristic of many of the countries in the region and has been a further obstacle to uniform and effective implementation of EIA (Weaver et al. 2002). According to Weaver, (2002), Africa needs capacity-building for EIA administrators, practitioners and the public; monitoring of compliance with EIA recommendations linking EIA with the full project life cycle and other high-level decision-making processes.

This study observed a negative relationship ( $r = -0.176$ ,  $P=0.000$ ) between perception of respondents regarding development of the ToR in EIA process and perception of respondent on monitoring and auditing of EMP of EIA process by REMA, RDB, developers. (section 4.3.2 and 4.4.3). In fact, 63 % of respondents confirm that the TORs for EIA process are not well developed and 100 % of respondents disagree on compliance of developers with their EMP in the EIA process. 20 % of respondent confirmed that some ToRs are even elaborated without visiting the working site. As results, developers ignore what has been planned in their EMP, their aim is not a voluntarily will to comply with environmental organic, but it is to get an EIA certificate which will help them to be allowed to implement their projects law (section 4.4.4)

This study allows also insights into EIA relationship between EIA project developers, EIA experts and lead agency (REMA and RDB) which affect immediately the decision making for EIA report and its follow up phase (section 4.4.5). Concerning the collaboration between REMA and RDB in decision making for EIA certificates and follow up phase for EIA process, this study showed that 70 % of respondent confirmed that REMA does not participate in the phase of decision making for EIA reports (section 4.3.3). As consequence, REMA as lead agency canceled some EIA certificates delivered by RDB (table n° 7). Rwanda is a unique country which has an EIA administrative body which has different responsibilities which are not necessarily related to environmental issues since RDB was established as a specialized organ in charge of fast tracking development activities. The investment and business departments have a tendency of influencing the EIA department (Munyazikwiye, 2010).

Concerning appealing process, the government still maintains fully monopoly through its institutions (REMA and RDB) on decision making for EIA certificate. According to the Art. 11 of official gazette no 22 of 15 November 2008,) if a developer is not satisfied with the

decision of lead agency (in case a project is not approved), he may appeal against the decision of the Authority to the Ministry in charge of environment (MINIRENA).

However, the decision made by the Ministry may be biased by the lead authority so that it would be like appealing to same people (“Kurega uwo uregera”). Some authors suggest that EIA decision making process should include also independent specialists prior to finalization. However, some countries like China and Cameroon do not provide the appealing process in their EIA procedure (Wang *et al.* 2003, Alemagi *et al.*, 2007 cited by Munyazikwiye, 2010)

Concerning relationship between developers and EIA experts (section 4.4.5), all respondents (100%) confirmed that relationship between developers and EIA experts end after getting EIA certificate. The EIA experts are professionals that are statutory required to register with REMA and help the developer to prepare EIA report based on the ToR developed by him or by the Authority (REMA), prepare the EMP and design mitigation measures and associated cost required for their implementation (Mashinga, 2007). Therefore, there is a need for developers to keep in touch with EIA experts even during the project implementation.

### **5.3 Perception of developers, EIA experts and lead authority on EMP implementation**

There was a difference ( $P=0.003$ , Fisher’s Exact Test) in the views held by REMA, RDB EIA staff and EIA experts on the participation in the EMP implementation. 70% of RDB EIA staff believes that they are not concerned by EMP follow up while 60% of EIA experts and REMA mentioned that RDB EIA staff is also concerned by all stage of EIA including monitoring and auditing of EMP of EIS (figure n° 18) In accordance to the Cabinet Minutes of 25/3/2009, RDB carry out the EIA activities on behalf and under the supervision of REMA; conducting Environmental Audit and prepare reports thereon is part of RDB’s duties and responsibilities.

In this study, EIA experts were mentioned by 75 % to not be involved in implementation of EMP for EIA process (section 4.2.7). This is surprising as EIA experts are the group who know most about EMP content should keep in touch with developers who hired EIA experts and wait for the decision for their EIS without any follow-up (table n° 9 showing relationship between developers and their EIA consultants in the EIA process) .

#### **5.4 To which extent do developers comply with their EMP to produce intended results in promoting sustainable development**

There was no difference ( $P=1.000$ , Fisher's Exact Test) in the views held by all respondents on the compliance of developers with their EMP implementation. 80 % of all respondents recognized that developers do not comply with their EMP for EIA process (section 4.4.3) Other authors like Weaver (2003), Mashinga (2007) showed also that developers of most of developing countries do not comply with EMP implementation for EIA process.

As confirmed by more than 60% of respondents to this study (section 4.4.4), the main reasons of developers' non compliance are lack of strong follow up by lead authority (REMA), ignorance on what has been mentioned in their EIS, and bad will of developers to spend cost of conducting EMP monitoring "The Developer has the responsibility of ensuring the implementation of mitigation measures and subsequent monitoring and Auditing are conducted as per EMP requirement. If he does not have technical skills, he has to hire an independent Monitoring and Auditing Expert to do it on his behalf. The reality is that very few if any meet that requirement. This situation is attributed to lack of effective and legally binding monitoring mechanism in place, and there is no consequence (punishment) for non-compliant" said Mashinga (interview results)

Some developers perceive EIA as a barrier not as a tool for sustainable development (Mashinga 2007). The results interview conducted in the CoK show also that some developers, from private sector or Government institutions, prefer to work hidden without registering for EIA certificates. According to the reports of Districts environmental facilitators known as REMA's interns, in the CoK as well in the others Districts of our country, there are still some projects undertaken without EIA certificates. REMA has the responsibility to audit these projects and adopt adequate measures in order to ensure that the rise of development observed in the CoK is sustainable (UNEP, 2011).

## **5.5 Contribution of EMP for EIA process in promoting sustainable in the COK**

From analysis conducted on EIA's data recorded by REMA and RDB from May 2005 to August 2012, results showed that a total number of 460 EIA certificates were delivered in different areas of projects development. The Districts of CoK (Gasabo, Kicukiro and Nyarugenge) are heading other Districts of the country in the number of projects submitted to EIA process, with 47.6% of all projects recorded from May 2005 to August 2012 (section 4.3.5 showing the total number of projects with EIA certificates by District from 2005 to August 2012). Amongst those projects, analysis shows that more than 67% are related to construction category (section 4.3.6).

As confirmed by 70 % of respondents, all mentioned projects contributed to sustainable development of local population and therefore contributing to well being of affected community. Results from EICV3 also show that population has grown most in the COK attracted by economic development and well being. Although the potential for EIA to contribute to sustainable development is difficult to estimate, this study showed that development projects have increased in the COK since 2005 and EIA as a tool for sustainable development has helped affected community to achieve sustainable development by improving their well being with job creation, and in resolving and mitigating environmental and climate change problems. This study did not conduct mathematical calculation on the input of EIA's process in promoting sustainable development.

For EIA to effectively contribute to sustainable development, it needs to show that it can contribute to poverty alleviation, employment creation and improved economic development (Weaver, 2002).

## **CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS**

This study on assessment of effectiveness of EIA and its potential implication for sustainable development in Rwanda is the first study conducted in the CoK focusing two important steps of EIA namely decision making for EIA certificates delivery and the implementation of Environmental Management Plan (EMP) of EIA reports recorded by REMA and RDB and show their consequential implications for sustainable development.

REMA and RDB face some challenges in the decision making for EIA certificates delivery and in the implementation of Environmental Management Plan (EMP). Amongst the main challenges this study highlighted the lack of training and required skills to prepare the ToR for some projects with advanced technologies and conduct monitoring and auditing. There is need of training in order to increase the EIA regulators' capacity to undertake and review EIA and conduct their monitoring and auditing. Lack of training for environmental officers is regarded as one of the biggest challenges facing EIA officers in Rwanda since 90% of the respondents strongly agreed or agreed with this statement.

This study gives also insights into EIA relationship between EIA project developers, EIA experts and lead agency (REMA and RDB) which affect immediately the decision making for EIA report and its follow up phase. This study showed also that developers do not comply with their EMP to produce intended results in promoting sustainable development. Therefore , the level of environmental monitoring and audit in the EIA process should be improved, and all steps provided by general EIA guidelines in Rwanda should be respected in EIA implementation.

The COK will continue to expand, it will receive more people from rural areas attracted by many projects of construction and industry, within an ecosystem which have limited regenerative capacities. Therefore all EIA process should be respected as a tool for sustainable development, especially the implementation of EMP. It is key that in its application, practitioners, developers and decision-makers ensure that the follow up phase of EIA is well implemented in order to serve as real tool rather than a paper work

As recommendation, this study suggests lead agency (REMA and RDB)

- Promoting and supporting capacity building for its EIA staff, developers and EIA expert
- Developing EIA Audits Guidelines specially for new projects with advanced technologies
- Elaborate an auditing plan and checklist for all projects and conduct EIA Audits on regular basic. The frequency of audits should reflect the level of significance of environmental impacts and the results of previous audits.
- To avail EIS and TOR to the public (published on website,..)
- Increasing private sector and public participation in the EIA process by conducting regular meetings with developers, EIA consultants and other important EIA stakeholders in Rwanda
- strengthening relationship between REMA-RDB, EIA experts-developers in the assurance of certificates delivery and implementation of EMP
- To make EIA department independent, directly under REMA supervision (not under supervision by RDB). This improve the effectiveness of EIA processes and to avoid the risk of being influenced by the investment and business department in RDB

## ACKNOWLEDGMENTS

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## APPENDIX

## **APPENDIX 1: Questionnaire for REMA and RDB Staff**

**Theogene NGABOYAMAHINA**

**National University of Rwanda**

**Faculty of Science**

**Biology Department**

**Msc Biodiversity Conservation**

**RE: Survey on Assessment of effectiveness of Environmental Impact Assessment (EIA) and its potential implication for sustainable development in Rwanda**

**Dear Madam/Sir**

I am writing to ask your help to provide important information that will help in preparing my research on Assessment of effectiveness of Environmental Impact Assessment (EIA) and its potential implication for sustainable development in Rwanda. In this respect I would like you to complete the following survey and return it electronically by 6 May 2013 via email [ngaboth2004@gmail.com](mailto:ngaboth2004@gmail.com)

This survey will contribute to enhancing the effectiveness of Environmental Impact Assessment (EIA) by assessing the implementation of Environmental Management Plan (EMP) as mentioned in EIA reports recorded by REMA and RDB and show consequential implications for sustainable development in our country.

This survey is being carried out in the framework of research for Masters Degree in Biodiversity and Conservation. Your administration has been carefully selected to participate and provide a representative sample of the views of main stakeholders in EIA process. All contributions will be used in a “non-attributable” way. For additional information or clarification contact Theogene NGABOYAMAHINA telephone 0788 56 71 58

Yours Sincerely,

**Theogene NGABOYAMAHINA**

**NATIONAL UNIVERSITY OF RWANDA**

**FACULTY OF SCIENCE**

**BIOLOGY DEPARTMENT**

**MSC BIODIVERSITY CONSERVATION**

**Assessment of effectiveness of Environmental Impact Assessment (EIA) and its potential implication for sustainable development in Rwanda (By Theogene NGABOYAMAHINA)**

---

**Questionnaire for REMA and RDB Staff**

**A. RESPONDENT'S IDENTIFICATION**

1. First Name (optional): .....
2. Surname (optional): .....
3. Institution: .....
4. Job title: .....

**B. RESPONDENT'S QUALIFICATION AND EXPERIENCE**

**(Please highlight the right answer)**

1. What is your level of education?

- |                            |   |
|----------------------------|---|
| Advanced level             | 1 |
| Bachelor's degree          | 2 |
| Post graduate diploma      | 3 |
| Master's degree            | 4 |
| Doctor of Philosophy (PhD) | 5 |

2. How would you describe the relationship between what you studied and your job requirement?

- |                  |   |
|------------------|---|
| Strongly related | 1 |
| Related          | 2 |
| Not related      | 3 |

3. How long (in years) have you been working in the current job?

|            |   |
|------------|---|
| >1         | 1 |
| 1-2        | 2 |
| 3-4        | 3 |
| 4-6        | 4 |
| 7 and over | 5 |

4. How many professional training related to EIA (workshops, seminars, etc) have you attended?

|        |   |
|--------|---|
| None   | 1 |
| 1-5    | 2 |
| 6-10   | 3 |
| 11-15  | 4 |
| 16 and | 5 |

5. How effective are you with the following skills relevant to the EIA process?

|                                                 | Strongly effective | Effective | Neutral | Ineffective | Strongly ineffective | No option |
|-------------------------------------------------|--------------------|-----------|---------|-------------|----------------------|-----------|
| 1. Public participation facilitation            | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 2. Integration of technical and social concerns | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 3. Impact prediction and assessment             | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. Mitigation measures and alternative          | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 5. Ability to review documents                  | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 6. Monitoring and evaluation skills             | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 7. Understanding project management             | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 8. Others (Please specify)                      | 1                  | 2         | 3       | 4           | 5                    | 6         |

### C. CHALLENGES AND OPPORTUNITIES IN THE IN THE PROCESS OF DECISION MAKING AND FOLLOW UP PHASE OF EIA IN RWANDA

(Please highlight the right answer)

1. What are the challenges faced by REMA and/or RDB in the following face of EIA process?

| Phase              | Challenges/gaps |                         |
|--------------------|-----------------|-------------------------|
|                    | On Policy level | On implementation level |
| 1. Scoping (TOR)   |                 |                         |
| 2. Decision making |                 |                         |
| 3. Monitoring      |                 |                         |

2. What do you think about the development of Terms of Reference (ToR) for EIA?

|                            |     |    |
|----------------------------|-----|----|
| ToR are well developed     | Yes | No |
| ToR are not well developed | Yes | No |

3. If no, why Terms of Reference (ToR) are not well developed?

|                                                   |     |    |
|---------------------------------------------------|-----|----|
| Lack of enough time                               | Yes | No |
| Data not available                                | Yes | No |
| Low capacity of EIA experts in development of ToR | Yes | No |
| There are no generic guideline for ToR in Rwanda  | Yes | No |

4. Most of the EIAs are carried out at the following stage of the project (choose one).

|                                          |   |
|------------------------------------------|---|
| During the planning stage of the project | 1 |
| During the implementation of the project | 2 |
| After the implementation of the project  | 3 |

5. What do you think about collaboration between REMA and RDB in EIA process?

|                                                                                                        |     |    |
|--------------------------------------------------------------------------------------------------------|-----|----|
| REMA participate in the phase of decision making for EIA reports                                       | Yes | No |
| RDB delivers EIA certificate without REMA contentment                                                  | Yes | No |
| Sometimes REMA cancels EIA certificates for projects that do not comply with environmental regulations | Yes | No |
| Regular meeting with REMA and RDB to discuss on EIA issues                                             | Yes | No |

6. How many projects that did REMA stop because they didn't comply with environmental regulations?

- 1) .....  
2) List some examples.....

7. What do you think is the relationship between developers and their consultants generally?

|                                                                               |     |    |
|-------------------------------------------------------------------------------|-----|----|
| Developers provide enough information and follow-up                           | Yes | No |
| Developers hire a consultant and wait for the decision without any follow-up. | Yes | No |
| Regular meeting with developers, consultant and authority                     | Yes | No |
| Developers do not know anything about EIA                                     | Yes | No |

## D. PARTICIPATION OF LEAD AUTHORITY (REMA & RDB) IN THE FOLLOW UP PHASE OF EIA REPORTS (EMP implementation)

(Please highlight the right answer)

1. To what extent do you think EMP of EIA process is implemented in in the City of Kigali?

| Strongly Agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|----------------|-------|---------|----------|-------------------|-----------|
| 1              | 2     | 3       | 4        | 5                 | 6         |

2. To what extent do you agree or disagree with the following statements?

|                                                                                                                      | Strongly Agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|----------------------------------------------------------------------------------------------------------------------|----------------|-------|---------|----------|-------------------|-----------|
| 1. All steps of EIA provided by the law are respected                                                                | 1              | 2     | 3       | 4        | 5                 | 6         |
| 2. Most of the terms of References of EIA studies are prepared by the authority                                      | 1              | 2     | 3       | 4        | 5                 | 6         |
| 3. Impact monitoring is often carried out after project approval                                                     | 1              | 2     | 3       | 4        | 5                 | 6         |
| 4. Monitoring of EMP is regularly carried out by the authority                                                       | 1              | 2     | 3       | 4        | 5                 | 6         |
| 5. Environmental audit is regularly carried out by the authority                                                     | 1              | 2     | 3       | 4        | 5                 | 6         |
| 6. Sensitization and training activities organized by REMA for EIA consultants, developers, local authorities, media | 1              | 2     | 3       | 4        | 5                 | 6         |

3. What do you think are the responsibilities of REMA in EMP's implementation?

| Role and responsibilities                                                                                    | YES | NO |
|--------------------------------------------------------------------------------------------------------------|-----|----|
| Did REMA appoint a specific environmental management representative for EIA auditing?                        |     |    |
| Did REMA provide the resources essential to the implementation and Control of EMP?                           |     |    |
| Have all training needs been identified?                                                                     |     |    |
| Are staff competent to fulfill their roles under the EMPs?                                                   |     |    |
| Are appropriate procedures established for external communications regarding the EMPs?                       |     |    |
| Are proper document control procedures established?                                                          |     |    |
| Did REMA undertake regular site visits to inspect EMP implementation?                                        |     |    |
| Did REMA prepare periodic environmental consolidated reports on the monitoring progress of running projects? |     |    |

4. When does REMA usually carry out the audits of EMP implementation for running projects?

| Monthly | Quarterly | Annually | At the end of a project | Randomly | Not done |
|---------|-----------|----------|-------------------------|----------|----------|
| 1       | 2         | 3        | 4                       | 5        | 6        |

5. Could you please estimate the percentage of Projects that REMA conducted in EMP's auditing?

| More than 70% | 70-50% | 50-10% | 10-1% | None | Don't Know |
|---------------|--------|--------|-------|------|------------|
| 1             | 2      | 3      | 4     | 5    | 6          |

6. To what extent do you think stakeholders are involved in the implementation of EMP of EIA process?

|                                   | Strongly effective | Effective | Neutral | Ineffective | Strongly ineffective | No option |
|-----------------------------------|--------------------|-----------|---------|-------------|----------------------|-----------|
| 1. Authority (REMA)               | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 2. Developers                     | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 3. EIA expert                     | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. City of Kigali                 | 1                  | 2         | 3       | 4           | 5                    | 6         |
| District Environmental officers   |                    |           |         |             |                      |           |
| 5. Ministries                     | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. Affected and interested people | 1                  | 2         | 3       | 4           | 5                    | 6         |

## E. EFFECTIVENESS OF EIA IN KIGALI CITY AND ITS CONTRIBUTION FOR SUSTAINABLE DEVELOPMENT

1. How effective are EIA reports of projects conducted in the City of Kigali?

| Visible effectiveness | Directly or indirectly effective | Ineffective | Uncertain |
|-----------------------|----------------------------------|-------------|-----------|
| 1                     | 2                                | 3           | 4         |

2. To what extent do you think EIA process had contributed to sustainable development (Social, Economic, and Environment) of the affected and interested people?

|                                                                                                     | Strongly effective | Effective | Neutral | Ineffective | Strongly ineffective | No option |
|-----------------------------------------------------------------------------------------------------|--------------------|-----------|---------|-------------|----------------------|-----------|
| 1. Contribution in resolving and prevention of environmental problems (soil erosion, pollution, etc | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 2. Contribution in job creation, taxes, ..                                                          | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 3. Contribution in social wellbeing of affected and interested people                               | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. Impact monitoring is often carried out after project                                             | 1                  | 2         | 3       | 4           | 5                    | 6         |

***Thank you.***

## APPENDIX 2: Questionnaire for EIA experts

### A. RESPONDENT'S IDENTIFICATION

1. First Name (optional): .....
2. Surname (optional): .....
3. Institution: .....
4. Job title: .....

### B. RESPONDENT'S QUALIFICATION AND EXPERIENCE

(Please highlight the right answer)

1. What is your level of education?

- |                            |   |
|----------------------------|---|
| Advanced level             | 1 |
| Bachelor's degree          | 2 |
| Post graduate diploma      | 3 |
| Master's degree            | 4 |
| Doctor of Philosophy (PhD) | 5 |

2. How would you describe the relationship between what you studied and your job requirement?

- |                  |   |
|------------------|---|
| Strongly related | 1 |
| Related          | 2 |
| Not related      | 3 |

6. How long (in years) have you been working as EIA Expert/ consultant?

|            |   |
|------------|---|
| >1         | 1 |
| 1-2        | 2 |
| 3-4        | 3 |
| 4-6        | 4 |
| 7 and over | 5 |

7. How many professional training related to EIA (workshops, seminars, etc) have you attended?

- |        |   |
|--------|---|
| None   | 1 |
| 1-5    | 2 |
| 6-10   | 3 |
| 11-15  | 4 |
| 16 and | 5 |

### C. PERCEPTION OF EIA EXPERT IN THE IMPLEMENTATION OF EMP IN EIA PROCESS.

1. What do you think that is the relationship between Developers and their EIA Consultants generally?

|                                                                               |     |    |
|-------------------------------------------------------------------------------|-----|----|
| Developers provide enough information and follow-up                           | Yes | No |
| Developers hire a consultant and wait for the decision without any follow-up. | Yes | No |
| Regular meeting with developers, consultant and authority                     | Yes | No |
| Developers do not know anything about EIA                                     | Yes | No |

2. Most of the EIAs are carried out at the following stage of the project (choose one)

|                                          |   |
|------------------------------------------|---|
| During the planning stage of the project | 1 |
| During the implementation of the project | 2 |
| After the implementation of the project  | 3 |

3. Most of the developers submit their projects to the authority because of the following reasons (you are welcome to provide multiple responses):

|                                                                   |   |
|-------------------------------------------------------------------|---|
| To fulfill the requirements of getting loans from local banks     | 1 |
| To fulfill the requirements to be financed by international funds | 2 |
| To obtain land title and building authorization from the District | 3 |
| To comply voluntarily with environmental organic law              | 4 |
| Others (specify)                                                  | 5 |

4. Are you involved in the EIA process?

|     |    |
|-----|----|
| Yes | No |
| 1   | 2  |

5. If yes, at which stages of the EIA process are you involved (you are welcome to provide multiple responses)?

|                               |   |
|-------------------------------|---|
| Screening                     | 1 |
| Scoping                       | 2 |
| Assessing and mitigation      | 3 |
| Reviewing and decision-making | 4 |
| Monitoring                    | 5 |

6. What do you think about the development of Terms of Reference (ToR)?

|                            |     |    |
|----------------------------|-----|----|
| ToR are well developed     | Yes | No |
| ToR are not well developed | Yes | No |

7. If no, why Terms of Reference (ToR) are not well developed?

|                                                   |     |    |
|---------------------------------------------------|-----|----|
| Lack of enough time                               | Yes | No |
| Data not available                                | Yes | No |
| Low capacity of EIA experts in development of ToR | Yes | No |
| There are no generic guideline for ToR in Rwanda  | Yes | No |

8. To what extent do you agree or disagree that a developer is considered as a stakeholder in the implementation of EMP of the EIA process?

|                |       |         |          |                   |           |
|----------------|-------|---------|----------|-------------------|-----------|
| Strongly agree | Agree | Neutral | Disagree | Strongly disagree | No option |
| 1              | 2     | 3       | 4        | 5                 | 6         |

9. What do you think are the responsibilities of Developers in the implementation of EMP?

.....

10. What do you think are the responsibilities of EIA experts/Consultants in EMP's implementation?

.....

#### **D. PARTICIPATION OF LEAD AUTHORITY (REMA & RDB) IN THE FOLLOW UP PHASE OF EIA REPORTS (EMP implementation)**

1. To what extent do you agree or disagree with the following statements?

|                                                                                                                      | Strongly Agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|----------------------------------------------------------------------------------------------------------------------|----------------|-------|---------|----------|-------------------|-----------|
| 1. All steps of EIA provided by the law are respected                                                                | 1              | 2     | 3       | 4        | 5                 | 6         |
| 2. Most of the terms of References of EIA studies are prepared by the authority                                      | 1              | 2     | 3       | 4        | 5                 | 6         |
| 3. Some terms of References of EIA studies are not well developed                                                    | 1              | 2     | 3       | 4        | 5                 | 6         |
| 4. Impact monitoring is often carried out after project approval                                                     | 1              | 2     | 3       | 4        | 5                 | 6         |
| 5. Monitoring of EMP is regularly carried out by the authority                                                       | 1              | 2     | 3       | 4        | 5                 | 6         |
| 6. Environmental audit is regularly carried out by the authority                                                     | 1              | 2     | 3       | 4        | 5                 | 6         |
| 7. Sensitization and training activities organized by REMA for EIA consultants, developers, local authorities, media | 1              | 2     | 3       | 4        | 5                 | 6         |

2. What do you think are the responsibilities of REMA in EMP's implementation?

| Role and responsibilities                                                                                    | YES | NO |
|--------------------------------------------------------------------------------------------------------------|-----|----|
| Did REMA appoint a specific environmental management representative(s)?                                      |     |    |
| Did REMA provide the resources essential to the implementation and Control of EMP?                           |     |    |
| Have all training needs been identified?                                                                     |     |    |
| Are staff competent to fulfill their roles under the EMPs?                                                   |     |    |
| Are appropriate procedures established for external communications regarding the EMPs?                       |     |    |
| Are proper document control procedures established?                                                          |     |    |
| Did REMA undertake regular site visits to inspect EMP implementation?                                        |     |    |
| Did REMA prepare periodic environmental consolidated reports on the monitoring progress of running projects? |     |    |

3. To what extent do you agree or disagree that REMA encourage Developers to participate in the implementation of EMP?

| Strongly agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|----------------|-------|---------|----------|-------------------|-----------|
| 1              | 2     | 3       | 4        | 5                 | 6         |

4. If EMP internal monitoring is not done, give the raisons

|                                                                                 | Strongly Agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|---------------------------------------------------------------------------------|----------------|-------|---------|----------|-------------------|-----------|
| 1. Lack of time                                                                 | 1              | 2     | 3       | 4        | 5                 | 6         |
| 2. Most of the terms of References of EIA studies are prepared by the authority | 1              | 2     | 3       | 4        | 5                 | 6         |
| 3. High cost to conduct such monitoring                                         | 1              | 2     | 3       | 4        | 5                 | 6         |
| 4. The authority does not follow up developers in the implementation of EMPs    | 1              | 2     | 3       | 4        | 5                 | 6         |
| 5. Local authorities do not follow up developers in the implementation of EMPs  | 1              | 2     | 3       | 4        | 5                 | 6         |
| 6. there no sanction planned for those who do not conduct internal monitoring   | 1              | 2     | 3       | 4        | 5                 | 6         |

## E. EFFECTIVENESS OF EIA IN KIGALI CITY AND ITS CONTRIBUTION FOR SUSTAINABLE DEVELOPMENT

1. How effective are EIA reports of projects conducted in the City of Kigali?

| Visible effectiveness | Directly or indirectly effective | Ineffective | Uncertain |
|-----------------------|----------------------------------|-------------|-----------|
| 1                     | 2                                | 3           | 4         |

2. To what extent do you think EIA process had contributed to sustainable development (Social, Economic and Environment) of the affected and interested people?

|                                                                                                     | Strongly effective | Effective | Neutral | Ineffective | Strongly ineffective | No option |
|-----------------------------------------------------------------------------------------------------|--------------------|-----------|---------|-------------|----------------------|-----------|
| 1. Contribution in resolving and prevention of environmental problems (soil erosion, pollution, etc | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 2. Contribution in job creation, taxes,..                                                           | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 3. Contribution in social wellbeing of affected and interested people                               | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. Impact monitoring is often carried out after                                                     | 1                  | 2         | 3       | 4           | 5                    | 6         |

### APPENDIX 3: Interview guide

Job title: .....

1. What are the challenges faced by REMA and/or RDB in the following face of EIA process?

| Phase              | Challenges/gaps |                         |
|--------------------|-----------------|-------------------------|
|                    | On Policy level | On implementation level |
| 1. Scoping (TOR)   |                 |                         |
| 2. Decision making |                 |                         |
| 3. Monitoring      |                 |                         |

2. What do you think about the participation of REMA in the decision making phase for EIA process and follow up phase?
3. How many projects did REMA stop because due to no compliancy with environmental regulations?  
List some examples.....
4. How do you judge the audits of EMP implementation for running projects conducted by REMA? Why?
5. How does REMA collaborate with RDB in the EIA process specially in the decision making phase and follow up phase?
6. How do you judge developers compliance in the implementation of EMP of EIA process?  
Why and what can be done to improve the situation.
7. To what extent do you think EIA process had contributed to sustainable development (Social, Economic, and Environment) of the affected and interested people?
8. What do you recommend for a better improvement of decision making phase and follow up phase of EIA in Rwanda?

**Thank you!**

## APPENDIX 4: Questionnaire for EIA Developers

### A. RESPONDENT'S IDENTIFICATION

1. First Name (optional): .....
2. Surname (optional): .....
3. Institution: .....
4. Job title: .....

### B. RESPONDENT'S QUALIFICATION AND EXPERIENCE

(Please highlight the right answer)

1. What is your level of education?

- |                            |   |
|----------------------------|---|
| Advanced level             | 1 |
| Bachelor's degree          | 2 |
| Post graduate diploma      | 3 |
| Master's degree            | 4 |
| Doctor of Philosophy (PhD) | 5 |

2. How long (in years) have you been working as EIA Developer?

|            |   |
|------------|---|
| >1         | 1 |
| 1-2        | 2 |
| 3-4        | 3 |
| 4-6        | 4 |
| 7 and over | 5 |

3. How many professional training related to EIA (workshops, seminars, etc) have you attended?

- |              |   |
|--------------|---|
| None         | 1 |
| 1-5          | 2 |
| 6-10         | 3 |
| 11-15        | 4 |
| 16 and above | 5 |

## C. PERCEPTION OF DEVELOPERS IN THE IMPLEMENTATION OF EMP IN EIA PROCESS.

(Please highlight the right answer)

5. What do you think that is the relationship between developers and their consultants generally?

|                                                                               |     |    |
|-------------------------------------------------------------------------------|-----|----|
| Developers provide enough information and follow-up                           | Yes | No |
| Developers hire a consultant and wait for the decision without any follow-up. | Yes | No |
| Regular meeting with developers, consultant and authority                     | Yes | No |
| Developers do not know anything about EIA                                     | Yes | No |

6. Most of the EIAs are carried out at the following stage of the project

|                                          |   |
|------------------------------------------|---|
| During the planning stage of the project | 1 |
| During the implementation of the project | 2 |
| After the implementation of the project  | 3 |

7. Most of the developers submit their projects to the authority because of the following reasons (you are welcome to provide multiple responses):

|                                                                   |   |
|-------------------------------------------------------------------|---|
| To fulfill the requirements of getting loans from local banks     | 1 |
| To fulfill the requirements to be financed by international funds | 2 |
| To obtain land title and building authorization from the District | 3 |
| To comply voluntarily with environmental organic law              | 4 |
| Others (specify)                                                  | 5 |

8. In which area of project are you involved in the EIA process?

.....  
 .....

9. If yes, at which stages of the EIA process are you involved (you are welcome to provide multiple responses)?

|                               |   |
|-------------------------------|---|
| Screening                     | 1 |
| Scoping                       | 2 |
| Assessing and mitigation      | 3 |
| Reviewing and decision-making | 4 |
| Monitoring                    | 5 |

10. Do REMA /RDB encourage you to participate in the implementation of EMP?

|     |    |
|-----|----|
| Yes | No |
| 1   | 2  |

11. To what extent do you agree or disagree that a developer is considered as a stakeholder in the implementation of EMP of the EIA process?

| Strongly agree | Agree | Neutral | Disagree | Strongly disagree | No option |
|----------------|-------|---------|----------|-------------------|-----------|
| 1              | 2     | 3       | 4        | 5                 | 6         |

12. What do you think are the responsibilities of Developers in EMP implementation?

.....

.....

13. When do you usually conduct internal monitoring of EMP implementation for your running projects?

| Monthly | Quarterly | Annually | At the end of a project | Randomly | Not done |
|---------|-----------|----------|-------------------------|----------|----------|
| 1       | 2         | 3        | 4                       | 5        | 6        |

14. When does REMA usually carry out the audits of EMP implementation for your running projects?

| Monthly | Quarterly | Annually | At the end of a project | Randomly | Not done |
|---------|-----------|----------|-------------------------|----------|----------|
| 1       | 2         | 3        | 4                       | 5        | 6        |

15. If EMP internal monitoring is not done, give the raisons

|                                                                                 | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | No option |
|---------------------------------------------------------------------------------|----------------|-------|---------|----------|-------------------|-----------|
| 1. Lack of time                                                                 | 1              | 2     | 3       | 4        | 5                 | 6         |
| 2. Most of the terms of References of EIA studies are prepared by the authority | 1              | 2     | 3       | 4        | 5                 | 6         |
| 3. High cost to conduct such monitoring                                         | 1              | 2     | 3       | 4        | 5                 | 6         |
| 4. The authority does not follow up developers in the implementation of EMPs    | 1              | 2     | 3       | 4        | 5                 | 6         |
| 5 . Local authorities do not follow up developers in the implementation of EMPs | 1              | 2     | 3       | 4        | 5                 | 6         |
| 6. there no sanction planned for those who do not conduct internal monitoring   | 1              | 2     | 3       | 4        | 5                 | 6         |

## E. EFFECTIVENESS OF EIA IN KIGALI CITY AND ITS CONTRIBUTION FOR SUSTAINABLE DEVELOPMENT

(Please highlight the right answer)

3. How effective are EIA reports of projects conducted in the City of Kigali?

| Visible effectiveness | Directly or indirectly effective | Ineffective | Uncertain |
|-----------------------|----------------------------------|-------------|-----------|
| 1                     | 2                                | 3           | 4         |

4. To what extent do you think EIA process had contributed to sustainable development (Social, Economic and Environment) of the affected and interested people?

|                                                                                                     | Strongly effective | Effective | Neutral | Ineffective | Strongly ineffective | No option |
|-----------------------------------------------------------------------------------------------------|--------------------|-----------|---------|-------------|----------------------|-----------|
| 1. Contribution in resolving and prevention of environmental problems (soil erosion, pollution, etc | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 2. Contribution in job creation, taxes,                                                             | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 3. Contribution in social wellbeing of affected and interested people                               | 1                  | 2         | 3       | 4           | 5                    | 6         |
| 4. Impact monitoring is often carried out after                                                     | 1                  | 2         | 3       | 4           | 5                    | 6         |

*Thank you .*

## **APPENDIX 5: Approved list of EIA experts**

REPUBLIC OF RWANDA



MINISTRY OF NATURAL RESOURCES

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### **ANNOUNCEMENT**

WITH VIEW OF IMPLEMENTING THE MINISTERIAL ORDER N° 003/2008 OF 15/08/2008 RELATING TO THE REQUIREMENTS AND PROCEDURE FOR ENVIRONMENTAL IMPACT ASSESSMENT, ESPECIALLY IN ARTICLE FIVE (5) ON SELECTION OF EXPERTS TO CONDUCT ENVIRONMENTAL IMPACT STUDY, THE MINISTRY OF NATURAL RESSOURCES IS PLEASED TO PUBLISH, HEREWITH ATTACHED, THE LIST OF AUTHORIZED ENVIRONMENTAL IMPACT ASSESSMENT (EIA) EXPERTS.

THE LIST IS VALID FROM THE 1st JULY 2012 UNTIL 30 JUNE 2013.

### **LIST OF AUTHORIZED ENVIRONMENTAL IMPACT**

- |                                                                                                                                                                  |                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. E.N.V Consult (T) Ltd</b><br>P.O. Box 31318 Dar es Salaam, Tanzania<br>Tel: 255 22 2772209                                                                 | <b>4. Robert Kariuki Wang'ombe</b><br>P.O. Box 5509-00506 Nairobi , Kenya                                                                                                                                                 |
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Done at Kigali, on .....

Stanislas KAMANZI

Minister of Natural Resources

## **APPENDIX 6: List of projects requiring EIA in Rwanda**

### **I. Infrastructure :**

1. Construction and repair of international roads, national roads, district roads and repair of large bridges;
2. Construction of industries, factories and activities carried out in those industries;
3. Construction of hydro- dams and electrical lines;
4. Construction of public dams for water conservation, rain water harvesting for agricultural activities and artificial lakes;
5. Construction of oil pipelines and its products, gases and storage tanks;
6. Construction of terminal ports and airports, railways and car parks;
7. Construction of hotels and large public buildings which house more than a hundred people per day;
8. Water distribution activities and sanitation;
9. Construction of public Land fills;
10. Construction of slaughter houses;
11. Construction of hospitals;
12. Construction of Stadiums and large markets;
13. Initial installation of communication Infrastructures.

### **II. Agriculture and Animal Husbandry**

1. Agricultural and breeding activities which use chemical fertilizers and pesticides in wetlands and large scale monoculture agricultural practices such as tea, coffee, flowers and pyrethrum etc...
2. Works and Activities that use bio-technology to modify seeds and animals

### **III Works in parks and in its buffer zone,**

### **IV. Works of extraction of mines.**

Source: (GoR, 2008b).